The effect of income distribution and gender equality on growth and employment: A gendered macroeconomic model

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"Capitalists earn what they spend, and workers spend what they earn"

N. Kaldor (1956, p.96)

Abstract - Insights from a large body of work contribute to the understanding of how constraints could be relaxed in an effort to promote broadly shared development and growth. Feminist economics' research into the causes and effects of gender inequality has produced valuable new scholarship that sheds light on these relationships. Building on this work, we aspire to highlight the relationship between gender and economic growth, by exploring how relations between men and women in the sphere of employment can influence the rate of economic growth, as well as investment. The suggested vehicle for the analysis is a post-Kaleckian demand-led growth model, which includes gender-specific variables. The economy-wide female relative wage is decomposed into three effects: i) employment effect (sectoral changes), ii) female wage effect (taking into account pay differentials as stimulus for investment), iii) structural wage effect (the impact of a change of male earnings on the economy). Each of these effects produces in turn a set of scenarios that illustrate the conditions under which an economy is lead towards gender-equal growth.

Keywords: gender, income distribution, economic growth, aggregate demand

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1. Introduction

There are several channels through which macroeconomic policies affect gender. The aim of this paper is to outline a macroeconomic model which analyses the various channels through which gender inequalities can influence growth and employment outcomes. Our research brings together Post-Keynesian economics and insights from feminist economics as an alternative and enriching perspective within the heterodox economics sphere. In our case this is achieved by incorporating gender-specific variables and assumptions in a demand-led model, developed along the lines of the Bhaduri-Marglin 1990 model. Thus the model, besides its novel contribution to post-Kaleckian models, by the inclusion of gender becomes an anthropogenic tool with holistic analytical implications, moving beyond the symbolic conflicts of dualism.

This paper is structured in two parts. In the first part we present the basic post-Keynesian/post-Kaleckian demand-led growth model. In the second part we describe the main features of an extended model with endogenous changes in productivity and employment, incorporating gender-relevant categories in the behavioural functions that determine private aggregate demand (consumption, investment). We also suggest an analytical solution.

2. Theoretical Background

2.1 The post-Keynesian model

The standard neoclassical growth model (the Solow growth model) emphasises the supply side rather than the demand side of the economy as the determinant of growth, assuming that demand will follow supply. Typically, wages are treated as a component of cost (Onaran, 2016). Macroeconomic problems are considered an outcome of a deficiency of savings. A decline in the wage share and an increase in the profit share is expected to lead to a rise in private investment due to higher profitability, and net exports due to lower unit labour costs, thus higher international competitiveness. However, this approach was unable to explain why growth was lower in the post-1980s compared to the 1960s and 1970s despite a rise in the profit share, and why recovery is still sluggish after 2008. The key to this question lies in the fact that the standard neoclassical growth model, based on microeconomic decisions of optimising agents, assumes full employment and does not incorporate demand-side constraints and hence excess capacity and involuntary unemployment.

Heterodox macroeconomic models address this problem by integrating the dual role of wages both as cost and source of demand (Onaran, 2016). These models synthesise the ideas of Keynes, Kalecki and Marx, but while accepting the direct positive effects of higher profits on private investment and net exports as emphasised in mainstream models, they contrast these positive effects with negative effects on consumption. Demand is central in the determination of growth and employment; growth is demand-constrained as long as the economy is operating below full employment levels, and the distribution of income between workers and capitalists (wages and profits) has a crucial effect on demand.

The post-Kaleckian model of growth and distribution has been developed by Taylor (1990; 2004), Dutt (1984; 1990), Blecker (1989), and Bhaduri and Marglin (1990) among

others. In this type of model, two different regimes emerge, depending on the elasticity of investment and saving to distribution and capacity utilization (Onaran, 2016): a wage-led regime, where an increase of the wage share leads to an increase in demand, or a profit-led regime, where an increase of the wage share leads to a decrease in demand. In a wage-led regime a redistribution of income against capitalists will tend to increase aggregate demand and as a result, output. In this case, if the positive effect of the increase in output offsets the negative effect of the decline in the profit share growth rates, a larger wage share can lead to higher profit rates, more investment (from the capitalists) and consequently more growth. In the opposite case, where we observe that a redistribution of income benefitting capitalists will tend to increase growth rates, the economy is regarded as profit-led.

These models allow for involuntary unemployment, underemployment and excess capacity (Onaran, 2016). Components of aggregate demand are determined by behavioural equations. Wages are an outcome of a bargaining process between employers and workers, contrary 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 in the demand-led models of growth and employment is that unemployment is involuntary: labour supply is inelastic and employment is demand-constrained in an economy where there is involuntary unemployment, hence not supply determined; leisure is not a choice but a residual.

On the demand side, consumption is expected to decrease when the wage share decreases, since workers consume more as a proportion of their income compared to the owners of capital. In technical terms, the marginal propensity to consume out of wage income is higher than that out of profit income. Secondly, a higher profitability (a higher profit share and a lower wage share) is expected to stimulate private investment for a given level of aggregate demand. Thirdly, net exports (exports minus imports), for a given level of domestic and foreign demand, will depend negatively on unit labour costs, which are by definition closely related to the wage share. Consequently, the total effect of the decrease in the wage share on aggregate demand of the private sector (households and firms) depends on the relative size of the reactions of consumption, private investment and net exports to changes in income distribution.

Extensive empirical research using post-Keynesian/post-Kaleckian models challenges the neoclassical view that all countries are profit-led (for instance, Onaran and Galanis, 2014; Onaran et al, 2011; Stockhammer et al, 2009; Hein and Vogel, 2008; Naastepad and Storm 2007; Stockhammer and Onaran, 2004; Bowles and Boyer, 1995). Germany, France and Italy as individual large members of the Eurozone are found to be wage-led (Onaran and Obst, 2015; Onaran and Galanis, 2014; Hein and Vogel, 2008), while small open economies in the Eurozone, such as Ireland and Austria, may be profit-led when analysed in isolation (Onaran and Obst, 2015; Hein and Vogel, 2008; Stockhammer and Ederer, 2008). However, Onaran and Obst (2015), Stockhammer et al (2009) and Onaran and Galanis (2014) show that demand in the Eurozone-12 collectively is wage-led. The Euro area as a whole can be considered a closed economy with low extra-EU trade (albeit with high intra-EU trade). The insight from this evidence is opposite to the mainstream neoclassical assumptions that a redistribution of income in favour of wages can lead to a higher income level and growth.

2.2 Gender- specific macroeconomic models

As opposed to conventional macroeconomic models, in feminist economics labour is treated as a produced means of production: the reproduction of labour is an outcome of both paid and unpaid work, and women have a disproportionate share of unpaid work relative to men (Onaran, 2016). Furthermore, power dynamics are in the core of the feminist analysis, both in paid and unpaid (by extension in informal and formal) employment, highlighting the costs of the exploitation of women's lack of bargaining power in the workplace. Although low wages for women can stimulate profits, investment, and exports in the short run (Seguino, 2000; Blecker and Seguino, 2002), disadvantaging women has negative effects on a country's long-run productivity growth. There is ample empirical evidence to support this claim (see Klasen and Lamanna, 2009 for an extensive review). Research also supports the view that job discrimination and social norms that restrict women's employment act as a brake on economic development and growth (Braunstein, 2008; 2013; Cavalcanti and Tavares, 2015).

