

CARE WORK AND THE ECONOMY

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gender-aware macroeconomic models

GENDERING MACROECONOMIC ANALYSIS AND DEVELOPMENT POLICY: A THEORETICAL MODEL FOR GENDER EQUITABLE DEVELOPMENT

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The Care Work and the Economy (CWE-GAM) Project strives to reduce gender gaps in economic outcomes and enhance gender equality by illuminating and properly valuing the broader economic and social contributions of caregivers and integrating care in macroeconomic policymaking toolkits. We work to provide policymakers, scholars, researchers and advocacy groups with gender-aware data, empirical evidence, and analytical tools needed to promote creative, gender-sensitive macroeconomic and social policy solutions. In this era of demographic shifts and economic change, innovative policy solutions to chronic public underinvestment in care provisioning and infrastructures and the constraints that care work places on women's life and employment choices are needed more than ever. Sustainable development requires gender-sensitive policy tools that integrate emerging understandings of care work and its connection with labor supply, and economic and welfare outcomes.

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1. INTRODUCTION

The aim of this paper is to develop a feminist post-Keynesian/post-Kaleckian demand-led growth model to theoretically analyse the role of labour market policies and fiscal policies on growth and employment.

We develop a three-sector gendered macroeconomic model with physical and social sectors (health, social care, education, child care) in the public and private market economy, and an unpaid reproductive sector providing domestic care. The production in the market economy is performed by male and female paid labour and capital.

On the demand side, we model behavioural equations for household consumption as a function of male and female wage income and profits. Consumption by the households can be on social services and the rest of the economy. We model private investment as a function of the profit share, GDP, and public debt to GDP ratio, which in turn affects the interest rate. Exports are a function of real unit labour costs (wage/productivity) and the GDP of the rest of the world. Imports are a function of real unit labour costs and the GDP. Real unit labour costs are the inverse of the profit share. Taxes are collected on wage and profit income. We model three types of government spending are modelled: In addition to physical infrastructure, which is traditionally recognized as public investment, we define current public spending in health, social care, education, and child care as public social infrastructure investment. The rest of the current government spending is defined as government consumption expenditure.

On the supply side, productivity in the physical sector is exogenous in the short run and endogenously changes in the long-run, and is a function of public physical and social infrastructure and current spending, household spending in the social sector, unpaid domestic care labour, wages of men and women, and growth.

Employment (in hours) is determined by output and labour productivity. Female and male labour supplies depend on wages, benefits and social infrastructure.

Demand has an effect on growth both in the short and the long run, as the model builds on realistic structural features of a capitalist market economy operating with excess capacity and involuntary unemployment. Gendered structural features regarding both the paid and reproductive unpaid labour such as gendered sectoral composition of employment, occupational segregation, institutions, and social norms regarding gendered consumption behaviour as well as the distribution of unpaid domestic care labour affect growth, productivity and employment.

The model aims to provide a theoretical basis to analyse the impact of gender equality and public spending. We provide a theoretical analysis of the effects on GDP, productivity (GDP per employee) and employment of men and women in both the short run and long run as a consequence of i) the impact of fiscal policies, in particular public spending in social infrastructure, and ii) decreasing gender wage gaps, in particular in the female

dominated social sector. This theoretical analysis provides a basis to further analyse the impacts of i) particular paths to closing gender wage gaps, e.g. via an upward convergence in wages, i.e. an increase in both male and female wages with a faster increase in the latter; ii) other types of fiscal spending, and iii) taxes on labour and capital income.

Crucially, a change in gender pay gap or the functional distribution of income between wages and profits or public spending in social vs. physical infrastructure will have both demand side effects in short- and long-run and supply side effects in the long run and affect output, productivity and the employment and income of men and women.

2. LITERATURE

We develop our model by bringing together two traditions, namely Post-Kaleckian economics and feminist economics.

There is a large body of research on the impact of gender inequality on growth and human development in developing countries. The existing literature concurs that women's bargaining power within the household is enhanced when they command resources and this translates into improved human development (Duflo, 2003; Duflo and Udry, 2004; Himmelweit et al., 2013; Phipps and Burton, 1998; Quisumbing and Maluccio, 2003; Thomas, 1990; Hashemi et al., 1996; Kabeer, 2001; Littlefield, 2003; Morrison, 2007; Pitt et al., 2006). Hoddinott and Haddad (1995) and Thomas (1997) showed that a rise in women's share of cash income in Ivory Coast and Brazil leads to an increase in spending on nutritional, health, and education expenditures as well, whereas the share of spending on private goods for men is decreasing. Similar results are found by Doss (2005), Duflo and Udry (2004), Morrison (2007), Phipps and Burton (1998) Rubalcava et al. (2004), Lundberg et al. (1997). An increase in assets controlled by women is positively associated with children's educational attainment and with their nutritional status— especially of girls (Doepke and Tertilt, 2011; Duflo, 2003; Engle, 1993; Gitter and Barham, 2008; Thomas, 1990).

Braunstein (2013) argues that the impact of income on human capacities depends not only on how much is earned and spent, but on what is purchased, and whether these commodities provide good substitutes or complements for unpaid care time. At first glance, women need to spend more of their income on social services to replace their unpaid reproductive labour, assuming these services are not freely provided by the public sector. More income in the hands of women or the presence of an employed mother in the household increases household spending on children (Lundberg et al, 1997; Pahl, 2000; Cappellini et al, 2014). Microeconomic studies across the board to a great extent attest that a larger share of women's income compared to that of men's, is spent to satisfy the needs of the household (Blumberg, 1991; Antonopoulos et al, 2010; Pahl, 2000) and a possible increase in their income leads to increased spending on children's education and wellbeing (Vogler and Pahl, 1994; Lundberg et al. 1997; Cappellini et al 2014), with further implications for the distribution of power within the household too (Vogler and Pahl, 1994). Men's income on the other hand, tends to be spent on capital

intensive and luxury goods. Seguino (2010; 2012) and Kabeer (1997) suggested that in developing countries women are more likely to consume domestically produced goods, while men are more likely to consume a higher proportion of luxury and/or imported goods (such as cell phones, automobiles and televisions). These studies highlight the positive effect that higher incomes for women can have for an economy, by shifting the consumption towards goods that have long-term impacts in the quality of life and workforce.

An area where this becomes more pronounced is unpaid caring labour where women carry unevenly more burden than men, with implications for growth (Seguino, 2010; 2012; Antonopoulos et al., 2010, Braunstein et al., 2011). Similarly, the increase and intensification of unpaid household labour compensate for the continuous shrinking of public services provision in health, social care and education, due to budget cuts, leading to higher intergenerational costs. Folbre (1995), Himmelweit et al. (2014), Pahl (1997), and Nelson (1996) stress the importance of including the unpaid care work largely done by women for the smooth running of society and the economy in economic analysis. The term “reproductive labour” used to describe this includes all the activities that in general ensure that the workforce is fed, healthy, and able to work. However, it will be wrong to claim that all of this caring activity takes part in the unpaid economy; the state is responsible to a large extent for the provision of services such as healthcare, childcare and education, in most countries of the world. Care is also increasingly commodified, provided by the private sector subject to the dynamics of markets.

Dissecting the household is fundamental in understanding how the inclusion of gender in a demand-led growth model would bring new insights. Households are understood as sources both of consumption and labour supply. The relations of power within a household as an outcome of the participation of women in paid employment have been well documented (Agarwal, 1997; and for a more extensive review see Himmelweit et al. 2013; De Henau and Himmelweit, 2013). Households provide unpaid work for the reproduction of the labour force (van Staveren 2010; De Henau and Himmelweit 2013b; Hamner and Akram-Lodhi 1998; Nelson 1996). The household is also a key source of demand for the economy. Consequently, another important empirical question to explore is how a higher degree of gender equality in wages or employment could change the composition of consumption. There is limited empirical research on the differences in propensities to consume by men and women, as well as the composition of consumption with respect to types of goods and services and their import content.

The provision of social welfare is usually undertaken by the state, by means of public spending in the social care sector, which not only has the potential to reduce women’s care burden, but is also a sector where employment creation tends to be predominantly female (Antonopoulos et al., 2010; Braunstein et al. 2011; Seguino, 2012; Onaran, 2016). The degree by which these needs of the population are met determines the types of welfare regime of a country, and would influence how growth can improve gender equality. The manner a state can nurture or obstruct equality is explored in Braunstein et al.’s (2011) categorisation of social welfare networks, formal or informal. An informal social

welfare support can be formed by means of kinship or solidarity networks. These networks however have evolved not only as an outcome of cultural norms, but to replace the scarcity of formal social welfare provision. In the exactly opposite side, we find countries which have an efficient formal social welfare provision system, provided by the state that nurtures equality (Braunstein et al, 2011).

Women do the majority of the unpaid reproductive labour, therefore the development of the social sector in the market economy with services provided by paid labour in the public sector, as well as the private sector, will have profound effects on women as well as on aggregate macroeconomic outcomes (Onaran, 2016; Folbre, 1995). First, on the supply side, this will reduce the need for unpaid labour to provide care, education and health, and improve the chances of women to participate in the paid economy. Secondly, on the demand side, given the current rates of occupational segregation the new jobs generated in the social sector will be traditionally female jobs, and thereby increase the employment chances of women (Tzannatos, 1995). Thirdly, both the public supply of social services and increased paid employment opportunities could transform gender norms concerning divisions of labour both within the household and paid versus unpaid work (Folbre and Nelson, 2000).

Furthermore, public investment in times of underemployment/ unemployment can compensate for the lack of effective demand in the economy, which can deter private investment (De Henau et al, 2016). A large body of research differentiates between two types of public spending, as productive (government capital spending), and unproductive expenditure (government current spending). Palley (2013) and Seguino (2012) for example consider public investment in technology and infrastructure productive expenditure and argue that it is leading to positive crowding in effects on private investment. Seguino (2012) however further distinguishes between public investment in physical and social infrastructure pointing out that both enhance the business environment and hence private investment. Elson (2016, 2017) and Women's Budget Group make the case for labelling public social expenditures as social infrastructure due to their effects on productivity and benefits which accrue to the society as a whole. Most of the post-Keynesian/Kaleckian literature does not model the public sector, with the notable exceptions of Blecker (2002), Seguino (2012), and Obst, Onaran and Nikolaidi (2017).

