Gendering macroeconomic analysis and development policy: a theoretical model

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Gendering macroeconomic analysis and development policy: a theoretical model

Abstract

The aim of this paper is to develop a feminist post-Keynesian/post-Kaleckian model to theoretically analyze the effects of labor market and fiscal policies on growth and employment. We develop a three-sector gendered macroeconomic model with physical and social sectors (health, social care, education, childcare) in the public and private market economy, and an unpaid reproductive sector providing domestic care. We provide a theoretical analysis of the effects on GDP, productivity 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 particular in the female dominated social sector. This theoretical analysis provides a basis to further analyze the impacts of an upward convergence in wages, other types of fiscal spending, and taxes.

1. Introduction

The aim of this paper is to develop a feminist post-Keynesian/post-Kaleckian model to theoretically analyze the effects of labor market and fiscal policies on output, productivity, employment of men and women and public sector budget balance. The model aims to support empirical analysis to gender macroeconomic policies in the developing countries and explore the conditions for a broader concept of development including gender equitable human development.

We synthesize and extend the gendered macroeconomic models by Elissa Braunstein, Irene van Staveren and Daniele Tavani (2011) and Stephanie Seguino (2010, 2012), who incorporate both demand and supply-side effects of gender equality in structuralist, post-Keynesian/post-Kaleckian models.

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 emphasized 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. An increasing wage share in national income or higher gender equality can have both positive and negative effects on output. 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 behavioral 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 labor. Furthermore, 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. Similarly, social norms may lead to a lower probability of women completing secondary and/or tertiary education in many countries around the world, which also creates a systemic disadvantage for them in the labor market. Moreover, social norms lead to women doing a higher share of unpaid care work and less market work. Neoclassical labor 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. Labor supply is inelastic, and employment is demand-constrained, not supply-determined.

Neoclassical macroeconomic models on the effects of gender inequality focus on the supply-side, in particular the effects of intra household bargaining on fertility, savings and human capital (e.g. Agenor and Agenor, 2014; Doepke and Tertilt, 2016; Fukui, Nakamura, and Steinsson, 2019); however they do not analyze the demand-side effects and ignore how demand constraints may lead to involuntary unemployment if an increase in gender equality in education or a decline in labor market imperfections such as wage discrimination and occupational segregation lead to higher female labor force participation (FLFP). They also do not analyze the effects of higher FLFP squeezing unpaid care in the absence of public provision of social infrastructure. On the contrary a rise in public spending in social infrastructure may lead to even negative effects on output as neoclassical models would not allow for high multiplier effects of public spending; investment is determined simply by savings rather than a behavioral model, and higher government spending leads to higher public borrowing and may even lead to lower private investment. Lower gender pay gap in the public sector leading to higher deficit may lead to similar negative effects in a neoclassical model.

Among the feminist structuralist, post-Keynesian/post-Kaleckian model Stephanie Seguino (2012) explicitly incorporate the public sector, the effect of public investment in physical and social infrastructure on private investment. Stephanie Seguino (2010, 2012) present both a short and long-run analysis incorporating endogenous technological change including the effects of gender equality, demand and public spending on productivity. Elissa Braunstein, Irene van Staveren and Daniele Tavani (2011) incorporate the effects of unpaid work and care as a gendered input into the market output, but they do not explicitly model the public sector or endogenous technological change, although the effects of care input on productivity is implicitly discussed. In all three papers there is recognition of the structural features of an economy that relies on human services or traditional sectors that primarily employs women, but essentially the analysis is at aggregate level without explicit modelling of sectoral output or employment of different sectors. Modelling and analysis of paid employment at a sectoral level is also not detailed, in particular the separate and opposite effects of an increase in output and productivity on employment is not analyzed. While Seguino (2012) and Braunstein, van Staveren and Tavani (2011) focus on the closed economy, Seguino (2010) detail the effects of gender equality on the balance of payments furthering earlier work by Robert Blecker and Stephanie Seguino (2002) and Korkut Ertürk and Nilüfer Çağatay (1995).

Synthesizing and extending these three feminist structuralist post-Keynesian/post-Kaleckian macroeconomic models, we develop a three-sector gendered open economy model with physical and social sectors (health, social care, education, childcare) 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 labor and capital.

On the demand-side, we model behavioral equations for household consumption in physical and social sectors, private investment, net exports, taxes and government investment in in physical and social infrastructure and current government spending.

An explicit modelling of consumption in different sectors has important consequences for gendering macroeconomic analysis. Higher gender equality in wages or employment could change the composition of consumption. By modelling consumption in two different market sectors explicitly, we allow for a formal analysis of the effects of different behavior by women and men in terms of marginal propensity to consume (MPC) out of their income on different types of goods and services. While there is macro-econometric evidence that the MPC out of wages are higher than that out of profits (see Onaran and Galanis, 2014 for a review), micro-level evidence shows that the propensity to save is higher for women than men and women tend to devote a larger share of their income to satisfy the needs of the household or on social expenditures like education and healthcare compared to men (Blumberg, 1991; Pahl, 2000; Stotsky, 2006; Morrison, Raju, and Sinha, 2007; Antonopoulos et al, 2010; Seguino and Floro, 2013). In developing countries women are also 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 (Seguino, 2010; 2012; Kabeer, 1997).

The analysis of the government sector, in particular the disaggregated modelling of social vs physical infrastructure is also crucial for a gendered macroeconomic analysis. The development of the social sector in the market economy with services provided by paid labor, 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 labor 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. Thirdly, both the public supply of social services and increased paid employment opportunities could transform gender norms

concerning division of labor (Folbre and Nelson, 2000). Furthermore, public investment in times of underemployment/unemployment can compensate for the lack of effective demand in the economy.

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, household spending in the social sector, unpaid domestic care labor, wages of men and women, and growth.

We explicitly model paid employment of women and men in separate sectors and not just output. Employment (in hours) is determined by output in different sectors and endogenously changing labor productivity.

Demand influences output 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 labor such as gendered sectoral composition of employment, occupational segregation, institutions, and social norms regarding gendered consumption behavior as well as the distribution of unpaid domestic care labor affect output, productivity and employment.

The model considers the role of unpaid domestic work, in particular its positive effects on labor productivity in the long run. Through its effect on productivity, unpaid care work also affects output in the long run.

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) 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 analyze 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 labor and capital income.

We examine the impact of labor market and fiscal policies on each component of aggregate output, which helps to identify the mechanisms of the effects. The model examines both short-run and long-run effects and presents the difference between them. 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 have both demand-side effects in the 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. For example, we expect public investment in social infrastructure to reduce women's unpaid domestic care work and increase their employment. The model anticipates that aggregate demand is stimulated both in the short and the long run. 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; hence there are opposite effects of output and productivity on employment. The long-run impact on productivity also depends on how much of the rise in paid employment decreases unpaid care labor and whether public spending in social infrastructure can more than offset the effects of the decline in unpaid domestic care labor.

As each variable corresponds to concrete variables available in national accounts or labor force statistics, the behavioral equations in the theoretical model can be econometrically estimated and the analytical solutions in the appendices can be used to calculate the effects of different policies.

2. A feminist post-Kaleckian theoretical model

In this section, we develop the model with two types of workers, female and male, which are respectively denoted by scripts F and M. The profits are earned by the capitalists, which are genderless for simplicity.

The model has three sectors, public social sector, which consists of the expenditures of the government in education, childcare, healthcare, and social care (denoted with script H), the rest of the economy (denoted with script N) and the unpaid care sector.[i] 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 labor productivity in the long run. The Online Appendix 1 presents list of the variables in the model.

