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The Role of Structural Fiscal Policy on Female Labor Force Participation in OECD Countries

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Prepared by Miyoko Asai, Qiaoe Chen, Jiro Honda, Xingwei Hu, and Qianqian Zhang*

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ABSTRACT: This paper examines the role of structural fiscal policies to promote female labor force participation and reduce gender gaps in labor markets in 26 OECD countries from 2000 to 2019. As both female labor force participation and many explanatory/control variables clearly exhibit non-stationarity (potentially leading to spurious regression results), we employ a panel vector error-correction model, in contrast with most previous empirical studies on this matter. Our analyses confirm statistically significant positive impacts of government spending on (1) early childcare and education, (2) active labor market programs, and (3) unemployment benefits, all of which would help encourage women to enter the labor force, while (4) an increase in relative tax rate on second earner could have negative impact on female labor force participation.

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WORKING PAPERS

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Contents

I. Introduction

1. **Promoting gender equality has been a common global goal for almost three decades, with increasing national initiatives across many countries.** In 1995, international communities reached a consensus to achieve gender equality and empower women during the landmark Fourth World Conference on Women in Beijing. The United Nations member states also put "achieving gender equality and empowering all women and girls" as the fifth sustainable development goals (SDG) by 2030, among other 16 SDGs. At the country level, many countries have started taking policy actions to improve gender equality. To facilitate member countries' efforts, the International Monetary Fund also established a strategy toward mainstreaming gender in its core activities in July 2022 to provide "granular and tailored macroeconomic and financial policy advice."[1]

2. **These efforts have led to significant progress in improving gender equality.** The World Economic Forum's Global Gender Gap Report in 2022 shows that globally, the gender gap is significantly reduced in health and education aspects, with 95 percent and 96 percent of the gap having been closed.[2]

3. **Large gaps, however, remain on multiple fronts.** For instance, gaps remain large in economic participation, opportunities, and political empowerment; particularly, gender gaps in labor markets—with high heterogeneity across regions—are sizable in many countries. Globally, women are less likely to participate in the labor market than men and bear more responsibility for unpaid care and domestic work. Also, on average, employed women earn only 77 percent of what men do. In addition, women have fewer opportunities to be in managerial positions or face more disadvantages in starting a business.[3]

4. **Furthermore, there are new challenges and opportunities in reducing gender gaps in the labor market following a series of shocks after the pandemic of COVID-19.[4]** At the onset of the outbreak, the pandemic had initially put more women than men in the frontline to fight with the virus (in the health and social sector workforce), while the COVID-19 crisis initially affected sectors of the economy with a large share of women workers in particular in the low-wage services sector such as retail, hospitality, food service, and the garment industry.[5] Post pandemic, however, the experience with temporary lock-downs may have inspired the need and ability for flexible working arrangements (e.g., remote/hybrid working style) in many countries, potentially encouraging more women to join the labor force. As inflation is higher than ever seen in several decades in many countries, intensifying structural reforms to improve productivity and economic capacity (such

[1] IMF Strategy Toward Mainstreaming Gender, IMF Policy Paper, July 2022.

[2] The World Economic Forum Global Gender Gap Report covers 146 countries, collects data on 14 indicators and groups them into four dimensions. The 14 indicators include labor force participation rate, wage equality for similar work, estimated earned income, legislators, senior officials and managers, professional and technical workers, literacy rate, enrollment in primary education, enrollment in secondary education, sex ratio at birth, healthy life expectancy, women in parliament, women in ministerial positions and years with female head of state, share of tenure years. The 14 indicators are then weighted to get the four sub-indexes. See details in the Global Gender Gap Report 2022.

[3] Detailed comparison can be found here: https://www.unwomen.org/en/what-we-do/economic-empowerment/facts-and-figures#notes.

[4] These shocks to the global economy include the Russia's war in Ukraine, climate change challenges, and high inflation with cost-of-living crisis.

[5] Special-Series on COVID-19 (by staffs of IMF, UN Women, and UNDP). Gender Equality and COVID-19: Policies and Institutions for Mitigating the Crisis (https://www.imf.org/-/media/Files/Publications/covid19-special-notes/en-special-series-on-covid-19-gender-equality-and-covid-19.ashx). And Stevenson, B. (2021) Women, work, and families: recovering from the pandemic-induced recession.

as those expanding workforce) could ease supply constraints and support monetary policy in fighting inflation, though with a time lag.[6]

5. **This paper contributes to the literature by undertaking a thorough and updated empirical approach to identify fiscal policy measures to address the remaining gender gap in the labor market.** Following the increasing recognition of the importance of gender equality, multiple empirical studies have explored the relationship between the female labor force participation rate (LFPR) and other macroeconomic indicators. Some of the studies using time-series data, however, have not fully addressed the non-stationarity issue of data used for empirical analyses. Since non-stationarity issues can have serious implications for the accuracy and reliability of econometric studies, it is important to carefully examine the stationarity properties of data and use appropriate statistical methods to account for non-stationarity. To update the impacts of fiscal policy on female LFPR, the paper thoroughly examines the stationarity of the data and applies a panel vector error correction model (to address identified non-stationarity and endogeneity). Further, we conduct variable selection (a modified Sharpley-value approach) to avoid possible over-parameterization or misspecification.

6. **Our findings on the role of structural fiscal policy are as follows:**

- Variables are non-stationary, and thus, any analyses without taking into account stationarity (e.g., a two-stage least squares (2SLS) panel model) are not suitable (non-stationarity issues can have serious implications for the accuracy and reliability of econometric studies).
- Structural fiscal measures can promote female labor force participation. Governments' financial support on childcare and early education, active labor market programs, and unemployment benefits could encourage women to join the labor market. The positive impact of government spending on unemployment benefits is largely channeled through government spending on active labor market programs.[7]
- Some measures, however, can have negative impacts. Increasing public pensions, for instance, could have a negative impact on female LFPR, possibly by encouraging women close to retirement to leave the labor market earlier. An increase in the relative tax rate on second earner is found to have a negative impact on the female labor supply.

7. **The remainder of the paper is organized as follows.** Section II briefly discusses the existing literature on the determinants of female LFPR, focusing on the fiscal policies' role. Section III presents the latest developments in the labor market from a gender lens and OECD member countries' public social spending. Section IV discusses the empirical methods used for this paper and the relevant results. Section V provides a preliminary conclusion and its implication to policymakers.

II. Literature Review

8. **Many empirical studies explore factors contributing to the outcomes of the female labor force.** Among the main economic literature, studies on labor demand and supply factors (e.g., production, unemployment, development of part-time jobs) find that unemployment rate and per capita income usually

[6] IMF, World Economic Outlook, October 2022.

[7] Participation in a labor market program is often conditional on receiving unemployment benefits. Ulku and Georgieva (2022) identified that, based on their data on unemployment benefits and active labor market policies in 191 countries in 2019 and 2020, participation in a training program is among others (periodic reporting on the job search and registration with public employment services) most commonly used eligibility conditions for unemployment benefits.

exhibit significant effects on female LFPR (Verick, 201choudhry4; Taşseven et al., 2016; Demirhan, 2017), while some argue that the relationship with economic development represents a U shape (Lechman, 2014; Chapman, 2015; Choudhry & Elhorst, 2018). Demographic factors are also extensively studied, including fertility, migration, marriages, and education level, which are also among the determinants of female LFPR, of which scales depend on country profiles (De Laat and Sevilla-Sanz, 2011; Busso and Fonseca, 2015; Kumari, 2018). Culture, social norms, laws and regulations, and other institutional arrangements have been studied to show that discrimination against women in society was a barrier to integrating women into the labor market (Fernández (2013) Gay, Hicks et al. (2018), Islam, Muzi and Amin (2018), Cavapzzi et al. (2021)).

9. **Some empirical studies examine the role of government policies in women's decision to participate in the labor force.** These studies generally highlight the importance of education and childcare services, income taxes, paid maternity/paternity leaves, and other policies (e.g., welfare, migration). Mincer (1985), for instance, argues that public policies on taxation, social security, welfare, or migration measures—initially not intended to influence female employment—can influence female behavior in the labor market. Other studies (e.g., Gustafsson et al. (1992), Anderson, P and P.B Levine (1999), Jaumotte (2003), and Thévenon (2013)) confirm the importance of childcare services.[8] Hotz. J.V. and J.K. Scholz (2001) reviewed empirical studies on the effects of earned income tax credit in the U.S. and argued that the literature provided consistent evidence that earned income tax credit has a positive impact on LFPR for single-parent households and a modest negative impact for secondary workers in two-parent families. Low and others (2020) confirm that imposing time limits on receiving social safety transfers in the U.S. in 1996 raised the employment of single mothers, and Hoynes and Schanzenbach (2012) found that the US SNAP program reduced the labor supply of single mothers.

10. **Particularly, some empirical studies use panel data to explore the role of fiscal policies on female labor force participation.** These studies mostly focused on OECD member countries (or specific groups of advanced economies), reflecting the data availability (only for these countries).

- Jaumotte (2003) and Thévenon (2013) conducted panel OLS regression analyses on the role of fiscal policies for female labor force participation for seventeen OECD member countries.[9] They covered the period from 1985 to 1999 and 1980 to 2007, respectively. Both studies find that increasing public childcare services could have a greater impact on female LFPR in countries with a relatively high degree of employment protection, and the effect of family benefits and length of paid leave vary across welfare regimes.
- Stadelmann-Steffen (2008) groups policy instruments into four factors (i.e., taxation, family policy, unemployment protection, and social security) and conducted a cross-sectional OLS regression using 2000 data in 28 OECD countries to test the relationship between female LFPR and fiscal policies. His study also concludes that family policy and unemployment protection are most important in increasing female LFPR, employment ratio of female to male, and female full-time and part-time employment. In general, taxation and social security policy, did not show a significant influence on female employment.

[8] Gustafsson et al. (1992) use logit and probit models and find that high-quality public childcare in Sweden helps increase female's working hours. Anderson, P. and P.B Levine (2000) estimate that in the United States, the elasticity of female labor force participation to the market price of childcare was between -0.05 and -0.35, with higher elasticity for less skilled women.

[9] Building on Jaumotte (2003), Thévenon (2013) uses updated data and policy instrument interaction analysis and controls the impact of institutional instruments. The policy instruments under their study include tax treatment of second earners relative to single individuals, family benefits such as childcare subsidies, child benefits, paid parental leave, and tax incentives to share paid work between spouses, together with female education and labor market conditions as control variables. The work also covers the impact of fiscal policies on female's full-time/part-time participation.

- Christiansen et al. (2016) use micro-level survey data for 24 European countries to differentiate macro-level policy influence from individual employment decisions on the outcome of female employment using data from 2002 to 2012 and micro-level survey data for 2002 and 2012. Their study also confirms that public spending on childcare could encourage females' decision to work while spending on family allowance has the opposite impact. In addition, providing parental leave could increase the possibility of female employment; however, this incentive is reversed once its length is beyond 140 weeks. Similarly, they also find that a higher marginal tax rate on secondary earners is associated with a lower chance of employment.
- Grigoli et al. (2018) studied the drivers of female LFPR in different age groups in 23 advanced economies using both macro-aggregate data and individual-level data from the 1980s to 2016. Their study includes cyclical and structural changes in the economy, labor market policies and institutions, and targeted policies on various groups of population. Their empirical analysis shows that higher labor tax wedges and more generous unemployment benefits are associated with lower female LFPR. Higher public spending on active labor market programs is also associated with higher female LFPR for young and prime-age women. In addition, better access to childcare (measured as public spending on early childhood education and care) and longer paid maternity leave are associated with higher female LFPR, while greater pension scheme generosity seems to encourage early retirement.

11. **Most of these empirical studies, however, are silent on the stationarity issue.** One exception is Grigoli et al. (2018), which indicate that their data on female LFPR do not have unit root, while Jaumotte (2003) and Thévenon (2013) do not indicate whether their data are stationary. Since non-stationarity issues can have serious implications for the accuracy and reliability of econometric studies, such as leading to spurious regression results and inaccurate parameter estimates (e.g., Madsen et al., 2008; Emerson, 2011), it is important to carefully examine the stationarity properties of data and use appropriate statistical methods to account for non-stationarity if necessary. This paper addresses these issues by thoroughly examining the existence of unit root for all variables used for the analyses and employing the Vector Error Correction Model (VECM).[10]

12. **According to the literature (mostly based on microdata), some structural fiscal policy measures are at play.** Specifically, those measures include changes in tax structure and government spending on early childhood education, unemployment benefits, and active labor market program. This paper further examines how these measures are associated with female LFPR.

- **Early childcare and education**: Public spending on early childcare and education supports the childcare center enrollment rate and reduces mothers' burden to take care of younger children at home so that they could participate in paid work. Multiple studies (Gustafsson et al. (1992), and Tekin (2005)) —mostly based on microdata—argue that public spending on early childcare and education, such as public childcare subsidies, could increase their motivation to join in the labor market. Specifically, Tekin (2005) examines the impact of actual subsidy receipt of single mothers on their employment in the US, using data from the 1999 National Survey of America's Families. It finds that single mothers are highly responsive to childcare subsidies by increasing their employment. Gustafsson et al., (1992) also finds that the public spending on

[10] Some research in labor economics (e.g., Queneau and Sen (2013), Ozdemir. Z et al. (2011), Mishra. V et al. (2009), and Engelhardt et al. (2004)) discuss unit root in the female labor force participation study. In Queneau and Sen's study of 12 countries, they do not find unit root for 7 countries (Australia, Finland, Germany, Japan, the Netherlands, Portugal, and Spain), but for the rest 5 countries (Canada, Italy, Norway, Sweden, and the U.S). Mishra V. et al. (2009) find unit roots for 28 OECD countries. Engelhardt et al. (2004) also found unit roots in their study, but Ozdemir. Z et al. (2011) do not in their study of 3 countries (Australia, Canada, and the U.S.). Some of these studies do not touch on the cross-sectional dependent variable test, while using conventional unit-root test methods on cross-sectional dependent panel data could result in substantial size distortion.

early childcare and education in Sweden encourages labor market activity of women with preschoolers, based on the analysis using the Swedish household survey.

- **Unemployment benefits**: There have been mixed empirical results on the effect of unemployment benefits on female LFPR in the literature. On the one hand, Farber et al. (2015) argue that, based on the analyses using Current Population Survey microdata, the availability of unemployment benefits had a negative effect on labor force exit in the US. Lechthaler et al. (2021)—following an experiment on the impact of unemployment benefits on labor force participation and job search effort—find that generous unemployment benefits would help keep people in the labor force by encouraging subsequent job searching efforts. Jakobsen et al. (2016) studied married migrant women's labor behavior in Denmark and found that they joined the labor market so that they are entitled to participate in the unemployment insurance system, which also gave them the "union right," such as for maternity leave. On the other hand, generous unemployment benefits could discourage active status in the labor force due to slack or arrangement of a single-earner family (i.e., less incentive to become a two-earner family) (Grigoli et al., 2018). There is also literature that finds no significant relationship between social security wealth and female labor supply decisions (McCarty, 1990).

- **Active labor market program**: Active labor market programs, such as job training and job search assistance, can help women who are unemployed or underemployed to acquire new skills or find suitable job opportunities, which can increase their labor force participation. Pimkina et al. (2020) argue that, in view of the past studies on some country cases (e.g., Uganda, Liberia, Dominican Republic), the empirical evidence linking training programs with female LFP is largely inconclusive. Grigoli et al. (2018) finds that, based on the panel data analyses for advanced economies, higher spending on active labor market programs not only raise female working or seeking employment, but also are associated with a lower likelihood of exit from the labor force, because it offsets the negative effect of job-replacement by computerization, i.e.," routinization"[11] on participation.

- **Old-age pensions:** There is limited research on pension wealth's effect on women's labor supply, especially labor supply well before retirement since most literature investigates the impact on employment at older ages. Grigoli et al. (2018) finds that more public spending on old-age pensions reduces LFPR for workers older than 55. Similarly, Bodná and Nerlich (2020) find that less generous early retirement schemes and stricter eligibility criteria are important for fiscal sustainability and improvement in labor supply as a whole, through the incentivization to old-age workers delaying their retirement. Sanchez-Marcos and Bethencourt (2018) quantify the effect on female labor supply by removing spousal and survivor pension benefits in their analysis and find that this will significantly increase female employment throughout the life cycle. Scarce literature on pension spending's impact on female LFPR warrants further research on this regard.

- **Tax rate**: Research on the relationship between female LFPR and income tax rate tilted to find the negative impact of income tax rate on labor supply, and this effect also varies along the income distribution spectrum. As tax measures, these studies focus on the labor tax wedge and/or the relative tax rate for the second earner.[12] Kaygusuz (2010) find that about one-quarter of married female LFPR rise in the 1980s in the U.S. was explained by the change in the income tax structure. However, Bar and Leukhina (2009) also

[11] Das and Hilgenstock (2018) define routinization as middle-skilled jobs consist of routine tasks which follow a precise set of procedures easily automated by information and computer technology (ICT), thus displacing middle-skilled labor, whereas tasks performed by high-skilled labor are complementary to ICT and those performed by low-skilled labor largely neutral.

