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The employment effects of public spending in infrastructure, the care economy and the green economy:

THE CASE OF EMERGING ECONOMIES

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Foreword from the ITUC:

The global challenges arising from the economic and social impacts of a rapidly changing world of work, due in no small part to the consequences of the climate emergency as well as the COVID-19 pandemic, have underscored the urgency of addressing employment deficits and inequalities. The world lost more than 255 million full-time jobs in 2020,[1] and the number of hours of work in 2022 remains well below pre-crisis levels,[2] indicating significant setbacks in the recovery process. Indeed, although countries increased their public spending during the pandemic and took measures to safeguard employment and incomes, in most cases their responses fell short of a strategic and long-term vision. The global climate crisis and the surging costs of energy in many parts of the world are fuelling the urgency to shift to a low-carbon economy, underpinned by a Just Transition for all.

Governments must put in place policies that foster the creation of quality, climate-friendly jobs. At the global level, unions have called for the creation of 575 million jobs and the formalisation of at least one billion informal jobs by 2030, which will help us deliver on the United Nations' 2030 Agenda commitment for full employment and decent work, as defined by Sustainable Development Goal 8 (SDG 8). However, this will not happen unless public investment increases, especially in climate-friendly sectors that benefit people; including infrastructure, the care economy, and the green economy. Investing in the creation of quality jobs in these sectors would, moreover, support formalisation efforts and a socially and environmentally just economic recovery.

This research report demonstrates that stepping up public investments would have a significant positive impact on both national GDP and employment. The report reviews the employment and GDP impacts of public spending increases across eight selected countries. Over five years, a repeated annual increase in public spending by 1% of GDP leads to:

- **In the care economy:** an average GDP increase of more than 11%, as well as a 6.3% increase in total employment levels.
- **In the green economy:** an average GDP increase of 10%, as well as a 7.5% increase in total employment levels.
- **In infrastructure:** both a GDP and employment increase of 12%.

In other words, this study underscores that investing in these three sectors must become a crucial priority for governments to manage the structural transformations of the labour market, and that it would contribute both to higher employment and overall economic growth.

This study further presents a description of funding scenarios for a substantial mobilisation of public spending to fairly finance this transition. For instance, it suggests making use of progressive forms of taxation (income and wealth), as well as considering the role of national investment banks and monetary policies.

It is now time to deliver on these ambitious yet urgent objectives. The planet and all its people deserve a just transition towards full employment within sustainable industries. For

[1] ILO (2021) COVID-19 and the world of work. Seventh edition
[2] ILO (2022) COVID-19 and the world of work. Eighth edition

this, governments must make the necessary public investments to support the creation of decent jobs and directly manage structural transformations in the labour market. Public policy must remain central to the development of industrial sectors that ensure formal, quality jobs and decent incomes, developed through continuous social dialogue that meaningfully involves trade unions. This study shows that governments must stop relying on a 'low road' approach to job creation, based on low wages and labour standards, as a misguided strategy to increase employment. This approach has simply not worked. By comparison, investing in decent and sustainable jobs is good for workers and for the economy overall.

Executive summary

This report investigates the impacts of increased public spending in the care economy,[3] the green economy,[4] and in infrastructure on the employment of men and women and a country's GDP, in eight selected emerging economies. The paper makes use of a vector autoregression (VAR) model for each country and explores policy scenarios for increased public spending within these three sectors.

The paper demonstrates the employment-creation potential of renewable energy, public transport, other infrastructure, and the care economy. In doing so, it highlights the potential of **strengthened policies to facilitate a just transition to a zero-carbon economy.** In addition, **the gendered employment effects of the three types of public spending are considered**, and the importance of a policy mix to ensure that a just transition is gender equitable is highlighted.

The paper further calculates the associated fiscal multipliers of public spending in care, the green economy, and infrastructure based on the estimated effects on GDP. **It is found that the multiplier effects on GDP are positive across all the analysed countries** and, in most of them, it is substantial in all the spending categories, reaching more than one in the medium term.

- **For public physical infrastructure,** the cumulative multipliers for six countries at the end of five years range between 1.9 in Colombia to 4.6 in South Korea, i.e., an increase in public spending in physical infrastructure (public gross fixed capital formation) by one Colombian Peso increases the Colombian GDP by 1.9 Colombian Peso at the end of five years. On average (across the eight countries considered), the cumulative multiplier effect of public spending in physical infrastructure on GDP is 2.6 in five years.
- **The cumulative multiplier effect of care spending** on GDP in five years for six countries ranges between 1.6 in Turkey and South Africa, and 4.5 in South Korea. On average (across eight countries), the cumulative multiplier effect of public spending in care is 2.17 in five years.

3 In this paper, the term "care economy" is used to refer to health care, social care, education, and childcare.
4 In analysing public spending in the green economy, the paper refers to renewable energy, energy efficiency and public transport.

- **The cumulative multiplier effect of public spending in the green economy** at the end of five years is between 1.1 in South Korea and 4.5 in Turkey across seven countries. On average, the cumulative multiplier effect of public spending in the green economy is 1.9 in five years.

The differences across countries indicate that not only the amount, but also the composition and targeted nature of spending play a role, in addition to other variables, such as the import dependency or the country's informality levels.

For clarity, the paper analyses the impact of public spending on the primary budget balance in the absence of any changes in the tax rates, i.e., what portion of public spending is self-financing. Further funding possibilities for a substantial mobilisation of public spending are **discussed, including progressive taxation of income and wealth, national investment banks or monetary policy.**

Based on the effects of public spending on employment and GDP, the paper discusses the potential for improvements in labour productivity in the medium term. **Productivity gains create space for higher wages, better working conditions, and a shorter working week with wage compensation.** They also help to address concerns regarding the effects of fiscal spending on the balance of payments constraints of emerging economies.

The study presents a policy simulation of the effects of a repeated annual increase in public spending in physical infrastructure, the care economy and the green economy by 1%-point as a ratio to GDP for five years:

- A repeated annual increase in public investment in **physical infrastructure** by 1%-point of GDP at the end of five years creates a **cumulative increase in GDP** at a rate ranging between 4.1% in the Philippines and 23.5% in South Korea across seven countries, and a **cumulative increase in total employment** ranging between 1.5% in India and 31.5% in South Africa. **On average, both GDP and employment increase by 12%**. In six countries employment figures for both men and women increase, and in Chile, Colombia, Indonesia, South Africa, and Turkey the rate of **increase in women's employment** is higher, although the number of new jobs for women remains lower than that for men due to a relatively low starting point. In the Philippines and India, the employment effect is positive and significant only for men. These differences illustrate the importance of gender mainstreaming in assessing the employment impact of public investment, and a careful consideration of complementary investments in other sectors that encourage women's employment.
- A repeated annual increase in public spending in **the care economy** by 1%-point at the end of five years leads to a cumulative **increase in GDP** at a rate ranging between 1.3% in Colombia, 4.9% in Turkey, 15.3% in Indonesia, 16.9% in India, and 23.7% in South Korea across seven countries. **Total employment** increases at a rate ranging between 1.5% in Chile, 3.1% in Turkey, 12.5% in Indonesia, 4.6% in India, and 18% in South Korea, creating jobs for both women and

men, albeit at a faster rate for women. **On average, GDP increases by 11.1% and employment increases by 6.3%.**

- A repeated annual increase in public spending in **the green economy** by 1%-point at the end of five years leads to a cumulative i**ncrease in GDP** at a rate ranging between 1.9% in the Philippines, 4.8% in Indonesia, 12.7% in India and 22% in Turkey across eight countries. The **cumulative effect on total employment** ranges between 0.9% in the Philippines and Indonesia to 5.7% in Turkey and 27% in Colombia. **On average, GDP increases by 10% and employment increases by 7.5%.**

Finally, the study presents the effects of a policy mix combining a repeated increase in public spending in the care and green economies, and other physical infrastructure (e.g., housing, buildings for schools and hospitals), each by 1%-point as a ratio to GDP every year for five years. According to this policy scenario, at the end of five years, the **cumulative increase in GDP** ranges from 6.6% in the Philippines to 27.1% in Colombia, 27.8% in South Africa, 31.8% in India, 37.2% in Indonesia, 43.8% in Turkey, 59% in Chile, and 63.6% in South Korea.

After five years, **cumulative total employment**[5] increases by 1% in the Philippines, 10.3% in India, 21% in Turkey, 23.8% in Indonesia, 27.8% in Chile, 39.3% in Colombia, 48.9% in South Korea, and 57% in South Africa. **On average, GDP increases by 37.1%, employment increases by 28.6%, employment of men increases by 25.4%, and employment of women increases by 33.5%.**

In addition, the paper registers the creation of a significant number of new jobs: 320 thousand in the Philippines, 2.2 million in Chile, 4.9 million in Turkey, 7.9 million in Colombia, 9.0 million in South Africa, 12.6 million in South Korea, 22.4 million in Indonesia, 27.6 million in India. This result signals the **significant potential held by the green and care economies for redeployment from carbon-intensive industries. Additionally, redeployment generates new education and training needs,** which reemphasises the increasing need to invest in the education sector of the care economy.

Starting with high gender gaps in employment, it is found that at the end of this policy stimulus more jobs are created for men than for women (except in Colombia and South Africa), yet **higher rates of growth in women's employment** are demonstrated (except in the Philippines). These findings underline **the importance of designing hiring and training policies that ensure the new green and physical infrastructure jobs also employ women and avoid existing occupational segregation patterns,** with women concentrated in the care economy and constituting a low share of the green economy.

Finally, the findings indicate the potential of the green and care jobs for redeployment, allowing for countries to move away from polluting and carbon-intensive industries by creating **new decent formal jobs** in sectors with strong benefits for the environment and society.

[5] Excluding agriculture.

Introduction

The world faces intersecting crises, with inequalities, a deficit in the care infrastructure, and ecological breakdown comprising climate change, biodiversity loss, deforestation, and plastic pollution presenting multiple urgent challenges to governments, societies and individuals. While responses to the Covid-19 crisis included a mobilisation of public spending, the short-term emergency response fell short of a long-term strategic vision to address these intersecting crises, which requires that public spending on infrastructure, the green and the care economies is placed at the heart of policy.

Taken individually it is clear that reversing the ecological crisis requires a massive and urgent mobilisation of large amounts of investment in renewable energy, public transport, and energy efficiency. Public spending in the green economy is the key policy to address both the scale and the timing of investment required for transition to a zero-carbon economy.

The pandemic exacerbated deficits in the care infrastructure of our societies, and its effects were intensified due to inadequate levels of health and social care and inadequate public spending in the care sector. Unpaid domestic care work increased during the pandemic, due to restrictions such as school closures, and was carried out disproportionately by women, increasing their time poverty, and reversing former gains made towards gender equality.

The pandemic exposed and amplified pre-existing inequalities whether they were based on class, race, gender, region or country. Dealing with inequality is key to tackling both the resulting public health crisis and the economic fallout of the pandemic. The pace of technological change in the fourth industrial revolution, with an increased reliance on artificial intelligence and robotisation, adds to concerns about the proportions of jobs destroyed to those created. Meanwhile, there exists an urgent need to increase employment in the care economy in an aging population, while also investing in the green economy to secure an ecologically sound future. The public provision of high-quality, universal, free basic services in social care, health, childcare, and education from early childhood and pre-school education to higher education tackles both the care deficit and inequalities by creating decent jobs with strong labour market institutions and providing much-needed services.

The scale and urgency of spending needs to address inequalities and the deficits in both the green and care economy require a large public spending program, which cannot be substituted by private investment based on a profit motive. Private investment in renewable energy has been too little, too late due risk-averse investment appetites, and fundamental uncertainty about the future of innovative green technologies. Private provision of health, social care or childcare services have led to an undersupply of these services, which are unaffordable by the many, as the private profit maximisation motive fails to account for long-term social returns.

The multiple crises of our times require a paradigm shift towards a full-employment targeted and needs-based approach to macroeconomic policy. Fiscal policy, in particular, must avoid competition between urgent social and ecological requirements. During the pandemic, short-term responses such as furlough schemes and flexible short-working time arrangements helped to limit the rise in unemployment, as did policies such as job guarantee schemes, education

grants, retraining schemes and paid, on-the-job training. Now, however, there is a strong case for large-scale public spending and employment programmes that guarantee decent wages and working conditions. A return to fiscal conservatism is not an option at a time when social and environmental needs require a substantial and urgent mobilisation of fiscal policy.

The aim of this report is to empirically analyse the impact of public spending in the care economy, the green economy and in infrastructure on the employment of men and women and GDP in emerging economies.[6] To do this, we empirically estimate a vector autoregression (VAR) model for each country. We then explore policy scenarios entailing a mix of public spending for an equitable, green transition to a caring and sustainable economy.

The care economy includes health care, social care, education, and childcare. In analysing public spending in the green economy, we focus on renewable energy, energy efficiency and public transport. Electricity and heat production, transport, and buildings account for about half of global greenhouse gas (GHG) emissions (Intergovernmental Panel on Climate Change (IPCC), 2014). Energy consumption contributes to around 75% of all anthropogenic GHG emissions (Batini et al., 2021). Achieving the international goal of keeping global average temperatures from rising above the 1.5°C threshold relative to the pre-industrial era (as recommended by the IPCC and endorsed by the 2015 Paris Agreement on climate change) requires significant and timely reductions in energy-related (and other) emissions (IRENA, 2020).

The report demonstrates the employment creation potential of renewable energy, public transport and other infrastructure, and the care economy to facilitate policies that could achieve the transition to a zero-carbon economy. The report addresses policy concerns regarding the impact of the transition to a zero-carbon economy on employment and inequalities. The findings clearly indicate the positive potential for a redeployment of workers from fossil-fuel sectors to the renewable energy industry or from the production of private transport vehicles to the production of public transport vehicles. In the context of redeployment, an expansion of the care economy also offers opportunities for redeployment from high-carbon or fossil fuel-based activities, as well as being needed in its own right. The care economy is a low-carbon sector with a high potential for employment creation given its labour intensity. The transition across sectors also creates new education and training needs, which in turn add to the need for further public spending in the care economy.

We analyse the gendered employment effects of these three types of public spending and emphasise the importance of a policy mix to ensure that a green transition is gender-equitable and that policies target both the ecological transition and care needs of the country.

We estimate the associated fiscal multipliers of public spending in the care and green economy and infrastructure based on their estimated effects on GDP. We also analyse the impact of spending on the primary budget balance in the absence of any changes in the tax rates, i.e., we analyse what portion of public spending is self-financing. Finally, we discuss further funding possibilities in terms of the use of progressive taxation of income and wealth, national investment banks or monetary policy to facilitate a needs-based approach to macroeconomic policy.

6 The empirical analysis covers eight selected emerging economies: Chile, Colombia, India, Indonesia, the Philippines, South Korea, South Africa, Turkey

Analysing the combined effects of public spending on employment and GDP, we examine the potential for improvements in labour productivity in the medium term. Productivity gains create space for higher wages, better working conditions and a shorter working week with wage compensation. They also help to address concerns regarding the effects of fiscal spending on the balance of payments constraints of the emerging economies.

Existing empirical research indicates that these three public spending categories have a strong positive effect on the GDP and employment, due to the labour intensive and domestic input content of the care and green economies.

Regarding the effects of public spending in the care economy, empirical research using input-output tables for a variety of emerging and developed economies find very high effects on the employment of women and, accounting for the indirect effects, also on the employment of men (Antonopoulos et al., 2010; İlkkaracan et al., 2015; İlkkaracan and Kim, 2019; ITUC et al., 2016, 2017; ILO, 2020). Using an econometric analysis, Oyvat and Onaran (2022) estimate that a 1% increase in public spending in the care economy contemporaneously increases GDP by 0.5%; women's and men's employment by 0.7% and 0.1% respectively, and leads to a 2.9% increase in GDP; a 2.2% increase in women's employment, and a 2.9% increase in men's employment cumulative over 10 years (including both direct and indirect effects, thanks to the high multiplier effects on the other sectors of the economy) in South Korea.

Onaran, Oyvat, and Fotopoulou, (2019a,b) econometrically estimate that a 1%-point increase in public spending in the care economy, as a ratio of GDP in the UK, leads to a medium-term increase in GDP of 2.7%; a 3.2% increase in women's employment, and a 0.4% increase in men's employment. Further, they estimate a 1%-point increase in public gross fixed capital formation, as a ratio of GDP, leads to a 2% increase in GDP; a 1.8% increase in women's employment, and a 1.6% increase in men's employment. In the care economy, the effects of such spending on total employment, as well women's employment, is higher due to the care economy being more labour intensive and comprising a higher share of women.

The IMF (2020) estimates that increasing public investment by 1%-point, as a ratio of GDP, could generate 20-33 million new jobs globally, with particularly marked effects in low-income countries. Wildauer et al. (2021) estimate the public investment multipliers to be as high as 5.25 after 10 years in the European Union, meaning an additional public investment of €1 billion could lead to an additional GDP of €5 billion after 10 years. Both Wildauer et al. (2021) and Obst et al. (2016) find the effect of fiscal spending is much higher if co-ordinated across EU members states.

With respect to the green economy, using multi-regional input-output and supply-and-use tables, the International Labour Organization (ILO) estimates that changes in energy production and use, including a shift towards renewable energy sources and greater efficiency can create around 18 million jobs (net of some 24 million new jobs and the loss of around 6 million jobs) by 2030 throughout the world economy.[7] This transition is expected to result in a slightly lower share of women in employment, given current gendered, sectoral employment patterns, while creating more employment for low- and medium-skilled workers (ILO, 2018).

[7] ILO (2018) simulations are based on the following scenarios: "In terms of electricity, the scenario implies an increased share of renewables for electricity generation (including a 59% increase in electricity produced from solar photovoltaic panels in 2030, compared to 2012), a decrease in the use of fossil fuels (a 50%reduction in coal-based electricity production), and a drop in overall demand as a result of greater efficiency. Similarly, under this scenario, energy demand by industry would fall by 20% by 2030 as a result of greater efficiency, and the remaining energy needs would be met through greater reliance on biomass and waste, rather than fossil fuel-based energy sources.".

The International Renewable Energy Agency (IRENA, 2020) presents simulation results based on a macro-econometric, post-Keynesian model that contends that renewable energy could employ 42 million people worldwide by 2050 (up from about 12 million in 2017) and energy efficiency jobs could reach 21 million as part of a just transition programme.[8]

In a recent IMF working paper, Batini et al. (2021) econometrically estimate a stronger and longer-lasting multiplier effect of renewable energy infrastructure[9] on GDP (around 1.1-1.5), compared to the non-eco-friendly, fossil-fuel energy investment (0.5-0.6). Using a cross-country VAR analysis for a panel of 11 countries over the period 2003-2019; i.e., the research found that every dollar (private and public) spent on activities such as zero-emission power plants or protection of wildlife and ecosystems can generate more than a dollar's worth of economic activity. The results indicate that the cumulative multiplier for green renewable energy spending falls only marginally over the years, which may reflect the fact that the investment includes different types of activities, e.g., construction, networks for transmission and distribution, and smart meters. Batini et al. (2021) assert that three factors explain the high multiplier effects: i) clean energy is more labour intensive than carbon-based fuels spending; in both the direct spending on projects, as well as the indirect spending on supplies. Clean energy investment also spends more on hiring people, and relatively less on acquiring land (on- or offshore), machines, supplies and energy itself; ii) clean energy has a higher domestic content in terms of both direct and indirect spending, such as retrofitting homes or upgrading the electrical grid system locally, and less on imports compared to fossil-fuel sectors; iii) clean-energy investments produce more jobs at all pay levels, including entry-level jobs, compared to the fossil-fuel industry, and include all levels of skills, e.g. electricians, carpenters, and plumbers.

Pollin et al. (2015) compared the employment effects of public spending in renewable energy and energy efficiency with spending in the fossil-fuel sectors using input-output analysis for Brazil, Germany, Indonesia, South Africa, South Korea. Pollin et al., (2009) present a similar analysis for the USA and find that spending in renewable energy and energy efficiency generates more employment than that can be generated by spending on fossil fuels. Pollin et al. (2022) also focused on South Korea and integrated a more detailed analysis of renewable energy, energy efficiency, including transition in public transport and electric vehicles, reforestation and phasing out fossil fuels. Their analysis suggested a pathway for emerging economies to dramatically lower emissions levels by raising both their energy efficiency and reliance on clean energy sources and demonstrated that clean energy investments can be a major engine supporting long-term development and employment.

With a focus on public transport, the American Public Transport Association (APTA, 2020) estimated that spending US$ 1 billion in the USA could create almost 50 thousand new jobs and a US$ 5 billion increase in GDP, as well as a significant increase in productivity.

Dafermos and Nikolaidi (2019) presented a post-Keynesian, global, macroeconomic model, incorporating the limits to material resources,

[8] IRENA (2020) assumes a 50% crowding-out effect, i.e., the additional investment required for the energy transition drains investment from other sectors with higher employment intensities. It is also assumed that carbon taxation makes it possible to a reduce income taxes, leading to higher disposable income and thereby higher consumer spending.

[9] The investment made to generate clean renewable energy is directed at building (and operating) the infrastructure, repowering, which is spending for the refurbishment or upgrading of existing system components with the latest more advanced equipment. Investment in electricity networks includes investment in new infrastructure to accommodate new demand (increased connections and consumption), investment to replace ageing infrastructure and the investment required to integrate renewables in the power system and includes both transmission and distribution, and expenditure on digital equipment for the smart monitoring and operation of the grid (e.g., smart meters, automation, and electrical vehicle fast charging stations). All these data exclude both financing and operational costs.

the damage on the current or future GDP due to climate change, and a financial sector including both the central bank and private banks to analyse the effects of green public investment, subsidies, and carbon taxes[10] They found that green subsidies could be effective in decarbonising private capital. The greening of public capital also had indirect effects on the emissions of private companies. However, their model also indicated that the high level of economic activity, due to increased public spending, came at an environmental cost with an increase in matter depletion and waste per capita. The implementation of green public investment and subsidies together with carbon taxes helped to mitigate some of these environmental effects.[11] However, they also highlighted the need for other policies to accompany a green fiscal policy mix. These could include stricter environmental regulation, policies that reduce the growth of carbon-intensive consumption, and financial policies, as well as a fundamental change in consumption patterns. Dafermos et al. (2022) further integrated the effect of public spending on consumption norms, e.g., how some forms of green public investment, such as public transport, could induce households to reduce the consumption of environmentally harmful goods or the creation of non-commercial public places for socialising could reduce environmentally harmful consumption for leisure.

Section two of this report presents the theoretical macroeconomic framework of the analysis. Section three discusses definitions of the care and the green economy and data issues. Section four presents the stylised facts regarding the structure of output and employment in the selected emerging economies. Section five analyses the channels through which public spending affects output as well as the employment of women and men. Section six presents the econometric estimation results. Section seven concludes with further implications for policy.

Theoretical framework

In this section, we present the theoretical framework to analyse the impact of public spending in the care economy, green economy, and infrastructure on output and on employment for men and women.

The theoretical framework of the analysis is based on a gendered, structuralist, post-Keynesian, demand-led growth model which builds on Onaran, Oyvat and Fotopoulou (2019a, 2022a, b) and Oyvat and Onaran (2022). The theoretical framework synthesises and furthers the models by Braunstein, van Staveren and Tavani (2011) and Seguino (2010, 2012), incorporating an explicit analysis of the components of demand and supply-side analysis, the government, and employment. Unlike standard, neoclassical growth models

[10] See Dafermos and Nikolaidi (2019) for a comparison of mainstream (Integrated Assessment Models and Computable General Equilibrium) models based on full-employment assumption and post-Keynesian ecological macroeconomic models.

[11] The analysis of carbon taxes, such as taxes on transport, pollution, or resource extraction, are beyond the scope of this report; nevertheless, a note is in place here. While the effectiveness of carbon taxes may be limited due to the low-price elasticity of the demand for high-carbon intensive goods and services by the high-income groups, it may help to partially offset the impact of fiscal stimulus on demand for polluting, high-carbon and fossil-fuel based sectors as well as material use. Pollin et al. (2015) also argue that the most effective way to limit rebound effects of public investment is to combine efficiency investments with complementary measures to greatly expand the supply of clean renewables and to raise the price or put firm limits on producing CO2 emissions. There are however also concerns about their distributional effects.

that assume full employment, this theoretical framework recognises i) demand-side constraints in the economy, which lead to excess capacity and involuntary unemployment, ii) the effects of different types of public spending on demand, income distribution, and employment in both the short term and the medium term, as well as on the supply side on productivity in the medium term, iii) the dual effects of wages on aggregate demand as well as production costs, iv) the effects of distribution of wealth and income between wages and profits, as well as gender gaps in wages and employment on both demand and productivity, v) the effects of the structural features of the economy in terms of sectoral composition, oligopolistic price setting, import dependency, gender differences in the distribution of unpaid and paid labour in different sectors, and bargaining power between labour and capital and between different genders.

The novelty of this paper is to explicitly introduce governments' current and capital spending in renewable energy, energy efficiency and public transport (REEEPT) as well as in the care economy. Overall, there are four different types of government spending: i) current spending in renewable energy, energy efficiency and public transport, ii) current spending in the care economy, including spending in education, childcare, health care, and social care, iii) capital spending in infrastructure (public sector gross fixed capital formation (GFCF)), and iv) other government spending. Public sector gross fixed capital formation includes capital spending in renewable energy, energy efficiency and public transport, as well as buildings for the care economy, e.g., hospitals or schools.

We begin by presenting the structure of the model. Appendix 1 presents the full theoretical model, including the behavioural equations, identities, and the list of the variables in the model.

The economy has three sectors: i) the social sector, which consists of the current expenditure of the government in the care economy, i.e., it provides public services in education, childcare, health care, and social care (therefore contributing to the development of human capabilities using paid labour, as defined by Braunstein et al. (2011), denoted with script H in the rest of the paper), ii) the rest of the market economy (denoted with script N), and iii) the unpaid care sector.

The model introduces two types of workers: women and men. The profits are earned by the employers, who are genderless for simplicity in our model.

Aggregate output and income are equivalent to the sum of the wage income of men, women, and profits.

The total wage income of women workers is a function of women's wage rate in the social sector, women's employment in the social sector, women's wage rate in the rest of the economy, and women's employment in the rest of the economy.

Similarly, the total wage income of men workers is a function of men's wage rates in the social sector, men's employment in the social sector, men's wage rates in the rest of the economy, and men's employment in the rest of the economy. Gender wage gaps are the ratio of men's wage rate to women's wage rate in each sector.

The aggregate output in the market economy (GDP, excluding unpaid activities) is the sum of households' social expenditure, household consumption in the rest of the economy, private investment expenditure, government's social expenditure in the care economy, government's current spending in renewable energy, energy efficiency and public transport,

public investment (gross fixed capital formation), government's other expenditures, and net exports of goods and services.

Government social expenditure in the care economy constitutes the public social sector output. The rest of the GDP is the market output in the rest of economy, which provides goods and services to meet both private demand (household consumption, private investment, and exports) and government demand for spending in REEEPT and public transport, public infrastructure investment (gross fixed capital formation), and other expenditures. Economic activity in the rest of the economy provides output for both spending in the green economy and the rest of economic activities.

The share of government's current expenditure in the care economy, in REEEPT, public infrastructure investment and other spending are all determined as a fiscal policy decision as a share of aggregate output.

Employment in the rest of the economy is determined by output and labour productivity in the rest of the economy (and is equal to output divided by productivity).

The share of women in employment in each sector is socially determined by occupational segregation.

The wage paid to men and women workers in the social sector constitutes public social expenditure and the social sector does not generate profit. Any non-labour inputs used constitute part of other government expenditure. Thus, the public social expenditure is a function of women and men's wage rate and employment in the social sector.

Profits, i.e., the operating surplus in the rest of the economy, is income minus wage payments. The profit share is the share of profits in output in the rest of the economy and is a negative function of men's and women's wages and employment and a positive function of labour productivity in the rest of the economy.

Next, the model introduces the unpaid domestic care labour within households. For a given demographic structure defining the care needs of a society, higher-paid employment by men and women is expected to have some negative impact on the supply of unpaid labour. An increase in government expenditure in the social sector (in education, childcare, health, and social care) is also expected to reduce the need in households for care; therefore, it leads to lower unpaid labour. The impact of employment and public social expenditure on the time spent on unpaid domestic care might be non-linear, and this negative impact might be decreasing in absolute values as it gets increasingly difficult to decrease unpaid care at lower levels of unpaid care. Unpaid domestic care labour is shared between women and men and is exogenous and institutionally and socially determined.

On the demand side of the model, components of aggregate demand are defined by behavioural equations.

The household consumption of goods and services other than social expenditure is a function of the after-tax wage income of men and women workers in both sectors and the profit income of capitalists. Households' social expenditure is also a function of after-tax profit and wage income of women and men workers in the two sectors, albeit with different parameters, and government social expenditure. The marginal propensity to consume goods and services produced in the social sector and the rest of the economy are assumed to be different for men and women workers, who make separate, though interdependent, decisions within the same

household,[12] reflecting the gender pay gap, as well as gendered differences in behaviour. Government social expenditure can, on the one hand, increase household social expenditure by providing wage income in the social sector, and on the other hand, decrease household social expenditure by reducing the need for these expenditures. Government current or capital spending in REEEPT also affects household consumption in two conflicting directions, e.g., while the provision of public transport may reduce demand for private cars, government spending can also lead to indirect rebound effects by increasing available household income for the consumption of other goods (See Dafermos et al. 2022).

Private investment is expected to increase because of higher aggregate output and after-tax profit share in the rest of the economy. Government infrastructure investment may have further positive direct effects on private investment by improving infrastructure and business expectations or substitute private investment in infrastructure. The model also introduces the effect of public debt to GDP on investment to consider the possible negative crowding-out effects of rising public debt on the interest rate and thereby, private investment (See Dafermos et al. 2022).

Public debt at a point in time is the public debt accumulated in the previous period, plus interest on this debt, plus total government expenditure in the current period, minus taxes collected from profits in the current period.

Exports are expected to increase with the income of the trading partners and the depreciation in currency and decrease with an increase in relative prices of exports to imports. Imports increase when domestic demand in N or domestic prices relative to import prices increase and decrease with the depreciation in currency. For simplicity, we assume that the marginal propensity to import in the social sector is negligible.

Domestic prices and export prices are set as a mark-up on nominal unit labour costs and other imported input costs, depending on the oligopolistic market power of firms in an imperfectly competitive market. As nominal unit labour costs are real-unit labour costs multiplied by domestic prices, and the wage share is identical to real-unit labour costs (corrected for the ratio of GDP at factor cost to GDP at market prices), a fall in the wage share, i.e., a rise in the profit share, leads to a fall in relative prices and improves net exports, depending on the labour intensity of exports, the pass through from labour costs to export prices and domestic prices, and the price elasticity of exports and imports.

Finally, on the supply side of the model, labour productivity is constant in the short term and changes endogenously in the medium term in the rest of the economy, as we assume technological change or adoption of new techniques take time.[13]

In the medium term, labour productivity is likely to be positively influenced by government spending in the social sector, REEEPT and public investment with some time lag. We also expect household consumption expenditure in privatised social services and domestic unpaid care labour to affect labour productivity positively. Higher output also leads to higher labour productivity due to the Verdoorn effect (Naastepad, 2006; Hein and Tarassow, 2010),

[12] Previous research shows that the marginal propensity to consume on social services is larger for women than men and the marginal propensity to consume other goods and services is larger for men than women (Onaran, Oyvat, and Fotopoulou, 2022a, b; Seguino and Floro, 2003; Morrison, Raju, and Sinha, 2007; Lee and Pocock, 2007).

[13] Increasing productivity in the social sector is less related to the availability of technology, as the quality of these services is more important and in many cases requires more nurses, care workers, teachers per patient or student. Productivity in the social sector is determined simply by definition by output per employee.

as greater scale can lead to a more efficient allocation of resources. Moreover, we consider that higher wages lead to labour-saving technologies, as well as higher effort, which increase labour productivity. Finally, labour productivity is expected to be path dependent and related to its past values, since part of the technology from the last period is transferred to the following period. We expect the effects of these to be realised over the medium term. The medium term in the model is a sufficiently long period for these effects on productivity to be realised, e.g., five years or more. Furthermore, the time required for these different factors to affect productivity is an empirical question, e.g., the impact of public investment in childcare may take longer than the impact of other types of government spending or higher wages.

Women's and men's labour-force participation rates (labour force as a ratio of population) are positive functions of average wages, benefits and social infrastructure and negative functions of unpaid domestic care labour. For simplicity, we assume that population is exogenously determined, as changes in fertility and mortality take a much longer period than the medium-term theoretical and empirical analysis reflected in this paper. If employment grows faster than the labour force for a particular type of worker, the unemployment rate decreases, and vice versa. If demand for employment for a particular type of worker is not met by an increase in labour supply due to constraints in supply, e.g., a low female labour supply due to a lack of provision of public social infrastructure for care, either there will be an exogenous increase in labour supply due to migration, or gender norms and occupational segregation coefficients will change, or wages will adjust. Similarly, a rise in wages in a particular sector, e.g. in the social sector, as an outcome of higher public social infrastructure or a faster increase in wages in the social sector compared to wages in the rest of the economy, is likely to lead to a higher labour supply of both men and women. This would lead to changes in the sectoral segregation ratios in the social sector and the rest of the economy, as well as a change in social gender norms and the distribution of unpaid domestic labour.

While the wage rates in the social sector are determined by the government as a policy decision, we allow the wage rates for men and women in the rest of the economy to be determined endogenously as an outcome of a bargaining process between employers and workers. Women and men workers' bargaining power depends on changes in labour demand in each sector and the labour supply of men and women, as well as several other exogenous factors. Among them are elements determined by labour market institutions and legislation, social wage (determined by public social expenditure or parts of public infrastructure such as public transport or social housing), social norms, and occupational segregation affected by these norms, as well as personal characteristics such as education, which is also affected by social norms. For simplicity, we assume expected prices are equal to actual prices. Hence, the real wage rates in the rest of the economy are functions of employment (or unemployment rate) for men and women, the spill-over effects from wages in the social sector and across genders, and of a set of exogenous factors that affect bargaining relations. The spill-over effects of wage setting in the social sector are twofold: firstly, wage setting in the public sector affects wage dynamics and negotiations in the rest of the economy too. Secondly, public spending in the social sector provides the social wage and improves the bargaining power of workers in the rest of the economy.

Finally, a gendered distribution of labour, i.e., women in both the paid economy in the social sector and the rest of the economy, and in the unpaid economy, changes according to shifts in the wages and employment of men and women and unpaid labour requirement with a lag in the medium term.

Definitions and Data

In this section we present the definitions and data sources for public spending in the care and green economy and infrastructure. Appendix 2 presents the data sources and availability for variables, which we use in an empirical analysis of Chile, Colombia, India, Indonesia, the Philippines, South Korea, South Africa, and Turkey.[14]

We define public spending in the care economy as the sum of output in the sectors of education that include childcare, health and social care (including long-term care).[15] Public spending in education, childcare, health and social care are categorised as current spending (government consumption) in national accounts. However, feminist economics literature emphasises the 'public good' of this investment, given its positive effects on productivity and other externalities, and refers to it as social infrastructure investment (Elson, 2016, 2017; Women's Budget Group, 2015; Onaran et al, 2019a,b, 2022a). İlkkaracan (2013) coined the term "purple economy" to identify the care economy.

Public infrastructure spending is defined as public gross fixed capital formation as reported in national accounts. Examples of public gross fixed capital formation are buildings for schools and hospitals or machinery and equipment used in the care sector that are not accounted for in the current spending data for the care economy defined above, social housing, transport and energy infrastructure. The latter two include capital spending in the green economy, e.g., in rail transport or in the renewable energy sector, such as investment in wind farms, solar farms, or hydropower plants or the infrastructure for the distribution of energy.

We define public spending in the green economy as spending in renewable energy (solar, wind, geothermal and hydro, labelled as RE), energy efficiency (weather proofing and installing heat pumps etc. in public and private buildings, industrial energy efficiency, grid upgrades, labelled as EE) and public transport (PT, both infrastructure and current spending to provide the services, excluding air transport, with a larger weight allocated to rail transport infrastructure). We refer to this spending category as public spending in REEEPT.

Public spending in the green economy includes the purchase of goods and services produced in various industries such as construction (including construction services), manufacturing (e.g. based on ISIC3 Rev3 classification plastic products (code 2520), glass products (2610), cement and plaster (2694) and concrete products (2695), non-ferrous metals (2720), fabricated metal products (all sub-industries, i.e. 281, 289), general purpose machinery (291), special purpose machinery (292), domestic appliances (2930), electrical machinery and apparatus (31, all sub-industries), electronic valves, tubes, etc. (3210), locomotives & rolling stock (3520), other transport equipment (3599),[16] and transport services (excluding air transport).

[14] The countries are selected based on data availability and coverage of structurally different emerging economies.

[15] Our definition of the output in the care economy is consistent with the ILO (2020) definition of care sectors defined as follows: "Based on ISIC 4, care sectors are: 85. Education; 86. Human health activities; 87. Residential care activities; 88. Social work activities without accommodation. In several cases ..., health and social work was aggregated at one-digit level". We do not deduct the output produced by the private sector in the care economy as it does not alter our empirical analysis of the effects of an increase in government spending in care. Informal domestic care workers, as well as unpaid domestic care work is not part of this analysis, and due to data restrictions in informality, is out of the scope of this report. It is important to note that public investments in formal care services would be expected to decrease the use of informally provided care services and therefore facilitate formalisation and better working conditions for care workers. Finally, we do not analyse the effects of tax credits to households to purchase care services separately.

[16] We use UNIDO data on value added at 4-digit ISICrev4 classification for the latest periods for which data is available, and link this with the data at 4-digit ISICrev3 classification for the earlier years and for the period for which data at 4-digit classification is not available we link this series with the data at 2-digit ISICRev3 classification, assuming that the value added of the industry at 4-Digit classification (e.g. industry 2520) grew at the same rate as the value added of the industry at 2-digit classification which includes the 4-digit industry (e.g. industry 25). To make the intuition behind the link between these industries at 2-digit vs. 4-digit classification more comprehensible, we report the industry codes in ISIC rev3 rather than ISIC rev4.

This category combines both current spending and gross fixed capital formation in terms of the national accounting categories and has an overlap with the public infrastructure. Spending in public transport or energy efficiency includes both infrastructure investment (construction of the railways and manufacture of the rail transport vehicles or investment in the grid) and current spending (in labour compensation or other inputs) to provide public transport or insulation services. Spending in renewable energy includes only capital spending to produce assets (such as wind or solar farms, hydropower plants, geothermal plants) but not the labour compensation (or other inputs) to produce energy using renewable energy sources. We discuss the estimation methodology and how we address these issues in section 5. We do not have long-time series data on private or public spending in gross fixed capital formation in renewable energy or energy efficiency and, in the case of public transport, where there is a long history of investment, data availability does not allow us to disaggregate public gross fixed capital formation by industry. Therefore, we estimate the effect of an increase in public spending in renewable energy, energy efficiency and public transport as a ratio to GDP by distributing this spending stimulus across manufacturing, construction, and transport industries that provide inputs to renewable energy and energy efficiency using weights based on input-output data, described in Pollin et al. (2015). In the case of public transport, we distribute the spending stimulus across manufacturing, construction, and transport industries[17] using weights reported in APTA (2020). We summarise these weights in detail in Appendix 3 Tables A3.1-2.

In our simulation analysis, we estimate the effect of a policy package which includes public spending in the three categories as follows:

1. An increase in spending in the care economy (social sector, i.e., education, childcare, health, and social care) by 1%-point as a ratio to GDP.
2. An increase in public infrastructure spending (public gross fixed capital formation) by 1%-point as a ratio to GDP.
3. An increase in public spending in REEEPT by 1%-point as a ratio to GDP.

The latter spending category in REEEPT, is split in turn as follows: half of this spending is allocated to renewable energy, which is allocated equally among investing in wind, solar, geothermal and hydropower.[18] Also, 20% of spending in REEEPT is allocated to energy efficiency, out of which 50% is allocated to weather proofing/energy efficiency in public and private buildings; 25% is allocated to industrial energy efficiency, and 25% is allocated to grid upgrade.[19] Finally, 30% of spending in REEEPT is allocated to public transport, out of which 10% is allocated to investment in rail transport vehicles, 18% is allocated to construction (to build the infrastructure) and 72% is allocated to the provision of the transport services. These weights are based on APTA (2020). Appendix 3 Table A3.2 then presents how an increase in spending in REEEPT by 1%-point as a ratio to GDP is allocated to manufacturing sub-industries (0.458%-point), construction (0.327%-point), and transport services (0.216%-point) as a ratio to GDP.

[17] The data in the national accounts for the transport industry includes both private and public transport services. Due to a lack of data to disaggregate the industry value added by provider, we must assume that one unit of stimulus spent in this sector will have the same effect on employment whether the spending is private or public. We excluded air transportation where possible. In the cases of missing data, we used data on total transport services and transportation, communication and storage and linked them with our original dataset (See Appendix 2).

[18] Large scale hydropower plants may have unsustainable environment effects; the proposed spending in this report prioritises small-scale hydropower plants. See Batini et al. 2021 and Pollin et al. (2015).

[19] The ratios for RE and EE allocation are based on the proposal in Pollin et al. (2015).

The spending distribution between different types of renewable energy, energy efficiency and public transport aims to provide an indicative policy simulation and can be adjusted based on the specific needs or resources of each country. The ratios we use for the simulations in this report should be regarded as plausible examples.

Next, we repeat the stimuli described above every year, and calculate the cumulative effect of these increases every year for five years.

Finally, appendix 3.3 presents ILO (2020; based on İlkkaracan and Kim, 2019) estimates regarding the additional spending requirements per year as a ratio to GDP in the care economy as the "high road" scenario compared to one that maintains the status quo.[20]. Appendix 3.4 presents an additional, average, annual low-carbon energy investment requirement as a ratio to GDP (%) for the period of 2016-2050 to limit global warming to 1.5°C compared to current policies based on Bertram et al. (2021) and McCollum, et al. (2018).[21] The additional average annual low-carbon energy investment requirement as a ratio to GDP ranges between 0.9% in South Korea and 3.8% in India.[22]

In analysing public spending in the green economy, we focus on those sectors with a public good profile of those that reinforce infrastructure. Unlike the ILO (2018), we do not analyse spending in private electrical vehicles as part of public stimulus to greening transport, as our aim is to highlight the role that public spending can play in a shift from the production of private transport vehicles to the production of public transport vehicles as part of a zero-carbon economy.[23] We also exclude biofuel as part of the renewable energy mix, mindful of the potential strain it would place on global agricultural resources, land use, sustainability, food prices and poverty.[24] We also do not include energy production using biomass and waste due to concerns about their carbon neutral status.[25] Nuclear energy is excluded from our simulation analysis due to the potentially major public safety concerns, as well as being a non-renewable energy source because of its reliance upon uranium.[26]

Other important areas that could achieve the transition to a zero-carbon, green economy and improve the sustainability of human activities, include expanding the circular economy (recycling for plastics, glass, pulp, metals and minerals; replacing the direct extraction of the primary resources for these products; growth in rental and repair services, reducing the ownership and replacement of goods),[27] sustainable and organic agriculture[28] and fishery, forestry, rewilding and protection of wildlife, biodiversity, and ecosystems. While we do not focus on the circular economy, agriculture, fishery, forestry, rewilding, and

[20] In the "high road" scenario care services are expanded by 2030 in terms of the extent of population coverage as well as the quality of services provided and employment created to meet the requirements of Sustainable Development Goals (SDGs) for the provision of public care services, health and well-being, quality education, and full and productive employment and decent work (ILO, 2020). The "status quo" scenario is the baseline case, which assumes that care services will expand in line with population increases but with the current coverage rates, quality standards and working conditions in care sectors remaining constant, with the result that both care deficits and decent employment deficits persist into 2030.