Aggregate output (Y_t) is the sum of male and female wage bill (WB_t^M and 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 show that average hourly male wages in the social sector are higher than average hourly female wages for most of the developing economies with an exception of 3 (out of 38) countries. Moreover, in 31 out of 38 countries average hourly male wages in the rest of the economy are higher than average hourly female wages. 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

We define gender wage gaps (α_t) for wages in H and N as below:

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

Following Table 1 we consider that $\alpha_t^H > 1$ is more likely for the majority of the developing economies and $\alpha_t^N > 1$ condition applies to most of the developing economies.

The aggregate output in the market economy (GDP) 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 expenditures[ii], 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 sector[iii], X_t is exports of goods and services and M_t is imports of goods and services.

The public social expenditures are a fiscal policy decision targeted as a share of aggregate output (κ_t^H) and constitutes the public social sector output (Y_t^H)[iv]. 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:

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

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

The employment in N is output over labor productivity in N (T_t^N):

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

The share of female employment in N is exogenous and institutionally and socially determined by occupational segregation and is denoted by β_t^N. The male workers in N constitute $(1 - \beta_t^N)$ of the sector:

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

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

Table 1 shows that the number of male workers is greater than the number of female workers in N for all the emerging economies reported. Hence, $\beta_t^N < 0.50$ is a likely outcome for an emerging economy.

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-labor inputs used constitute part of government consumption (G^C). 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.

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

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.

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

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

In Table 1, we observe that the share of female workers in H is larger than the share of female workers in N for all countries. Moreover, in 80% of emerging economies in Table 1, the share of female workers in H are over 50%. Therefore, a rise in the share of H in aggregate output would also increase the share of female workers in total employment in the majority of the cases.

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

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

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 labor, since it would decrease the time that could be allocated for care($q_F < 0, q_M < 0$). Higher government expenditures in H are also expected to reduce the need for domestic care; therefore, it would lead to lower unpaid labor ($q_G < 0$). 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 N. The profits are earned by the capitalists and is their income in N after wage payments.

$$R_t = Y_t^N - \ w_t^{NF} E_t^{NF} \ - w_t^{NM} \ E_t^{NM} \tag{17}$$

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

$$\pi_t = \frac{Y_t^N - \ w_t^{NF} E_t^{NF} \ - w_t^{NM} \ E_t^{NM}}{Y_t^N} \tag{18}$$

The next set of equations present the behavioral 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 of female and male workers in H and N 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, 2015; 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. The non-linearities in the relationship between sources of incomes and consumption might be an outcome of changing propensities to consume with changing incomes.

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

The marginal propensity to consume in N is assumed to be different for male and female workers in N, reflecting the gender pay gaps as well as differences in behavior.

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, and governments' social expenditures:

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

The marginal propensity to consume social goods is different for male and female workers in N. 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.[v] Following this assumption, governments' social expenditures (G_t^H) can *i)* increase households' social expenditures by providing wage income in H, *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 N, as mentioned above.

Next, private investment (I_t) is

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

where D is 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 N. Following Amit Bhaduri and Stephen Marglin (1990), 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 Thomas Obst, Özlem Onaran and Maria Nikolaidi (2020).

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*.

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

Exports are shown by X:

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

The income of the trading partners (Y_t^{World}) and the real deprecation 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 unit labor costs, and hence would increase the export competitiveness and hence exports of an economy ($x_2 > 0$). Imports are shown by M:

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

Higher domestic demand in N would stimulate the demand on imported goods and services ($n_1 > 0$) and the real deprecation 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 labor 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 labor costs are real unit labor costs multiplied by domestic prices, and the wage share is identical to real unit labor 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 labor intensity of exports, the pass through from labor 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), Özlem Onaran and Giorgos Galanis (2014) find that an increase in profit share increases net exports. Similarly, Ensar Yilmaz (2015) and Bruno Jetin and Ozan Kurt (2016) also respectively find a strong positive impact of profit shares on net exports in Turkey and Thailand. Germán 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, labor 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 H is given and simply equal to output per hour of employment in both the short and the long run.[vi] Labor productivity in N (T_t^N) is

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

In the long run, the labor 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 labor[vii] to affect labor productivity positively ($h_7, h_8 > 0$). Nevertheless, we expect the effects of these to be realized over the long run, namely in the next period. Higher output would also lead to higher labor 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 Karl Marx (1867) and later the theoretical contributions and empirical findings of C.W.M. (Ro) Naastepad (2006) and Eckhart Hein and Artur Tarassow (2010), we consider that higher female and male wages in N leads to capitalists' preference towards labor-saving technologies, which would increase labor 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. Last, the labor 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 realized, 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.

Unpaid domestic care labor, 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:

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

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

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

In our model for simplicity, we do not model the impact of higher public social infrastructure on labor supply, fertility, and migration. Again, for simplicity we ignore the feedback effects of changes in labor supply and consequently unemployment on wages in the long run. 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 labor 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 labor, β_d. The latter may lead to a further change in occupational segregation, e.g. a decline in β^H or an increase in β^N and lower gender pay gaps in both sectors. While these are interesting extensions, they are outside the scope of this theoretical model, where our primary aim is to analyze the impact of public spending and exogenous changes in wages and gender pay gap on employment of women and men.

3. The effects of the public social expenditures with employment generation in the social sector

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 analyze the case where public social expenditure increases through new public sector employment in the social sector, i.e. hiring more public sector employees in the social sector without changing their hourly wage rate ($w_t^{HM} = w_t^{HM*}, w_t^{HF} = w_t^{HF*}$).

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 labor productivity and public debt/GDP. We will also discuss the overall impact on female and male employment and public debt/GDP.

3.1 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 effect of an increase in the share of public social infrastructure investment in GDP (κ_t^H) on output. The overall impact (Ψ_{tt}^k) is the sum of the direct impact on GDP and the partial effect on each component of demand multiplied by the multiplier term. These effects are shown in detail in Appendix 1.

As summarized in Figure 1, higher public social expenditures will stimulate the consumption in N, since it will generate new employment and income in H. Hence, the short-run effects on consumption in N (apart from the multiplier effects) is due to the partial effect of public social expenditures on female and male employment. The magnitude of the effect on consumption in N depends on the marginal propensities to consume in H for the female and male workers.

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. Based on the female employment shares in Table 1 and as in the literature (e.g. Ilkkaracan, Kim and Kaya, 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 (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), or autonomous private investment (i_0)). The partial (pre-multiplier) effect of public social expenditures on female and male employment in N is zero, as the impact of social expenditures on productivity will be realized only in the next period.

The short-run impact of public social expenditures on consumption in H 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.

For a constant output in N, the short-run partial effect of public social expenditures (κ_t^H) on private investment is due to higher aggregate output because of increasing public social expenditures as well as higher public debt (d_{tt}^k). Higher aggregate output stimulates investment. However, the increase in public social expenditures may lead to an increase in public debt/GDP, which in turn may have a negative effect on private investment ($i_3 < 0$) in the short run due to the crowding out effect, depending on the effect on the interest rate and

interest elasticity of investment. However, the negative effect on public debt/GDP may be moderated as tax revenues as well as GDP increase. The rest of the effects on private investment are due to the multiplier effects of a change in Y^N.

Higher aggregate output stimulates investment. 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 labor productivity in the short run.

The short run partial effects of public social expenditures on exports and imports is zero for a constant output in N, because its partial effect on the profit share is zero in the short run. Finally, an increase in the public social expenditures/GDP has a positive effect on other types of public investment.

In this section we discuss the short-run effects of the public social expenditures on aggregate output due to its direct effects on GDP, consumption, public debt and investment as well as the multiplier effects. In the next section, we discuss the long-run effects on aggregate output.

3.2 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, The long-run impact of public social expenditures is summarized in Figure 2 (also in Appendix 1). The effect in the next period is due to changes in labor productivity and public debt.