Recent research highlights the beneficial effect of public social infrastructure spending on employment generation and economic growth. De Henau et al (2016) using input-output analysis find for seven OECD countries that investment in social infrastructure would create roughly double the amount of new jobs as investment in physical infrastructure (directly and through a strong multiplier effect). Their findings also note a decrease in the gender gap in employment with more investment in social infrastructure, reflecting in part the concentration of women in the social sector. In a similar vein, Bargawi and Cozzi (2014) using the Cambridge Alphametrics Model (CAM), compare and contrast three scenarios for Europe: continued austerity, gender-neutral expansionary scenario and gendered expansionary scenario. Projections for their gendered expansionary scenario suggest that an additional 7.3 million jobs for women could be created in the Eurozone

and the United Kingdom by government expenditure in social infrastructure (as opposed to reduction of public spending). Additionally, they find that higher growth rates under the gendered scenario can lead to significant reductions of debt-to-GDP ratios and lower budget deficits. Antonopoulos et al (2010) for the USA using micro-simulation find that for the same amount of investment in the social sector and physical infrastructure investment the number of jobs created from investment in social care is more than double (1.2 million vs 550,000 jobs) than in the alternative scenario of physical infrastructure investment, reducing significantly the gender employment gap. Antonopoulos and Kim (2008) examining South Africa make similar observations to the study for the USA for an increase in public spending in social infrastructure. Finally, Ilkcaracan et al (2015) investigating the impact of public investment in social care services on employment, gender equality and poverty in Turkey, find that fiscal prioritization of early childhood care and preschool education as a subsector of social infrastructure compared to investment in physical infrastructure and cash transfers “presents an enormous potential for decent job creation, particularly in the female-dominated occupations and sectors” (p. 7). Antonopoulos et al. (2010) and Ilkcaracan et al. (2015) use micro household data to match the macro labour demand with personal characteristics of the working age population to model employment effects on women and men. Ilkcaracan and Kim (2018, also in ILO 2018) extend the input-output analysis regarding impact of public spending in early childhood care, education, health and long-term care to 45 countries.

To summarize, the literature in the nexus of gender equality- public spending- human development in developing countries underlines the fact that greater public spending in services that reduce the care burden of women empower them in many levels: increased financial independence, higher literacy and better health outcomes for them and their children, thus ensuring not only short term effects (higher labour force participation), but significant long run effects (higher productivity, better quality of workforce and shifting gender stereotypes).

2.1. FEMINIST POST-KEYNESIAN/POST-KALECKIAN MACROECONOMIC ANALYSIS

The discussion above shows that there is a multilevel positive correlation between gender equality and macroeconomic growth; however most Kaleckian models (e.g. Bhaduri and Marglin, 1990; Blecker 2002; Stockhammer et al. 2009; Onaran et al., 2011; Onaran and Galanis 2014; Onaran and Obst, 2016; Obst, Onaran, Nikolaidi, 2017; Hein and Vogel, 2008; Naastepad and Storm, 2006/7; Stockhammer and Onaran, 2004; Onaran and Stockhammer, 2005; Hein and Tarassow, 2010; Naastepad, 2006) have not integrated these linkages with the notable exceptions Ertürk and Çağatay (1995); Blecker and Seguíno, (2002); Braunstein et al, (2011); Seguíno (2010, 2012), Braunstein et al., (2018) and Onaran, Oyvāt, Fotopoulou (2018).

Ertürk and Çağatay’s landmark 1995 paper was the first attempt to analyse empirically the relationship between women’s share of the workforce and long-term economic growth and short-term macroeconomic changes, with reference to structural adjustment policies.

Using cross-country data for 1985 and 1990, they conclude that structural adjustment policies lead to the feminization of the labour force, through changes in income distribution, reflected in decreasing wage shares in manufacturing, and through shifts in the outward orientation of the economy as measured by the increase in the ratio of exports to GNP.

Blecker and Seguino (2002) analyse the impact of a rise in women's wages relative to men's on export competitiveness and growth. They argue that under certain parameters, gender equity may not be compatible with growth in export-oriented semi-industrialised economies. Their analysis is informed by the fact that in the labour markets of many developing countries female workers in the export sector face employment constraints that result in their segregation in export sector jobs at lower wages than male workers receive in the non-export industries.

Braunstein et al. (2011), incorporate reproduction in a structuralist/post-Keynesian model and introduce notions from the behavioural science explaining attitudes according to "altruist" or "selfish" types of economies, linking care with the gender-wage gap and gendered job segregation. Based on this analytical framework, Braunstein et al., (2018) analyse how care models, globalization and macroeconomic policy stance shape the macroeconomic structure and development trajectories of different economies using a principle component analysis.

Seguino (2012), develops a two-sector model (human development sector vs. the rest) and argue that greater equality can either be a drag on or a stimulus to growth, depending on the type of inequality and macro-level policies regulating trade and investment. Under the right conditions, a more equitable distribution of income and opportunities (in the form of human development) can be a self-sustaining stimulus to growth, with significant trans-generational effects.

Our model synthesizes gendered post-Kaleckian models (Braunstein et al, 2011; Seguino, 2010; 2012), post-Kaleckian models which explicitly incorporate the public sector (Obst, Onaran, Nikolaidi, 2017; Seguino, 2012) and post-Kaleckian models which integrate both the demand and supply side and short and long-run analysis (Hein and Tarassow 2010, Naastepad, 2006, Seguino, 2010; 2012). Furthermore, we explicitly model employment and not just output. The importance of post-Keynesian/Kaleckian macroeconomic models for our purposes is that it puts inequality at the heart of the determination of demand and output, as they integrate the dual role of wages as cost and as source of demand. These models accept the direct positive effects of higher profits on private investment and net exports as emphasised in mainstream models, contrasting these positive effects with the negative effects on consumption. Demand plays a central role in determining output and employment, and the distribution of income between workers and capitalists (wages and profits) have a crucial effect on demand. These models allow for involuntary unemployment, underemployment, and excess capacity (Onaran, 2016). This approach is different from the neoclassical macroeconomic models based on microeconomic decisions of optimizing agents. Components of aggregate demand are determined by behavioural

equations. Wages are an outcome of a bargaining process between employers and workers as opposed to the neoclassical theory, where they are determined by the marginal product of labour. Neoclassical labour supply is based on the choice between leisure and consumption. The difference of the demand-led models of output and employment is that unemployment is involuntary. Labour supply is inelastic and employment is demand-constrained, not supply-determined. In this respect, the upwards convergence of wages, coupled with public social and physical investment can lead to higher human development and growth (Seguino, 2012). Public investment can partially be self-financing in the sense that it creates the conditions for crowding in of private investment, stimulating labour productivity, and growth thus generating tax revenues (Seguino, 2016).

The gender pay gap in this analysis translates social norms and prejudice into economic behaviour, assuming a preference by employers for a particular type of workers (black/white, or by extension, male/female) as well as endogenously determined education outcomes and labour supply behaviour. From a feminist political economy approach gender wage gap is determined by the relative bargaining power of men and women vis-a-vis capital, which for the purpose of this paper is considered as exogenously determined.

3. A FEMINIST POST-KALECKIAN THEORETICAL MODEL WITH PUBLIC EXPENDITURE, WAGES, PAID EMPLOYMENT AND UNPAID LABOUR

In this section, we develop a feminist post-Kaleckian model that considers gender inequalities and social infrastructure investment. In this paper, we introduce a model with two workers, female and male, which are respectively demonstrated by scripts F and M in the equations. We disaggregate profit share into its components: output, female and male wage rates, and female and male paid employment. This would allow us to examine the impact of changing wage-gaps and different policies on output and paid employment of female and male workers. The profits are earned by the capitalists, which are genderless for simplicity in our model.

The model has two sectors, public social sector, which consists of the expenditures of the government in education, childcare, healthcare, and social care (demonstrated with script H), and the rest of the economy or N sector (demonstrated with script N). The public spending in this social sector is defined as investment in social infrastructure in line with the feminist economics literature (Elson, 2016, 2017; Women's Budget Group, 2015). We also introduce household's spending in marketized social services. Both public and household's social expenditures have short-run demand effects and influence labour productivity in the long-run. Appendix 1 presents list of the variables in the model.

In line with Braunstein et al, (2011) and Braunstein et al., (2018), we also model unpaid care labour within the household, and its effects on productivity.

Aggregate output (Y_t) is the sum of total male wage bill (WB_t^M), total female wage bill (WB_t^F) and profits (R_t).

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

The total wage bill for female workers (WB_t^F) is a function of female wages in the social sector (w_t^{HF}), female employment in the social sector (E_t^{HF}), female wages in the rest of the economy (w_t^{NF}), and female employment in the rest of the economy (E_t^{NF}):

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

Similarly the total wage bill for male workers (WB_t^M) is a function of male wages in the social sector (w_t^{HM}), male employment in the social sector (E_t^{HM}), male wages in the rest of the economy (w_t^{NM}), and male employment in the rest of the economy (E_t^{NM}):

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

The data for selected emerging economies in Table 1 below show that average hourly male wages are significantly higher than average hourly female wages for most of the developing economies. There is also significant occupational/sectoral segregation with women constituting the majority in the social sector and are substantially underrepresented in the rest of the economy.

Table 1: The gender wage ratio and share of female employment in selected emerging economies

Country	Year	Average male wage / Average female wage (total economy, hourly wages)	Women's share of employment in the total economy, (hours worked)	Women's share of employment in the social sector (no of persons)	Women's share of employment in the rest of the economy) no of persons
Argentina	2014	0.965	0.413	0.738	0.378
Bolivia	2014	1.066			
Brazil	2014	1.190	0.428	0.737	0.403
Chile	2013	1.259	0.403	0.676	0.402
Colombia	2016	1.003			
Costa Rica	2016	0.960	0.367		
Dominican R.	2015	1.080	0.383	0.762	0.365
Ecuador	2014	1.148	0.392	0.638	0.378
El Salvador	2014	0.950	0.425	0.679	0.414
Guatemala	2014	1.007	0.345	0.644	0.335
Honduras	2014	0.869			
Malaysia	2015	0.978	0.382	0.706	0.360
Mexico	2014	1.072	0.380	0.612	0.366
Nicaragua	2014	1.027			
Pakistan	2016	1.121	0.232	0.397	0.225
Paraguay	2015	0.982	0.413		
Peru	2014	1.258	0.452	0.534	0.448

Russia	2015	1.323	0.487		
South Korea	2016	1.506	0.424		
Thailand	2016	0.822	0.456	0.734	0.445
Ukraine	2016	1.255	0.481		
Uruguay	2014	1.094	0.445	0.738	0.421
Venezuela	2006	1.068			
Vietnam	2016	1.120	0.485		
AVERAGE		1.088	0.410	0.661	0.380

Notes: Authors' own calculations from ILO (2018)'s Global Wage Database. We report the latest observations for the emerging economies, which have data on average male and female wages for 2000s. Employees in healthcare, social care and education activities are considered as part of the social sector and employees in other activities are considered as part of the rest of the economy.