[21] Net-Zero 2050 is a scenario that limits global warming to 1.5°C through climate policies and innovation, reaching net zero CO2 emissions around 2050, which is compatible with the long-term temperature goal of the Paris Agreement (Bertram et al. 2021). Current Policies assume that only currently implemented policies are preserved, leading to a global warming by up to 3°C by 2100 and high associated climate impacts.

[22] Country specific estimates are provided based on the GCAM5.3_NGFS Model in Bertram et al. (2021). McCollum, et al. (2018) presents estimations for India based on six other models, where additional low-carbon investment range between 1% and 5.4%.

[23] See Dafermos and Nikolaidi (2019) for a discussion of the effect of public transport on private car use.

[24] Pollin et al. (2015) also argue that "some bioenergy sources such as corn ethanol and woodburning offer little or no improvement on emissions relative to burning coal or oil". They nevertheless explore clean biofuel sources as part of the policy simulation.

[25] See Batini et al. 2021 for a discussion.

[26] See Pollin et al. (2015) who also exclude nuclear energy in policy simulations.

[27] ILO (2018) estimate that "almost six million jobs can be created by moving away from an extract-manufacture-use-discard model and embracing the recycling, reuse, remanufacture, rental and longer durability of goods. Notably, it means a reallocation from the mining and manufacturing sectors to waste management (recycling) and services (repair, rent)."

[28] Batini et al (2021) report that "The IPCC's 2019 Special Report on Climate Change and Land estimates that the agri-food sector emits between 21-37% of greenhouse gases ¬ a share expected to raise to 50% of all global emissions by 2050 absent policy action.... The sector is also widely indicated as the first cause of natural resources and biodiversity degradation, including its leading role as a driver of deforestation, with large associated carbon releases."

conservation in this report, we recognise the importance of analysing the role of policies in these areas as part of future research on a green transition.

We define public spending broadly, including spending by municipalities and local authorities and not solely by central government, depending on the nature of the sector and the preferences regarding the structure of governance and devolution in the country. The ownership structure in different industries may also take diverse forms, including central government or municipal ownership or cooperatives that bring together producers and/or users. Similarly, public spending may take the form of public investment, public employment programmes, contracting or public subsidies, in areas where private capital already exists, and public capital accumulation may take time e.g., in a country where electric utilities are publicly provided, the government can easily use green public investment to decarbonise electricity provision; but in a country where utilities are private, the government may need to rely on green subsidies to reduce the reliance of electricity production on fossil fuels unless it decides to nationalise the utilities.[29]

Stylised facts of key structural indicators

In this section we present a descriptive analysis of the stylised facts of key structural indicators of selected countries as of 2019 (the year before the Covid-19 pandemic) in Table 1.

The emerging country cases in this report range from India, with the lowest GDP per capita of US$6,714 (in PPP, constant 2017 international US$) to South Korea among the high-income country category with a GDP per capita of US$42,759 (in PPP).

Despite improvements in aggregate income, substantial inequalities persist, with total employment rates still below 70% in all eight country cases, and a high share of informal employment, that reaches above 80% in the extreme cases of India and Indonesia. Employment rates for women are below those of men in all cases, with the lowest rate of employment for women at 19.7% in India, followed by Turkey at 27.6% and the highest rate still below 60% in Indonesia (52.4%). There are further issues regarding the women's employment rate being lower in urban areas. The employment rate of men ranges between a very low rate of 46.1% in South Africa and 79.7% in Indonesia.

Both the care economy and the green economy provide an important potential for employment, as well as just transition, and there are substantial gaps in terms of required investment for a caring and green transition as discussed in Section 3. As of 2019, the ratio of output in the care economy to GDP ranges between 4.4% in Indonesia and 16% in South Korea, representing between 4.3% of total employment in the Philippines and 15.2% in South Korea. The share of value added in the manufacturing sectors providing input to REEEPT in GDP is higher in South Korea at 14.2% compared to others, with Indonesia at 4.7% and the Philippines at a rate as low as 1.1%. The share of construction in GDP is between 3.1% (South Africa) and 10.7% (Indonesia), and that of transport (excluding air transport) is low at a share between 0.7% (Turkey) and 3.5% (India).

[29] We are grateful to Maria Nikolaidi for this comment.

TABLE 1. KEY INDICATORS, 2019

	CHILE	COLOMBIA	INDIA	INDONESIA	PHILIPPINES	SOUTH KOREA	SOUTH AFRICA	TURKEY
GDP IN CONSTANT 2015 PRICES IN USD (1000)	262807032	321687569	2695611315	1049318967	396224788	1637850078	358712445	997437115
GDP PER CAPITA IN PPP (CONSTANT 2017 INTERNATIONAL $)	24968	14585	6714	11812	8915	42759	13710	28197
EMPLOYMENT RATE, TOTAL (%)	58,8	60,8	46,7	66,1	56,4	60,3	40,1	44,5
EMPLOYMENT RATE, MEN (%)	69,3	73,4	71,9	79,7	69,4	68,8	46,1	62,2
EMPLOYMENT RATE, WOMEN (%)	48,8	48,9	19,7	52,4	43,6	51,9	34,5	27,6
OUTPUT IN THE CARE ECON/GDP (%)	11,8	14,8	7,9	4,4	9,2	16,0	15,6	12,5
VALUE ADDED IN MANUFACTURING SECTORS								
PROVIDING INPUT TO REEEPT/GDP (%) (I)	1,9	1,5	1,8	4,7	1,1	14,2	3,7	3,5
VALUE ADDED IN CONSTRUCTION/GDP (%)	6,9	7,6	6,7	10,7	7,9	5,5	3,1	5,4
VALUE ADDED IN TRANSPORT (EXCLUDING AIR TRANSPORT)/GDP (%)	2,4	3,3	3,5	2,9	2,3	1,6	7.9 (VII)	0,7
THE SHARE OF INFORMAL EMPLOYMENT IN TOTAL EMPLOYMENT (%) (II)	29,3	62,4	88,6	82,4	36,1	25,1	35,3	32,0
PUBLIC GFCF/GDP (%)	2,3	3,5	6,1	3,6	4,8	5,0	2,4	3,4
EMPLOYMENT IN THE CARE ECONOMY/ TOTAL EMPLOYMENT (%) (II)	14,9	8,4	5,2	6,6	4,3	15,2	12,2	11,7
EMPLOYMENT IN CONSTRUCTION/TOTAL EMPLOYMENT (%) (II)	8,5	6,9	11,9	6,2	9,7	7,4	8,2	4,5
EMPLOYMENT IN TRANSPORT (EXCLUDING AIR TRANSPORT)/ TOTAL EMPLOYMENT (%) (II)	8,5	7,9	6,2	4,9	9,0	8,4	6,1	4,5
EMPLOYMENT IN MANUFACTURING/TOTAL								
EMPLOYMENT (%) (II)	9,9	11,8	12,1	14,4	8,5	16,3	10,8	18,4
WOMEN'S SHARE IN EMPLOYMENT IN THE								
CARE ECONOMY (%) (II)	72,9	70,4	45,3	63,1	71,8	74,6	72,6	61,3
WOMEN'S SHARE IN EMPLOYMENT IN CONSTRUCTION (%) (II)	7,4	5,8	7,8	2,1	2,1	9,9	11,1	4,3
WOMEN'S SHARE IN EMPLOYMENT IN TRANSPORT (EXCLUDING AIR TRANSPORT) (%) (II)	19,5	13,7	3,6	6,7	7,2	18,0	19,1	9,2
WOMEN'S SHARE IN EMPLOYMENT IN THE								
MANUFACTURING SECTOR (%) (II)	32,6	44,9	20,8	43,4	41,1	28,4	34,7	25,4
WOMEN'S SHARE IN EMPLOYMENT IN THE MANUFACTURING SECTORS PROVIDING INPUT TO REEEPT (%) (III)	NA	25,4	NA	36,3	50,7	24,5	NA	NA
IMPORTS/VALUE ADDED IN THE MANUFACTURING SECTORS PROVIDING INPUT TO REEEPT (%) (IV)	301,5	192,1	141,5	103,3	351,2	51,7	261,2	172,7
IMPORTS/VALUE ADDED IN THE MANUFACTURING SECTOR (%) (V)	162,9	96,4	54,2	47,5	108,8	66,9	150,7	96,5
IMPORTS/VALUE ADDED IN SERVICES (%) (V)	8,7	8,1	8,8	7,5	12,7	13,5	7,4	5,5
ENERGY IMPORTS, NET (% OF ENERGY USE) (V)	65,2	-274,1	34,3	-103,1	45,8	81,4	-14,5	75,2
CO2 EMISSIONS PER CAPITA (T CO2 PC) (VI)	4,8	1,5	1,7	2,2	1,3	11,3	7,4	4,4
CO2 EMISSIONS/GDP CONSTANT 2015 USD PPP (VI)	0,2	0,1	0,3	0,2	0,1	0,3	0,6	0,2
CO2 INTENSITY OF TOTAL ENERGY SUPPLY (CO2/TES; T CO2/TJ) (VI)	52,3	40,6	58,8	57,8	52,4	49,9	73,9	59,7
ENERGY INTENSITY: TOTAL ENERGY SUPPLY/GDP (PPP) (GJ/ THOUSAND 2015 USD PPP) (VI)	4,0	2,7	4,3	3,1	2,7	5,4	8,3	2,7
RENEWABLE SHARE (MODERN RENEWABLES) IN FINAL ENERGY CONSUMPTION (SDG 7.2) (%) (VI)	25,3	22,8	15,9	9,7	10,4	3,4	5,6	14,1

Source: i) South Africa at 2-digit level; 2017 for others 2018, see Appendix 2; ii) ILOSTAT online database, for Korea, the Philippines and Turkey informal employment share is proxied by the share of self-employed; iii) UNIDO database, see Appendix 2 for details; iv) UNIDO database, Demand-Supply balance, 2016, 2-digit data for all countries; v) World Bank WDI database, 2016 for comparability; vi) IEA (https://www.iea.org/data-and-statistics/data-browser) for CO2 emissions and intensity, energy intensity, renewable share data. See Appendix 2 for other variables. Vii) Transportation (including air transport) and storage, communication for South Africa.

There are important gender differences in terms of the share of women in employment across different industries. While the share of women is high in the care economy (between 45.3% in India and 74.6% in South Korea), their share is low in construction (between 2.1% in Indonesia and 11.1% in South Africa) and transport (3.6% in India and 19.5% in Chile). In the manufacturing industry, women's share in employment is higher than in construction and transport; however, in the manufacturing sectors providing input to REEEPT, women's share is lower (between 24.5% in South Korea and 36.3% in Indonesia) compared to their share in aggregate manufacturing in most countries. These gendered differences indicate the importance of investing in both the care and green economies to support gender equality efforts.

The share of renewable energy in final energy consumption (modern renewables, as defined by SDG 7.2) ranges between 25.3% in Chile and 3.4% in South Korea at the low end, indicating a large gap and the vast potential for new investment. As in the rest of the world, emerging economies need to reduce the emission intensity of total energy supply as well as energy intensity (Total energy supply/GDP). As of 2019, CO2 intensity of total energy supply (t CO2/TJ) ranges between 40.6 in Colombia on the lowest end and 73.9 in South Africa.

Energy intensity (GJ/thousand 2015 USD PPP) is between 2.7 in (Colombia, the Philippines, Turkey) and 8.3 in South Africa (again on the high end). There are also important inequalities in terms of global climate justice, with the Philippines having the lowest CO2 emissions per capita (1.3 t CO2 pc) and South Korea with the highest (11.3 t CO2 pc).

Investment in the green economy offers both opportunities and challenges in terms of the balance of payments. It decreases the energy intensity as well as the dependence on energy imports, which is a significant issue for South Korea, Turkey, Chile, the Philippines, and India, who import (net) between 81.4% (South Korea) and 34.3% (India) of their energy use. Imports constitute a high share in the value added of manufacturing in general, and an even higher share in the manufacturing sectors providing input to REEEPT in all countries except South Korea. The ecreese in energy imports as countries increase their energy self-sufficiency via their investment in renewables and energy efficiency can partially offset the balance of payments constraints in the medium term. Furthermore, the productivity gains of investments in the care economy, also with a very low import content, can further relax these constraints.

The effects of public spending on employment and GDP

In this section, we discuss the effects of changes in public spending on output and the employment of women and men based on the theoretical framework described in Section 2.

Public spending in the care economy can increase through a rise in employment or higher wages in the public social sector.[30] In the case of public spending in REEEPT or infrastructure, it can take the form of public sector contracting or subsidising a private provider to provide goods and services. It can also occur as a result of direct public employment programmes, which can create a rise in employment and wages

[30] In the short term (within a year contemporaneously) we assume that care employment can be increased with the existing capital stock (e.g., hospitals, care homes, schools etc.). The model and the estimation methodology allow for growth in the capital stock in the care economy in the following years. We also estimate combined effects of expanding both care employment (and wages) and public gross fixed capital formation, which includes investment in the public buildings such as hospitals, care homes, nurseries, and schools. To overcome labour shortages in this sector, education and training spending is crucial, albeit with potential time lags.

in the rest of the economy. For simplicity, in describing the theoretical channels through which public spending affects output and employment below, we focus on a case where the direct effect of public spending in REEEPT or infrastructure is to hire more employees, and any wage effects are indirect due to the increased bargaining power of labour.[31] The empirical estimation methodology (VAR) discussed below captures the effects of an increase in public spending via both an increase in employment and wage rates, and estimates of the cumulative effects on output and employment.

An increase in public spending affects the components of aggregate demand and thereby output in both the short and the medium term, as summarised in Table 2.

TABLE 2. THE IMPACT OF AN INCREASE IN PUBLIC SPENDING ON AGGREGATE DEMAND

	DIRECT EFFECTS IN THE SHORT TERM		DIRECT EFFECTS IN THE MEDIUM TERM	
	PUBLIC SPENDING IN THE SOCIAL SECTOR (CARE ECONOMY)	PUBLIC SPENDING IN REEEPT (GREEN ECONOMY) OR INFRASTRUCTURE	PUBLIC SPENDING IN THE SOCIAL SECTOR (CARE ECONOMY)	PUBLIC SPENDING IN REEEPT (GREEN ECONOMY) OR INFRASTRUCTURE
CONSUMPTION IN N	RISING EMPLOYMENT IN H (+)	RISING EMPLOYMENT IN N (+) REDUCING PRIVATE CONSUMPTION BY PUBLIC PROVISION (-)	RISING PRODUCTIVITY AND PROFIT SHARE (?)	RISING PRODUCTIVITY AND PROFIT SHARE (?)
CONSUMPTION IN H	DIRECT POSITIVE EFFECT (+) RISING EMPLOYMENT IN H (+) REDUCING PRIVATE CONSUMPTION BY PUBLIC PROVISION (-)	RISING EMPLOYMENT IN N (+)	RISING PRODUCTIVITY AND PROFIT SHARE (?)	RISING PRODUCTIVITY AND PROFIT SHARE (?)
PRIVATE INVESTMENT	CHANGE IN PUBLIC DEBT/ GDP (-/0?)	CHANGE IN PUBLIC DEBT/ GDP (-/0?) IMPROVED BUSINESS ENVIRONMENT OR INFRASTRUCTURE (+) SUBSTITUTE PRIVATE INVESTMENT IN INFRASTRUCTURE (-)	RISING PRODUCTIVITY AND PROFIT SHARE (+) CHANGE IN PUBLIC DEBT/ GDP (-/0?)	RISING PRODUCTIVITY AND PROFIT SHARE (+) CHANGE IN PUBLIC DEBT/ GDP (-/0?)
GOVERNMENT EXPENDITURES	DIRECT POSITIVE EFFECT (+)	DIRECT POSITIVE EFFECT (+)		
NET EXPORTS	0	NEGATIVE EFFECT DUE TO INCREASE IN IMPORTS (-)	RISING PRODUCTIVITY AND LOWER REAL-UNIT LABOUR COSTS (+)	RISING PRODUCTIVITY AND LOWER REAL-UNIT LABOUR COSTS (+) NEGATIVE EFFECT DUE TO INCREASE IN IMPORTS (-)

Note: There are also further multiplier effects not shown in the table

[31] If wages increase as part of the public spending program, in our model this will have direct effects on the profit share, and thereby investment and net exports, which is an extension to the analysis we present below.

We first discuss the short-term effects. All three types of public spending are expected to have direct positive effects on total output, as well as further multiplier effects, as they generate more employment and aggregate income, which in turn increases household consumption and private investment due to demand effects. The magnitude of the multiplier effects of the three different types of spending will depend on i) the labour intensity of the sectors receiving the extra spending, ii) the marginal propensity to import out of the new spending, iii) the effects on household consumption by substituting private spending, iv) the effects on private investment by providing public infrastructure, and v) the gender composition of new employment.

With respect to the gendered effects, there are important differences in the effects of public spending in the care economy versus in REEEPT and infrastructure. Women constitute a larger share of employment in the social sector. Therefore, we can expect that a rise in the share of social sector in aggregate output increases the share of women workers in total employment. Furthermore, an increase in social expenditures providing childcare or elderly care is expected to increase women's labour force participation and their employment in the rest of the economy as well, if matched with an increase in output and labour demand. These effects on the gender composition of employment in turn affects consumption patterns and average marginal propensity to consume in the economy. Previous research shows that the marginal propensity to consume on social services is larger for women than men and the marginal propensity to consume in the rest of the goods and services is larger for men than women (Onaran, Oyvat, and Fotopoulou, 2022a, b; Seguino and Floro, 2003; Morrison, Raju, and Sinha, 2007; Lee and Pocock, 2007).

Higher public spending with constant tax rates could increase the public debt as a ratio to GDP, if multiplier effects are not very high. This, in turn, might lead to an increase in the interest rate under certain circumstances, particularly where monetary policy does not actively accommodate fiscal policy. Consequently, depending on the interest elasticity of investment, there may be negative crowding out effects on private investment. However, this effect might be small if investment is not very sensitive to interest rate and the effect of public borrowing on the interest rate is not very high.

Finally, a rise in the employment of men and women (as a ratio to their labour supply) will lead to an increase in the wage rates of men and women. Changes in the wage rates of men and women also affect each other.

Next, we discuss the medium-term effects, when labour productivity (output/worker) in the rest of the economy is expected to increase in response to an increase in output, wages, private and public spending in the care economy, green economy, and infrastructure.

An increase in public social expenditure is expected to have a direct positive impact on labour productivity in the medium term through its contributions to human capabilities. This could be due to the positive impact of education and childcare on skills or of health care on health outcomes. The effect of social care on productivity could be more indirect by improving the social fabric, social security, and welfare, in addition to allowing unpaid domestic carers to realise their full potential. In all three types of care spending, there is also a further positive effect on productivity due to the increased labour force participation of women – who would otherwise provide domestic unpaid social care – to unleash their full productive potential. On the unpaid care side of the economy, higher public spending in care may reduce some types of unpaid care needs in the household, related to supervisory unpaid labour if not emotional labour (Folbre, 2006). Both paid and unpaid care improves the productive capabilities and skills of recipients (England, 2005; Folbre, 2006; Folbre and Heintz, 2017) and could increase productivity-enhancing knowledge (Folbre and Heintz. 2019).

In the case of all three types of public spending, higher output in the economy also leads to higher labour productivity, as a higher scale can lead to the more efficient allocation of resources. Households' consumption in social services may also increase with higher incomes, which in turn would increase labour productivity.

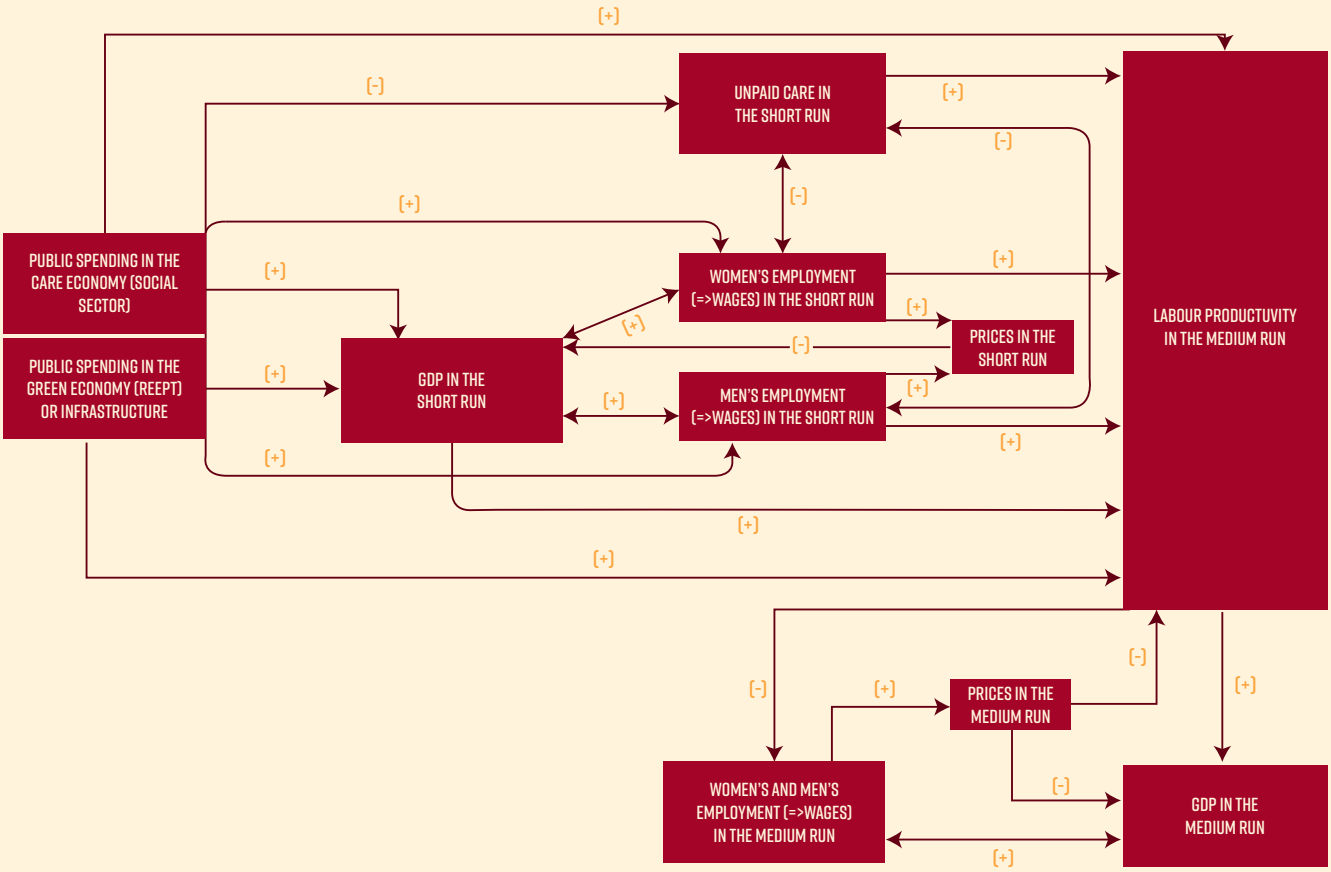
In the case of public spending on infrastructure, labour productivity is expected to increase via the direct effects of improved infrastructure, as well as indirectly through its effect on private investment.

The increase in labour productivity further affects output because higher labour productivity has a positive effect on the profit share, which in turn stimulates private investment. Higher productivity is also expected to increase exports and decrease imports due to the low unit labour costs, as it increases the international competitiveness of the economy. The change in labour productivity could also affect consumption because it changes the distribution of income between wages and profits, which have different marginal propensities to consume.

As in the short term, in the medium term, an increase in public spending can lead to change in public debt/GDP, and further affect private investments. However, as public social expenditure also affects labour productivity in the medium term, the possible crowding out effects may be eased or even reversed in this time frame.

The medium-term effect of public spending on employment depends on the relative size of the increase in output and labour productivity. We expect the proportionate increase in output to be larger than that of productivity in response to all three public spending categories, and thereby a positive medium-term effect on employment, albeit with gender differences. Figure 1 summarises the effect of public spending on employment, output, and labour productivity.

FIGURE 1. THE EFFECT OF PUBLIC SPENDING ON EMPLOYMENT, OUTPUT, AND LABOUR PRODUCTIVITY



Estimation methodology

We use a systems approach based on vector autoregression (VAR) as the estimation methodology, to tackle the multi-dimensional, complex causal relations between public spending, output, and employment as described in Section 2 and 5. Oyvat and Onaran (2022) uses VAR for estimating the effects of public spending in the care economy in South Korea. Batini et al (2020) estimated the effects of public spending in clean renewable energy and alternatives on GDP using semi-structured VAR for a panel of countries. Wildauer et al. (2021) estimated a VAR model on the effect of public gross fixed capital formation on GDP in the European Union. Onaran and Stockhammer (2005) estimated the effect of functional income distribution on output and employment using VAR for the cases of Turkey and South Korea. Stockhammer and Onaran (2004), Barbosa-Filho and Taylor (2006), Kiefer and Rada (2015), and Jump and Mendieta-Muñoz (2017) estimated the effect of the wage share or wages on output and/or employment for the USA, UK, or France. The advantage of this approach is that the interaction between public spending, wages, employment, demand, and productivity can be incorporated, and it is more suitable to deal with the endogeneity issues, and accounting for dynamic endogenous changes in wages, labour supply, occupational segregation, productivity, and unpaid work. VAR allows for tracing the effects through an entire system rather than analysing one equation at a time. However, using this approach requires a focus on a sub-set of the variables in the theoretical model, since degrees of freedom in the estimations could quickly erode with extra variables due to use of multiple lags (Enders, 2015).

We carry out country-specific estimations using time series data. The estimation period is determined by data availability for each country. We estimate the impact of an increase in public spending in public infrastructure (public GFCF), the care economy, sub-industries providing inputs to REEEPT, on the employment of men and women in the non-agricultural sector and GDP. Combining the effects on employment of men and women in the non-agricultural sector, we calculate the effects on total non-agricultural sector employment. The employment indicator in the econometric estimations is based on the non-agricultural sector to avoid potential biases due to the high share of informal or self-employed or unpaid family workers in agricultural employment.

We estimate alternative specifications with different combinations of public spending variables:

1) Specification (1) exists of five variables in the system with the following order: public GFCF, output in the social sector (education, childcare, health, and social care), employment of men and women in the non-agricultural sector, and GDP. We do not include REEEPT together with public GFCF in the same specification to reduce double counting, as most of the infrastructure spending involves construction and inputs from manufacturing. This specification accounts for public spending in REEEPT as part of the total public GFCF and excludes the current spending in REEEPT.

2) Specification (2) includes the sub-industries providing input to REEEPT existing of six variables with the following order: value added in construction, public transport services (excluding air transport), the value added of a synthetic sector consisting of the sum of the value added of manufacturing sub-industries providing input to REEEPT,[32] employment of men and women in the non-agricultural sector, and GDP. We use the value added in public transport services, construction, and manufacturing sub-industries as separate variables rather than using their sum for REEEPT, as they are expected to have different multiplier effects due to differences in their labour intensity and imported input content.

Based on the estimated cumulative orthogonalized impulse response functions, we first present the effect of an increase in each public spending category as described in section 3 contemporaneously and for the following 5 years. In Specification 1 we analyse the effects of an increase in each of the care economy and public GFCF by 1%-point as a ratio to GDP. In specification 2, we analyse the effects of an increase in the sum of the value added in construction by 0.327%-point, public transport services by 0.216%-point, manufacturing sub-industries providing input to REEEPT by 0.458%-point, all as a ratio to GDP (based on the weights presented in Appendix Table A3.2).

Second, we calculate the cumulative effects of repeating these stimuli for five years.[33] Third, we present an alternative scenario in which we multiply the effects of a 1%-point increase in the care economy/GDP and the REEEPT/GDP with the required additional investment reported in Appendices 3.3-4, as discussed in Section 3.

Based on these estimations, we calculate the effects of public spending on the employment rate (total as well as for men and women) for the projected rate of growth of population (applying the rate of growth in non-agricultural employment to total employment).

Finally, we calculate the sum of the employment effect of an increase in care, REEEPT and public gross fixed capital formation. Alternative specifications (1 and 2) discussed above are used to present the cumulative effects on employment and GDP.

A note about the issue that our RE category does not include current spending for energy production using renewable energy is in place here. The VAR methodology partly addresses this issue by accounting for the lagged multiplier effects of capital investment in RE on total employment. We also do not explicitly estimate the effects of disinvestment in polluting, carbon-intensive and fossil fuel-based activities, but the theoretical channels allow for the possibility for green (REEEPT) investment to substitute or decrease brown/high-carbon investment or consumption demand as far as historical data captures such relationships albeit in a limited sense, given that the transition to renewables is a relatively new process. Nevertheless, our results show the employment potential of green economy and care economy to open space for policy discussion for redeployment in low-carbon sectors away from the high-carbon sectors.[34]

[32] For South Korea, Turkey, Chile, and Colombia this is the sum of value added in manufacturing sub-industries 2520, 2610, 2694, 2695, 2720, 28 (all sub-industries, i.e., 281, 289), 291, 292, 293, 31 (all sub-industries), 3210, 352, 3599 (codes based on ISIC3 Rev3 classification). For South Africa, the Philippines, India, and Indonesia this is the sum of value added in manufacturing sub-industries 2520, 2610, 2694, 2720, 28 (all sub-industries, i.e., 281, 289), 291, 292, 31 (all sub-industries), 3210, 352. The names of the industries are listed in Section 3 and further details are in Appendix 3. When taking the sum of sub-industries, we use value added rather than output to avoid double counting. Similarly, as the VAR methodology accounts for the effect of an increase in demand in one industry on the others, we also use the value added in construction and public transport services.

[33] Five years is realistic as a new term of policy change in the government policies as well as allowing policies to meet the urgency of the required investment by 2030.

[34] The effects of renewable energy investment on emissions depend on what happens with high-carbon spending. The emission reduction will be much higher in the case in which the investment in renewables increases and the investment in fossil fuels declines, compared to the case in which the investment in renewables increases and the investment in fossil fuel remains unchanged.

Estimation results and policy simulations

This section presents the estimation results on the impact of public gross fixed capital formation (public GFCF), the care economy and the green economy (sub-industries providing inputs to REEEPT) on GDP, women's and men's employment (in the non-agricultural sector) based on VAR analysis. Appendix 5 presents the estimated, cumulative (orthogonalized) impulse-response functions. Based on the estimated impulse responses for specification 1, Figures 2 and 4 report the cumulative percentage change in GDP, and women's and men's employment (and total employment, all in non-agricultural sectors)[35] in response to a one-off 1%-point increase in public GFCF as a ratio of GDP and care economy output as a ratio of GDP, respectively. Figure 6 reports the effects of a one-off 1%-point increase in public spending in the green economy (REEEPT) as a ratio of GDP based on the estimated impulse responses for specification 2. In Figures 2, 4 and 6, the effects in year zero are the contemporaneous effects of this initial shock, while the effects in year five show the cumulative effects in the medium term summing the contemporaneous and lagged effects of this one-off shock. The effect on GDP is the multiplier effect, also illustrating the change in GDP in response to a one-unit change in the public spending category (both measured in local currency). Figures 3, 5, and 7 present the effects of a five-year long repeated annual increase in public spending in GFCF, the care economy and the green economy by 1%-point as a ratio of GDP every year (repeating and accumulating the effects of a one-off shock each year).

7.1 THE EFFECTS OF PUBLIC GROSS FIXED CAPITAL FORMATION

As can be seen in Figure 2, in Chile, a one-off increase in public GFCF by 1%-point of GDP leads to 1.8% increase in GDP contemporaneously and 3.7% in five years, i.e., an increase in public spending in public gross fixed capital formation by one Chilean Peso increases the Chilean GDP by 3.7 Chilean Peso at the end of five years. The employment of women and men increases respectively by 1.7% and 2% during the first year of the stimulus, and by 3.5% and 3.2% in five years.

In Colombia, the contemporaneous increase in GDP is smaller (0.3%); however, GDP increases by 1.9% in five years. The employment of women and men increases respectively by 2.2% and 0.07% in five years with total employment increasing by 1%.

In India, employment of men by year 1 and year 3 increases by 0.4% and 0.8% respectively, while the effects on women's employment and GDP are insignificant.

In Indonesia, GDP increases by 1% contemporaneously, and by 3% by the fifth year, and the employment of women and men increases contemporaneously by 0.5% and 0.6% respectively, and by 2.5% and 2.1% by year five.

[35] Henceforth, unless specified otherwise, the employment figures refer to the change in the non-agricultural sector.

In the Philippines, the impact on GDP is small contemporaneously (0.4%); GDP increases by 0.9% in five years, and men's employment increases by 0.7% in cumulative, while the impact on women's employment is negative, albeit low and insignificant from year four. Total employment increases by 0.4% by year five.

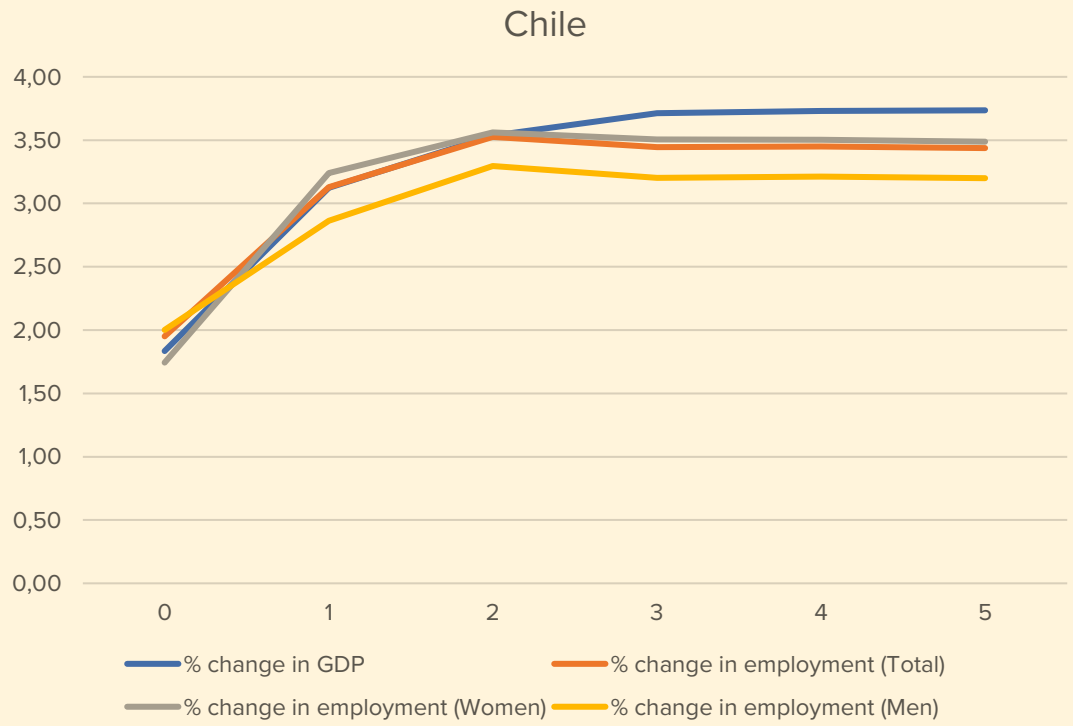
In South Africa, GDP increases by 1.3% contemporaneously and by 2.4% in five years; employment of women and men increases by 6.8% and 4.1% respectively in five years. The effect on non-agricultural employment is larger than that on GDP, which could be due to urbanisation and informality. Public infrastructure spending may have more positive effects on urban output and employment that could attract rural dwellers to urban areas, leading to a higher rate of growth in non-agricultural employment than in the rest of the country. Also, GDP is likely to underestimate the informal economy's output, while employment data based on household labour force surveys is more likely to capture some informal employment. Urbanisation itself may contribute to a higher rate of growth in informal employment in the cities. The estimations are based on data for the post-1991 period for South Africa, where the mobility of the black South African population was severely restricted until 1991, which suppressed the urban share of population at low levels, and our estimations might be capturing the increase in urbanisation after the end of migration restrictions during apartheid (Bakker, Parsons, and Rauch, 2020). These results are robust to controlling for urbanisation and informal economy share, as discussed in more detail in Appendix 4.

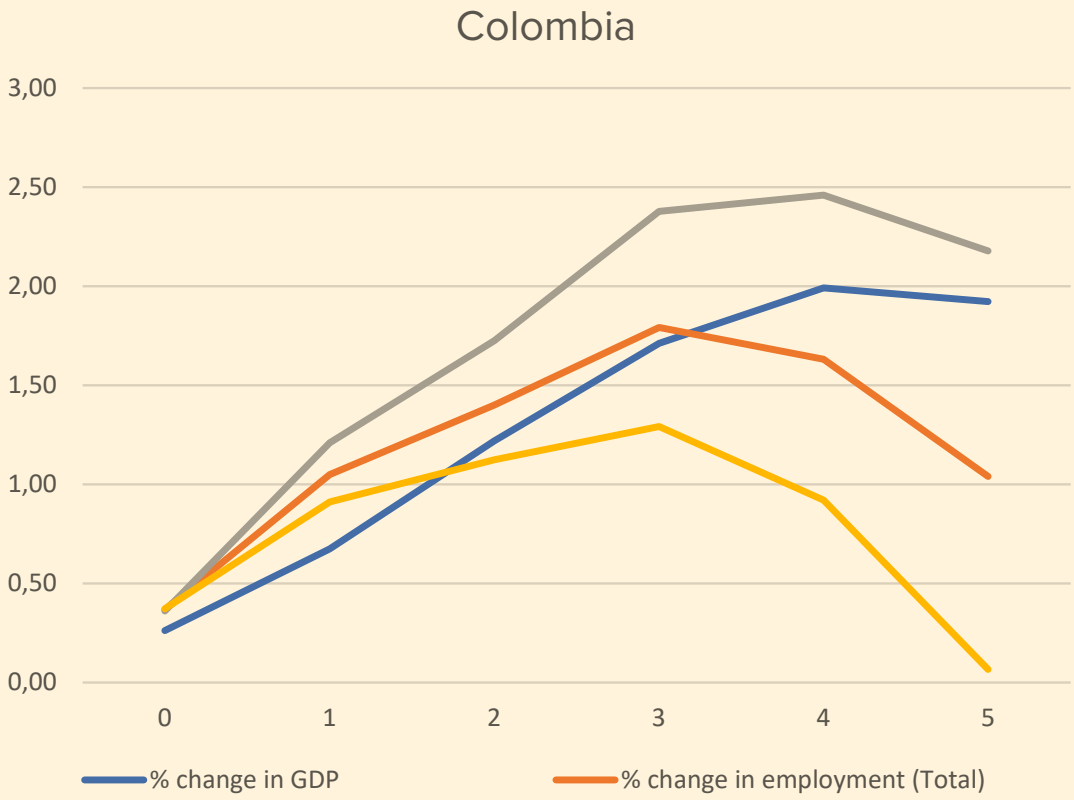
In South Korea the effects on GDP are particularly strong: 1.6% contemporaneously and 4.6% in five years. Men's and women's employment increases contemporaneously by 1.9% and 1.1% respectively and 3.9% and 3.2% in five years.

In Turkey, while the effects are low in the short term, they increase steeply and in five years GDP increases by 4.1%; and women's and men's employment increases by 4.5% and 2.7% respectively.

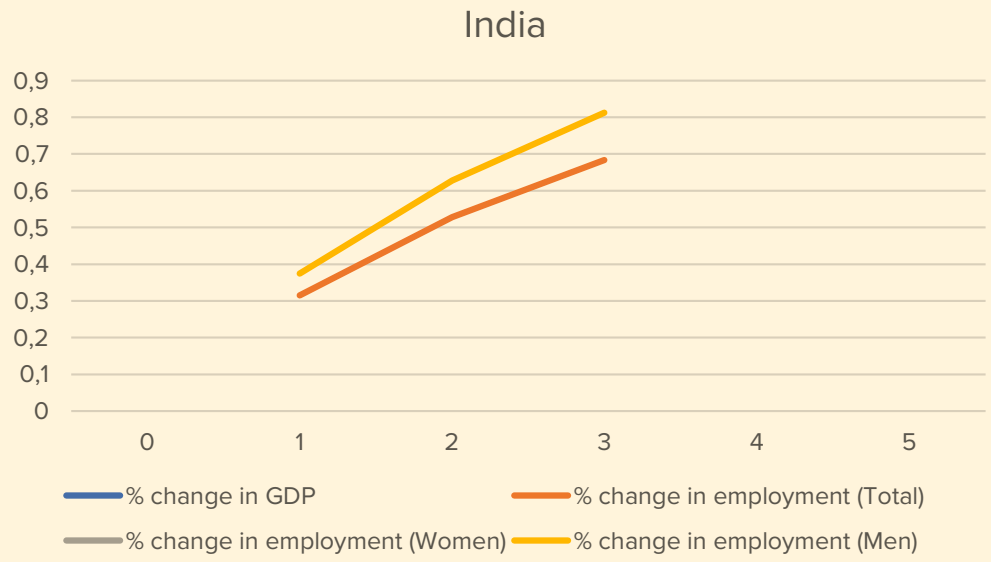
To summarise, the multiplier effects of a one-off increase in public physical infrastructure at the end of five years are greater than one in six countries and range between 1.9 in Colombia to 4.6 in South Korea; i.e., an increase in public spending in physical infrastructure (public gross fixed capital formation) by one Colombian Peso increases the Colombian GDP by 1.9 Colombian Peso at the end of five years. There are two exceptions with multipliers for GFCF below one (albeit positive): in India the multiplier effect of GFCF is insignificant, and in the Philippines the multiplier effect of GFCF reaches to 0.9 in five years. Section 7.4 below discusses the potential reasons for these exceptions across all spending categories. On average, GDP increases by 2.6% and employment increases by 2.4%.

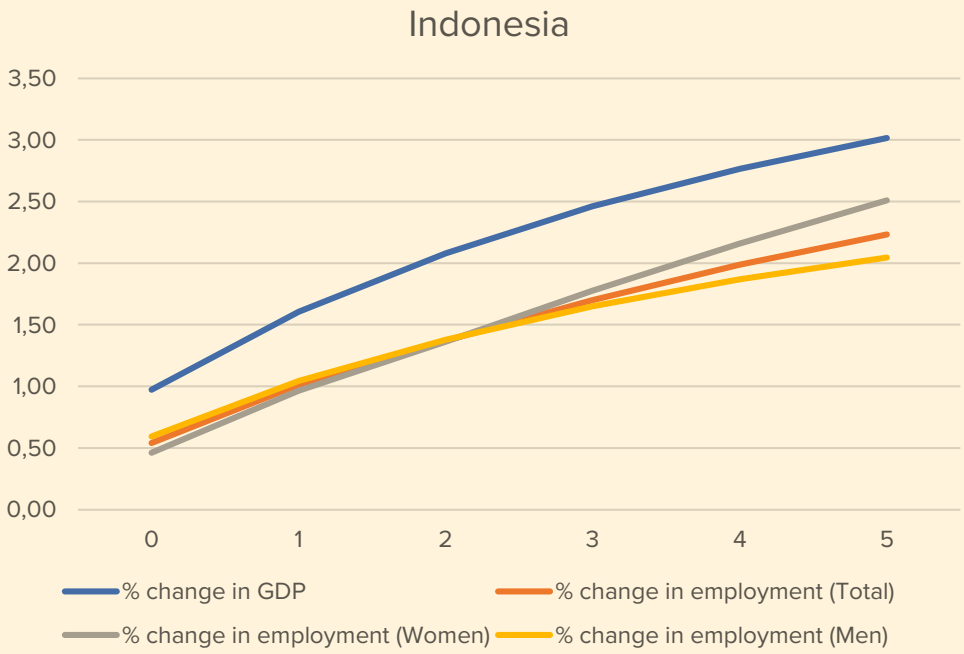
FIGURE 2: THE CUMULATIVE % CHANGE IN GDP, WOMEN'S AND MEN'S AND TOTAL EMPLOYMENT (ALL IN THE NON-AGRICULTURAL SECTOR) IN RESPONSE TO A 1%-POINT INCREASE (ONE-OFF) IN PUBLIC GFCF AS A RATIO TO GDP.