Figure 2

Figure 3 summarizes these effects of an increase in social expenditures/GDP on labor productivity in the next period.

First, higher public social investment has a direct positive impact on labor productivity in the next period through better education, childcare, health and social care. However, the positive effects of public social investment may be slightly reduced due to a decrease in both household consumption in the social sector and unpaid care labor, because public social expenditures reduce households' need for social expenditures funded by their own income and unpaid care labor within the household, but we expect these effects to be small and non-linear. First, without significant privatization in the social sector, an increase in public social

expenditures is very unlikely to lead to a large decrease in households' social expenditures that would reverse the positive effects of higher public social expenditures on labor productivity. Second, while the unpaid care work is expected to decrease due to higher social expenditures, it is unlikely to be large enough to offset the positive effects of public social expenditures on labor productivity. Therefore, we expect the overall effect of these three components on labor productivity to be positive. Additionally, higher public social expenditures is likely to lead to an increase in output in the short run, which also influences labor productivity in the next period through the Verdoorn effects as well as the increase in the other public expenditures, which increase together with aggregate output. Last, unpaid labor and households' social expenditures also change along with aggregate output, because higher GDP leads to an increase in employment, which reduces the time available for unpaid care but increases household expenditure in the social sector due to higher income.

Figure 3

Next, we demonstrate the partial long-run impact of public social investment on each component of aggregate demand. First, higher public social investment changes wage income of women and men and profits due to changes in employment, which in turn affect households' consumption in the social sector and the rest of the economy. For a constant output in N, the partial impact of public social investment on female and male employment in N is likely to be negative, since higher public social investment is likely to increase labor productivity as discussed above. This changes income distribution in favor of profits and (for a constant output in N) has a negative partial impact on the consumption of female and male workers in N and H and a positive partial impact on the consumption of the capitalists. If public social expenditures also has a positive effect on GDP in the next period, the overall effects on female and male employment could also be positive as it will be discussed further in Section 3.3.

The share of public social expenditures affects private investment through the effects on the profit share and public debt/GDP in the long run. The public social expenditures affect labor productivity in the next period, which changes the denominator of public debt/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. Higher public social expenditure is likely to increase the profit share due to higher productivity in the next period and stimulate private investment. Finally, higher public social expenditure has a

further positive effect on private investment through the multiplier effects, if it leads to greater output in the rest of the economy in the long run.

Higher profit share also has a partial positive effect on exports and a negative effect on imports.

In summary, the sign of the effect of public social expenditures on aggregate output in the next period depends on its effects on labor productivity which in turn affect the profit share and the public debt/GDP and the magnitude of the consequent crowding out effects. In the next section, we discuss the cumulative effects of public social expenditures on employment.

3.3 The cumulative effects on employment

A higher share of public social expenditure in GDP affects total female and male employment in the short run due to higher aggregate output in addition to directly creating employment in the social sector. Higher aggregate output generates further employment both in the social sector and in the rest of the economy. Table 1 shows that the share of women in hours of employment (β_t^H) is greater than 0.5 in 80% of the selected emerging countries. Based on this, we expect that the direct impact of an increase in public social expenditures on female employment is likely to be larger than its effect on male employment in most developing economies.

Figure 4 summarizes the impact of an increase in public social expenditures on employment. We expect an increase in female and male employment in the short run. In the next period, the effect depends on the relative magnitude of the effects on output and productivity. While higher output increases employment, higher productivity leads to lower labor demand for a given output. if the impact of higher public social expenditures on aggregate output in the next period is positive and large enough to offset the negative effect of higher labor productivity on employment, female and male employment also increase in the long-run. In the unlikely case where the long-run effect of public social expenditures on aggregate output is negative or too small that the negative effect of higher labor productivity dominates, female and male employment can decline in the next period. The cumulative effect depends on the sum of the short-run and long-run effects. From a Keynesian feminist point of view we expect relatively strong multiplier effects of government social spending on output and despite substantial labor productivity effects, it is highly likely that in cumulative in the long-run employment, in particular of women, increases in response to an increase in public social infrastructure spending. However, in the unlikely case where productivity effects more than

offsets the output effects, either other types of public spending or shortening of the working hours with hourly wage compensation could mitigate the negative cumulative effects on employment.

Figure 4

4. The impact of closing the gender wage gap in the social sector on output, employment and public debt

In this section, we examine the case in which the share of public social expenditure in GDP (κ_t^H) increases through closing the gender pay gap in **the social sector** without a direct increase in employment, i.e. without hiring new public sector employees in **the social sector (**H) at the beginning. Hence, the gender wage ratio, α_t^H decreases with a rise in the female wage rate in H with a constant male wage rate ($w_t^{HM} = w_t^{HM*}$). The employment in H is constant ($E_t^{HF} = E_t^{HF*}$, $E_t^{HM} = E_t^{HM*}$) prior to the multiplier effects.

The implications of this case are very similar to the case in which public social expenditure increases with hiring new employees in the public social sector. The main difference between the two cases is through the effects on consumption in the rest of the economy (N). In the short run, an increase in only female wages in H would have a partial effect on consumption in the rest of the economy solely due to higher consumption out of female wage income. For the same amount of increase in κ_t^H, whether the impact on consumption in the rest of the economy is larger in the case of 'new hiring in H' or the case of 'closing the gender wage gap in H 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 of closing the 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 effect of closing the gender pay gap in H on households' social expenditures is the same as in the case of new hiring in H, as for simplicity in our model we did not distinguish the marginal propensity to consume in the social sector out of female and male wages in H.

Similarly, closing the gender pay gap in H increases the share of public social expenditures in GDP, and thereby affects private investment, all other types of public spending as well in the short run.

The short-run impact of closing the gender pay gap in H on total output is summarized in Figure 5 and the detailed effects are derived in the Online Appendix 6.

Figure 5

In the next period the impact of closing gender pay gap in H on the components of aggregate demand is due to the effects on labor productivity. For a constant male wage rate, an increase in the female wage rate in H affects labor productivity due to an increase in public social expenditures. Hence, we expect effects similar to the case in which public social expenditures increase due to new hiring in H as shown in detail in the Online Appendix 6. The main difference arises because for the same amount of change in the share of public social expenditures in GDP, the short-run effects of increasing female wages in H on output is different. This is because changes in output has both a direct and an indirect effect on labor productivity due to changes in unpaid labor, other public expenditures and households' social expenditures, as shown in Figure 3.

The short-run effect of an increase in female wages in H on total employment is solely through its effect on total output. Higher female wages affect total output in N, which leads to changes in employment in N. Moreover, the changes in total output also affect public social expenditures through the multiplier effects which would further affect employment in H.

The effect of higher female wages in H on employment in the next period is determined by the relative magnitude of the effects on total output and labor productivity in the next period. These effects are further analyzed in the Online Appendix 6. If closing the gender pay gap in H leads to an increase in aggregate output high enough to offset the negative effects of a possible increase in labor productivity on labor demand, employment increases in the next period.

Finally, an increase in female wages in H has both a direct impact on public debt/GDP as public social expenditures increase as well as an indirect impact due to changes in aggregate output (Online Appendix 6).

In summary, the effects of closing the gender pay gap in **the social sector** will be similar to the case of hiring more people in **the social sector with constant wage rates** except that the effects in the short run on output is solely due to the effects of the higher female wages in **the social sector** (apart from the multiplier effects) and compared to the first case we expect a lower effect on aggregate output and employment in the economy.

5. Conclusion and policy implications

This paper develops a post-Keynesian/post-Kaleckian feminist model to theoretically analyze the effects of labor market and fiscal policies on growth and employment. We present a three-sector gendered macroeconomic model with physical and social sectors (health, social care, education, childcare) in the public and private market economy, and an unpaid domestic care sector.

