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Integrating the Social Reproduction of Labour into Macroeconomic Theory

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Integrating the Social Reproduction of Labour into Macroeconomic Theory

Mark Setterfield*

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Abstract

The purpose of this paper is to contribute to the integration of unpaid care-giving in the household into short- and long-term macroeconomic theory and, in particular, the theoretical structure of production on the supply-side of the economy. The ambition of the project is to furnish a general theoretical representation of how unpaid care giving and its (gendered) social structure contributes to the technical conditions of production in the sphere of marketed output. In so doing, it aims to provide macro theorists with an apparatus that allows consistent description of both short-term (levels of activity) and long-term (rates of growth) macro outcomes in a manner that routinely integrates feminist insights regarding the gendered structure of the social reproduction of labour into macroeconomic analysis.

JEL codes: E11, E12, B54, E23, J13, J16, J24, O33

Keywords: Social reproduction of labour, unpaid care-giving, macroeconomic theory, potential output, natural rate of growth, technical change.

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1. Introduction

According to Folbre (2023), in addition to its field-specific concerns with issues related to gender and sexuality, feminist economics should permeate all micro- and macro-theoretic arguments, because of the breadth and generality of its insights into matters pertaining to both structure and agency in the economic sphere. Responding to Folbre’s challenge involves, in part, transcending the ‘boundary problem’ (see, for example, Dengler and Strunk 2018, p.163), according to which different subjective values are attached to different concepts and activities in economics. These values then shape the focus of formal economic theory. Motivated by these considerations, the purpose of this paper is to begin addressing the question: in light of Folbre (2023), what, henceforth, should macro theory look like?

One aspect of the project associated with answering this question concerns the supply-side role of gendered, unpaid care-giving in the social reproduction of labour. Heterodox macro models routinely feature class and technological change as associated topics of analysis, linked by the theory of induced, factor biased technical change. It could therefore be argued by analogy that they should also routinely feature gender and the social reproduction of labour: a source of social stratification (gender) that, in turn, bears on the efficiency of an input into the production of marketed goods and services (via the process of social reproduction). The possibility exists that like class and technical change, gender and the social reproduction of labour routinely shape the supply side of the economy (and, in a broader macro-theoretic context, the process of demand formation) in non-negligible ways, of which macro-theorists

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1 That this boundary problem applies to concepts and activities that are the focus of feminist economics – such as care-giving – is no doubt related in (arguably large) part to the particular sociology of economics as a discipline. On the relationship between this sociology, its toxicity, and the attention paid to (and value placed on) feminist economics see, for example, Kim (2023).

2 The analysis in what follows will focus on the reproduction of labour power between production periods in the short run, and both this process and the biological reproduction of the labour force (as represented by a model of endogenous fertility) in the long run. Elsewhere, ‘social reproduction’ is understood as a still-broader project encompassing other aspects of the reproduction of capitalist society as a whole. See, for example, Munro (2019); Quick (2023) for further discussion of the term social reproduction and its usage.
should be aware and to which – as occasion requires – they should pay attention.\footnote{It should go without saying that the process of abstraction may sometimes recommend that the sort of considerations that are the focus in what follows be set aside. The argument here does not suggest otherwise, but is instead designed to show that they should not be systematically ignored.}

Even as narrowly defined in this paper, there exist vitally important institutional dimensions to the social reproduction of labour. Of first-order importance in this regard is the particular pattern of gender relations – patriarchy – that, to date, has provided a \textit{common} institutional basis for the social reproduction of labour across space and time. This cannot be safely ignored – and is not in the analysis that follows. At the same time, the institutions shaping the social reproduction of labour can and do vary over time. As noted by McDonough \citeyear{McDonough2021} pp.28-29, social reproduction occurs through changing combinations and patterns of family, community, state and market activities. These aspects of the institutional dimension of social reproduction will influence the formal modelling of social reproduction processes in macro theory, by affecting either the precise array of structural equations utilized (as in Porcile et al. \citeyear{Porcile2023}) and/or the size and sign of the parameters associated with any given structural equation (as in Katzner \citeyear{Katzner1990}). We abstract from such considerations in what follows.

Following a brief review of existing literature in the next section, the remainder of the paper is divided into two main sections. Section 3 takes up short-term considerations (macro statics). This involves studying the effects on potential output of reproducing labour power between production periods within a population of given size. Section 4 then moves on to long-term considerations (macro dynamics). Here, the natural rate of growth is shown to be affected by the social reproduction of labour via effects of the latter on both population growth and technological change. Finally, section 5 offers some conclusions.
2. Existing literature

The project of engendering macro theory is not new – so the ‘challenge’ associated with Folbre (2023) in the introduction has not gone un-noticed. To date, the project features both neoclassical and heterodox contributions, with demand-side effects frequently emphasized as the novelty of the latter (see, for example, Seguino 2020 for a recent survey). However, the integration of unpaid care into heterodox macro theory is of more recent vintage (Seguino 2020, pp.38-9; Blecker and Braunstein 2022). Meanwhile, focus on modelling the effects of care-giving and the social reproduction of labour on supply conditions (and in particular, factor productivity), and hence potential output in the short run and the natural rate of growth in the long run, appears to be the preserve of a small literature (see especially Braunstein et al. 2011; Onaran et al. 2022; Vasudevan and Raghavendra 2022).