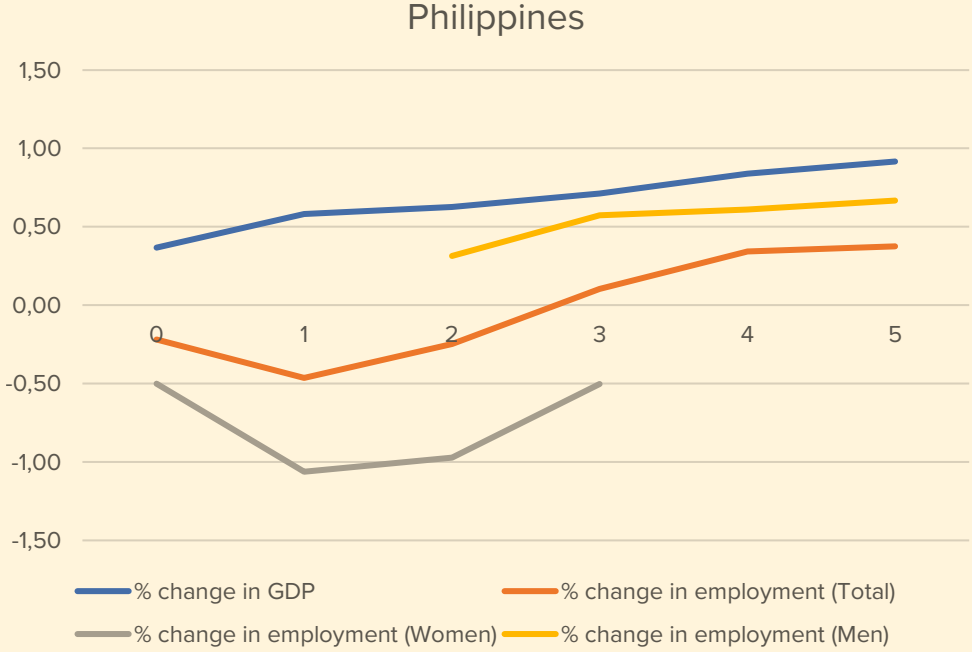


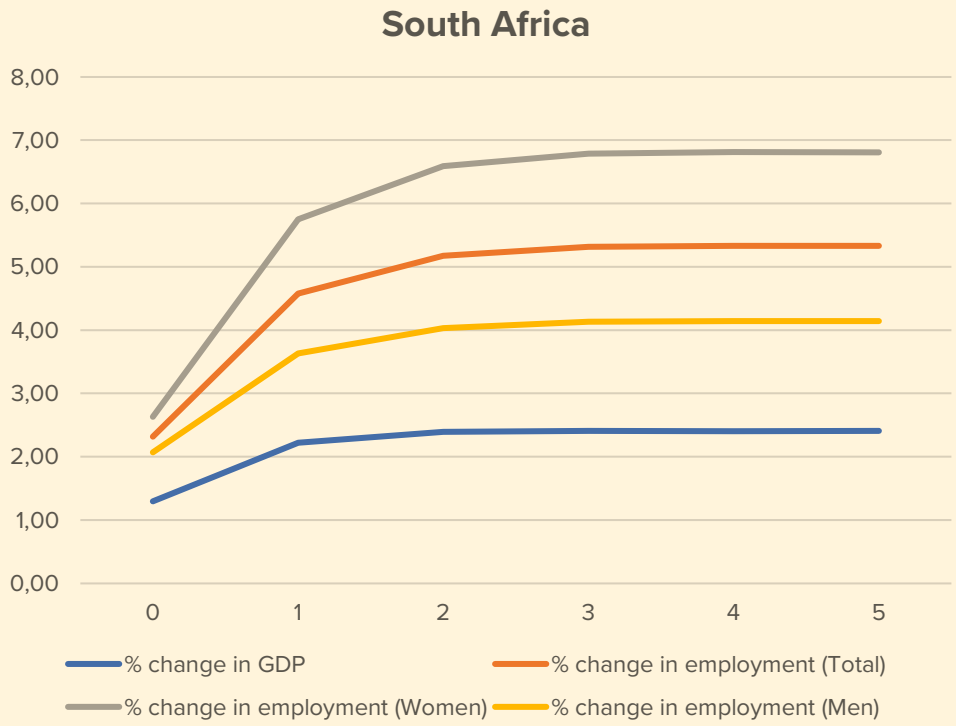


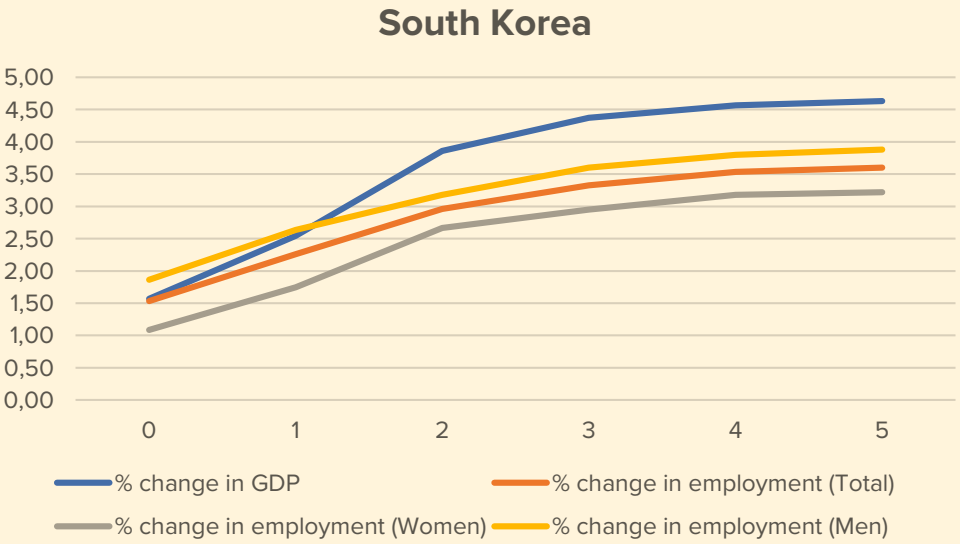
Notes: Simulations are based on coefficients from VAR estimations for specification 1 in Section 6 Methodology for each estimate is explained in Appendix 4 and impulse response function figures are in Appendix 5.


India
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
0
1
2
3
4
5
% change in GDP
% change in employment (Total)
% change in employment (Women)
% change in employment (Men)


Indonesia
3,50
3,00
2,50
2,00
1,50
1,00
0,50
0,00
0
1
2
3
4
5
% change in GDP
% change in employment (Total)
% change in employment (Women)
% change in employment (Men)


Philippines
1,50
1,00
0,50
0,00
-0,50
-1,00
-1,50
0
1
2
3
4
5
% change in GDP
% change in employment (Total)
% change in employment (Women)
% change in employment (Men)


South Africa
8,00
7,00
6,00
5,00
4,00
3,00
2,00
1,00
0,00
0
1
2
3
4
5
% change in GDP
% change in employment (Total)
% change in employment (Women)
% change in employment (Men)


South Korea
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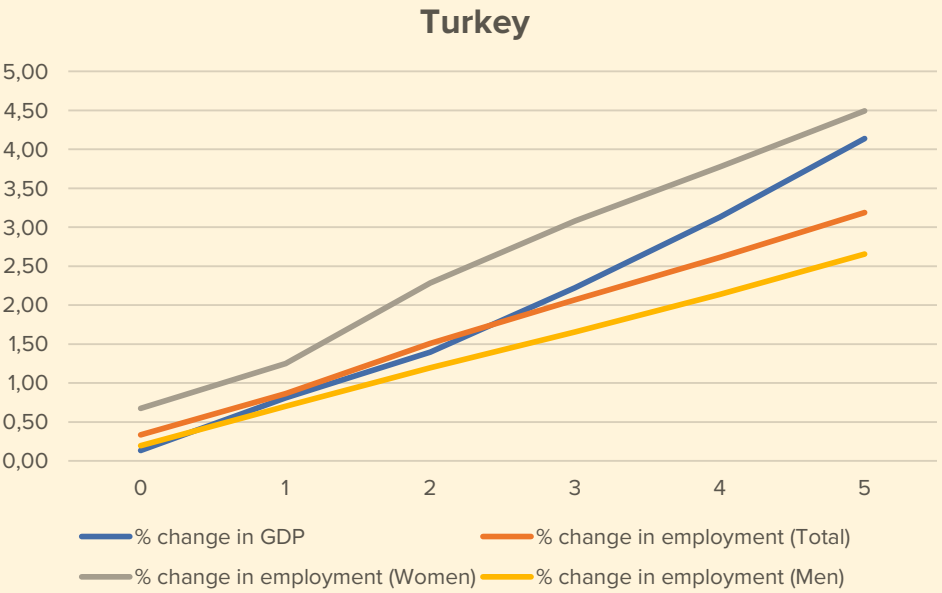
4,50
4,00
3,50
3,00
2,50
2,00
1,50
1,00
0,50
0,00
0
1
2
3
4
5
% change in GDP
% change in employment (Total)
% change in employment (Women)
% change in employment (Men)


Turkey
5,00
4,50
4,00
3,50
3,00
2,50
2,00
1,50
1,00
0,50
0,00
0
1
2
3
4
5
% change in GDP
% change in employment (Total)
% change in employment (Women)
% change in employment (Men)

Next, we present a simulation of the effects of a five-year long, repeated annual increase in public spending in GFCF by 1%-point as a ratio of GDP every year (repeating the effects of a one-off shock discussed above). Figure 3 presents the effects at the end of five years. An annual increase in public investment in GFCF by 1%-point of GDP at the end of five years creates a cumulative increase in GDP by 4.1% in the Philippines, 8% in Colombia, 12.4% in Turkey, 13.6% in Indonesia, 13.9% in South Africa, 21.3% in Chile, and 23.5% in South Korea. The consequent, cumulative increase in total employment ranges between 1.5% in India, 7.5% in Colombia, 9.2% in Indonesia, 11% in Turkey, 18.5% in South Korea, 20.5% in Chile, and 31.5% in South Africa across seven countries. In six countries the employment of both men and women increases, and in Chile, Colombia, Indonesia, South Africa, and Turkey, the rate of increase in women's employment is higher, although the number of new jobs for women is still lower than that for men due to a low starting point. In the Philippines and India, the employment effect is positive only for men, while the effect on women's employment is insignificant in India and negative in the Philippines, which illustrates complex movements across the urban and rural and formal and informal sectors that disadvantage women, as well as data issues. In the Philippines, the decline in women's employment (by 3%) leads to a decline in total employment (by 0.1%) despite an increase in men's employment (by 2.2%). These differences illustrate the importance of gender mainstreaming in assessing the employment impact of public investment. On average, both GDP and employment increase by 12%. The employment rate (as a ratio to 15+ population) increases by around 10%-points in Chile, South Africa, and South Korea, by about 4%-points in Colombia, Indonesia, and Turkey, and by 0.4%-point in India.

FIGURE 3A. THE CUMULATIVE % CHANGE IN GDP AND EMPLOYMENT (TOTAL, WOMEN, AND MEN, NON-AGRICULTURAL) AT THE END OF FIVE YEARS IN RESPONSE TO A REPEATED INCREASE IN PUBLIC SPENDING IN GFCF BY 1%-POINT AS A RATIO TO GDP EVERY YEAR.

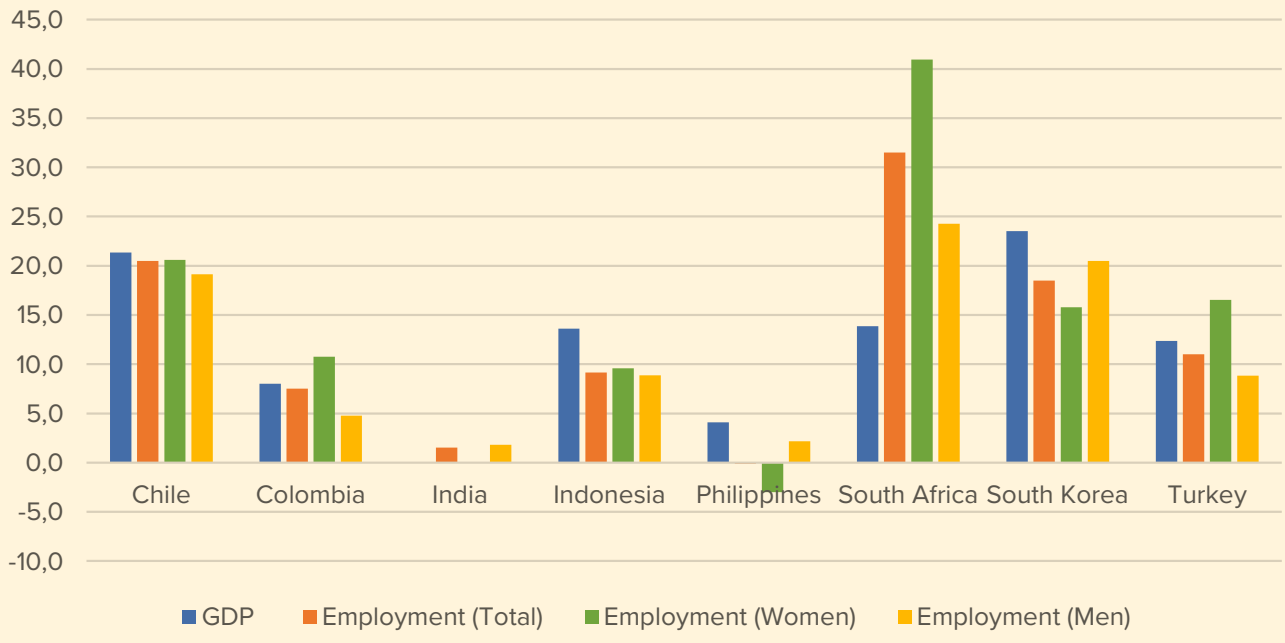


FIGURE 3B. THE CUMULATIVE %-POINT CHANGE IN THE EMPLOYMENT RATE (TOTAL, WOMEN, AND MEN) AT THE END OF FIVE YEARS IN RESPONSE TO A REPEATED INCREASE IN PUBLIC SPENDING IN GFCF BY 1%-POINT AS A RATIO TO GDP EVERY YEAR.

7.2 THE EFFECTS OF PUBLIC SPENDING IN THE CARE ECONOMY

Based on the estimated impulse responses for specification 1, Figure 4 below reports the cumulative % change in GDP, and women's and men's employment (and total employment, in the non-agricultural sector) in response to a one-off 1%-point increase in public spending in the care economy as a ratio to GDP (the output in the sectors of education, health care, childcare, and social care). The results overall show that growth in the care economy has positive effects on GDP and total employment, with stronger effects on women's employment (except for in Chile). This is consistent with the stylised facts discussed in Section 3 which show that women's share of employment in the care sector is significantly higher compared to their share in the rest of the economy.

A one-off increase in public spending in the care economy by 1%-point of GDP in Chile leads to an increase in GDP by 2.2% contemporaneously and by 3.1% in five years. The employment of women and men increases contemporaneously by 0.7% and 2.1%, respectively, however, the effects are insignificant afterwards.

In Colombia, GDP increases by 0.3% cumulatively over five years, which is weak by international comparison.[36] The employment of women and men increases contemporaneously by 0.3% and 0.2% respectively and by 0.5% and 0.1% by the fifth year.

In India, GDP increases contemporaneously by 2% and by 2.8% in five years. The employment of women and men increases contemporaneously by 0.4% and 0.1% respectively, and by 1.8% and 1% in five years.

[36] See Section 7.4 for a discussion of potential reasons.

In Indonesia, the effects are markedly strong in the medium term, with a 0.8% increase in GDP contemporaneously and by 3.6% in five years. The employment of women and men increases by 0.3% and 0.7% contemporaneously, and by 3.8% and 2.7% in five years.

In the Philippines, the effects are very low: contemporaneously a 0.04% increase in GDP peaking at 0.15% in year two, and in five years an increase in the employment of women and men by 0.05% and 0.04%.

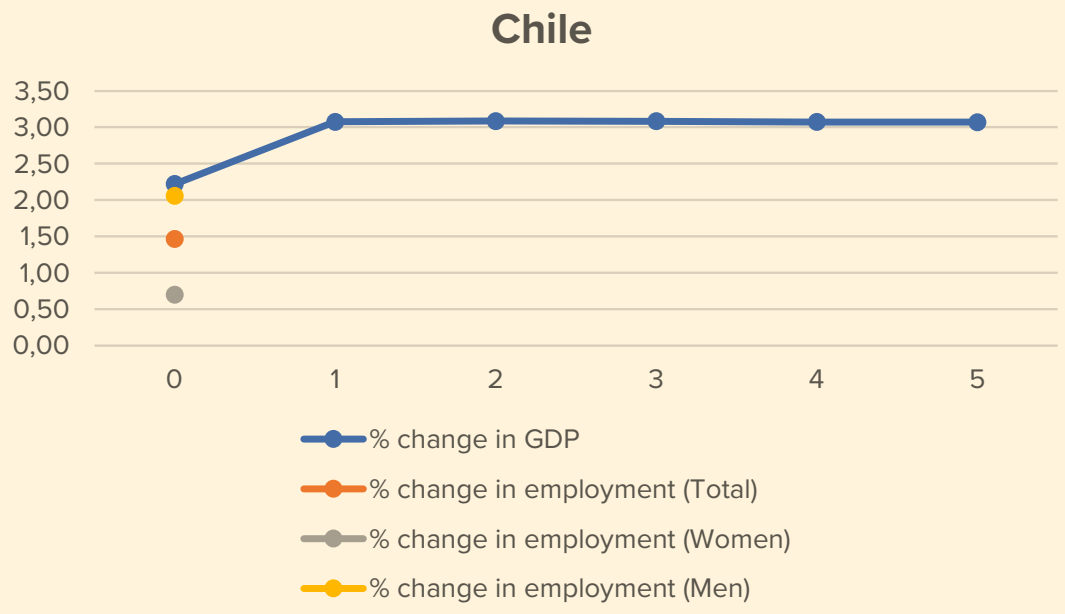
In South Africa, at the end of five years GDP increases by 1.6%, and the employment of women and men increases by 2.9% and 1.1% respectively. As in the case of GFCF discussed in Section 7.1, the effects on employment exceed that on GDP, potentially due to urbanisation and growing urban informal employment.

In South Korea, GDP increases contemporaneously by 1.2% and by 4.5% in five years. The employment of women and men increases contemporaneously by 2.2% and 0.9% and by 4% and 2.8% in five years.

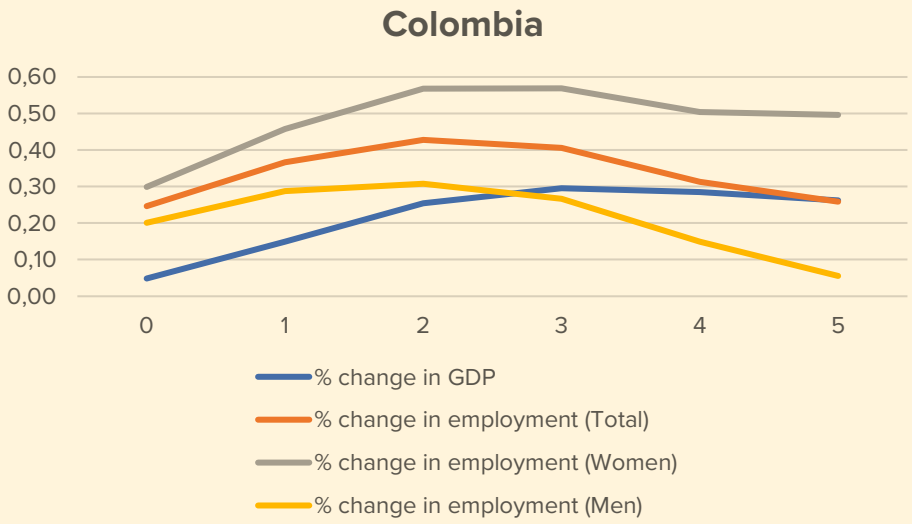
In Turkey, although the effects start slow, in five years GDP increases by 1.6%, and the employment of women and men increases by 1.2% and 0.8% respectively.

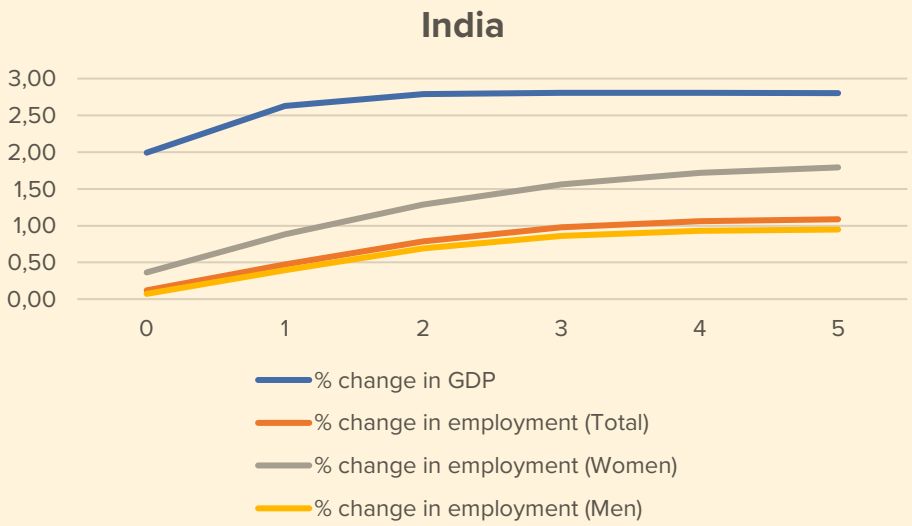
To summarise the effects of a one-off increase in the care spending, the multiplier effects on GDP in five years are larger than 1 in six countries and range between 1.6 in Turkey and South Africa and 4.5 in South Korea. There are two exceptions with multipliers for care below one (albeit positive): In Colombia, the multiplier of care spending is 0.3 in five years and in the Philippines, it peaks at 0.15% in two years. Section 7.4 below discusses the potential reasons for these exceptions across all spending categories. On average, GDP increases by 2.2% and employment increases by 1.4%.

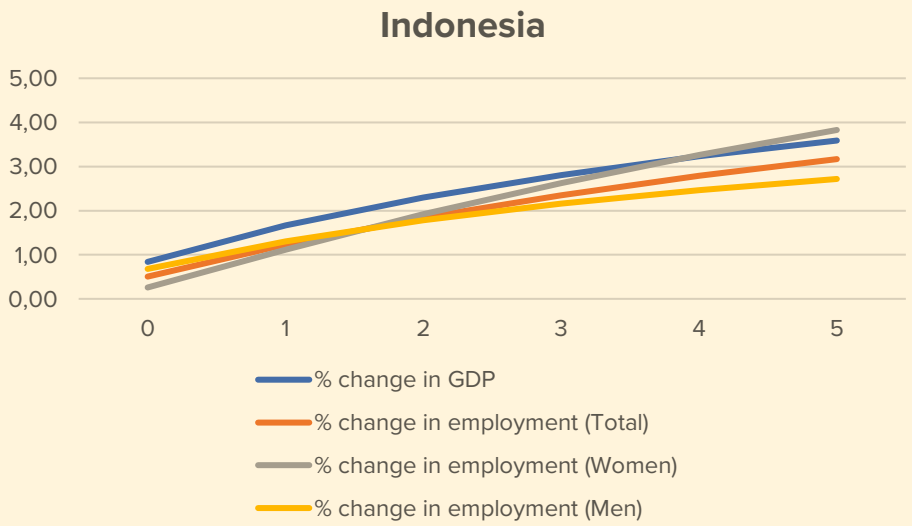
FIGURE 4: THE CUMULATIVE % CHANGE IN GDP, WOMEN'S AND MEN'S AND TOTAL EMPLOYMENT (ALL IN THE NON-AGRICULTURAL SECTOR) IN RESPONSE TO A 1%-POINT INCREASE (ONE-OFF) IN PUBLIC SPENDING IN THE CARE ECONOMY AS A RATIO TO GDP.



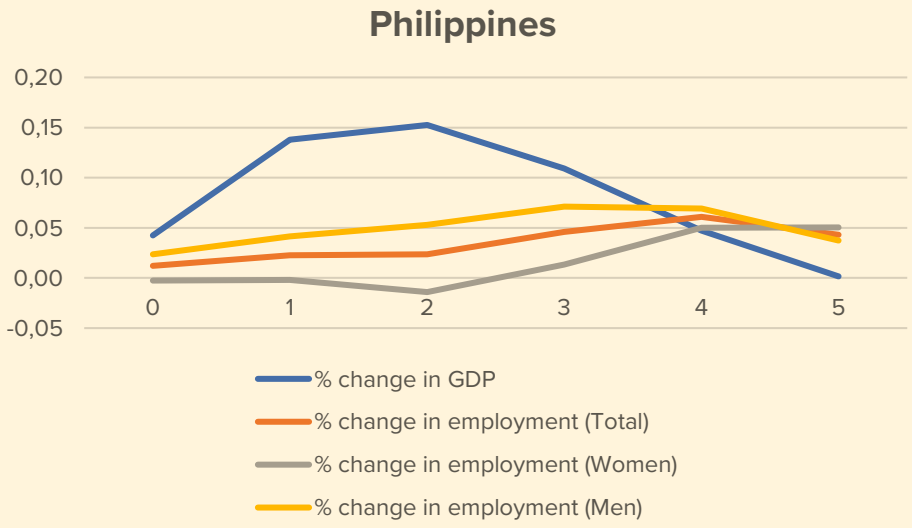
Notes: Simulations are based on coefficients from VAR estimations for specification 1 in Section 6 Methodology for each estimate is explained in Appendix 4 and impulse response function figures are in Appendix 5.

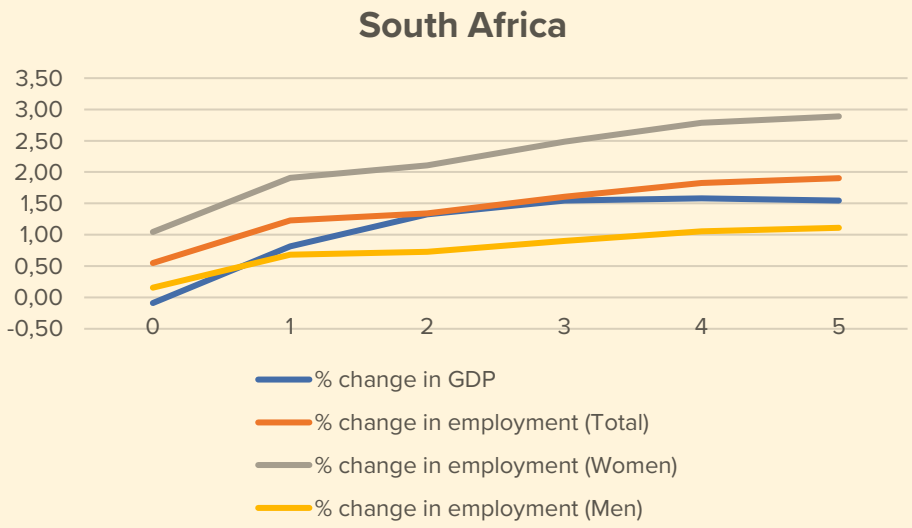


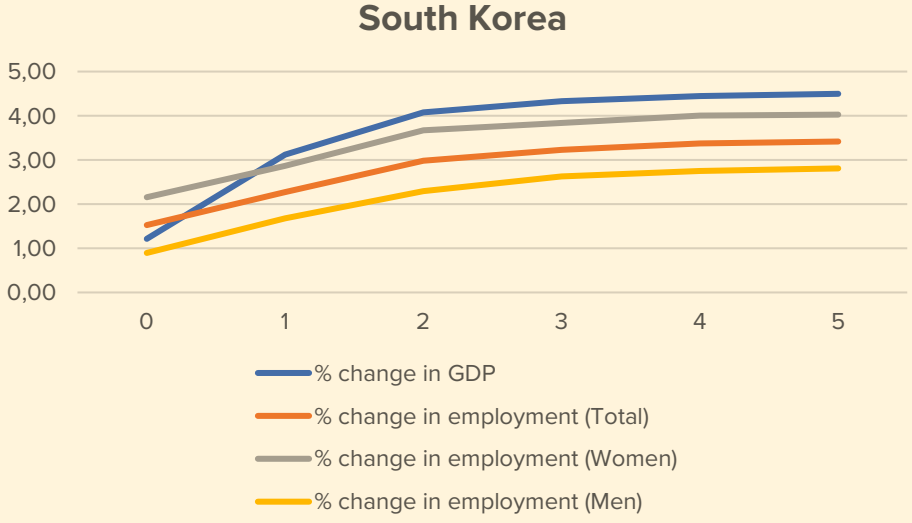




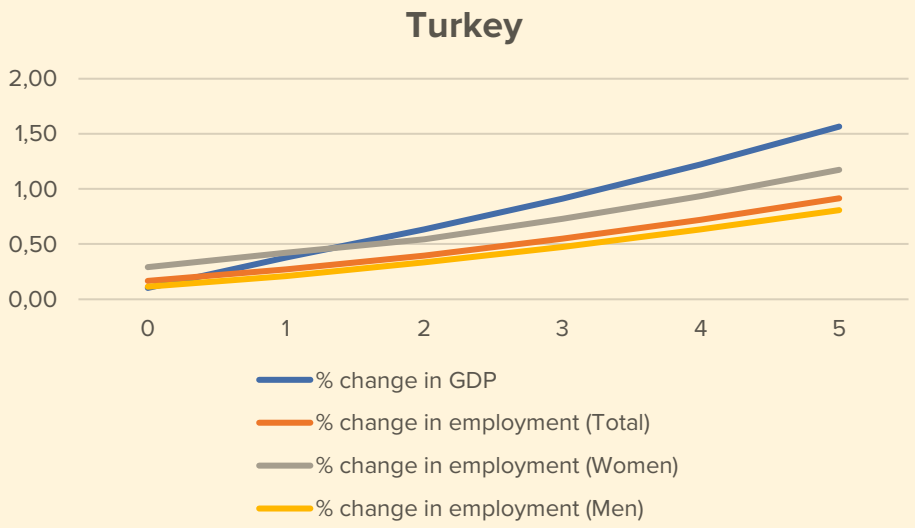
Notes: Simulations are based on coefficients from VAR estimations for specification 1 in Section 6 Methodology for each estimate is explained in Appendix 4 and impulse response function figures are in Appendix 5.







Notes: Simulations are based on coefficients from VAR estimations for specification 1 in Section 6 Methodology for each estimate is explained in Appendix 4 and impulse response function figures are in Appendix 5.



Notes: Simulations are based on coefficients from VAR estimations for specification 1 in Section 6 Methodology for each estimate is explained in Appendix 4 and impulse response function figures are in Appendix 5.

Next, we present a simulation of the effects of a five-year long, repeated annual increase in public spending in the care economy by 1%-point as a ratio of GDP every year (repeating the effects of a one-off shock discussed above). Figure 5 below presents the effects at the end of five years. An annual increase in public spending in the care economy by 1%-point at the end of five years leads to a cumulative increase in GDP by 0.5% in the Philippines, 1.3% in Colombia, 4.9% in Turkey, 6.9% in South Africa, 15.3% in Indonesia, 16.9% in India, 18.9% in Chile, and 23.7% in South Korea. Total employment increases by 0.2% in the Philippines, 1.5% in Chile, 2% in Colombia, 3.1% in Turkey, 4.6% in India, 8.7% in South Africa, 12.5% in Indonesia, and 18% in South Korea, creating jobs for both women and men, albeit at a faster rate for women. On average, GDP increases by 11.1% and employment increases by 6.3%. The employment rate (as a ratio to 15+ population) increases by 10.3%-points in South Korea, 5.5%-points in Indonesia, 3.1%-points in South Africa, by around 1%-point in Colombia, Turkey, and India, 0.7%-points in Chile and by 0.1%-point in the Philippines.

FIGURE 5A. THE CUMULATIVE % CHANGE IN GDP AND EMPLOYMENT (TOTAL, WOMEN, AND MEN, NON-AGRICULTURAL) AT THE END OF FIVE YEARS IN RESPONSE TO A REPEATED INCREASE IN PUBLIC SPENDING IN THE CARE ECONOMY BY 1%-POINT AS A RATIO OF GDP EVERY YEAR.

FIGURE 5B. THE CUMULATIVE %-POINT CHANGE IN THE EMPLOYMENT RATE (TOTAL, WOMEN, AND MEN) AT THE END OF FIVE YEARS IN RESPONSE TO A REPEATED INCREASE IN PUBLIC SPENDING IN THE CARE ECONOMY BY 1%-POINT AS A RATIO OF GDP EVERY YEAR.

7.3 THE EFFECTS OF PUBLIC SPENDING IN THE GREEN ECONOMY

Based on the estimated impulse responses for specification 2, Figure 6 reports the cumulative % change in GDP, and women's and men's employment (and total employment, all in the non-agricultural sector) in response to a one-off 1%-point increase in public spending in the green economy (REEEPT) as a ratio of GDP.

In Chile, GDP increases contemporaneously by 1.9%, and by 1.5% in five years. Women's and men's employment increases contemporaneously by 1.5% and 2.1% respectively. In five years, the cumulative increases in the employment of women and men are only 0.5% and 0.6% respectively, illustrating the existence of high positive effects on labour productivity.

In Colombia, GDP increases contemporaneously by 0.9% and by 4.1% in five years. While the contemporaneous effects on employment are insignificant, the employment of women and men increases substantially by 7.8% and 6.8% respectively in five years. Again, the stronger, long-term impact of REEEPT on non-agricultural employment compared to GDP could be an outcome of rural-to-urban migration and growth of urban informal sector employment, as discussed above in Section 7.1 for the case of South Africa and elaborated further in Section 7.4.

In India, GDP increases contemporaneously by 3.1% and by 1.5% by in five years. The employment of women and men increases by 1.8% and 0.8% respectively in five years.

In Indonesia, GDP increases contemporaneously by 0.3% and by 1.4% in five years. While the contemporaneous effects on employment are insignificant, the employment of women and men increases by 0.9% and 0.2% in five years.

In the Philippines, the effects are again low: GDP increases by 0.4% in five years. Contemporaneously women's employment increases by 0.7%, which then dies off. Men's employment increases by 0.2% in five years.

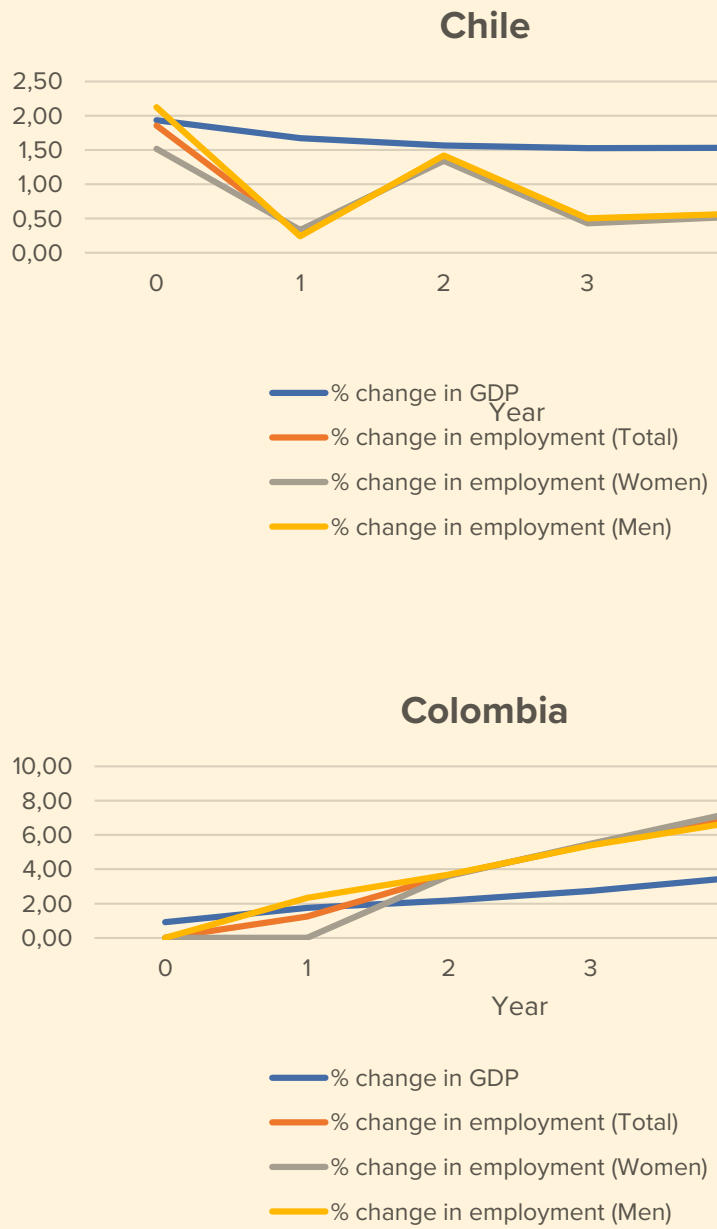
In South Africa, GDP increases contemporaneously by 1% and 0.7% in five years. The employment of women and men increases contemporaneously by 1.6% and 1.9% respectively, and by 2% and 1.5% in five years. The effect on employment is again higher than that on GDP due to its effects on urbanisation and informality as discussed in Section 7.1 and elaborated further in Section 7.4.

In South Korea GDP increases by 1.1% contemporaneously, and by 1.3% in year 1, before returning to a cumulative increase of 1.1% in five years. The employment of women and men contemporaneously increases by 1% and 0.5%, and by 1.3% and 1.1% in year five. The increase in total employment marginally exceeds that in GDP in five years in the case of a public stimulus to the green economy which may indicate that some urbanisation and informality effects offset potential productivity effects, as discussed above in Section 7.1 in the case of South Africa and elaborated further in Section 7.4.

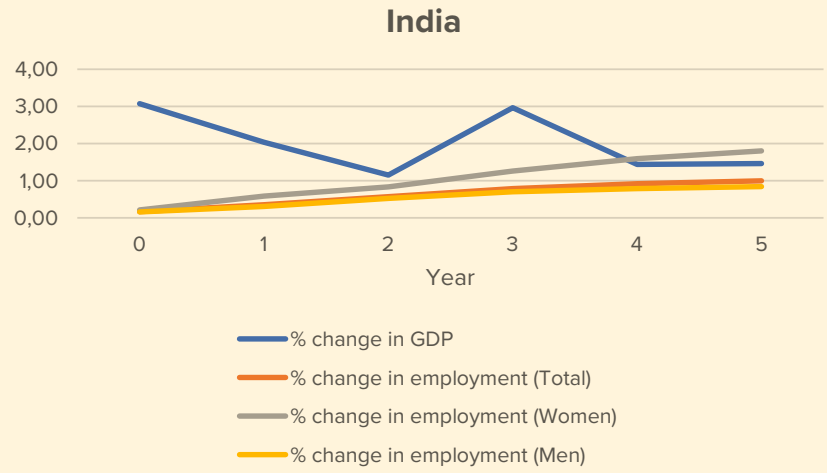
In Turkey, GDP increases contemporaneously by 0.8% and by 4.5% in five years. Contemporaneously, there is only a positive effect on men's employment by 0.2% but, in five years, the employment of women and men increases by 2.2% and 1.1% respectively.

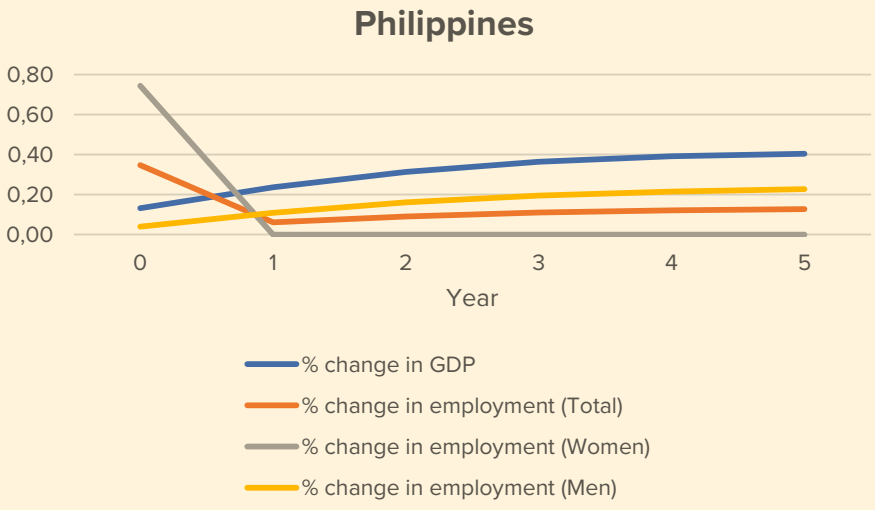
To summarise, in response to a one-off increase in spending, the multiplier effects of public spending in the green economy on GDP are greater than 1 in seven countries and between 1.1 in South Korea and 4.5 in Turkey. The Philippines is an exception, with a REEEPT multiplier of 0.4 (albeit positive below one). Section 7.4 below discusses the potential reasons for the exception across all spending categories. On average, GDP increases by 1.9% and employment increases by 1.7%.

FIGURE 6: THE CUMULATIVE % CHANGE IN GDP, AND WOMEN'S AND MEN'S EMPLOYMENT (AND TOTAL EMPLOYMENT, ALL IN THE NON-AGRICULTURAL SECTOR) IN RESPONSE TO A 1%-POINT INCREASE (ONE-OFF) IN PUBLIC SPENDING IN THE GREEN ECONOMY (REEEPT) AS A RATIO OF GDP.