This theoretical model can form the basis for the empirical analysis of gender equality and fiscal policy on output 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 stylized facts of a developing economy with a significant unpaid reproductive economy, high gender pay and/or employment gaps, low female labor force participation rate and high occupational segregation. In particular, we can analyze 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 effects of government spending in the other sectors or changes in the tax rates are further potential applications of the model. As the analytical solutions are symmetrical, we do not present them in the paper.

Four important policy implications flow from our analysis: First, regarding fiscal policy, we expect public investment in social infrastructure to reduce women's unpaid domestic care work, while increasing their labor supply and enabling them to spend more time in paid work. Aggregate demand is stimulated both in the short and the long run. 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.

Second, 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 labor 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 spillover 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 and Kim, 2008; Antonopoulos et al., 2010; Ilkkaracan, Kim and Kaya, 2015; Ilkkaracan and Kim, 2018; De Henau et al., 2016), public investment in physical infrastructure creates fewer jobs 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 can further shed light on the gendered policy implications. Similar differences in the impact of wages in different sectors follow. As H is more labor intensive than N, the impact of a wage increase in H on output is expected to be substantially higher.

Third, 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 labor leads to a 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.

Finally, policy mix scenarios can be analyzed by combining 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.

In this paper we modelled the impact of closing gender gaps only for the case of rising female wages with constant male wages. The impact of the case of an alternative scenario of closing gender gaps via an upward convergence can be derived from the model. 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.

One limitation of the model is that it focuses on the real economy and does not include the financial sector and is not useful to analyze monetary policy. However, we model the effect of interest rate on investment via the effects of public debt on interest rate, although from a Keynesian perspective the effect of changes in interest rate on investment is likely to be small.

Overall, the model can be utilized to empirically analyze a specific economy and develop an appropriate policy mix to achieve a gender equitable development given the behavioral parameters of the components of aggregate demand and the structural features of the economy. The model is generalizable to low-income countries that lacks physical or social infrastructure, or a high-income country, but depending on the level of economic development

or gender relations, the relevant parameters and values of sectoral shares, occupational segregation, and pay gaps will differ; hence the effect of policies are an empirical question depending on these parameters and structural features.

To illustrate empirical application, Author 1, 2, and 3 (2019) and Author 2 and 1 (2020) present an econometric estimation of the model for the UK and South Korea respectively, and find positive effects of public social infrastructure on output and female and male employment not just in the short run but also in the long run, despite strong productivity effects as the multiplier effects are relatively strong. As expected, female employment effects are much stronger. A policy combination of hiring more nursery teachers, care workers, nurses and teachers and paying them higher wages in the public sector leads to both greater equality and higher employment for both women and men and higher productivity.

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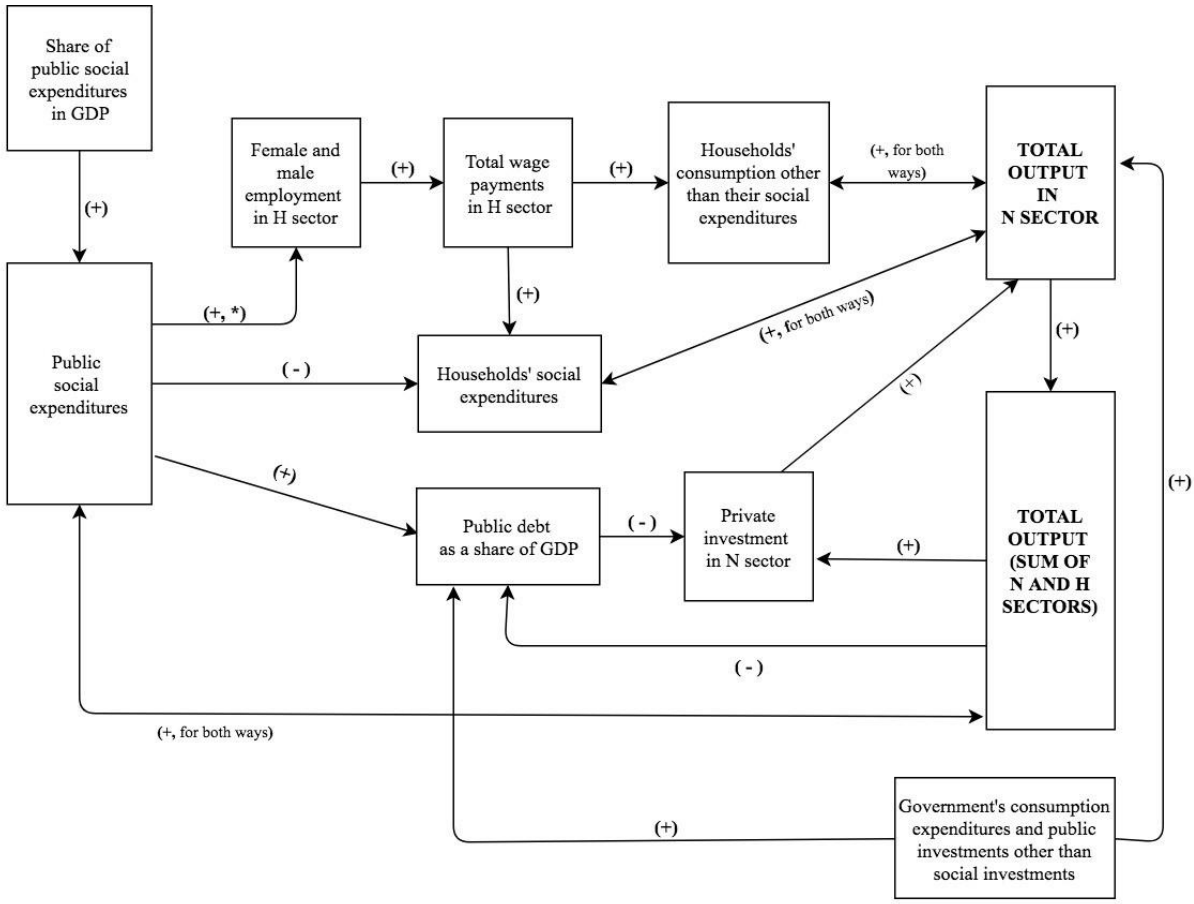
Table 1: The female employment share and average hourly male wage/female wage ratio in selected emerging economies

Country	Year	Women's share in hours of employment		Average male wage/female wage (Hourly rate)	
		Rest of the economy	*Social sector*	*Rest of the economy*	*Social sector*
Argentina	2019	0.327	0.693	1.043	1.032
Azerbaijan	2018	0.254	0.735	1.590	1.242
Bangladesh	2017	0.221	0.433	1.166	1.147
Bolivia	2009	0.289	0.619	1.401	1.493
Brazil	2019	0.395	0.752	1.208	1.414
Cambodia	2017	0.410	0.533	1.068	1.212
Chile	2015	0.310	0.697	1.139	1.509
Colombia	2019	0.334	0.687	0.912	1.288
Costa Rica	2019	0.317	0.581	0.910	1.033
Côte d'Ivoire	2017	0.219	0.355	1.315	1.471
Dominican R.	2019	0.413	0.729	-	-
Ecuador	2016	0.281	0.657	0.980	1.107
Egypt	2018	0.086	0.550	1.114	1.146
El Salvador	2018	0.337	0.627	1.143	0.984
Ethiopia	2013	0.329	0.418	1.510	1.275
Guatemala	2016	0.249	0.613	1.117	1.012
Honduras	2018	0.300	0.648	0.942	1.010
Indonesia	2015	0.272	0.582	1.222	1.087
Iran	2018	0.109	0.474	-	-
Malaysia	2018	0.334	0.673	1.135	1.196
Mexico	2019	0.324	0.634	1.105	1.131
Myanmar	2019	0.387	0.792	1.083	1.009
Nepal	2017	0.213	0.480	1.249	1.464
Pakistan	2018	0.086	0.353	1.830	1.329
Peru	2019	0.341	0.615	1.124	1.131
Philippines	2019	0.332	0.704	0.974	0.917
Romania	2018	0.391	0.783	1.049	1.075
Russia	2017	0.406	0.800	1.280	1.049
Saudi Arabia	2015	0.080	0.389	2.121	1.151
South Africa	2018	0.388	0.724	1.439	1.389
South Korea	2018	0.344	0.743	1.311	1.585
Sri Lanka	2018	0.265	0.632	1.146	0.941
Tanzania	2014	0.250	0.509	1.334	1.119
Thailand	2019	0.430	0.722	1.040	1.117
Turkey	2014	0.208	0.588	0.979	1.314
Uganda	2017	0.256	0.454	1.310	1.892
Ukraine	2017	0.408	0.806	1.165	1.078
Uruguay	2018	0.370	0.736	1.124	1.090
Venezuela	2012	0.304	0.731	0.948	1.023
Vietnam	2019	0.400	0.705	1.080	1.154
AVERAGE		**0.299**	**0.624**	**1.200**	**1.201**