The data for selected emerging economies (Table 1) show that average hourly male wages are significantly higher than average hourly female wages for most of the developing economies. Therefore, we define gender wage gaps (α_t) for wages in H and N sectors as below:

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

N sector produces the majority of the economic market activities output; therefore, following Table 1 we consider that $\alpha_t^N > 1$ is more likely for most of the developing economies. It is also likely that $\alpha_t^H > 1$ based on evidence from the UK, where α_t^H is 1.8 and α_t^N is 1.2 in 2013 (own calculations based on EU KLEMS data).

The aggregate output in the market economy (GDP, excluding unpaid activities) is

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

where C_t^H is households' social expenditures¹, C_t^N is consumption in the rest of the economy, I_t is private investment expenditures, G_t^H is government's social infrastructure expenditures, G_t^C is government's consumption expenditures, I_t^G is public investments other than investments in the social sector², X_t is exports of goods and services and M_t is imports of goods and services. The public social expenditures is a fiscal policy decision targeted as a share of aggregate output (κ_t^H), and constitutes the public social sector output (Y_t^H)³. The rest of the GDP is the market output in the rest of economy (Y_t^N):

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

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

The share of government's consumption expenditures (G_t^C) and public investments other than social infrastructure investment in the social sector (I_t^G) are also determined by government as a share of aggregate output and are respectively κ_t^C and κ_t^G :

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

$$I_t^G = \kappa_t^G Y_t \quad (9)$$

¹ While theoretically household consumption of social services amount to investment in human infrastructure as well and affects productivity in our model, as discussed below, we preserved the term "consumption" for this category consistent with the definitions in national accounts.

² Government's social infrastructure expenditures are classified as current spending on labour services in the national accounts. The physical infrastructure associated with providing social infrastructure such as schools and hospitals are counted as physical infrastructure. Hence part of I_t^G also contributes to social infrastructure. However, our classification is important for a gendered analysis of the employment impact of different fiscal policy decisions as G_t^H is very female labour intensive while construction, just as most other parts of I_t^G is male labour intensive.

³ For simplicity, we assume that H sector only consists of the public social sector. The employment and supply in this sector is entirely financed by public social expenditures. The households' private social consumption (see equation 22) is supplied by the private market output in the rest of economy (Y_t^N). Hence, private social consumption do not directly contribute to the generation of employment in H sector; however, they affect labour productivity in the next period positively as discussed below.

The employment in the N sector is output over labour productivity in the N sector (T_t^N):

$$E_t^N = \frac{Y_t^N}{T_t^N} = \frac{(1 - \kappa_t^H) Y_t}{T_t^N} \quad (10)$$

In our model, the share of female employment in N sector is exogenous and institutionally and socially determined leading to occupational segregation, and is demonstrated by β_t^N . The male workers in N sector constitute $(1 - \beta_t^N)$ of the sector⁴:

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

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

Table 1 shows that the number of male workers is greater than the number of female workers in N sector for all the emerging economies reported. Hence, $\beta_t^N < 0.50$ is a likely outcome for an emerging economy. In the UK, β_t^N is 0.42 and β_t^H is 0.76 in 2013 (own calculations based on EU KLEMS data).

We assume that the wage bill paid to male and female workers in the social sector constitutes the public social expenditures and the social sector is not making profits. Any non-labour inputs used constitute part of government consumption (G^C). Following this, the public social expenditure can be written as a function of employment (E_t^H), average female wage (w_t^{FH}), average male wage (w_t^{MH}), female employment share (β_t^H) and male employment share ($1 - \beta_t^H$) in the social sector.

$$G_t^H = \kappa_t^H Y_t = \beta_t^H E_t^H w_t^{FH} + (1 - \beta_t^H) E_t^H w_t^{MH} \quad (13)$$

Using equations (13) and (4), we can write the total employment (E_t^H), female employment (E_t^{HF}) and male employment (E_t^{HM}) in the social sector as a function of public social expenditures and female wages in the social sector.

⁴ For simplicity, we abstract from the presence of trans workers and classify them as either male or female in our model.

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

$$E_t^{HF} = \frac{\beta_t^H \kappa_t^H Y_t}{w_t^{FH}(\beta_t^H + \alpha_t^H - \beta_t^H \alpha_t^H)}, \quad E_t^{HM} = \frac{(1 - \beta_t^H) \kappa_t^H Y_t}{w_t^{FH}(\beta_t^H + \alpha_t^H - \beta_t^H \alpha_t^H)} \quad (15a,b)$$

In Table 1, we observe that the share of female workers in social sector is larger than the share of female workers in N for all countries. Moreover, in all emerging economies except Pakistan, the share of female workers in the social sector are over 50%. Therefore, we can expect that a rise in the share of social sector in aggregate output would also pull the share of female workers in total employment to higher levels.

We model the unpaid domestic care labour (U_t) within the households as

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

For a given demographic structure defining care needs of a society, (q_0) the higher male and female paid employment is expected to have some negative impact on the supply of unpaid labour, since it would decrease the time that could be allocated for care or housework ($q_F < 0, q_M < 0$). Higher government expenditures in the social sector are also expected to reduce the need in households for care; therefore, it would lead to lower unpaid labour ($q_G < 0$). We specify the equation in logs, since the impact of employment in N and public social expenditures on the time spent on unpaid domestic care might be non-linear (the negative impact might be decreasing in absolute values as it gets increasingly more difficult to decrease unpaid care at lower levels of unpaid care).

Next, we define the profits (R) in the N sector. We consider that the income in the N sector are distributed between workers and capitalists as wages and profits. The profits are earned by the capitalists and is their income in the N sector after wage payments.

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

The profit share in the N sector is the share of profits in the output in the N sector. Therefore, the profit share could also be written as a function of female wages and labour productivity in the N sector:

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

The next set of equations present the behavioural equations defining the demand side of the model. Consumption of households in goods and services other than social expenditures is a function of total wage income (wage bills) of female and male workers in H and N sectors and profit income of capitalists after taxes. t_t^W is the rate of tax on wages and t_t^R is the rate of tax on profits. Following previous empirical literature (e.g. Hein and Vogel, 2009; Molero-Simarro, 2011; Onaran and Galanis, 2014; Onaran and Obst, 2016) in the post-Kaleckian literature that estimates the relationship between consumption, wages, and profits in logarithms; we define the logarithm of non-social consumption as functions of logarithms of after tax profits, and female and male wage bills in H and N sectors. The non-linearities in the relationship between sources of incomes and consumption might be an outcome of changing propensities to consume with changing incomes.

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

The marginal propensity to consume in N is assumed to be different for male and female workers in the N sector, reflecting the gender pay gaps as well as differences in behaviour. We discuss this in more detail below while presenting the analysis of the model.

The households' social expenditures (C_t^H) is also a function of after tax profits and wage bills of female and male workers in N and H sectors, and governments' social expenditures:

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

The marginal propensity to consume social goods is different for male and female workers in the N sector. We assume that the marginal propensity to consume social goods is the same for male and female workers working in the social sector in an attempt to simplify the model.⁵ Following this assumption, governments' social expenditures (G_t^H) can *i*)

⁵ As the majority of the workers in H are women, the impact of this simplification is not very important. The assumption helps to simplify the model by using only G_t^H to reflect the

increase households' social expenditures by providing wage income in the social sector, *ii*) decrease households' social expenditures by reducing the need for these expenditures. We assume that the demand for C_t^H is provided by the private sector in the market economy as part of the output in the N sector, as mentioned above.

Next, private investment (I_t) is

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

where D is the public debt. The private investment is expected to increase as a result of higher aggregate output ($i_1 > 0$). $\pi_t(1 - t_t^R)$ is the after tax share of disposable profits in the N sector. Following Bhaduri and Marglin (1990) and Blecker (1989), we expect the profit share to have a positive direct impact on private investment ($i_2 > 0$). Last, we use the ratio of public debt to GDP, $(D/Y)_t$, to consider the possible negative crowding out effects of rising public debt on the interest rate and thereby, private investment ($i_3 < 0$), as in Obst, Onaran, Nikolaidi (2017).

The public debt at time t (D_t) is the public debt accumulated from the public debt in the previous period (D_{t-1}) with an interest rate of r_{t-1} , plus the total government expenditures at t , minus the taxes collected from profits and wages at time t .

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

$$D_t = (1 + r_{t-1}) D_{t-1} + \frac{Y_t^N (\kappa_t^H + \kappa_t^C + \kappa_t^G)}{1 - \kappa_t^H} - w_t^{NF} (\alpha_t^N E_t^{NM} + E_t^{NF}) t_t^W - w_t^{HF} (\alpha_t^H E_t^{HM} + E_t^{HF}) t_t^W - t_t^R (Y_t^N - w_t^{NF} (E_t^{NF} + \alpha_t^N E_t^{NM})) \quad (22')$$

Exports are shown by X :

$$\log X_t = x_0 + x_1 \log Y_t^{World} + x_2 \log \pi_t + x_3 \log \varepsilon_t \quad (23)$$

The income of the trading partners (Y_t^{World}) and the real depreciation in currency (x_3) increases the exports ($x_1, x_3 > 0$). A rise in the profit share is equivalent to a fall in real

demand effect while at the same time capturing the substitution effect of public social infrastructure provision on private demand for social expenditure.

unit labour costs, and hence would increase the export competitiveness and hence exports of an economy ($x_2 > 0$). Imports are shown by M :

$$\log M_t = n_0 + n_1 \log Y_t^N + n_2 \log \pi_t + n_3 \log \varepsilon_t \quad (24)$$

Higher domestic demand in the N sector would stimulate the demand on imported goods and services ($n_1 > 0$) and the real depreciation in currency (x_3) reduces the imports ($n_3 < 0$). A rise in the profit share would decrease imports, because it would increase the competitiveness of domestic goods against imported products.

This is a reduced form modelling of the relative price effects on exports and imports. Domestic prices and export prices are functions of nominal unit labour costs, based on a mark-up pricing model in an imperfectly competitive economy. Exports are a function of relative prices of exports to imports, and imports are a function of domestic prices relative to import prices. 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, 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. To simplify the model we do not present the price equations and relative price effects on net exports. Our claim on the impact of profit share on net exports is also supported by the previous empirical literature. For 7 large emerging economies (Turkey, South Korea, Mexico, China, India, Argentina, South Africa), Onaran and Galanis (2014) find that an increase in profit share increases exports and reduces imports⁶. Similarly, Yilmaz (2015) and Jetin and Kurt (2016) also respectively find a strong positive impact of profit shares on net exports in Turkey and Thailand. Alarco (2016) finds negative impact of wage share on net exports in 16 Latin American countries, although the impact for some of the countries is insignificant.