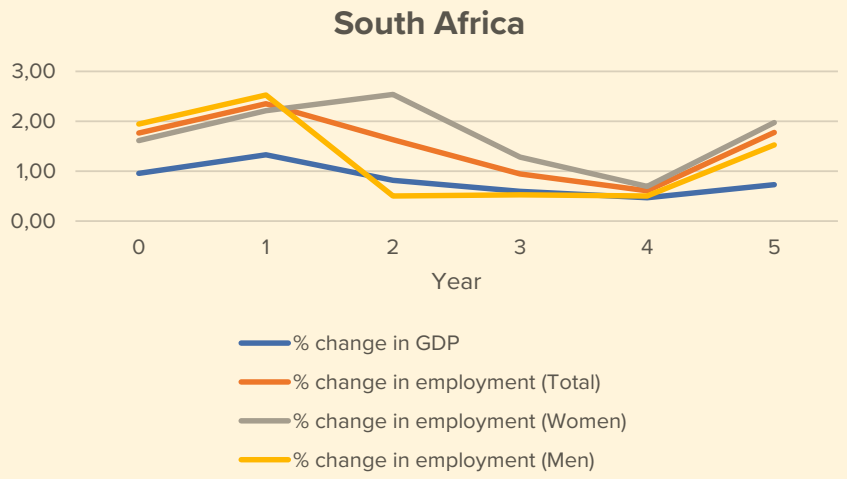


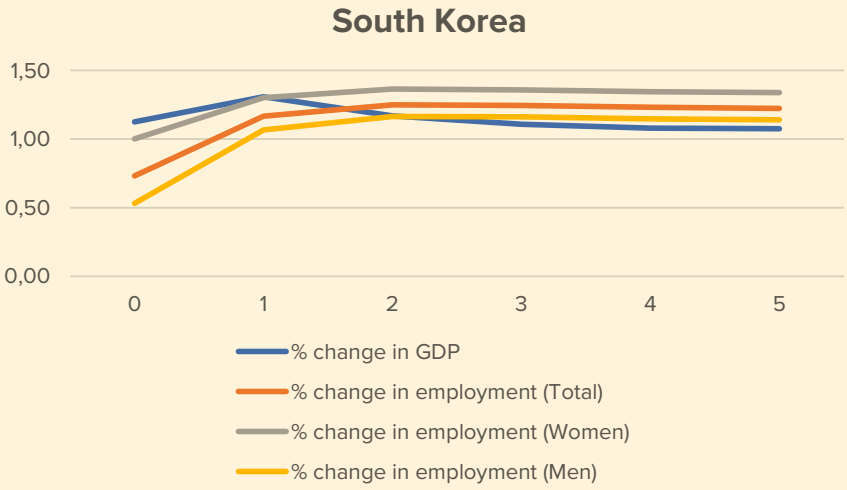
Notes: Simulations are based on coefficients from VAR estimations for specification 2 in Section 6. The methodology for each estimate is explained in Appendix 4 and impulse response function figures can be found in Appendix 5.

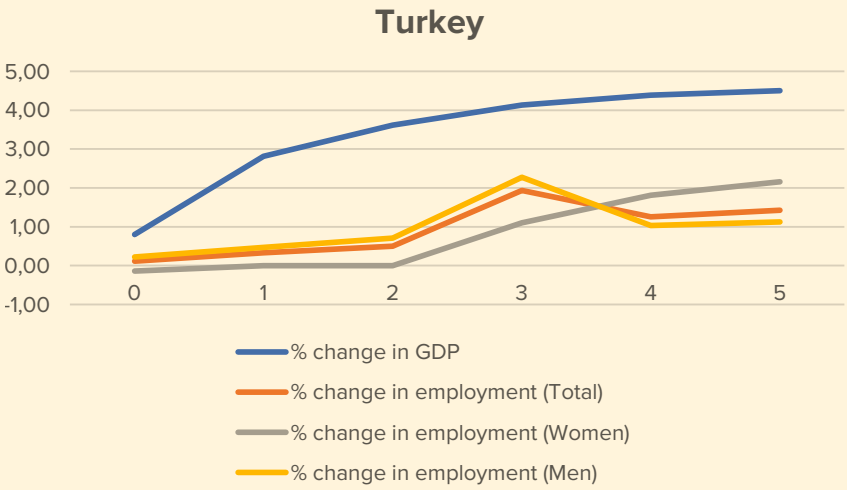




Notes: Simulations are based on coefficients from VAR estimations for specification 2 in Section 6. The methodology for each estimate is explained in Appendix 4 and impulse response function figures can be found in Appendix 5.







Notes: Simulations are based on coefficients from VAR estimations for specification 2 in Section 6. The methodology for each estimate is explained in Appendix 4 and impulse response function figures can be found in Appendix 5.

Next, we present a simulation of the effects of a five-year long, repeated annual increase in public spending in the green economy (REEEPT) by 1%-point as a ratio of GDP every year (repeating the effects of a one-off shock discussed above). Figure 7 below presents the effects at the end of 5 years. An annual repeated increase in public spending in the green economy (REEEPT) by 1%-point at the end of five years leads to a cumulative increase in GDP by 1.9% in the Philippines, 4.8% in Indonesia, 5% in South Africa, 7.1% in South Korea, 10.2% in Chile, 12.7% in India, 16.1% in Colombia, and 22% in Turkey. The cumulative effect on total employment ranges between 0.9% in the Philippines and Indonesia to 3.8% in India, 5.2% in Chile, 5.7% in Turkey, 7% in South Korea, 9.4% in South Africa, and 27% in Colombia. On average, GDP increases by 10% and employment increases by 7.5%. The employment rate (as a ratio to 15+ population) increases by 13.2%-point in Colombia, 4%-points in South Korea, 3.3%-points in South Africa, 2.6%-points in Chile, 2%-points in Turkey, 1%-point in India, and by 0.3-0.4%-point in Indonesia and the Philippines.

FIGURE 7A. THE CUMULATIVE % CHANGE IN GDP AND EMPLOYMENT (TOTAL, WOMEN, AND MEN, IN THE NON-AGRICULTURAL SECTOR) AT THE END OF FIVE YEARS IN RESPONSE TO A REPEATED INCREASE IN PUBLIC SPENDING IN THE GREEN ECONOMY (REEEPT) BY 1%-POINT AS A RATIO OF GDP EVERY YEAR

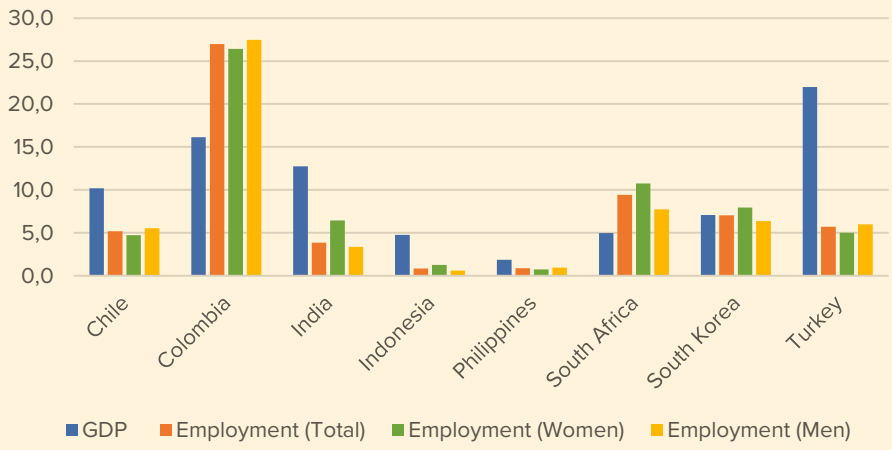


FIGURE 7B. THE CUMULATIVE %-POINT CHANGE IN THE EMPLOYMENT RATE (TOTAL, WOMEN, AND MEN) AT THE END OF FIVE YEARS IN RESPONSE TO A REPEATED INCREASE IN PUBLIC SPENDING IN THE GREEN ECONOMY (REEEPT) BY 1%-POINT AS A RATIO OF GDP EVERY YEAR

7.4 SUMMARY AND POLICY SIMULATION

Tables 3a-b summarise the results in Section 7.1-3. As can be seen in Table 3a, in response to a one-off increase in public spending, the multiplier effects on GDP are in most countries substantial in all spending categories and reach above one in the medium term. For public GFCF, six multipliers at the end of five years are over 1, which range between 1.9 in Colombia to 4.6 in South Korea. Six countries demonstrate multiplier effects of the care spending on GDP in five years greater than 1, ranging between 1.6 in Turkey and South Africa and 4.5 in South Korea. The multiplier effects of public spending in the green economy (REEEPT) are over 1 for seven countries and range between 1.1 in South Korea and 4.5 in Turkey at the end of five years (in South Africa 1.3 in year 2). However, there are exceptions with multipliers for some spending categories below one (albeit positive) in some countries. For example, in India the multiplier effect of GFCF is insignificant. In Colombia, the multiplier effect of care spending is 0.3 in five years. In the Philippines, the multiplier effect of GFCF reaches to 0.9 in five years but the multipliers of REEEPT and care remain substantially lower than one (0.4 and 0 respectively). These exceptional cases stand in contrast to the strong evidence of high multipliers in other countries, and indicate that not only the amount, but the composition and the targeted nature of spending matters. The differences in the import dependency of manufacturing or, specifically, REEEPT industries provides a partial explanation for these exceptions: in these countries, increased public spending might have led to a higher demand for imports, leading to a smaller increase in domestic production compared to the original increase in stimulus. The degree of informality could be another potential reason: the increase in public spending might lead to a higher increase in informal economy production not captured by the formal GDP measure in the national accounts compared to other countries. However, controlling for the share of informal economy in GDP (where significant) only marginally improved the multiplier effects, if at all.[37]

Public spending in all categories has significant effects on productivity (comparing effects on GDP and employment), in the medium term in five countries – Chile, Indonesia, South Korea, Turkey and the Philippines (albeit at a low rate in the latter). There is evidence for productivity effects in Colombia in response to GFCF, and in India to the care economy and REEEPT. In South Africa (in response to all categories), and Colombia (in response to the care economy and REEEPT), potential productivity effects appear to be more than offset by the effects of urbanisation and informality, leading to a higher rate of increase in non-agricultural employment compared to GDP.[38] As discussed in Section 7.1, public infrastructure spending may have more positive effects on urban output and employment that could attract rural dwellers to urban areas, leading to a higher rate of growth in non-agricultural employment than in the rest of the country. Also, GDP is likely to underestimate the informal economy's output, while employment data based on household labour force surveys is more likely to capture some informal employment. Urbanisation itself may contribute to a higher rate of growth in informal employment in the cities.

[37] As discussed in more detail in Section 4, if public spending substitutes private consumption or investment (e.g., by providing alternatives) or crowds out private investment by increasing borrowing cost, the magnitude of the multiplier may get smaller. However, in the historical data, there is less evidence of the former, and previous econometric analysis indicates that investment is not very sensitive to cost of borrowing (Onaran and Galanis, 2014, Onaran, Oyvat, Fotopoulou, 2022a). However, the methodology of VAR in this paper does not provide evidence of these specific channels, and further macro econometric research utilising single equation estimations of the full macroeconomic model is required to shed light on such differences. Additionally, further research on country case studies of public spending in different areas could shed light on how targeted and well-designed features may contribute to a higher multiplier impact of spending.

[38] As a memo item, we also estimate the elasticity of employment (total, non-agricultural) to GDP (based on specification 1 and only significant coefficients), which in the short term (year one) ranges between 0.03 in Turkey and Indonesia to 0.3 in South Korea and Chile, and in the medium term (year five) ranges between 0.1 in Turkey, 0.15 in Indonesia, 0.2 in South Africa and 0.3 in Chile and Korea. The elasticity is very low in Colombia (0.01 in year one) and the Philippines (0.01-0.03 in years two-three). In India the elasticity is insignificant in years 1-5.

Given the high multiplier effects of public spending in most cases, public spending is partly self-financing (comparing the growth of public spending and GDP). The negative effect on primary budget balance (excluding interest payments) ranges between 0.3%-point (South Korea) and 0.8%-point (Turkey, India, Indonesia, South Africa). In the case of the care economy, it ranges between 0.8%-point (South Korea, Turkey) and 0.9%-point (Chile, Colombia, Indonesia, South Africa) in the case of GFCF, and around 0.9%-point in the case of the green economy, based on the cumulative effects of a 1%-point increase (one-off) in the public spending category in five years. The care economy spending has a slightly higher rate of self-financing. However, as we discuss in the policy implications below, a substantial mobilisation of public spending within these sectors requires a more progressive taxation of income and wealth, as well as accommodating monetary policy and borrowing.

TABLE 3A. SUMMARY OF THE EFFECTS OF A ONE-OFF AND REPEATED (FIVE-YEAR) INCREASE IN PUBLIC SPENDING IN GFCF, THE CARE ECONOMY AND THE GREEN ECONOMY (REEEPT) BY 1%-POINT AS A RATIO TO GDP.

PUBLIC SPENDING IN PHYSICAL INFRASTRUCTURE (GFCF)

	GDP (% CHANGE)		TOTAL EMPLOYMENT (NON-AGRICULTURAL) (% CHANGE)		WOMEN'S EMPLOYMENT (NON-AGRICULTURAL) (% CHANGE)		MEN'S EMPLOYMENT (NON-AGRICULTURAL) (% CHANGE)	
	YEAR 0	IN FIVE YEARS (CUMULATIVE)	YEAR 0	IN FIVE YEARS (CUMULATIVE)	YEAR 0	IN FIVE YEARS (CUMULATIVE)	YEAR 0	IN FIVE YEARS (CUMULATIVE)
CHILE	1,83	3,73	1,95	3,44	1,74	3,49	2,00	3,20
COLOMBIA	0,26	1,92	0,37	1,04	0,36	2,18	0,37	0,07
INDIA	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
INDONESIA	0,97	3,02	0,54	2,23	0,46	2,51	0,59	2,05
PHILIPPINES	0,37	0,92	-0,22	0,38	-0,50	0,00	0,00	0,67
SOUTH AFRICA	1,30	2,41	2,32	5,33	2,63	6,81	2,07	4,14
SOUTH KOREA	1,57	4,63	1,53	3,60	1,09	3,22	1,86	3,88
TURKEY	0,14	4,14	0,33	3,19	0,67	4,50	0,19	2,65
AVERAGE	**0,80**	**2,60**	**0,85**	**2,40**	**0,81**	**2,84**	**0,89**	**2,08**

CARE ECONOMY

	GDP (% CHANGE)		TOTAL EMPLOYMENT (NON-AGRICULTURAL) (% CHANGE)		WOMEN'S EMPLOYMENT (NON-AGRICULTURAL) (% CHANGE)		MEN'S EMPLOYMENT (NON-AGRICULTURAL) (% CHANGE)	
	YEAR 0	IN FIVE YEARS (CUMULATIVE)	YEAR 0	IN FIVE YEARS (CUMULATIVE)	YEAR 0	IN FIVE YEARS (CUMULATIVE)	YEAR 0	IN FIVE YEARS (CUMULATIVE)
CHILE	2,22	3,07	1,46	0,00	0,70	0,00	2,06	0,00
COLOMBIA	0,05	0,26	0,25	0,26	0,30	0,50	0,20	0,06
INDIA	1,99	2,80	0,12	1,09	0,36	1,79	0,07	0,95
INDONESIA	0,84	3,59	0,51	3,17	0,26	3,83	0,68	2,72
PHILIPPINES	0,04	0,00	0,01	0,04	-0,00	0,05	0,02	0,04
SOUTH AFRICA	-0,09	1,55	0,55	1,90	1,04	2,89	0,15	1,11
SOUTH KOREA	1,21	4,50	1,52	3,41	2,16	4,02	0,89	2,80
TURKEY	0,10	1,56	0,16	0,91	0,29	1,17	0,11	0,81
AVERAGE	**0,80**	**2,17**	**0,57**	**1,35**	**0,64**	**1,78**	**0,52**	**1,06**

GREEN ECONOMY (REEEPT)								
	GDP (% CHANGE)		TOTAL EMPLOYMENT (NON-AGRICULTURAL) (% CHANGE)		WOMEN'S EMPLOYMENT (NON-AGRICULTURAL) (% CHANGE)		MEN'S EMPLOYMENT (NON-AGRICULTURAL) (% CHANGE)	
	YEAR 0	IN FIVE YEARS (CUMULATIVE)	YEAR 0	IN FIVE YEARS (CUMULATIVE)	YEAR 0	IN FIVE YEARS (CUMULATIVE)	YEAR 0	IN FIVE YEARS (CUMULATIVE)
CHILE	1,93	1,54	1,86	0,53	1,52	0,00	2,12	0,56
COLOMBIA	0,91	4,10	0,00	7,25	0,00	7,79	0,00	6,79
INDIA	3,07	1,46	0,17	0,99	0,21	1,80	0,16	0,84
INDONESIA	0,25	1,39	0,00	0,48	0,00	0,92	0,00	0,19
PHILIPPINES	0,13	0,40	0,35	0,13	0,74	0,00	0,04	0,23
SOUTH AFRICA	0,95	0,73	1,76	1,77	1,61	1,97	1,94	1,52
SOUTH KOREA	1,13	1,08	0,73	1,22	1,00	1,34	0,53	1,14
TURKEY	0,80	4,51	0,12	1,43	-0,14	2,16	0,22	1,13
AVERAGE	1,15	1,90	0,62	1,73	0,62	0,00	0,63	1,55

Note: Contemporaneous effects are the same as in Table 3a. The table is based on Figures 3, 5, 7

TABLE 3B. SUMMARY OF THE EFFECTS OF A REPEATED ANNUAL INCREASE IN PUBLIC SPENDING IN PHYSICAL INFRASTRUCTURE (GFCF), THE CARE ECONOMY AND THE GREEN ECONOMY (REEEPT) BY 1%-POINT AS A RATIO TO GDP AT THE END OF FIVE YEARS.

PUBLIC SPENDING IN PHYSICAL INFRASTRUCTURE (GFCF)							
	GDP (CUMULATIVE % CHANGE IN FIVE YEARS)	TOTAL EMPLOYMENT (NON-AGRICULTURAL) (CUMULATIVE % CHANGE IN FIVE YEARS)	WOMEN'S EMPLOYMENT (NON-AGRICULTURAL) (CUMULATIVE % CHANGE IN FIVE YEARS)	MEN'S EMPLOYMENT (NON-AGRICULTURAL) (CUMULATIVE % CHANGE IN FIVE YEARS)	TOTAL EMPLOYMENT RATE (CUMULATIVE % -POINT CHANGE IN FIVE YEARS)	WOMEN'S EMPLOYMENT RATE (CUMULATIVE % -POINT CHANGE IN FIVE YEARS)	MEN'S EMPLOYMENT RATE (CUMULATIVE % -POINT CHANGE IN FIVE YEARS)
CHILE	21,34	20,49	20,61	19,14	10,10	8,70	10,85
COLOMBIA	8,03	7,50	10,75	4,77	3,67	4,68	2,61
INDIA	0,00	1,53	0,00	1,83	0,38	0,00	0,74
INDONESIA	13,60	9,17	9,58	8,88	4,04	3,45	4,63
PHILIPPINES	4,11	-0,11	-3,01	2,18	-0,04	-1,04	0,98
SOUTH AFRICA	13,85	31,48	40,93	24,27	11,09	12,55	9,71
SOUTH KOREA	23,53	18,48	15,78	20,50	10,52	7,67	13,39
TURKEY	12,37	11,02	16,54	8,83	3,89	3,36	4,50
AVERAGE	12,10	12,44	13,90	11,30	5,46	4,92	5,93

CARE ECONOMY							
	GDP (CUMULATIVE % CHANGE IN FIVE YEARS)	TOTAL EMPLOYMENT (NON-AGRICULTURAL) (CUMULATIVE % CHANGE IN FIVE YEARS)	WOMEN'S EMPLOYMENT (NON-AGRICULTURAL) (CUMULATIVE % CHANGE IN FIVE YEARS)	MEN'S EMPLOYMENT (NON-AGRICULTURAL) (CUMULATIVE % CHANGE IN FIVE YEARS)	TOTAL EMPLOYMENT RATE (CUMULATIVE %-POINT CHANGE IN FIVE YEARS)	WOMEN'S EMPLOYMENT RATE (CUMULATIVE %-POINT CHANGE IN FIVE YEARS)	MEN'S EMPLOYMENT RATE (CUMULATIVE %-POINT CHANGE IN FIVE YEARS)
CHILE	18,94	1,46	0,70	2,06	0,72	0,30	1,17
COLOMBIA	1,30	2,03	2,93	1,27	0,99	1,28	0,69
INDIA	16,90	4,59	7,85	3,96	1,14	0,65	1,60
INDONESIA	15,29	12,46	13,70	11,63	5,49	4,93	6,06
PHILIPPINES	0,49	0,21	0,10	0,30	0,08	0,03	0,13
SOUTH AFRICA	6,91	8,75	13,96	4,71	3,08	4,28	1,88
SOUTH KOREA	23,69	18,01	22,39	13,76	10,25	10,88	8,99
TURKEY	4,90	3,05	4,16	2,60	1,08	0,85	1,33
AVERAGE	11,05	6,32	8,22	5,04	2,86	2,90	2,73

GREEN ECONOMY (REEEPT)							
	GDP (CUMULATIVE % CHANGE IN FIVE YEARS)	TOTAL EMPLOYMENT (NON-AGRICULTURAL) (CUMULATIVE % CHANGE IN FIVE YEARS)	WOMEN'S EMPLOYMENT (NON-AGRICULTURAL) (CUMULATIVE % CHANGE IN FIVE YEARS)	MEN'S EMPLOYMENT (NON-AGRICULTURAL) (CUMULATIVE % CHANGE IN FIVE YEARS)	TOTAL EMPLOYMENT RATE (CUMULATIVE %-POINT CHANGE IN FIVE YEARS)	WOMEN'S EMPLOYMENT RATE (CUMULATIVE %-POINT CHANGE IN FIVE YEARS)	MEN'S EMPLOYMENT RATE (CUMULATIVE %-POINT CHANGE IN FIVE YEARS)
CHILE	10,18	5,17	4,72	5,53	2,55	1,99	3,13
COLOMBIA	16,12	26,98	26,41	27,46	13,20	11,51	14,99
INDIA	12,73	3,84	6,44	3,36	0,96	0,53	1,36
INDONESIA	4,76	0,85	1,25	0,58	0,38	0,45	0,30
PHILIPPINES	1,86	0,86	0,74	0,95	0,34	0,26	0,43
SOUTH AFRICA	4,98	9,40	10,75	7,73	3,31	3,30	3,09
SOUTH KOREA	7,06	7,05	7,96	6,37	4,01	3,87	4,16
TURKEY	21,98	5,69	5,00	5,97	2,01	1,02	3,04
AVERAGE	9,96	7,48	7,91	7,24	3,34	2,87	3,81

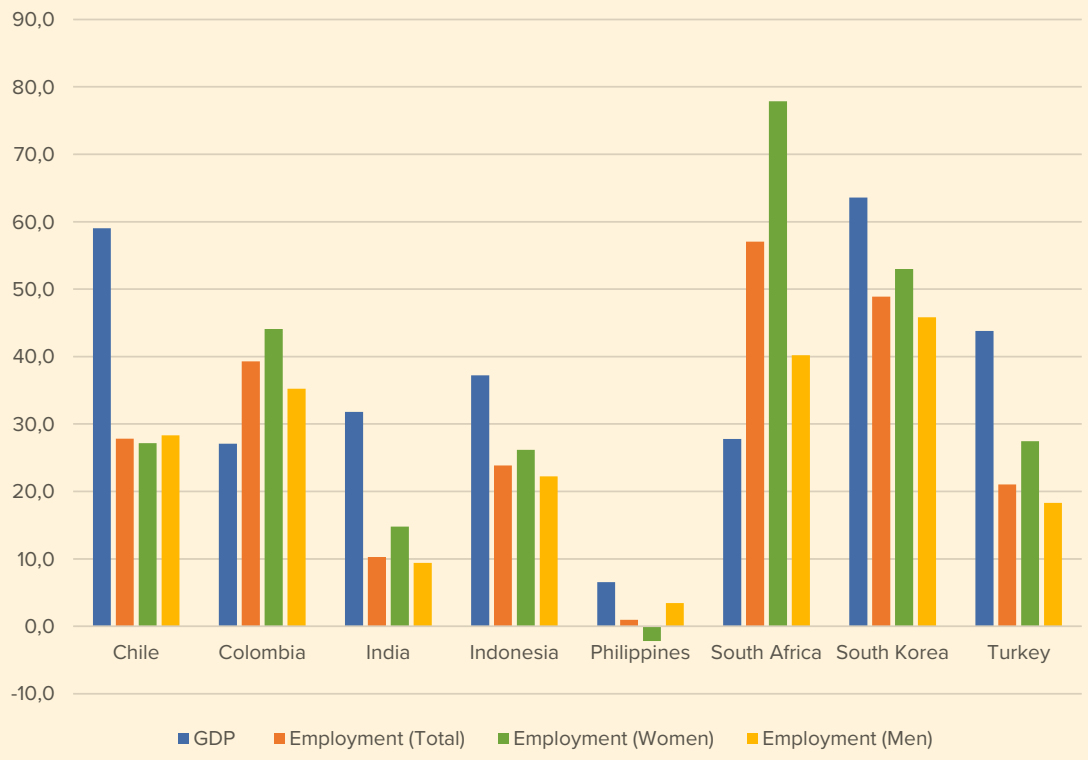
Note: Contemporaneous effects are the same as in Table 3a. The table is based on Figures 3, 5, 7

Finally, we present the effects of a policy mix combining a repeated increase in public spending in the care and green economy, and other infrastructure, each by 1%-point as a ratio of GDP every year for five years, based on the sum of the effects in Figure 3 for GFCF, Figure 5 for the care economy, and Figure 7 for the green economy. Figure 8 and Table 4 (below) present the cumulative effects at the end of five years. At the end of five years, the cumulative increase in GDP ranges from 6.6% in the Philippines to 27.1% in Colombia, 27.8% in South Africa, 31.8% in India, 37.2% in Indonesia, 43.8% in Turkey, 59% in Chile, and 63.6% in South

Korea. After five years total (non-agricultural) employment increases in cumulative by 1% in the Philippines, 10.3% in India, 21% in Turkey, 23.8% in Indonesia, 27.8% in Chile, 39.3% in Colombia, 48.9% in South Korea, and 57% in South Africa. On average, GDP increases by 37.1%, employment increases by 28.6%, employment of men increases by 25.4%, and employment of women increases by 33.5%. The creation of a high number of new jobs (320 thousand in the Philippines, 2.2 million in Chile, 4.9 million in Turkey, 7.9 million in Colombia, 9 million in South Africa, 12.6 million in South Korea, 22.4 million in Indonesia, 27.6 million in India) signals the potential of the green and care jobs for redeployment from the polluting, high-carbon, and fossil fuel-based sectors. Starting with high gender gaps in employment, at the end of this policy stimulus more jobs are created for men than for women (except in Colombia and South Africa) despite higher rates of growth in women's employment (except in the Philippines). It is important to design hiring and training policies to make sure the new green and physical infrastructure jobs also employ women to challenge existing occupational segregation patterns, with women concentrated in the care economy and constituting a low share of the green economy.

FIGURE 8. POLICY MIX COMBINING PUBLIC SPENDING IN THE CARE AND GREEN ECONOMY, AND OTHER INFRASTRUCTURE: THE SUM OF THE CUMULATIVE % CHANGE IN GDP AND EMPLOYMENT (TOTAL, WOMEN, AND MEN, NON-AGRICULTURAL), AND NUMBER OF NEW JOBS (TOTAL, WOMEN AND MEN, NON-AGRICULTURAL), AT THE END OF FIVE YEARS IN RESPONSE TO A REPEATED INCREASE IN PUBLIC SPENDING IN GFCF, THE CARE ECONOMY AND THE GREEN ECONOMY (REEEPT) BY 1%-POINT AS A RATIO TO GDP EVERY YEAR.

8a. % change in GDP and employment (total, women, and men, non-agricultural)



8b Number of new jobs (thousands)

Note: Calculations are based on the sum of the effects in Figures 3, 5, 7.

TABLE 4. THE SUM OF THE CUMULATIVE % CHANGE IN GDP AND EMPLOYMENT (TOTAL, WOMEN, AND MEN, NON-AGRICULTURAL), AND NUMBER OF NEW JOBS (TOTAL, WOMEN AND MEN, NON-AGRICULTURAL, THOUSANDS), AT THE END OF FIVE YEARS IN RESPONSE TO A REPEATED INCREASE IN PUBLIC SPENDING IN GFCF, THE CARE ECONOMY AND THE GREEN ECONOMY (REEEPT) BY 1%-POINT AS A RATIO TO GDP EVERY YEAR.

	GDP (CUMULATIVE % CHANGE IN FIVE YEARS)	TOTAL EMPLOYMENT (NON-AGRICULTURAL) (CUMULATIVE % CHANGE IN FIVE YEARS)	WOMEN'S EMPLOYMENT (NON-AGRICULTURAL) (CUMULATIVE % CHANGE IN FIVE YEARS)	MEN'S EMPLOYMENT (NON-AGRICULTURAL) (CUMULATIVE % CHANGE IN FIVE YEARS)	TOTAL NUMBER OF NEW JOBS (THOUSANDS, CUMULATIVE CHANGE IN FIVE YEARS)	NEW JOBS FOR WOMEN (THOUSANDS, CUMULATIVE CHANGE IN FIVE YEARS)	NEW JOBS FOR MEN (THOUSANDS, CUMULATIVE CHANGE IN FIVE YEARS)
CHILE	59	27,8	27,2	28,3	2152	919	1234
COLOMBIA	27,1	39,3	44,1	35,2	7869	4051	3818
INDIA	31,8	10,3	14,8	9,4	27642	6392	21250
INDONESIA	37,2	23,8	26,2	22,2	22414	10030	12383
PHILIPPINES	6,6	1	-2,2	3,5	320	-315	635
SOUTH AFRICA	27,8	57	77,9	40,2	9013	5503	3511
SOUTH KOREA	63,6	48,9	53	45,8	12621	5857	6764
TURKEY	43,8	21	27,5	18,3	4950	1909	3041
AVERAGE	**37,1**	**28,6**	**33,5**	**25,4**			

Note: Based on the results presented in Figure 8.

Conclusion and policy implications

Building a caring and sustainable society in the aftermath of the pandemic is possible and public investment in strategic sectors that are good for people and the planet will be key to such a policy programme.

The aim of this report is to analyse the impact of public spending in the care economy, the green economy, and infrastructure on the employment of men and women and GDP in emerging economies. We analyse the gendered employment effects of these three types of public spending and emphasise the importance of a policy mix to ensure that a green transition is gender-equitable and both the ecological transition and care needs of the countries are addressed.

We estimate the associated fiscal multiplier effects of public spending in the care and green economy and infrastructure. The multiplier effects on GDP are always positive and, in most countries, substantial in all spending categories, reaching above one in the medium term. Among the multipliers above 1, for public physical infrastructure (after a one-off increase), the multipliers at the end of five years range between 1.9 in Colombia to 4.6 in South Korea; the multiplier effects of the care spending on GDP in five years range between 1.6 in Turkey and South Africa and 4.5 in South Korea; the multiplier effects of the public spending in the green economy are between 1.1 in South Korea and 4.5 in Turkey. The differences across countries indicate that not only the amount but also the composition and targeted nature of spending matters, in addition to differences in import dependency or informality.

We present a policy simulation of the effects of a repeated annual increase in public spending in physical infrastructure, the care economy, and the green economy by 1%-point as a ratio of GDP for five years. An annual increase in public investment in physical infrastructure by 1%-point of GDP at the end of five years creates a cumulative increase in GDP ranging between 4.1% in the Philippines and 23.5% in South Korea and a cumulative increase in total employment ranging between 1.5% in India and 31.5% in South Africa. On average, both GDP and employment increase by 12%. In six countries the employment of both men and women increase and in Chile, Colombia, Indonesia, South Africa, and Turkey the rate of increase in women's employment is higher, although the number of new jobs for women is still lower than that for men due to a low starting point. In the Philippines and India, the employment effect is positive and significant only for men. These differences illustrate the importance of gender mainstreaming in assessing the employment impact of public investment.

An annual increase in public spending in the care economy by 1%-point at the end of five years leads to a cumulative increase in GDP ranging between 0.5% in the Philippines, 1.3% in Colombia, 4.9% in Turkey, 15.3% in Indonesia, 16.9% in India, and 23.7% in South Korea. Total employment increases between 0.2% in the Philippines, 1.5% in Chile, 3.1% in Turkey, 12.5% in Indonesia, 4.6% in India, and 18% in South Korea, creating jobs for both women and men, albeit at a faster rate for women. On average, GDP increases by 11.1% and employment increases by 6.3%. An annual increase in public

spending in the green economy by 1%-point at the end of five years leads to a cumulative increase in GDP ranging between 1.9% in the Philippines, 4.8% in Indonesia, 12.7% in India and 22% in Turkey. The cumulative effect on total employment ranges between 0.9% in the Philippines and Indonesia to 5.7% in Turkey and 27% in Colombia. On average, GDP increases by 10% and employment increases by 7.5%. Finally, we present the effects of a policy mix combining a repeated increase in public spending in the care and green economy, and other physical infrastructure (e.g., housing, buildings for schools, hospitals), each by 1%-point as a ratio to GDP every year for five years. On average, GDP increases by 37.1%, employment increases by 28.6%, employment of men increases by 25.4%, and employment of women increases by 33.5%. The creation of a high number of new jobs (320 thousand in the Philippines, 2.2 million in Chile, 4.9 million in Turkey, 7.9 million in Colombia, 9.0 million in South Africa, 12.6 million in South Korea, 22.4 million in Indonesia, 27.6 million in India) signals the potential of green and care jobs for redeployment from polluting, high-carbon, and fossil fuel-based sectors. Starting with high gender gaps in employment, at the end of this policy stimulus, more jobs are created for men than for women (except in Colombia and South Africa) despite higher rates of growth in women's employment (except in the Philippines). It is important to design hiring and training policies to make sure the new green and physical infrastructure jobs also employ women going beyond the existing occupational segregation patterns with women concentrated in the care economy and constituting a low share of the green economy.

The findings clearly indicate the potential of the green and care jobs for redeployment from polluting, high-carbon, and fossil fuel-based sectors. In the context of redeployment, an expansion of the care economy is not only needed on its own right, but it also offers opportunities for redeployment from high-carbon or fossil fuel-based activities. The care economy is a low-carbon sector with a high potential for employment creation given its labour intensity. The transition across sectors also creates new education and training needs, which in turn add to the need for further public spending in the care economy.

How can such investments be financed? Public spending even without any increases in the tax rates, is partially self-financing, thanks to the strong multiplier effects. But the scale and urgency of the social and ecological needs for an effective response to the intersecting crises of inequalities, care and climate change requires the use of all available policy. Public borrowing to fund some of this spending can be justified given their medium-term effects on productivity and sustainability. Alternatively, to put it negatively, the expected damage to the ecology, society, and economy if investment needs are not delivered on time mean that responsible fiscal policy requires urgent and large public spending funded by all means, including borrowing. Also, in the case of public spending in the care economy, considering the long-term effects on productivity, such spending could be considered as public investment in social infrastructure rather than current expenditure, which justifies borrowing to fund spending if need be.

National and regional investment banks working in cooperation with the government and central bank are also crucial for funding large-scale public infrastructure projects.

Ultimately, the large scale of spending requires a combination of progressive taxation of both income and wealth. Onaran, Oyvat, Fotopoulou (2019a) estimate that an increase in the tax rate on wealth has a high positive impact on output,

and thereby employment and the budget in the UK, because it decreases wealth concentration, which in turn reduces the financialisation of non-financial companies, market concentration, and barriers to entry, and thereby stimulates private investment. As such, taxation of wealth is a particularly effective policy to fund purple and green public spending, while tackling income, gender, and wealth inequalities. Tippet, Wildauer, Onaran (2021) presents the tax revenue potential of a progressive scheme of wealth taxation, aiming at the top 1% of the wealthiest households in the UK. This is particularly important after the pandemic which is likely to have increased wealth inequality.

Crucially, any policy mix should involve the coordination of fiscal and monetary policies. Increasingly, the strict separation between monetary and fiscal policy is becoming difficult to justify. Effective monetary policy requires coordination with expansionary fiscal policy that targets long-term public investment in care and green infrastructure, builds on a needs-based approach to policy and considers long-term strategies to tackle inequalities, social, economic, and ecological sustainability. The lessons of the past decade show that the central banks' mandate should include the dual target of full or high employment and an inflation target high enough to be compatible with it; moving within a band, with a higher weight for employment. Although unconventional monetary policy (quantitative easing (QE)) has done the heavy lifting in terms of policy since the Great Recession, helping to stabilise financial markets and prevent a new Great Depression, monetary policy is less effective than fiscal policy. One reason for this is that the elasticity (sensitivity) of private corporate investment to interest rate is low while its elasticity to demand is high. QE has further contributed to inequalities, financialisation and higher wealth concentration at the top 1% via asset price inflation; both led to lower private corporate investment (Onaran, Oyvat, Fotopoulou 2019a, Tori and Onaran 2018, 2021, 2022), which in turn leads to low productivity.

International policy coordination can make a further difference, particularly for emerging economies. The effects of public spending are stronger and negative effects on the current account balance are moderated, if policies are implemented simultaneously in all the countries (Onaran, 2016; Obst et al., 2016; Wildauer et al., 2021). If large, high-income economies lead the way, their actions create space for small, import-dependent, balance of payments-constrained emerging economies. From the perspective of the emerging economies, public investment as part of a well-designed industrial policy is key to structural change and productivity gains. Managing short-term constraints on the balance of payments requires further policies in terms of capital controls and FDI policies. Finally, two policies that address further amplified post-pandemic global inequalities stand out: first, the cancellation or restructuring of parts of the debt of developing countries needs to be part of the international development agenda. Secondly, a transfer of technology to support the mass, not-for-profit, global production of key public goods from vaccines and medication to solar panels, turbines, or batteries for storing renewable energy is the only way to tackle global crises such as the pandemic or climate change in the context of global climate justice.

The coordination of fiscal policies with labour market policies makes the effects of fiscal spending stronger and eases the funding pressures, as higher wages lead to higher tax revenues (Onaran, 2016; Obst et al., 2016; Onaran et al., 2019a). Strong pro-labour institutions – particularly, strong, well-coordinated trade unions, equal pay legislation,

increased job security, permanent contracts, higher minimum wages, and improved and equitable parental leave are positive policy goals for equality-led and sustainable development. Moreover, labour-market regulation for a shorter working week can promote a rise in gender equality in paid and unpaid work and income, while also facilitating a green transition, as well as higher productivity (Onaran and Calvert Jump, 2022). Having more time may enable behavioural changes towards greener ways of living with less carbon-intensive habits being replaced by more labour- and time-intensive household work and leisure activities or commuting routines. For example, cooking with fresh and local ingredients rather than heating ready meals, growing one's own food, washing reusable rather than disposable textile goods, walking or cycling rather than driving, as well as commuting less, could all be enabled by a shorter working week. More personal time would also encourage personal education, reading, community interaction, socialising or exercising rather than material consumption.[39]

In this report we do not analyse the effects of public spending on greenhouse gas emissions, climate change or material resource depletion. While increased energy efficiency and the use of renewable energy facilitates the transition to a zero-carbon economy, increased economic activity puts pressure on the ecology in terms of both emissions and material use. The constraints of the planet in terms of the limits of the biosphere and material resources require further research in terms of the appropriate mix of fiscal policy combining carbon taxes with green subsidies and green public spending, as well as other policies that facilitate meaningful behavioural change.

[39] See Onaran and Calvert Jump (2022); Stronge and Harper (2019); Knight, Rosa and Schor (2013).

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Appendix 1.
The model

TABLE A1 BELOW PRESENTS THE LIST OF THE VARIABLES IN THE MODEL.

Table A1: List of variables in the theoretical model

Appendix 1: Variables and data sources

SYMBOL	VARIABLE NAME
WB	TOTAL WAGE BILL, LABOUR COMPENSATION ADJUSTED FOR THE LABOUR INCOME OF THE SELF-EMPLOYED (REAL), IN BILLIONS
WB^F	TOTAL WAGE BILL FOR FEMALE WORKERS (REAL, ADJUSTED LABOUR COMPENSATION), IN BILLIONS
WB^M	TOTAL WAGE BILL FOR MALE WORKERS (REAL, ADJUSTED LABOUR COMPENSATION), IN BILLIONS
E^H	TOTAL EMPLOYMENT IN THE PUBLIC SOCIAL SECTOR (TOTAL HOURS WORKED BY PERSONS ENGAGED IN EDUCATION AND HEALTH & SOCIAL WORK CATEGORIES OF THE INDUSTRIAL CLASSIFICATION OF EUKLEMS), IN BILLIONS
E^N	TOTAL EMPLOYMENT IN THE REST OF THE ECONOMY, IN BILLIONS
E^{HF}	HOURS OF EMPLOYMENT OF WOMEN IN THE PUBLIC SOCIAL SECTOR, IN BILLIONS
E^{HM}	HOURS OF EMPLOYMENT OF MEN IN THE PUBLIC SOCIAL SECTOR, IN BILLIONS
E^{NF}	HOURS OF EMPLOYMENT OF WOMEN IN THE REST OF THE ECONOMY, IN BILLIONS
E^{NM}	HOURS OF EMPLOYMENT OF MEN IN THE REST OF THE ECONOMY, IN BILLIONS
w^{HF}	AVERAGE FEMALE HOURLY WAGE RATE IN THE PUBLIC SOCIAL SECTOR (REAL)
w^{HM}	AVERAGE MALE HOURLY WAGE RATE IN THE SOCIAL SECTOR (REAL)
w^{NF}	AVERAGE FEMALE HOURLY WAGE RATE IN THE REST OF THE ECONOMY (REAL)
w^{NM}	AVERAGE MALE HOURLY WAGE RATE IN THE REST OF THE ECONOMY (REAL)
α^H	RATIO BETWEEN MALE AND FEMALE WAGES IN THE PUBLIC SOCIAL SECTOR
α^N	RATIO BETWEEN MALE AND FEMALE WAGES IN THE REST OF THE ECONOMY
C^H	HOUSEHOLDS' PRIVATE SOCIAL EXPENDITURES (REAL), IN BILLIONS
C^N	PRIVATE CONSUMPTION OF GOODS AND SERVICES IN THE REST OF THE ECONOMY (REAL), IN BILLIONS
I	PRIVATE INVESTMENT (REAL), IN BILLIONS

G^C	GOVERNMENT'S OTHER EXPENDITURES (REAL), IN BILLIONS
I^G	PUBLIC INVESTMENT (GROSS FIXED CAPITAL FORMATION, REAL), IN BILLIONS
G^H	GOVERNMENT'S SOCIAL INFRASTRUCTURE EXPENDITURES (REAL), IN BILLIONS
G^G	GOVERNMENT'S CURRENT EXPENDITURES IN RENEWABLE ENERGY, ENERGY EFFICIENCY, PUBLIC TRANSPORT (REAL), IN BILLIONS
M	IMPORTS (REAL), IN BILLIONS
X	EXPORTS (REAL), IN BILLIONS
Y^H	TOTAL EXPENDITURE IN THE SOCIAL SECTOR (REAL), IN BILLIONS
Y^N	TOTAL EXPENDITURE IN THE REST OF THE ECONOMY (REAL), IN BILLIONS
κ^H	SHARE OF GOVERNMENT SPENDING ON THE SOCIAL SECTOR IN TOTAL OUTPUT
κ^C	SHARE OF GOVERNMENT'S OTHER EXPENDITURES IN TOTAL OUTPUT
κ^G	SHARE OF GOVERNMENT'S CURRENT EXPENDITURES IN RENEWABLE ENERGY, ENERGY EFFICIENCY, PUBLIC TRANSPORT IN TOTAL OUTPUT
κ^I	SHARE OF GOVERNMENT SPENDING ON PUBLIC INVESTMENT IN FIXED CAPITAL IN TOTAL OUTPUT
T^N	PRODUCTIVITY IN THE REST OF THE ECONOMY (REAL)
β^N	SHARE OF WOMEN EMPLOYED IN THE REST OF THE ECONOMY
β^H	SHARE OF WOMEN EMPLOYED IN THE PUBLIC SOCIAL SECTOR
U	UNPAID DOMESTIC CARE LABOUR
R	GROSS OPERATING SURPLUS (REAL), IN BILLIONS
π	PROFIT SHARE IN THE REST OF THE ECONOMY (R/Y^N)
t^W	IMPLICIT TAX RATE ON LABOUR, %
t^R	IMPLICIT TAX RATE ON CAPITAL INCOME, %
T^C	IMPLICIT TAX RATE ON CONSUMPTION, %
D/Y	GENERAL GOVERNMENT CONSOLIDATED DEBT/Y
ε	REAL EXCHANGE RATE
Y^{World}	REST OF THE WORLD INCOME
N	POPULATION

The variables corresponding to female and male workers are denoted by scripts F and M respectively. The public social sector and the rest of the market economy are denoted by scripts H and N.