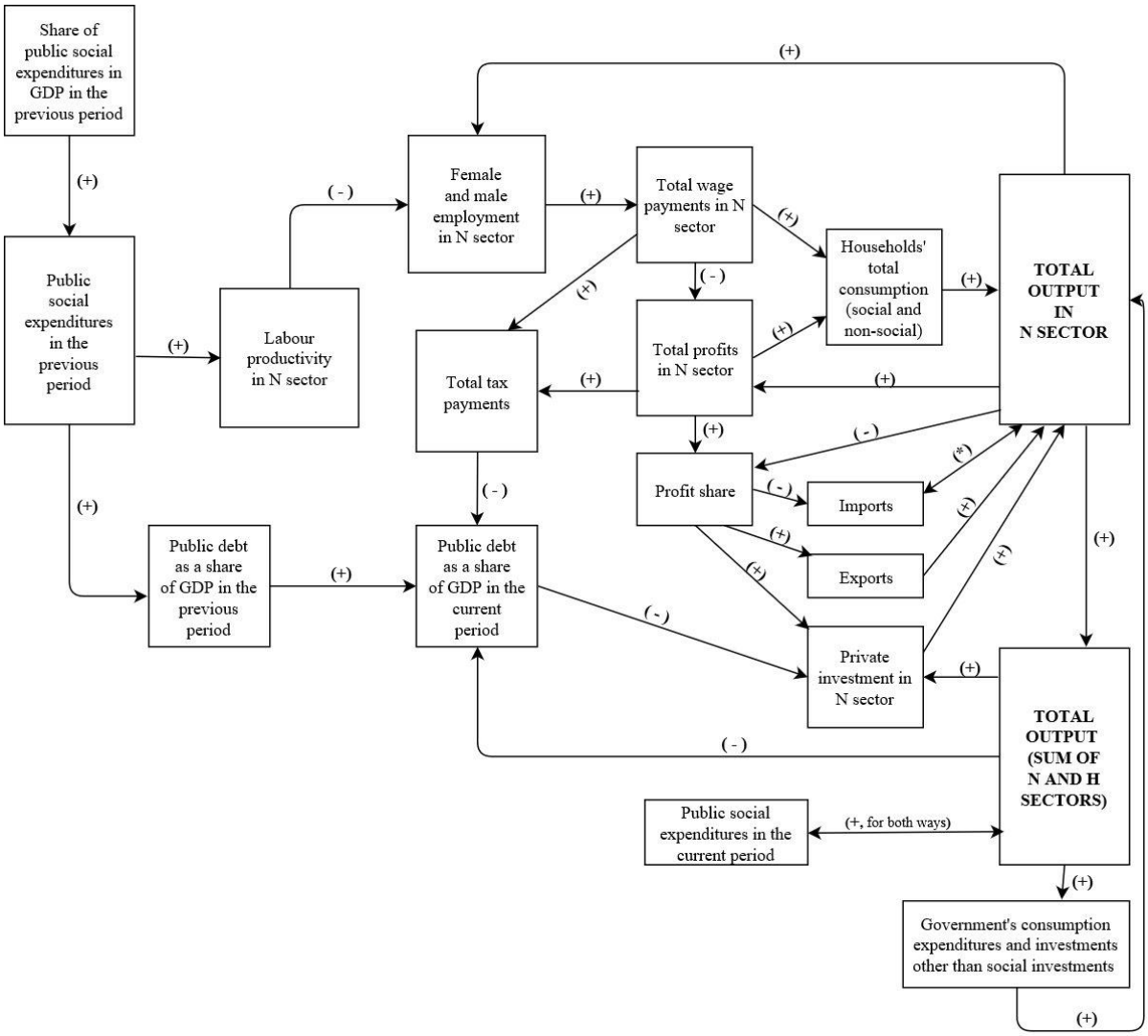
Notes: Own calculations based on data on the number of employees, mean weekly hours worked per employed person and mean monthly nominal earnings of employees by sex and economic activity provided by the ILO (2020) ILOSTAT Database. We report the latest observations for the emerging economies, for which the relevant data is available. Healthcare, social care and education activities are considered as the social sector and other sectors are part of the rest of the economy. Data for Argentina is urban only.

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



* 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.

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



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.

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

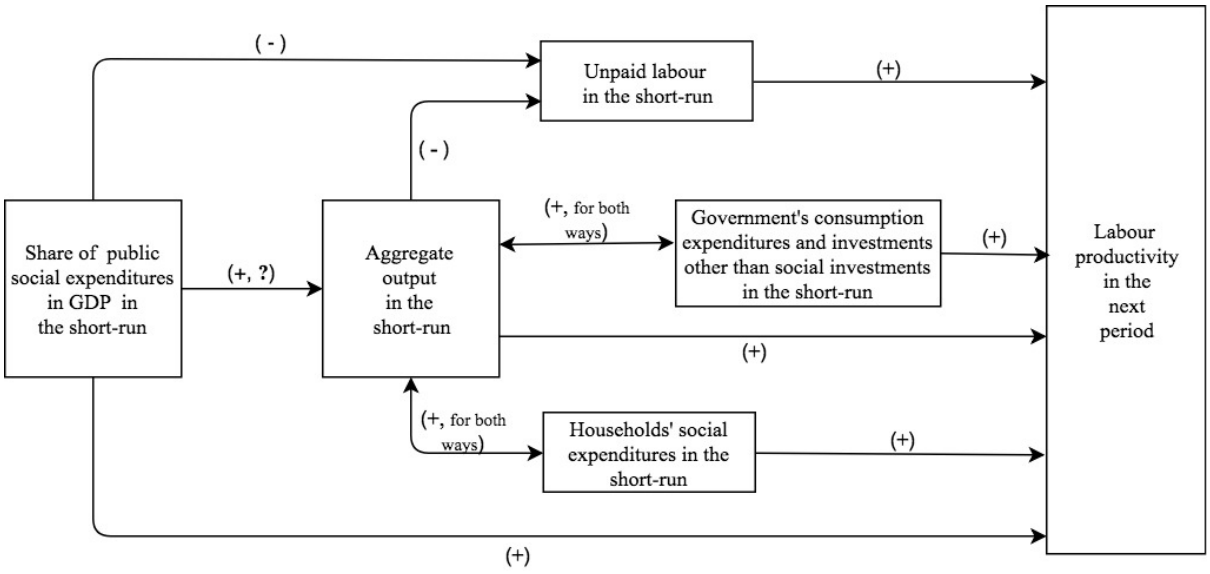


Figure 4: The impact of an increase in share of public social expenditures as a share of GDP on total employment in the short-run and the next period