In Braunstein et al. (2011), the (gendered) production of human capacities \( (H_c) \) by means of unpaid household labour is described as:

\[
H_c = H_c(f(u), m(u)), \ m' > f' > 0; \ H_{cm} < H_{cf} < 0
\]  

\(4\)

See also Zuazu-Bermejo (2024, pp.15-16).

Of course, the social reproduction of labour will affect the quantity of labour available for production in the short run, not least because it creates a demand on the limited time resources of a given population. Note, however, that more time devoted to domestic care giving at the expense of time devoted to paid labour by those already participating in the labour force may, in principle, increase the total quantity of labour available in the sphere of paid production if it sufficiently increases labour force participation. As will become clear in due course, the social reproduction of labour may also be linked to the quantity of labour available in the long run if, as in Heintz and Folbre (2022), fertility and hence population growth is endogenous.

Human capacities are defined in this paper as “features that make human beings more economically effective (such as emotional maturity, patience, self-confidence, and the ability to work well with others, as well as standard human capital measures such as skills and education)” (Braunstein et al. 2011, pp.9-10), or more simply, “individual attributes that improve productive contributions” (Heintz and Folbre 2022, p.150). So defined, human capacities are acquired rather than innate, and can be considered equivalent to human capital broadly defined (as acquired attributes of individuals that enhance their (marginal) productivity). Human capacities arise from a variety of sources, including care services (Elson 1995) that may be either marketed (such as the services of a day spa) or result from unpaid care in the home (such as care for an elderly relative). The latter is the focus of attention in this paper.
where \( f(u) \) and \( m(u) \) are the wages paid to women and men, respectively (both wage rates increasing in the level of economic activity, proxied by the capacity utilization rate \( u \)). The sign of the derivatives \( H_{cm} \) and \( H_{cf} \) captures the notion that rising wages incentivizes reallocation of time away from unpaid care giving and towards the paid labour market, thus reducing the domestic production of human capacities. The relative size of the derivatives \( m' > f' \) and \( H_{cm} < H_{cf} \) reflects the gendered structures of the paid labour market and the sphere of household production, respectively. On this basis, output per person becomes:

\[
Q = Q[f(u), m(u), H_c(f(u), m(u))], \quad Q_f, Q_m > 0; \quad Q_{H_c} > 0
\]  

(2)

where \( Q_f, Q_m > 0 \) captures classical induced factor biased (CIFB) technical change.\(^6\)

One limitation of this approach is that it describes only the short term (albeit with CIFB technical change treated as a short-term phenomenon – itself a questionable assumption). Articulation of the long-term (that is, derivation of an expression for the rate of productivity growth \( q \) from the implicit function \( Q[\cdot] \)) remains unclear.\(^7\)

In Onaran et al. (2022), unpaid care in the home enters directly into the determination of the (log) level of output per worker, together with (inter alia) the CIFB mechanism and a Verdoorn effect, according to which productivity varies directly with the level of output. This is effectively an extension of equation (2). Onaran et al. (2022) present their model as one of long-run productivity growth, but as specified their equation of motion will converge to a steady-state level of productivity. Under the special case conditions that transform their dependent variable into a log-difference in the level of productivity, the resulting rate of productivity growth depends on the log level of labour supplied to the process of domestic

\(^6\)The CIFB technical change hypothesis posits that technical change is spurred by pressure on profits arising from the growth of real wages in excess of productivity.

\(^7\)In particular, the notion that the level of labour productivity depends on the allocation of time towards domestic production of human capacities does not translate into the proposition that long run growth of labour productivity can be related to reallocation of labour time towards unpaid care giving, because the share of time devoted to unpaid care is bounded.
care giving. Why a constant level of care giving in the household should result in steady long-run growth in productivity in the sphere of production is unclear.

Finally, like Onaran et al. (2022), Vasudevan and Raghavendra (2022) posit a direct effect of time devoted to unpaid care in the home on the level of labour productivity in the sphere of production. As in equation (2), meanwhile, and in common with both Braunstein et al. (2011) and Onaran et al. (2022), labour productivity is increasing in both male and female earnings – but not because of CIFB technical change. Instead, an increase in earnings is understood to raise labour productivity by facilitating the substitution of marketed care goods and services for unpaid care giving and the purchase of goods that increase the productivity of unpaid care giving itself. Ultimately, Vasudevan and Raghavendra (2022) postulate an implicit function for the level of labour productivity akin to equation (2), with additional terms that capture the public provision of care services and the capital stock (public and private). As in Braunstein et al. (2011), there is no description of the rate of growth of productivity – and no obvious way of deriving such an expression from the implicit function describing the level of productivity.