[12] The labor tax wedge measures the cost of income tax relative to total wages paid by the employer for a single-earner family, while the relative income tax rate measures the difference between the average tax rate for a single earner and the average marginal tax rate for the second earner in a family with two children (see Appendix III for details).

studied the income tax reform in the U.S. and its impact on married couples from 1960 to 2000, and they found that the change in tax law accounted for only 8 percent of the increase in the proportion of two-earner couples in the 1980s, but no effect in the other decades. One possible explanation is that higher tax rates may either force people to stay in the labor force to earn more to offset the loss of income or discourage them from working altogether (Bar and Leukhina (2009), Kaygusuz (2010), and Guner et al. (2012)). Coelho et al. (2022) provide an exhaustive overview of the interactions between tax policy and gender equality, and their empirical studies (based on the analyses using the latest household and individual level data covering 22 economies) suggest that the additional tax burdens faced by secondary earners in non-individualized, progressive systems, help explain labor supply gender gaps.

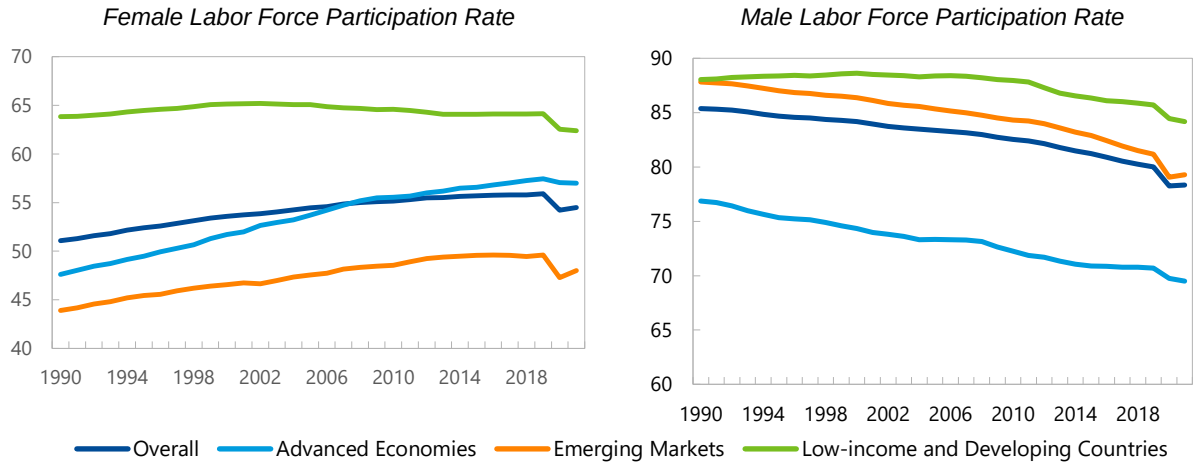
III. Stylized Facts

13. **Globally, over the past two decades, female LFPR (which includes both people employed and actively seeking employment) has gradually risen, while male LFPR has declined slightly.** This improvement was driven mostly by the significant improvement in advanced economies (AEs) in female LFPR, where female LFPR increased by almost 10 percent from 47.6 percent in 1990, while emerging markets (EMs) saw a 4 percent increase. Low-income countries (LIDCs) experienced a slight decline (by 1.5 percentage points), though their average female LFPR in LIDCs is much higher than in other countries, staying above 60 percent (Figure 1, left side).

14. **In contrast, the average male LFPR in the world declined from its peak in 1990 (77 percent) to 2021, and this trend is shared by all different income groups (Figure 1 right side).** Similar to female LFP, male LFPR in LIDCs are higher than other country groups, staying close to 90 percent in most years, while in AEs, male LFPR stays above 70 percent in general, representing the lowest and fastest decline among other groups.

15. **The COVID-19 pandemic had a strong impact on LFPR.** As discussed in Tang et al. (2020), the COVID-19 crisis affected sectors of the economy with a large share of female workers (such as retail, hospitality, food service, and the garment industry) in many countries. Due to the lockdown and closing of childcare centers, women—who already undertook the majority of unpaid care and domestic work before COVID-19—took on even more unpaid household work and childcare. Within two to three years after the pandemic, in most countries, both female and male LFPR recovered afterward, reaching their pre-COVID level. In terms of the magnitude of the impact and the pace of recovery, there is obviously significant heterogeneity by country.

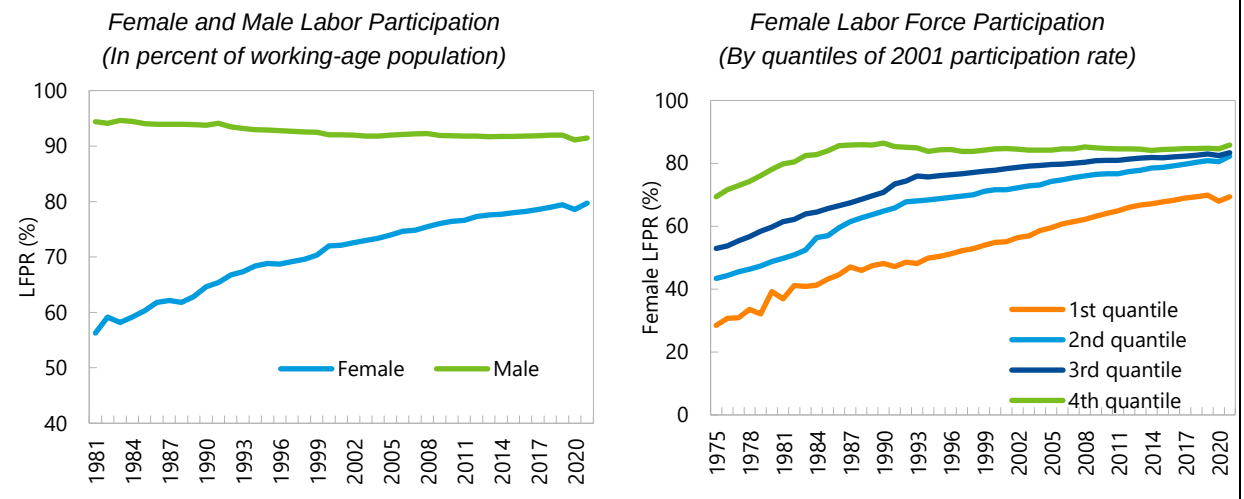
Figure 1. LFPR for Population Above 25-Years Old
(In percent, simple average)



Data source: ILO and Author's calculation.

16. **Among OECD countries, on average, their female LFPR follows an upward trend (Figure 2).** On average, female LFPR steadily increased from 60 percent in the 1980s to 72 percent in the early 2000s, more recently at a slower pace. Male LFPR has slightly declined by 2 percent from 94 percent to 92 percent in the same period, further narrowing of the gender gap. Splitting the sample countries by the level as of 2001, we find that the countries with the lowest female LFPR made constant progress since the 1970s, while changes in the participation rate in those at the highest level were very modest for the last few decades.

Figure 2. Female and Male LFPR

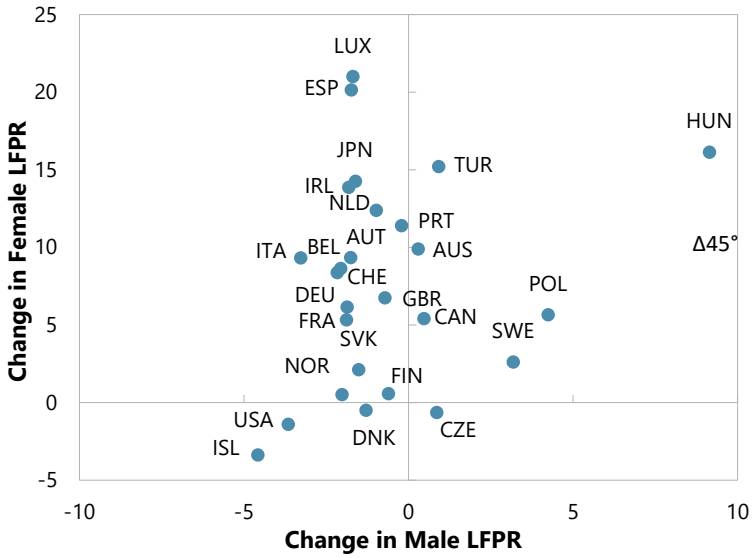


Sources: OECD and Author's calculation.

17. **There is large heterogeneity across countries in the pace of female LFPR increase (Figure 3).** Within the OECD, the majority of countries experienced a large improvement in female LFPR, while only several countries witnessed a slight decline in female LFPR or stable female LFPR. For example, Nordic countries' female LFPR remained very stable, and female LFPR in the US and Iceland declined. Similarly, male

LFPR in Nordic countries remained relatively stable, while most countries saw their male LFPR decline. It is worth noting that Nordic countries' gender gaps in LFPR were narrower than others in 2000, which largely explains the subsequent smaller gains.

Figure 3. Change in Female Prime LFPR in OECD (2000 to 2021)



Sources: OECD and Author's calculation.

18. **In light of the earlier findings from the literature,** we examine the correlations between female LFPR and each of the structural fiscal policy measures (while acknowledging that these correlations do not indicate causal relationships) (Figure 4). The analyses suggest a possible association between female LFPR and these structural measures, warranting further exploration.

Figure 4. Correlation between Key Public Spending and Female LFPR (Continued)

Public Spending on Early Childcare and Education
(2017–2019)

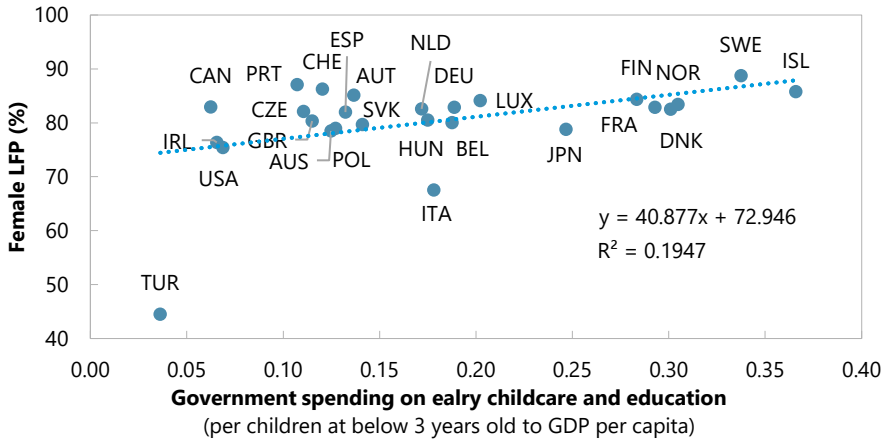
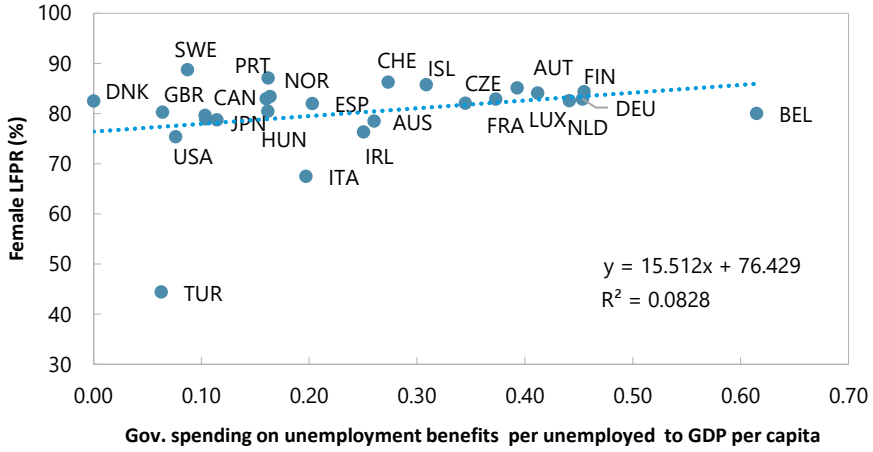
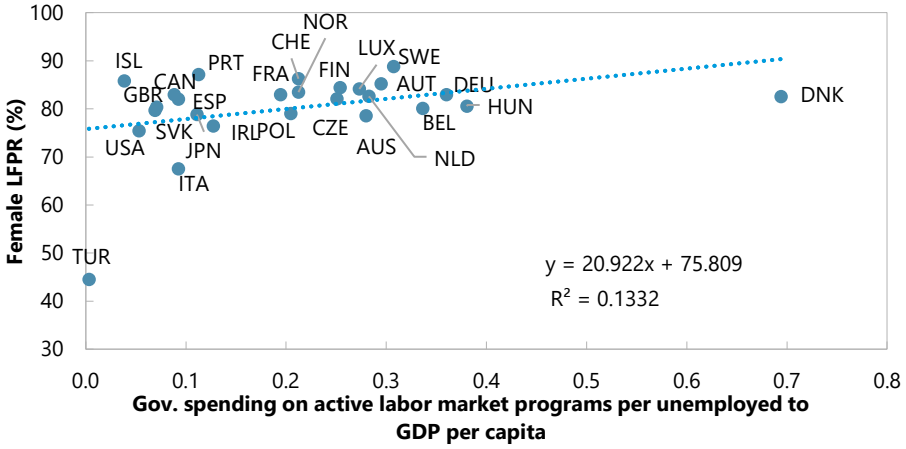


Figure 4. Correlation between Key Public Spending and Female LFPR (Concluded)

Female LFPR and Gov. Spending on Unemployment Benefits (2017–2019)



Female LFPR and Public Spending on Active Labor Market (2017–2019)

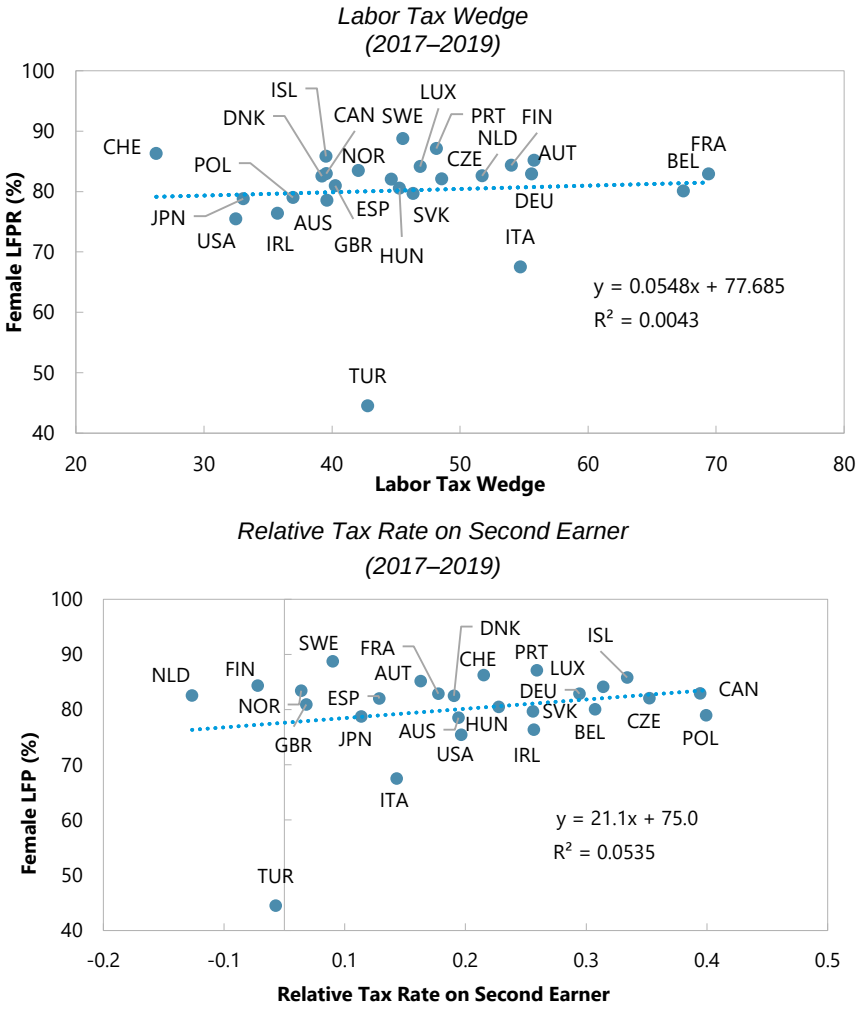


Sources: OECD and Author's calculation.

- **There are generally positive correlations between female LFPR and government spending on early childhood education, unemployment benefits, and active labor market program**.

- **Similarly, correlations exist between female LFPR and income tax rate (Figure 5).** The scatterplots reveal a positive correlation between female LFPR and labor taxes, including the labor tax wedge and the relative income tax rate on the second earner. This may look counterintuitive, while several factors could impact the positive correlation. With using country-level data, other factors would need to be controlled, to better understand the role of tax rate.