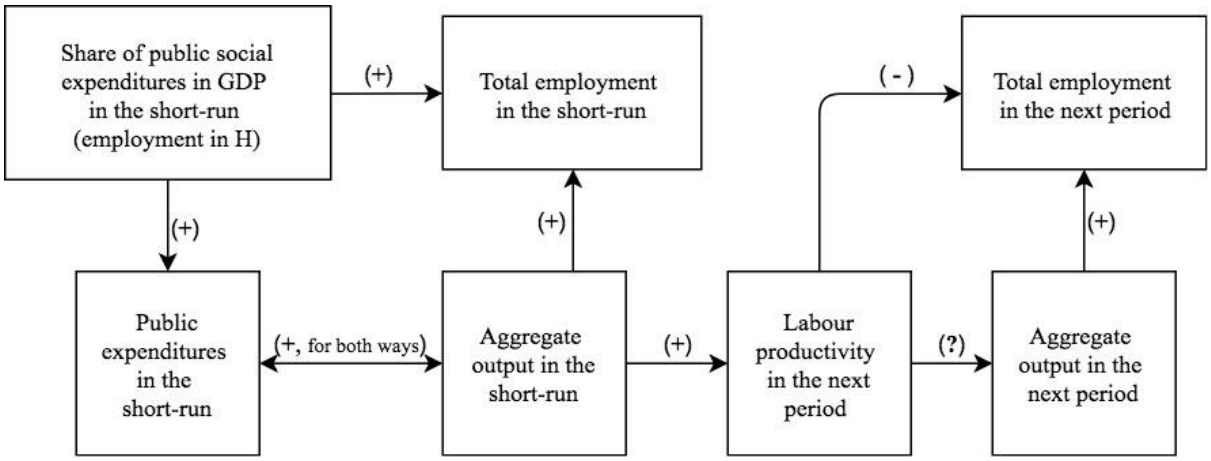
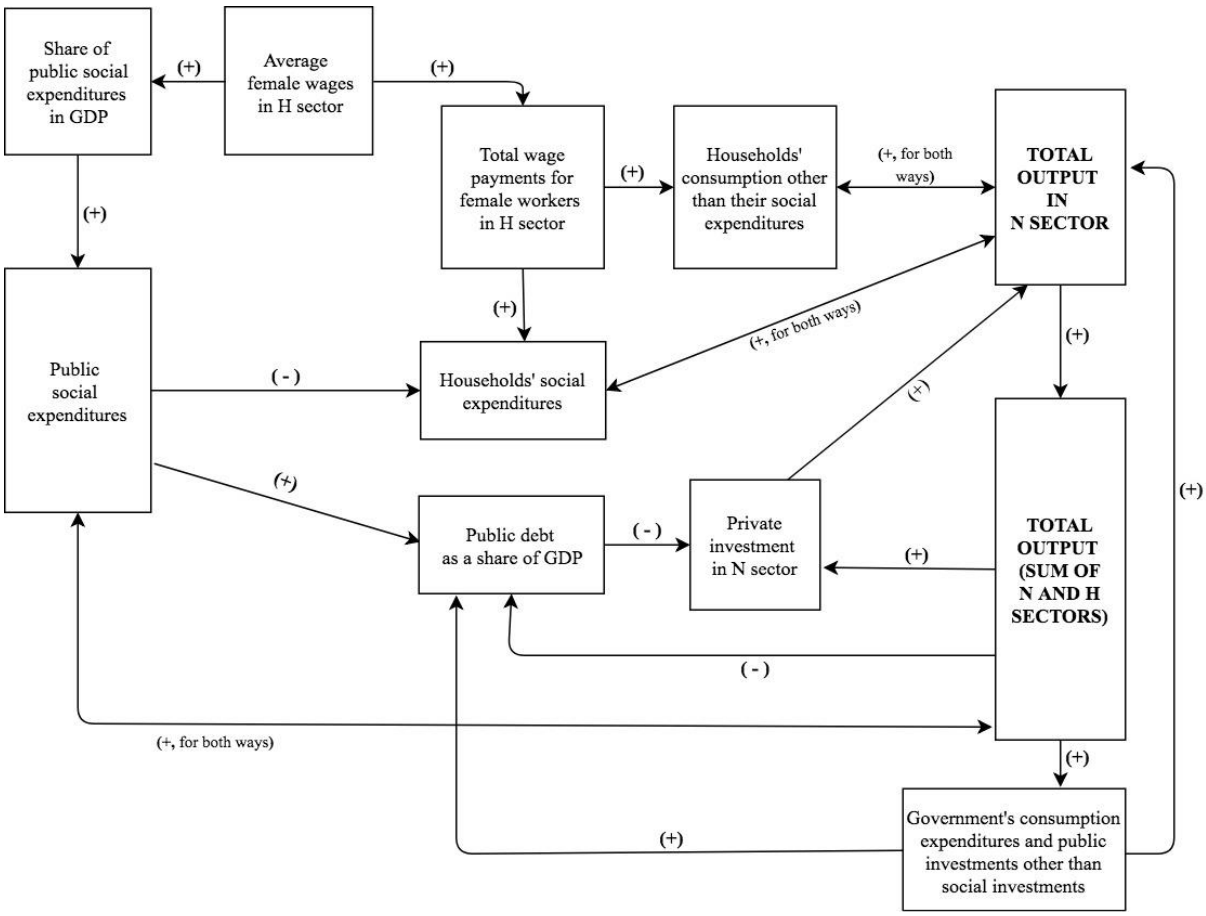


Figure 5: The short-run impact of closing the gender pay gap in H on total output



Appendix 1: The effects of a change in the share of public social infrastructure investment in GDP

A1.1 The short-run effects

The short-run effects of higher share of public social expenditures are shown in equation (A1.1)

$$\Psi_{tt}^{k} = \frac{dY_t}{d\kappa_t^H} = \frac{dY_t}{dY_t^N}\frac{\partial Y_t^N}{\partial \kappa_t^H} + \left.\frac{\partial Y_t}{\partial \kappa_t^H}\right|_{Y_t^N}$$
$$= \left(\frac{\left.\frac{\partial C_t^N}{\partial \kappa_t^H}\right|_{Y_t^N} + \left.\frac{\partial C_t^H}{\partial \kappa_t^H}\right|_{Y_t^N} + \left.\frac{\partial I_t}{\partial \kappa_t^H}\right|_{Y_t^N} + \left.\frac{\partial X_t}{\partial \kappa_t^H}\right|_{Y_t^N} - \left.\frac{\partial M_t}{\partial \kappa_t^H}\right|_{Y_t^N} + \left.\frac{\partial G_t^C}{\partial \kappa_t^H}\right|_{Y_t^N} + \left.\frac{\partial I_t^G}{\partial \kappa_t^H}\right|_{Y_t^N}}{1-\varphi_k} + Y_t \right) \quad \text{(A1.1)}$$
$$* \ \frac{1}{(1-\kappa_t^H)}$$

where

$$\varphi_k = \left.\frac{\partial C_t^N}{\partial Y_t^N}\right|_{\kappa_t^H} + \left.\frac{\partial C_t^H}{\partial Y_t^N}\right|_{\kappa_t^H} + \left.\frac{\partial I_t}{\partial Y_t^N}\right|_{\kappa_t^H} + \left.\frac{\partial X_t}{\partial Y_t^N}\right|_{\kappa_t^H} - \left.\frac{\partial M_t}{\partial Y_t^N}\right|_{\kappa_t^H} + \left.\frac{\partial G_t^C}{\partial Y_t^N}\right|_{\kappa_t^H} + \left.\frac{\partial I_t^G}{\partial Y_t^N}\right|_{\kappa_t^H} \quad \text{(A1.2)}$$

The multiplier term for N is $\left(\frac{1}{1-\varphi_k}\right)\left(\frac{1}{1-\kappa_t^H}\right)$ which is derived in Online Appendix 2.