A common feature of the existing literature is that its treatment of the social reproduction of labour is ‘built for (some other) purpose’: models of the process arise as a bespoke means to some other (broader) end in macro theory, with the result that focus on the social reproduction of labour is somewhat ‘indirect’. The approach taken here involves singling out the social reproduction of labour as a focus of attention in and of itself. The ambition is to then fashion an ‘integrated’ approach to treating the social reproduction of labour that can be used subsequently in short- and long-term macro models of varying types and that are

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8One possibility, of course, is that the productivity of domestic care giving need not be constant. As noted immediately below, this possibility is entertained in the model of Vasudevan and Raghavendra (2022). It is also a feature of the model developed in this paper.

9Labour productivity is described as increasing in both of these variables.

10Once again, long run growth of labour productivity cannot be based on reallocation of labour time towards unpaid care giving because the share of time devoted to unpaid care is bounded.
built for different purposes.

3. **Short-term Considerations: Macroeconomic statics**

We start by describing the production of marketed output (hereafter production) by writing:

\[ Y_p = \min \left[ \frac{K}{v}, \frac{N_{\text{max}}}{a} \right] \]  \hspace{1cm} (3)

where \( Y_p \) denotes potential output, \( K \) is the capital stock, \( N_{\text{max}} = (1 - U_{\text{min}})L \) is the maximum possible level of employment, derived from the minimum attainable rate of unemployment \( (U_{\text{min}}) \) and the total labour force, \( L \), and \( v \) and \( a \) are the full-capacity capital-output ratio and the labour-output ratio, respectively. Assuming that the economy is labour constrained, we can write:

\[ Y_p = \frac{N_{\text{max}}}{a} = \frac{(1 - U_{\text{min}})L}{a} \]  \hspace{1cm} (4)

Now consider the labour-output ratio \( a = \frac{N}{Y} \) which, as will become clear immediately below, will bring us into the sphere of social reproduction. Write:

\[ a = \frac{1}{n} \sum_{i=1}^{n} a_i = \frac{1}{n} \sum_{i=1}^{n} a_{i-1}e^{(\delta - \alpha_i)} \]  \hspace{1cm} (5)

where \( n \) is the duration of the short run (the period of time for which the capital stock is fixed and during which the flow of potential output in (4) is produced), \( \delta > 0 \) is per-production-period atrophy of labour power, and \( \alpha_i > 0 \) denotes unpaid production of human capacities in production period \( i \) designed to offset \( \delta \). In (5), maintaining the productivity of labour from one production period to the next requires \( \alpha_i = \delta - i.e., sufficient social reproduction of labour power (\alpha_i) to offset the per-production-period atrophy of labour power in the sphere of production (\delta). \]
Next write:

\[ \alpha_i = \frac{N_c}{a_{ci}} \]  

(6)

where:

\[ a_{ci} = a_{ci-1} e^{\alpha_c} \]  

(7)

In (6), the extent of social reproduction depends on the unpaid labour applied to care \((N_c)\) and the productivity of care-giving, as reflected in the size of the care-giving to social reproduction ratio, \(a_c\). In other words, the flow of human capacities \(\alpha_i\) is produced by unpaid care-giving labour per production period \((N_c)\), with a labour-output ratio in the unpaid care giving process of \(a_c\). Equation (6) thus describes the ‘social reproduction of labour power by means of (unpaid care giving) labour’\(^{11}\). Finally, in (7), \(a_c \geq 0\) represents the (in)capacity of the household to maintain the productivity of unpaid care giving \((a_c)\) between production periods. We will comment further on the sign of \(\alpha_c\) (and hence the behaviour of \(a_{ci}\) and its implications for the value of \(a\)) in what follows.

Beforehand, however, we first consider the determination of \(L\) and \(N_c\) in the numerators of equations (4) and (6), drawing on Vasudevan and Raghavendra (2022) and Onaran et al. (2022). Turning first to the sphere of production, we write:

\[ L = L_{mp} + L_{fp} \]  

(8)

where \(L_{mp}\) and \(L_{fp}\) denote the total labour supplied to the process of production by men and women, respectively. Now write:

\[ L_m = L_{mp} + L_{ms} \]

\(^{11}\)Note the absence of any commodity inputs from the sphere of production in this reproduction process. We abstract from this (plausible) connection between the sphere of production and the process of social reproduction for the sake of simplicity – as have others (see, for example, Braunstein et al., 2011, and equation (1) above).
and:

\[ L_{m_p} = \phi L_m , \quad \phi = \frac{L_{m_p}}{L_m} \quad (9) \]

That is, working-age men divide their total time \( L_m \) between labour force participation \( (L_{m_p}) \) and leisure (which we equate with self-care), \( L_{m_s} \), according to the fixed proportion \( \phi \).\(^{12}\)