Figure 5. Tax Wedge and Female LFPR



Sources: OECD and Author's calculation.

IV. Empirical Analysis

Data

19. **The empirical analysis uses mainly the OECD social expenditure database to extract key indicators on government spending.** Following the literature study, we organize the explanatory variables into three groups: macroeconomic variables, fiscal policy variables, and labor market variables (Box 1). All spending-related variables (2000-2019) are calculated as spending per head of eligible population relative to GDP per capita. These spendings include public spending on early childcare and education, family cash benefits, healthcare, pension, unemployment benefits, and active labor market programs. The labor tax wedge data is from OECD, and the relative tax rate for the second earner is calculated using an approach by Jaumotte (2003).[13] The tax progressivity indicator is calculated by Geber et al. (2020). Other data are from the World

[13] Appendix III provides details on data sources and definitions used in the empirical study.

Economic Outlook, UN and OECD employment database, and World Development Indicators database. The country covered in this study includes 26 member countries from OECD.[14]

Box 1. 2SLS Regression

Before embarking on cointegration analyses, an update of the previous studies with additional fiscal policy variables and control variables is performed. A two-stage least squares (2SLS) panel instrumental variable model with the following specification is used, consistent with Jaumotte (2003), Thévenon (2013), and Grigori et al. (2018). We use the latest data up to 2019 for 26 OECD countries in the specification of:

$$y_{i,t} = \alpha P_{it} + \beta L_{it} + \delta X_{it} + \epsilon_i + \mu_t + \varepsilon_{i,t}$$

where $y_{i,t}$ represents prime-age female/Male LFPR (25-54) of countries *i* in year *t*, with which the results will be compared between female and male. P_{it} represents the time-varying fiscal policy measures, including tax policy measures (tax progressivity, relative tax rate for second-earners, labor tax wedge), and expenditure policy measures (public spending on active labor market programs, early childhood care and education, family cash benefits, healthcare, old-age pension, and unemployment benefits). L_{it} represents labor market characteristics and variations, including female's crude birth rate, employment protection legislation, employment ratio between services and industrial sectors, coordination in wage setting, part-time employment share, union density, years of education, and weeks of parental paid leave. X_{it} represents macroeconomic conditions, including GDP per capita, number of internet users, output gap, trade openness, restrictiveness of migration policy, and urban population. In addition, the model also includes country fixed effects(ϵ_i) and time-fixed effects(μ_t). $\varepsilon_{i,t}$ is the error term.

We have also tested the endogeneity of fiscal policy variables and applied instrumental variables that have met the exclusion restriction criteria, including lagged explanatory variables. The econometrically tested endogenous policy variables include public spending on family cash benefits per head of population below 20 years old and active labor market program per unemployed person for the female LFPR regression, and public spending on unemployment benefits per unemployed for male LFPR regression. Here, the instrumental variable approach intends to address the potential reverse causalities and bias from unobserved cofounders. The lagged IV method mitigates the endogeneity problem by reducing both bias and the root mean squared errors. For example, some family cash benefits are only provided to civil servants, and spending on active labor market programs are targeted at the unemployed, therefore such spending could be impacted by labor supply decision, rendering them being endogenous to the outcomes of LFPR and employment. The regressions are in heteroskedasticity-robust estimations. Multicollinearity is also tested, and the final specifications have necessarily dropped the redundant variables. To account for the wearing-off effects of education length on LFPR, we also add the years of education in squared terms in the regressors to examine a non-linear relationship.

Our regression results are generally consistent with previous studies. As seen from Appendix II, on the fiscal policy variables, the regressions show consistently that increasing the relative tax rate on second earners and labor tax wedge are associated with the decline of female LFPR, though not necessarily all specifications are significant. On the contrary, increasing public spending on childcare, family cash benefits, and active labor market programs are associated with a significant rise in female LFPR. Other public spending, spending on old-age pension, health care, and unemployment benefits are negatively associated with female LFPR. In addition, longer paid parental leave and education, and deepening of urbanization are also associated with a rise in female LFPR, while a more integrated economy (measured by trade openness) is negatively associated with female LFPR, consistent with Grigori et al. (2018).

[14] Using the dataset, we updated the previous studies based on a two-stage least squares panel instrumental variable model (Box 1).

Panel Unit Root Tests

20. **According to econometric theory, if time series or panel variables are non-stationary, regressing such variables with least-square methods may produce spurious results.** Therefore, testing a variable's stationarity becomes a necessary step for any econometric exercise. The unit-root test is generally used to find non-stationarity in time or panel series. In addition, more recent econometric developments indicate that macroeconomic panel data are likely cross-sectionally dependent. For example, they face common shocks, and the effect on one country could spill over to other countries. Some studies (O'Connell (1998), Pesaran (2015)) also show that using conventional unit-root test methods on cross-sectionally dependent panel data could result in substantial size distortion.

21. **For these reasons, we first tested the cross-sectional dependence before conducting panel unit root tests.** The cross-sectional dependence test shows that except for the labor tax wedge and tax progressivity, all other variables are cross-sectionally dependent. For the cross-sectional dependent variables, we use Pesaran Crips CIPS unit-root test with lags and trends. And for the cross-sectional independent variables, we applied five conventional panel unit root tests, namely, Im-Pesaran-Shin, Augmented Dickey-Fuller, Phillips-Perron, Breitung, and Harris-Tzavalis, considering the panel cross-section numbers (*N*) and length of time series (*T*). Since sometimes the various tests do not produce consistent results, we used judgment to confirm its stationarity based on the majority of the test results. We also performed unit root tests on the first difference of the variables.

22. **The panel unit root tests for LFPR, policy variables, and macro variables indicate that most variables are integrated of order (1).** Most variables are tested with unit root at its level but not at its first differencing, i.e., they are non-stationary or integrated of order (1), or *I(1*). Because they are *I*(1) series, we could not use the OLS regression but consider the cointegration regression methods. (See Table AII.2 and 3 on the unit root tests results). While these variables are expressed in ratios, the shocks to them have increased in the past twenty years, together with the spillover effect from other countries could have contributed to their variances and intensified the non-stationarity.

23. **Moreover, these *I (1)* processes demonstrate strong co-movements along several linear directions.** This observation could be validated by conducting cointegration tests, which find the number of *I(0)* linear combinations among these *I(1)* processes. The number varies when the group of endogenous variables changes, so we decide the number and the group at the same time. When no cointegration exists, a VAR in difference could be a proper model; however, with cointegrated *I(0)* terms, we have to include them in the VAR in difference. (Granger and Newbold (1974), Engle and Granger (1987)). The final model would be a panel vector error correction model (VECM).

Variables Selection

24. **Before undertaking VECM analyses, we conduct variables selection, to avoid possible over-parameterization or misspecification.** Building on previous studies (Jaumotte (2003), Thévenon (2013) and Grigoli et al. (2018)), we first start with 22 policy and control variables (panel data series available for the analyses), including GDP per capita, output gap, tax progressivity, the relative tax rate on the second-earner, labor tax wedge, government spending on childcare and early education, government spending on family cash benefits, government spending on old-age pension, government spending on healthcare, government spending on active labor market programs, government spending on unemployment benefits, coordination of wage setting, crude birth rate for women, services employment to industry employment ratio, employment protection regulation, length of parental paid leaves, part-time employment ratio, union density, tertiary education rate,

restrictiveness of migrant integration policies, trade openness and urban population (see details in Appendix III for details). However, not all of them have enough explanatory power for LFPR. Also, as some of them are highly correlated, one variable's explanatory and predictive power could have already been explained by others. Therefore, we select a subset of these variables (or features, predictors) for the studies of LFPR, and place the selected ones in their appropriate positions in the VECM model. To avoid subjective pick and choice, we apply a modified Sharpley-value approach, a machine-learning algorithm, to separate these available variables into three categories: (i) endogenous to LFPR; (ii) exogenous but significant to LFPR; and (iii) nonsignificant to the change of LFPR. The selection criteria for endogenous variables are based on the likelihood-ratio tests, using the 5 percent critical value of Chi-squared distribution. Also, at the 5 percent significance level, the selection of exogenous ones is based on their t-statistics in the equation of labor participation, controlling the selected endogenous variables (see Appendix I for the details on model selection based on the method of Hu (2020)).[15]

25. **Based on the above-mentioned selection process, we find eleven explanatory variables to model female LFPR in the panel VECM.** Among them, ten series are endogenous to the LFPR at a 5 percent significance level: public active labor market program spending; output gap; government unemployment benefit spending; female tertiary education rate; trade union density; employment ratio in services to industry; government childcare spending; government pension spending; GDP per capita; and labor tax wedge. The part-time employment rate is selected as an exogenous variable in the short-run equation of the LFPR. Although the relative tax rate for the second earner (measured as income tax rate difference between the second earner and the first one) is not estimated as statistically significant, we consider it for the VECM analyses for comparison purposes. We reject other variables for the panel VECM because their explanatory power is either negligible or largely explained by the selected ones. Finally, the estimated number of cointegration equations is three for the selected series. Five explanatory variables are selected for the male LFPR in the panel VECM. These variables are: trade union density, male tertiary education rate, government spending on active labor market programs, government spending on unemployment benefits, and employment ratio in services to industry. GDP per capita is selected as an exogenous variable in the short-run equation. Finally, there are two cointegration equations in the male VECM.

Cointegrated Auto-Regression Analysis

26. **We choose to apply a panel VECM because it could simultaneously address non-stationarity and endogeneity issues.** As found in the baseline, some variables are endogenous to the female LFPR. Other cointegration methods, such as FMOLS or DOLS, will not be suitable to address the endogeneity issue. However, we found that the panel VECM fit most to our purpose. It consists of two parts: a long-run equilibrium and a short-run deviation, with an error correction term to adjust the short-run deviation from its long-run equilibrium. The long-run equilibrium relationship means that variables are cointegrated and they move together in the long run. The general form of VECM is as follows:

$$\Delta Z_t = \alpha\beta' Z_{t-1} + \gamma_1 \Delta Z_{t-1} + \cdots + \gamma_k \Delta Z_{t-k} + \xi \Delta X_t + \varepsilon_t$$

where

[15] Hu (2020) employed a Bayesian approach and game theory to select variables from the set of candidates by evaluating each variable's marginal gain/loss in the overall model performance. Unlike many algorithm-based variable selection approaches, such as the general to specific test, his method also considers model uncertainty.

- Z_t is the vector of endogenous variables at time *t*, including the female (male) labor force participation rate (prime age between 25 and 54);
- X_t is the vector of exogeneous variables at time *t*;
- Δ is the first-difference operator;
- *k* is the lag length of the VAR in difference, which drops the error correction term $\alpha\beta' Z_{t-1}$ from the above VECM model;
- $\alpha, \beta, \gamma_1, \ldots, \gamma_k, \text{and } \xi$ are unknown coefficient matrices, to be estimated from the historical data;
- ε_t is the vector of residual at time *t*.

The variables Z_t and X_t are selected through the above-mentioned variable selection process. The stationary and pre-determined $\beta' Z_{t-1}$ are the long-run equations between the endogenous variables where **β** is the cointegrating vectors. The matrix **α**, called adjustment coefficients, measures the speed the long-run relations $\beta' Z_{t-1}$ is integrated to the short-run dynamics (the VAR in difference). So, $\alpha\beta' Z_{t-1}$ is the error correction to the VAR in difference. The rank of **α** or **β** is also selected in the above-mentioned program at the same time we find Z_t and X_t. Finally, in practice, the lag length *k* is determined by AIC or BIC criteria in the VAR in level variables.

27. **We run several statistical tests to establish the numbers of cointegration equations and the dependent variables in such equations.** Since there are potentially n-1 cointegration relationships in the long run, where n is the number of variables, we conducted cointegration tests to identify the maximum number of cointegration equations based on the unrestricted trace test. Afterward, we choose the variables which are mostly endogenous as a dependent variable in the cointegration equation based on the block endogeneity tests, except for the female LFPR, which is our focus and is as a default dependent variable. Finally, we run residual unit root tests of the cointegration equations as a robustness check to ensure it is stationary. (Details of test results are in the Appendix Table AII.5 and 6).[16]

Panel VECM Results

28. **The panel VECM regression analysis reveals that fiscal structural policies can have a significant impact on female labor force participation rate (Appendix Table AII.7).**

- In the long run, the labor tax wedge, and the relative tax rate on second earners are negatively associated with female LFPR, whereas government spending on early childcare and education, unemployment benefits, and active labor market programs are positively associated with female LFPR. Notably, government spending on pensions is negatively associated with female LFPR. Additionally, the output gap and tertiary education rate also positively impact female LFPR, but GDP per capita and trade union density have a negative impact.

[16] The VECM model specifies the exogenous and endogenous variables in the long-run, short-run, or both equations. So, the Granger causality is modelled through the regression on the lagged values. Both the long- and short-run equations contain lagged values as regressors. For contemporaneous causality, we study the responses of the endogenous variables to the Cholesky shocks on the VECM (Sims, 1980). To do so, we order the endogenous variables and their equations according to their block-exogeneity test statistics in the VECM system. Consequently, the ith shock (i.e., the unexpected change on the ith endogenous variable) contemporaneously affects the i+1st, i+2nd, i+3rd, etc. endogenous variables. Therefore, the endogenous variables have a restricted ordering in the VECM model.

- In the short run, our results suggest that increasing government spending on active labor market programs is associated with an increase in female LFPR, while increasing government spending on unemployment benefits is associated with a decline in female LFPR. However, we did not find a significant direct impact on female LFPR from changes in government spending on early childcare and education or pensions. Similarly, neither the labor tax wedge nor the relative tax rate for second earners impacts female LFPR in the short run at a significant level. Another endogenous variable that significantly impacts female LFPR in the short run is the female tertiary education rate. The part-time jobs variable is an exogenous variable in the model, and it is found to have a significantly positive impact.

29. **Impulse response analyses (to combine the short-run and long-run effects) confirm the positive impacts of government spending on childcare and education, unemployment benefits, and active labor market programs and the negative impact of relative tax rate on second earner**. To fully understand the combined effects from both the short run and long run among the explanatory variables, we conduct both single and accumulative impulse analysis (Table 1 and Figure 6). The impulse is Cholesky decomposed (with degree of freedom adjustment) and variables are ordered based on their relative exogeneity from a block exogeneity test. It shows that changes in key policy variables can impact female LFPR directly through its coefficient or indirectly through its impact on other variables in the system. Notably, under accumulative response analysis, increases in government spending on childcare and education, unemployment benefits, and active labor market programs can boost female LFPR starting one year later (t+1), while an increase in pension spending could have a negative impact on female LFPR at a margin. On the tax policy side, the increase of relative tax rate on the second earner could have negative impact on female LFPR as well.

- **The size of the female LFPR's response to key policy variables could be further decomposed (Table 2)**. For example, one standard deviation (SD) change in government spending on childcare education could increase female LFPR by 0.08 percent in year 2, with 0.06 percent from the short-run impact. One SD change in government spending on active labor market programs could increase female LFPR by 0.14 percent, with 0.09 percent due to short-run impact. However, for one SD change in government spending on unemployment benefits in year 2, the female LFPR could be reduced by 0.01 percent due to the negative contribution of short-run impact of 0.06 percent, while long-run effect is positive 0.05 percent. In year 3, the long-run effect overcomes the short-run effect and results in a positive impact on female LFPR.
- **Further analyses reveal that the impacts of unemployment benefits are largely channeled through active labor market programs.** To measure the effects of a particular channel on the response function, we apply perturbation techniques in which we artificially manipulate the coefficients of the channel. Thus, the effects are the difference of the response functions between with or without the perturbation in the VECM dynamic system. Specifically, we let the estimated coefficients of the channel to be increased by 1 percent; then the changes of the impulse response function, in percentage, measures the sensitivity of the response function with respect to the channel. The result shows that a change in public spending on active labor market programs could have strong direct positive impact on female LFPR. However, the positive impact on female LFPR from change in public spending on unemployment benefits is mainly channeled through the public spending on active labor market programs, which indicates that government spending on active labor market program plays a more important role in boosting female LFPR.

30. **Using the female employment rate, further analyses confirm that public spending on active labor market programs has a significant positive influence on employment.**[17] This indicates that government support for active labor market programs not only attracts more women to join the formal labor

[17] Female employment rate is the total female employed divided by the female working age population.

market, but also supports their employment. In contrast, we could not find a statistically significant impact of the spending on unemployment benefits on female employment rate. The spending could only help attract women to the labor force, but not support their employment. In addition, increasing of public pension spending also has a statistically significant negative impact on female employment rate. (Appendix Table All.9 and graph).