Finally, on the supply side of the model, labour productivity is constant in the short run and changes endogenously in the long run in the rest of the economy, as we assume technological change or adoption of new techniques take time. We assume productivity in the social sector is given and simply equal to output per hour of employment in both the short and the long run.⁷ Labour productivity in the N sector (T_t^N) is

⁶ The effects of profit share were significant for all except profit share's impact on South Africa's exports.

⁷ Output in H is simply equal to the wage bill in H, as there is no profit in H. Increasing productivity in H is less related to the availability of technology or better skills, as the

$$\begin{aligned} \log T_t^N = & h_0 + h_1 \log G_{t-1}^H + h_2 \log I_{t-1}^G + h_3 \log G_{t-1}^C \\ & + h_4 \log Y_{t-1} + h_5 \log w_{t-1}^{NF} + h_6 \log(\alpha_{t-1}^N w_{t-1}^{NF}) + h_7 \log C_{t-1}^H \\ & + h_8 \log U_{t-1} + h_9 \log T_{t-1}^N \end{aligned} \quad (25)$$

In the long run, the labour productivity is likely to be positively influenced by lagged values of government's social infrastructure investment as well as government's consumption expenditures and other public investment ($h_1, h_2, h_3 > 0$). We also expect households' consumption expenditures in marketized social services (C^H) and domestic unpaid care labour to affect labour productivity positively ($h_7, h_8 > 0$). Nevertheless, we expect the effects of these to be realised over the longer-run, namely in the next period. Higher output would also lead to higher labour productivity due to Verdoorn effect (Naastepad, 2006; Hein and Tarassow, 2010), as greater scale can lead to more efficient allocation of sources ($h_4 > 0$). Moreover, following Marx (1867) and later the theoretical contributions and empirical findings of Naastepad (2006) and Hein and Tarassow (2010), we consider that higher female and male wages in N leads to capitalists' preference towards labour-saving technologies, which would increase the labour productivity ($h_5, h_6 > 0$). This is also consistent with the new Keynesian efficiency wage theories (Shapiro and Stiglitz, 1984). Higher output and higher wages have also a lagged effect, since the change in technology and/or techniques pushed by these factors would require time. This is also consistent with Hein and Tarassow (2010) that estimates lagged positive effects of wages and output on labour productivity. Last, the labour productivity in the previous period is also positively related with the productivity in the current period, since part of the technology from the last period would be transferred to the following period ($h_9 > 0$). The next period is a sufficiently long time period for these effects 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. In the theoretical model, we abstract from differences in the lag structure of the effects. Appendix 2 presents a further simplification of the productivity for the purposes of the analytical solution in the next section. Unpaid domestic care labour, U is shared between women (U^F) and men (U^M), where β_d is the share of U^F in U , and is exogenous and institutionally and socially determined:

$$U_t^F = \beta_d U_t \quad (26)$$

quality of these services is more important and is in many cases requires more hours of nurses, care workers, teachers per patient or student.

$$U_t^M = (1 - \beta_d)U_t \quad (27)$$

In case of extreme gender inequality $\beta_d = 1$.

Female and male labour force participation rates (labour force as a ratio to population, N_t^F and N_t^M) are positive functions of average wages, benefits and social infrastructure and negative functions of U_t . Hence female and male labour force is

$$L_t^F = (l_{1F}(w_t^{FH} + w_t^{FN}) + l_{2F}G_t^H + l_{3F}U_t^F)N_t^F \quad (28)$$

$$L_t^M = (l_{1M}(w_t^{MH} + w_t^{MN}) + l_{2M}G_t^H + l_{3M}U_t^M)N_t^M \quad (29)$$

For simplicity we consider benefits as part of G_t^H .

Population, N_t^F and N_t^M are equal to past population plus net migration (NM_t) plus the number of new born minus the number of deaths, where fertility (death rate) is a positive (negative) function of social infrastructure and unpaid care:

$$N_t^F = N_{t-1}^F + NM_t^F + n_{1F}G_t^H + n_{2F}U_t^F \quad (30)$$

$$N_t^M = N_{t-1}^M + NM_t^M + n_{1F}G_t^H + n_{2F}U_t^F \quad (31)$$

If employment grows faster than the labour force for a particular type of worker, unemployment rate will decrease, and vice versa. If demand for employment, E , 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 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. While in our model for simplicity we ignore the feedback effects of changes in labour supply and consequently unemployment on wages, it is realistic to assume that in the long run changes in labour demand vs labour supply can lead to changes in wages. Changes in population via increased migration, to relax labour supply

constraints in the care economy due to rising need for care work along with rising female employment is also not analysed in this model, and is assumed to be exogenous.

Similarly a rise in wages in a particular sector, e.g. H 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 higher labour supply of both men and women, leading to also 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 these are interesting extensions, they are outside the scope of this theoretical model, where our primary aim is to analyse the impact of public spending and exogenous changes in wages and gender pay gap on employment of women and men.

3.1. THE IMPACT OF THE PUBLIC SOCIAL EXPENDITURES ON OUTPUT, EMPLOYMENT AND PUBLIC DEBT

In this section, we examine the short-run and long-run effects of an increase in the share of social expenditures in GDP on aggregate output, employment and public debt/GDP. In this section, we analyse the case where public social expenditure increases through new public sector employment in the social sector ($w_t^{HM} = w_t^{HM*}, w_t^{HF} = w_t^{HF*}$). We first examine the effect of social expenditures on aggregate output through direct stimulus by rising government expenditures and employment. Next, we will examine the impact of public social investment in the long-run, which will in turn effect labour productivity and public debt/GDP. We will also discuss the overall impact on female and male employment and public debt/GDP. Finally, we will examine and discuss how our results would change when public social expenditure rise through closing the gender wage gap in H (i.e. increasing female wages with a constant male wage) rather than generating new employment in H.

3.1.1 THE SHORT-RUN EFFECT OF A CHANGE IN THE SHARE OF PUBLIC SOCIAL INFRASTRUCTURE INVESTMENT IN GDP

We start our analysis with the short-run impact of the share of public social *infrastructure investment* (κ_t^H) in GDP on output. The overall impact (Ψ_{tt}^k) is the sum of public social infrastructure investment's partial effect on each component of demand multiplied by the multiplier term:

$$\begin{aligned}
\Psi_{tt}^k &= \frac{dY_t}{d\kappa_t^H} = \frac{dY_t}{dY_t^N} \frac{dY_t^N}{d\kappa_t^H} \\
&= \frac{\left| \frac{\partial C_t^N}{\partial \kappa_t^H} \right|_{Y_t^N} + \left| \frac{\partial C_t^H}{\partial \kappa_t^H} \right|_{Y_t^N} + \left| \frac{\partial I_t}{\partial \kappa_t^H} \right|_{Y_t^N} + \left| \frac{\partial X_t}{\partial \kappa_t^H} \right|_{Y_t^N} - \left| \frac{\partial M_t}{\partial \kappa_t^H} \right|_{Y_t^N} + \left| \frac{\partial G_t^H}{\partial \kappa_t^H} \right|_{Y_t^N} + \left| \frac{\partial G_t^C}{\partial \kappa_t^H} \right|_{Y_t^N} + \left| \frac{\partial I_t^G}{\partial \kappa_t^H} \right|_{Y_t^N}}{1 - \left| \frac{\partial C_t^N}{\partial Y_t^N} \right|_{\kappa_t^H} - \left| \frac{\partial C_t^H}{\partial Y_t^N} \right|_{\kappa_t^H} - \left| \frac{\partial I_t}{\partial Y_t^N} \right|_{\kappa_t^H} - \left| \frac{\partial X_t}{\partial Y_t^N} \right|_{\kappa_t^H} + \left| \frac{\partial M_t}{\partial Y_t^N} \right|_{\kappa_t^H} - \left| \frac{\partial G_t^H}{\partial Y_t^N} \right|_{\kappa_t^H} - \left| \frac{\partial G_t^C}{\partial Y_t^N} \right|_{\kappa_t^H} - \left| \frac{\partial I_t^G}{\partial Y_t^N} \right|_{\kappa_t^H}} \\
&* \frac{1}{(1 - \kappa_t^H)}
\end{aligned} \tag{32}$$

where

$$\begin{aligned}
\varphi_k &= \left| \frac{\partial C_t^N}{\partial Y_t^N} \right|_{\kappa_t^H} + \left| \frac{\partial C_t^H}{\partial Y_t^N} \right|_{\kappa_t^H} + \left| \frac{\partial I_t}{\partial Y_t^N} \right|_{\kappa_t^H} + \left| \frac{\partial X_t}{\partial Y_t^N} \right|_{\kappa_t^H} - \left| \frac{\partial M_t}{\partial Y_t^N} \right|_{\kappa_t^H} + \left| \frac{\partial G_t^H}{\partial Y_t^N} \right|_{\kappa_t^H} + \left| \frac{\partial G_t^C}{\partial Y_t^N} \right|_{\kappa_t^H} \\
&\quad + \left| \frac{\partial I_t^G}{\partial Y_t^N} \right|_{\kappa_t^H}
\end{aligned} \tag{33}$$

The multiplier term is $\left(\frac{1}{1-\varphi_k}\right)\left(\frac{1}{1-\kappa_t^H}\right)$ which is derived in Appendix 3. The outcomes of equation (32) is summarised in Figure 1.

The partial effect of the public social expenditures on female and male employment is positive in the short-run as it generates new employment in the social sector and pushes total output to an upper level (See Appendix 4). Based on the female employment shares in Table 1 and as in the literature (e.g. Ilkkaracan et al, 2015), we expect the partial impact of public social expenditures on female employment relative to male employment in the social sector to be larger than the partial effects of all shocks in N sector (e.g. share of government's consumption expenditures in GDP (κ_t^C), share of public investments other than social infrastructure investment in GDP (κ_t^G), autonomous private investment (i_0)) as in equation (33)-(35).