Below are the behavioural equations and identities discussed in section 2. The model extends Onaran, Oyvat, and Fotopoulou (2022b) with public spending in renewable energy, energy efficiency and public transport.

The model below also presents endogenous labour force participation and wage bargaining equations as discussed in Oyvat and Onaran (2022). See Onaran, Oyvat, and Fotopoulou (2022b) for a more detailed technical presentation of an earlier version of the model without these extensions.

Aggregate output and income

$$Y_t = WB_t^M + WB_t^F + R_t \quad (1)$$

Total wage income

$$WB_t^F = w_t^{HF} E_t^{HF} + w_t^{NF} E_t^{NF} \quad (2)$$

$$WB_t^M = w_t^{HM} E_t^{HM} + w_t^{NM} E_t^{NM} \quad (3)$$

Gender wage gaps

$$\alpha_t^N = \frac{w_t^{NM}}{w_t^{NF}}, \qquad \alpha_t^H = \frac{w_t^{HM}}{w_t^{HF}} \quad (4)$$

Aggregate demand and sectoral composition, and government spending

$$Y_t = C_t^N + C_t^H + I_t + G_t^H + G_t^G + G_t^C + I_t^G + X_t - M_t \quad (5)$$

$$Y_t^H = G_t^H = \kappa_t^H Y_t \quad (6)$$

$$Y_t^N = Y_t - G_t^H = Y_t(1 - \kappa_t^H) \quad (7)$$

$$G_t^G = \kappa_t^G Y_t \quad (8)$$

$$G_t^C = \kappa_t^C Y_t \quad (9)$$

$$I_t^G = \kappa_t^I Y_t \quad (10)$$

Employment

$$E_t^N = \frac{Y_t^N}{T_t^N} = \frac{(1 - \kappa_t^H) Y_t}{T_t^N} \quad (11)$$

$$E_t^{NF} = \frac{(1 - \kappa_t^H)\, Y_t}{T_t^N} \beta_t^N = \frac{Y_t^N}{T_t^N} \beta_t^N \quad (12)$$

$$E_t^{NM} = \frac{(1 - \kappa_t^H)\, Y_t}{T_t^N} (1 - \beta_t^N) = \frac{Y_t^N}{T_t^N} (1 - \beta_t^N) \quad (13)$$

$$G_t^H = \kappa_t^H Y_t = \beta_t^H E_t^H w_t^{FH} + (1 - \beta_t^H) E_t^H w_t^{MH} \quad (14)$$

$$E_t^H = \frac{\kappa_t^H Y_t}{w_t^{FH}(\beta_t^H + \alpha_t^H - \beta_t^H \alpha_t^H)} \quad (15)$$

$$E_t^{HF} = \frac{\beta_t^H \kappa_t^H Y_t}{w_t^{FH}(\beta_t^H + \alpha_t^H - \beta_t^H \alpha_t^H)}, \quad (15a,b)$$

$$E_t^{HM} = \frac{(1 - \beta_t^H) \kappa_t^H Y_t}{w_t^{FH}(\beta_t^H + \alpha_t^H - \beta_t^H \alpha_t^H)}$$

Unpaid domestic care

$$\log U_t = q_0 + q_G \log G_t^H + q_F \log E_t^{NF} + q_M \log E_t^{NM} \tag{16}$$

Profits

$$\begin{aligned} R_t = Y_t^N - \ & w_t^{NF} E_t^{NF} - w_t^{NM} E_t^{NM} = Y_t^N - E_t^N(\beta_t^N + \alpha_t^N - \beta_t^N \alpha_t^N) w_t^{NF} \\ & = \left((1-\kappa_t^H) Y_t - E_t^N(\beta_t^N + \alpha_t^N - \beta_t^N \alpha_t^N) w_t^{NF}\right) \end{aligned} \tag{17}$$

Profit share

$$\pi_t = \frac{Y_t^N - \ w_t^{NF} E_t^{NF} - w_t^{NM} E_t^{NM}}{Y_t^N} = 1 - \frac{(\beta_t^N + \alpha_t^N - \beta_t^N \alpha_t^N) w_t^{NF}}{T_t^N} \tag{18}$$

Consumption of households

$$\begin{aligned} \log C_t^N = \ & c_0 + c_R \log[R_t(1 - t_t^R)] \\ & + c_{NF} \log[w_t^{NF} E_t^{NF}(1 - t_t^W)] + c_{HF} \log[w_t^{HF} E_t^{HF}(1 - t_t^W)] \\ & + c_{NM} \log[w_t^{NM} E_t^{NM}(1 - t_t^W)] \\ & + c_{HM} \log[w_t^{HM} E_t^{HM}(1 - t_t^W)] + c_G \log G_t^G + c_I \log I_t^G \end{aligned} \tag{19}$$

$$\begin{aligned} \log C_t^H = \ & z_0 + z_G \log G_t^H \\ & + z_R \log[R_t(1 - t_t^R)] \\ & + z_F \log[w_t^{NF} E_t^{NF}(1 - t_t^W)] + z_M \left(\log[w_t^{NM} E_t^{NM}(1 - t_t^W)]\right) \end{aligned} \tag{20}$$

Private investment

$$logI_t = i_0 + i_1 \log Y_t + i_2 \log[\pi_t(1 - t_t^R)] + i_3 \log\left(\frac{D}{Y}\right)_t + i_G logI_t^G \tag{21}$$

Public debt

$$D_t = (1 + r_{t-1})\, D_{t-1} + G_t^H + G_t^G + G_t^C + I_t^G - t_t^W (WB_t^F + WB_t^M) - t_t^R R_t \tag{22}$$

$$\begin{aligned} D_t = \ & (1 + r_{t-1})\, D_{t-1} + \frac{Y_t^N(\kappa_t^H + \kappa_t^C + \kappa_t^G + \kappa_t^I)}{1 - \kappa_t^H} - w_t^{NF}(\alpha_t^N E_t^{NM} + E_t^{NF}) t_t^W \\ & - w_t^{HF}(\alpha_t^H E_t^{HM} + E_t^{HF}) t_t^W - t_t^R\left(Y_t^N - w_t^{NF}(E_t^{NF} + \alpha_t^N E_t^{NM})\right) \end{aligned} \tag{22'}$$

Exports

$$logX_t = x_0 + x_1 logY_t^{World} + x_2 log \left(\frac{P_x}{P_m}\right)_t + x_3 log\varepsilon_t \tag{23}$$

Imports

$$logM_t = n_0 + n_1 logY_t^N + n_2 log\left(\frac{P}{P_m}\right)_t + n_3 log\varepsilon_t \quad (24)$$

Domestic prices

$$logP = p_0 + p_{ulc}\, log(ulc) + p_m logP_m \quad (25)$$

Export prices

$$\log P_x = p_{x0} + p_{xulc}\log(ulc) + p_{xm}\log P_m \quad (26)$$

Labour productivity

$$\begin{aligned}\log T_t^N = {} & h_0 + h_1 \log G_{t-1}^H + h_2 \log I_{t-1}^G + h_3 \log G_{t-1}^G + h_4 \log G_{t-1}^C \\ & + h_5 \log Y_{t-1} + h_6 \log w_{t-1}^{NF} + h_7 \log(\alpha_{t-1}^N w_{t-1}^{NF}) \\ & + h_8 \log C_{t-1}^H + h_9 \log U_{t-1} + h_{10} \log T_{t-1}^N\end{aligned} \quad (27)$$

Distribution of unpaid care

$$U_t^F = \beta_d U_t \quad (28)$$

$$U_t^M = (1 - \beta_d) U_t \quad (29)$$

Women's and men's labour force participation rates

$$L_t^F = (l_{1F}(w_t^{FH} + w_t^{FN}) + l_{2F} G_t^H + l_{3F} U_t^F) N_t^F \quad (30)$$

$$L_t^M = (l_{1M}(w_t^{MH} + w_t^{MN}) + l_{2M} G_t^H + l_{3M} U_t^M) N_t^M \quad (31)$$

Wage bargaining

$$\log w_t^{NF} = p_{0F} + p_{1F}\log\left((E_t^{NF} + E_t^{HF})/L_t^F\right) + p_{2F}\log w_t^{HF} \quad (32)$$

$$\log w_t^{NM} = p_{0M} + p_{1M}\log\left((E_t^{NM} + E_t^{HM})/L_t^M\right)) + p_{2M}\log w_t^{HM} \quad (33)$$

Sectoral gender segregation

$$\boldsymbol{\beta_H = b_{h1} G_{t-1}^H} \quad (34)$$

$$\boldsymbol{\beta_N = b_{n1} G_{t-1}^H} \quad (35)$$

$$\boldsymbol{\beta_d = b_{d1} G_{t-1}^H} \quad (36)$$

Appendix 2.

List of variables in the econometric estimations, data sources and period

VARIABLE‡	SOURCE	PERIOD
CARE SECTOR OUTPUT (EDUCATION, HEALTHCARE, SOCIAL CARE) EXPENDITURES (CONSTANT LOCAL CURRENCY)ZZ	CHILE, EDUCATION: UN DATA FOR 2013-2019; OECD EDUCATION STATISTICS FOR 2012; UN DATA FOR 1974-2011*. COLOMBIA, EDUCATION: UN DATA FOR 2005-2019.; UN DATA FOR 1970-2004*. COLOMBIA, EDUCATION: UN DATA FOR 2005-2019.; UN DATA FOR 1970-2004*. COLOMBIA, HEALTHCARE, AND SOCIAL CARE: UN DATA FOR 2005-2019; OECD HEALTH STATISTICS FOR 2000-2003; UN DATA FOR 1970-1999*. INDIA, EDUCATION: UN DATA FOR 2011-2019; INDIA KLEMS FOR 1980-2010; UN DATA FOR 1970-1980*‡. INDIA, HEALTHCARE, AND SOCIAL CARE: UN DATA FOR 2011-2019; INDIA KLEMS FOR 1980-2010; UN DATA FOR 1970-1980*‡. THE PHILIPPINES, EDUCATION: WORLD BANK, WORLD DEVELOPMENT INDICATORS; PHILIPPINE STATISTICS AUTHORITY (2000-2019); UN DATA FOR 1992-2009*; UN DATA FOR 1970-1991*‡. THE PHILIPPINES, HEALTHCARE, AND SOCIAL CARE: WHO FOR 2000-2019; UN DATA FOR 1992-2009*; UN DATA FOR 1970-1991*‡. SOUTH AFRICA, PUBLIC EDUCATION: WORLD BANK, WORLD DEVELOPMENT INDICATORS FOR 2000-2019; UN DATA FOR 1993-1999*; UN DATA FOR 1970-1992*‡. SOUTH AFRICA, HEALTHCARE: WHO GLOBAL HEALTH EXPENDITURES FOR 2000-2019; UN DATA FOR 1993-1999*; UN DATA FOR 1970-1992*‡. SOUTH KOREA, EDUCATION, HEALTHCARE, AND SOCIAL CARE: BANK OF KOREA (2010-2019); WORLD KLEMS (1970-2009). TURKEY, EDUCATION: TURKSTAT FOR 2003-2019; UN DATA FOR 1998-2002‡, UN DATA 1970-1997*‡. TURKEY, HEALTHCARE: TURKSTAT FOR 1999-2019; OECD HEALTH STATISTICS (1986-1998); UN DATA 1970-1985*‡.	CHILE: 1974-2019; COLOMBIA: 1970-2019. INDIA: 1970-2019;INDONESIA: 1970-2019; THE PHILIPPINES: 1970-2019; SOUTH AFRICA: 1970-2019; SOUTH KOREA: 1970-2019; TURKEY: 1970-2019

VARIABLE[†]	SOURCE	PERIOD
CARE SECTOR (EDUCATION, HEALTHCARE, SOCIAL CARE) EMPLOYMENT	ILO FOR COLOMBIA, INDONESIA, TURKEY	COLOMBIA, INDONESIA, TURKEY (1991-2019)
PUBLIC GROSS FIXED CAPITAL FORMATION (GENERAL GOVERNMENT, CONSTANT LOCAL CURRENCY)	IMF INVESTMENT AND CAPITAL STOCK DATASET, 1960-2019	ALL COUNTRIES (1970-2019)
CONSTRUCTION VALUE ADDED (CONSTANT LOCAL CURRENCY)	CHILE: UN DATA FOR 1974-1989, 2018-2019; LA KLEMS FOR 1990-2017. COLOMBIA: LA KLEMS FOR 1991-2019; UN DATA FOR 1970-1990. INDIA: UN DATA FOR 1970-2019. INDONESIA: UN DATA FOR 1970-2019. THE PHILIPPINES: UN DATA FOR 1970-2019. SOUTH AFRICA: UN DATA FOR 1970-2019. SOUTH KOREA: UN DATA FOR 1995-2019; WORLD KLEMS FOR 1970-1994. TURKEY: UN DATA FOR 1970-2019.	CHILE: 1974-2019; COLOMBIA: 1970-2019; INDIA: 1970-2019; INDONESIA: 1970-2019; THE PHILIPPINES: 1970-2019; SOUTH AFRICA: 1970-2019; SOUTH KOREA: 1970-2019; TURKEY: 1970-2019
TRANSPORTATION (AIR TRANSPORTATION EXCLUDED) VALUE ADDED (CONSTANT LOCAL CURRENCY)	CHILE: OECD STAN FOR 2008-2017; UN DATA FOR 2005-2007, 2018-2019[§], UN DATA FOR 1970-2004[±]. COLOMBIA: OECD STAN FOR 2005-2019; UN DATA FOR 1970-2004[±]. INDIA: GOVERNMENT OF INDIA MINISTRY OF STATISTICS AND PROGRAMME FOR 2011-2019; INDIAN KLEMS FOR 1980-2010[§]; UN DATA FOR 1970-1979[±]. INDONESIA: STATISTICS INDONESIA FOR 2000-2014; STATISTICS INDONESIA FOR 2015-2019[§]; UN DATA FOR 1970-1999[±]. THE PHILIPPINES: PHILIPPINE STATISTICS AUTHORITY FOR 2000-2019; UN DATA FOR 1998-2000[§]; UN DATA FOR 1970-1997[±]. SOUTH AFRICA: UN DATA FOR 1970-2019[±]. SOUTH KOREA: OECD STAN FOR 2007-2018; OECD FOR 2018-2019[§], WORLD KLEMS FOR 1970-2012[¤]. TURKEY: TURKSTAT FOR 2003-2019; OECD FOR 1998-2002[§]; UN DATA FOR 1970-1997[±].	ALL COUNTRIES (1970-2019)

VARIABLE†	SOURCE	PERIOD
GDP - (CONSTANT LOCAL CURRENCY)	WORLD BANK, WORLD DEVELOPMENT INDICATORS	ALL COUNTRIES (1970-2019)
GDP DEFLATOR	WORLD BANK, WORLD DEVELOPMENT INDICATORS	ALL COUNTRIES (1970-2019). CHILE: 1975-2019; COLOMBIA: 1975-2019. INDIA: 1981-2019; INDONESIA: 1976-2019; THE PHILIPPINES: 1970-2019; SOUTH AFRICA: 1976-2019; SOUTH KOREA: 1970-2019; TURKEY: 1970-2019
EMPLOYMENT (TOTAL, MEN, WOMEN)	CHILE: ST. LOUIS FED FOR 1986-2019; ILO FOR 1975-1983; 1984-1985 DATA INTERPOLATED USING ST. LOUIS FED AND ILO SERIES. WOMEN'S AND MEN'S SHARE IN TOTAL EMPLOYMENT IN 1976 USED FOR 1975. INDONESIA: ILO FOR 1976-2019. DATA FOR 1981, 1983-1984 ARE INTERPOLATED BASED ON ILO DATA. THE PHILIPPINES: ILO FOR 1975-2019. THE AVERAGE OF WOMEN'S AND MEN'S SHARE IN TOTAL EMPLOYMENT IN 1978 AND 1980 IS USED FOR 1979. SOUTH AFRICA: WORLD BANK, WORLD DEVELOPMENT INDICATORS FOR 1991-2019. EMPLOYMENT DATA FOR 1976-1990 CALCULATED BASED ON REGISTERED UNEMPLOYMENT DATA FOR 1976-1990 AND LABOUR FORCE PARTICIPATION DATA INTERPOLATED FROM WORLD BANK, WORLD DEVELOPMENT INDICATORS DATA FOR 1970, 1980, 1985, 1991. SOUTH KOREA: ILO FOR 1970-2019. TURKEY: ILO FOR 1988-2019; MINISTRY OF DEVELOPMENT FOR 1980-1987; ONARAN (2000, BASED ON BULUTAY 1995) FOR 1970-79. WOMEN'S AND MEN'S SHARE IN TOTAL EMPLOYMENT IN 1985 IS USED FOR WOMEN'S AND MEN'S SHARE IN 1980-1985	
NON-AGRICULTURAL EMPLOYMENT (TOTAL, MEN, WOMEN)	CHILE: ILO FOR 1980-2019 COLOMBIA: ILO FOR 1975-2019 INDIA: INDIA KLEMS FOR TOTAL EMPLOYMENT. ILO FOR WOMEN'S AND MEN'S SHARE IN TOTAL EMPLOYMENT FOR 1991-2019. WOMEN'S AND MEN'S SHARE IN TOTAL EMPLOYMENT FOR 1982-1990 INTERPOLATED BASED ON CENSUS OF INDIA 1981 AND ILO. WOMEN'S AND MEN'S SHARE IN TOTAL EMPLOYMENT FOR 1980 IS ASSUMED TO BE THE SAME AS IN 1981. INDONESIA: ILO FOR 1976-2019. DATA FOR 1981, 1983-1984 ARE INTERPOLATED BASED ON ILO DATA. THE PHILIPPINES: TOTAL EMPLOYMENT AND SHARE OF AGRICULTURAL EMPLOYMENT FROM WORLD BANK, WORLD DEVELOPMENT INDICATORS FOR TOTAL NON-AGRICULTURAL EMPLOYMENT IN 1991-2019. ILO FOR TOTAL NON-AGRICULTURAL EMPLOYMENT IN 1971-1990. ILO FOR SHARE OF WOMEN'S AND MEN'S EMPLOYMENT SHARE IN NON-AGRICULTURAL SECTOR IN 1971-1978 AND 1980-2019. SHARE OF WOMEN'S AND MEN'S EMPLOYMENT DATA FOR 1979 IS INTERPOLATED BASED ON ILO DATA. SOUTH AFRICA: ILO FOR 1991-2019 SOUTH KOREA: ILO FOR 1970-2019 TURKEY: ILO FOR TOTAL NON-AGRICULTURAL EMPLOYMENT IN 1988-2019 AND ONARAN (2000, BASED ON BULUTAY 1995) FOR TOTAL NON-AGRICULTURAL EMPLOYMENT IN 1982-1987. ILO FOR SHARE OF WOMEN'S AND MEN'S EMPLOYMENT IN NON-AGRICULTURAL SECTOR IN 1982-1985 AND 1988-2019. SHARE OF WOMEN'S AND MEN'S EMPLOYMENT DATA FOR 1986-87 ARE INTERPOLATED BASED ON ILO DATA.	CHILE: 1980-2019; COLOMBIA: 1975-2019. INDIA: 1980-2019; INDONESIA: 1976-2019; THE PHILIPPINES: 1971-2019; SOUTH AFRICA: 1991-2019; SOUTH KOREA: 1970-2019; TURKEY: 1982-2019

VARIABLE†	SOURCE	PERIOD
EMPLOYMENT-TO-POPULATION RATIO (15+; TOTAL, MEN, WOMEN)	EMPLOYMENT (15+; TOTAL, MEN, WOMEN)/TOTAL POPULATION (15+; TOTAL, MEN, WOMEN) WORLD BANK, WORLD DEVELOPMENT INDICATORS FOR TOTAL POPULATION (15+; TOTAL, MEN, WOMEN) FOR 1970-2019.	CHILE: 1975-2019; COLOMBIA: 1975-2019. INDIA: 1981-2019; INDONESIA: 1976-2019; THE PHILIPPINES: 1970-2019; SOUTH AFRICA: 1976-2019; SOUTH KOREA: 1970-2019; TURKEY: 1980-2019
POPULATION (15+; TOTAL, MEN, WOMEN)	WORLD BANK, WORLD DEVELOPMENT INDICATORS FOR TOTAL POPULATION (15+; TOTAL, MEN, WOMEN) FOR 1970-2019. UNDESA, WORLD POPULATION PROSPECTS 2019 FOR POPULATION (15+; TOTAL, MEN, WOMEN) PROJECTIONS FOR 2024.	ALL COUNTRIES (1970-2024)
MANUFACTURING SUB-INDUSTRIES, VALUE ADDED (CONSTANT LOCAL CURRENCY)	UNIDO- INDUSTRIAL STATISTICS DATABASE MANUFACTURING, 4-DIGIT ISICREV4 DATA FOR THE LATEST PERIODS FOR WHICH DATA IS AVAILABLE, LINKED WITH THE DATA AT 4-DIGIT ISICREV3 CLASSIFICATION FOR THE EARLIER YEARS AND FOR THE PERIOD FOR WHICH DATA AT 4-DIGIT CLASSIFICATION IS NOT AVAILABLE LINKED WITH THE DATA AT 2-DIGIT ISICREV3 CLASSIFICATION, FOR THE FOLLOWING INDUSTRIES (CODES ACCORDING TO 4-DIGIT ISICREV3; SOUTH AFRICA HAS ONLY 2-DIGIT ISICREV3 DATA): PLASTIC PRODUCTS (CODE 2520), GLASS PRODUCTS (2610), CEMENT AND PLASTER (2694) AND CONCRETE PRODUCTS (2695), NON-FERROUS METALS (2720), FABRICATED METAL PRODUCTS (ALL SUB-INDUSTRIES, I.E., 281, 289), GENERAL PURPOSE MACHINERY (291), SPECIAL PURPOSE MACHINERY (292), DOMESTIC APPLIANCES (2930), ELECTRICAL MACHINERY AND APPARATUS (31, ALL SUB-INDUSTRIES), ELECTRONIC VALVES, TUBES, ETC. (3210), RAILWAY/TRAMWAY LOCOMOTIVES & ROLLING STOCK (3520), MANUFACTURE OF OTHER TRANSPORT EQUIPMENT N.E.C. -3599	ALL COUNTRIES (1970-2018)

†All nominal variables for value added and output are deflated by GDP deflator

* Output data including total other community, social and personal services linked to series on education or health and social care provided by the database for the later period.

‡ Value added data linked with the series for the later period

§ Data on all transportation and storage industry value added linked with the series for the later period

± Data on all transportation, storage and communications industry value added linked with the series for the later period

¤ Data on all transportation value added data linked with the series for the later period

Appendix 3.

TABLE A3.1 THE DISTRIBUTION OF PUBLIC SPENDING FOR THE CARE ECONOMY, PUBLIC INFRASTRUCTURE, AND GREEN TRANSITION ACROSS INDUSTRIES (RE+EE+PT) AS A RATIO TO GDP

SOUTH AFRICA INDIA, INDONESIA, PHILLIPINES						
						RATIO TO GDP
CARE: HEALTH AND SOCIAL CARE + EDUCATION & CHILDCARE						0,010
PUBLIC INFRASTRUCTURE: PUBLIC GROSS FIXED CAPITAL FORMATION						0,010
			INDUSTRY	MANUFACTURING INDUSTRY CODE (ISIC4 REV3 CODE)	INDUSTRY SHARE IN RE, EE OR PT	RATIO TO GDP
GREEN (REEEPT)						0,010
	SHARE IN REEEPT	SHARE IN RE				
RENEWABLE ENERGY (RE)	0,50					0,005
SOLAR		0,25				0,001
			ELECTRICAL MACHINERY	31 (TOTAL)	0,51	0,001
			GLASS PRODUCTS	2610	0,08	0,000
			NON-FERROUS METALS	2720	0,08	0,000
			STRUCTURAL METAL PRODUCTS	281	0,10	0,000
			ENGINES, TURBINES	2911	0,07	0,000
			CONSTRUCTION		0,16	0,000
WIND		0,25				0,001
			CONSTRUCTION		0,13	0,000
			CONSTRUCTION SERVICES		0,13	0,000
			PLASTIC PRODUCTS	2520	0,13	0,000
			OTHER FABRICATED METAL	289	0,13	0,000
			GENERAL MACHINERY	291	0,38	0,000
			LIFTING EQUIPMENT	2915	0,04	0,000
			ELECTRICAL MACHINERY	31 (TOTAL)	0,04	0,000
GEOTHERMAL		0,25				0,001
			CONSTRUCTION		0,60	0,001
			PUMPS, COMPRESSORS	2912	0,40	0,001
HYDRO		0,25				0,001
			PLASTER, CEMENT	2694	0,33	0,000
			CONSTRUCTION		0,18	0,000
			ENGINES, TURBINES	2911	0,21	0,000
	SHARE IN REEEPT	SHARE IN EE	ELECTRICAL MACHINERY	31 (TOTAL)	0,28	0,000

SOUTH AFRICA INDIA, INDONESIA, PHILLIPINES						
						RATIO TO GDP
ENERGY EFFICIENCY (EE)	0,20					0,002
PUBLIC AND PRIVATE BUILDINGS		0,5				0,001
			CONSTRUCTION		0,50	0,001
			CONSTRUCTION SERVICES		0,50	0,001
INDUSTRIAL ENERGY EFFICIENCY		0,25				0,001
			SPECIAL MACHINERY	292	0,40	0,000
			GENERAL MACHINERY	291	0,20	0,000
			ENGINES, TURBINES	2911	0,20	0,000
			CONSTRUCTION		0,10	0,000
			CONSTRUCTION SERVICES		0,10	0,000
GRID UPGRADES		0,25				0,001
			CONSTRUCTION		0,13	0,000
			CONSTRUCTION SERVICES		0,13	0,000
			GENERAL MACHINERY	291	0,25	0,000
			ELECTRICAL MACHINERY	31 (TOTAL)	0,50	0,000
	SHARE IN REEEPT	SHARE IN PT				
PUBLIC TRANSPORT (PT)	0,30					0,003
PUBLIC TRANSPORT VEHICLES: LOCOMOTIVES, ROLLING STOCK		0,10			0,10	0,000
PUBLIC TRANSPORT SERVICES		0,72			0,72	0,002
CONSTRUCTION		0,18			0,18	0,001

SOUTH KOREA, CHILE, COLOMBIA, TURKEY			
			RATIO TO GDP
			0,010
			0,010
INDUSTRY	MANUFACTURING INDUSTRY CODE (ISIC4 REV3 CODE)	INDUSTRY SHARE IN RE, EE OR PT	RATIO TO GDP
			0,010
			0,005
			0,001
ELECTRICAL EQUIPMENT, AND SUPPLIES	31 (TOTAL)	0,55	0,001
GLASS PRODUCTS	2610	0,09	0,000
NONFERROUS METAL INGOTS AND PRIMARY NONFERROUS METAL PRODUCTS	2720	0,09	0,000

SOUTH KOREA, CHILE, COLOMBIA, TURKEY			
			RATIO TO GDP
FABRICATED METAL PRODUCTS EXCEPT MACHINERY AND FUNITURE	28=281+289	0,12	0,000
BUILDING CONSTRUCTION AND REPAIR		0,16	0,000
			0,001
BUILDING CONSTRUCTION AND REPAIR		0,26	0,000
PLASTIC PRODUCTS	2520	0,13	0,000
FABRICATED METAL PRODUCTS EXCEPT MACHINERY AND FUNITURE	28=281+289	0,13	0,000
MACHINERY AND EQUIPMENT OF GENERAL PURPOSE	291	0,38	0,000
OTHER TRANSPORTATION EQUIPMENT	359 OR 3599	0,04	0,000
ELECTRONIC COMPONENTS AND ACCESSORIES	3210	0,04	0,000
			0,001
BUILDING CONSTRUCTION AND REPAIR		0,60	0,001
MACHINERY AND EQUIPMENT OF GENERAL PURPOSE	291	0,40	0,001
			0,001
CEMENT AND CONCRETE PRODUCTS	2694+2695	0,33	0,000
CIVIL ENGINEERING CONSTRUCTION		0,18	0,000
MACHINERY AND EQUIPMENT OF GENERAL PURPOSE	291	0,21	0,000
ELECTRICAL EQUIPMENT, AND SUPPLIES	31 (TOTAL)	0,28	0,000
			0,002
			0,001
CONSTRUCTION		1,00	0,001
			0,001
MACHINERY AND EQUIPMENT OF GENERAL PURPOSE	291	0,20	0,000
MACHINERY AND EQUIPMENT OF SPECIAL PURPOSE	292	0,40	0,000
ELECTRICAL EQUIPMENT, AND SUPPLIES	31 (TOTAL)	0,20	0,000
BUILDING CONSTRUCTION AND REPAIR		0,20	0,000
			0,001
BUILDING CONSTRUCTION AND REPAIR		0,25	0,000
MACHINERY AND EQUIPMENT OF GENERAL PURPOSE	291	0,25	0,000
ELECTRONIC COMPONENTS AND ACCESSORIES	3210	0,25	0,000
HOUSEHOLD ELECTRICAL APPLIANCES	2930	0,125	0,000
ELECTRICAL EQUIPMENT, AND SUPPLIES	31 (TOTAL)	0,125	0,000
			0,003
		0,10	0,000
		0,72	0,002
		0,18	

TABLE A3.2 THE DISTRIBUTION OF GREEN PUBLIC SPENDING IN INDUSTRIES (RE+EE+PT) AS A RATIO TO GDP

SOUTH AFRICA INDIA, INDONESIA, PHILLIPINES			
INDUSTRY	ISIC4 REV3 CODE	ISIC4 REV4 CODE	RATIO TO GDP
PLASTIC PRODUCTS	2520	2220	0,000
GLASS PRODUCTS	2610	2310	0,000
PLASTER, CEMENT	2694	2394	0,000
NON-FERROUS METALS	2720	2420	0,000
STRUCTURAL METAL PRODUCTS	281	251	0,000
OTHER FABRICATED METAL	289	259	0,000
GENERAL MACHINERY	291	281	0,001
ENGINES, TURBINES	2911	2811	0,000
PUMPS, COMPRESSORS	2912	2813	0,001
LIFTING EQUIPMENT	2915	2816	0,000
SPECIAL MACHINERY	292	282	0,000
ELECTRICAL MACHINERY	31 (TOTAL)	27	0,001
LOCOMOTIVES, ROLLING STOCK	352	3020	0,000
SUM OF MANUFACTURING SUB-INDUSTRIES PROVIDING INPUT TO REEEPT/GDP			0,005
CONSTRUCTION			0,003
PUBLIC TRANSPORT SERVICES			0,002
TOTAL: (MANUFACTURING+CONSRUCTION+PUBLIC TRANSPORT SERVICES)/GDP			0,010

SOUTH KOREA, CHILE, COLOMBIA, TURKEY			
INDUSTRY	ISIC4 REV3 CODE	ISIC4 REV4 CODE	RATIO TO GDP
PLASTIC PRODUCTS	2520	2220	0,000
GLASS PRODUCTS	2610	2310	0,000
CEMENT AND CONCRETE PRODUCTS	2694+2695	2394+2395	0,000
NONFERROUS METAL INGOTS AND PRIMARY NONFERROUS METAL PRODUCTS	2720	2420	0,000
FABRICATED METAL PRODUCTS EXCEPT MACHINERY AND FUNITURE	28=281+289	251+259	0,000
MACHINERY AND EQUIPMENT OF GENERAL PURPOSE	291	281	0,001
MACHINERY AND EQUIPMENT OF SPECIAL PURPOSE	292	282	0,000
HOUSEHOLD ELECTRICAL APPLIANCES	2930	2750	0,000
ELECTRICAL EQUIPMENT, AND SUPPLIES	31 (TOTAL)	27	0,001
ELECTRONIC COMPONENTS AND ACCESSORIES	3210	2610	0,000
OTHER TRANSPORTATION EQUIPMENT	3599	3099	0,000
LOCOMOTIVES, ROLLING STOCK	352	3020	0,000
SUM OF MANUFACTURING SUB-INDUSTRIES PROVIDING INPUT TO REEEPT/GDP			0,005
CONSTRUCTION			0,003
PUBLIC TRANSPORT SERVICES			0,002
TOTAL: (MANUFACTURING+CONSTRUCTION+PUBLIC TRANSPORT SERVICES)/GDP			0,010

Notes: How an increase in spending in REEEPT by 1% as a ratio to GDP is allocated to manufacturing sub-industries and construction is based on Table A.3 in Pollin et al. (2015) based on input-output tables for renewable energy and energy efficiency (REEE) spending (excluding biofuel). We use the weights reported in Pollin et al. (2015) for South Africa also for India, Indonesia, and the Philippines; and we use the weights reported for South Korea also for Chile, Colombia, and Turkey. The allocation of spending in public transport to construction, manufacturing of rail transport vehicles (3520) and transport services is based on APTA (2020). Mining has a weight of 0.10 in geothermal industry in Pollin et al. (2015) which we allocated to construction to simplify the systems estimation. Research and development (R&D) are distributed to manufacturing to simplify the systems estimation and due to lack of long time series on R&D which starts after 1995 or even in 2000s in some cases.

TABLE A3.3 THE COST OF EXPANSION OF CARE SERVICES UNDER THE "STATUS QUO"* VS. "HIGH ROAD"* SCENARIOS AS A RATIO TO GDP (%)

	"STATUS QUO" SCENARIO	"HIGH ROAD" SCENARIO	ADDITIONAL SPENDING IN CARE SERVICES REQUIRED BY 2030 FOR THE "HIGH ROAD" SCENARIO COMPARED TO CURRENT POLICIES: "HIGH ROAD" - "STATUS QUO"	ADDITIONAL ANNUAL SPENDING IN CARE SERVICES REQUIRED FOR 5 YEARS FOR THE "HIGH ROAD" SCENARIO COMPARED TO CURRENT POLICIES: "HIGH ROAD" - "STATUS QUO"
INDIA	3,6	8,6	5	1,0
INDONESIA	3,9	12,5	8,6	1,7
PHILIPPINES	14,1	19,6	5,5	1,1
SOUTH KOREA	11	12,3	1,3	0,3
TURKEY	8,8	10,9	2,1	0,4

Source: İlkkaracan and Kim, 2019, also reported in ILO 2020

Note: *In the "high road" scenario care services are expanded by 2030 in terms of the extent of population coverage as well as the quality of services provided and employment created, to meet the requirements of SDGs; in particular, SDG 5, target 5.4, calling for the provision of public care services; SDG 3 on health and well-being; SDG 4 on quality education; and SDG 8 on full and productive employment and decent work.

"Status quo" scenario is the baseline case, which assumes that care services will expand in line with population increases but with the current coverage rates, quality standards and working conditions in care sectors remaining constant, with the result that both care deficits and decent employment deficits persist into 2030.

TABLE A3.4 AVERAGE ANNUAL LOW-CARBON ENERGY INVESTMENT REQUIREMENT AS A RATIO TO GDP (%) FOR THE PERIOD OF 2016-2050 UNDER DIFFERENT SCENARIOS ESTIMATED BY DIFFERENT MODELS

COUNTY/REGION	MODEL	CURRENT POLICIES	NET ZERO 2050 (1.5°C)	ADDITIONAL LOW-CARBON INVESTMENT REQUIRED TO LIMIT GLOBAL WARMING TO 1.5°C COMPARED TO CURRENT POLICIES: NET ZERO 2050 (1.5°C) - CURRENT POLICIES
COLOMBIA*	GCAM5.3_NGFS	0,64	2,01	1,37
INDONESIA*	GCAM5.3_NGFS	0,30	2,01	1,71
SOUTH KOREA*	GCAM5.3_NGFS	0,11	1,06	0,95
SOUTH AFRICA*	GCAM5.3_NGFS	0,58	2,69	2,11
INDIA*	GCAM5.3_NGFS	1,37	4,83	3,46
INDIA**	AIM/CGE	0,22	3,37	3,15
INDIA**	IMAGE	0,47	1,46	0,99
INDIA**	MESSAGEIX-GLOBIOM	0,27	1,52	1,25
INDIA**	POLES	0,79	2,92	2,13
INDIA**	REMIND-MAGPIE	2,29	7,73	5,44
INDIA**	WITCH-GLOBIOM	0,87	5,16	4,29
ASIA**	AIM/CGE	0,47	3,38	2,91
	IMAGE	0,33	1,14	0,81
	MESSAGEIX-GLOBIOM	0,24	1,06	0,82
	POLES	0,78	2,39	1,61
	REMIND-MAGPIE	1,53	4,88	3,35
	WITCH-GLOBIOM	0,74	4,35	3,61
MIDDLE EAST AND AFRICA**	AIM/CGE	0,22	4,08	3,86
	IMAGE	0,61	1,57	0,96
	MESSAGEIX-GLOBIOM	0,24	1,65	1,41
	POLES	0,52	3,12	2,60
	REMIND-MAGPIE	1,18	5,88	4,70
	WITCH-GLOBIOM	0,66	9,10	8,44
LATIN AMERICA AND THE CARIBBEAN**	AIM/CGE	0,52	2,29	1,77
	IMAGE	0,68	1,30	0,62
	MESSAGEIX-GLOBIOM	0,27	1,18	0,91
	POLES	0,88	1,84	0,96
	REMIND-MAGPIE	1,34	3,29	1,95
	WITCH-GLOBIOM	0,56	1,91	1,35

Source: *Ratios to GDP are own calculations based on required investment amount reported in Bertram et al. (2021).

Net-Zero 2050 is a scenario that limits global warming to 1.5°C through climate policies and innovation, reaching net zero CO2 emissions around 2050, which is compatible with the long-term temperature goal of the Paris Agreement.

Current Policies assumes that only currently implemented policies are preserved, leading to a global warming by up to 3°C by 2100 and high associated climate impacts.

Country specific estimates are provided based on the GCAM5.3_NGFS Model.

**McCollum, et al. (2018) Supplementary Data Tables, which provides country estimations only for India among the countries analysed in this report and regional estimates, which we list as an indicative reference.

Appendix 4.
Estimation methodology

We estimate the VAR model based on the following specification:

$$AX\_t=A\_0+A\_1\ X\_(t-1)+e\_t \qquad (A4.1)$$

which can be written in reduced form as

$$X\_t=C\_0+C\_1\ X\_(t-1)+u\_t \qquad (A4.2)$$

X_t is a vector of endogenous variables consisting of the logarithmic change in the public expenditure items, employment of men and women in the non-agricultural sector (E_t^M and E_t^F), and GDP (Y).

X_t for the first specification with five variables is as follows:

$$X_t = \begin{bmatrix} \log\left(I_t^G\right) \\ \log Y_t^H \\ \log(Y_t) \\ \log(E_t^M) \\ \log(E_t^F) \end{bmatrix} \qquad (A4.3)$$

where I_t^G is public GFCF, Y_t^H is output in the social sector (alternatingly referred as the care economy: education, childcare, health, and social care),[40] Y_t is GDP, and E_t^M and E_t^Fis employment of men and women in the non-agricultural sector.

From (1) and (2), Au_t=e_t :

$$a_{41}\begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & 1 & 0 \\ a_{51} & a_{52} & a_{52} & a_{52} & 1 \end{pmatrix}\begin{pmatrix} u_1 \\ u_2 \\ u_3 \\ u_4 \\ u_5 \end{pmatrix} = \begin{pmatrix} e_1 \\ e_2 \\ e_3 \\ e_4 \\ e_5 \end{pmatrix} \qquad (A4.4)$$

where e_t are structural shocks. Equation (4) defines the contemporaneous effects.

X_t for the second spec ables is as follows:

$$X_t = \begin{bmatrix} \log Y_t^C \\ \log Y_t^{PT} \\ \log Y_t^{MRE} \\ \log(Y_t) \\ \log(E_t^M) \\ \log(E_t^F) \end{bmatrix} \qquad (A4.5)$$

[40] In Colombia, Indonesia, and Turkey the effects of the care economy are based on an increase in employment in the care sector as the effects of care output is insignificant in some cases. In our simulations for Colombia, Indonesia, and Turkey, we assume that the percentage change in employment in care sector and percentage change in care output will be equal.

where Y_t^Cis value added in construction, Y_t^PTis the value added of transport services, Y_t^MREis sum of value added in manufacturing sub-industries providing input to REEEPT (see Section 3), Y_t^ is GDP and E_t^M and E_t^Fis employment of men and women in the non-agricultural sector.

The contemporaneous effects for specification two are defined in Equation (A4.6):

(A4.6)

$$\begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & 1 & 0 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 & 0 \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & 1 \end{pmatrix} \begin{pmatrix} u_1 \\ u_2 \\ u_3 \\ u_4 \\ u_5 \\ u_6 \end{pmatrix} = \begin{pmatrix} e_1 \\ e_2 \\ e_3 \\ e_4 \\ e_5 \\ e_6 \end{pmatrix}$$

All variables are in logarithms.

We estimate VAR with Cholesky decomposition imposing a triangular structure for the contemporaneous effects for simplicity, given the low number of observations and the relatively high number of variables in the systems. In the VAR estimations, public spending variables are the most exogenous variables as they are part of a policy decision. In specification (1) public gross fixed capital formation comes at the top of these exogenous public spending variables due to the time lags required to plan and implement these projects. Public spending in the care economy (social sector) is affected by GFCF but is contemporaneously exogenous to GDP and employment. In specification (2) value added in construction comes at the top of these exogenous public spending variables, followed by public transport services, which depends on construction but is otherwise contemporaneously exogenous while value added in manufacturing sub-industries are affected by the value added in construction and public transport contemporaneously. In all specifications, an increase in any public expenditure affects aggregate output (GDP) contemporaneously. Finally, public spending categories and aggregate output (GDP) affect employment of men and women contemporaneously. As VAR specification allows limited number of contemporaneous effects, the rest of the interactions in the VAR specification are through lagged effects of all the variables affecting each other.

Both specifications (1) and (2) are estimated introducing total employment instead of employment of men and women as two separate variables to test for robustness, and the results are largely robust.

To test for further robustness or to improve the significance and explanatory power, we also estimate the systems i) in first differences of the variables; ii) estimation period starting in 1980s (rather than 1970s); iii) for alternative orders of different public spending categories; iv) two or three lags; v) with a time trend to account for structural change and other variables that we do not account for in the system estimations (e.g. wage rates, labour market institutions, terms of trade, imported input prices) or other exogenous control variables such as population (+15), informal economy share in GDP, level of urbanisation, real exchange rates, world GDP, trade openness/GDP, oil rent/ GDP in the world, mineral rent/GDP in the world. The details of the specifications chosen as the baseline for simulations are summarized in Table A4.1-2 for each country.

We calculate the effects of a 1%-point increase in GFCF, the care economy output and the value added of the three sub-industries providing input to REEEPT in terms of the percentage change in GDP, and employment of women and men by using the cumulative impulse response function coefficients[41] which report the response of GDP, and employment of women and men (in logarithms) to a one standard deviation increase in changes in public spending categories (all in logarithms, reported in Figure A5.1 and A5.2) for five periods. Figures 2-8 in section 7 present these effects. The transformations use data of the last year of the estimation period for GDP, employment, and public spending categories. In the case of REEEPT in Figure 6 we report the sum of the statistically significant effects in response to an increase in the value added of manufacturing sectors providing input to REEEPT, construction and transport based on separate estimates of impulse responses to the increase in each sector; i.e. the total effects of an increase in the value added in construction by 0.327%-point, public transport services by 0.216%-point, manufacturing sub-industries providing input to REEEPT by 0.458%-point, all as a ratio to GDP (based on the weights presented in Appendix Table A3.2). As we consider the sum of only the significant effects for each sub-sector providing input to REEEPT in each period, the effects in figure 6 are more volatile from year to year.