Table 1. Impulse Response to Key Variables

Period	Public Spending on Early Childcare and Education	Public Spending on Unemployment Benefits	Public Spending on Pension	Public Spending on Active Labor Market Programs	Labor Income Tax Wedge	Relative Tax Rate on Second Earner
1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00099
	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
2	0.00082	-0.00012	-0.00013	0.00136	-0.00005	-0.00124
	(0.00000)	(-0.00001)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
3	0.00115	0.00039	-0.00077	0.00218	0.00017	-0.00139
	(0.00000)	(-0.00002)	(-0.00001)	(0.00000)	(0.00000)	(0.00000)
4	0.00129	0.00096	-0.00133	0.00279	0.00024	-0.00136
	(0.00000)	(-0.00002)	(-0.00001)	(0.00000)	(-0.00001)	(0.00000)
5	0.00140	0.00146	-0.00177	0.00330	0.00029	-0.00135
	(0.00000)	(-0.00002)	(-0.00001)	(0.00000)	(-0.00001)	(0.00000)
6	0.00150	0.00189	-0.00214	0.00375	0.00033	-0.00135
	(0.00000)	(-0.00002)	(-0.00001)	(0.00000)	(-0.00001)	(0.00000)
7	0.00159	0.00228	-0.00248	0.00414	0.00037	-0.00135
	(0.00000)	(-0.00002)	(-0.00001)	(0.00000)	(-0.00001)	(0.00000)
8	0.00168	0.00263	-0.00279	0.00450	0.00042	-0.00137
	(0.00000)	(-0.00002)	(-0.00001)	(0.00000)	(-0.00001)	(0.00000)
9	0.00177	0.00295	-0.00308	0.00482	0.00047	-0.00138
	(0.00000)	(-0.00001)	(-0.00001)	(0.00000)	(-0.00001)	(0.00000)
10	0.00186	0.00323	-0.00335	0.00512	0.00053	-0.00139
	(0.00000)	(-0.00001)	(-0.00001)	(0.00000)	(-0.00001)	(0.00000)

Cholesky One S.D. (d.f. adjusted) Innovations

Cholesky ordering: Relative Tax rate on Second Earner, Female LFPR, Public Spending on Pension, Output gap, Labor income tax wedge, Public Spending on Unemployment Benefits, Tertiary Education Rate, Trade Union Density, Public Spending on Active Labor Market Programs, GDP per capita, Public Spending on Early Childcare and Education

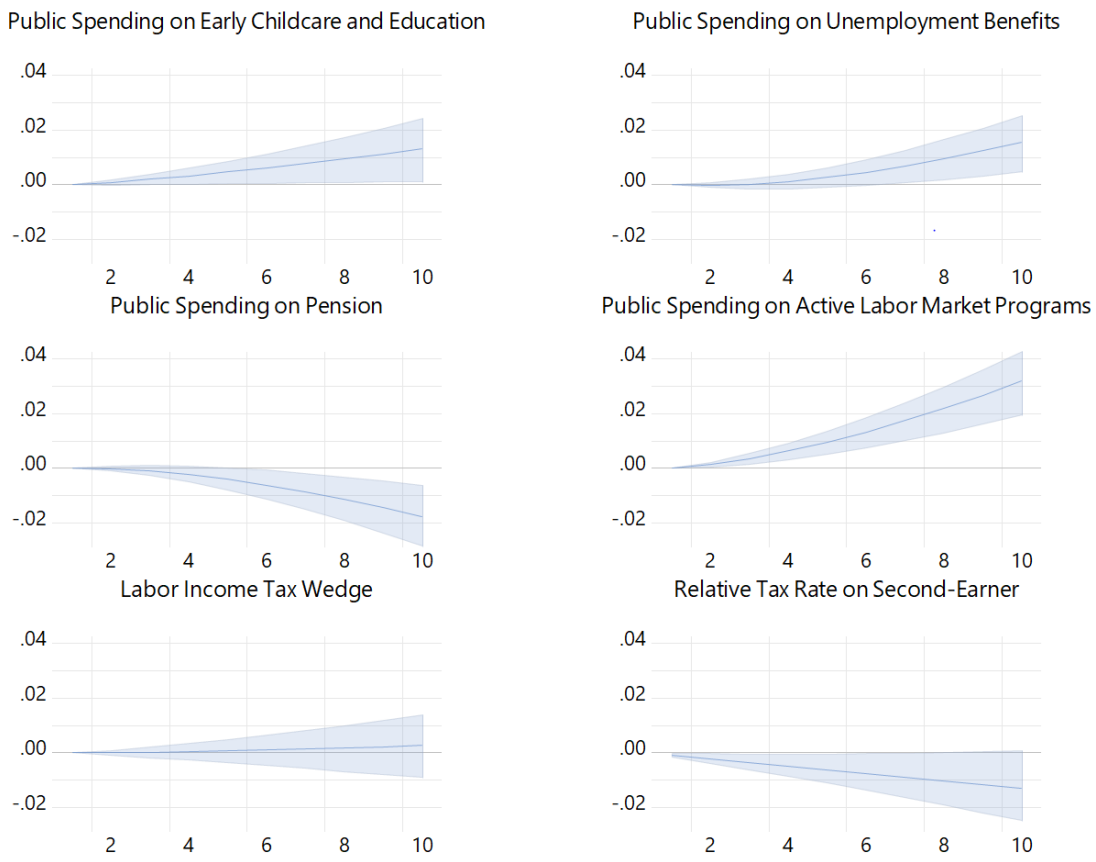
Standard errors: Bootstrap (10000 repetitions) standard deviations in parentheses

Table 2. Decomposing the Short-Run and Long-Run Effect in the Impulse Analysis for Female LFPR to Key Policy Variables

	Relative Tax Rate of Second Earner			Public Pension Spending			Labor Tax Wedge			Public Spending on Unemployment Benefits			Public Spending on Active Labor Programs			Public Spending on Childcare		
Period	IRF	short-run	long-run	IRF	short-run	long-run	IRF	short-run	long-run	IRF	short-run	long-run	IRF	short-run	long-run	IRF	short-run	long-run
1	-9.91E-04	-9.91E-04	-9.91E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2	-1.24E-03	-1.13E-03	-1.10E-03	-1.27E-04	4.46E-04	-5.73E-04	-4.97E-05	3.65E-05	-8.62E-05	-1.21E-04	-6.13E-04	4.91E-04	1.36E-03	9.68E-04	3.89E-04	8.24E-04	6.70E-04	1.54E-04
3	-1.39E-03	-1.30E-03	-1.20E-03	-7.70E-04	3.90E-04	-1.03E-03	1.69E-04	2.78E-04	-1.48E-04	3.85E-04	-6.85E-04	9.40E-04	2.18E-03	1.34E-03	7.59E-04	1.15E-03	8.51E-04	3.05E-04
4	-1.36E-03	-1.29E-03	-1.29E-03	-1.33E-03	3.04E-04	-1.41E-03	2.39E-04	3.41E-04	-1.90E-04	9.63E-04	-6.44E-04	1.34E-03	2.79E-03	1.47E-03	1.10E-03	1.29E-03	8.52E-04	4.53E-04
5	-1.35E-03	-1.28E-03	-1.38E-03	-1.77E-03	2.50E-04	-1.74E-03	2.85E-04	3.58E-04	-2.15E-04	1.46E-03	-6.23E-04	1.71E-03	3.30E-03	1.52E-03	1.42E-03	1.40E-03	8.47E-04	5.96E-04
6	-1.35E-03	-1.28E-03	-1.47E-03	-2.14E-03	2.18E-04	-2.04E-03	3.28E-04	3.60E-04	-2.27E-04	1.89E-03	-6.15E-04	2.03E-03	3.75E-03	1.54E-03	1.70E-03	1.50E-03	8.45E-04	7.35E-04
7	-1.35E-03	-1.28E-03	-1.55E-03	-2.48E-03	2.00E-04	-2.32E-03	3.74E-04	3.59E-04	-2.26E-04	2.28E-03	-6.11E-04	2.32E-03	4.14E-03	1.55E-03	1.96E-03	1.59E-03	8.43E-04	8.68E-04
8	-1.36E-03	-1.27E-03	-1.63E-03	-2.79E-03	1.88E-04	-2.57E-03	4.23E-04	3.57E-04	-2.14E-04	2.63E-03	-6.09E-04	2.58E-03	4.50E-03	1.55E-03	2.20E-03	1.68E-03	8.42E-04	9.97E-04
9	-1.38E-03	-1.27E-03	-1.70E-03	-3.08E-03	1.82E-04	-2.80E-03	4.74E-04	3.55E-04	-1.95E-04	2.94E-03	-6.07E-04	2.81E-03	4.82E-03	1.55E-03	2.41E-03	1.77E-03	8.41E-04	1.12E-03
10	-1.39E-03	-1.27E-03	-1.78E-03	-3.35E-03	1.77E-04	-3.02E-03	5.27E-04	3.54E-04	-1.68E-04	3.23E-03	-6.07E-04	3.01E-03	5.12E-03	1.55E-03	2.61E-03	1.86E-03	8.41E-04	1.24E-03
11	-1.41E-03	-1.27E-03	-1.85E-03	-3.60E-03	1.75E-04	-3.21E-03	5.82E-04	3.53E-04	-1.35E-04	3.49E-03	-6.06E-04	3.19E-03	5.39E-03	1.55E-03	2.78E-03	1.95E-03	8.41E-04	1.35E-03

Note: The interaction between short-run and long-run effect is omitted in the table.

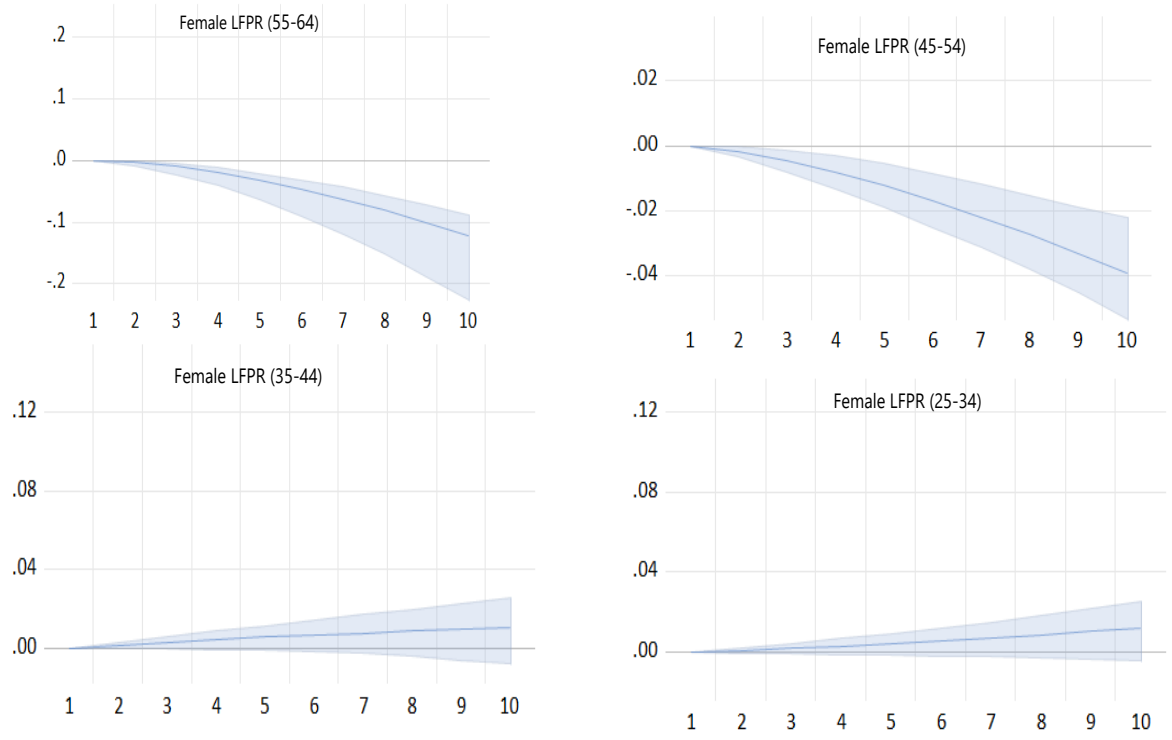
Figure 6. Accumulative Response of Female LFPR to Impulse of Key Variables



Source: OECD and Author's calculation.
Note: Government spending variables are divided by the eligible population and GDP per capita.

31. **While the impulse analysis shows that increasing public pension generosity could result in the reduction of female LFPR growth, we extend our analysis to shed light on the potential channels (Figure 7).** Many studies have identified that the generosity of the pension system could incentivize people to withdraw from the labor force early. These studies focus on the labor force close to retirement age, typically over 50 years. For example, Duval (2003) studies the impact of the pension system and other social transfer programs on the retirement decisions of older males (55-59) in OECD countries. He finds that the early-retirement mechanisms have sizable effects on their retirement decisions. Our study focuses on the behavior of prime-aged (25-54) female LFPR, so we break down it into three different age groups (25-34, 35-44, 45-54) and add the older age group (55-64) to run the same regression again. The results confirm that increasing pension spending (i.e., more generous pension payments, could negatively impact on the LFPR of the older age group (55-64 and 45-54). The impulse response of the younger age group (25-34 and 35-44) is positive, which may indicate that the expected pension earnings could also be a factor in impacting the decision of the young generation.

Figure 7. Impulse Response of Female LFPR to Government Spending on Pension by Age Groups



Source: OECD and author's calculation.
Notes:
1. The chart shows the accumulated responses to Cholesky Standard Deviation (degree of freedom adjusted) at 95 percent confidence interval, using standard percentile bootstrap with 5000 bootstrap repetitions.
2. Government spending on pension is divided by the population older than the actual retirement age and GDP per capita.

32. **While our study focuses on the female LFPR, we also conduct a similar regression on male LFPR (Appendix Table AII.8).** We find fewer explanatory variables to be important in the panel VECM regression compared to female LFPR. Additionally, government spending on active labor market program and unemployment benefits, are confirmed to positively impact male LFPR in the long run. Other factors, such as high union density, tertiary education rate, and job opportunities in services vs industries, are also found to support high male LFPR. But only government spending on unemployment benefits shows a significant impact on male LFPR in the short run. The GDP per capita is included as an exogenous variable in the short-run analysis with a positive sign, showing that high economic development could result in higher male LFPR. Finally, impulse analysis on fiscal policy does not provide any conclusive result.

33. **Compared with the 2SLS results, the panel VECM provides more accurate and nuanced analysis.** First, the 2SLS model result is not reliable in theory due to its non-stationarity problem. Second, even after controlling data and country coverage, when we compare the result of VECM in the long run with the 2SLS, we note that 2SLS model could not confirm the statistical significance of some policy variables, though it has the same sign on coefficients as in the VECM.

Robustness Test

34. **We checked the robustness of the baseline results of the VECM analyses by comparing the coefficients under various modifications and conducting out-of-sample forecasting.** Such modifications include VAR in the first difference and VECM with different lags. The standard VAR in first difference didn't have the cointegration equation but only focused on the short-run dynamics. The standard VAR gives similar results for the short-run dynamics as in the VECM. While in the VECM we selected one lag length based on the Akaike information criterion (AIC) and the Schwarz information criterion (SIC) for VAR, we also tested the VECM by adding another lag. The results are also very close to the original VECM. Moreover, it also showed that the impact of public pension spending is more significant in the second year. The out-of-sample forecast by the VECM model also shows a relatively small forecast error, indicating the VECM is quite robust.[18]

V. Concluding Remarks

35. **This paper aims at deepening the understanding on the role of structural fiscal policy measures to promote female labor force participation and reduce gender gaps.** Specifically, we carefully examine the stationarity of variables of the panel data series, since non-stationarity issues can have serious implications for the accuracy and reliability of econometric studies. The paper does find non-stationarity and thus explores cointegration analyses (VECM) to look into the role of structural fiscal policy measures (e.g., changes in tax structure and government spending on early childhood education, unemployment benefits, and active labor market program). While we observe different short-term and long-term impacts with the VECM, the impulse response analyses provide consistent results over time.

36. **The impulse response analyses confirm that some policy measures taken by the government promote female labor force participation.** Those measures are: government support for early childcare and education, active labor market programs, and unemployment benefits. Among them, the impacts of active labor market programs are found to be significantly larger than others. And the positive impact from government spending on unemployment benefits is also largely channeled through active labor market programs. A caveat for these analyses is that these findings—based on the overall size of each spending item (relative to GDP per capita)—do not take into account their design and other features of each spending item. To explore the use of these spending items, policymakers would need to carefully consider the design of each spending (tailored to the country's circumstances) to maximize the efficiency of spending, as they do for all other expenditures.

37. **The paper also confirms that high relative tax rate on female labor could discourage female entering in the labor force.** In addition, while the paper only finds that labor tax wedge has negative effect on female labor force participation in the long run, the impulse analysis could not confirm whether changing the labor tax wedge could encourage female labor supply within medium term. These results, in general, are not inconsistent with the literature, as previous studies on the relationship between female labor force participation rate and income tax rate find mixed results. To precisely gauge the impacts of tax structure, more granular analyses, using microdata, would likely be warranted.