The short run partial impact of public social expenditures (κ_t^H) on consumption in N is below for a given level of output in N (Y_t^N=Y_t^{N*}) prior to the multiplier effects.

$$\left.\frac{\partial C_t^N}{\partial \kappa_t^H}\right|_{Y_t^N} = C_t^N\left(c_{HF}\frac{e_{kt}^{HF}w_t^{HF}}{WB_t^{HF}} + c_{HM}\frac{e_{kt}^{HM}w_t^{HF}\alpha_t^H}{WB_t^{HM}}\right) > 0 \quad \text{(A1.3)}$$

Figure 1

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

$$\left.\frac{\partial C_t^H}{\partial \kappa_t^H}\right|_{Y_t^N} = C_t^H\left(z_G\frac{1}{(1-\kappa_t^H)\kappa_t^H}\right) \quad \text{(A1.4)}$$

As discussed above, the sign for equation (A1.4) is ambiguous, but it's likely to be negative.

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

$$\left.\frac{\partial I_t}{\partial \kappa_t^H}\right|_{Y_t^N} = I_t \left(i_1 \frac{1}{1-\kappa_t^H} + i_2 \frac{\left.\frac{\partial \pi_t}{\partial \kappa_t^H}\right|_{Y_t^N}}{\pi_t} + i_3 \frac{d_{tt}^k}{\left(\frac{D}{Y}\right)_t} \right) \tag{A1.5}$$

where the partial impact on the profit share is zero for a constant output in N.

$$\left.\frac{\partial \pi_t}{\partial \kappa_t^H}\right|_{Y_t^N} = 0 \tag{A1.6}$$

For a constant output in N, the impact of rising public debt/GDP on investment is likely to be negative ($i_3 < 0$) in the short run); however, the rise in public debt/GDP can be reduced due to rising tax revenues as well as increasing GDP (See Online Appendix 3).

The short-run partial impact of higher public social expenditure/GDP on exports and imports is zero, since the partial impact on the profit share is zero, as shown below:

$$\left.\frac{\partial X_t}{\partial \kappa_t^H}\right|_{Y_t^N} = X_t \left(x_2 \frac{\left.\frac{\partial \pi_t}{\partial \kappa_t^H}\right|_{Y_t^N}}{\pi_t} \right) = 0 \tag{A1.7}$$

$$\left.\frac{\partial M_t}{\partial \kappa_t^H}\right|_{Y_t^N} = M_t \left(n_2 \frac{\left.\frac{\partial \pi_t}{\partial \kappa_t^H}\right|_{Y_t^N}}{\pi_t} \right) = 0 \tag{A1.8}$$

Finally, the positive impact of higher public social expenditures on different types of government expenditures is shown below:

$$\left.\frac{\partial G_t^H}{\partial \kappa_t^H}\right|_{Y_t^N} = \frac{Y_t^N}{(1-\kappa_t^H)^2} > 0 \tag{A1.9}$$

$$\left.\frac{\partial G_t^C}{\partial \kappa_t^H}\right|_{Y_t^N} = \frac{\kappa_t^C Y_t^N}{(1-\kappa_t^H)^2} > 0 \tag{A1.10}$$

$$\left.\frac{\partial I_t^G}{\partial \kappa_t^H}\right|_{Y_t^N} = \frac{\kappa_t^G Y_t^N}{(1-\kappa_t^H)^2} > 0 \tag{A1.11}$$

A1.2 The next period

The long-run effect of a rising share of social expenditures in GDP on aggregate output is shown in equation (A1.12):.

$$\begin{aligned}\Psi_{t(t-1)}^k = \frac{dY_t}{d\kappa_{t-1}^H} &= \frac{dY_t}{dY_t^N}\frac{dY_t^N}{d\kappa_{t-1}^H} \\ &= \frac{\left.\frac{\partial C_t^N}{\partial \kappa_{t-1}^H}\right|_{Y_t^N} + \left.\frac{\partial C_t^H}{\partial \kappa_{t-1}^H}\right|_{Y_t^N} + \left.\frac{\partial I_t}{\partial \kappa_{t-1}^H}\right|_{Y_t^N} + \left.\frac{\partial X_t}{\partial \kappa_{t-1}^H}\right|_{Y_t^N} - \left.\frac{\partial M_t}{\partial \kappa_{t-1}^H}\right|_{Y_t^N}}{(1-\varphi_k)(1-\kappa_t^H)} \\ &+ \frac{\left.\frac{\partial G_t^C}{\partial \kappa_{t-1}^H}\right|_{Y_t^N} + \left.\frac{\partial I_t^G}{\partial \kappa_{t-1}^H}\right|_{Y_t^N}}{(1-\varphi_k)(1-\kappa_t^H)}\end{aligned} \tag{A1.12}$$

where $\frac{1}{(1-\varphi_k)(1-\kappa_t^H)}$ is the multiplier.

To derive the partial effect of κ_{t-1}^H on each component of GDP, we first exhibit its influence on labor productivity as the public social investments affect the profit share and employment in the next period through labor productivity in equation (A1.13).

$$\begin{aligned}\left.\frac{\partial T_t^N}{\partial \kappa_{t-1}^H}\right|_{Y_t^N} = T_t^N \Bigg(&\frac{h_1}{\kappa_{t-1}^H} + \frac{h_7 z_G + h_8 q_G}{\kappa_{t-1}^H} + \frac{(h_1+h_2+h_3+h_4)}{Y_{t-1}}\Psi_{tt}^k \\ &+ \frac{\big((z_G+z_R+z_F+z_M)h_7 + (q_G+q_F+q_M)h_8\big)}{Y_{t-1}}\Psi_{tt}^k \\ &- \frac{h_7(z_F+z_M-z_R)+h_8(q_F+q_M)}{1-\kappa_{t-1}^H}\Bigg)\end{aligned} \tag{A1.13}$$

Next, the partial impact of public social investment on consumption in N and H in the next period are respectively shown in the equations (A1.14) and (A1.15):

$$\left.\frac{\partial C_t^N}{\partial \kappa_{t-1}^H}\right|_{Y_t^N} = C_t^N \left(c_{NF} \frac{\left(e_{k(t-1)}^{NF} w_t^{NF}\right)}{WB_t^{NF}} + c_{NM} \frac{\alpha_t^N \left(e_{k(t-1)}^{NM} w_t^{NF}\right)}{WB_t^{NM}} - c_R \frac{(e_{k(t-1)}^{NM} \alpha_t^N + e_{k(t-1)}^{NF}) w_t^{NF}}{R_t} \right) \tag{A1.14}$$

$$\left.\frac{\partial C_t^H}{\partial \kappa_{t-1}^H}\right|_{Y_t^N} = C_t^H \left(z_F \frac{\left(e_{k(t-1)}^{NF} w_t^{NF}\right)}{WB_t^{NF}} + z_M \frac{\alpha_t^N \left(e_{k(t-1)}^{NM} w_t^{NF}\right)}{WB_t^{NM}} - z_R \frac{(e_{k(t-1)}^{NM} \alpha_t^N + e_{k(t-1)}^{NF}) w_t^{NF}}{R_t} \right) \tag{A1.15}$$

where $e_{k(t-1)}^{NF}$ 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 in the next period. The partial impact of κ_{t-1}^H on employment in N due to changes in labor productivity is shown in more detail in Online Appendix 3.