We do not estimate the effects on exports and imports as adding more variables to the system of VAR equation with short time series is not possible. Estimating import effects would require separate estimations, e.g., adding imports while excluding employment. However, this is beyond the scope of this report. We note the issues of balance of payments constraints in both the theoretical framework and in the descriptive discussion of the stylised facts of the structure of the economy and the green and care economy, and finally in the conclusion. Exchange rates is also not explicitly modelled in the theoretical or empirical analysis, but we check for robustness of our results by controlling for changes in the real exchange rate. Again, further discussions of the exchange rate determination are beyond the scope the report.

[41] Due to the short estimation period, we report only the impulse responses for five years after the shock. In Specification 1 in the following periods and countries, we take some statistically insignificant effects into account when calculating the cumulative effects where we failed to find statistically significant effects (within 90% confidence interval). In Colombia: in year 4-5 the response of GDP and women's employment and in year 3-5 of men's employment to public GFCF, in year 0, 4-5 the response of GDP, in year 5 of men's employment, in year 3-5 of women's employment to the care sector. In Indonesia: in years 3-5 response of GDP, years 0, 3-5 response of women's employment, years 4-5 response of men's employment to public GFCF; in year 0 response of men's employment to care sector. In the Philippines in years 2-5 the response of GDP, years 0-1 of men's employment to public GFCF. In South Africa in year 0 the response of women's employment to public GFCF, in Year 0 response of GDP, year 0-3 response of women's employment and year 0-5 of men's employment to care sector. In South Korea in year 0-1 response of GDP and women's employment to public GFCF. In Turkey: in year 0-2, 4-5 response of GDP, year 0 of men's and women's employment to public GFCF; in year 0 response of GDP, year 2-5 of women's employment and year 5 of men's employment to care sector In India: the response of GDP in all years to the care sector. Finally, in India the effects of GFCF on GDP are negative albeit insignificant, so we do not consider them as they are economically not plausible.

TABLE A4.1. DETAILS OF SPECIFICATION 1

	ESTIMATION PERIOD	LAGS	LEVEL / DIFFERENCE	CONTROL VARIABLES	ORDER OF VARIABLES
CHILE	1982-2018	1	DIFFERENCE	LOG(POPULATION_15); RER; INFORMAL; LOG(WORLD_GDP); RENT_GDP_W	OUTPUT IN THE SOCIAL SECTOR, PUBLIC GFCF, GDP,
COLOMBIA	1994-2018	3	LEVEL	LOG(POPULATION_15); RER; OIL_GDP_W; LOG(WORLD_GDP)	AS IN A4.3
INDIA	1982-2018	1	DIFFERENCE	INFORMAL; LOG(WORLD_GDP); DRER; OIL_GDP_W; TRADE_GDP	AS IN A4.3
INDONESIA	1992-2018	1	LEVEL	LOG(POPULATION_15); LOG_ WORLD_GDP	AS IN A4.3
THE PHILIPPINES	1974-2018	3	LEVEL	LOG_POPULATION_15; TIME TREND; LOG_WORLD_GDP	AS IN A4.3
SOUTH AFRICA	1993-2018	1	DIFFERENCE	URBAN; INFORMAL; RENT_GDP_W; LOG(POPULATION_15)	OUTPUT IN THE SOCIAL SECTOR, PUBLIC GFCF, GDP,
SOUTH KOREA	1972-2018	1	DIFFERENCE	DRER	AS IN A4.3
TURKEY	1992-2018	1	LEVEL	LOG(POPULATION_15); TIME TREND; INFORMAL; RER URBAN; LOG(WORLD_GDP)	AS IN A4.3

Notes: The definition and data source for the control variables are as follows: “population_15” is population over 14; “rer” is real exchange rate; “informal” is informal economy’s share in GDP; “world_gdp” is total GDP in the world; “rent_gdp_w” is the mineral rent/GDP in the world; “oil_gdp_w” is oil rent/GDP in the world; “trade_gdp” is (exports+imports)/GDP; “urban” is the level of urbanisation. population_15, world_ gdp; rent_gdp_w; oil_gdp_w; trade_gdp; urban are from World Bank (2022) World Development Indicators. informal is from Elgin et al (2021). We used World Bank (2022) World Development Indicators for rer data in Chile, Colombia and estimated rer using official USD exchange rate and GDP deflator in India, South Korea, Turkey as real exchange rate data is missing for the years of estimation.

TABLE A4.2. DETAILS OF SPECIFICATION 2

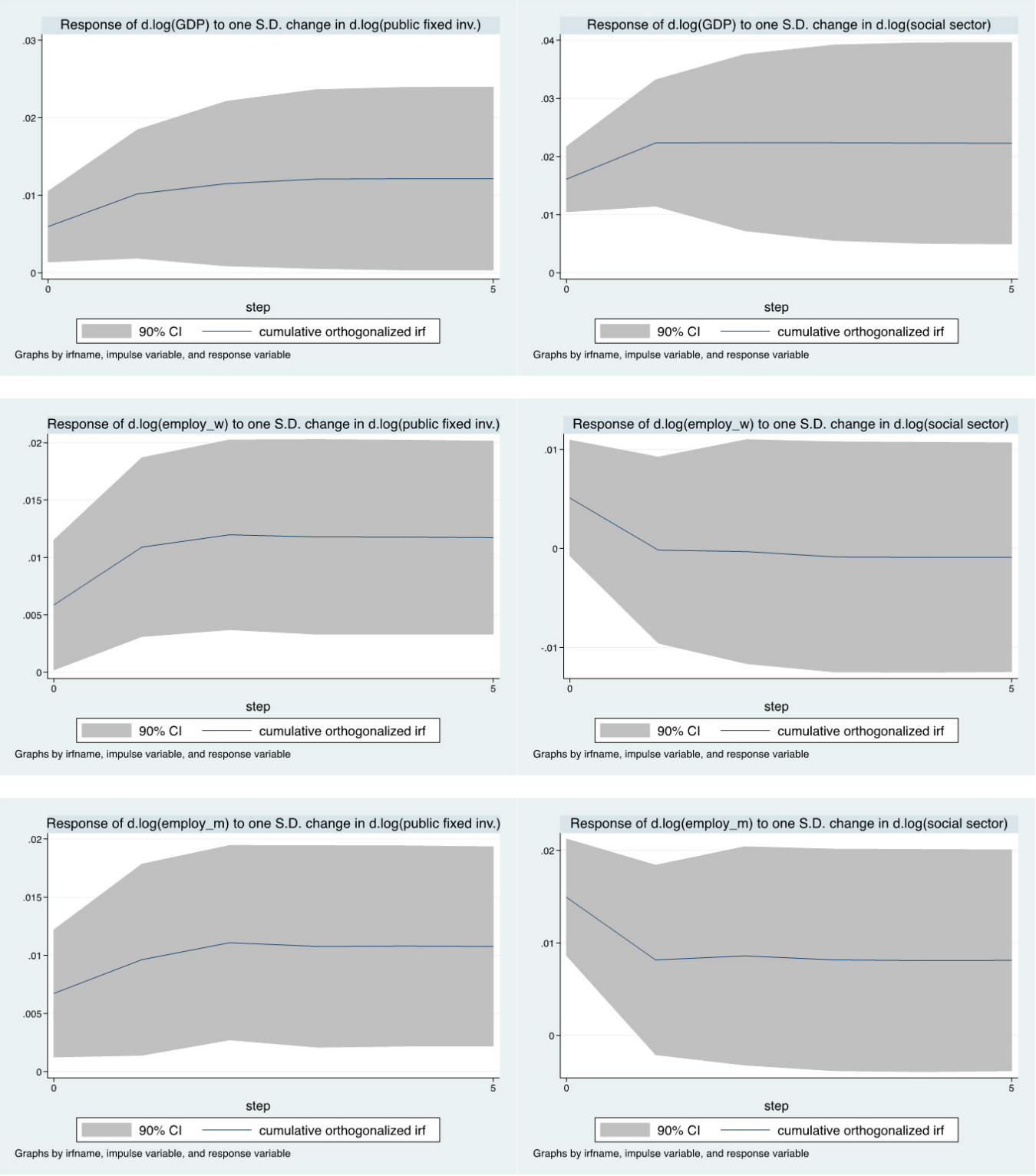
	ESTIMATION PERIOD	LAGS	LEVEL / DIFFERENCE	CONTROL VARIABLES	ORDER OF VARIABLES
CHILE	1982-2018	1	DIFFERENCE	LOG_POPULATION_15; RER; INFORMAL; LOG_WORLD_GDP; RENT_GDP_W	VALUE ADDED IN MANUFACTURING SUB-INDUSTRIES PROVIDING INPUT TO REEEPT, CONSTRUCTION, TRANSPORT, GDP,
COLOMBIA	1978-2018	3	LEVEL	TIME TREND; LOG_POPULATION_15; RER	AS IN A4.5
INDIA	1982-2018	2	DIFFERENCE	INFORMAL; LOG_WORLD_GDP; RER; URBAN; TIME TREND	AS IN A4.5
INDONESIA	1977-2017	1	LEVEL	LOG_POPULATION_15; LOG_WORLD_GDP; TIME TREND	AS IN A4.5
THE PHILIPPINES	1972-2018	1	LEVEL	LOG_POPULATION_15; URBAN; LOG_WORLD_GDP	AS IN A4.5
SOUTH AFRICA	1994-2018	2	DIFFERENCE	RER ; LOG_POPULATION_15; RENT_GDP_W; INFORMAL; DURBAN	AS IN A4.5
SOUTH KOREA	1972-2018	1	DIFFERENCE	TIME TREND	AS IN A4.5
TURKEY	1983-2018	1	LEVEL	LOG_POPULATION_15; TIME TREND; RER; LOG_WORLD_GDP; URBAN; INFORMAL; RENT_GDP_W; OIL_GDP_W	VALUE ADDED IN TRANSPORT, MANUFACTURING SUB-INDUSTRIES PROVIDING INPUT TO REEEPT, CONSTRUCTION, GDP,

Notes: See Note in Table A4.1

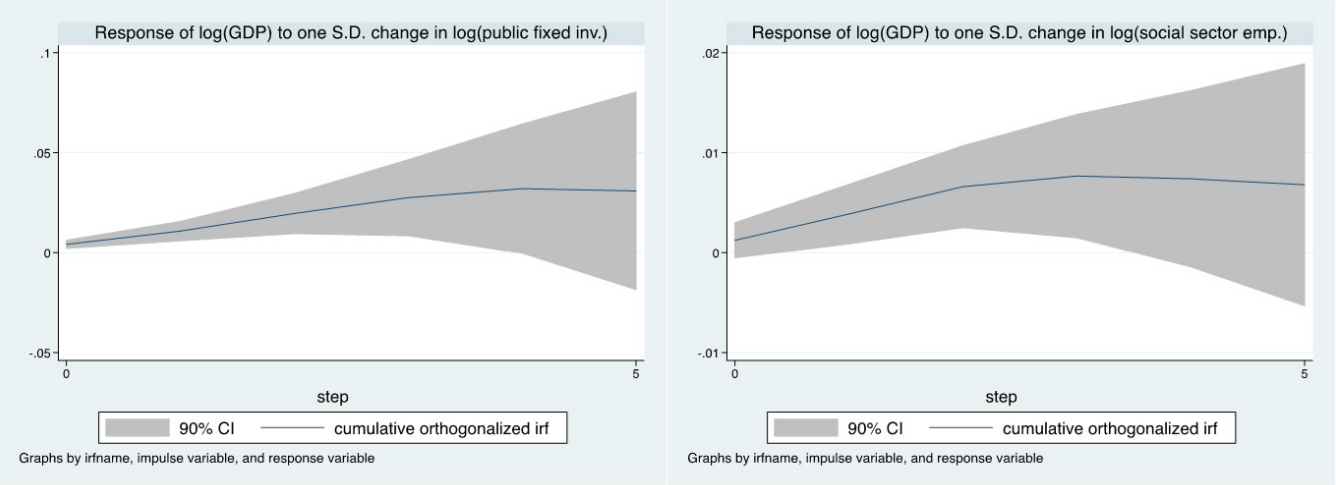
Appendix 5.

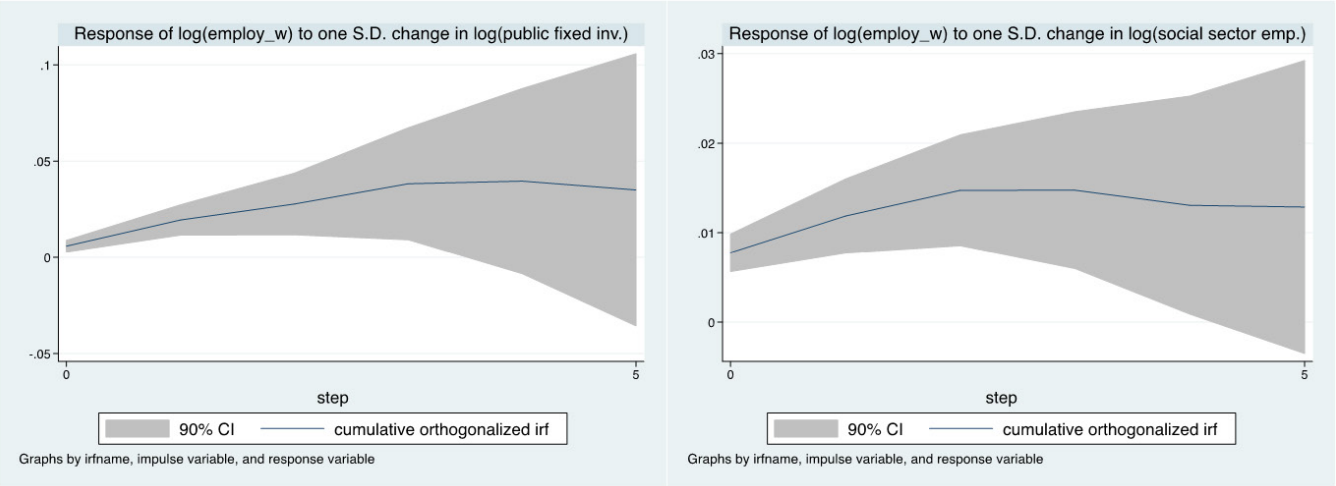
FIGURE A5.1. CUMULATIVE ORTHOGONALIZED IMPULSE RESPONSE FUNCTIONS BASED ON SPECIFICATION 1: THE RESPONSE OF GDP AND WOMEN'S AND MEN'S EMPLOYMENT (EMPLOY_W AND EMPLOY_M, IN NON-AGRICULTURAL SECTOR) TO A ONE-STANDARD DEVIATION INCREASE IN PUBLIC GROSS FIXED CAPITAL FORMATION AND SOCIAL SECTOR OUTPUT (CARE ECONOMY)

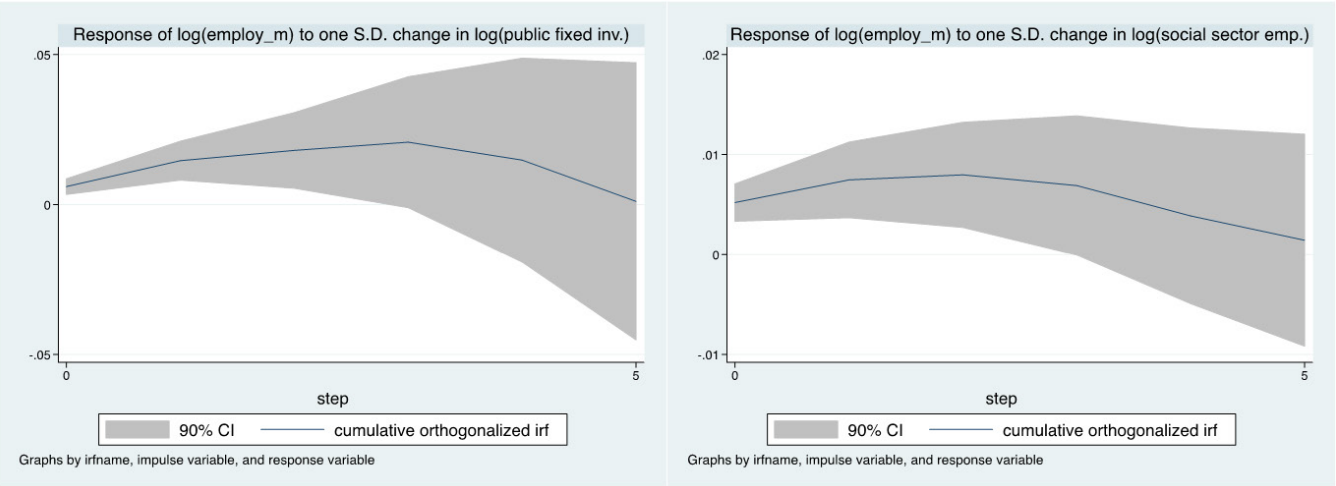
CHILE



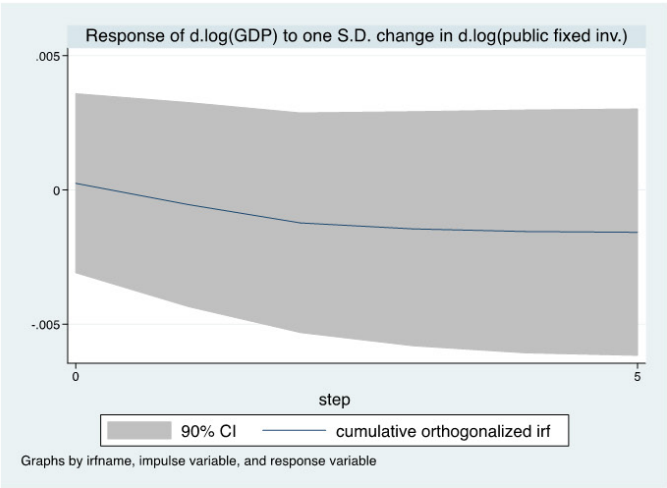
COLOMBIA

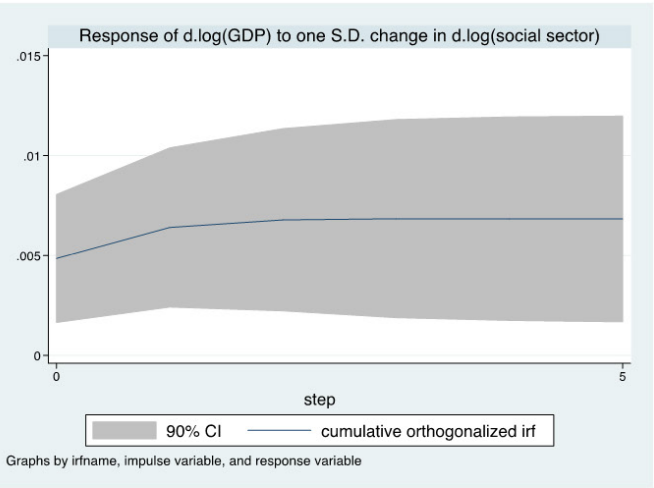

Response of log(GDP) to one S.D. change in log(public fixed inv.)
.1
.05
0
-.05
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable
Response of log(GDP) to one S.D. change in log(social sector emp.)
.02
.01
0
-.01
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

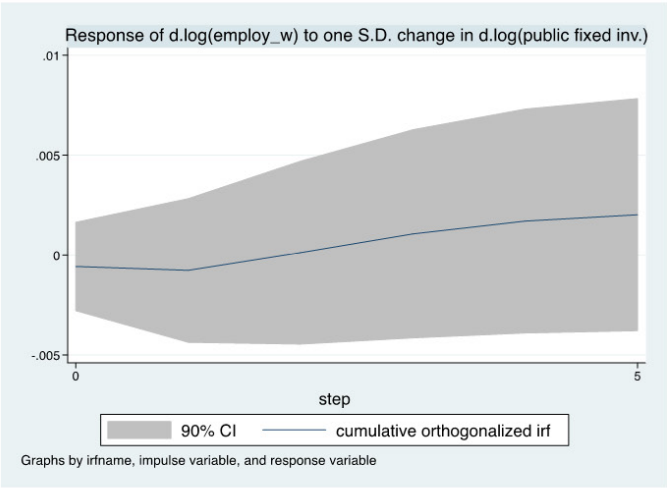

Response of log(employ_w) to one S.D. change in log(public fixed inv.)
.1
.05
0
-.05
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable
Response of log(employ_w) to one S.D. change in log(social sector emp.)
.03
.02
.01
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

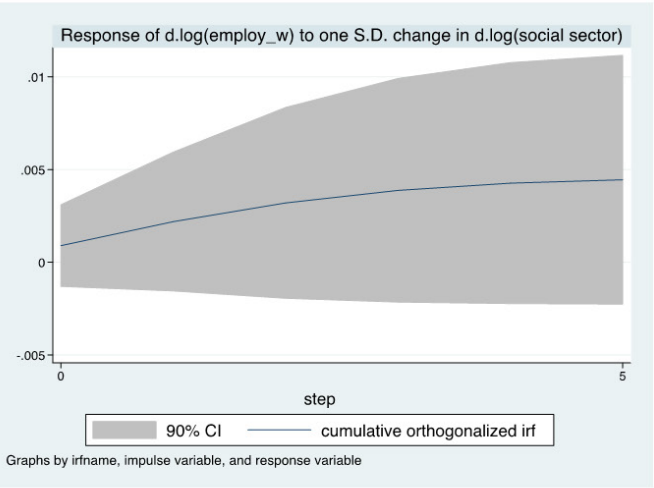

Response of log(employ_m) to one S.D. change in log(public fixed inv.)
.05
0
-.05
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable
Response of log(employ_m) to one S.D. change in log(social sector emp.)
.02
.01
0
-.01
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

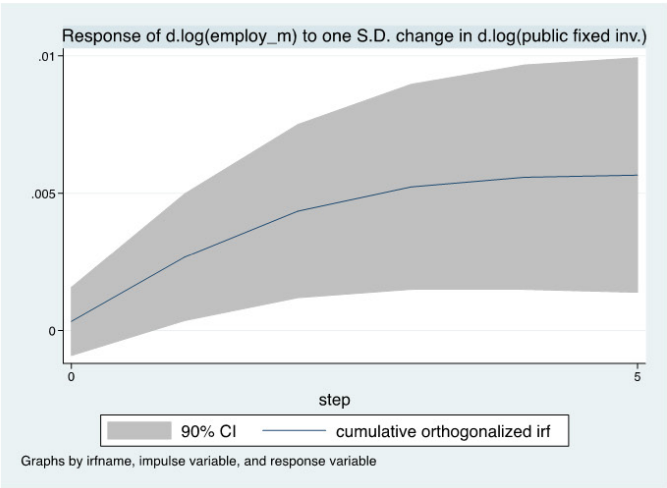
INDIA

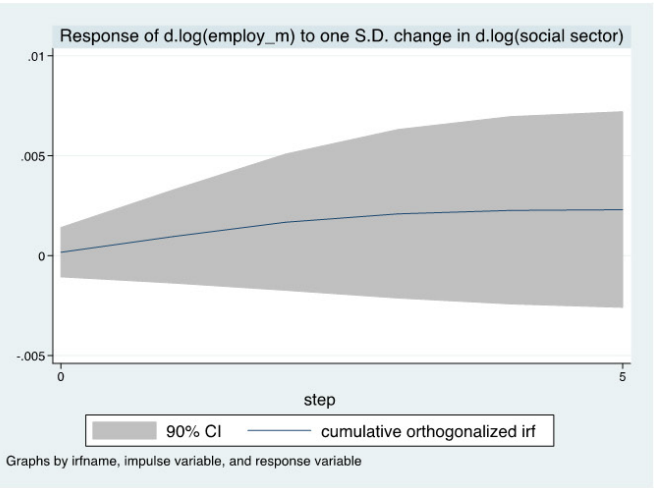

Response of d.log(GDP) to one S.D. change in d.log(public fixed inv.)
.005
0
-.005
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable


Response of d.log(GDP) to one S.D. change in d.log(social sector)
.015
.01
.005
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

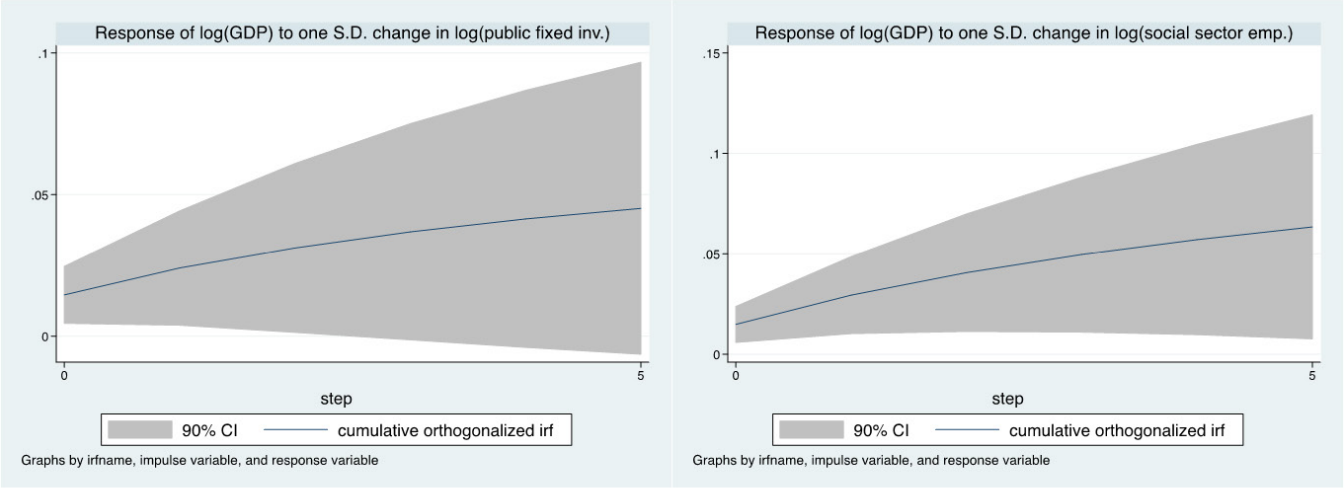

Response of d.log(employ_w) to one S.D. change in d.log(public fixed inv.)
.01
.005
0
-.005
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

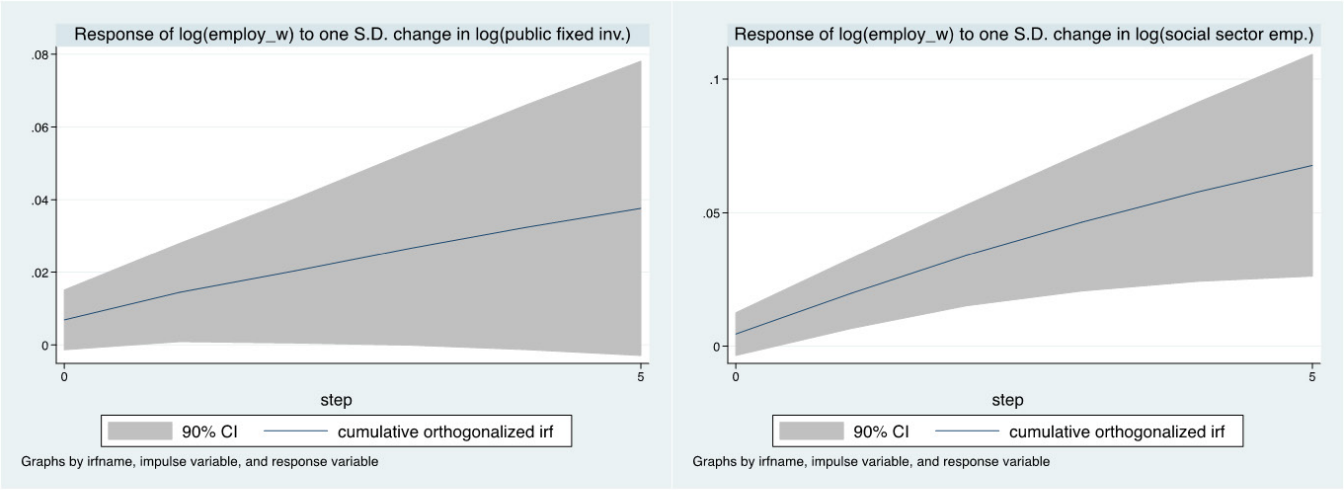

Response of d.log(employ_w) to one S.D. change in d.log(social sector)
.01
.005
0
-.005
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

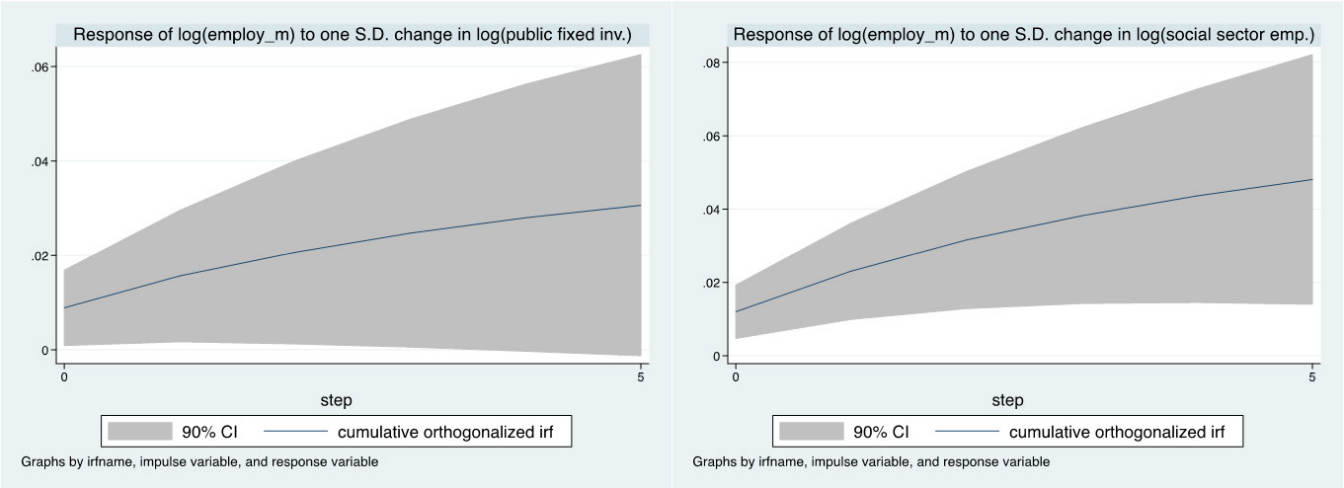

Response of d.log(employ_m) to one S.D. change in d.log(public fixed inv.)
.01
.005
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable


Response of d.log(employ_m) to one S.D. change in d.log(social sector)
.01
.005
0
-.005
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

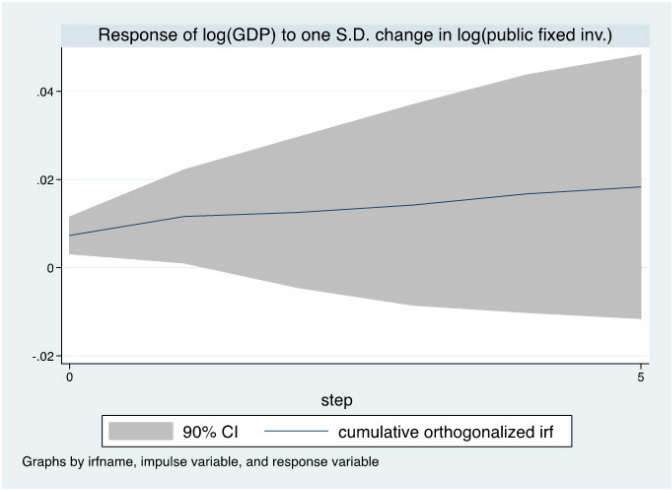
INDONESIA

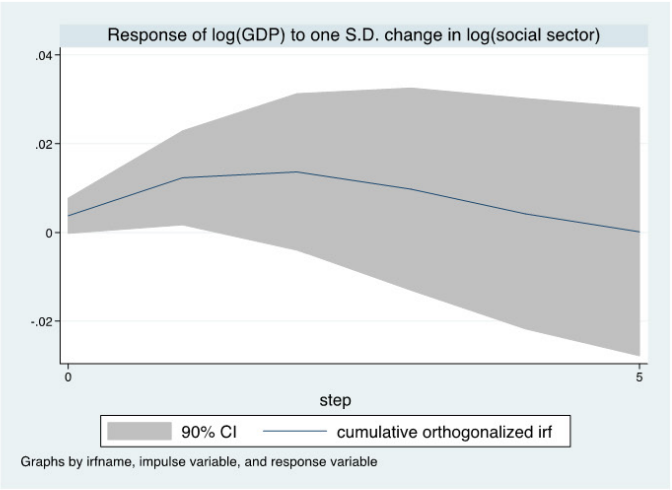

Response of log(GDP) to one S.D. change in log(public fixed inv.)
.1
.05
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable
Response of log(GDP) to one S.D. change in log(social sector emp.)
.15
.1
.05
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

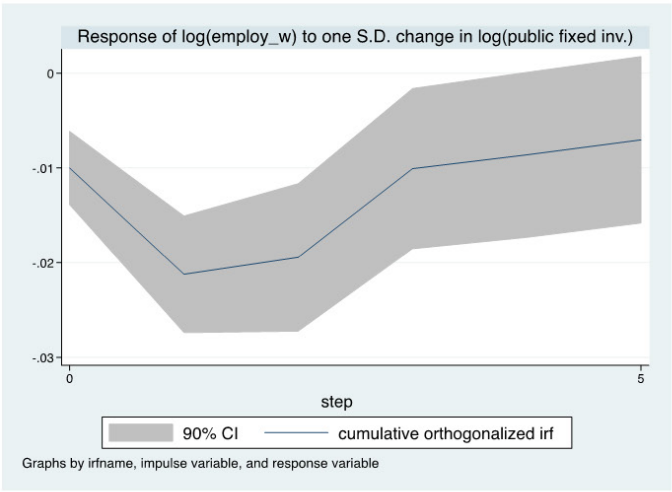

Response of log(employ_w) to one S.D. change in log(public fixed inv.)
.08
.06
.04
.02
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable
Response of log(employ_w) to one S.D. change in log(social sector emp.)
.1
.05
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

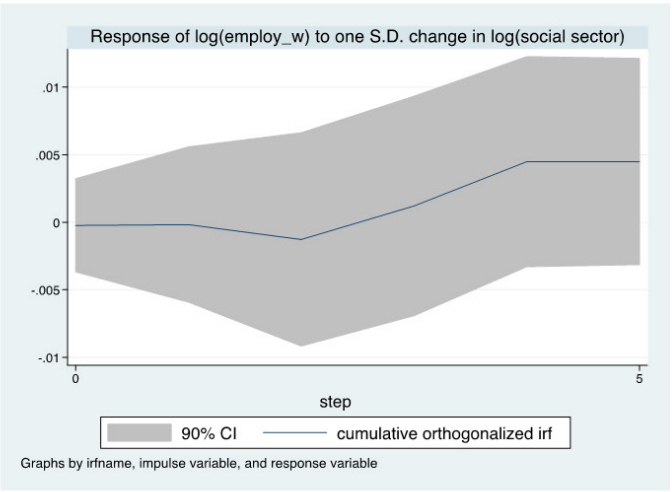

Response of log(employ_m) to one S.D. change in log(public fixed inv.)
.06
.04
.02
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable
Response of log(employ_m) to one S.D. change in log(social sector emp.)
.08
.06
.04
.02
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

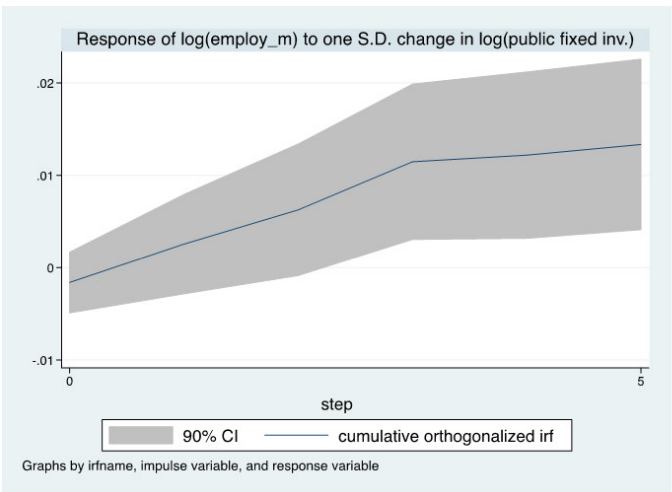
THE PHILIPPINES

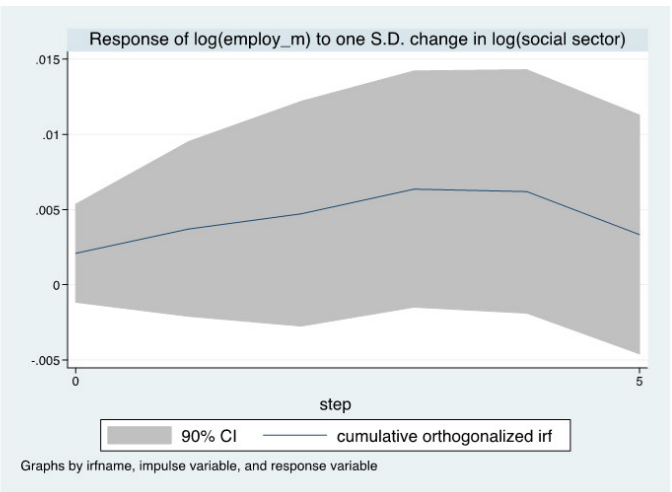




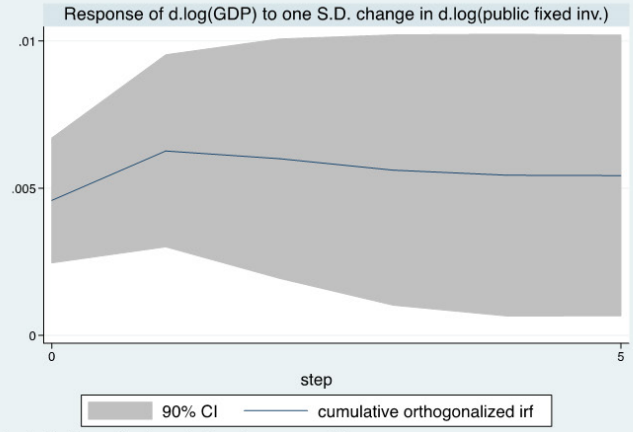


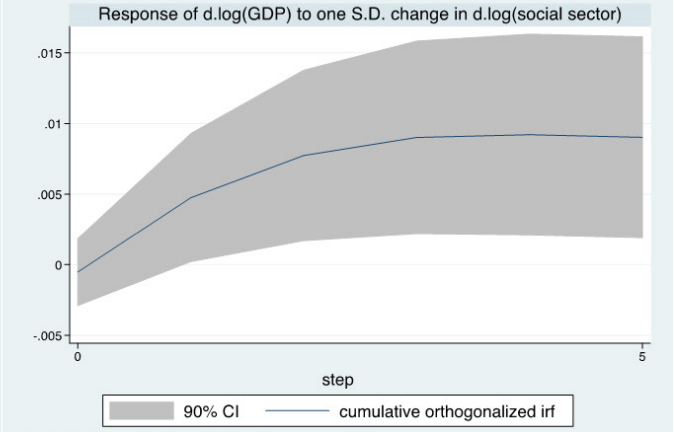


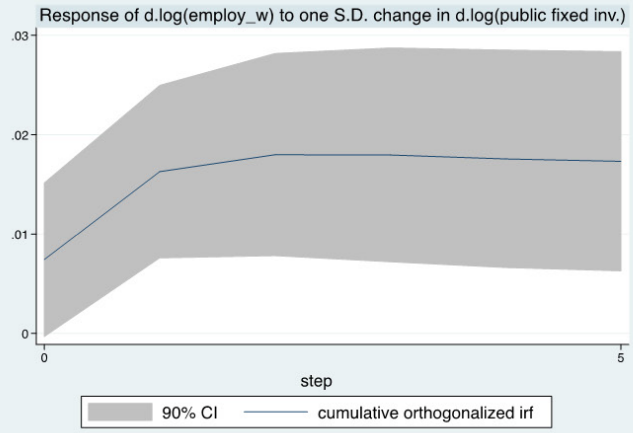


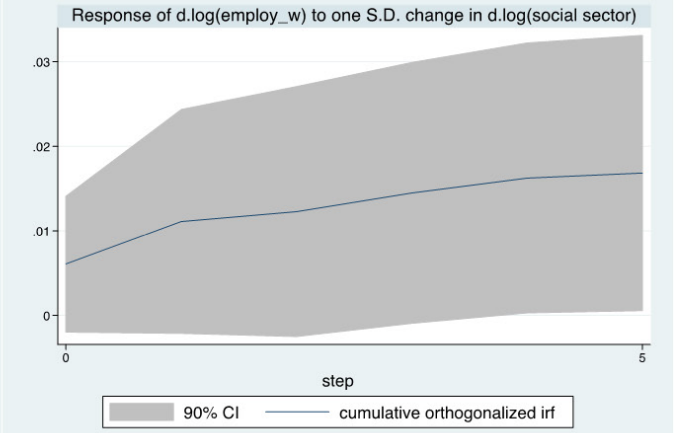


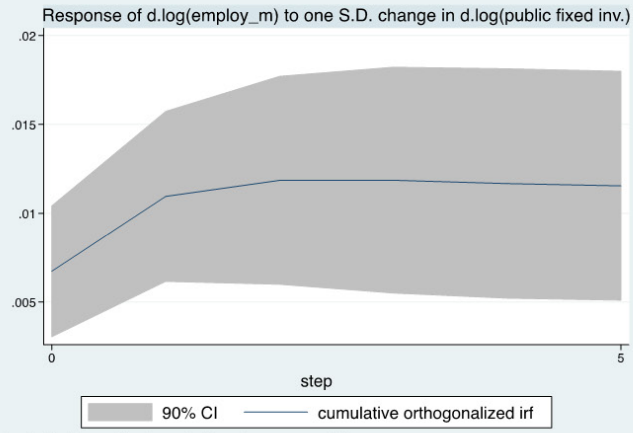
SOUTH AFRICA

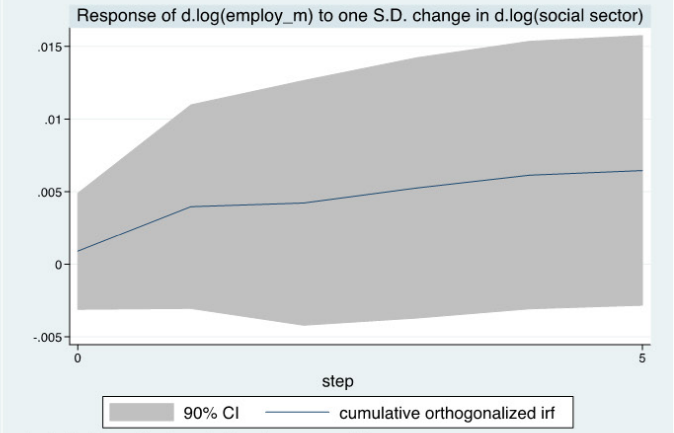




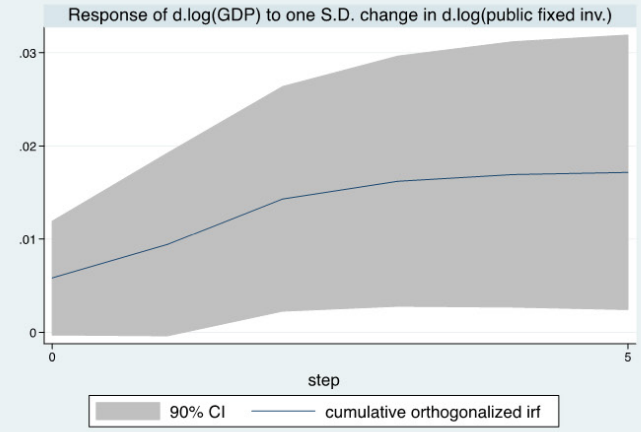


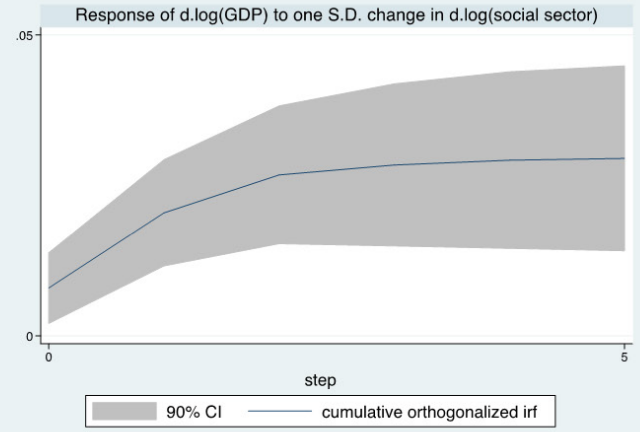


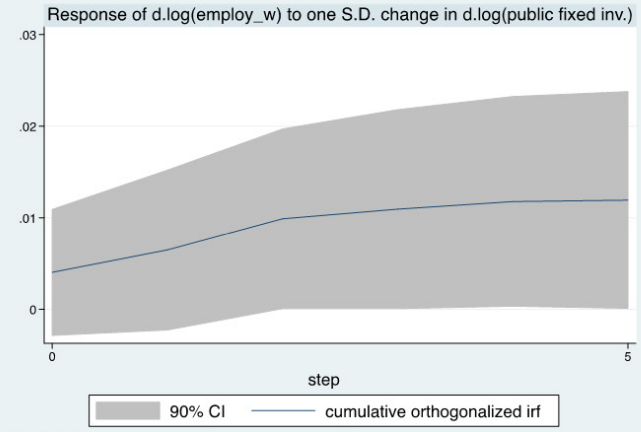


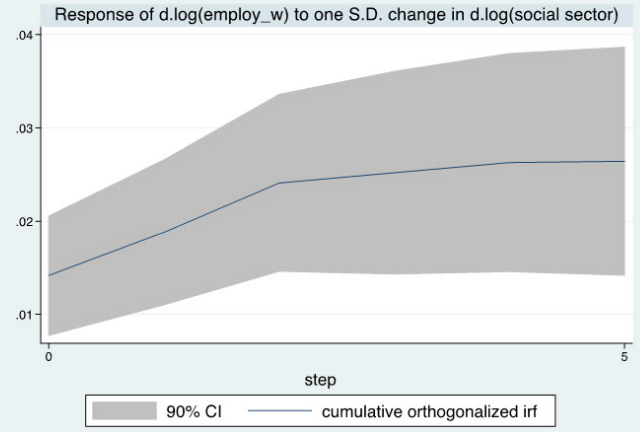


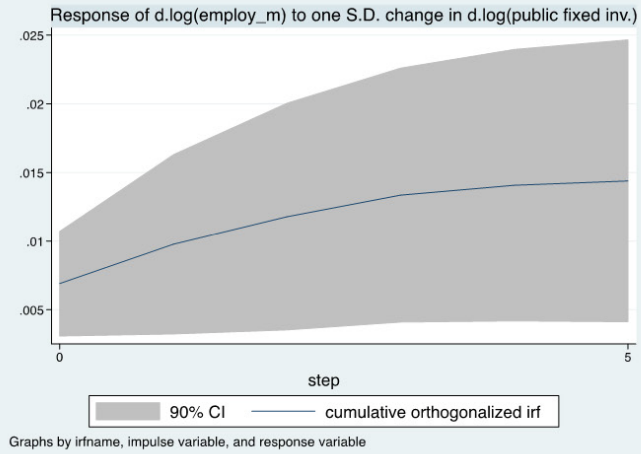
SOUTH KOREA

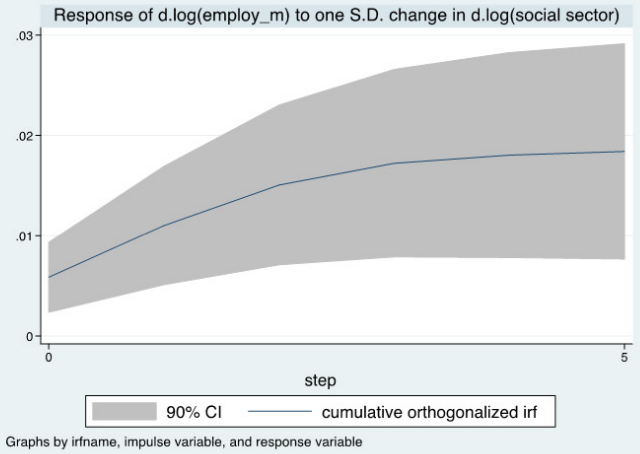

Response of d.log(GDP) to one S.D. change in d.log(public fixed inv.)
.03
.02
.01
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable


Response of d.log(GDP) to one S.D. change in d.log(social sector)
.05
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

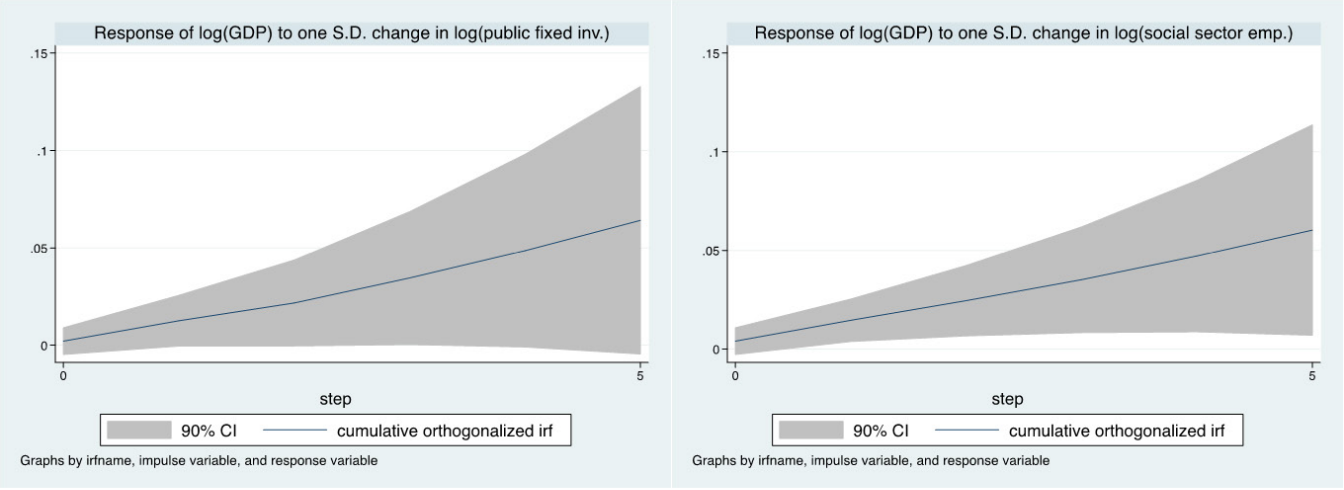

Response of d.log(employ_w) to one S.D. change in d.log(public fixed inv.)
.03
.02
.01
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

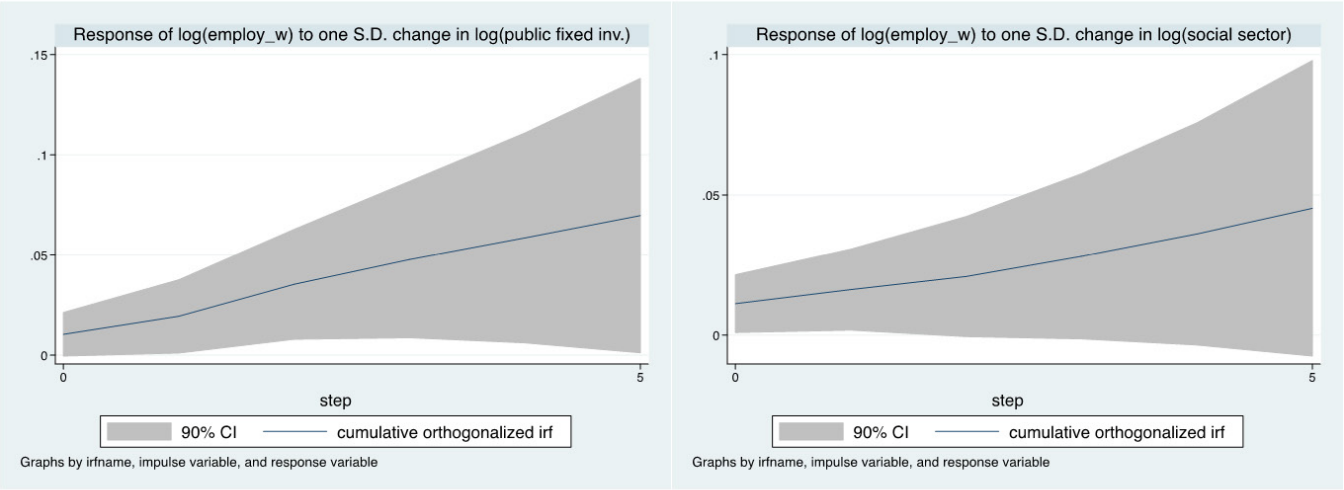

Response of d.log(employ_w) to one S.D. change in d.log(social sector)
.04
.03
.02
.01
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable


Response of d.log(employ_m) to one S.D. change in d.log(public fixed inv.)
.025
.02
.015
.01
.005
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable


Response of d.log(employ_m) to one S.D. change in d.log(social sector)
.03
.02
.01
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

TURKEY


Response of log(GDP) to one S.D. change in log(public fixed inv.)
.15
.1
.05
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable
Response of log(GDP) to one S.D. change in log(social sector emp.)
.15
.1
.05
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable


Response of log(employ_w) to one S.D. change in log(public fixed inv.)
.15
.1
.05
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable
Response of log(employ_w) to one S.D. change in log(social sector)
.1
.05
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

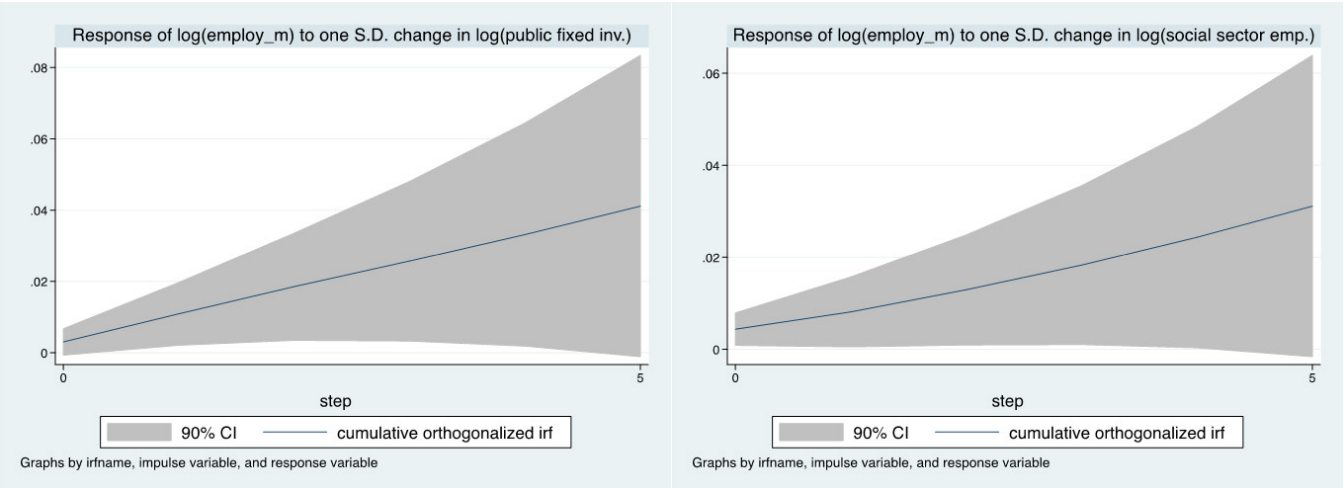
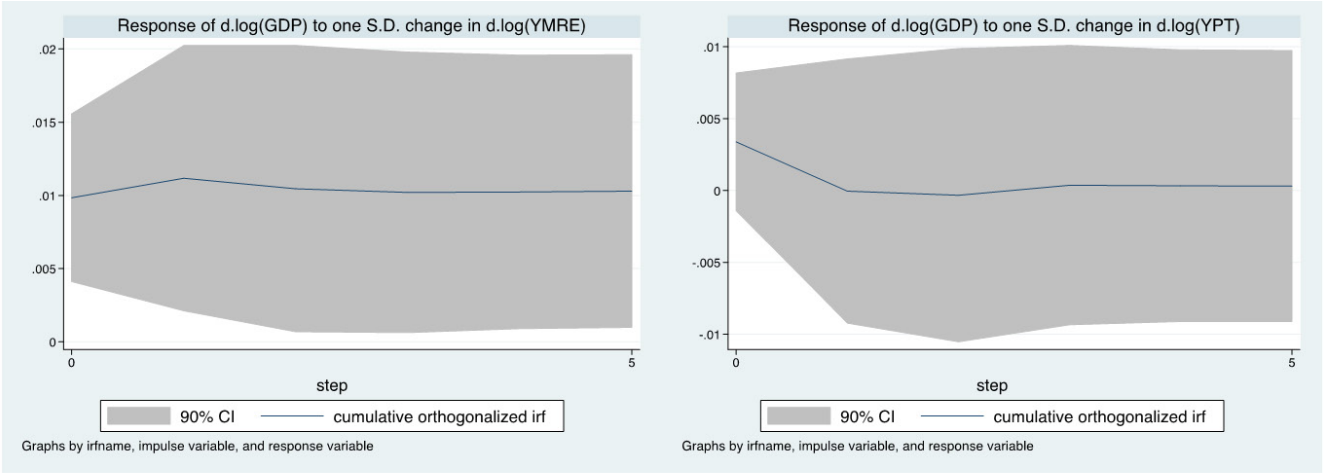
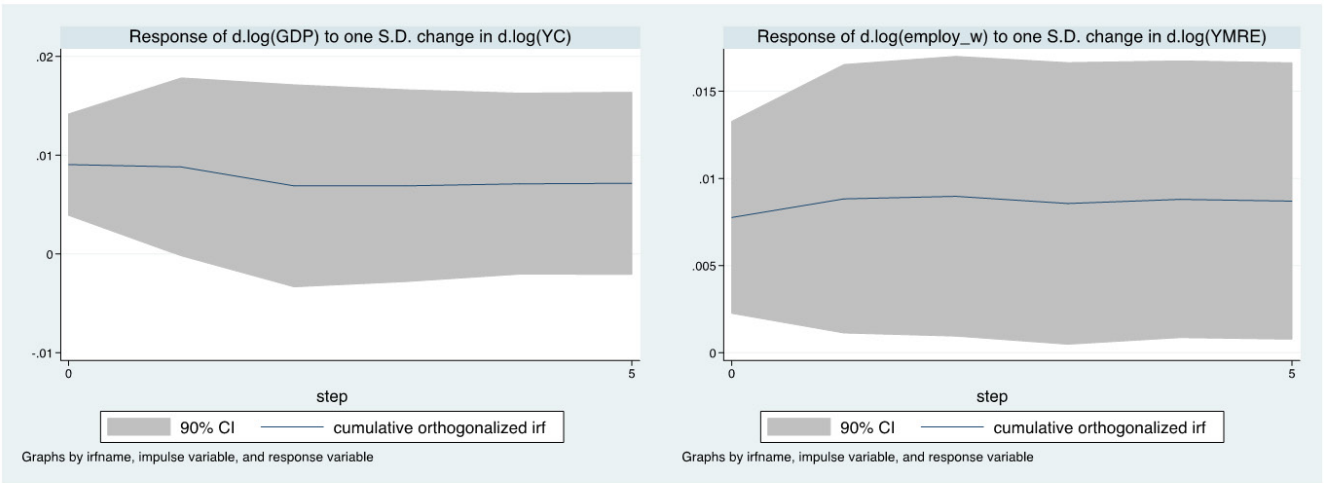
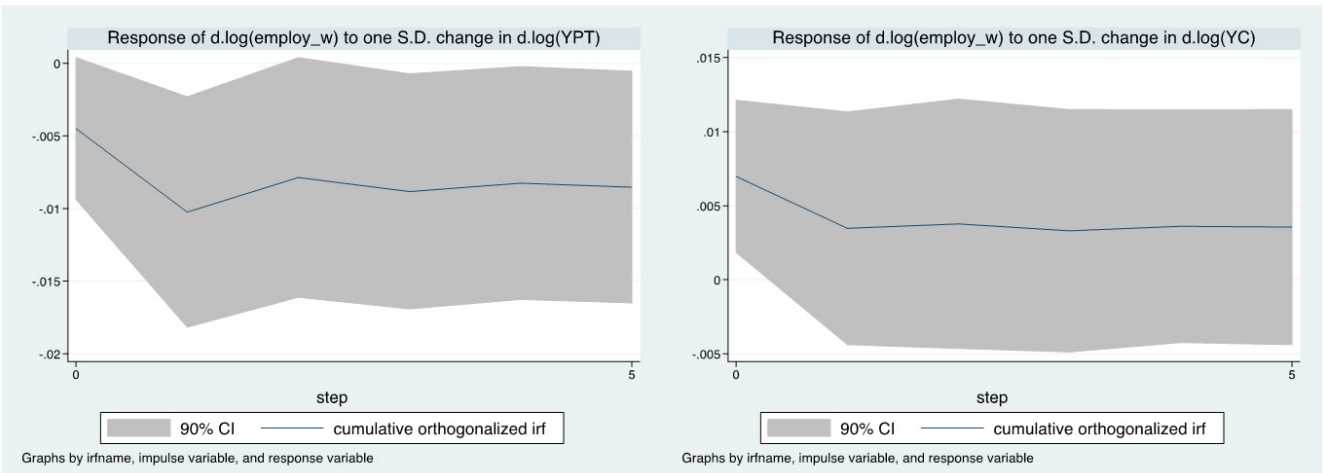

Response of log(employ_m) to one S.D. change in log(public fixed inv.)
.08
.06
.04
.02
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable
Response of log(employ_m) to one S.D. change in log(social sector emp.)
.06
.04
.02
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

FIGURE A5.2. CUMULATIVE ORTHOGONALIZED IMPULSE RESPONSE FUNCTIONS BASED ON SPECIFICATION 2: THE RESPONSE OF GDP AND WOMEN'S AND MEN'S EMPLOYMENT (EMPLOY_W AND EMPLOY_M, IN NON-AGRICULTURAL SECTOR) TO A ONE-STANDARD DEVIATION INCREASE IN VALUE ADDED IN MANUFACTURING SECTOR THAT SUPPLIES INPUTS TO REEEPT (YMRE), TRANSPORTATION (AIR TRANSPORTATION EXCLUDED, YPT), CONSTRUCTION (YC)

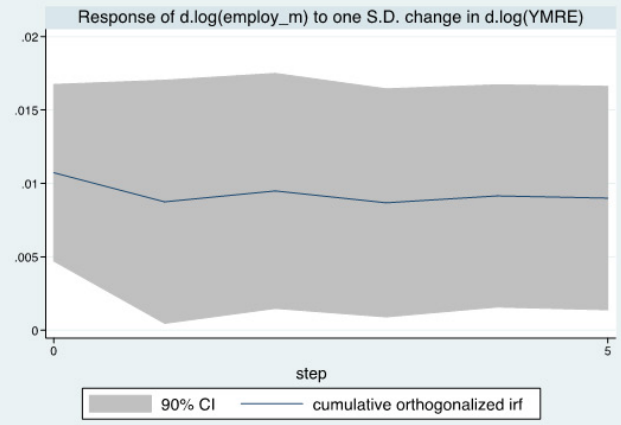
CHILE

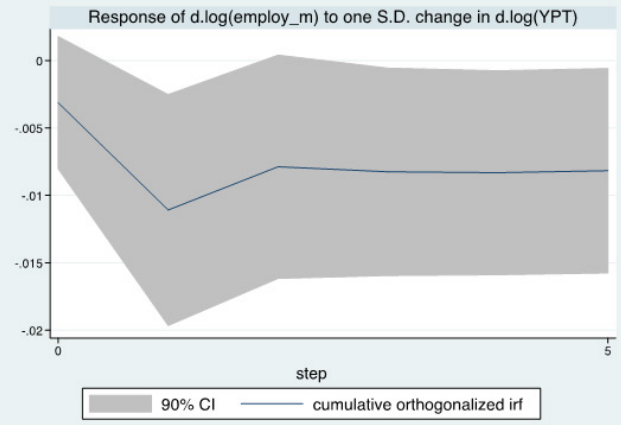


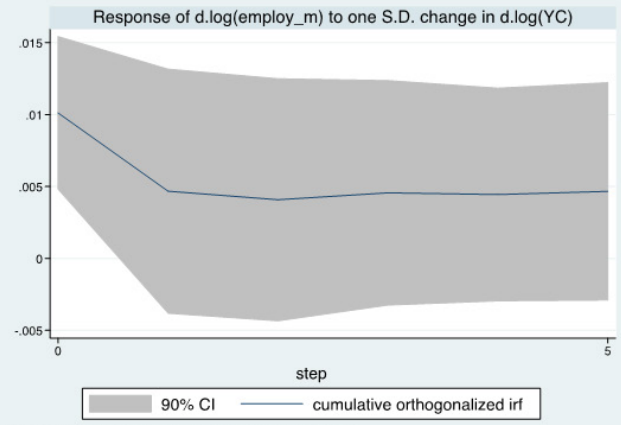




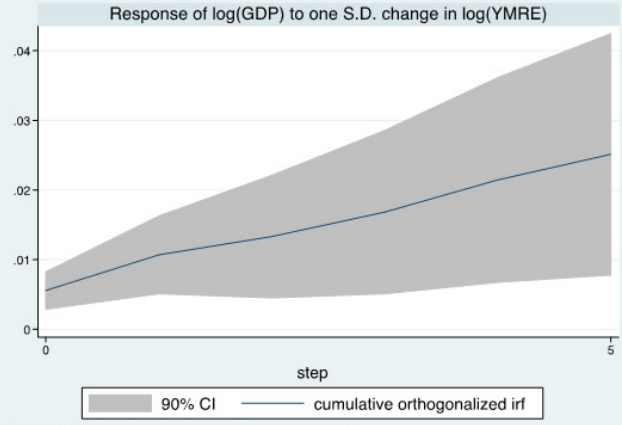
CHILE

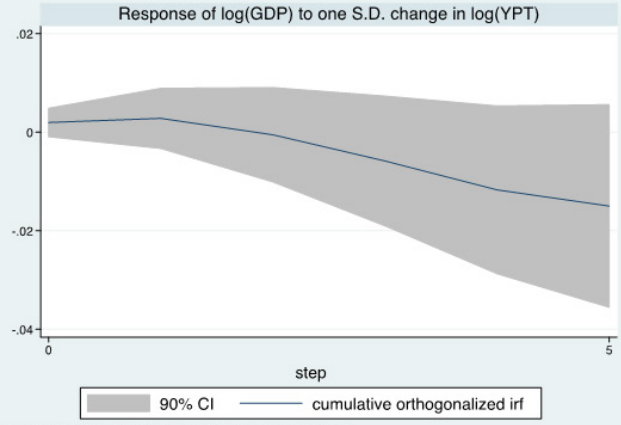




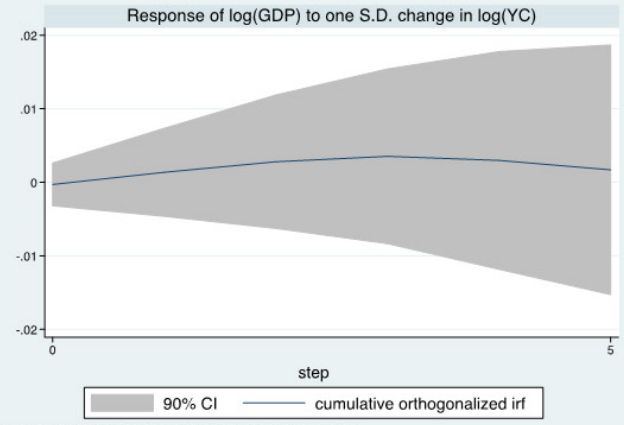


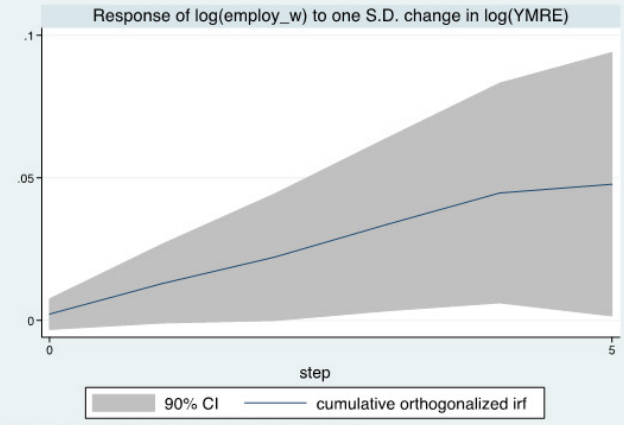
COLOMBIA

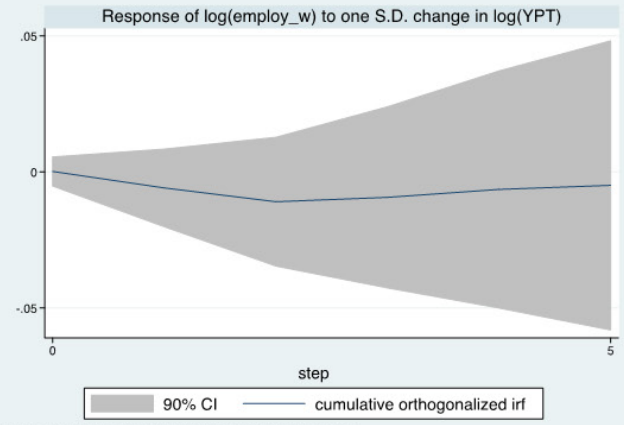


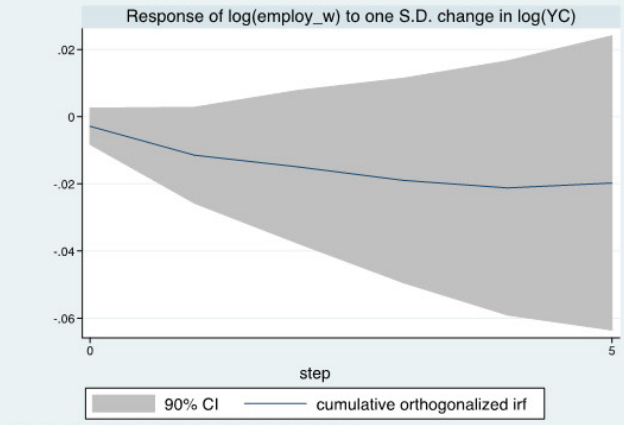


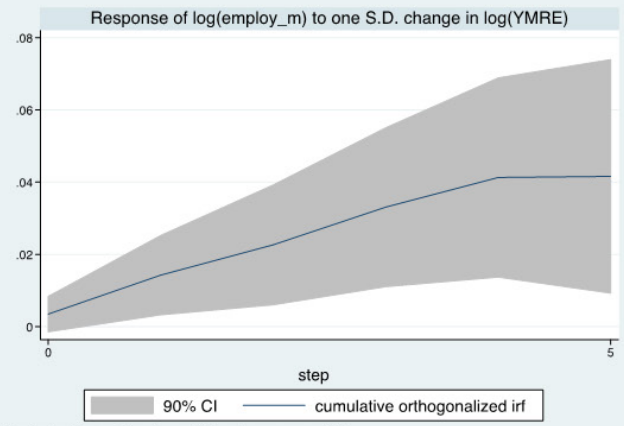
COLOMBIA

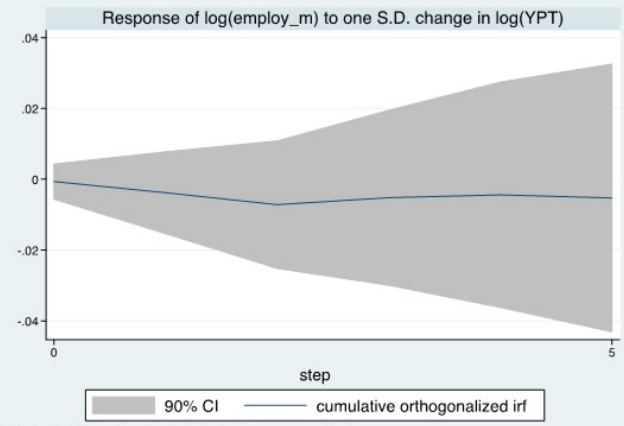

Response of log(GDP) to one S.D. change in log(YC)
.02
.01
0
-.01
-.02
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

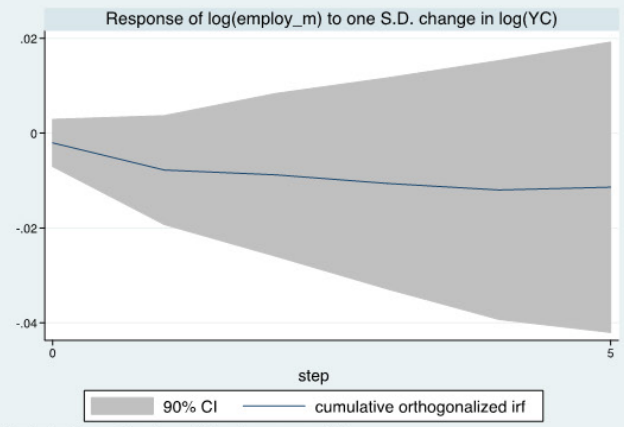

Response of log(employ_w) to one S.D. change in log(YMRE)
.1
.05
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable


Response of log(employ_w) to one S.D. change in log(YPT)
.05
0
-.05
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

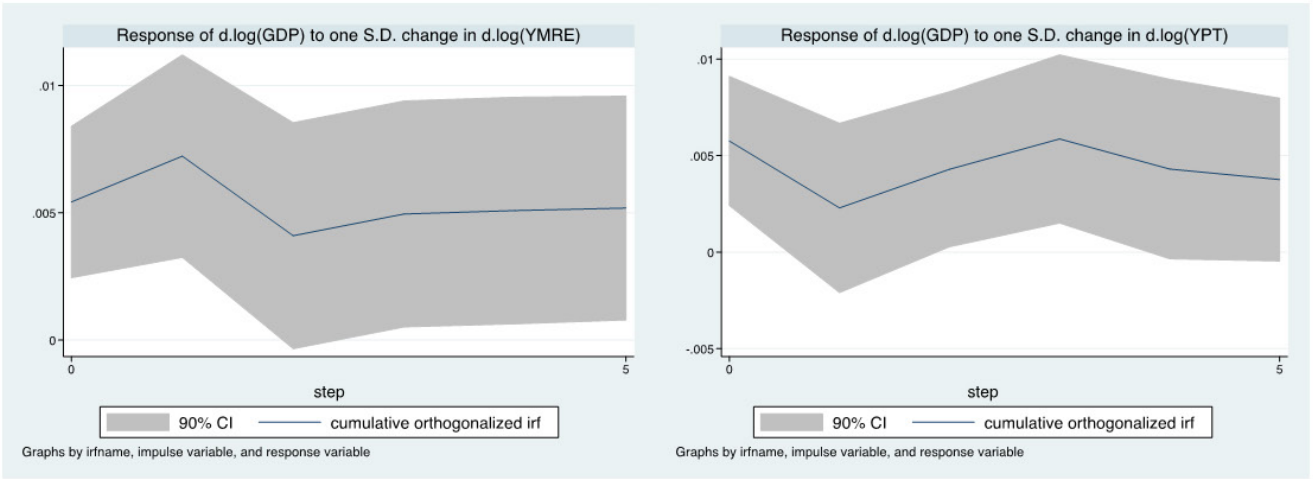

Response of log(employ_w) to one S.D. change in log(YC)
.02
0
-.02
-.04
-.06
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

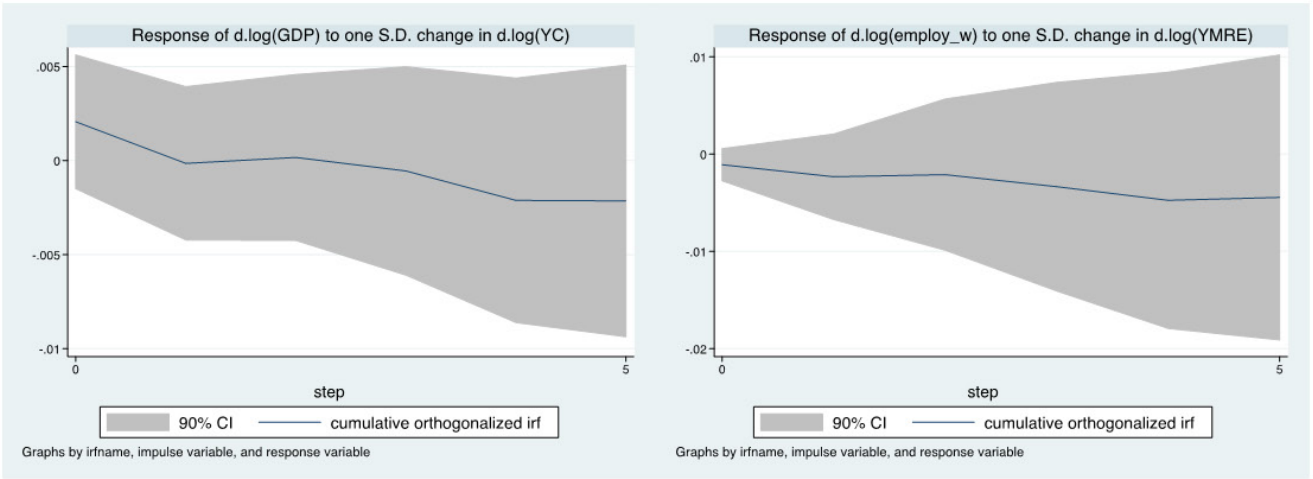

Response of log(employ_m) to one S.D. change in log(YMRE)
.08
.06
.04
.02
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

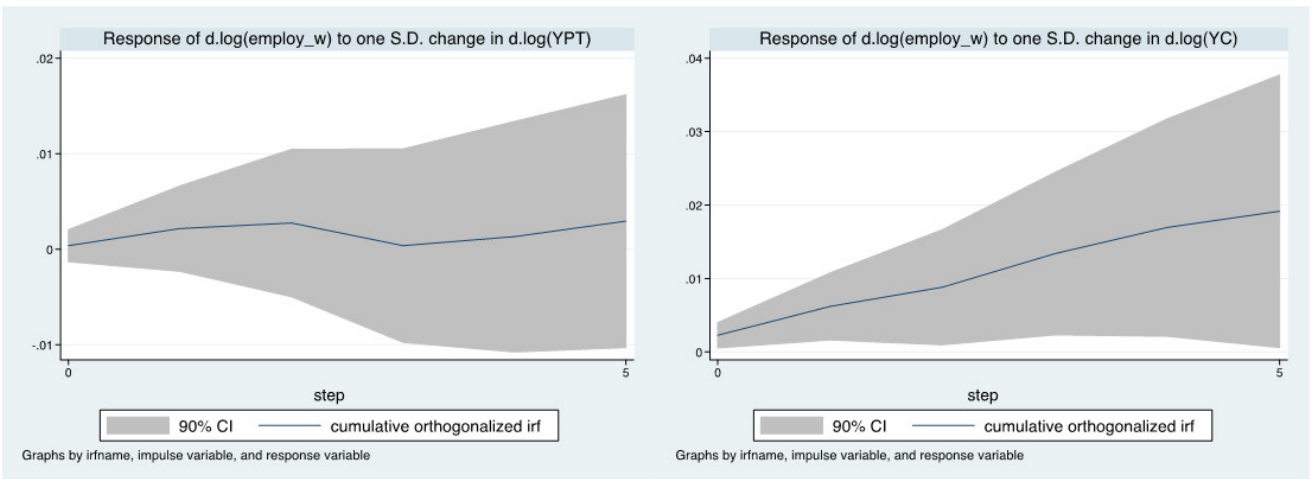

Response of log(employ_m) to one S.D. change in log(YPT)
.04
.02
0
-.02
-.04
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

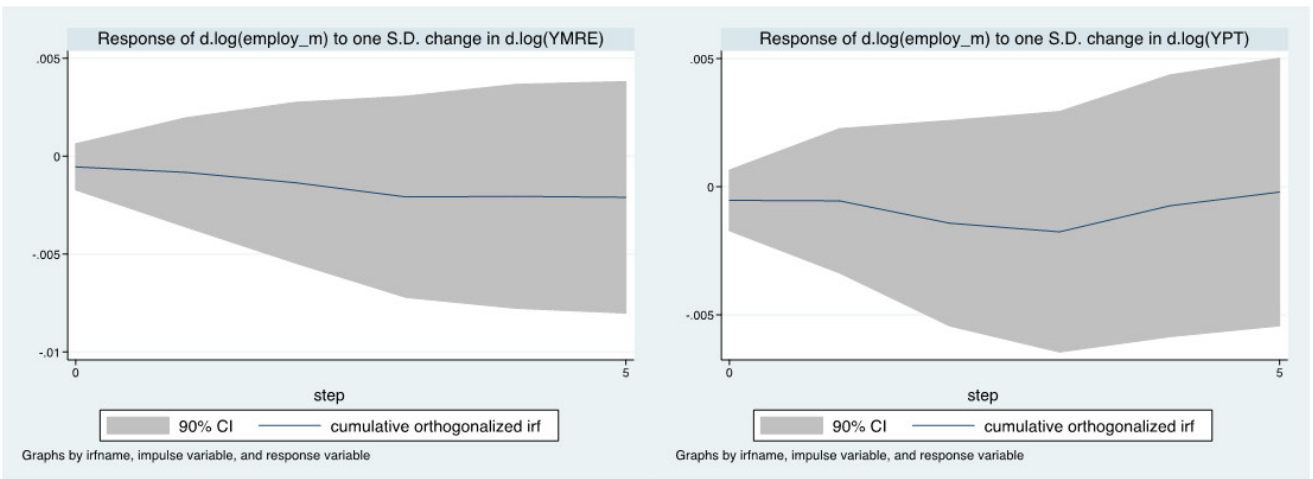

Response of log(employ_m) to one S.D. change in log(YC)
.02
0
-.02
-.04
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

INDIA

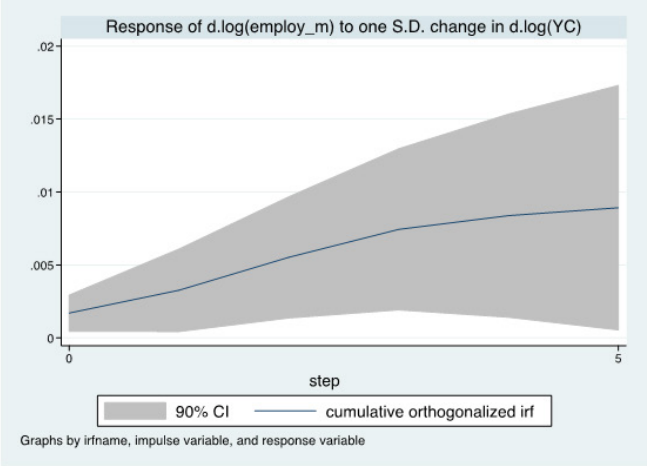

Response of d.log(GDP) to one S.D. change in d.log(YMRE)
.01
.005
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable
Response of d.log(GDP) to one S.D. change in d.log(YPT)
.01
.005
0
-.005
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable


Response of d.log(GDP) to one S.D. change in d.log(YC)
.005
0
-.005
-.01
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable
Response of d.log(employ_w) to one S.D. change in d.log(YMRE)
.01
0
-.01
-.02
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

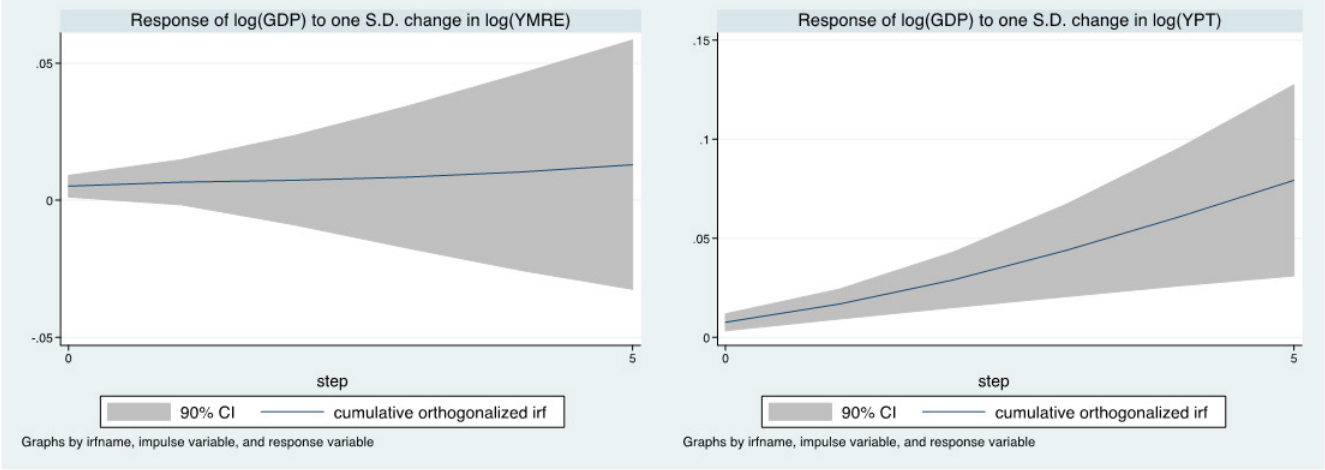

Response of d.log(employ_w) to one S.D. change in d.log(YPT)
.02
.01
0
-.01
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable
Response of d.log(employ_w) to one S.D. change in d.log(YC)
.04
.03
.02
.01
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