38. **The results of government pension generosity call for further analyses.** With further breakdown of data by different age groups, we find that generous pension packages could lower female labor force participation, particularly, for old age people. From a policy perspective, if the level of pensions is deemed to

[18] The out-of-sample forecast error measured by Mean Absolute Percentage Error (MAPE)—based on the estimation through 2016—is 0.18 percent for female LFPR in 2018 and 2019.

adversely affect female's decision to participate labor force, consideration could be given to exploring other gender-friendly policies (e.g., spending on active labor market programs) to offset its effect. To draw robust conclusion on the implications of pension generosity, factors such as pension design, entitlements and payment mechanisms should be further examined.

39. **These findings have significant policy implications, particularly for countries with low female LFPR.** First, countries should consider enhancing the structural fiscal measures (government support for early childcare and education, active labor market programs, and unemployment benefits). As the impact of each of these measures may differ, the measure with the largest impact may be selected to maximize the efficiency of spending, taking into account a country's own experiences and environments. Second, given the significance of active labor market programs, countries could explore and invest more in the most effective programs to improve human capital, with proper design being crucial. Finally, these measures have long-term positive impacts on promoting female LFPR and reducing gender gaps, making it important to sustain the measures over a long period. It continues to be important to further explore policy measures (addressing these gender gaps), taking into account the individual circumstances of each country (particularly for developing countries).

40. **As a future study, a more in-depth analysis on the impacts of the COVID-19 pandemic on female LFPR would also be warranted.** Female LFPR was severely impacted by the outbreak of COVID-19 pandemic, particularly for women working in the sectors with a large share of female workers (such as retail, hospitality, food service, and the garment industry) (Tang, et al. 2020). Within two to three years after the pandemic, in most countries, female LFPR recovered afterward, reaching their pre-COVID level. However, there was high heterogeneity by country in terms of the magnitude of the impact and the pace of recovery. As a future study, a more in-depth analysis on the factors contributing to the impacts and any policy responses to mitigate the impacts of such temporary shocks would be warranted.

Appendix I. Model Selection Methodology

We select a VECM model to study the relationship between the LFPR and its covariates for two primary reasons. First, the LFPRs affect most of the potential covariates. We use vector autoregression (VAR) to address the endogeneity issue (cf, Sims (1980)), in which the lagged values of LFPR act as regressors for other endogenous variables. So, the VECM focuses on the Granger endogeneity which we find in Granger causality tests. Secondly, most of the data series are tested to be of *I(1)* processes, though rate variables could still be *I(0)* whenever they contain a mean-reverse mechanism. Simply converting *I(1)* into *I(0)* series by taking first differences would lose critical components in the VAR modeling (cf, Engle and Granger (1987)). These components are called error corrections, which is added back to the VAR in difference in the VECM model.

In building the VECM model from 22 panel data series of which the LFPR is our primary interest, there are four unknown elements: (1) the number of cointegrating equations in the VECM; (2) the endogenous variables to the LFPR; (3) exogenous variables to the LFPR variable in the model, controlling the endogenous ones; and (4) statistically redundant variables to LFPR in the VECM model. These four elements interplay with each other, and a change of anyone could affect all others. So, we capitalize on a machine-learning procedure to automatically build the model. In the iterative procedure, we fix one element while holding others unchanged. Then, we rotate other elements to fix any inconsistencies until the resulting model converges and no further fine-tunes are required. The following algorithm details the learning process.

Appendix Table AI.1. Model Selection Algorithm

Step 1	Assign an initial guess for the number of cointegration equations.
Step 2	Select endogenous variables by their weighted contribution to the loglikelihood in the *LFPR*-equation in many random sequences of modeling scenarios.
Step 3	Select exogenous variables from the unselected variables in *Step* 2 by their significance to the *LFPR*-equation.
Step 4	Using the selected endogenous and exogenous variables to test the number of cointegrating equations; then update the number if necessary.
Step 5	Repeat *Step 2-Step4* until the selection results are stable.

Let *N* be the set of all candidate covariate variables and *v*(*T*) be the loglikelihood function of the *LFPR*-equation when *T* are the endogenous variables in the VECM. So, (*N*, *v*) is a coalitional game if we consider all possible subsets of *N* for *T* and the payoff function *v(T)*. Consider the following random sequence of all data series in *N*:

$$LFPR \rightarrow i^{(1)} \rightarrow i^{(2)} \rightarrow i^{(3)} \dots\dots \rightarrow i^{(n-1)} \rightarrow i^{(n)}.$$

where $i^{(k)}$ is the *k*-th data series in the random sequence. Starting from LFPR, we sequentially admit one variable at a time to the model and finally make a hierarchy of *n+1* models: the first model consists of LFPR alone; the second consists of $LFPR$ and $i^{(1)}$; $\dots\dots$; and the $n+1$st consists of $LFPR$ and all data in N. In the random sequence, the marginal contribution of variable $i^{(k)}$ *is*

$$v\left(i^{(1)}, i^{(2)}, \dots\dots, i^{(k)}\right) - v\left(i^{(1)}, i^{(2)}, \dots\dots, i^{(k-1)}\right).$$

When the true model variables, say ***S***, are $\left\{i^{(1)}, i^{(2)}, \dots\dots, i^{(k)}\right\}$ or $\{i^{(1)}, i^{(2)}, \dots\dots, i^{(k-1)}\}$, then the marginal contribution, scaled by 2, converges asymptotically to a chi-squared distribution. Compared to the model

$\{i^{(1)}, i^{(2)}, \ldots\ldots, i^{(k)}\}$, the coefficients for the *de facto* variable $i^{(k)}$ are all zeros in the nested model $\{i^{(1)}, i^{(2)}, \ldots\ldots, i^{(k-1)}\}$. So, the chi-squared distribution has degrees of freedom equal to the number of zero restrictions. Thus, the likelihood-ratio test could determine ***S*** contains $i^{(k)}$ or not at a specified significance level.

However, the true VECM model variables ***S*** are never known. Therefore, we calculate many randomly added loglikelihood values by randomizing many modeling hierarchies. Finally, a weighted average of marginal contributions is calculated for each variable in *N*, compared to the .05 Chi-squared critical value to decide whether the variable is selected or not as endogenous to the LFPR. Moreover, for any two random sequences, variable *i*'s added loglikelihood values are different in general. They are affected by both overfitting and underfitting problems. When irrelevant variables precede variable *i* in the sequence, they create underfitting to the added loglikelihood value of variable *i*. When some true model variables are preceded by variable *i* in the sequence, the added loglikelihood value contains an overfitting issue. For example, if variable *i* lies in one of the first few positions in the sequence, its added likelihood value tends to be larger than that when it lies in one of the last few positions, others remaining unchanged. In the latter case, much of its explanatory power has already been accounted for by the data preceded variable *i* in the sequence. Therefore, we should apply different weights on the added loglikelihood values. The weights mitigate both the overfitting and underfitting.

The weights come from a deliberate mechanism design which forces the expected model performance to be fairly distributed among all candidates in *N*. As we know, the weights for marginal contributions in the renowned Shapley value in the coalitional game (*N*, *v*) fairly distribute v(*N*) among all candidate variables in *N*. As *v*(*N*) contains noise from irrelevant variables, *v*(*N*) is either overfitted or underfitted. Also, the performance of the true model *v*(***S***) is not observable. So, we modify the distribution such that the expected model performance E(*v*(***S***)) is attributed to all potential variables in *N*, and the expectation assumes equal opportunity among all the candidates. This is the end objective of the mechanism design, which, together with three other Shapley-value or fairness axioms, is used to derive a new set of weights for marginal contributions (see Hu (2020) for the weights, derivation, and computation). These modified Shapley-value weights are then used for calculating a weighted average of added loglikelihood values, i.e., weighted likelihood-ratio test statistic. Like the weights in the Shapley value, the modified weights depend only on variable's location in the random sequence and the size of *N*. Finally, the weighted likelihood-ratio test statistics are used to decide the selection of the candidates, using the 5 percent critical value of the chi-squared distribution.

Appendix II. Regression Results

Appendix Table AII.1. Country Coverage

Exercise	Countries
2SLS OLS Unit root test VECM	Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States

Appendix Table AII.2. Cross-sectional Dependence Test

Variable	CD-test
Dependent variables	
Female LFPR	27.750***
Employment rate for female	36.790***
Male LFPR	7.140***
Tax Variables	
Tax progressivity	1.820*
Relative tax rate on second-earner	2.180**
Labor tax wedge	-1.280
Spending variables	
Old-age pension per population older than effective retirement age	12.550***
Health care per population	9.430***
Active labor market programs per unemployment persons	32.400***
Unemployment benefits per unemployed persons	46.420***
Early childcare and education per child under 3 years old	3.660***
Family cash benefit excl. maternity leave per population under 20 years old	9.960***
Labor market variables	
Part-time employment ratio	18.790***
Services employment to industry employment ratio	69.330***
Union density	49.370***
Crude birth rate for women	19.820***
% of female with tertiary education	92.130***
% of male with tertiary education	81.160***
Internet users	75.270***
Other social	
Output gap	46.600***
Trade openness	67.500***
GDP per capita	62.900***
Urban population	40.200***
Restrictiveness of migrant integration policies	-2.040**

*** p<0.01, ** p<0.05, * p<0.1

Note: government spending variables are divided by GDP per capita

Appendix Table AII.3. Panel Unit Root Tests for Cross Sectionally Dependent Variables

	Lag				Stationarity
	0	1	2	3	
Dependent variable					
Female LFPR	2.770	2.847	1.829	0.881	*I(1)**
Employment rate for female	4.792	4.017	5.863	3.564	*I(1)*
Male LFPR	-0.839	0.092	1.529	3.329	*I(1)*
Tax Variables					
Tax progressivity	0.160	1.824	3.091	3.025	*I(1)*
Relative tax rate on second-earner	1.127	2.867	4.817	4.736	*I(1)**
Spending variable					
Old-age pension per population older than effective retirement age	4.000	4.803	5.404	4.377	*I(1)*
Healthcare per population	1.793	2.290	4.638	5.460	*I(1)*
Active labor market per unemployment persons	2.792	1.775	2.700	5.742	*I(1)*
Unemployment benefits per unemployed persons	0.710	0.980	2.729	2.836	
Early childcare and education per child under 3 years old	1.999	2.590	3.785	3.430	*I(1)*
Family cash benefit excl. maternity leave per population under 20 years old	-1.354*	0.389	0.776	3.356	*I(1)*
Labor market variables					
Part-time employment ratio	-0.081	-0.700	0.354	-0.974	*I(1)*
Services employment to industry employment ratio	-1.188	-0.557	1.915	1.018	*I(1)*
Union density	2.143	2.603	4.839	7.234	*I(1)*
Crude birth rate for women	0.830	0.586	1.031	1.178	*I(1)*
% of female with tertiary education	-1.757**	-1.613*	1.143	3.234	*I(1)**
% of male with tertiary education	-0.516	0.666	1.970	6.496	*I(1)**
Internet users	-4.076***	-6.985***	-3.205***	1.061	*I(0)*
Other social variables					
Output gap	1.762	0.854	0.802	2.181	*I(1)*
Trade openness	1.654	2.088	4.646	4.294	*I(1)*
GDP per capita	4.898	3.713	3.537	3.638	*I(1)*
Urban population	-0.089	-2.820***	-0.565	0.055	*I(1)**
Restrictiveness of migrant integration policies	3.125	2.354	1.097	0.007	*I(1)*

*** p<0.01, ** p<0.05, * p<0.1

Notes: government spending variables are divided by GDP per capita

*denotes the variable's first difference is cross-sectional independent and its first different variables are tested with traditional unit root tests.

Appendix Table AII.4. Panel Unit Root Tests for Cross Sectional Independent Variables

	Tax progressivity	Labor tax wedge
Im-Pesaran-Shin	-0.956	-0.940
Augmented Dickey-Fuller	62.686	123.095***
	-0.036	-4.371***
	0.048	-2.363***
	1.048	6.971***
Phillips-Perron	72.842**	72.147**
	-0.922	-1.660**
	-0.727	-1.220
	2.044**	1.976**
Breitung	-0.609	-0.917
Harris-Tzavalis	*7.932*	*7.957*
Stationality	*I(1)*	*I(1)*

*** p<0.01, ** p<0.05, * p<0.1

Note: government spending variables are divided by GDP per capita

Appendix Table AII.5. VAR Lag Order Selection Criteria Test

Lag	LogL	LR	FPE	AIC	SC	HQ
0	599.925	NA	0.000	-5.09026	-4.91144	-5.01814
1	7070.445	12212.7600	0.000	-59.86533	-57.54058*	-58.92767*
2	7241.574	305.2175	1.30e-41*	-60.10021*	-55.62954	-58.29703
3	7362.594	203.2717	0.000	-59.90125	-53.28465	-57.23255
4	7475.860	178.4789	0.000	-59.63515	-50.87263	-56.10092
5	7609.377	196.5184	0.000	-59.54439	-48.63595	-55.14463
6	7744.388	184.6915	0.000	-59.46657	-46.41220	-54.20129
7	7906.158	204.4884	0.000	-59.62042	-44.42013	-53.48962
8	8067.482	187.1639*	0.000	-59.77041	-42.42420	-52.77408

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Appendix Table AII.6. Cointegration Test

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.440215	618.2184	334.9837	0
At most 1 *	0.307917	399.4819	285.1425	0
At most 2 *	0.213535	260.7274	239.2354	0.0036
At most 3	0.169873	170.1693	197.3709	0.4775
At most 4	0.101805	99.98068	159.5297	0.9966
At most 5	0.067116	59.50288	125.6154	1
At most 6	0.039915	33.31114	95.75366	1
At most 7	0.023749	17.95455	69.81889	1
At most 8	0.015038	8.893252	47.85613	1
At most 9	0.007499	3.18085	29.79707	1
At most 10	0.000874	0.342946	15.49471	1
At most 11	3.56E-05	0.013427	3.841465	0.9076

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Appendix Table AII.7. Panel VECM Results for Female LFPR

Vector Error Correction Estimates

Included observations: 377

Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	CointEq2	CointEq3
Female LFPR - LFPR_F(-1)	1.00000	0.35957**	-0.02551***
		(0.18066)	(0.00632)
		[1.99027]	[-4.03471]
GDP per capita - GDPPCA(-1)	0.04967*	1.00000	-0.00718
	(0.02891)		(0.00624)
	[1.71791]		[-1.15005]
Output gap - GAP(-1)	-0.03554***	-0.07240	1.00000
	(0.00917)	(0.05435)	
	[-3.87628]	[-1.33194]	
Gov. spending on early child care and education - E	-0.32426***	1.96547***	-0.00685
	(0.07398)	(0.36664)	(0.01169)
	[-4.38305]	[5.36078]	[-0.58589]
Gov. spending on unemployment benefits - UNEMP	-0.29437***	-1.21739***	-0.00736
	(0.04499)	(0.13375)	(0.00863)
	[-6.54279]	[-9.10223]	[-0.85323]
Gov. spending on old age pension - OLDAGE(-1)	0.13899***	-0.09864	0.01525***
	(0.02334)	(0.08714)	(0.00478)
	[5.95493]	[-1.13198]	[3.19152]
Gov. spending on active labor market - EMP(-1)	-0.39059***	-1.08721***	-0.04515***
	(0.04323)	(0.16533)	(0.00793)
	[-9.03542]	[-6.57601]	[-5.69133]
Labor tax wedge - TAXWEGE(-1)	0.05517*	0.93882***	-0.00516
	(0.03258)	(0.09911)	(0.00693)
	[1.69358]	[9.47248]	[-0.74512]
Relative tax rate on second earner - TAXR(-1)	0.15447***	-0.43024**	0.01475
	(0.04923)	(0.16878)	(0.01254)
	[3.13781]	[-2.54915]	[1.17675]
% of female with tertiary education - TERTIARY_F(-1)	-0.04756*	0.67641***	0.00099
	(0.02723)	(0.11382)	(0.00530)
	[-1.74622]	[5.94260]	[0.18690]
Employment ratio - EMPR(-1)	-0.00958	-0.95858***	0.01761***
	(0.02496)	(0.07740)	(0.00576)
	[-0.38401]	[-12.38526]	[3.05505]
Trade union density - TUD(-1)	0.03908***	-0.08740***	-0.00473**
	(0.00766)	(0.02936)	(0.00185)
	[5.10436]	[-2.97658]	[-2.55063]
C	-4.58488***	-16.32105***	-4.37844***
	(0.42847)	(1.08158)	(0.07722)
	[-10.70059]	[-15.08994]	[-56.69888]

*** p<0.01, ** p<0.05, * p<0.1

Note: government spendings are divided by GDP per capita.