Meanwhile:

\[ L_f = L_{f_p} + L_c \quad (10) \]

where:

\[ L_c = L_{c_m} + L_{f_s} \]

\[ L_{c_m} = \theta L_f , \quad \theta = \frac{L_{c_m}}{L_f} \]

\[ L_{f_s} = \psi L_f , \quad \psi = \frac{L_{f_s}}{L_f} \]

so that:

\[ L_c = (\theta + \psi) L_f , \quad 0 < \theta + \psi \leq 1 \quad (11) \]

and hence (substituting (11) into (10)):

\[ L_{f_p} = (1 - [\theta + \psi]) L_f \quad (12) \]

In other words: working-age women divide their time between labour force participation \( (L_{f_p}) \) and unpaid care-giving \( (L_c) \); their unpaid care-giving is divided between caring for men \( (L_{c_m}) \) and leisure/self-care \( (L_{f_s}) \); and their labour force participation is ultimately

\(^{12}\)We abstract, for simplicity, from the possibility that labour force participation is endogenous to outcomes in the sphere of production, such as the value of the real wage (as in Braunstein et al., 2011) or the value of output per working-age person (as in Heintz and Folbre, 2022). See, however, the discussion of long-term dynamics in section 4 below, where we allow fertility and hence population growth to vary endogenously in response to outcomes in the sphere of production when discussing the determination of the natural rate of growth.
determined as a residual (equation (12)), given the demands on their time associated with
care-giving in accordance with the parameters $\theta$ and $\psi$, which determine the proportions of
$L_f$ devoted to caring for men and self care, respectively.\textsuperscript{13}

Finally, the allocation of men’s and women’s time as outlined above implies that:

$$nN_c = L_m + L_c = (1 - \phi)L_m + (\theta + \psi)L_f$$

$$\Rightarrow N_c = \frac{(1 - \phi)L_m + (\theta + \psi)L_f}{n} \quad (13)$$

Several remarks on the allocation of time are in order. First, note that if we assume
that $1 - \phi < \theta + \psi \Rightarrow \phi > 1 - (\theta + \psi)$, then gender affects the quantity of male/female
labour force participation as well as its structure (the latter reflected in women’s treatment
of labour force participation as a residual, given the time demands of care-giving). Second,
$\theta \neq 0$ captures the assumption that unpaid care-giving is gendered: only women care for
household members other than themselves.\textsuperscript{14} Note that in this formulation, care-givers care
for themselves\textsuperscript{15} and must do so to a sufficient extent if they are to maintain their own
productivity in the spheres of both production and social reproduction and hence (ceteris
paribus) the productivity of men in the process of production. In other words (and again,
ceteris paribus), $\psi$ sufficiently large is instrumental in the achievement of $\alpha_c = 0$ (no decline
in productivity of care-giving) and $\alpha = \delta$ (sufficient production of human capacities to offset

\textsuperscript{13}In Vasudevan and Raghavendra (2022), the share of time devoted to unpaid care giving is endogenous
to (inter alia) the level of labour productivity in the sphere of production. We abstract from this feedback
effect in this paper, in order to focus attention on causality running from unpaid domestic care-giving to
productivity in the sphere of production.

\textsuperscript{14}This is equivalent to the ‘extreme gender inequality’ case in Onaran et al. (2022, p.35), and can therefore
be considered a simplifying first approximation. In practice, care-giving work (paid and unpaid) is performed
by both men and women, with gender affecting the value attached to such ‘female coded’ work (see, for
example Folbre et al., 2021, on ‘care penalties’). Note that race and class also stratify care-giving, affecting
(for example) whether or not any given household provides its own (unpaid) care and if not, with whom the
household contracts to provide paid care-giving services. We abstract from these sources of stratification
here and in what follows.

\textsuperscript{15}There is, then, no infinite regress problem arising from the question ‘who cares for the care givers?’
the per-production-period atrophy of labour power).

Third, the expression in (12) suggests that there exists a linear trade-off between caregiving for men and self care that can leaves women’s labour force participation unchanged. This trade-off may ultimately be non-linear, however (Vasudevan and Raghavendra, 2022), and in any event, is constrained by the sufficient amount of self-care required by women to reproduce their own labour power. We will return to discussion of this last observation below. Fourth, the parameters $\phi$, $\theta$ and $\psi$ may be endogenous to (for example) the value of the wage rate and/or the level of economic activity, while ‘caring spirits’ (Braunstein et al., 2011) may play a role in determining the size of $\theta$. Finally, and for the sake of simplicity, we abstract from the care-giving time that women devote to children. This is because children do not contribute to the workforce in equation (8). Even so, unpaid child care will impose an additional demand on $L_f$ that may affect the relationship between production and social reproduction.\footnote{See Appendix A for reflections on the inclusion of unpaid child care in the model developed here.}

We are now in a position to combine the insights outlined above and, in so doing, spell out their implications for $Y_p$ in equation (4). First, substituting (9) and (12) into (8), we get:

$$L = \phi L_m + (1 - [\theta + \psi]) L_f$$

(14)

$$\Rightarrow Y_p = \frac{(1 - U_{min})[\phi L_m + (1 - [\theta + \psi]) L_f]}{a}$$

(15)

Here we see the effects of gender on potential output (in equation (15)) operating via participation in paid production (as in equation (14)).