Figure 1: The short-run impact of an increase in the share of public social expenditure in GDP on total output

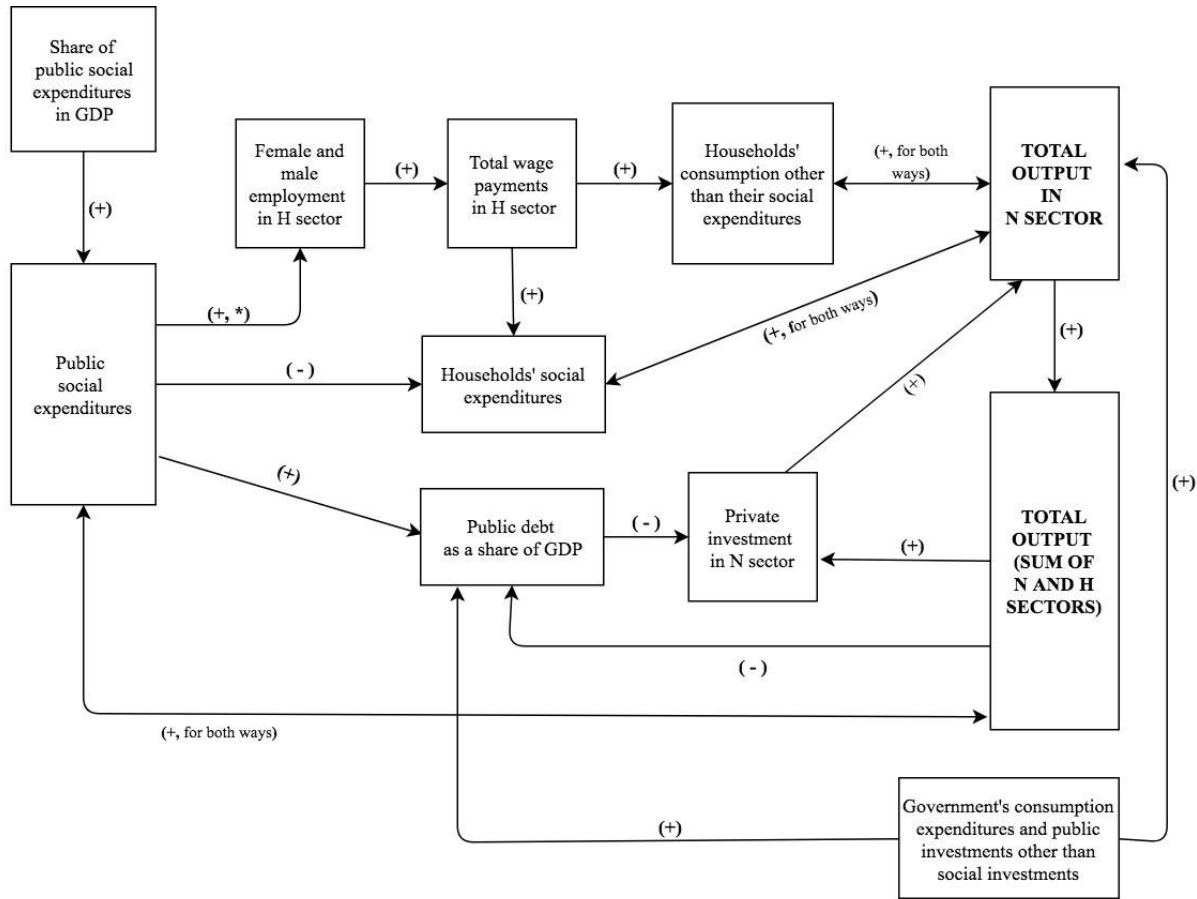


Figure 1

* Based on Table 1, the positive partial impact of public expenditures is expected to be relatively larger for female employment compared to the partial impact from expenditures in N sector

$$(e_{kt}^{HF} / e_{kt}^{HM}) > \left| \frac{\partial E_t^{NF}}{\partial \kappa_t^C} \right|_{Y_t^N} / \left| \frac{\partial E_t^{NM}}{\partial \kappa_t^C} \right|_{Y_t^N} \quad (33)$$

$$(e_{kt}^{HF} / e_{kt}^{HM}) > \left| \frac{\partial E_t^{NF}}{\partial \kappa_t^G} \right|_{Y_t^N} / \left| \frac{\partial E_t^{NM}}{\partial \kappa_t^G} \right|_{Y_t^N} \quad (34)$$

$$(e_{kt}^{HF}/e_{kt}^{HM}) > \left| \frac{\partial E_t^{NF}}{\partial i_0} \right|_{Y_t^N} / \left| \frac{\partial E_t^{NM}}{\partial i_0} \right|_{Y_t^N} \quad (35)$$

Moreover, the partial effect of public social expenditures on female employment in N (e_{kt}^{NF}) and male employment in N is zero (e_{kt}^{NM}), as the impact of social expenditures on productivity will be realised only in the next period.

The short-run partial impact of public social expenditures (κ_t^H) on consumption in N is given below for a given level of output in N sector ($Y_t^N = Y_t^{N*}$).

$$\left| \frac{\partial C_t^N}{\partial \kappa_t^H} \right|_{Y_t^N} = C_t^N \left(c_{HF} \frac{e_{kt}^{HF} w_t^{HF}}{WB_t^{HF}} + c_{HM} \frac{e_{kt}^{HM} w_t^{HF} \alpha_t^H}{WB_t^{HM}} \right) > 0 \quad (36)$$

Higher public social expenditures will stimulate the consumption in N, since it will generate new employment and income in H. The magnitude of public social expenditures on consumption in N depends on the marginal propensities to consume in H for the female and male workers.

The short-run partial impact of public social expenditure (κ_t^H) on consumption in H is

$$\left| \frac{\partial C_t^H}{\partial \kappa_t^H} \right|_{Y_t^N} = C_t^H \left(z_G \frac{1}{(1 - \kappa_t^H) \kappa_t^H} \right) \quad (37)$$

As discussed above, the sign of z_G and hence equation (37) is ambiguous, but it's likely to be negative. This is because a rise in public social expenditures could reduce the households' need for social expenditures, although it generates new employment, hence income in the social sector.

The partial effect of public social expenditures (κ_t^H) on private investment is

$$\left| \frac{\partial I_t}{\partial \kappa_t^H} \right|_{Y_t^N} = I_t \left(i_1 \frac{1}{1 - \kappa_t^H} + i_2 \frac{\left| \frac{\partial \pi_t}{\partial \kappa_t^H} \right|_{Y_t^N}}{\pi_t} + i_3 \frac{d_{tt}^k}{\left(\frac{D}{Y} \right)_t} \right) \quad (38)$$

where the impact through higher public debt is shown by d_{tt}^k . The first term in (38) shows the direct impact of rising public social expenditures on private investments. The short-run effect of public social expenditures on the profit share is zero for a constant output in the rest of economy, since public social expenditures do not affect labour productivity in the short-run.

$$\left| \frac{\partial \pi_t}{\partial \kappa_t^H} \right|_{Y_t^N} = 0 \quad (39)$$

However, for a constant output in N, the rising public social expenditures leads to a negative effect on private investment due to rising public debt/GDP ($i_3 < 0$) in the short-run due to the crowding out effect. (See Appendix 4). However, this negative effect will be slightly moderated as tax revenues increase. Rising public social expenditures/GDP also increases the denominator of the public debt/GDP ratio.

The short-run partial impact of public social expenditures on exports and imports is zero for a constant output in N, because its partial impact on the profit share is zero in the short-run.

$$\left| \frac{\partial X_t}{\partial \kappa_t^H} \right|_{Y_t^N} = X_t \left(x_2 \frac{\left| \frac{\partial \pi_t}{\partial \kappa_t^H} \right|_{Y_t^N}}{\pi_t} \right) = 0 \quad (40)$$

$$\left| \frac{\partial M_t}{\partial \kappa_t^H} \right|_{Y_t^N} = M_t \left(n_2 \frac{\left| \frac{\partial \pi_t}{\partial \kappa_t^H} \right|_{Y_t^N}}{\pi_t} \right) = 0 \quad (41)$$

Finally, a rising share of public social expenditures has a positive effect on all types of public investment is positive as shown in equations (42)-(44).

$$\left| \frac{\partial G_t^H}{\partial \kappa_t^H} \right|_{Y_t^N} = \frac{Y_t^N}{(1 - \kappa_t^H)^2} > 0 \quad (42)$$

$$\left| \frac{\partial G_t^C}{\partial \kappa_t^H} \right|_{Y_t^N} = \frac{\kappa_t^C Y_t^N}{(1 - \kappa_t^H)^2} > 0 \quad (43)$$

$$\left| \frac{\partial I_t^G}{\partial \kappa_t^H} \right|_{Y_t^N} = \frac{\kappa_t^G Y_t^N}{(1 - \kappa_t^H)^2} > 0 \quad (44)$$

3.1.2 THE EFFECT OF A CHANGE IN THE SHARE OF PUBLIC SOCIAL INFRASTRUCTURE INVESTMENT IN GDP IN THE NEXT PERIOD

The effect of a rising share of social expenditures in GDP on aggregate output in the next period is the sum of its partial impact on each component of GDP multiplied by the multiplier term, $\frac{1}{(1 - \varphi_k)(1 - \kappa_t^H)}$.

$$\begin{aligned} \Psi_{t(t-1)}^k &= \frac{dY_t}{d\kappa_{t-1}^H} = \frac{dY_t}{dY_t^N} \frac{dY_t^N}{d\kappa_{t-1}^H} \\ &= \frac{\left| \frac{\partial C_t^N}{\partial \kappa_{t-1}^H} \right|_{Y_t^N} + \left| \frac{\partial C_t^H}{\partial \kappa_{t-1}^H} \right|_{Y_t^N} + \left| \frac{\partial I_t}{\partial \kappa_{t-1}^H} \right|_{Y_t^N} + \left| \frac{\partial X_t}{\partial \kappa_{t-1}^H} \right|_{Y_t^N} - \left| \frac{\partial M_t}{\partial \kappa_{t-1}^H} \right|_{Y_t^N}}{(1 - \varphi_k)(1 - \kappa_t^H)} \\ &\quad + \frac{\left| \frac{\partial G_t^H}{\partial \kappa_{t-1}^H} \right|_{Y_t^N} + \left| \frac{\partial G_t^C}{\partial \kappa_{t-1}^H} \right|_{Y_t^N} + \left| \frac{\partial I_t^G}{\partial \kappa_{t-1}^H} \right|_{Y_t^N}}{(1 - \varphi_k)(1 - \kappa_t^H)} \end{aligned} \quad (45)$$

The long-run impact in equation (45) is summarised in Figure 2.