Appendix Table AII.7. Panel VECM Results for Female LFPR (Continued)

Error Correction:	D(LFPR_F)	D(GDPPCA)	D(GAP)	D(EDU)	D(UNEMP)	D(OLDAGE)	D(EMP)	D(TAXWEGE)	D(TAXR)	D(TERTIARY_F)	D(EMPR)	D(TUD)
COINTEQ1	-0.05424***	-0.00222	-0.00888	0.00666	0.02437*	-0.01818	0.01514	0.02320	0.02127**	0.02849*	0.00282	-0.05056***
	(-0.00458)	(-0.01127)	(-0.00835)	(-0.00416)	(-0.01315)	(-0.02772)	(-0.01204)	(-0.01427)	(-0.00931)	(-0.01604)	(-0.01755)	(-0.01569)
	[-11.8312]	[-0.19658]	[-1.06370]	[1.59946]	[1.85385]	[-0.65607]	[1.25791]	[1.62561]	[2.28428]	[1.77632]	[0.16051]	[-3.22341]
COINTEQ2	0.00120	-0.00763*	0.00151	0.00171	0.02021***	0.01144	0.01571***	-0.01185**	-0.00528	-0.03697***	-0.00329	0.01613***
	(-0.00169)	(-0.00417)	(-0.00309)	(-0.00154)	(-0.00486)	(-0.01025)	(-0.00445)	(-0.00527)	(-0.00344)	(-0.00593)	(-0.00649)	(-0.00580)
	[0.70735]	[-1.83088]	[0.48860]	[1.11045]	[4.15755]	[1.11655]	[3.53049]	[-2.24728]	[-1.53521]	[-6.23583]	[-0.50748]	[2.78214]
COINTEQ3	0.03209	-0.55883***	-0.53684***	0.05304**	0.39897***	0.74961***	-0.06449	0.01165	0.15461***	0.26083***	0.63329***	0.28711***
	(-0.02524)	(-0.06203)	(-0.04596)	(-0.02291)	(-0.07239)	(-0.15259)	(-0.06627)	(-0.07856)	(-0.05126)	(-0.08829)	(-0.09660)	(-0.08636)
	[1.27127]	[-9.00911]	[-11.6801]	[2.31528]	[5.51163]	[4.91253]	[-0.97323]	[0.14828]	[3.01634]	[2.95433]	[6.55571]	[3.32462]
D(LFPR_F(-1))	0.02767	0.17019	0.13541	0.11003***	0.30848**	-0.05025	0.24764**	0.21623	0.11252	-0.12647	-0.52957***	-0.03728
	(-0.04538)	(-0.11153)	(-0.08264)	(-0.04119)	(-0.13016)	(-0.27437)	(-0.11915)	(-0.14125)	(-0.09216)	(-0.15875)	(-0.17370)	(-0.15528)
	[0.60974]	[1.52594]	[1.63853]	[2.67133]	[2.37011]	[-0.18316]	[2.07833]	[1.53083]	[1.22084]	[-0.79666]	[-3.04881]	[-0.24011]
D(GDPPCA(-1))	0.01236	0.69672***	0.20510***	-0.02640	-0.11536	-0.59637***	0.09232	-0.17755*	0.04915	0.20546*	-0.30790**	-0.20714*
	(-0.03239)	(-0.07961)	(-0.05899)	(-0.02940)	(-0.09291)	(-0.19584)	(-0.08505)	(-0.10083)	(-0.06579)	(-0.11331)	(-0.12398)	(-0.11084)
	[0.38168]	[8.75148]	[3.47679]	[-0.89788]	[-1.24172]	[-3.04513]	[1.08544]	[-1.76095]	[0.74708]	[1.81320]	[-2.48335]	[-1.86881]
D(GAP(-1))	-0.01682	-0.38040***	0.07462	0.03142	-0.07305	-0.00465	-0.16461	0.26960**	-0.06822	-0.35590**	-0.17364	0.04367
	(-0.04320)	(-0.10616)	(-0.07867)	(-0.03921)	(-0.12389)	(-0.26116)	(-0.11342)	(-0.13445)	(-0.08773)	(-0.15111)	(-0.16534)	(-0.14781)
	[-0.38942]	[-3.58311]	[0.94851]	[0.80129]	[-0.58960]	[-0.01779]	[-1.45133]	[2.00511]	[-0.77759]	[-2.35527]	[-1.05021]	[0.29542]
D(EDU(-1))	0.08627	0.06209	0.06953	0.13364**	-0.08566	-0.31825	-0.12767	0.14131	-0.09658	0.65679***	0.38633*	0.12889
	(-0.05830)	(-0.14330)	(-0.10618)	(-0.05292)	(-0.16722)	(-0.35251)	(-0.15309)	(-0.18148)	(-0.11841)	(-0.20396)	(-0.22317)	(-0.19950)
	[1.47970]	[0.43326]	[0.65483]	[2.52532]	[-0.51225]	[-0.90281]	[-0.83399]	[0.77864]	[-0.81567]	[3.22019]	[1.73111]	[0.64603]
D(UNEMP(-1))	-0.03950**	0.09005**	0.05424	-0.02782*	0.01987	-0.05793	0.01083	0.07778	0.04546	-0.08956	-0.11991*	0.03440
	(-0.01815)	(-0.04460)	(-0.03305)	(-0.01647)	(-0.05205)	(-0.10972)	(-0.04765)	(-0.05649)	(-0.03686)	(-0.06348)	(-0.06946)	(-0.06210)
	[-2.17660]	[2.01903]	[1.64130]	[-1.68877]	[0.38180]	[-0.52797]	[0.22724]	[1.37689]	[1.23357]	[-1.41082]	[-1.72634]	[0.55401]
D(OLDAGE(-1))	0.00610	0.00665	-0.01108	0.00845	-0.03196	-0.03145	-0.01526	-0.02155	0.00691	-0.00124	0.06897*	0.08502**
	(-0.00980)	(-0.02409)	(-0.01785)	(-0.00890)	(-0.02811)	(-0.05927)	(-0.02574)	(-0.03051)	(-0.01991)	(-0.03429)	(-0.03752)	(-0.03354)
	[0.62236]	[0.27603]	[-0.62085]	[0.95015]	[-1.13667]	[-0.53061]	[-0.59297]	[-0.70614]	[0.34685]	[-0.03613]	[1.83822]	[2.53481]
D(EMP(-1))	0.04566**	-0.00452	-0.00088	0.05878***	-0.03995	-0.08798	0.22341***	0.03637	0.02008	-0.04080	-0.01188	-0.03737
	(-0.01985)	(-0.04880)	(-0.03616)	(-0.01802)	(-0.05694)	(-0.12004)	(-0.05213)	(-0.06180)	(-0.04032)	(-0.06945)	(-0.07599)	(-0.06794)
	[2.30002]	[-0.09267]	[-0.02437]	[3.26157]	[-0.70163]	[-0.73297]	[4.28569]	[0.58851]	[0.49802]	[-0.58738]	[-0.15638]	[-0.55005]

*** p<0.01, ** p<0.05, * p<0.1

Note: government spendings are divided by GDP per capita.

Appendix Table AII.7. Panel VECM Results for Female LFPR (Concluded)

Error Correction:	D(LFPR_F)	D(GDPPCA)	D(GAP)	D(EDU)	D(UNEMP)	D(OLDAGE)	D(EMP)	D(TAXWEGE)	D(TAXR)	D(TERTIARY_F)	D(EMPR)	D(TUD)
D(TAXWEGE(-1))	0.00259	-0.04320	-0.00468	0.00482	0.00385	-0.00805	0.13624***	0.14070**	-0.01425	0.13817**	0.03944	-0.00039
	(-0.01784)	(-0.04385)	(-0.03249)	(-0.01619)	(-0.05118)	(-0.10788)	(-0.04685)	(-0.05554)	(-0.03624)	(-0.06242)	(-0.06830)	(-0.06105)
	[0.14536]	[-0.98506]	[-0.14403]	[0.29767]	[0.07528]	[-0.07463]	[2.90811]	[2.53337]	[-0.39312]	[2.21367]	[0.57754]	[-0.00637]
D(TAXR(-1))	0.00128	0.09514	0.07326	-0.04955**	0.11193	-0.29158*	0.04921	-0.02632	-0.07198	-0.07688	-0.13263	0.02524
	(-0.02564)	(-0.06302)	(-0.04669)	(-0.02327)	(-0.07354)	(-0.15502)	(-0.06732)	(-0.07981)	(-0.05207)	(-0.08970)	(-0.09814)	(-0.08774)
	[0.04975]	[1.50971]	[1.56897]	[-2.12925]	[1.52205]	[-1.88085]	[0.73094]	[-0.32980]	[-1.38221]	[-0.85717]	[-1.35145]	[0.28763]
D(TERTIARY_F(-1))	0.02521*	-0.00820	-0.00613	0.00415	0.09662**	0.04468	-0.02143	-0.11523**	-0.05144*	0.00253	0.04303	-0.01670
	(-0.01464)	(-0.03599)	(-0.02667)	(-0.01329)	(-0.04200)	(-0.08854)	(-0.03845)	(-0.04558)	(-0.02974)	(-0.05123)	(-0.05605)	(-0.05011)
	[1.72146]	[-0.22783]	[-0.22994]	[0.31212]	[2.30037]	[0.50463]	[-0.55718]	[-2.52793]	[-1.72946]	[0.04947]	[0.76769]	[-0.33316]
D(EMPR(-1))	-0.00229	-0.02762	0.01648	-0.00959	-0.03117	-0.06436	-0.02779	0.10172**	0.00248	-0.06510	-0.04829	-0.02222
	(-0.01471)	(-0.03616)	(-0.02680)	(-0.01336)	(-0.04220)	(-0.08896)	(-0.03863)	(-0.04580)	(-0.02988)	(-0.05147)	(-0.05632)	(-0.05035)
	[-0.15573]	[-0.76364]	[0.61510]	[-0.71767]	[-0.73850]	[-0.72342]	[-0.71940]	[2.22102]	[0.08310]	[-1.26469]	[-0.85741]	[-0.44140]
D(TUD(-1))	-0.00941	-0.06365*	-0.00802	0.02058	-0.06655	0.01138	-0.09954***	-0.00631	0.03727	-0.00882	0.13307**	0.29862***
	(-0.01450)	(-0.03563)	(-0.02640)	(-0.01316)	(-0.04158)	(-0.08765)	(-0.03806)	(-0.04512)	(-0.02944)	(-0.05071)	(-0.05549)	(-0.04960)
	[-0.64904]	[-1.78646]	[-0.30387]	[1.56381]	[-1.60047]	[0.12988]	[-2.61499]	[-0.13985]	[1.26601]	[-0.17389]	[2.39811]	[6.01999]
C	0.00355***	0.00341	-0.00297*	0.00320***	-0.00658**	0.01316**	-0.00391	0.00372	0.00000	0.03365***	0.02345***	-0.00767**
	(-0.00092)	(-0.00227)	(-0.00168)	(-0.00084)	(-0.00265)	(-0.00559)	(-0.00243)	(-0.00288)	(-0.00188)	(-0.00324)	(-0.00354)	(-0.00316)
	[3.84275]	[1.50128]	[-1.76084]	[3.81040]	[-2.48049]	[2.35269]	[-1.61131]	[1.29075]	[0.00096]	[10.4005]	[6.62240]	[-2.42205]
D(PT_A)	0.03438***	-0.09458***	-0.08203***	0.00109	0.02468	0.14151***	-0.05116**	0.02780	0.03418**	0.03413	0.18334***	-0.03916
	(-0.00839)	(-0.02061)	(-0.01527)	(-0.00761)	(-0.02405)	(-0.05070)	(-0.02202)	(-0.02610)	(-0.01703)	(-0.02933)	(-0.03210)	(-0.02869)
	[4.10008]	[-4.58947]	[-5.37153]	[0.14274]	[1.02636]	[2.79124]	[-2.32388]	[1.06494]	[2.00699]	[1.16358]	[5.71251]	[-1.36477]
R-squared	0.488716	0.385979	0.348846	0.128755	0.18878	0.133326	0.186142	0.079535	0.067511	0.204328	0.26689	0.26059
Adj. R-squared	0.465993	0.358689	0.319905	0.090033	0.152726	0.094807	0.149971	0.038625	0.026067	0.168965	0.234307	0.227728
Sum sq. resids	0.028242	0.170596	0.093664	0.023266	0.232324	1.032365	0.194705	0.273624	0.116485	0.345603	0.413758	0.330668
S.E. equation	0.008857	0.021769	0.01613	0.008039	0.025404	0.053551	0.023256	0.027569	0.017988	0.030984	0.033902	0.030307
F-statistic	21.50689	14.14372	12.05402	3.325114	5.236011	3.461306	5.146114	1.944167	1.628971	5.777993	8.19115	7.929679
Log likelihood	1255.659	916.6431	1029.664	1292.189	858.4273	577.2843	891.7256	827.5844	988.5627	783.5629	749.6349	791.89
Akaike AIC	-6.571137	-4.772642	-5.372222	-6.764928	-4.463805	-2.972331	-4.640454	-4.300182	-5.154179	-4.066647	-3.886657	-4.110822
Schwarz SC	-6.393821	-4.595326	-5.194906	-6.587612	-4.286489	-2.795014	-4.463138	-4.122866	-4.976863	-3.88933	-3.709341	-3.933506
Mean dependent	0.005591	0.013394	3.59E-05	0.00362	-0.002629	0.005798	-0.002466	0.000352	-0.00124	0.0378	0.018481	-0.016569
S.D. dependent	0.012121	0.027183	0.019559	0.008428	0.027598	0.056285	0.025224	0.028118	0.018227	0.033988	0.038743	0.034487

Determinant resid covariance (dof adj.)	2.36E-41
Determinant resid covariance	1.35E-41
Log likelihood	11319.12
Akaike information criterion	-58.7752
Schwarz criterion	-56.27191
Number of coefficients	240

*** p<0.01, ** p<0.05, * p<0.1

Note: government spendings are divided by GDP per capita.

Appendix Table AII.8. Panel VECM Results for Male LFPR

Vector Error Correction Estimates

Included observations: 402

Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	CointEq2
Male LFPR - LFPR_M(-1)	1.00000	-1.77938***
		(0.60391)
		[-2.94642]
Trade union density - TUD(-1)	-0.02347***	1.00000
	(0.00726)	
	[-3.23469]	
% of male with tertiary education - TERTIARY_M(-1)	-0.17042**	2.71265***
	(0.03419)	(0.44230)
	[-4.98519]	[6.13312]
Employment ratio - EMPR(-1)	0.09432*	-2.00069***
	(0.02503)	(0.42722)
	[3.76846]	[-4.68308]
Gov. spending on active labor market - EMP(-1)	-0.05259***	-7.05062
	(0.02581)	(1.36889)
	[-2.03769]	[-5.15060]
Gov. spending on unemployment benefits - UNEMP(-1)	-0.05989***	-3.73914***
	(0.03148)	(1.11260)
	[-1.90230]	[-3.36071]
C	-3.95048***	-0.21864***
	(0.12957)	(3.56814)
	[-30.48818]	[-0.06128]

*** p<0.01, ** p<0.05, * p<0.1

Note: government spendings are divided by GDP per capita.