Next, combining (5), (6), (7), and (13) yields:
\[ a = \frac{1}{n} \sum_{i=0}^{n} a_{i-1} e^{\left( \delta - \frac{(1-\phi)L_m + (\theta + \psi)L_f}{na_{i-1}} \right)} \]  

(16)

\[ \Rightarrow Y_p = \frac{(1 - U_{\text{min}})L}{\frac{1}{n} \sum_{i=0}^{n} a_{i-1} e^{\left( \delta - \frac{(1-\phi)L_m + (\theta + \psi)L_f}{na_{i-1}} \right)}} \]  

(17)

Here we see the effects of gender on potential output (in equation (17)) operating via the labour-output ratio (in equation (16)). Note that if we assume \( \alpha_c = 0 \), so that the productivity of unpaid care giving remains constant in the short run, then \( \forall i = 1, ..., n, a_{c_i} = a_{c_{i-1}} \equiv \bar{a}_c \) so that:

\[ \alpha_i = \frac{N_c}{a_{c_i}} = \frac{(1 - \phi)L_m + (\theta + \psi)L_f}{na_c} \equiv \bar{\alpha} \]

If we further assume that \( \phi, \theta \) and \( \psi \) are sufficient to yield a value of \( \bar{\alpha} \) such that \( \bar{\alpha} = \delta \), then it follows that \( a = \frac{1}{n} \sum_{i=1}^{n} a_{i-1} e^{(\delta - \bar{\alpha})} = \frac{1}{n}a_0 n \equiv \bar{a} \). Finally, combining these insights, (17) becomes:

\[ Y_p = \frac{(1 - U_{\text{min}})L}{\bar{a}} \]

This exercise reveals what is required of the social reproduction of labour (\( \alpha_c = 0; \phi, \theta, \psi \) s.t. \( \alpha = \delta \)) to produce the ‘standard’ short-run macro assumption of a constant labour-output ratio (given the state of technology). Contrary to the conventional wisdom, that \( a = \bar{a} \) simply because of the absence of technical change during the short run, it is now revealed that \( a = \bar{a} \) in the sphere of production also requires that certain conditions hold in the process of social reproduction.

Finally, if we combine (4), (14), and (16), we obtain:
\[
Y_p = \left(1 - U_{\text{min}}\right) \left[ \phi L_m + \left(1 - \left[\theta + \psi\right]\right) L_f \right] \frac{1}{n} \sum_{i=0}^{n} a_i e^{-\delta \left(\frac{(1-\phi)L_m + (\theta + \psi)L_f}{a_{\text{ext}} - \alpha c - \tau} \right)}
\]

This expression provides us with a full account of the determinants of \(Y_p\), taking into account the gendered structures of both labour force participation and the social reproduction of labour that is required to support labour productivity in the sphere of paid production in the short run.

4. **Long-Term Considerations: Macroeconomic dynamics**

Suppose now that we change the ‘timescale’ of reference for the social reproduction of labour. The previous section referred to social reproduction between production periods within the short run. Hereafter, we will analyze both production and social reproduction on a short-run basis, so that the timescale for the social reproduction of labour is synchronized with the implicit timescale in the sphere of production (one calendar year). On the basis of these considerations, and starting from (18), we now write:

\[
y_p = n - \hat{a}
\]

where \(y_p\) denotes the annual average rate of growth of \(Y_p\) — that is, Harrod’s natural rate of growth — while \(n \equiv \hat{L}=\hat{P}\) (where \(P\) denotes total population), so that the share of the working-age population in the total population \(\left(\frac{L_m + L_f}{P}\right)\) and the labour force participation rate \(\chi = \frac{L}{L_m + L_f}\) are both assumed constant in the long run, and:

\[
a = a_0 e^{(\delta_a - \alpha_a - \gamma)t}
\]
where $\delta_a$ is the annual atrophy of labour power in any given short run, $\alpha_a$ is the annual unpaid production of $H_c$ designed to offset $\delta$ during the same short run, $\tau$ denotes Harrod-neutral (labour-saving) technical change, and $t = 1, \ldots, \infty$ denotes successive short runs.