The role of household is fundamental in this context. Feminist macroeconomic models need to take into consideration household power relations, by unpacking the black box that has become the household in mainstream approaches (Onaran, 2016). Households are understood as both as sources of consumption and labour supply. More importantly, households, within this framework, are institutions of production and investment, through unpaid work and the reproduction of the labour force (van Stavaren 2010; DeHenau and Himmelweit 2013b; Hamner and Akram-Lodhi 1998; Nelson 1996). 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). By adding gender specific variables and assumptions to the model we acknowledge the variety of roles for each member of the household, which have different economic impacts, as reflected by power dynamics in households.

Most of the feminist macroeconomics on the effects of gender inequality on growth have analysed the cases of developing economies (Seguino 2012a). Significant contributions include Ertürk and Çağatay (1995), Braunstein (2000), Blecker and Seguino (2002), Akram-Lodhi and Hanmer (2008), Seguino (2010, 2012b) and Braunstein, van Stavaren and Tavani (2011). Seguino (2012b) and Braunstein et al, (2011) developed a theoretical macro model based on the stylised structural features of a modern industrial economy with a large human development/ social services sector that primarily employs women; nonetheless, these models have not been empirically estimated.

The model by Braunstein et al (2011) incorporates "investment in human capacities" by individuals and households. The term "human capacities" includes a set of characteristics, measured by standard human capital indicators such as skills and education, as well as emotional maturity, patience and self-confidence. The aforementioned "investment" first generates directly current aggregate demand. Second, it increases labour productivity both through the short-term, daily aspects of reproduction, and in the longer-term, through the creation of future productive capacity and boosting economic growth, although the latter is not incorporated in the short-run model. Investment in human

capacities is determined by expectations about future economic opportunities, which are directly related to higher wages and economic activity. In this context, investment in human capacities plays a similar role to physical investment, a significant difference between feminist and non-gender specific theoretical approaches, where investment in human capacities is usually not acknowledged as investment, but expenditure.

Braunstein et al.'s model defines "caring spirits" as the tendency to provide care, which determines the process through which expectations are transformed into actual investments in human capacities.[2] Caring spirits are determined by social norms, individual motivation, public preferences and the structure of the social welfare state. The model distinguishes between "strong/altruistic" versus "weak/individualistic" caring spirits as well as "caring" and "non-caring" states. Favourable opportunities translate into higher investment in human capacities in societies with "strong/altruistic" caring spirits than in individualistic ones. Strong caring spirits increase the likelihood of an economy being wage-led, because higher wages translate into a higher investment in human capacities. If the increase in human capacities' investment is high enough, then total investment in physical and human capacities could increase despite a lower profit share. Braunstein et al' s model shows that higher female wages not only directly affect demand, but also could raise labour productivity and reduce unit labour costs via greater investment in "human capacities" at the household level. The net effect of higher female wages on profits and investment is ambiguous, and may be positive under certain parameters. Although this is a detailed theoretical model to integrate gender in a demand led growth model, it does not explicitly model the government sector, employment, the effects of the gender distribution of income on consumption, and the long-run supply-side (productivity) effects of social infrastructure on private investment.

Seguino (2012b) introduces a two-sector open economy model (human development sector versus the rest of the economy) with government. Seguino finds 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 transgenerational effects.

The task ahead is to incorporate gender inequality in not only theoretical but also empirical models of demand-led growth. Furthermore, a gendered model needs to integrate both the short-run demand effects and the long-run productivity effects. Drawing from these contributions, there are four important entry points in the post-Keynesian/Kaleckian demand-led growth models to integrate gender (Onaran, 2016).

The first is via household spending: a higher degree of gender equality is expected to change the composition of household spending, e.g. more income in the hands of women is expected to increase the share of household spending that will benefit children (Pahl, 2000; 2008)—hence spending on human capacities, such as on education, is taken to be

[2] Braunstein et al (2011) use the term "caring spirits" in analogy to Keynes' animal spirits.

a positive function of gender equality at the household level.[3] Demand-led growth models traditionally model consumption as a function of wages and profits; a gender-aware macro modelling strategy requires estimating consumption as a function of female and male wages and profits, and disaggregating consumption into household spending on human capacities and other spending.

The second entry point is via investment. In the standard demand-led growth models private investment by firms is simply a function of profitability and demand. However, private investment responds to infrastructure. In mainstream models, public spending only on physical infrastructure, such as transport, has positive crowding-in effects on private investment. Nevertheless, social infrastructure in terms of education and health is necessary for the productivity and profitability of private investment. Hence, investment should be modelled as a function of both public and private spending which enhances human capacities and social infrastructure. Greater gender equality, in other words a decrease in gender pay gap,[4] through changing not just the level, but the composition of consumption and increasing social infrastructure too, will consequently have a further positive effect on private investment.

The third and fourth entry points are to integrate the role of the government (our forthcoming contribution) and the impact of changes in distribution and spending on employment respectively, the rationale for which will be discussed in more detail below.

3.1 An extended gendered macroeconomic model

The aim of this section is to outline a gendered macroeconomic model by integrating several different theoretical contributions, including: i) the effect of income distribution on growth (Bhaduri and Marglin 1990; Stockhammer et al 2009; Onaran and Galanis 2014); ii) the effect of income distribution and growth on employment (Stockhammer and Onaran 2004); iii) the interaction of growth, income distribution and productivity (Hein and Tarassow 2010; Naastepad 2006); and iv) the effects of changes in male and female wages in an economy with social reproduction (Braunstein et al 2011).

For simplicity, a two-sector model is proposed for the market economy[5]. A "social" sector that provides the social infrastructure that includes the services such as care, health and education that contribute to building human capacities, and a remaining sector that represents the rest of the market economy. Social infrastructure is produced both in the market economy by the paid labour of men and women in the public and private sectors,

[3] In the following we refer to household spending as consumption in line with the standard practice in macro models; but a note is in place here: household spending includes components that are beneficial to productivity, and part of that can be considered as spending in human capacity.

[4] There may be different mechanisms through which gender equality can increase (Onaran, 2016). For example if women's wages are predominantly below the living wage while men's wages are predominantly at least at the level of living wage or above, a rise of the statutory wage to the level of living wage will reduce the gender pay gap, increasing women's average wages while not effecting male wages. A rise in gender equality could also take the form of increases in the wages of both women and men, while at the same time closing the gender pay gap. Depending on the parameters of the economy, these will have different effects on growth and employment.

[5] The non-market home economy provides goods and services produced by unpaid labour, predominantly supplied by women. Here we focus on the market economy.

and in the home economy by unpaid labour. The social sector typically employs more women than men. The rest of the economy includes physical infrastructure, among other things, and employment is predominantly male. Aggregate output is determined by demand, made up of private consumption (household spending), private investment, net exports and government spending. While the model acknowledges that unpaid labour contributes to the welfare of the society, its market value is zero, and it is not therefore part of aggregate output as measured by the conventional GDP figures.