Figure 2: The long-run impact of an increase in the share of public social expenditure in GDP on total output

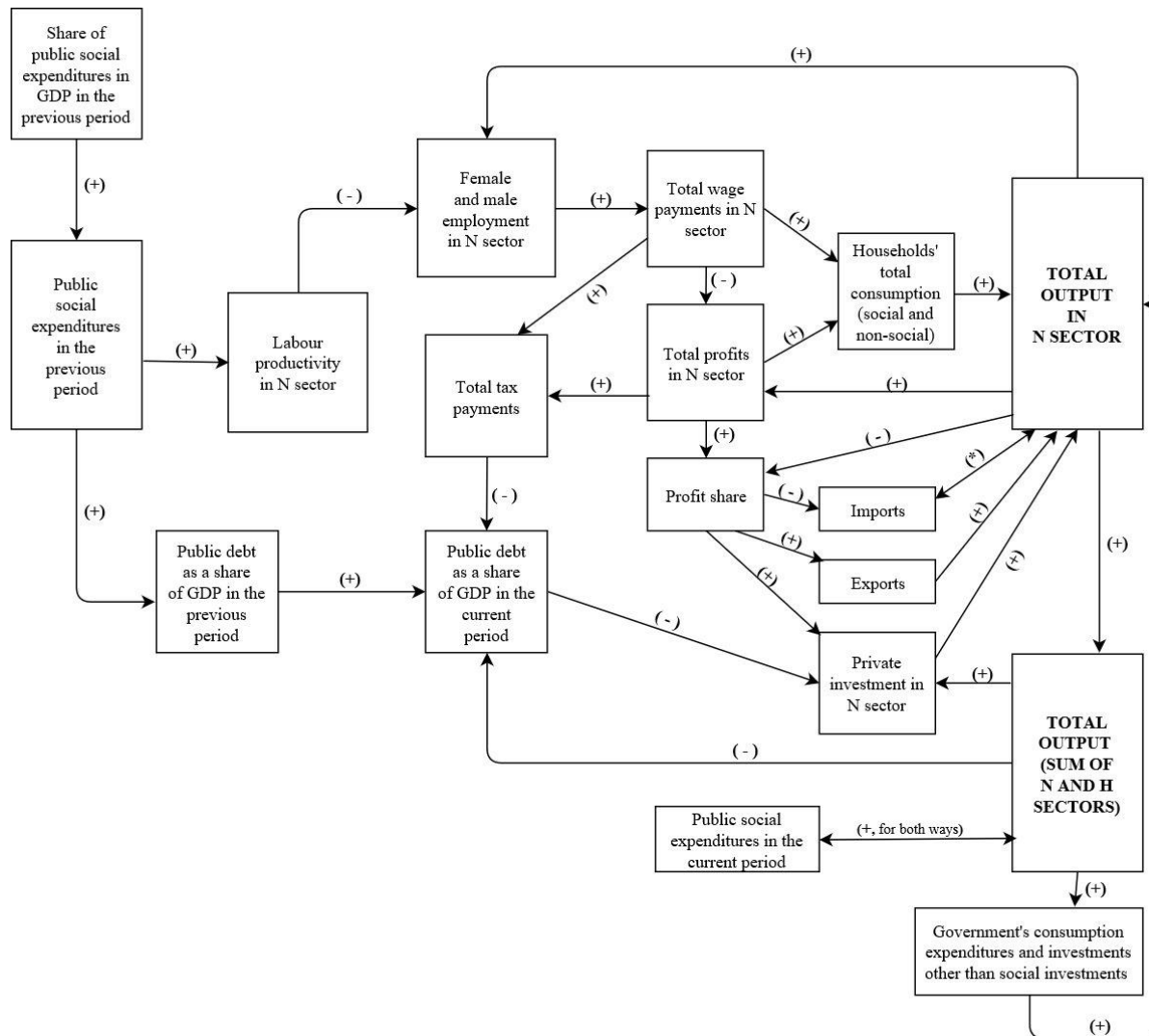


Figure 2

Notes: All variables without time represent the current period.

*The impact of total output on imports is positive and the impact of imports on total output is negative.

To derive the partial effect of κ_{t-1}^H on each component of GDP, we first exhibit its influence on labour productivity as the public social investments affect the profit share and employment in the next period through labour productivity.

$$\begin{aligned}
\left| \frac{\partial T_t^N}{\partial \kappa_{t-1}^H} \right|_{Y_t^N} &= T_t^N \left(\frac{h_1}{\kappa_{t-1}^H} + \frac{h_7 z_G + h_8 q_G}{\kappa_{t-1}^H} + \frac{(h_1 + h_2 + h_3 + h_4)}{Y_{t-1}} \Psi_{tt}^k \right. \\
&\quad + \frac{((z_G + z_R + z_F + z_M)h_7 + (q_G + q_F + q_M)h_8)}{Y_{t-1}} \Psi_{tt}^k \\
&\quad \left. - \frac{h_7(z_F + z_M - z_R) + h_8(q_F + q_M)}{1 - \kappa_{t-1}^H} \right) \quad (46)
\end{aligned}$$

The first term in parenthesis reflects the direct effect of public social investment on labour productivity. The second term is public social investment's direct impact on labour productivity through households' social expenditures and unpaid labour within the household as higher social expenditures would reduce the need for both. The third term shows the effect through rising output with higher public social expenditures, which will have an impact on labour productivity in the next term through output as well as the effects of other government expenditures which increase together with the rising aggregate output. The combination of last two terms is public social investment's impact through changing unpaid labour and households' social expenditures in parallel to the rising aggregate output.

Figure 3 summarises the impact of the share of social expenditures in GDP on labour productivity in the next period. Overall, the total effect on productivity is ambiguous, and is likely to be positive. This is due to two reasons. First, for constant total income in N sector and without significant changes in the private funding of social spending, decline in public social expenditures is very unlikely to lead to a similar increase in households' social expenditures that would reverse the negative effects of lower public social expenditures on labour productivity. Second, the unpaid care work that is expected to increase due to lower social expenditures is unlikely to compensate the positive effects of public social expenditures on labour productivity.

Figure 3: The summary of the impact of the share of public social expenditures in GDP on labour productivity in the next period

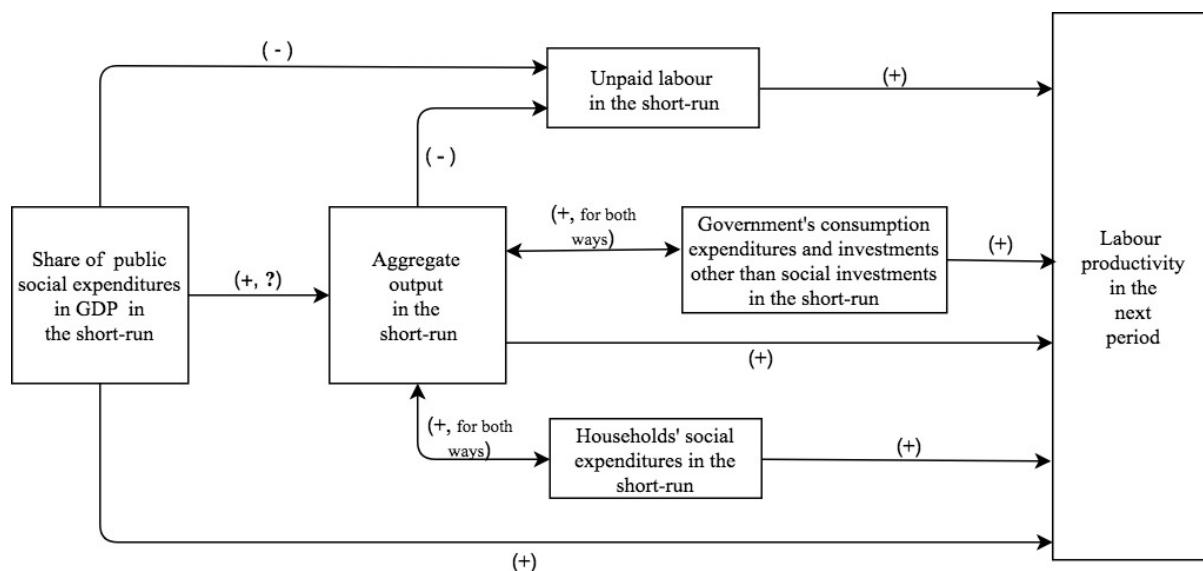


Figure 3

Next, we demonstrate the partial long-run impact of public social investment on each component of aggregate output. First, higher public social investment changes total wage bills and profits through employment, which in turn affect C_t^N and C_t^H :

$$\left. \frac{\partial C_t^N}{\partial \kappa_{t-1}^H} \right|_{Y_t^N} = C_t^N \left(c_{NF} \frac{(e_{k(t-1)}^{NF} w_t^{NF})}{WB_t^{NF}} + c_{NM} \frac{\alpha_t^N (e_{k(t-1)}^{NM} w_t^{NF})}{WB_t^{NM}} - c_R \frac{(e_{k(t-1)}^{NM} \alpha_t^N + e_{k(t-1)}^{NF}) w_t^{NF}}{R_t} \right) \quad (47)$$

$$\left. \frac{\partial C_t^H}{\partial \kappa_{t-1}^H} \right|_{Y_t^N} = C_t^H \left(z_F \frac{(e_{k(t-1)}^{NF} w_t^{NF})}{WB_t^{NF}} + z_M \frac{\alpha_t^N (e_{k(t-1)}^{NM} w_t^{NF})}{WB_t^{NM}} - z_R \frac{(e_{k(t-1)}^{NM} \alpha_t^N + e_{k(t-1)}^{NF}) w_t^{NF}}{R_t} \right) \quad (48)$$

$e_{k(t-1)}^{NF}$ and $e_{k(t-1)}^{NM}$ are respectively the partial effect of the share of public social expenditures in GDP on female and male employment in N sector in the next period. The partial impact of κ_{t-1}^H on employment in N will be through labour productivity as shown in Appendix 4.

The share of public social expenditures affects private investment through the effects on the profit share and public debt/GDP in the long-run:

$$\left| \frac{\partial I_t}{\partial \kappa_{t-1}^H} \right|_{Y_t^N} = I_t \left(i_2 \frac{\left| \frac{\partial \pi_t}{\partial \kappa_{t-1}^H} \right|_{Y_t^N}}{\pi_t} + i_3 \frac{d_{t(t-1)}^k}{\left(\frac{D}{Y} \right)_t} \right) \quad (49)$$

where $d_{t(t-1)}^k$ is the partial effect of rising public social expenditures on public debt/GDP. The public social expenditures lead to accumulation of public debt that might become an impediment on the private investments in the next period. The public social expenditures also influence the labour productivity in the next period, which would change the denominator of public debt-to-GDP ratio. Moreover, public social expenditures change the distribution between wages and profits, which in turn affect public debt as the tax rates on different types of income are different. These effects are more in detail shown in Appendix 5.