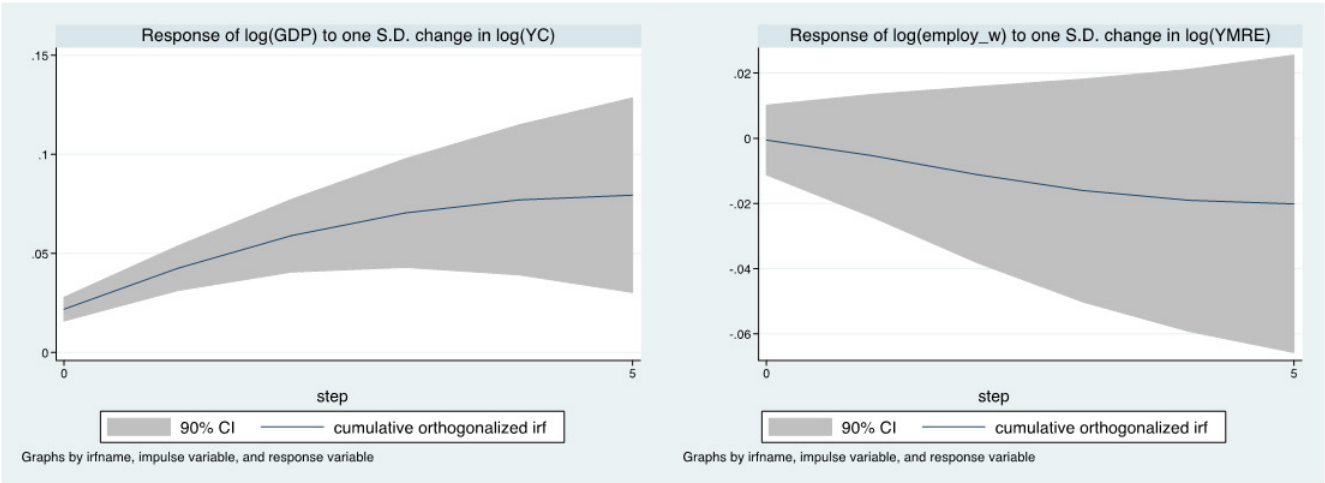

Response of d.log(employ_m) to one S.D. change in d.log(YMRE)
.005
0
-.005
-.01
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable
Response of d.log(employ_m) to one S.D. change in d.log(YPT)
.005
0
-.005
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

INDIA



INDONESIA





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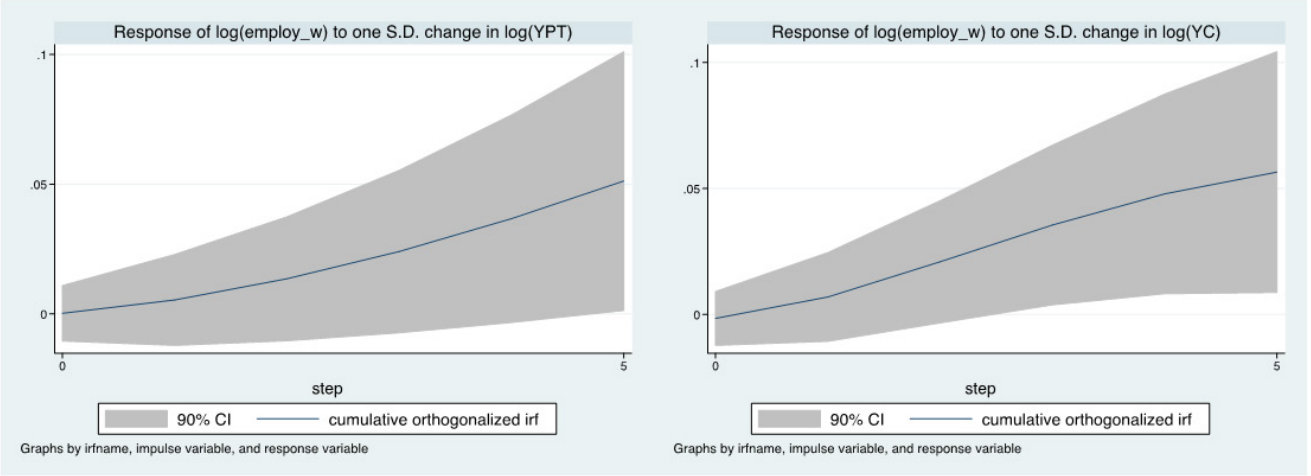
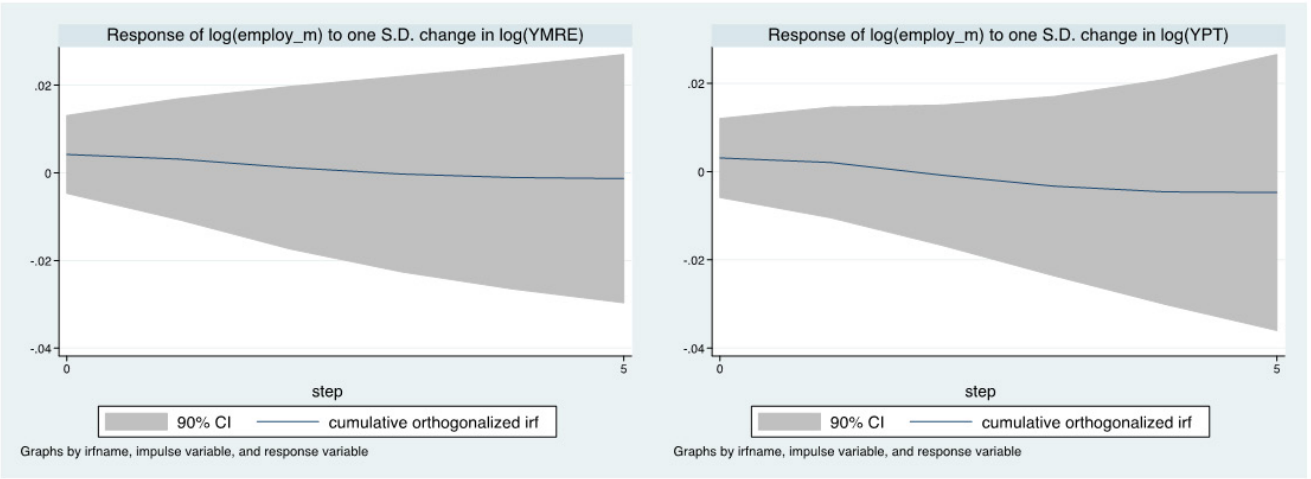
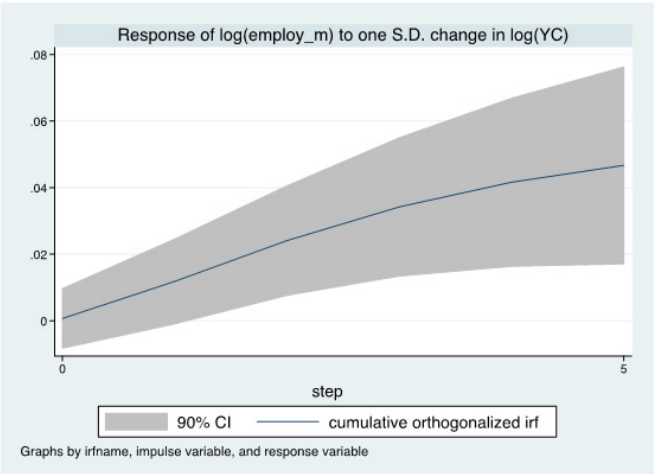
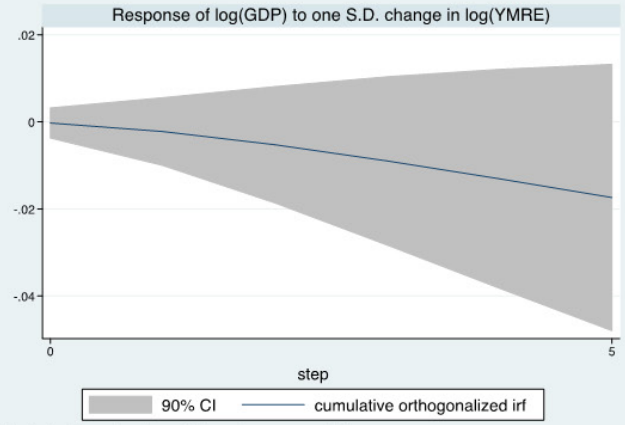
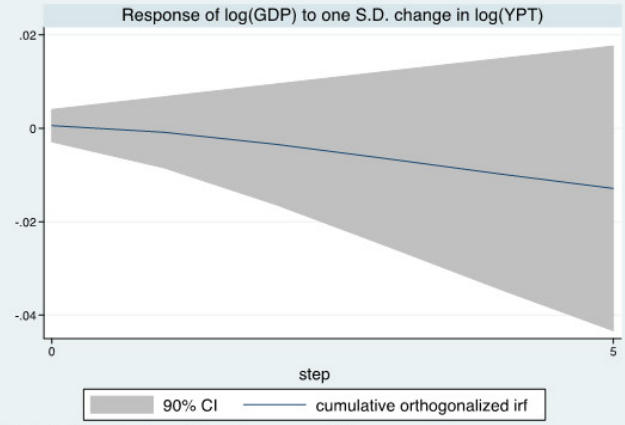

Response of log(employ_w) to one S.D. change in log(YPT)
.1
.05
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable
Response of log(employ_w) to one S.D. change in log(YC)
.1
.05
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

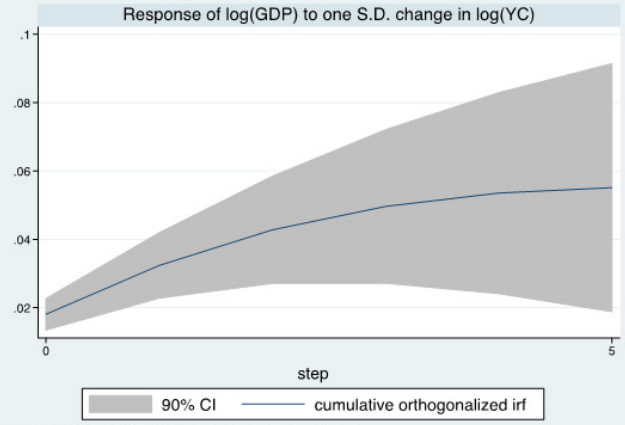

Response of log(employ_m) to one S.D. change in log(YMRE)
.02
0
-.02
-.04
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable
Response of log(employ_m) to one S.D. change in log(YPT)
.02
0
-.02
-.04
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

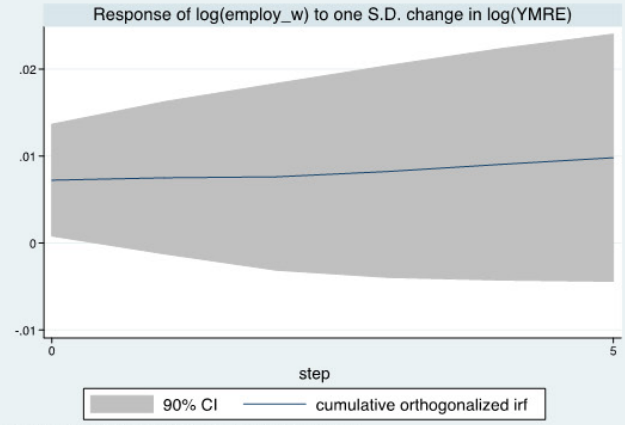

Response of log(employ_m) to one S.D. change in log(YC)
.08
.06
.04
.02
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

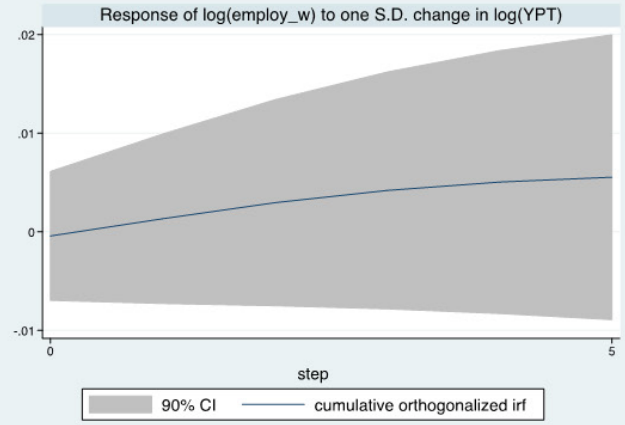
THE PHILIPPINES

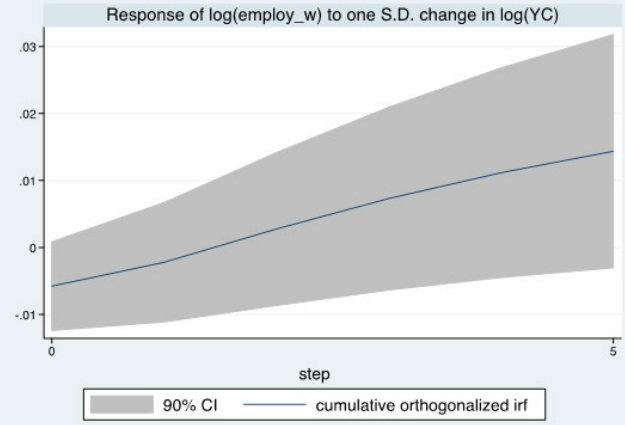


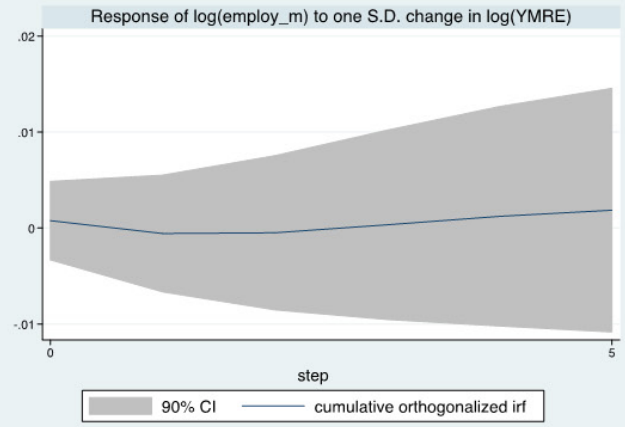


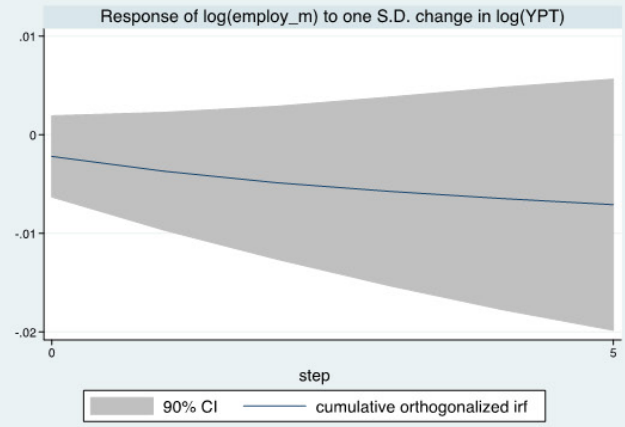




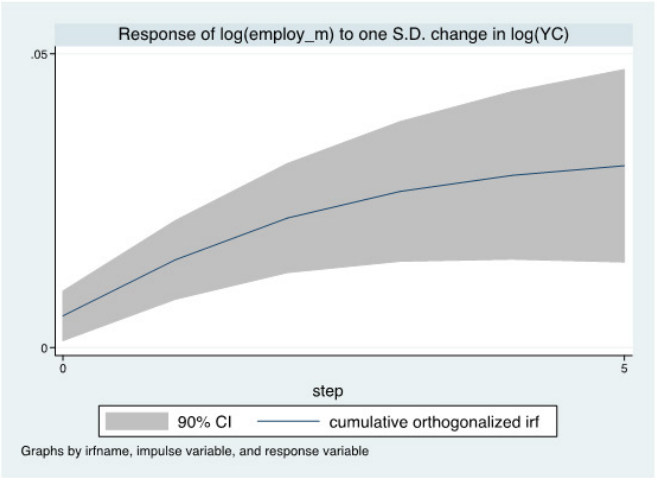




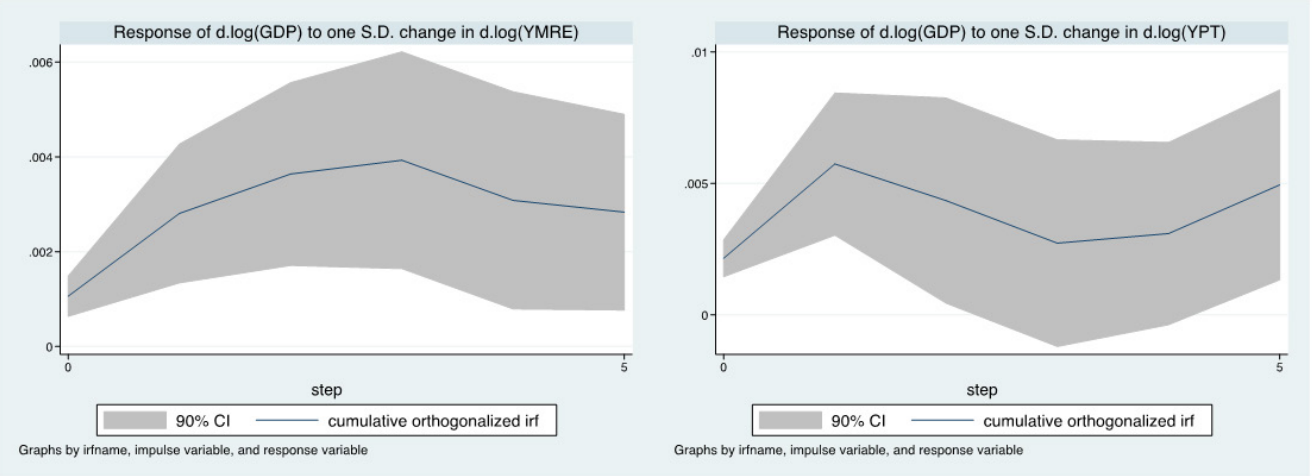


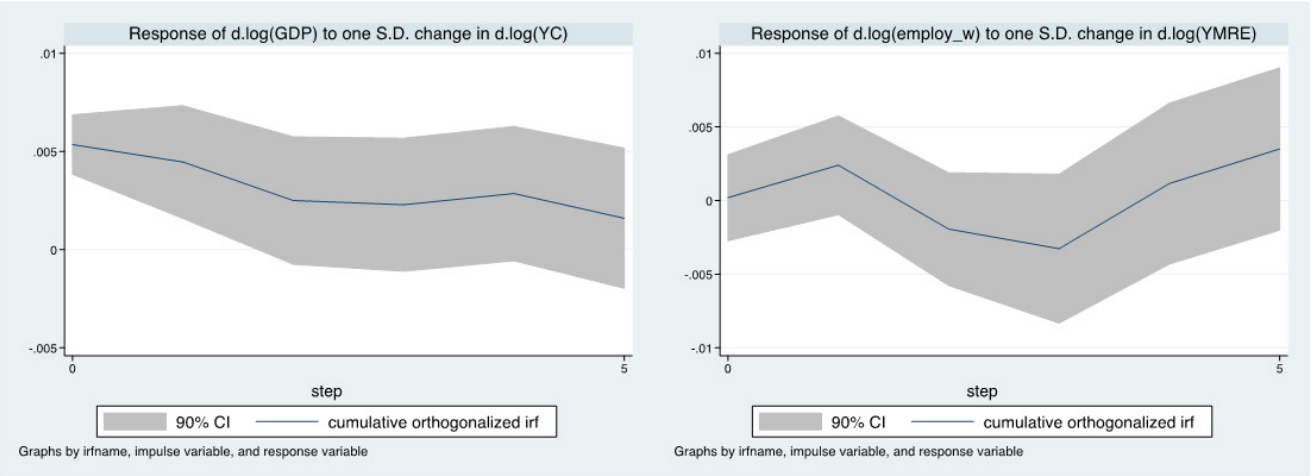


THE PHILIPPINES

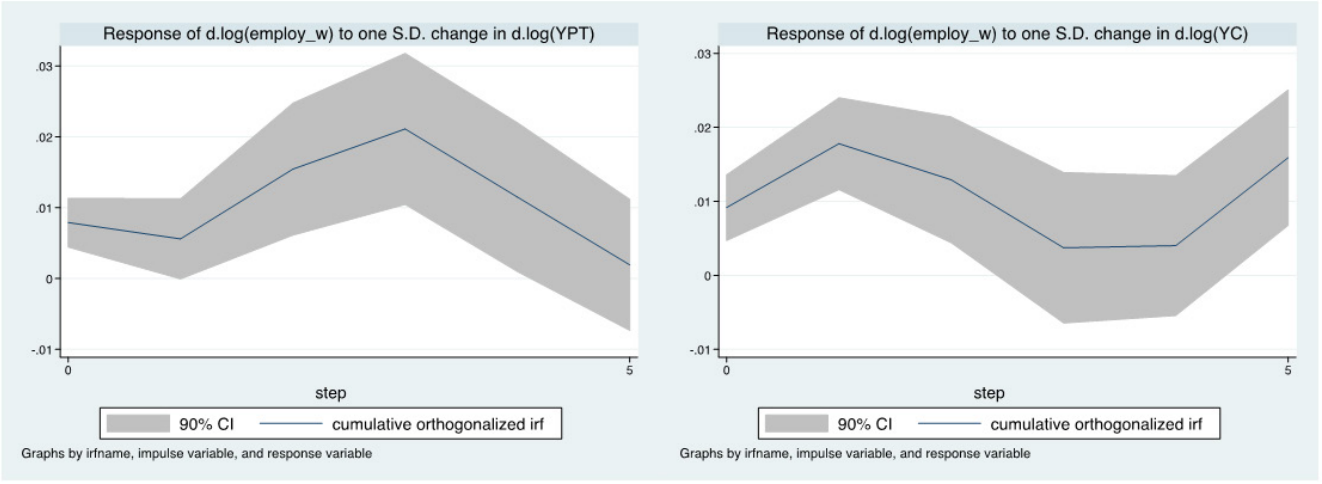


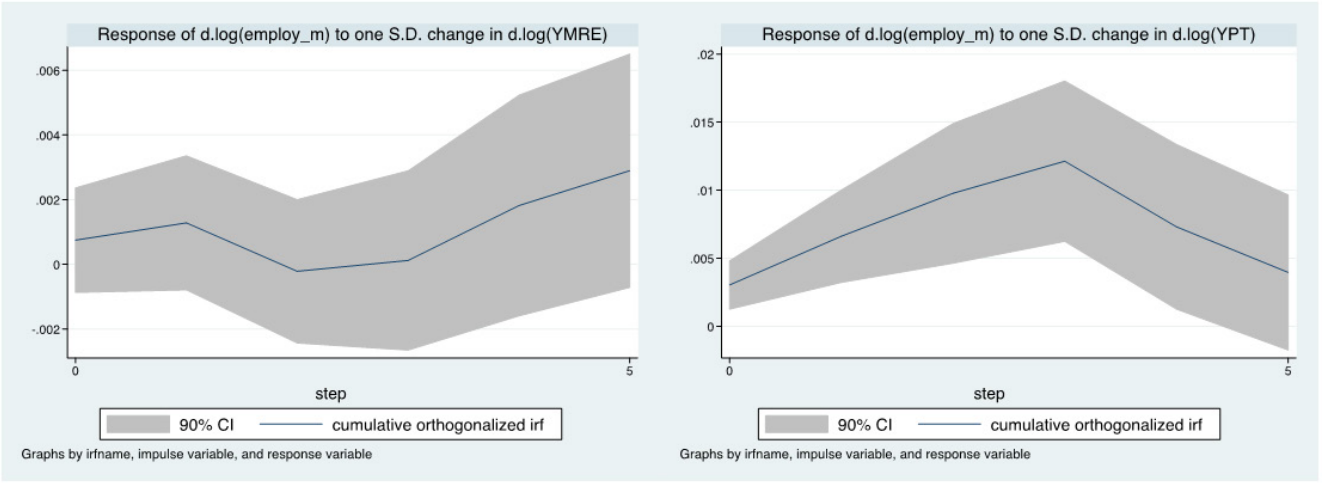
SOUTH AFRICA

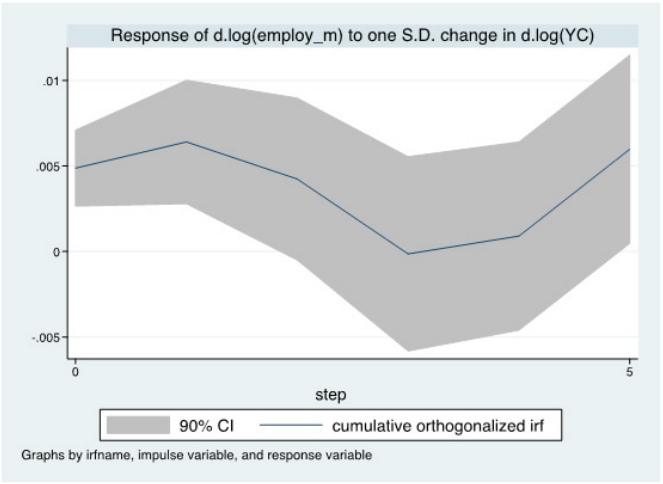




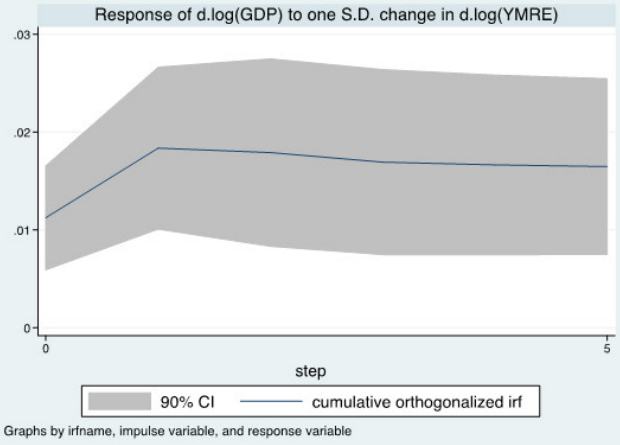
SOUTH AFRICA

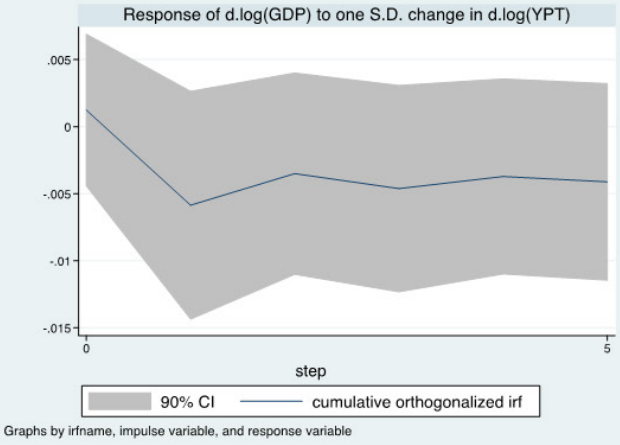


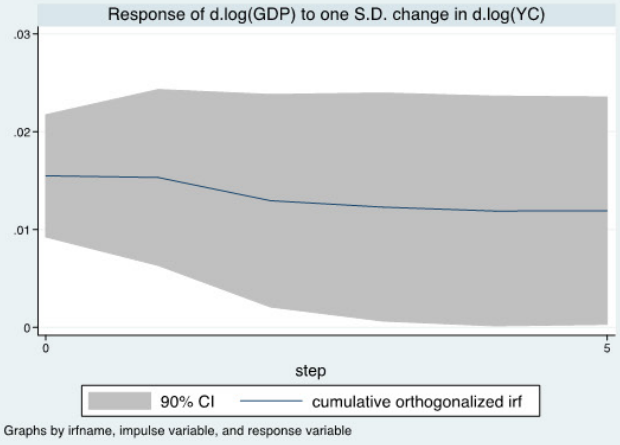


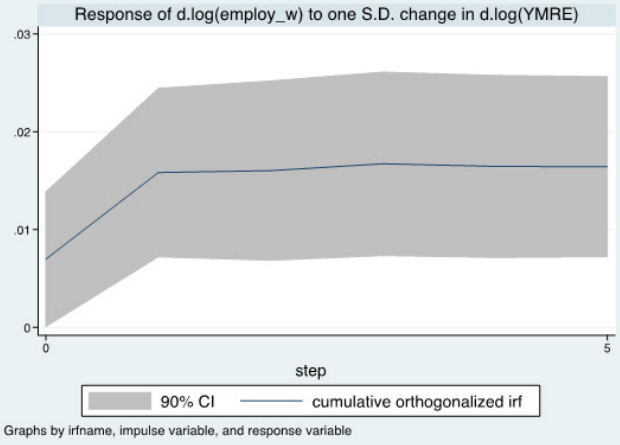


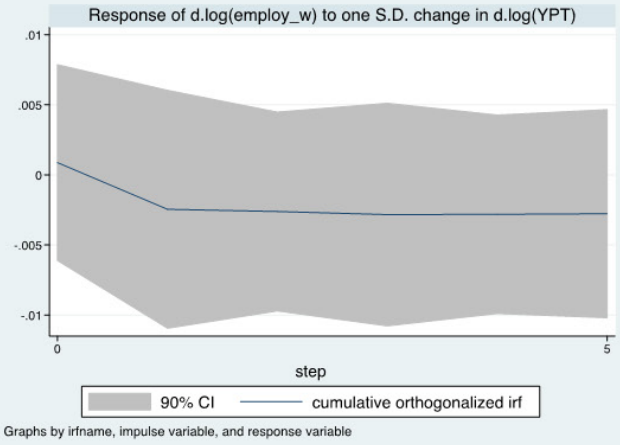
SOUTH KOREA

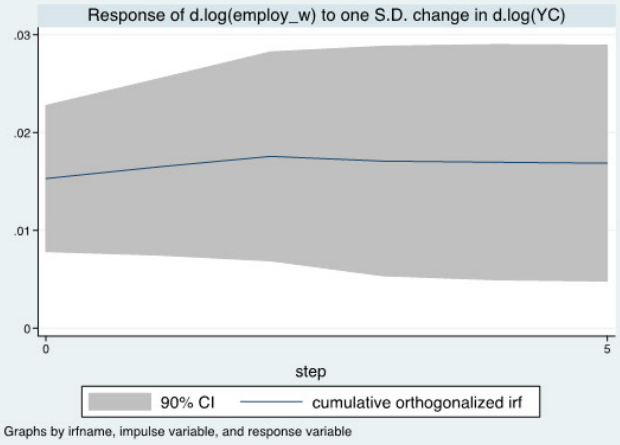

Response of d.log(GDP) to one S.D. change in d.log(YMRE)
.03
.02
.01
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

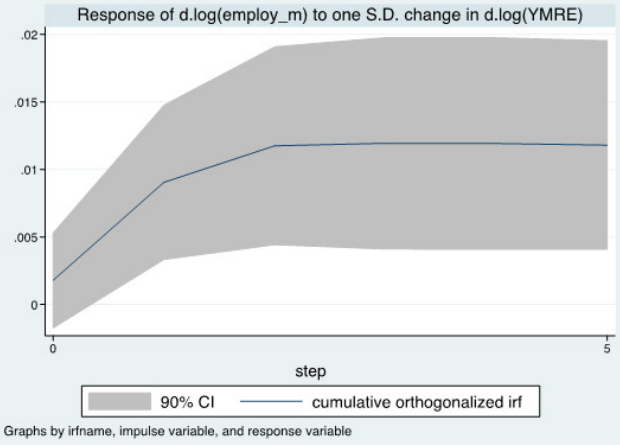

Response of d.log(GDP) to one S.D. change in d.log(YPT)
.005
0
-.005
-.01
-.015
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

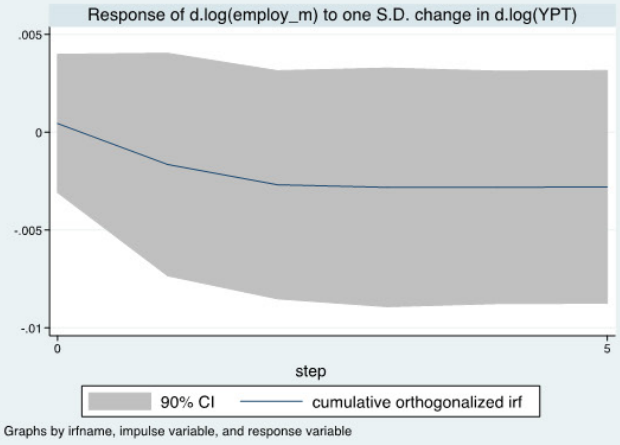

Response of d.log(GDP) to one S.D. change in d.log(YC)
.03
.02
.01
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable


Response of d.log(employ_w) to one S.D. change in d.log(YMRE)
.03
.02
.01
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

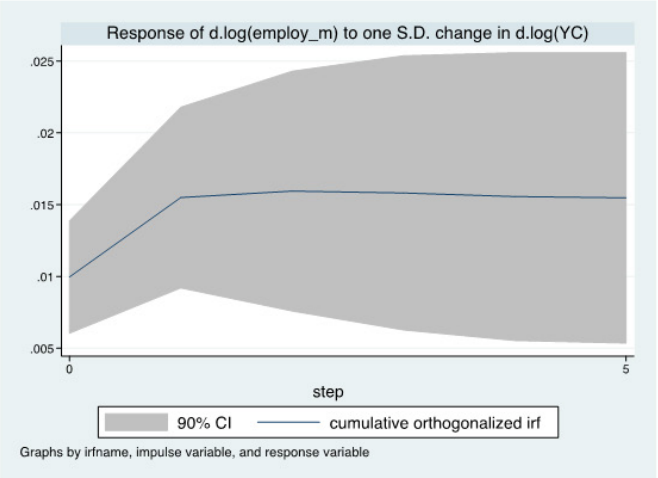

Response of d.log(employ_w) to one S.D. change in d.log(YPT)
.01
.005
0
-.005
-.01
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable


Response of d.log(employ_w) to one S.D. change in d.log(YC)
.03
.02
.01
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

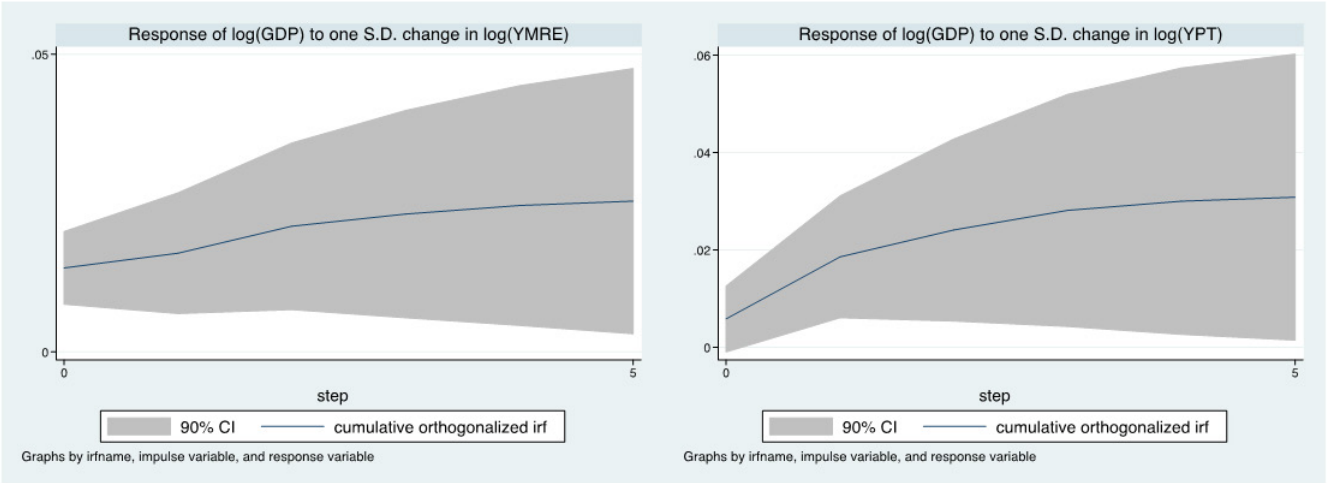

Response of d.log(employ_m) to one S.D. change in d.log(YMRE)
.02
.015
.01
.005
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

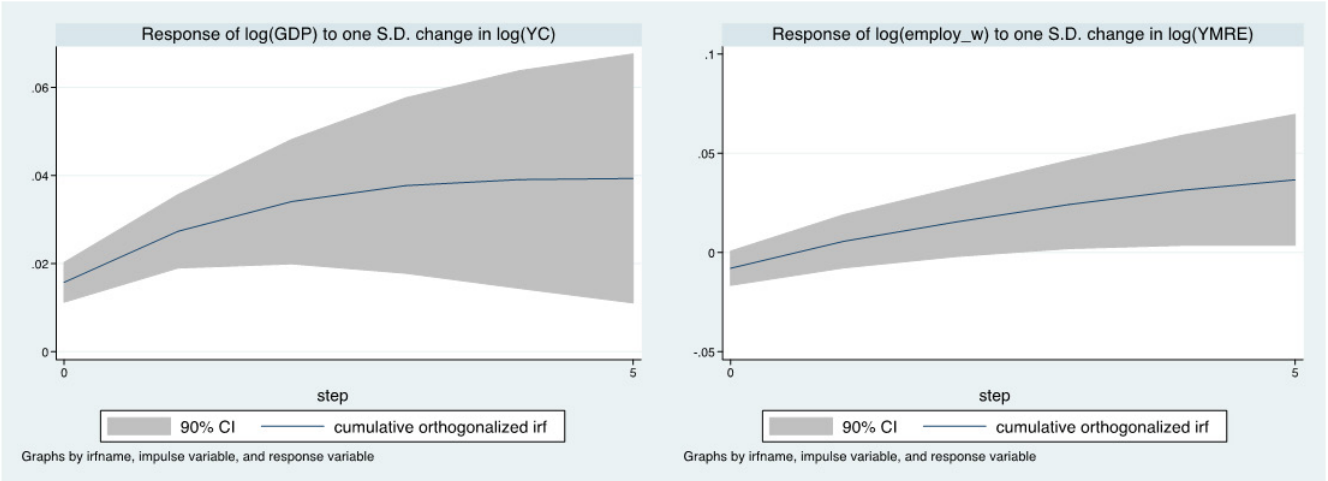

Response of d.log(employ_m) to one S.D. change in d.log(YPT)
.005
0
-.005
-.01
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

SOUTH KOREA

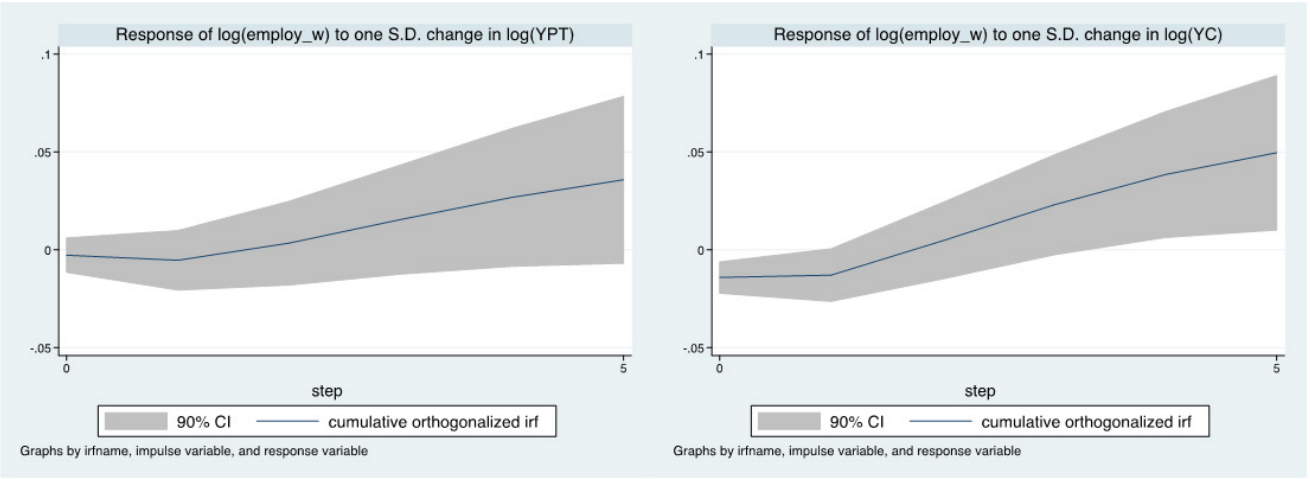


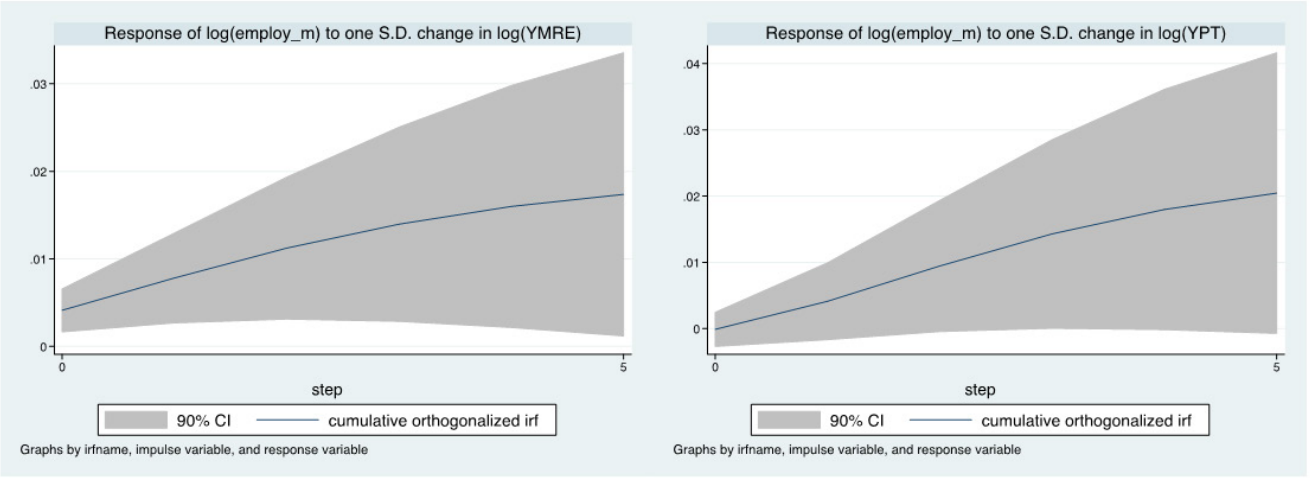
TURKEY





TURKEY


Response of log(employ_w) to one S.D. change in log(YPT)
.1
.05
0
-.05
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable
Response of log(employ_w) to one S.D. change in log(YC)
.1
.05
0
-.05
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable


Response of log(employ_m) to one S.D. change in log(YMRE)
.03
.02
.01
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable
Response of log(employ_m) to one S.D. change in log(YPT)
.04
.03
.02
.01
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step
90% CI
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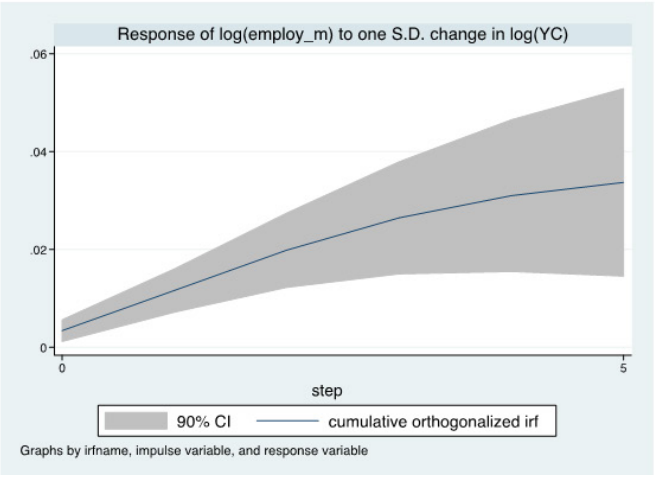
Graphs by irfname, impulse variable, and response variable


Response of log(employ_m) to one S.D. change in log(YC)
.06
.04
.02
0
0
5
step
90% CI
cumulative orthogonalized irf
Graphs by irfname, impulse variable, and response variable

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