3.1.1 The rationale: propensity to consume

Demand-led growth models traditionally model consumption by households only of those goods and services produced in the market economy by paid labour (Onaran, 2016). A gender-aware macro modelling strategy first requires disaggregating consumption into two categories: household spending on social infrastructure (produced by paid and unpaid labour), and consumption of goods and services produced by the rest of the economy. Secondly, while consumption is traditionally modelled as a function of aggregate wages and profits, a gender-aware approach has to address gender income differentials by modelling consumption (in both sectors) as a function of income from female waged employment, male waged employment, and profits. For simplicity, wages are treated as exogenous, determined outside the model by bargaining and labour market institutions. As a result, total female and male wage incomes, as well as wage and profit shares are endogenous.

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. There is empirical evidence that the marginal propensity to consume out of wages is higher than that out of profits (Onaran and Galanis, 2014), and since female wage income in aggregate is lower than male wage income, the hypothesis here is that the marginal propensity to consume out of female wage income is higher than that out of male wage income. Consequently an increase in female wage rates or female employment, other things being equal, is expected to lead to higher consumption.

Another important empirical question to explore is how a higher degree of gender equality in wages or employment could change the composition of consumption. Braunstein (2013) theorised 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 will increase household spending on children (Lundberg et al, 1997; Pahl, 2000; Cappellini et al, 2014). The key assumption here is the spending behaviour of women, due to their role in the household. Microeconomic studies across the board to a great extend attest that a larger share of women's income compared to that of men's, is spend to satisfy the needs of household (Blumberg, 1991; Antonopoulos et al, 2010; Pahl, 2000). A number of qualitative studies find that a possible increase in women's income leads to increased spending on children's education and wellbeing (Vogler and Pahl,

1994; Lundeberg 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 (2012a) and Kabeer (1997) suggested that in developing countries, women are more likely to consume domestic goods, while men are more likely to consume a higher proportion of luxury and/or imported goods (such as cell phones, automobiles and televisions). Van Stavaren (2010) mentions a study by Bunting (1998) for the USA which found that the highest propensity to consume is found in the lowest income households, which have the highest share of women (62%), compared to richer households. Therefore, a rise in female wage income is very likely to increase the propensity to consume on particular categories of goods.

3.1.2 The rationale: propensity to save

Ertürk and Çağatay (1995) proposed that increases in the intensity of women's unpaid work in the household raises savings rates. This is echoed in the interesting finding of Floro and Seguino (2002), for a group of semi-industrialised countries, that higher incomes and more bargaining power for women was associated with higher aggregate savings rates, merits attention. This could be partially as an outcome of the fact that often within households, the risk-taking behaviour of one individual is cushioned by other individuals in the household (van Stavaren 2002), exploiting their "caring spirits". Women are described as risk-averse partially due to their role in the household, as providers. This finding can also be an outcome of the gendered stereotypes of financial institutions (who favour men in the provision of credit), in essence increasing the propensity of women to save to smooth consumption and cover household needs (van Stavaren 2010).

3.1.3 The importance of the public sector

Most of the Post-Keynesian literature does not model the public sector, with the notable exceptions of Blecker (2002) and Seguino (2012b). Women do the majority of 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. 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.[6] 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). Finally, public investment in times of underemployment/ unemployment addresses the lack of effective demand in the economy, which can deter private investment (DeHenau et al, 2016).

[6] It is acknowledged that occupational segregation (de/feminization of labour) is an issue that needs to be tackled as well.

Recent empirical evidence highlights the beneficial effect of public spending on employment generation and economic growth. DeHenau et al (2016) using input-output analysis find for seven OECD countries (UK, USA, Japan, Australia, Germany, Denmark and Italy) that investment in the social sector 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 by created in the Eurozone and the United Kingdom by gendering government expenditure (as opposed to reduction of public spending) and private investment. Furthermore, 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 a microsimulation find that for the same amount of investment in the social sector (care for the elderly, ill and children) and physical infrastructure investment the number of jobs created from investment in social care is more than double (1.2 million versus 550000 jobs) than in the alternative scenario of physical infrastructure investment, reducing significantly the gender employment gap. With regards to emerging economies, 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, Ilkkaracan 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).

3.1.4 Types of investment

In the standard demand-led growth models private investment in physical capital is simply a function of profitability (the share of profits in national income) and demand. In a gendered macro model, in order to fully understand the importance of social infrastructure, the response of private investment to the business environment created by social as well as physical infrastructure in the short run, and their positive effects on productivity in the long run also need to be included. Physical infrastructure investment[7] is undertaken by capitalists and the state, while social infrastructure investment is undertaken by individuals, households and the state. Traditionally, public spending in physical infrastructure is expected to generate positive crowding-in effects on private investment. However, social infrastructure in terms of education and health is significant for the productivity and profitability of private investments. While we may expect to see

[7] Physical investment is composed of investment in fixed capital as well as investment in technological change, thus accounting for the fact that technological change is endogenous to the process of physical investment and as a result, growth.

positive effects on the "animal spirits" of firms even in the short run through an expected improvement in the business environment, longer term effects of lagged public spending (or average values of the past five years) should be integrated into empirical estimations of private investment behaviour.

3.1.5 Other features: net exports, productivity and indicators of empowerment

Net exports can be simply modelled as a function of aggregate demand and unit labour costs. Further, it could be assumed that social services are non-tradable and all net exports are in the rest of the economy. In the present paper, we do not explore this extension of the model, but we acknowledge its significance.

To allow for the long-term effects of social infrastructure, the model should further integrate supply-side effects by modelling changes in labour productivity. Hein and Tarassow (2010) and Naastepad (2006) incorporated productivity into the standard (non-gendered) demand-led growth model. In our extended framework, productivity could be modelled as a function of investment, disaggregated into private and public investment in social and physical infrastructure. Additionally, following the post-Keynesian literature on technological change, productivity is a positive function of demand and a negative function of the profit share. The latter is due to a higher wage share, in other words a lower profit share, inducing more innovation. This is consistent with efficiency wage effects in the new Keynesian labour economics literature. Technological change is endogenous.

Lastly, a gendered macroeconomic analysis should focus on outcomes beyond growth. As a measure of empowerment, the levels of employment of men and women may be a more direct indicator than the aggregate growth rate, by also incorporating the effects on employment. In the standard demand-led growth models, Stockhammer and Onaran (2004) modelled employment in the context of an SVAR model. In this gendered framework, employment in social services and the rest of the economy can be modelled as a function of demand, labour productivity and labour costs. Using the latest figures about the share of female and male employment in each sector, and assuming these do not change, the total female and male employment in the economy for a given demand can be estimated.

The model can then be econometrically estimated and used to simulate the effects of changes in public spending in the social sector versus the rest of the economy on employment of men and women, as well as macroeconomic outcomes such as private investment, productivity, growth and the budget deficit. Other exogenous variables such as male and female wages or the gender composition of the sectors can also be changed to simulate effects on growth and employment. The ultimate aim is to have a model that can guide public spending policy and wage policy to achieve an equitable development strategy. In the following section, we will present an outline of the formal model for a stylised developed economy.