Appendix Table AII.8. Panel VECM Results for Male LFPR (Concluded)

Error Correction:	D(LFPR_M)	D(TUD)	D(TERTIARY_M)	D(EMPR)	D(EMP)	D(UNEMP)
CointEq1	-0.00492	-0.07525**	0.18363***	0.06234*	0.03536	0.09021***
	(-0.00475)	(-0.03018)	(-0.03662)	(-0.03289)	(-0.02252)	(-0.02561)
	[-1.03638]	[-2.49377]	[5.01404]	[1.89527]	[1.57023]	[3.52243]
CointEq2	0.00008	-0.00062	-0.00231	-0.00035	0.00553***	0.00501***
	(-0.00020)	(-0.00129)	(-0.00157)	(-0.00141)	(-0.00096)	(-0.00110)
	[0.39875]	[-0.47998]	[-1.47071]	[-0.24994]	[5.73915]	[4.57306]
D(LFPR_M(-1))	-0.02070	0.39773	-0.58978	-0.48509	-0.07867	0.12886
	(-0.05198)	(-0.33059)	(-0.40121)	(-0.36032)	(-0.24668)	(-0.28056)
	[-0.39812]	[1.20310]	[-1.47002]	[-1.34630]	[-0.31889]	[0.45928]
D(TUD(-1))	-0.00058	0.35530***	0.08480	0.07107	-0.03945	-0.02253
	(-0.00750)	(-0.04770)	(-0.05788)	(-0.05199)	(-0.03559)	(-0.04048)
	[-0.07731]	[7.44919]	[1.46500]	[1.36705]	[-1.10843]	[-0.55665]
D(TERTIARY_M(-1))	0.00242	0.04596	-0.03185	0.02025	-0.06962**	0.05048
	(-0.00637)	(-0.04053)	(-0.04918)	(-0.04417)	(-0.03024)	(-0.03439)
	[0.37935]	[1.13396]	[-0.64766]	[0.45837]	[-2.30217]	[1.46757]
D(EMPR(-1))	-0.00448	-0.02509	-0.01090	0.00208	-0.02967	-0.05813
	(-0.00677)	(-0.04308)	(-0.05228)	(-0.04695)	(-0.03215)	(-0.03656)
	[-0.66096]	[-0.58248]	[-0.20838]	[0.04428]	[-0.92281]	[-1.58998]
D(EMP(-1))	0.00022	-0.04230	-0.03158	-0.05543	0.20360***	-0.00561
	(-0.01003)	(-0.06381)	(-0.07744)	(-0.06955)	(-0.04761)	(-0.05415)
	[0.02191]	[-0.66297]	[-0.40782]	[-0.79698]	[4.27612]	[-0.10360]
D(UNEMP(-1))	-0.01448	0.11261*	-0.20996***	0.01019	-0.00084	0.03894
	(-0.00941)	(-0.05984)	(-0.07262)	(-0.06522)	(-0.04465)	(-0.05078)
	[-1.53836]	[1.88191]	[-2.89111]	[0.15628]	[-0.01885]	[0.76683]
C	-0.00102***	-0.00778***	0.02640***	0.02862***	-0.00227	0.00114
	(-0.00036)	(-0.00230)	(-0.00280)	(-0.00251)	(-0.00172)	(-0.00195)
	[-2.81787]	[-3.37901]	[9.44511]	[11.4012]	[-1.32072]	[0.58366]
D(GDPPCA)	0.04487***	-0.23259***	0.00580	-0.67487***	0.16039***	-0.27980***
	(-0.00934)	(-0.05942)	(-0.07211)	(-0.06476)	(-0.04434)	(-0.05042)
	[4.80235]	[-3.91458]	[0.08038]	[-10.4212]	[3.61752]	[-5.54881]
R-squared	0.071132	0.224523	0.098701	0.248663	0.193087	0.12704
Sum sq. resids	0.009083	0.367352	0.541049	0.436384	0.204544	0.264577
S.E. equation	0.004814	0.030612	0.037151	0.033365	0.022843	0.02598
F-statistic	3.33545	12.61061	4.769737	14.41514	10.42247	6.338548
Log likelihood	1579.85	836.162	758.337	801.5492	953.8555	902.1275
Akaike AIC	-7.810198	-4.110259	-3.72307	-3.938056	-4.695798	-4.438445
Schwarz SC	-7.710784	-4.010844	-3.623655	-3.838642	-4.596384	-4.339031
Mean dependent	-0.000355	-0.017214	0.024885	0.018645	-0.001702	-0.002405
S.D. dependent	0.004938	0.03437	0.038691	0.038058	0.025142	0.027492
Determinant resid covariance (dof adj.)		9.56E-21				
Determinant resid covariance		8.22E-21				
Log likelihood		5873.386				
Akaike information criterion		-28.86262				
Schwarz criterion		-28.14683				
Number of coefficients		72				

*** p<0.01, ** p<0.05, * p<0.1

Note: government spendings are divided by GDP per capita.

Appendix Table AII.9. Panel VECM result for Female Employment Rate

Vector Error Correction Estimates
Included observations: 377
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	CointEq2	CointEq3
Relative tax rate on second-earner - TAXRATIO(-1)	0.33674	0.00797	-0.65069
Labor tax wedge - TAXWAGE(-1)	0.00219	-0.00305	0.93836
Gov. spending on old age pension - OLDAGE(-1)	0.24173	0.01069	-0.19061
Gov. spending on active labor market - EMP(-1)	-0.73234	-0.03547	-0.72936
% of female with tertiary education - TERTIARY_F(-1)	-0.16905	0.00445	0.79567
Gov. spending on unemployment benefits- UNEMP(-1)	-0.29724	-0.00876	-0.97879
Output gap - GAP(-1)	-0.06696	1.00000	-0.02088
Trade union density - TUD (-1)	0.03396	-0.00477	-0.11662
Gov. spending on early child care and education - EDU(-1)	-0.19845	-0.00814	2.26393
GDP per capita - GDPPC(-1)	-0.02515	-0.00197	1.00000
Services employment to industry employment ratio - STOI_RATIO(-1)	0.07543	0.01327	-0.99634
Employment rate for female - ER_F(-1)	1.00000	-0.03580	-0.14230
C	-2.90681	-4.41187	-14.87166

Appendix Table AII.9. Panel VECM result for Female Employment Rate (Continued)

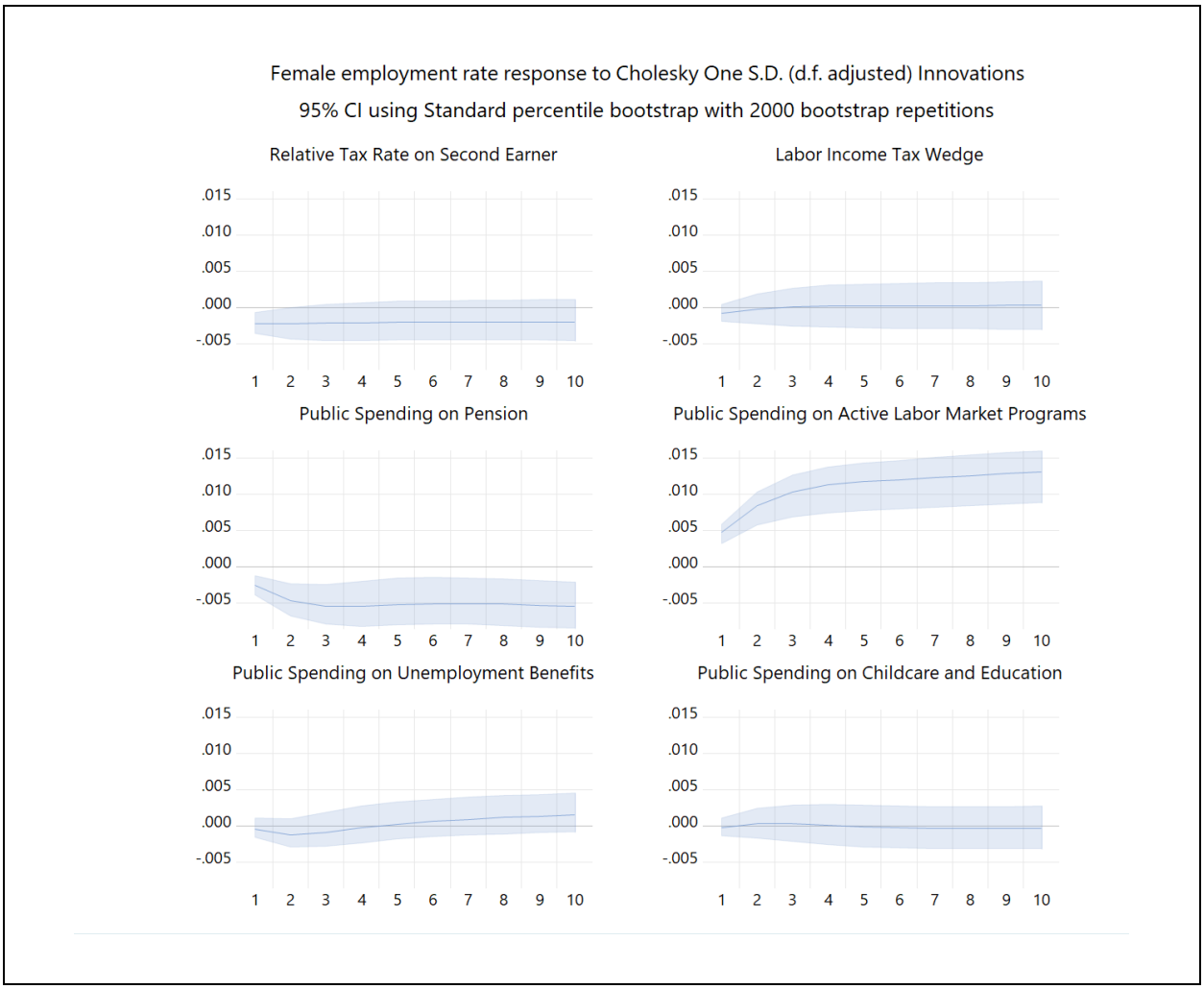
Error Correction:	D(TAXRATIO)	D(TAXWAGE)	D(OLDAGE)	D(EMP)	D(TERTIARY_F)	D(UNEMP)	D(GAP)	D(TUD)	D(EDU)	D(GDP)	D(STOI_RATIO)	D(ER_F)
CointEq1	0.00926	0.00998	-0.03261	0.03565	0.01524	0.05271	-0.00243	-0.02869	0.00567	0.00137	-0.0156	-0.03448
	(-0.00744)	(-0.01138)	(-0.02191)	(-0.00954)	(-0.01266)	(-0.01031)	(-0.00662)	(-0.01253)	(-0.00331)	(-0.00889)	(-0.01368)	(-0.00510)
	[1.24445]	[0.87701]	[-1.48813]	[3.73697]	[1.20429]	[5.11190]	[-0.36682]	[-2.28970]	[1.71105]	[0.15461]	[-1.13963]	[-6.75923]
CointEq2	0.14775	0.00755	0.78677	-0.05831	0.2646	0.3698	-0.54217	0.32641	0.04102	-0.57485	0.69025	-0.09603
	(-0.05128)	(-0.07842)	(-0.15099)	(-0.06574)	(-0.08721)	(-0.07105)	(-0.04559)	(-0.08634)	(-0.02283)	(-0.06124)	(-0.09430)	(-0.03515)
	[2.88121]	[0.09627]	[5.21087]	[-0.88695]	[3.03386]	[5.20449]	[-11.8920]	[3.78034]	[1.79680]	[-9.38694]	[7.31987]	[-2.73214]
CointEq3	-0.00339	-0.011	0.01343	0.01129	-0.03523	0.0156	-0.00079	0.01132	0.0019	-0.00979	0.00147	-0.00111
	(-0.00301)	(-0.00460)	(-0.00886)	(-0.00386)	(-0.00512)	(-0.00417)	(-0.00268)	(-0.00507)	(-0.00134)	(-0.00360)	(-0.00554)	(-0.00206)
	[-1.12620]	[-2.38932]	[1.51466]	[2.92575]	[-6.88125]	[3.73961]	[-0.29494]	[2.23310]	[1.41916]	[-2.72352]	[0.26617]	[-0.53943]
D(TAXRATIO(-1))	-0.07267	-0.02851	-0.30077	0.04696	-0.08816	0.12445	0.07837	0.02078	-0.04466	0.10224	-0.16015	0.04328
	(-0.05248)	(-0.08026)	(-0.15453)	(-0.06728)	(-0.08926)	(-0.07272)	(-0.04666)	(-0.08837)	(-0.02336)	(-0.06268)	(-0.09651)	(-0.03597)
	[-1.38454]	[-0.35518]	[-1.94637]	[0.69795]	[-0.98763]	[1.71130]	[1.67961]	[0.23519]	[-1.91162]	[1.63123]	[-1.65940]	[1.20301]
D(TAXWAGE(-1))	-0.01766	0.13886	-0.0205	0.14244	0.12797	0.0191	0.00484	0.00231	0.00797	-0.03232	0.00996	0.02466
	(-0.03656)	(-0.05591)	(-0.10764)	(-0.04687)	(-0.06218)	(-0.05066)	(-0.03250)	(-0.06156)	(-0.01627)	(-0.04366)	(-0.06723)	(-0.02506)
	[-0.48309]	[2.48365]	[-0.19047]	[3.03922]	[2.05818]	[0.37702]	[0.14882]	[0.03754]	[0.48960]	[-0.74025]	[0.14813]	[0.98412]
D(OLDAGE(-1))	0.00777	-0.01937	-0.03382	-0.01282	-0.00047	-0.02795	-0.00967	0.08462	0.00954	0.00905	0.06231	-0.01119
	(-0.01999)	(-0.03056)	(-0.05884)	(-0.02562)	(-0.03399)	(-0.02769)	(-0.01777)	(-0.03365)	(-0.00890)	(-0.02387)	(-0.03675)	(-0.01370)
	[0.38866]	[-0.63358]	[-0.57471]	[-0.50032]	[-0.01385]	[-1.00927]	[-0.54431]	[2.51451]	[1.07204]	[0.37896]	[1.69549]	[-0.81710]
D(EMP(-1))	0.02206	0.02975	-0.04646	0.19988	-0.02776	-0.0893	-0.02543	-0.03457	0.04747	-0.03705	0.07674	0.07782
	(-0.04160)	(-0.06362)	(-0.12249)	(-0.05333)	(-0.07075)	(-0.05764)	(-0.03699)	(-0.07004)	(-0.01852)	(-0.04968)	(-0.07650)	(-0.02851)
	[0.53024]	[0.46759]	[-0.37928]	[3.74794]	[-0.39229]	[-1.54927]	[-0.68743]	[-0.49352]	[2.56323]	[-0.74582]	[1.00312]	[2.72909]
D(TERTIARY_F(-1))	-0.04498	-0.11177	0.07736	-0.03107	-0.00807	0.07531	-0.01564	-0.01234	0.00397	-0.02307	0.07017	0.0151
	(-0.03016)	(-0.04613)	(-0.08881)	(-0.03867)	(-0.05130)	(-0.04179)	(-0.02682)	(-0.05078)	(-0.01343)	(-0.03602)	(-0.05546)	(-0.02067)
	[-1.49119]	[-2.42325]	[0.87113]	[-0.80342]	[-0.15725]	[1.80202]	[-0.58330]	[-0.24295]	[0.29569]	[-0.64042]	[1.26521]	[0.73027]
D(UNEMP(-1))	0.03542	0.06155	-0.05338	-0.00509	-0.08825	0.00277	0.0484	0.04588	-0.03411	0.08188	-0.09639	-0.03616
	(-0.03647)	(-0.05578)	(-0.10739)	(-0.04676)	(-0.06203)	(-0.05054)	(-0.03243)	(-0.06141)	(-0.01624)	(-0.04356)	(-0.06707)	(-0.02500)
	[0.97095]	[1.10350]	[-0.49700]	[-0.10884]	[-1.42259]	[0.05481]	[1.49253]	[0.74706]	[-2.10083]	[1.87968]	[-1.43706]	[-1.44637]

Appendix Table AII.9. Panel VECM result on Female Employment Rate (Concluded)