Higher public social expenditures affect the profit share in the next period through labour productivity:

$$\left| \frac{\partial \pi_t}{\partial \kappa_{t-1}^H} \right|_{Y_t^N} = \left(\frac{(\alpha_t^N - \alpha_t^N \beta_t^N + \beta_t^N) w_t^{NF}}{(T_t^N)^2} \right) \left| \frac{\partial T_t^N}{\partial \kappa_{t-1}^H} \right|_{Y_t^N} \quad (50)$$

Finally, the share of public social expenditures in aggregate output affects exports and imports through the changes in the profit share, which is in turn affected through labour productivity:

$$\left| \frac{\partial X_t}{\partial \kappa_{t-1}^H} \right|_{Y_t^N} = X_t \left(x_2 \frac{\left| \frac{\partial \pi_t}{\partial \kappa_{t-1}^H} \right|_{Y_t^N}}{\pi_t} \right) \quad (51)$$

$$\left| \frac{\partial M_t}{\partial \kappa_{t-1}^H} \right|_{Y_t^N} = M_t \left(n_2 \frac{\left| \frac{\partial \pi_t}{\partial \kappa_{t-1}^H} \right|_{Y_t^N}}{\pi_t} \right) \quad (52)$$

3.1.3 THE EFFECT OF A CHANGE IN THE SHARE OF PUBLIC SOCIAL INFRASTRUCTURE INVESTMENT IN GDP ON EMPLOYMENT AND PUBLIC DEBT

A higher share of public social expenditure in GDP affects total female employment through rising aggregate output and its direct impact on creating employment in social sector:

$$\frac{dE_t^F}{d\kappa_t^H} = \left(\beta_t^N \frac{(1 - \kappa_t^H)}{T_t^N} + \beta_t^H \frac{\kappa_t^H}{w_t^{HF}(\beta_t^H + \alpha_t^H - \beta_t^H \alpha_t^H)} \right) \Psi_{tt}^k + \frac{\beta_t^H Y_t^N}{w_t^{HF}(\beta_t^H + \alpha_t^H - \beta_t^H \alpha_t^H)(1 - \kappa_t^H)^2} \quad (53)$$

The first term in (53) reflects that a higher share of public social expenditure in GDP affects the female employment in H and N through changes in the aggregate output. The second term in (53) shows the direct effect of expanding public social expenditures on generating employment in the social sector.

Similarly, a higher share of social expenditures increases total male employment through aggregate output and its direct impact on creating employment in the social sector:

$$\frac{dE_t^M}{d\kappa_t^H} = \left((1 - \beta_t^N) \frac{(1 - \kappa_t^H)}{T_t^N} + (1 - \beta_t^H) \frac{\kappa_t^H}{w_t^{HF}(\beta_t^H + \alpha_t^H - \beta_t^H \alpha_t^H)} \right) \Psi_{tt}^k + \frac{(1 - \beta_t^H) Y_t^N}{w_t^{HF}(\beta_t^H + \alpha_t^H - \beta_t^H \alpha_t^H)(1 - \kappa_t^H)^2} \quad (54)$$

Table 1 shows that β_t^H is larger than 0.5 in all countries listed except Pakistan. Based on this, we expect that the direct impact of rising public social expenditures on female employment is likely to be larger than its effect on male employment in most developing economies as shown below:

$$\left(\left| \frac{\partial E_t^{NF}}{\partial \kappa_t^H} \right|_{Y_t} + \left| \frac{\partial E_t^{HF}}{\partial \kappa_t^H} \right|_{Y_t} \right) = \frac{\beta_t^H Y_t^N}{w_t^{HF}(\beta_t^H + \alpha_t^H - \beta_t^H \alpha_t^H)(1 - \kappa_t^H)^2} > \frac{(1 - \beta_t^H) Y_t^N}{w_t^{HF}(\beta_t^H + \alpha_t^H - \beta_t^H \alpha_t^H)(1 - \kappa_t^H)^2} = \left(\left| \frac{\partial E_t^{NM}}{\partial \kappa_t^H} \right|_{Y_t} + \left| \frac{\partial E_t^{HM}}{\partial \kappa_t^H} \right|_{Y_t} \right) \quad (55)$$

Overall, the impact of rising share of public social expenditures in GDP on employment is:

$$\frac{dE_t}{d\kappa_t^H} = \left(\frac{1 - \kappa_t^H}{T_t^N} + \frac{\kappa_t^H}{w_t^{HF}} \right) \Psi_{tt}^k + \frac{Y_t^N}{w_t^{HF} (\beta_t^H + \alpha_t^H - \beta_t^H \alpha_t^H) (1 - \kappa_t^H)^2} \quad (56)$$

The impact of rising public social expenditures on total female employment in the long-run is:

$$\frac{dE_t^F}{d\kappa_{t-1}^H} = e_{k(t-1)}^{NF} + \left(\beta_t^N \frac{(1 - \kappa_t^H)}{T_t^N} + \frac{\beta_t^H \kappa_t^H}{w_t^{HF} (\beta_t^H + \alpha_t^H - \beta_t^H \alpha_t^H)} \right) \Psi_{t(t-1)}^k \quad (57)$$

The public social expenditures have a partial impact on labour productivity in the next period, which also affects the female employment in N in the next period. This is shown by the first term of (57). The second term shows the impact of rising public social expenditures on female employment through aggregate output.

The rising share of public social expenditures affects male employment in the long-run through its partial effect on labour productivity and employment ($e_{k(t-1)}^{NM}$) and through aggregate output:

$$\frac{dE_t^M}{d\kappa_{t-1}^H} = e_{k(t-1)}^{NM} + \left((1 - \beta_t^N) \frac{(1 - \kappa_t^H)}{T_t^N} + \frac{(1 - \beta_t^H) \kappa_t^H}{w_t^{HF} (\beta_t^H + \alpha_t^H - \beta_t^H \alpha_t^H)} \right) \Psi_{t(t-1)}^k \quad (58)$$

The overall effect of rising public social expenditures on total employment in the long-run is given in equation (59). Figure 4 summarises the impact of higher share of public social expenditures as a share of GDP on employment.

$$\frac{dE_t}{d\kappa_{t-1}^H} = e_{k(t-1)}^{NM} + \left(\frac{(1 - \kappa_t^H)}{T_t^N} + \frac{\kappa_t^H}{w_t^{HF} (\beta_t^H + \alpha_t^H - \beta_t^H \alpha_t^H)} \right) \Psi_{t(t-1)}^k \quad (59)$$

Figure 4: The summary of the impact of an increase in share of public social expenditures as a share of GDP on total employment in the short-run and in the next period

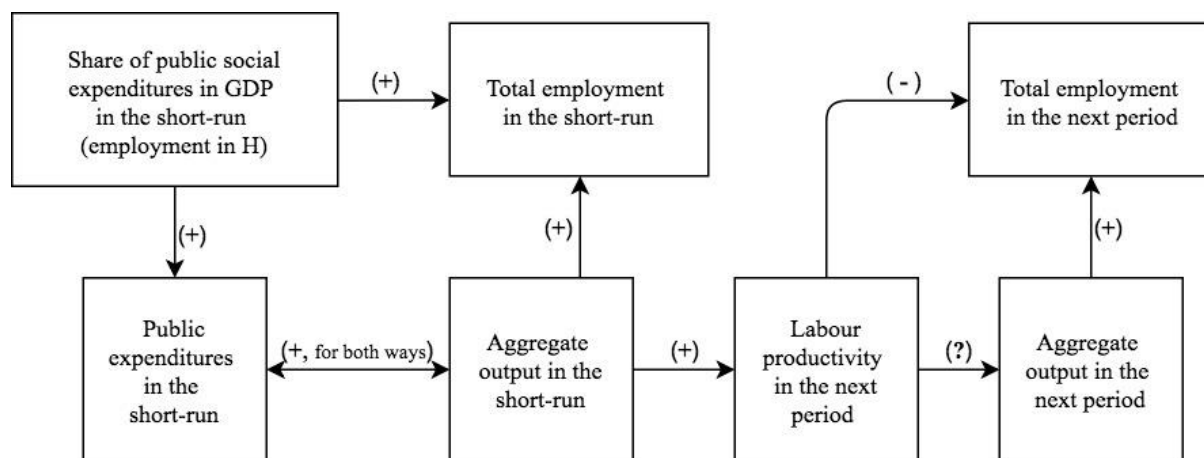


Figure 4

Finally, the impact of rising public expenditures on public debt/Y in the short-run and the impact in the next period are respectively as below:

$$\frac{d\left(\frac{D}{\bar{Y}}\right)_t}{d\kappa_t^H} = d_{tt}^k + d_{tt}^Y \Psi_{tt}^k \quad (60)$$

$$\frac{d\left(\frac{D}{\bar{Y}}\right)_t}{d\kappa_{t-1}^H} = d_{t(t-1)}^k + d_{tt}^Y \Psi_{t(t-1)}^k \quad (61)$$

d_{tt}^Y is the impact of rising aggregate output on public debt/GDP as discussed in Appendix 5. In equation (60) public social expenditures affect public debt/GDP through its short-run direct effect and its short-run effect on aggregate output. In equation (61) public social expenditures have a direct effect on the public debt/GDP and an effect through aggregate output in the next period.

3.2 The impact of closing the gender wage gap in the H sector on output, employment and public finance

In this section, we examine the case in which the share of public social expenditure in GDP increases through closing gender gap in H, rather than an increase in employment in

H. Hence, the gender wage ratio, α_t^H decreases with a rise in the female wage in H with a constant male wage ($w_t^{HM} = w_t^{HM*}$). The employment in H sector is constant ($E_t^{HF} = E_t^{HF*}$, $E_t^{HM} = E_t^{HM*}$) for constant total output in N.