3.2 The model

3.2.1 One sector model with male and female workers

In this section we start with a short-run model, with two workers (wage recipients), male and female (denoted by the subscript M and F respectively), and one capitalist (profit recipient) for a one-sector closed economy without government. The demand side of the economy is defined by the saving (or consumption) behaviour of the female and male workers and the capitalists and the investment behaviour of the firms. The total income of the economy is distributed between female and male wage income and profits, as in the post-Kaleckian tradition. For simplification, the behaviour of the capitalist class is assumed to be gender neutral.[8]

Y, total income consists of the total profits of the capitalist, R,, the total wage income of the male workers, W_M, ,and the total wage income of the female workers, W_F:

$$Y = W_M + W_F + R \qquad (1)$$

The profit share, π, is one minus the share of total wage income:

$$\pi = 1 - \frac{W_M + W_F}{Y} \qquad (2)$$

In the presence of gender pay gap, female wages are lower than male wages:

$$w_M = \alpha w_F \qquad (3)$$

Where $\alpha > 1$ and denotes the discrimination coefficient[9].

Capacity utilization, u, is defined as actual output as a ratio to potential output, Y^*; dividing and multiplying with the capital stock, K, u can be written as:

$$\frac{Y}{K}\frac{K}{Y^*} = u \qquad (4)$$

Where $\frac{Y^*}{K}$ is the potential capital productivity.

[8] There is a growing body of literature that examines the decision making behaviour of female capitalists and the impact the presence of women in the board of directors has on the performance of a firm (Burke 2000; Terjensen, Sealy and Singh 2009; Konrad et al 2008; van der Walt and Ingley 2003; Burke and Mattis 2013; Perrault 2015). There is some evidence that the risk taking behavior of women entrepreneurs are different from men, which may provide room for extending the model. However, as there are only very few female capitalists, their behaviour is unlikely to change the overall results from an empirical point of view.

[9] In Oaxaca (1973) and Becker (1985) α is defined as:

$$\alpha = \frac{\frac{w_M}{w_F} - \frac{w_M^o}{w_F^o}}{\frac{w_M^o}{w_F^o}} \quad (3.a)$$

Where $\frac{w_M^o}{w_F^o}$ is the male- female wage ratio in absence of discrimination, which applies both in the case that male and female labour are perfect substitutes and in the case they are not. However, Oaxaca (1973) and Becker (1985) alike stress that (3.a) is very difficult to estimate, due to the problems defining how much of the gender pay gap is a result of discrimination, thus we use the observed gender pay gap (3).

Assuming that technology is constant in the short run, i.e. $\frac{Y^*}{K}$ is constant,[10] we can proxy u as:

$$\frac{Y}{K} = u \qquad (5)$$

The total employment in the economy, E_T, is:

$$E_T = E_F + E_M \qquad (6)$$

Where E_F and E_M are female and male employments respectively, and

$$E_F = \beta E_T \quad and \quad E_M = (1-\beta)E_T \qquad (7)$$

Where $\beta < 0.5$ in line with the current stylised facts.

Demand for labour of women, E_F, is a function, e, of capacity utilization, u, female wages, w_F, male wages, w_M, and a discrimination factor, z:

$$E_i = e^i(u, w_i, w_j, z) \qquad (8)$$

Where the subscript $i, j = \{M, F\}$, defines the gender of the workers. Higher capacity utilisation is expected to increase employment ($\frac{de^i}{du} = e_1^i > 0$) for both types of workers. The effect of own wage on labour demand is negative; i.e. an increase in w_i reduces the demand for i ($\frac{de^i}{dw_i} = e_2^i < 0$).[11] If labour demand is completely insensitive to labour costs, and responds only to demand, e_1^i is zero. If the cross-price (cross-wage) elasticity of labour demand is positive, higher w_j creates incentives for substituting workers j with workers i, increasing the demand for i ($\frac{de^i}{dw_j} = e_3^i > 0$). We assume that male and female workers are substitutes for each other; the degree of substitution depends on the cross-price elasticities. If there is full labour market segregation, where the labour markets for men and women are for completely different tasks, the cross-wage elasticity would be zero. The term z is the level employment discrimination between male and female workers, indicating the level employer discrimination. Greater z represents greater discriminating behaviour of employers against female workers over male workers, and $\frac{de^M}{dz} = e_4^M > 0$ and $e_4^F < 0$. If the employers are completely indifferent between female and male workers, hence if there is no labour market discrimination, *z=0*.

For simplicity, we assume that the impacts of own wages and substitute worker's wages are the same for both workers:

$$e_2^M = e_2^F = e_2\,,\; e_3^M = e_3^F = e_3 \qquad (9)$$

Moreover,

[10] Assuming Y*/K is constant, we set it arbitrarily to 1 to simplify the presentation of the model.

[11] Labour demand is a function of real unit labour cost; however real unit labour cost (wage share) is w^iE^i/Y, which is w^iE^i/uK. K is constant in the short run, and will change only in the long run; in the short run only employment adjusts. Therefore, linearizing and writing E as a function of w only alters the coefficient of u.

$$|e_2| \geq |e_3| \qquad (10)$$

If there is no discrimination neither in the labour market nor prior to the labour market, then women and men workers are perfect substitutes, *i. e.* $|e_2| \geq |e_3|$,. If there is some segregation, $|e_2| \geq |e_3|$; i.e. the sensitivity to own wage is higher than the sensitivity to the substitute worker's wage in absolute values.

Rate of accumulation, i.e. investment/capital Stock, *I/K*, is a positive function of the profit rate. Profit rate, r, is:

$$r = \frac{R}{K} = \frac{Y - W_M E_M - W_F E_F}{K} = u - \frac{W_M E_M + W_F E_F}{K} \quad (11)$$

$$\frac{I}{K} = i(r) = i\left(u - \frac{E_M w_M + E_{TF} w_F}{K}\right) \qquad (12)$$

Where $\frac{di}{dr} = i_1 > 0$. The impact of r on investment can be decomposed to the impact of capacity utilization, and the profit share, π, as:

$$\pi = 1 - \frac{w_M E_M}{Y} - \frac{w_F E_F}{Y} = 1 - \frac{w_M E_M K}{YK} - \frac{w_F E_F K}{YK} = 1 - \frac{w_M E_M + w_F E_F}{uK} \qquad (13)$$

Hence r= πu

Finally, we model the savings based on different saving behaviour of the capitalists and male and female workers:

$$S = S_M + S_F + S_R \qquad (14)$$

Both types of wage workers have lower marginal propensity to save and higher marginal propensity to consume than the marginal propensity to save of the capitalists, s_3. As mentioned in the previous section, since female wage income in aggregate is lower than male wage income, we assume that the marginal propensity to save out of female wage income, s_1, is lower than that out of male wage income, s_2:

$$\frac{S}{K} = s_1 \frac{w_M}{K} + s_2 \frac{w_F}{K} + s_3 \frac{R}{K} = s_1 \frac{w_M E_M}{K} + s_2 \frac{w_F E_F}{K} + s_3 \left[u - \frac{E_M w_M + E_F w_F}{K}\right] (15)$$

With $s_3 > s_2 > s_1$

In equilibrium:

$$\frac{S}{K} = \frac{I}{K}$$

Thus:

$$s_1 \frac{w_M E_M}{K} + s_2 \frac{w_F E_F}{K} + s_3 \left[u - \frac{E_M w_M + E_F w_F}{K}\right] = i\left(u - \frac{E_M w_M + E_F w_F}{K}\right) (16)$$