Now consider $\delta_a$ and $\alpha_a$. First, we assume that:

$$\delta_a = \delta_a e^{\alpha_t} \quad (21)$$

In other words, the aggregate quantity $\delta_a$ grows over time at a rate equivalent to that of the total labour force. Next, consider the determination of $\alpha_a$. Recalling (7), we can write:

$$\alpha_a = \frac{nN_c}{\frac{1}{n} \sum_{i=1}^{n} a_{c_i}} = \frac{(1 - \phi)L_m + (\theta + \psi) L_f}{\frac{1}{n} \sum_{i=1}^{n} a_{c_i}} \quad (22)$$

and:

$$\frac{1}{n} \sum_{i=1}^{n} a_{c_i} = \frac{1}{n} \sum_{i=1}^{n} a_{c_{i-1}} e^{\alpha_c} \quad (23)$$

which upon substitution yields:

$$\alpha_a = \frac{(1 - \phi)L_m + (\theta + \psi) L_f}{\frac{1}{n} \sum_{i=1}^{n} a_{c_{i-1}} e^{\alpha_c}}$$

$$\Rightarrow \alpha_a = \frac{[(1 - \phi)L_{m0} + (\theta + \psi) L_{f0}] e^{nt}}{\frac{1}{n} \sum_{i=1}^{n} a_{c_{i-1}} e^{\alpha_c}} \quad (24)$$

where we assume that total labour devoted to care also grows at a rate equivalent to that of the total labour force.

Finally, it follows from (20) that:

$$\hat{a} = \delta_a - \alpha_a - \tau \quad (25)$$
Substituting (21) and (24) into (25) we arrive at:

\[
\hat{a} = \delta_0 e^{nt} - \left[\frac{(1 - \phi) L_{m0} + (\theta + \psi) L_f}{n} \sum_{i=1}^{n} a_{c_i - 1} e^{\alpha_c} \right] e^{nt} - \tau \tag{26}
\]

Equation (26) reveals that even assuming that the annual atrophy of labour power and the quantity of care-giving labour devoted to offsetting this atrophy grow at the same rate \( n \), labour productivity growth in the sphere of paid production (\( \hat{a} < 0 \)) is sensitive not just to technical change, but also to the gendered structure of labour devoted to care (as reflected in the parameters \( \phi, \theta \) and \( \psi \)) and the capacity of households to maintain the productivity of caregiving (\( \alpha_c > 0 \)) between production periods within any given short run. In other words, technical change in the sphere of production and the extent and productivity of unpaid labour designed to maintain human capacities by socially reproducing labour power co-determine the rate of growth of labour productivity. Given the role of \( \hat{a} \) in determining \( y_p \) in (19), it follows that unpaid care giving will be similarly influential in the determination of the natural rate of growth.

Now suppose that, following Foley (2000) and Heintz and Folbre (2022), we posit that fertility and hence (ceteris paribus) population growth vary inversely with per capita income. Specifically, following Heintz and Folbre (2022, pp.150-52), we write the rate of change of the total population as:

\[
\dot{P} = \mu \left[ \sigma \frac{\beta Y_p}{L_m + L_f} \right]^{-\gamma} N - \epsilon N \tag{27}
\]

where \( \epsilon \) is the (constant) mortality rate, \( \mu \) captures the effects of socio-cultural norms on fertility, \( \frac{\beta Y_p}{L_m + L_f} \) is current output per working-age adult (with \( \beta = \frac{Y}{Y_p} \) assumed constant) and captures the opportunity cost of children – the foregone real output associated with devoting time to children rather than participation in paid production – \( \sigma \) is a scaling parameter that, based on the gendered structure of the labour market, captures the size of the opportunity
cost just described for women, and \( \gamma \) is the elasticity of the rate of change of population with respect to the same opportunity cost. Note that:

\[
\frac{\beta Y_p}{L_m + L_f} = \frac{\beta Y_p}{(1 - U_{min})L} \frac{(1 - U_{min})L}{L_m + L_f} = \frac{\beta(1 - U_{min})\chi}{a}
\]

Substituting this expression into (27) and standardizing by the total population, we arrive at:

\[
n = \mu \left[ \frac{\sigma \beta(1 - U_{min})\chi}{a} \right]^{-\gamma} - \epsilon \tag{28}
\]

Finally, combining (21) and (24) with (20) and then substituting the result into (28) yields:

\[
n = \mu \left[ \frac{\sigma \beta(1 - U_{min})\chi}{a \left(\delta_0 e^{nt} - \frac{[(1 - \phi) L_m0 + (\theta + \psi)L_f0] e^{nt}}{\sum_{i=1}^n a_{ci-1} e^{\alpha c}} - \tau\right) t}\right]^{-\gamma} - \epsilon \tag{29}
\]

Equation (29) reveals that, just as with productivity growth, population growth is sensitive to the gendered structure of labour devoted to care (as reflected in the parameters \( \phi, \theta \) and \( \psi \)) and the capacity of households to maintain the productivity of caregiving (\( \alpha_c \geq 0 \)) between production periods within any given short run. Given the role of \( n \) in determining \( y_p \) in (19), this reveals a second channel of influence of the parameters associated with unpaid care-giving on the natural rate of growth.