Error Correction:	D(TAXRATIO)	D(TAXWAGE)	D(OLDAGE)	D(EMP)	D(TERTIARY_F)	D(UNEMP)	D(GAP)	D(TUD)	D(EDU)	D(GDP)	D(STOI_RATIO)	D(ER_F)
D(GAP(-1))	-0.06277	0.28011	-0.0307	-0.1559	-0.31329	-0.07256	0.0704	0.0134	0.02627	-0.37736	-0.15095	-0.00367
	(-0.08852)	(-0.13538)	(-0.26064)	(-0.11348)	(-0.15055)	(-0.12266)	(-0.07870)	(-0.14905)	(-0.03940)	(-0.10571)	(-0.16278)	(-0.06068)
	[-0.70908]	[2.06915]	[-0.11779]	[-1.37378]	[-2.08093]	[-0.59154]	[0.89445]	[0.08988]	[0.66665]	[-3.56958]	[-0.92732]	[-0.06052]
D(TUD(-1))	0.03556	0.00366	-0.02694	-0.06882	-0.00721	-0.02631	0.01257	0.30001	0.02655	-0.03601	0.06896	-0.05359
	(-0.02981)	(-0.04559)	(-0.08778)	(-0.03822)	(-0.05070)	(-0.04131)	(-0.02650)	(-0.05020)	(-0.01327)	(-0.03560)	(-0.05482)	(-0.02043)
	[1.19274]	[0.08027]	[-0.30696]	[-1.80060]	[-0.14220]	[-0.63703]	[0.47410]	[5.97672]	[2.00057]	[-1.01137]	[1.25784]	[-2.62252]
D(EDU(-1))	-0.09264	0.14292	-0.27693	-0.14757	0.66666	-0.11435	0.05247	0.14216	0.12935	0.04275	0.43241	0.08464
	(-0.11909)	(-0.18212)	(-0.35064)	(-0.15267)	(-0.20254)	(-0.16501)	(-0.10588)	(-0.20052)	(-0.05301)	(-0.14222)	(-0.21899)	(-0.08163)
	[-0.77786]	[0.78473]	[-0.78980]	[-0.96659]	[3.29151]	[-0.69301]	[0.49560]	[0.70897]	[2.43995]	[0.30061]	[1.97459]	[1.03695]
D(GDP(-1))	0.04985	-0.18986	-0.54451	0.06195	0.18465	-0.15943	0.18429	-0.19326	-0.03088	0.665	-0.24891	0.08479
	(-0.06666)	(-0.10195)	(-0.19628)	(-0.08546)	(-0.11338)	(-0.09237)	(-0.05927)	(-0.11225)	(-0.02967)	(-0.07961)	(-0.12259)	(-0.04569)
	[0.74779]	[-1.86228]	[-2.77409]	[0.72487]	[1.62863]	[-1.72596]	[3.10946]	[-1.72171]	[-1.04045]	[8.35314]	[-2.03046]	[1.85571]
D(STOI_RATIO-1))	0.00675	0.11026	-0.07943	-0.01596	-0.06903	-0.01024	0.02528	-0.03142	-0.00341	-0.0153	-0.08301	-0.0325
	(-0.03001)	(-0.04590)	(-0.08837)	(-0.03848)	(-0.05105)	(-0.04159)	(-0.02668)	(-0.05054)	(-0.01336)	(-0.03584)	(-0.05519)	(-0.02057)
	[0.22490]	[2.40203]	[-0.89882]	[-0.41488]	[-1.35236]	[-0.24619]	[0.94749]	[-0.62177]	[-0.25523]	[-0.42685]	[-1.50408]	[-1.57957]
D(ER_F(-1))	-0.01889	0.05173	-0.3445	0.19884	-0.12054	0.41639	0.20842	-0.02137	0.09462	0.27323	-0.74305	0.26467
	(-0.08037)	(-0.12291)	(-0.23663)	(-0.10303)	(-0.13669)	(-0.11136)	(-0.07145)	(-0.13532)	(-0.03578)	(-0.09598)	(-0.14779)	(-0.05509)
	[-0.23508]	[0.42088]	[-1.45584]	[1.92990]	[-0.88188]	[3.73923]	[2.91688]	[-0.15793]	[2.64476]	[2.84679]	[-5.02780]	[4.80462]
C	0.00033	0.00455	0.01264	-0.00276	0.0345	-0.00581	-0.0027	-0.00793	0.00325	0.00387	0.02296	0.00236
	(-0.00189)	(-0.00289)	(-0.00556)	(-0.00242)	(-0.00321)	(-0.00261)	(-0.00168)	(-0.00318)	(-0.00084)	(-0.00225)	(-0.00347)	(-0.00129)
	[0.17596]	[1.57717]	[2.27513]	[-1.14181]	[10.7519]	[-2.22386]	[-1.60935]	[-2.49612]	[3.86375]	[1.71574]	[6.61725]	[1.82262]
D(PT_A)	0.03531	0.03064	0.14029	-0.04535	0.02905	0.02944	-0.07883	-0.03825	0.00267	-0.09159	0.17396	0.0051
	(-0.01703)	(-0.02605)	(-0.05016)	(-0.02184)	(-0.02897)	(-0.02360)	(-0.01514)	(-0.02868)	(-0.00758)	(-0.02034)	(-0.03132)	(-0.01168)
	[2.07268]	[1.17631]	[2.79709]	[-2.07649]	[1.00263]	[1.24707]	[-5.20532]	[-1.33346]	[0.35159]	[-4.50223]	[5.55350]	[0.43667]
R-squared	0.059561	0.075763	0.145021	0.193011	0.217668	0.212471	0.354453	0.255261	0.128311	0.396978	0.296151	0.35134
Adj. R-squared	0.017764	0.034686	0.107022	0.157145	0.182898	0.17747	0.325762	0.222161	0.089569	0.370177	0.264868	0.322511
Sum sq. resids	0.117478	0.274745	1.018434	0.193061	0.339809	0.225539	0.092858	0.333052	0.023278	0.16754	0.397243	0.055191
S.E. equation	0.018065	0.027626	0.053188	0.023158	0.030723	0.02503	0.01606	0.030416	0.008041	0.021573	0.033218	0.012382
F-statistic	1.425008	1.844402	3.816424	5.381434	6.260185	6.070373	12.35415	7.711914	3.311951	14.81209	9.467065	12.18691
Log likelihood	986.9625	826.8135	579.8453	893.3233	786.7501	864.0142	1031.294	790.5362	1292.093	920.0503	757.3128	1129.364
Akaike AIC	-5.14569	-4.296093	-2.985917	-4.64893	-4.083555	-4.493444	-5.38087	-4.10364	-6.764418	-4.790718	-3.927389	-5.901133
Schwarz SC	-4.968374	-4.118777	-2.8086	-4.471614	-3.906239	-4.316128	-5.203554	-3.926324	-6.587102	-4.613402	-3.750073	-5.723817
Mean dependent	-0.00124	0.000352	0.005798	-0.002466	0.0378	-0.002629	3.59E-05	-0.016569	0.00362	0.013394	0.018481	0.006246
S.D. dependent	0.018227	0.028118	0.056285	0.025224	0.033988	0.027598	0.019559	0.034487	0.008428	0.027183	0.038743	0.015043
Determinant resid covariance (dof adj.)		0.00000										
Determinant resid covariance		0.00000										
Log likelihood		11290.00										
Akaike information criterion		-58.62071										
Schwarz criterion		-56.11742										
Number of coefficients		240										

*** p<0.01, ** p<0.05, * p<0.1

Note: government spendings are divided by GDP per capita.


Female employment rate response to Cholesky One S.D. (d.f. adjusted) Innovations
95% CI using Standard percentile bootstrap with 2000 bootstrap repetitions
Relative Tax Rate on Second Earner
Labor Income Tax Wedge
Public Spending on Pension
Public Spending on Active Labor Market Programs
Public Spending on Unemployment Benefits
Public Spending on Childcare and Education
.015
.010
.005
.000
-.005
1 2 3 4 5 6 7 8 9 10

Appendix Table AII.10. 2SLS Baseline Regression Results for LFPR

	Female LFPR (log)		Male LFPR (log)	
	Level	First difference	Level	First difference
Tax progressivity	-0.1262	0.0976	0.1178	0.0595
	(0.2333)	(0.0817)	(0.0867)	(0.1411)
Relative tax rate on second-earner	-0.0573	-0.0768	0.0675***	0.0372
	(0.0713)	(0.0753)	(0.0223)	(0.0686)
Labor tax wedge	-0.0733*	0.0035	-0.0562***	-0.0006
	(0.0422)	(0.0136)	(0.0151)	(0.0266)
Gov. spending on early childcare and education per child under 3 years old	0.2578*	0.0182	-0.0263	0.0089
	(0.1435)	(0.0511)	(0.0482)	(0.0846)
Gov. spending on family cash benefit excl. maternity leave per population under 20 years old	0.0394**	0.0154	-0.0054	-0.0057
	(0.0183)	(0.0311)	(0.0045)	(0.0113)
Gov. spending on old-age pension per population older than effective retirement age	-0.0569**	0.0113	0.0183	0.0028
	(0.0261)	(0.0122)	(0.0116)	(0.0219)
Gov. spending on healthcare per population	-0.0459	0.0031	-0.0117	0.0333
	(0.0344)	(0.0130)	(0.0080)	(0.0666)
Gov. spending on active labor market programs per unemployment persons	0.1411*	0.1099	0.0450*	0.2115
	(0.0758)	(0.1488)	(0.0246)	(0.4516)
Gov. spending on unemployment benefits per unemployed persons	-0.0727	-0.0856**	-0.0394*	-0.6126
	(0.0566)	(0.0390)	(0.0215)	(1.2679)
Coordination of wage setting	-0.0132***	0.0012	0.0017	0.0008
	(0.0050)	(0.0012)	(0.0015)	(0.0054)
Crude birth rate for women	0.1304***	-0.0372*	0.0417*	0.0356
	(0.0415)	(0.0223)	(0.0219)	(0.0986)
Services employment to industry employment ratio	0.0424	0.0236	-0.0294***	-0.0112
	(0.0646)	(0.0214)	(0.0108)	(0.0315)
Employment protection regulation	0.0641**	-0.0141*	-0.0291**	0.0089
	(0.0321)	(0.0082)	(0.0146)	(0.0425)
Length of parental paid leaves (mothers and fathers)	0.0115***	-0.0003	0.0008	-0.0012
	(0.0032)	(0.0016)	(0.0011)	(0.0054)
Part-time employment ratio	0.0650**	-0.0061	0.0010	-0.0046
	(0.0275)	(0.0096)	(0.0057)	(0.0101)
Union density	0.0632	0.0356	-0.0017	0.0137
	(0.0401)	(0.0244)	(0.0115)	(0.0370)
Years of education	2.8642***	-0.0835	-0.5343	2.8983
	(0.9637)	(0.5448)	(0.3500)	(5.2751)
Years of education (squared)	-0.5642***	0.0153	0.1102	-0.5982
	(0.2015)	(0.1113)	(0.0710)	(1.0796)
Internet users	0.0333**	-0.0070	0.0067*	0.0082
	(0.0139)	(0.0069)	(0.0038)	(0.0197)
Restrictiveness of migrant integration policies	-0.0016	-0.0007	-0.0008**	0.0017
	(0.0013)	(0.0007)	(0.0004)	(0.0037)
Output gap	-0.0065	0.1254**	-0.0573	0.1184
	(0.1603)	(0.0487)	(0.0531)	(0.1868)
GDP per capita	0.0892	-0.0408	0.0399**	-0.0285
	(0.0972)	(0.0330)	(0.0199)	(0.0546)
Trade openness	-0.1200***	-0.0445***	-0.0037	-0.0577
	(0.0379)	(0.0169)	(0.0110)	(0.0885)
Urban population	0.7006***	-0.2153	0.2306***	-0.0029
	(0.1922)	(0.4687)	(0.0687)	(0.4835)
Constant	-3.3911*	0.0090***	4.1182***	0.0010
	(1.8422)	(0.0035)	(0.4897)	(0.0078)
Observations	477	440	479	440
Number of ifscode	26	25	26	25
Control variables	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Heteroskedasticity robust	Yes	Yes	Yes	Yes
R2_Within	0.773		0.626	
R2_Overall	0.164	0.0993	0.0151	0.0356

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix III. Definition of Variables and Data Sources

Tax Progressivity

Measure of progressive capacity and is defined as the Kakwani index calculated over a fixed range of income.

Data source: Database from Gerber et al. (2018) "Income Tax Progressivity: Trends and Implications."

Relative tax rate on second earners is measured as difference between the average tax rate to the second earner and to the single earner. The average tax rate on the second earner is calculated as

$$1 - \frac{(Household\ net\ income\ of\ family\ B - Household\ net\ income\ of\ family\ A)}{(Household\ gross\ income\ of\ family\ B - Household\ gross\ income\ of\ family\ A)}$$

where family B denotes the situation in which the first earner earns 100 percent of the average wage (AW) while the second earner earns 67 percent of the AW, and family A denotes the situation in which there is a single earner, who earns 100 percent of the AW. Both types of families are assumed to have two children. The difference between gross and net income includes income taxes, employees' social security contribution, and universal cash benefits. The relative tax rate on second earners is calculated as:

Average tax rate to the second earner in household B– Average tax rate to the single earner in household A

Data source: OECD Taxing Wages Database (Taxing Wages – Comparative tables (oecd.org)), October 25, 2021, and authors' calculation

Labor tax wedge is the ratio between the amount of taxes paid by an average single worker (a single person at 100 percent of AW) without children and the corresponding total labor cost for the employer. The average tax wedge measures the extent to which tax on labor income discourages employment. This indicator is measured in percentage of labor cost.

Data source: OECD Taxing Wages Database.

Public Spending

- **Early childcare and education** include all public financial support (in cash, in-kind or through the tax system) for families with children participating in formal daycare services (e.g., crèches, day care centers and family day care for children under 3) and pre-school institutions (including kindergartens and day-care centers which usually provide an educational content as well as traditional care for children aged from 3 to 5, inclusive). The total spending is then divided by the population aged below 3 years old and standardized by GDP per capita.

- **Family cash benefits** is derived by excluding the maternity leave benefits from the family cash benefit. Family-cash benefits include the different form of family allowances, child benefits and financial support for families provided through the tax system. The total spending is then divided by the population aged below 20 years old and standardized by GDP per capita as many of such benefits are given to families with young children.

- **Pension** comprises all cash expenditures including lump-sum payments on old-age pensions, which provides an income for people retired from the labor market or guarantee incomes when a person has reached a "standard" pensionable age or fulfilled the necessary contributory requirements. This category also includes early retirement pensions: pensions paid before the beneficiary has reached the 'standard' pensionable age relevant to the program. The total spending is then divided by the population aged above effective retirement age and standardized by GDP per capita.

- **Active labor market programs** include purposes of employment services, training for youth, integration of persons with disabilities, direct job creations, and employment incentives. The total spending is then divided by the number of unemployed workers and standardized by GDP per capita.

- **Unemployment benefits** are defined as expenditure on cash benefits for people to compensate for unemployment. This includes redundancy payments from public funds, as well as the payment of pensions to beneficiaries before they reach the standard pensionable age, if these payments are made because the beneficiaries are out of work or for other labor market policy reasons. The total spending is then divided by the number of unemployed workers and standardized by GDP per capita.

- **Healthcare** the spending on healthcare goods and services including personal healthcare (e.g., curative care, rehabilitative care, long-term care) and collective services (e.g., prevention and public health services and health administration). The total spending is then divided by the total population and standardized by GDP per capita.

Data source: OECD Social Expenditure database, (Social Expenditure Database (SOCX) - OECD), directly received from OECD on November 9, 2022.

Labor force participation rate is calculated as the labor force divided by the total working-age population

Data source: OECD Labor force statistics, September 2, 2022.

Employment rate is calculated as utilized labor force divided by the total working-age population.

Data source: OECD Labor force statistics, September 2, 2022.

Population: population by single age sex. Data source: UN World Population Prospects 2022, (LFS by sex and age - indicators (oecd.org), September 2, 2022.

Effective retirement age is defined as the average age of exit from the labor force for workers aged 40 and over.

Data source: OECD Pensions at a Glance– OECD and G20 indicators (https://stats.oecd.org/Index.aspx?DataSetCode=PAG), July 1, 2022.

Crude birth rate is the number of live births per 1,000 midyear population.

Data source: World Bank Group World Bank Open data, November 18, 2022.

Length of parental paid leave is the total weeks of paid maternity, parental, and home care for mothers and fathers.

Data source: OECD Family Database (OECD Family Database - OECD), March 31, 2022.

Years of education takes the average number of completed years of education of a population. For data gaps, they are interpolated using a linear growth approach.

Data source: UN Human Development Index (Human Development Index | Human Development Reports (undp.org)), December 8, 2021.

Internet users are individuals who have used the Internet (from any location) in the last 3 months. The Internet can be used via a computer, mobile phone, personal digital assistant, games machine, digital TV etc.

Data source: World Bank World Development Indicators, July 29, 2022.

Urban population refers to people living in urban areas as defined by national statistical offices.

Data source: World Bank World Development Indicators, July 25, 2022.

Part-time employment rate uses part-time worker under national definition and covers workers aged between 25 years old and 54 years old. The definition of part-time work varies considerably across OECD countries and three main approaches can be distinguished: i) a classification based on the worker's perception of his/her employment situation; ii) a cut-off (generally 30 or 35 hours per week) based on usual working hours, with persons usually working fewer hours being considered part-timers; iii) a comparable cut-off based on actual hours worked during the reference week. A criterion based on actual hours will generally yield a part-time rate higher than one based on usual hours, particularly if there are temporary reductions in working time as a result of holidays, illness, short timing, etc.

Data source: OECD Labor Force Statistics.

Employment ratio between service and industry sectors is calculated as the employment rate between that of the service sector versus that of the industry sector.

Data source: International Labor Organization, (International Labor Organization (ilo.org)), November 22, 2022.

Employment protection legislation indicator is measured by the strictness of employment protection, indicating the procedures and costs involved in dismissing individuals or groups of workers and the procedures involved in hiring workers on fixed-term or temporary work agency contracts. The greater the number, the stricter the legislation is for employment protection.

Data source: OECD Employment Protection Legislation Database (OECDEmploymentProtectionLegislationDatabase.xlsx (live.com)), Aug 11, 2021.

Coordination of wage-setting measures the level of wage setting coordination, such as existence of binding norms, negotiation guidelines.

Data source: OECD AIAS ICTWSS database, (OECD/AIAS ICTWSS database - OECD) July 25, 2022.

Trade union density indicator is defined as the number of net union members (i.e excluding those who are not in the labor force, unemployed and self-employed) as a proportion of the number of employees.

Data source: OECD Database on Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts (ICTWSS), https://stats.oecd.org/Index.aspx?DataSetCode=TUD,. July 27, 2002.

Restrictiveness of migrant integration policies indicator measures migration policy changes whether it represents a change towards more restrictiveness or less restrictiveness within the existing legal system. The greater the number, the more restrictive the legal system moves towards.

Data source: International Migration Institute, University of Oxford, DEMIG POLICY data downloads — IMI (migrationinstitute.org), July 27, 2022.

Output gap is defined as the difference between the actual output of an economy and its potential output.

Data source: IMF World Economic Outlook.

PPP GDP per capita is the sum of gross value added by all resident producers in the economy plus any product taxes (less subsidies) not included in the valuation of output, in purchasing-power-parity dollars per capita.

Data source: IMF World Economic Outlook.

Trade openness is measured as the sum of a country's exports and imports as a share of that country's GDP.

Data source: IMF World Economic Outlook.

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