Solving for the equilibrium capacity utilisation, we first analyse the effect a change in the male wage rate on the capacity utilisation:

$$\frac{du}{dw_M} = -\frac{s_1\frac{E_M}{K} + s_1\frac{w_M e_2}{K} + s_2\frac{w_F e_3}{K} - s_3\left(\frac{E_M}{K} + \frac{w_M e_2}{K} + \frac{w_F e_3}{K}\right)}{s_1\frac{w_M e_1^M}{K} + s_2\frac{w_F e_1^F}{K} + s_3 - s_3\left(\frac{w_M e_1^M}{K} + \frac{w_F e_1^F}{K}\right) - i_1\left(1 - \frac{w_M e_1^M}{K} - \frac{w_F e_1^F}{K}\right)} -$$

$$\frac{i_1\left(\frac{E_M}{K} + \frac{w_M e_2^M}{K} + \frac{w_F e_3^F}{K}\right)}{s_1\frac{w_M e_1^M}{K} + s_2\frac{w_F e_1^F}{K} + s_3 - s_3\left(\frac{w_M e_1^M}{K} + \frac{w_F e_1^F}{K}\right) - i_1\left(1 - \frac{w_M e_1^M}{K} - \frac{w_F e_1^F}{K}\right)} =$$

$$\frac{E_M\,(s_3 - s_1 - i_1) + e_2^M w_M\,(s_3 - s_1 - i_1) + w_F e_3^F (s_3 - s_2 - i_1)}{K\,(s_3 - i_1) + w_M e_1^M\,(s_1 - s_3 + i_1) + w_F e_1^F (s_2 - s_3 + i_1)} \qquad (17)$$

Due to the Keynesian stability condition we hypothesise that the denominator, φ,is positive:

$$\frac{du}{dw_M} = \frac{(s_3 - s_1 - i_1)\left(E_M + e_2\ w_M\right) + w_F e_3\ (s_3 - s_2 - i_1)}{\varphi} \qquad (18)$$

Based on previous empirical research (Onaran and Galanis, 2014; Onaran and Obst, 2015), we assume that $s_3 - s_1 > 0$, hence an increase in male wages decreases savings, i.e. increases consumption demand; however whether the impact on consumption is larger than the negative impact on investment, i_1, i.e. the sign of $s_3 - s_1 - i_1$ is ambiguous. This term would give us the impact of a change in the male wage share on the economy in the standard post-Kaleckian models without employment. However, as our model includes employment, the impact of the wages on demand is more complex.

Defining:

$$\varepsilon_M = E_M + e_2^M w_M = E_M + \frac{dE_M}{dw_M}\, w_M \qquad (19)$$

If the wage elasticity of labour demand for men, $\frac{dE_M}{dW_M}\frac{W_M}{E_M} > -1, then\ \varepsilon_M > 0.$

Thus, we can derive different scenarios for the effects of a change in the male wages on capacity utilization for cases where male employment is inelastic (elasticity > -1) or elastic (elasticity < -1):

Likewise, based on previous research (Onaran and Galanis, 2014; Onaran and Obst, 2015) we assume that $s_3 - s_2 > 0$, and $s_3 - s_2 > s_3 - s_1$, but the sign of $s_3 - s_2 - i_1$ is also ambiguous. This term describes the indirect induced effect of a change in the male wages on *u* via its effect on female employment and thereby on female wage income. This term is only relevant if the female employment is elastic with respect to male wages, which is our working assumption.

There are seven likely theoretical outcomes of a rise in male wages on demand (capacity utilization):

1. If the impact of a male wage change on consumption is higher than the impact on investment in absolute value ($s_3 - s_1 - i_1 > 0$), and if male employment is inelastic, as the effect of induced changes on the female employment and wage income on

consumption is surely higher than the impact on investment in absolute value ($s_3 - s_2 > s_3 - s_1$), then an increase in the male wages would have a positive impact on the capacity utilization. We call this a male wage-led demand regime.

2. However, if male employment is elastic, despite a positive value of $s_3 - s_1 - i_1$, higher wages decrease employment and thereby decrease male wage share, reversing the positive impact of wages, if the induced positive effects through female employment is small relative to the direct effects of male wages on demand. We call this a profit-led demand regime.

3. In an intermediate case, if male employment is elastic, and if $s_3 - s_1 - i_1 > 0$, but if the induced positive effects through female employment is relatively large, the regime is wage-led.

4. If male employment is inelastic, and if the impact of a male wage change on consumption is lower than the impact on investment in absolute value ($s_3 - s_1 - i_1 < 0$), and if the effect of induced changes in the female wage income on consumption is also lower than the impact on investment in absolute value $(s_3 - s_2 - i_1 < 0)$, the demand regime will be profit-led.

5. If the values of s_3, s_1, s_2, i_1 are as in case *4*, but if male employment is elastic, and if the induced positive effects through female employment is relatively small, the regime is again male wage-led.

6. We get an intermediate case, if male employment is elastic, and if $s_3 - s_1 - i_1 < 0$ but if $s_3 - s_2 - i_1 > 0$, the regime is male-wage-led.

7. Finally if male employment is elastic, and if $s_3 - s_1 - i_1 < 0$, but if $s_3 - s_2 - i_1 < 0$ and is sufficiently large, the regime is again profit-led.

Similarly, the effect of a change in the wages of women on capacity utilization is:

$$\frac{du}{dW_F} = \frac{(s_3 - s_2 - i_1)\left(w_F e_2^F + E_F\right) + e_3^M w_M\,(s_3 - s_1 - i_1)}{\varphi} \quad (19)$$

As in the previous case:

$$\varepsilon_F = E_F + e_2^F w_F = E_F + \frac{dE_F}{dw_F}\, w_F \quad (20)$$

We can similarly identify seven cases where the demand regime is female wage-led or profit-led.

3.2.2 Two-sector model with male and female workers

In this section we consider that the economy is composed of two sectors: the social sector or human development sector, which includes education, healthcare, and care for children and elderly, (denoted by the script *H*) and the rest of the economy, which includes industry, transportation and construction among other categories (denoted by the script *N*). We hypothesize that wage rate for men are the same in both sectors, and likewise for women. Consistent with the stylized facts, we assume that the share of women employed in the social sector is higher than that of men, and the share of women in the rest of the economy is lower than that of men.

Thus in the social sector labour demand for women is:

$$E_{HF} = e^{HF}(u, w_F, w_M, z) \qquad (21)$$

and labour demand for men is

$$E_{HM} = e^{HM}(u, w_M, w_F, z) \qquad (21.b)$$

In the rest of the economy, labour demand for women is:

$$E_{NF} = e^{NF}(u, w_F, w_M, z) \qquad (21.c)$$

and labour demand for men

$$E_{NM} = e^{NM}(u, w_M, w_F, z) \qquad (21.d)$$

The sensitivity of employment to *u*, own and substitute worker's wages are defined as in Section 3.1.1.