The implications of this case is very similar to the case in which public social expenditure increases with generation of new employment in the public social sector. The main difference between the two cases is through consumption in N. In the short-run, the rising female wages in H would have a partial effect on consumption other than social expenditures solely through female consumption as shown in equation (62).

$$\left. \frac{\partial C_t^N}{\partial w_t^{HF}} \right|_{Y_t^N, w_t^{HM}, E_t^H} = c_{HF} C_t^N \left(\frac{E_t^{HF}}{WB_t^{HF}} \right) > 0 \quad (62)$$

For the same amount of increase in κ_t^H , whether the impact on C_t^N is larger for 'higher employment in H' or 'closing gender wage gap in H case' depends on the marginal propensities to consume for female and male workers in H. If the marginal propensity to consume is larger for female workers in H, the impact through closing gender wage gap in H will be stronger, and if the marginal propensity to consume is larger for male workers the effect through higher employment in H will be stronger.

For the same amount of increase in κ_t^H , the short-run influence of closing gender pay gap in H on households' social expenditures is the same as in the case of rising employment in H, as for simplicity in our model we did not distinguish the impact of female and male wages in H on households' social expenditures. Similarly, for constant N output, closing gender pay gap in H influences private investments, government's social expenditures, government's consumption expenditures and public expenditures other than social investments in the short-run solely through the share of public social expenditures in GDP. For constant output in N, the partial impact of closing gender pay gap in H on exports and imports is zero, since the partial effect of the share of public social expenditures in GDP on profit share is also zero as in equation (39). The short-run impact of closing gender pay gap in H sector on total output is summarised in Figure 5 and the detailed effects are shown Appendix 7.

Figure 5: The short-run impact of closing gender pay gap in H sector on total output

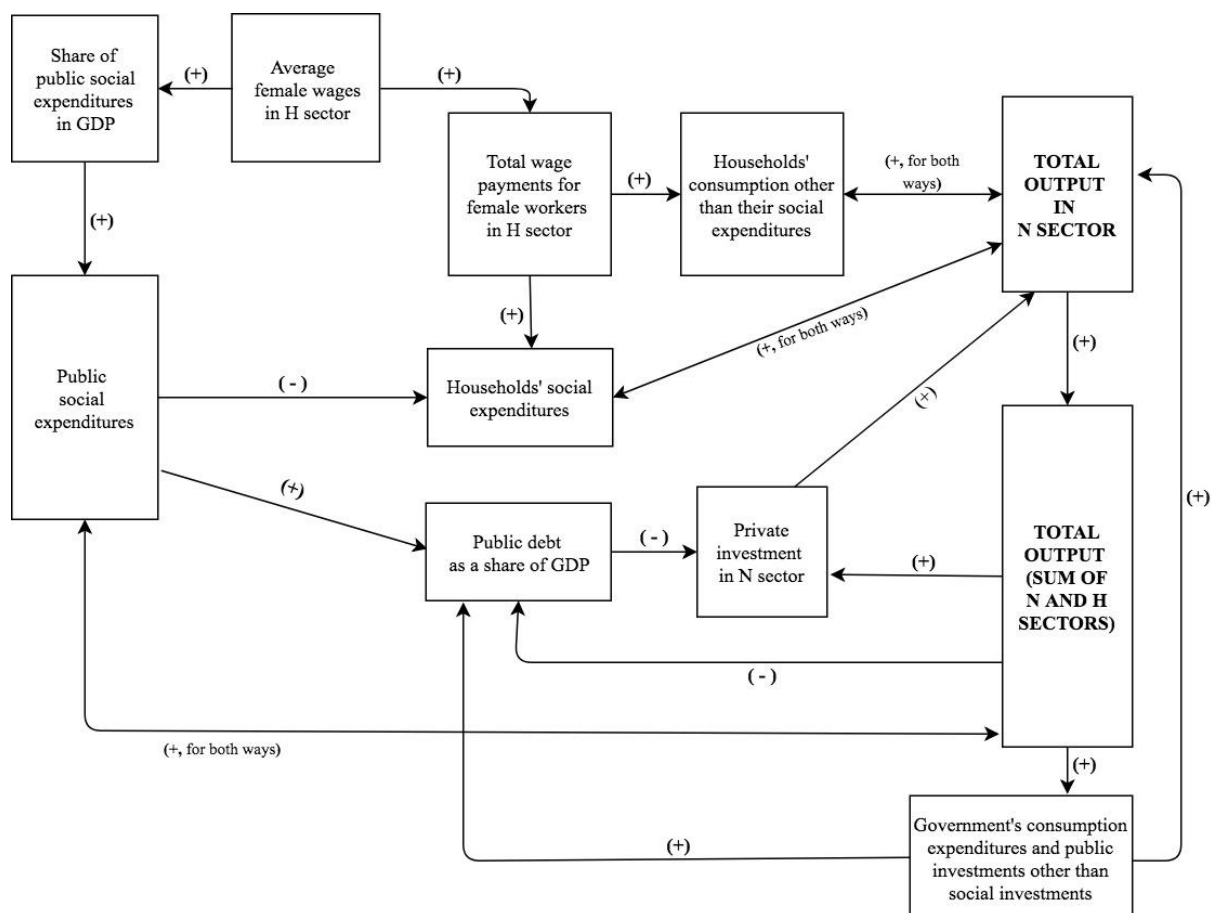


Figure 5

Moreover, the impact of closing gender pay gap in H sector on the components of GDP in the next period is through labour productivity in the next period. For constant male wages, the rising female wages in H sector affects the labour productivity through higher public social expenditures. Hence, we would expect effects similar to the case in which public social expenditures increase through rising employment in H as shown in Appendix 7. The main difference arises due to the fact that, for the same amount of change in the share of public social expenditures in GDP, the short-run effects of rising female H wages on aggregate output is different. This is because aggregate output has a direct influence on labour productivity in the next period and has an indirect impact on labour productivity through unpaid labour, public consumption expenditures other than social expenditures, public social investment and households' social expenditures as shown in Figure 3.

The short-run effect of higher female wages in H on total employment is solely through its effect on total output. Higher female wages effect total output in N, which leads to changes in employment in N. Moreover, the changes in total output also effect public

social expenditures through the multiplier effects which would further affect employment in H.

The impact of higher female wages in H on employment in the next period is through the effect on total output and labour productivity in the next period. These effects are further discussed in Appendix 7. If closing gender pay gap in H leads to an increase in aggregate output greater than a possible increase in labour productivity, we would observe an increase in employment in the next period.

Last, higher female wages in H has a direct impact on public debt-to-GDP ratio as share of public social expenditures in GDP rise and also has an indirect impact through aggregate output. Closing gender pay gap in H also affects the public debt-to-GDP ratio in the next period, since a part of the public debt in the short-run is transferred to the next period and higher female wages' in H affect total output in both the short-run and the next period (Appendix 7).

4. CONCLUSION AND POLICY IMPLICATIONS

This paper developed a post-Keynesian/post-Kaleckian feminist demand-led growth model to theoretically analyse the role of labour market policies and fiscal policies on growth and employment. We presented a three sector gendered macroeconomic model with physical and social sectors (health, social care, education, child care) in the public and private market economy, and an unpaid reproductive sector providing domestic care. The production in the market economy is performed by male and female paid labour and capital.

We provided a theoretical analysis of the effects on GDP, productivity (GDP per employee) and employment of men and women in both the short run and long run as a consequence of i) , fiscal policies, in particular public spending in social infrastructure, and ii) decreasing gender wage gaps in the female dominated social sector.

This theoretical model can form the basis for the empirical analysis of gender equality and fiscal policy on growth and employment of men and women and serve as a tool for policy analysis and gender-responsive budgeting. The policy implications of the model can be discussed in the context of the stylised facts of a developing economy with a significant size of the unpaid reproductive economy, high gender pay and/or employment gaps, low female labour force participation rate and high occupational segregation. In particular, we can analyse the impact of a policy mix of upward convergence via a simultaneous increase in both female and male wages with closing gender pay gaps (faster increase in female wages than male wages) and a rise in public spending in social vs. physical investment, and discuss possible alternative outcomes based on alternative parameters of the model.

The impact of government spending in the other sectors or changes in the tax rates are further potential extensions of the model. As the analytical solutions are symmetrical, we

do not present them in the paper. Three important policy implications to emphasize flow from our analysis:

Regarding fiscal policy, we expect public investment in social infrastructure to reduce women's unpaid domestic care work, while increasing their labour supply and enabling them to spend more time in paid work. Aggregate demand is stimulated both in the short and the long run, with positive effects on employment. Due to sectoral and occupational segregation, public spending in social infrastructure is expected to create more female employment compared to physical infrastructure. In the long run, government spending and higher female income is expected to increase productivity, which may partially moderate the positive impact of fiscal spending on employment. The long run impact on productivity also depends on how much of the rise in paid employment decreases unpaid care labour and whether public spending in social infrastructure can more than offset the effects of the decline in unpaid domestic care labour. If the short and long term multiplier and the productivity effects of public investment in social infrastructure are stronger than those of public investment in physical infrastructure, and given the labour intensive and domestic demand oriented nature of social infrastructure and occupational segregation, such investment is expected to lead to very strong increases in employment of women as well as creating substantial amount of jobs for men in all sectors of the economy due to spill over effects of demand from the social sector to the rest of the economy. This policy thereby also contributes to closing the gender gaps in employment. According to empirical research based on input-output tables (Antonopoulos et al., 2010; Ilkkaracan et al., 2015; De Henau et al., 2016), public investment in physical infrastructure creates fewer jobs in total and most new jobs are predominantly male jobs; however this research does not consider the long term effects on productivity. An empirical analysis of our model for a specific economy can further shed light on the gendered policy implications.

Similar differences in the impact of wages in different sectors follow: as H is more labour intensive than N, the impact of a wage increase in H on output is expected to be substantially higher.

With respect to tax policies, if the economy is wage-led increasing the progressivity of the tax regime via increasing taxes on capital and decreasing taxes on labour leads to stronger positive impact on output. Conversely, if the economy is profit-led, increasing the progressivity of the tax system leads to further negative effects on output and employment.

In this paper we modelled the impact of closing gender gaps only for the case of a rising female wage with a constant male wage. The impact of the case of alternative scenario of closing gender gaps via an upward convergence can be derived from the model. Similarly, the impact of a rise in only male wages, with a constant female wage, (i.e. the case of increasing gender inequality) can be derived as well. The impact of increasing wages and/or upward convergence in both sectors can be derived by summing up the effects in both N and H.

Finally, policy mix scenarios can be analysed by adding up the impact of increasing public spending and wages. This latter is particularly important in the long-run in a wage-led economy where employment may decrease in N despite an increase in output, if the output effects are small but productivity effects are large. In this case fiscal spending can ensure equality-led growth is combined with employment expansion for both women and men.

Overall, the model can be utilized to empirically analyse a specific economy and develop an appropriate policy mix to achieve a gender equitable development given the parameters of the economy.

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