A composite statement of the long-run results derived above can be achieved by combining (19), (26) and (29) to derive the following expression for the natural rate of growth:

\[
y_p = \mu \left[ \frac{\sigma \beta(1 - U_{min})\chi}{a \left(\delta_0 e^{nt} - \frac{[(1 - \phi) L_m0 + (\theta + \psi)L_f0] e^{nt}}{\sum_{i=1}^n a_{ci-1} e^{\alpha c}} - \tau\right) t}\right]^{-\gamma} - \epsilon - \delta_0 e^{nt} + \frac{[(1 - \phi) L_m0 + (\theta + \psi)L_f0] e^{nt}}{\sum_{i=1}^n a_{ci-1} e^{\alpha c}} + \tau
\]
4.1. Further reflections on the long run

The results derived thusfar merit several further remarks. First, note that the presence of \( \tau \) in the long run means that in principle, labour-saving technical change can substitute for the production of human capacities \( \alpha_a = \frac{[(1-\phi)L_{mA}+(\theta+\psi)L_{f0}]e^{nt}}{\sum_{i=1}^{n} a_{ci-1} e^{\alpha_c}} \) in equation (26) when it comes to simply maintaining the value of \( \hat{a} \) in the face of atrophying labour power \( \delta_{a0} e^{nt} \). A corollary of this observation is that technical change in the sphere of paid production can conceal problems associated with the social reproduction of labour (specifically, \( \alpha_a < \delta_a \)). Either way, this demonstrates that issues arising from the sphere of unpaid care giving can prevent full realization (reflected in the size of \( \hat{a} \)) of the fruits of technical progress, since \( \hat{a} = \delta_a - \alpha_a - \tau > -\tau \) when \( \delta_a - \alpha_a > 0 \). On this basis, and unlike existing research in macroeconomics (see, for example Goldin et al., 2024), it is appropriate to direct attention towards unpaid care giving when seeking to explain macroeconomic phenomena such as productivity growth slowdowns.

Consider, for example, the determinants of \( \alpha_a \) itself, bearing in mind the gendered structure of social relations in the household. This draws attention (once again) to the functional relationship between \( \alpha_c \) (and hence the productivity of unpaid care giving) and \( \psi = \frac{L_{sf}}{L_f} \) (the time devoted by women to self care). Suppose, for example, that given the values of \( \phi \) and \( \theta \), \( \psi \) is too low to maintain \( \alpha_c \leq 0 \) – which circumstances may arise if the financial needs of the household are such that women cannot treat either their own labour force participation or the time that they devote to caregiving for other household members as adjusting residuals. Since \( \alpha_c > 0 \) implies a higher value of \( \frac{1}{n} \sum_{i=1}^{n} a_{ci-1} e^{\alpha_c} \) (relative to the case where \( \alpha_c \leq 0 \)) in (4), the result will be an increase in the value of \( \hat{a} \) – that is, a productivity growth slowdown.

Another issue concerns the possible endogeneity of \( \delta_a \) in the long run. Suppose, for example, that \( \delta_a = \delta_a(\tau), \delta_a' \neq 0 \). In other words, the extent to which labour power atrophies in the short run depends on the extent of labour-saving technical change. Specifically, whether
\( \delta'_a > 0 \) or \( \delta'_a < 0 \) will likely depend \((\textit{inter alia})\) on power relations in the sphere of production and hence on the power bias of labour-saving technical change \cite{skott_and_guy_2007}. For example, technical change that increases the surveillance of, and hence effort extracted from, production workers will increase \( \delta_a \), \textit{ceteris paribus}. This will imply that a higher value of

\[
\alpha_a = \frac{[(1-\phi)L_{m0}+(\theta+\psi)L_{f0}]e^\gamma t}{\sum_{i=1}^{\infty} \alpha_{i-1} e^{a_{i-1}}} \]

is required to maintain \( \alpha_a = \delta_a \) and hence \((\textit{ceteris paribus})\) the values of \( \hat{a} \) and \( y_p \) in equations (26) and (19), respectively. These developments will have implications for both the household and the sphere of paid production. Hence suppose that the power-bias of technical change in a \textit{male-dominated} industry is such that \( \delta'_a > 0 \), the implications for the household being that a higher \( \theta = \frac{L_{cm}}{L_f} \) is now required. This may, in turn, result in adverse implications for \( \psi \) given the time constraints faced by women and financial constraints faced by the household, which together may prevent the treatment of women’s labour force participation as an adjusting residual. The circumstances thusfar described may ultimately have adverse implications (via \( \alpha_c \) and hence \( \alpha_a \)) for \( \hat{a} \) and hence \( y_p \) in equations (26) and (19), respectively, as the productivity of unpaid caregiving labour falls, reducing the production of human capacities below the level necessary to offset the atrophy of labour power in the short run. In this scenario, because of its implications for the social reproduction of labour and the feedback effects of the latter onto the sphere of paid production, labour-saving technical change may be (at least partially) self-defeating in terms of its effects on productivity growth and the natural rate of growth.