The profit rate is:

$$r = \frac{Y - w_M\,(E_{NM} + E_{HM}) - w_F(E_{HF} + E_{NF})}{K} \qquad (22)$$

Thus the rate of accumulation is

$$\frac{I}{K} = i(r) = i\left(u - \frac{W_M(E_{NM}+E_{HM}) - W_F(E_{HF}+E_{NF})}{K}\right) \qquad (23)$$

In the two sector model, it makes economically more sense to define consumption in different sectors as savings is not sector specific. Consumption in the total economy, normalized by K is given by

$$\frac{C}{K} = (c_{HM} + c_{NM})\left(\frac{w_M\,(E_{NM} + E_{HM})}{K}\right) + (c_{HF} + c_{NF})\left(\frac{w_F\,(E_{NF} + E_{HF})}{K}\right) + c_R\left(u - \frac{w_M(E_{NM} + E_{HM}) + w_F(E_{HF} + E_{NF})}{K}\right) \qquad (24)$$

Based on the insights from the empirical literature (Lundberg et al 1997; Pahl 2000; Cappellini et al 2014), we assume that the marginal propensity of women to consume out of their wage income on goods produced by the social sector, c_{HF}, is higher than that of men, c_{HM}: $c_{HF} > c_{HM}$. For the rest of the economy we cannot identify a relationship

between the marginal propensities of men and women to spend on products of this sector; both $c_{NF} > c_{NM}$ and $c_{NF} < c_{NM}$ are possible.

In equilibrium:

$$\frac{S}{K} = \frac{I}{K} = u - \frac{C}{K} = \frac{I}{K}$$

Solving for equilibrium capacity utilization, next we analyse the effect of a change in male wage rate on demand (capacity utilization):

$$\frac{du}{dW_M} =$$

$$= -\frac{\left(\frac{c_{HM} + c_{NM} - c_R}{K}\right)(E_{NM} + E_{HM} + W_M(e_2^{NM} + e_2^{HM}) + (\frac{c_{HF} + c_{NF} - c_R}{K})W_F(e_3^{NF} + e_3^{HF})}{1 - i_1 - \frac{(i_1 - c_{HM} + c_{NM})W_M(e_1^{NM} + e_1^{HM}) + (i_1 - c_{HF} + c_{NF})W_M(e_1^{NF} + e_1^{HF})}{K}}$$

$$- \frac{\frac{i_1}{K}((E_{NM} + E_{HM} + W_M(e_2^{NM} + e_2^{HM}) + W_F(e_3^{NF} + e_3^{HF})}{1 - i_1 - \frac{(i_1 - c_{HM} - c_{NM} - c_R)W_M(e_1^{NM} + e_1^{HM}) + (i_1 - c_{HF} - c_{NF} - c_R)W_M(e_1^{NF} + e_1^{HF})}{K}}$$

$$= \frac{(c_{HM} + c_{NM} - i_1)\,(E_{NM} + E_{HM} + W_M(e_2^{NM} + e_2^{HM})) + \,(c_{HF} + c_{NF} - i_1)\,W_F(e_3^{NF} + e_3^{HF})}{\varphi'} \quad (25)$$

The denominator, φ', is assumed to be positive and equal to:

$$\varphi' = K - Ki_1 - (i_1 - c_{HM} - c_{NM} - c_R)W_M(e_1^{NM} + e_1^{HM}) + (i_1 - c_{HF} - c_{NF} - c_R)W_M(e_1^{NF} + e_1^{HF}) \quad (26)$$

Then:

$$\frac{du}{dw_M} = \frac{(c_{HM}+c_{NM}-c_R-i_1)\,(E_{NM}+E_{HM}+W_M(e_2^{NM}+e_2^{HM}))}{\varphi'} + \frac{(c_{HF}+c_{NF}-c_R-i_1)\,w_F(e_3^{NF}+e_3^{HF})}{\varphi'} \quad (25.b)$$

The sign of the impact of male wages on demand depends on the following:

1. Whether the impact of a male wage change on consumption is higher than the impact on investment in absolute value depends on the sign of $(c_{HM} + c_{NM} - c_R - i_1)$ and $(c_{HF} + c_{NF} - c_R - i_1)$. We expect $(c_{HM} + c_{NM}) > c_R$ and $(c_{HF} + c_{NF}) > c_R$, since the marginal propensity to consume of capitalists is expected to be smaller compared to male and female workers (e.g. Onaran and Galanis, 2014). If the gap between the marginal propensities to consume of workers (both male and female) and capitalists is larger than the direct impact of wages on investment, thus $(c_{HM} + c_{NM} - c_R - i_1)$ and $(c_{HF} + c_{NF} - c_R - i_1)$ are positive, and if labour demand is inelastic, as we will discuss in more detail below, the economy shows wage-led characteristics. Alternatively, if $(c_{HM} + c_{NM} - c_R - i_1)$ and $(c_{HF} + c_{NF} - c_R - i_1)$ are negative, the economy would show characteristics of a profit-led regime, again in the case of an inelastic labour demand.
2. The impact of wages on demand will also depend on the wage elasticity of labour demand. $E_{NM} + E_{HM} + w_M(e_2^{NM} + e_2^{HM}) = A_M$ exhibits male wage's effect on

demand through employment. The sign of A_M depends on the employment-weighted wage elasticity of the labour demand for male workers in each sector:

$$A_M = E_{NM} + E_{HM} + w_M(e_2^{NM} + e_2^{HM}) = E_{NM}\left(1 + \frac{dE_{NM}}{dw_M}\frac{w_M}{E_{NM}}\right) + E_{HM}\left(1 + \frac{dE_{HM}}{dw_M}\frac{w_M}{E_{HM}}\right) \quad (26)$$

With respect to the sign of A_M, it is possible to distinguish three cases:

i) In the first case, if the elasticity of demand for employment of male workers in both sectors with respect to a change in the male wage share is larger than -1, i.e. In the case of inelastic male labour demand:

$$\epsilon_{NM} = \frac{dE_{NM}}{dW_M}\frac{W_M}{E_{NM}} > -1,\ \epsilon_{HM} = \frac{dE_{HM}}{dW_M}\frac{W_M}{E_{HM}} > -1$$

then $A_M > 0$. If $(c_{HM} + c_{NM} - c_R - i_1)$ and $(c_{HF} + c_{NF} - c_R - i_1)$ are negative, an increase in the male wage will have a negative impact on capacity utilisation and the regime is profit-led. Alternatively, if $(c_{HM} + c_{NM} - c_R - i_1)$ and $(c_{HF} + c_{NF} - c_R - i_1)$ are positive, an increase in the male wage will have a positive impact on demand and the regime is male wage-led.

ii) In the second case, if the elasticity of demand for employment of male workers in both sectors with respect to a change in the male wage is bigger than -1 and the employment is relatively elastic:

$$\epsilon_{NM} = \frac{dE_{NM}}{dW_M}\frac{W_M}{E_{NM}} < -1$$

$$\epsilon_{HM} = \frac{dE_{HM}}{dW_M}\frac{W_M}{E_{HM}} < -1$$

then $A_M < 0$. Then if $(c_{HM} + c_{NM} - c_R - i_1)$ and $(c_{HF} + c_{NF} - c_R - i_1)$ are negative, an increase in the male wage will have a positive impact on capacity utilisation and the regime is male wage-led. Alternatively, if $(c_{HM} + c_{NM} - c_R - i_1)$ and $(c_{HF} + c_{NF} - c_R - i_1)$ are positive, an increase in the male wage will have a negative impact on demand and the regime is profit-led.

iii) In the third case, the elasticity of demand for employment of male workers in the rest of the economy is inelastic ($|\epsilon_{NM}| < 1$), whereas the elasticity of demand for employment of male workers in the social sector of the economy is elastic($|\epsilon_{HM}| > 1$).[12] In this case, either:

$$\frac{E_{NM}}{E_T}(1 + \epsilon_{NM}) + (1 + \epsilon_{HM})\frac{E_{HM}}{E_T} > 0$$

or

[12] Assuming that H is relatively labour intensive and is more likely to have an elastic labour demand, we rule out the other possibility where $|\epsilon_{NM}| > 1$ but $|\epsilon_{HM}| < 1$.

$$\frac{E_{NM}}{E_T}(1+\epsilon_{NM})+(1+\epsilon_{HM})\frac{E_{HM}}{E_T}<0$$

Hence, the impact of male wages through employment would be ambiguous.