(A1.16) demonstrates the share of public social expenditures effect on private investment.

$$\left.\frac{\partial I_t}{\partial \kappa_{t-1}^H}\right|_{Y_t^N} = I_t \left(i_2 \frac{\left.\frac{\partial \pi_t}{\partial \kappa_{t-1}^H}\right|_{Y_t^N}}{\pi_t} + i_3 \frac{d_{t(t-1)}^k}{\left(\frac{D}{Y}\right)_t} \right) \tag{A1.16}$$

where $d_{t(t-1)}^k$ is the partial effect of rising public social expenditures on public debt/GDP. The sign of $d_{t(t-1)}^k$ is ambiguous (See Online Appendix 4).

The sign of the effect on the profit share, $\left.\frac{\partial \pi_t}{\partial \kappa_{t-1}^H}\right|_{Y_t^N}$, depends on the effect of higher public social expenditures on labor productivity as shown below; however, we expect it to be positive as $\left.\frac{\partial T_t^N}{\partial \kappa_{t-1}^H}\right|_{Y_t^N}$ is more likely to be positive.

$$\left.\frac{\partial \pi_t}{\partial \kappa_{t-1}^H}\right|_{Y_t^N} = \left(\frac{(\alpha_t^N - \alpha_t^N \beta_t^N + \beta_t^N) w_t^{NF}}{(T_t^N)^2} \right) \left.\frac{\partial T_t^N}{\partial \kappa_{t-1}^H}\right|_{Y_t^N} \tag{A1.17}$$

Finally, for a constant output in N, the partial effect of public social expenditures on exports and imports are expected to be positive and negative respectively as it is more likely that $\frac{\partial T_t^N}{\partial \kappa_{t-1}^H}\Big|_{Y_t^N} > 0$ and hence $\frac{\partial \pi_t}{\partial \kappa_{t-1}^H}\Big|_{Y_t^N} > 0$.

$$\frac{\partial X_t}{\partial \kappa_{t-1}^H}\Big|_{Y_t^N} = X_t \left(x_2 \frac{\frac{\partial \pi_t}{\partial \kappa_{t-1}^H}\Big|_{Y_t^N}}{\pi_t} \right) \tag{A1.18}$$

$$\frac{\partial M_t}{\partial \kappa_{t-1}^H}\Big|_{Y_t^N} = M_t \left(n_2 \frac{\frac{\partial \pi_t}{\partial \kappa_{t-1}^H}\Big|_{Y_t^N}}{\pi_t} \right) \tag{A1.19}$$

A1.3 The effects on employment and public debt

(A1.20) and (A1.21) show the effects of a higher share of public social expenditure in GDP on female and male employment respectively in the short run.

A higher share of public social expenditure in GDP affects total female employment due to increasing aggregate output and its direct impact on employment in the social sector:

$$\frac{dE_t^F}{d\kappa_t^H} = \left(\beta_t^N \frac{(1-\kappa_t^H)}{T_t^N} + \beta_t^H \frac{\kappa_t^H}{w_t^{HF}(\beta_t^H + \alpha_t^H - \beta_t^H \alpha_t^H)} \right) \Psi_{tt}^k + \frac{\beta_t^H Y_t^N}{w_t^{HF}(\beta_t^H + \alpha_t^H - \beta_t^H \alpha_t^H)(1-\kappa_t^H)^2} \tag{A1.20}$$

$$\frac{dE_t^M}{d\kappa_t^H} = \left((1-\beta_t^N) \frac{(1-\kappa_t^H)}{T_t^N} + (1-\beta_t^H) \frac{\kappa_t^H}{w_t^{HF}(\beta_t^H + \alpha_t^H - \beta_t^H \alpha_t^H)} \right) \Psi_{tt}^k + \frac{(1-\beta_t^H) Y_t^N}{w_t^{HF}(\beta_t^H + \alpha_t^H - \beta_t^H \alpha_t^H)(1-\kappa_t^H)^2} \tag{A1.21}$$

Overall, the effect of increasing share of public social expenditures in GDP on employment is:

$$\frac{dE_t}{d\kappa_t^H} = \left(\frac{1-\kappa_t^H}{T_t^N} + \frac{\kappa_t^H}{w_t^{HF}} \right) \Psi_{tt}^k + \frac{Y_t^N}{w_t^{HF}(\beta_t^H + \alpha_t^H - \beta_t^H \alpha_t^H)(1-\kappa_t^H)^2} \tag{A1.22}$$

The effect of increasing public social expenditures on total female and male employment in the next period are respectively shown in equations (A1.23) and (A1.24):

$$\frac{dE_t^F}{d\kappa_{t-1}^H} = e_{k(t-1)}^{NF} + \left(\beta_t^N \frac{(1-\kappa_t^H)}{T_t^N} + \frac{\beta_t^H \kappa_t^H}{w_t^{HF}(\beta_t^H + \alpha_t^H - \beta_t^H \alpha_t^H)}\right)\Psi_{t(t-1)}^k \qquad \text{(A1.23)}$$

$$\frac{dE_t^M}{d\kappa_{t-1}^H} = e_{k(t-1)}^{NM} + \left((1-\beta_t^N)\frac{(1-\kappa_t^H)}{T_t^N} + \frac{(1-\beta_t^H)\kappa_t^H}{w_t^{HF}(\beta_t^H + \alpha_t^H - \beta_t^H \alpha_t^H)}\right)\Psi_{t(t-1)}^k \qquad \text{(A1.24)}$$

Last, the total effect of increasing public social expenditures on total employment in the long run is given in equation (A1.25).

$$\frac{dE_t}{d\kappa_{t-1}^H} = e_{k(t-1)}^{NM} + e_{k(t-1)}^{NF} + \left(\frac{(1-\kappa_t^H)}{T_t^N} + \frac{\kappa_t^H}{w_t^{HF}(\beta_t^H + \alpha_t^H - \beta_t^H \alpha_t^H)}\right)\Psi_{t(t-1)}^k \qquad \text{(A1.25)}$$

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

$$\frac{d\left(\frac{D}{Y}\right)_t}{d\kappa_t^H} = d_{tt}^k + d_{tt}^Y \Psi_{tt}^k \qquad \text{(A1.26)}$$

$$\frac{d\left(\frac{D}{Y}\right)_t}{d\kappa_{t-1}^H} = d_{t(t-1)}^k + d_{tt}^Y \Psi_{t(t-1)}^k \qquad \text{(A1.27)}$$

Endnotes

[ii] H refers to the sector producing "human capabilities" as defined by Braunstein et al. (2011). N refers to the rest of the economy producing goods and services outside this sector, or simply "non-human capabilities" sectors.

[ii] We preserved the term "consumption" for this category consistent with the definitions in national accounts.

[iii] Government's social infrastructure expenditures are classified as current spending on labor 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 labor intensive while construction, just as most other parts of I_t^G is male labour intensive.

[iv] For simplicity, we assume that H only consists of the public social sector. The employment and supply in this sector are entirely financed by public social expenditures and funded by either taxation or borrowing, and the households do not pay for these in-kind publicly provided services. The households' private social consumption (see equation 21) is supplied by the private market output in the rest of economy (Y_t^N). Hence, private social consumption does not directly contribute to the generation of employment in H sector; however, they affect labor productivity in the next period positively as discussed below.

[v] If we allow for the MPC of women and men working in H also to differ, the positive effects of gender equality or public social spending on output and productivity would be amplified, if women have a higher MPC in H as indicated by the micro-econometric evidence..

[vi] Output in H is simply equal to the wage bill in H, as there is no profit in H.

[vii] If there are satellite accounts for time use, the effect of unpaid labor on productivity can be empirically estimated.