The interaction of productivity in the sphere of reproduction and productivity growth in the sphere of production just described may shed light on the suggestion by \cite{weisskopf_1987}, that threat-based elicitation of effort in the sphere of production need not succeed in raising productivity growth. Whereas providing incentives to increase the supply of effort (‘carrots’) allows for the exercise of household choice (given power relations within the household), ‘sticks’ designed to compel effort supply for fear of adverse consequences (job and/or income loss) do not. The possibility therefore exists that the use of sticks in the sphere of production
will more often elicit sub-optimal effort-supply responses, by failing to take into account the requirements of social reproduction and the household income and hours constraints to which the latter is subject – with the result that the positive effects of sticks on productivity growth in the sphere of production are accompanied by negative effects operating via the sphere of reproduction where \( \textit{ceteris paribus} \) (and as noted above), a decline in \( \alpha_c \) caused by a reduction in \( \psi \) that renders \( \alpha_a < \delta_a \) will diminish productivity growth.

5. Conclusions

As is demonstrated by surveys of the field (Seguino, 2020; Zuazu-Bermejo, 2024), concern with the social reproduction of labour is but a small part of a much larger feminist macroeconomics ecosphere. This point is also made by observation of the fact that the literature devoted to the task of integrating the social reproduction of labour into macroeconomic accounts of potential output in the short run and the natural rate of growth in the long run is as-yet small (Braunstein et al., 2011; Onaran et al., 2022; Vasudevan and Raghavendra, 2022). Nevertheless, as the contributions just cited demonstrate, modelling the social reproduction of labour in a macro-theoretic context can make important contributions to our understanding of both short- and long-term macroeconomic outcomes.

One common problem with the existing literature is that its focus on the social reproduction of labour is ‘indirect’, subservient to its focus on other issues. As a result, unresolved problems exist with respect to the consistent treatment of the social reproduction of labour in both short- and long-run macro-theoretic contexts. The purpose of this paper is to furnish a generic ‘technology’ for integrating the social reproduction of labour consistently into both short- and long-run macro theory and in so doing, to help foreground the potential importance of this process in macro theory. Although its treatment of (among other things) power relations within the household and the resultant allocation of time towards paid pro-
duction or unpaid care giving in the home is simple, the approach taken reveals that unpaid care-giving may have important effects on the determination of the potential output ‘ceiling’ on economic activity in the short run and the natural rate of growth in the long run. Insights into phenomenona such as productivity slowdowns and the impact of labour-saving but power-biased technical change on productivity growth also emerge. The hope is that in so doing the analysis in this paper will provide a more robust platform for further research designed to integrate processes associated with the social reproduction of labour into macroeconomic theory.

Appendix A  Caring for children and the implications for the allocation of women’s time

Suppose that, in keeping with assumptions made previously about the gendered structure of care giving, we re-write the allocation of women’s care-giving time as:

\[ L_c = L_{cm} + L_{cc} + L_{fs} \]

where:

\[ L_{cc} = \gamma L_f, \quad \gamma = \frac{L_{cc}}{L_f} \]

denotes time devoted to care for children, and all other variables are as previously defined. Then equations (11) and (12) become:

\[ L_c = (\theta + \gamma + \psi)L_f, \quad 0 < \theta + \gamma + \psi \leq 1 \]  \hspace{1cm} (11a)

and:

\[ L_{fp} = (1 - [\theta + \gamma + \psi])L_f \]  \hspace{1cm} (12a)
respectively. Women now divide their time between labour force participation and unpaid care-giving ($L_c$), the latter itself divided between caring for men, caring for children, and leisure/self-care. As is clear from equation (12a), caring for children further reduces the labour force participation of women, *ceteris paribus*. However, in and of itself it will have no effect on the quantity of unpaid labour devoted to the social reproduction of labour in each production period ($N_c$) since children do not participate in the sphere of production. This last observation may be modified, however, if the demands of the household fisc constrain the ability of women to treat $L_{fp}$ as an adjusting residual. Hence suppose that $L_{fp}$ must be held constant while children’s play becomes less self-organizing and demands greater parental supervision – as, for example, when organized sports substitute for ‘scratch’ games played in the street. This will reduce $\theta$ and/or $\psi$ which will, in turn, affect the efficiency of the social reproduction of labour, and hence the efficiency of labour in the sphere of production and the value of potential output (see equation (17)).

Of course, caring for children contributes to the reproduction of labour between generations, so child care will inevitably affect the sphere of production in the long run. It could be argued that $L_{cc}$ will ultimately contribute to $\alpha_a$ in equation (24), as part of the process by which retiring workers are replaced by new workers entering the labour force. However, we abstract from these long-term dynamics in this paper, leaving their full and proper investigation to further research.

**References**