Next we examine the effect of a change in the female wage rate:

$$\frac{du}{dW_F}=$$

$$=\frac{\left(\frac{c_{HM}+c_{NM}-c_R}{K}\right)(W_M(e_3^{NM}+e_3^{HM})+\left(\frac{c_{HF}+c_{NF}-c_R}{K}\right)(E_{NF}+E_{HF}+W_F(e_2^{NF}+e_2^{HF})}{1-i_1-\frac{(i_1-c_{HM}+c_{NM}-c_R)W_M(e_1^{NM}+e_1^{HM})+(i_1-c_{HF}-+c_{NF}-c_R)W_M(e_1^{NF}+e_1^{HF})}{K}}$$

$$-\frac{\frac{i_1}{K}((E_{NM}+E_{HM}+W_M(e_3^{NM}+e_3^{HM})+W_F(e_2^{NF}+e_2^{HF})}{1-i_1-\frac{(i_1-c_{HM}-c_{NM}-c_R)W_M(e_1^{NM}+e_1^{HM})+(i_1-c_{HF}-c_{NF}-c_R)W_M(e_1^{NF}+e_1^{HF})}{K}}$$

$$=\frac{(c_{HM}+c_{NM}-c_R-i_1)\,w_M(e_3^{NM}+e_3^{HM})}{\varphi'}$$

$$+\frac{\left(\left(E_{NF}+E_{HF}+w_F(e_2^{NF}+e_2^{HF})\right)(c_{HF}+c_{NF}-c_R-i_1\right)}{\varphi'} \quad (27)$$

Interpretations similar to (25) is derived from (27).

Lastly, we analyse the relative magnitude of the impact of the changes in the female wage and the male wage respectively; i.e. we compare $\frac{du}{dW_F}$ and $\frac{du}{dW_M}$. This comparison shows the possible impact of changing wage gap on demand (capacity utilization). For

$$\frac{du}{dW_F}>\frac{du}{dW_M}$$

The following condition should hold

$$(c_{HM}+c_{NM}-c_R-i_1)\,(w_M(e_3^{NM}+e_3^{HM})-w_M(e_2^{NM}+e_2^{HM})-E_{NM}-E_{HM})+(E_{NF}+E_{HF}+w_F(e_2^{NF}+e_2^{HF})-w_F(e_3^{NF}+e_3^{HF}))(c_{HF}+c_{NF}-c_R-i_1)>0 \quad (28)$$

Assuming that in each sector, the own wage elasticities ($\epsilon_{NM}, \epsilon_{NF}, \epsilon_{HM}, \epsilon_{HF}$) and the cross-wage elasticities of labour demand ($\gamma_{NM}, \gamma_{NF}, \gamma_{HM}, \gamma_{HF}$) are the same for female and male workers

$$\epsilon_{NM}=\epsilon_{NF}=\epsilon_N$$

$$\epsilon_{HM}=\epsilon_{HF}=\epsilon_H$$

$$\gamma_{NM}=e_3^{NM}\,\frac{w_M}{E_{NM}}=\gamma_{NF}=e_3^{NF}\,\frac{w_F}{E_{NF}}=\gamma_N$$

$$\gamma_{HM}=e_3^{HM}\,\frac{w_M}{E_{HM}}=\gamma_{NF}=e_3^{HF}\,\frac{w_F}{E_{HF}}=\gamma_H$$

Thus (28) becomes:

$$(c_{HM} + c_{NM} - c_R - i_1)\,(E_{HM}\gamma_H + E_{NM}\gamma_N - E_{NM}(1+\epsilon_N) - E_{HM}(1+\epsilon_H)) - (E_{HF}\gamma_H + E_{NF}\gamma_N - E_{NF}(1+\epsilon_N) - E_{HF}(1+\epsilon_H))(c_{HF} + c_{NF} - c_R - i_1) > 0$$

which can be rearranged as:

$$(E_{NF}(1+\epsilon_N-\gamma_N) + E_{HF}(1+\epsilon_H-\gamma_H))(c_{HF} + c_{NF} - c_R - i_1) - (c_{HM} + c_{NM} - c_R - i_1)\,(E_{NM}(1+\epsilon_N-\gamma_N) + E_{HM}(1+\epsilon_H-\gamma_H)) > 0 \qquad (28.b)$$

If the impact of both female and male wage change on consumption is higher than the impact on investment in absolute value, and if the total marginal propensity to consume for female workers is larger than the total marginal propensity to consume for male workers, then:

$$(c_{HF} + c_{NF} - c_R - i_1) > (c_{HM} + c_{NM} - c_R - i_1) > 0 \qquad (29)$$

However, as the number of female workers is lower according to the stylised facts of our research, and are more heavily concentrated in H compared to men, where labour demand is likely to be more elastic (or less inelastic; i.e. ϵ_H is negative and larger in absolute value compared to ϵ_N):

$$\left(E_{NF}\left(1+\epsilon_N-\gamma_N\right) + E_{HF}\left(1+\epsilon_H-\gamma_H\right)\right) < (E_{NM}\left(1+\epsilon_N-\gamma_N\right) + E_{HM}(1+\epsilon_H-\gamma_H)) \quad (30)$$

The differences between both sides of the inequalities (29) and (30) determine whether $\frac{du}{dW_F}$ or $\frac{du}{dW_M}$ is larger.

While the relative impact of male and female wages on demand is ambiguous, under the assumption of some plausible parameters consistent with the empirical estimations in the previous Post-Kaleckian estimations (e.g. Onaran and Galanis, 2014; Onaran and Obst, 2015), albeit without gender and employment elasticities, and stylised facts regarding gendered sectoral employment segregation, it is realistic to expect that an increase in female wages will have a larger impact than an increase male wages on demand; i.e. the economy is both female and male wage-led but also gender-equality-led, as an upward convergence in female and male wages is likely to increase demand. For instance, a rise in the minimum wage to a living wage rate, which is likely to affect mostly female workers is likely to have a larger impact on overall demand (capacity utilization) than the rise in the above median wages, which mostly will effect men. Similarly, extending the model to include public spending and taxation, if the positive impact of female wages on demand is higher than male wages, progressive tax and tax credit policies, which effect women are likely to have a larger stimulus impact for the economy,

To illustrate this in Table 1 below we simulate the difference in the impact of a rise in female and male wages on demand (u), for four different sets of parameters set as follows:

Table 1: *An example of the set of parameters for a hypothetical economy and the relative impact of a rise in female and male wages on demand*

Parameter or variable	Value			
	(1)	(2)	(3)	(4)
E_{NF}	30	30	30	30
ϵ_N	-0.4	-0.4	-0.4	-0.4
γ_N	0.3	0.3	0.3	0.3
E_{HF}	70	70	70	70
ϵ_H	-0.6	-0.9	-0.6	-0.5
γ_H	0.1	0.1	0.1	0.1
E_{NM}	100	100	100	100
E_{HM}	10	10	10	10
c_{HF}	0.7	0.7	0.7	0.7
c_{NF}	0.1	0.1	0.1	0.1
c_R	0.45	0.45	0.45	0.45
i_1	0.1	0.1	0.1	0.1
c_{HM}	0.3	0.3	0.4	0.4
c_{NM}	0.4	0.4	0.4	0.4
$(c_{HM} + c_{NM} - c_R - i_1)$	0.15	0.15	0.25	0.25
$(c_{HF} + c_{NF} - c_R - i_1)$	0.25	0.25	0.25	0.25
$\left(E_{NF}(1 + \epsilon_N - \gamma_N) + E_{HF}(1 + \epsilon_H - \gamma_H)\right)$	30	9	30	37
$(E_{NM}(1 + \epsilon_N - \gamma_N) + E_{HM}(1 + \epsilon_H - \gamma_H))$	33	30	33	34
$(E_{NF}(1 + \epsilon_N - \gamma_N) + E_{HF}(1 + \epsilon_H - \gamma_H))(c_{HF} + c_{NF} - c_R - i_1)$	7.5	2.25	7.5	9.25
$(c_{HM} + c_{NM} - c_R - i_1)\,(E_{NM}(1 + \epsilon_N - \gamma_N) + E_{HM}(1 + \epsilon_H - \gamma_H))$	4.95	4.5	8.25	8.5
$(\frac{du}{dW_F} - \frac{du}{dW_M})\,\varphi'$	2.55	-2.25	-0.75	0.75

As can be seen in the first column, the impact of female wage rate on demand is higher than that of male wage rate under the values set in Table 1. While these parameters are plausible, the precise impact as well as the direction of the impact is very sensitive to the parameters, and thereby the theory of gender-equality-led growth needs to be brought to empirical terrain by the econometric estimation of these parameters.

Finally, we analyse the impact of a change in female as opposed to male wages on employment of both women and men. First, the impact of a rise in only female wage rate on female and male employment is as follows:

$$\frac{dE_F}{dW_F} = \frac{dE_{HF}}{dW_F} + \frac{dE_{NF}}{dW_F} = (e_1^{HF} + e_1^{NF})\frac{du}{dW_F} + e_2^{HF} + e_2^{NF} \quad (31)$$

$$\frac{dE_M}{dW_F} = \frac{dE_{HM}}{dW_F} + \frac{dE_{NM}}{dW_F} = (e_1^{HM} + e_1^{NM})\frac{du}{dW_F} + e_3^{HM} + e_3^{NM} \quad (31.b)$$

Hence, the impact of a rise on female wage rate on total employment is:

$$\frac{dE_T}{dW_F} = \frac{dE_F}{dW_F} + \frac{dE_M}{dW_F} = \frac{du}{dW_F}(e_1^{HF} + e_1^{NF} + e_1^{HM} + e_1^{NM}) + (e_2^{HF} + e_2^{NF} + e_3^{HM} + e_3^{HM}) \quad (32)$$

The second term in (32) is the direct effect of female wages on total employment, which is expected to be negative, assuming a low sensitivity of male employment to female wages. The first term in (32) shows the effect of female wage rate through capacity utilisation. In the profit-led demand regimes, the sign for $\frac{dE_T}{dW_F}$ will be negative. Nevertheless, if the demand regime is female wage-led; the sign for $\frac{dE_T}{dW_F}$ becomes ambiguous as higher wages might create employment through leading to greater capacity utilisation, if the female labour demand is not very elastic and/or if the male employment is very sensitive to female wages. The employment regime may be conflictual if demand is wage-led and in case of highly elastic female employment, female employment may fall while male employment increases.

The impact of a rise in only male wage rate on female and male employment will be similar to (31):

$$\frac{dE_M}{dW_M} = \frac{dE_{HM}}{dW_M} + \frac{dE_{NM}}{dW_M} = (e_1^{HM} + e_1^{NM})\frac{du}{dW_M} + e_2^{HM} + e_2^{NM} \quad (33)$$

$$\frac{dE_F}{dW_M} = \frac{dE_{HF}}{dW_M} + \frac{dE_{NF}}{dW_M} = (e_1^{HF} + e_1^{NF})\frac{du}{dW_M} + e_3^{HF} + e_3^{NF} \quad (33.b)$$

Following this, the impact of a rise on male wage rate on total employment is:

$$\frac{dE_T}{dW_M} = \frac{dE_F}{dW_M} + \frac{dE_M}{dW_M} = \frac{du}{dW_M}(e_1^{HF} + e_1^{NF} + e_1^{HM} + e_1^{NM}) + (e_2^{HM} + e_2^{NM} + e_3^{HF} + e_3^{HF}) \quad (34)$$

In profit-led economies the sign for $\frac{dE_T}{dW_M}$ is also negative. In male wage-led regimes, the sign for $\frac{dE_T}{dW_M}$ is ambiguous, as the positive impact of male wages through capacity utilisation might be larger than the absolute value of the direct negative impact of male wages on employment.

Lastly, we compare the impacts of male and female wages on total employment. In the case that the female wages have a more positive/less negative effect on total employment than the male wages ($\frac{dE_T}{dW_F} > \frac{dE_T}{dW_M}$), the following conditions should hold:

$$\left(\frac{du}{dW_F} - \frac{du}{dW_M}\right) =$$

$$(e_1^{HF} + e_1^{NF} + e_1^{HM} + e_1^{NM}) + (e_2^{HF} + e_2^{NF} + e_3^{HM} + e_3^{HM} - e_2^{HM} - e_2^{NM} - e_3^{HF} - e_3^{HF}) > 0$$

(35)

The female wage is more likely to have a greater impact on employment than the male wage if the female wage's impact on capacity utilisation is larger. Moreover, the relative direct effects of female and male wages on employment are determinant on whether $\frac{dE_T}{dW_F}$ or $\frac{dE_T}{dW_M}$ will be larger.

4. Extensions

In the next stage, we will examine the long run implications of gender equality by incorporating government spending and taxation, changes in productivity as a result of both private and public spending in the social sector. We will also include the net exports sector. We also aim at presenting a systematic analysis of all possible regimes with respect to the effect of gender equality on men and women's employment and wage share and the impact of public spending and tax policies on these outcomes.

5. Conclusion

Feminist economics' research into the causes and effects of gender inequality has produced valuable new scholarship that sheds light on these relationships. Building on this work, we attempted to present the relationship between gender and economic growth, by exploring how relations between men and women in the sphere of employment can influence the rate of economic growth, as well as investment. Using a post-Kaleckian demand-led growth model, which includes gender-specific variables, we decomposed the economy-wide female relative wage in: i) the employment effect (sectoral changes), ii) the female wage effect (taking into account pay differentials as stimulus for investment), iii) the structural wage effect (the impact of a change of male earnings on the economy).

The ultimate goal is to analyse the impact of increasing wages and increasing gender equality (decreasing gender wage gap) on growth and employment of both men and women in both the short run and long run.

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