# CARE WORK AND THE ECONOMY

Advancing policy solutions with gender-aware macroeconomic models

## NORMS, GENDER WAGE GAP AND LONG-TERM CARE

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## THE CARE WORK AND THE ECONOMY (CWE-GAM) PROJECT

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

Find out more about the project at www.careworkeconomy.org.

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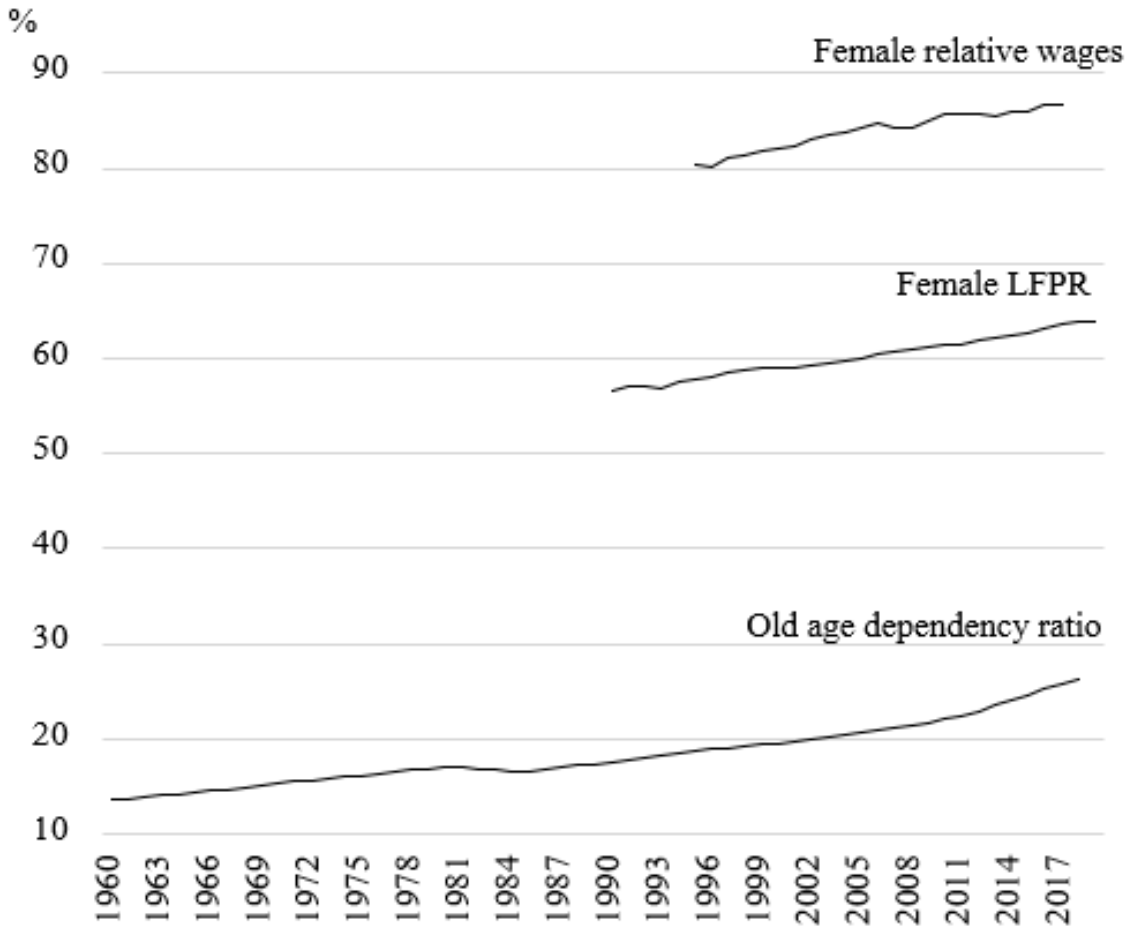
## 1. INTRODUCTION

Countries across the world are facing population aging, albeit at varied pace, and the demand for long-term care (LTC) has become an imminent issue to policymakers. In recent years, a growing literature has emerged that explores the attendant consequences of the rising demand for long-term care. One strand of recent literature studies long-term care needs as a driver of the elderly's savings behavior over the life cycle (Ameriks, Briggs, Caplin, Shapiro and Tonetti, 2015; Curtis, Lugauer and Mark, 2015; Bueren, 2017). Another strand of the literature employs both general and partial equilibrium dynamic models to examine the role of unpaid care by family members in determining the demand for long-term care and the long-run effects for economic growth (Tabata, 2005; Mommaerts, 2015; Kydland and Pretnar, 2019). These papers focus on the dynamics of demand for long-term care and labor supply when both paid and unpaid care options are available. Evaluating policy options for financing long-term care, such as pension reforms and increasing consumption tax rates, is a subject of the third strand of the literature on long-term care (Song, Storesletten, Wang and Zilibotti, 2015; McGrattan, Miyachi and Peralta-Alva, 2019).

To date however, the gender dimensions of long-term care, particularly the role of persistent gender norms, remain largely absent in the discussion. This is a serious gap in the literature for analyzing the impact of long-term care needs on economic outcomes. A few studies such as Galor and Weil (1996), Lagerlöf (2003), Agénor (2018), and Agénor and Agénor (2014) are some examples of papers that take gender seriously in the long-run dynamics of economic growth. To the best of our knowledge, however, Barigozzi, Cremer and Roeder (2017) is the only study of informal eldercare that considers the role of gender norms. Our paper builds a model to further explore the relationship between gender norms and provision of eldercare. Different from Barigozzi et al. (2017), that studies how gender norm affects the social costs of different long-term care arrangements, we use a macroeconomic approach that focuses on explaining the relationship between observed gender wage gaps and the distribution of care work. Our paper aims to provide a tractable benchmark to introduce gender-biased care work in macroeconomic models.

Figure 1: Long-Run Trends of Female Labor and Aging in OECD Countries (1960-2018)




Notes: Female relative wages are defined as the percentage of women's median earnings relative to men's median earnings (OECD Data). The female labor force participation rate is defined as the percentage of female population ages 15-64 that is economically active (ILOSTAT) and the old age dependency ratio is the proportion of people older than 64 out of the working-age population (UN World Population Prospects: 2019 Revision).

Figure 1 illustrates broadly parallel trends in female relative wages, female labor force participation and the old age dependency ratio in OECD countries.[1] This suggests that the steady increase in female relative wages has been accompanied by a proportionate rise in female labor force participation, while populations have aged in similar rates during the same period. Given these trends, people might expect less informal care to be provided by family

[1] We focus on OECD countries due to data limitations on the gender-disaggregated wage gap in developing countries.

members in their old age and, thus, increase their savings to meet their increased demand for formal market-based long-term care. Indeed, neoclassical growth models suggest that as the gender wage gap falls (or as female relative wages rises), women will devote less time to care work due to the increased opportunity costs (Galor and Weil, 1996).

However, whether the fall of gender wage gap translates to decreased time on women's care work depends heavily on gender norms. Evidence suggest that family norms around household division of labor are still strong, regardless of the trends in relative wages (Burda, Hamermesh and Weil, 2013; Bertrand, Kamenica and Pan, 2015). The persistence of gender norms may also help explain the long-term care puzzle, the paradoxical trend describing the low demand for private long-term care insurance despite increasing needs for long-term care (Mommaerts, 2015; Ko, 2016; Lockwood, 2018). [2] Our paper fills in the gap in the macroeconomics literature by examining the role of gender norms in the dynamics of long-term care and female labor supply. We hypothesize that in cases where traditional gender norms are strong, there will be lower growth in female labor supply and lower output.

## 2. BACKGROUND

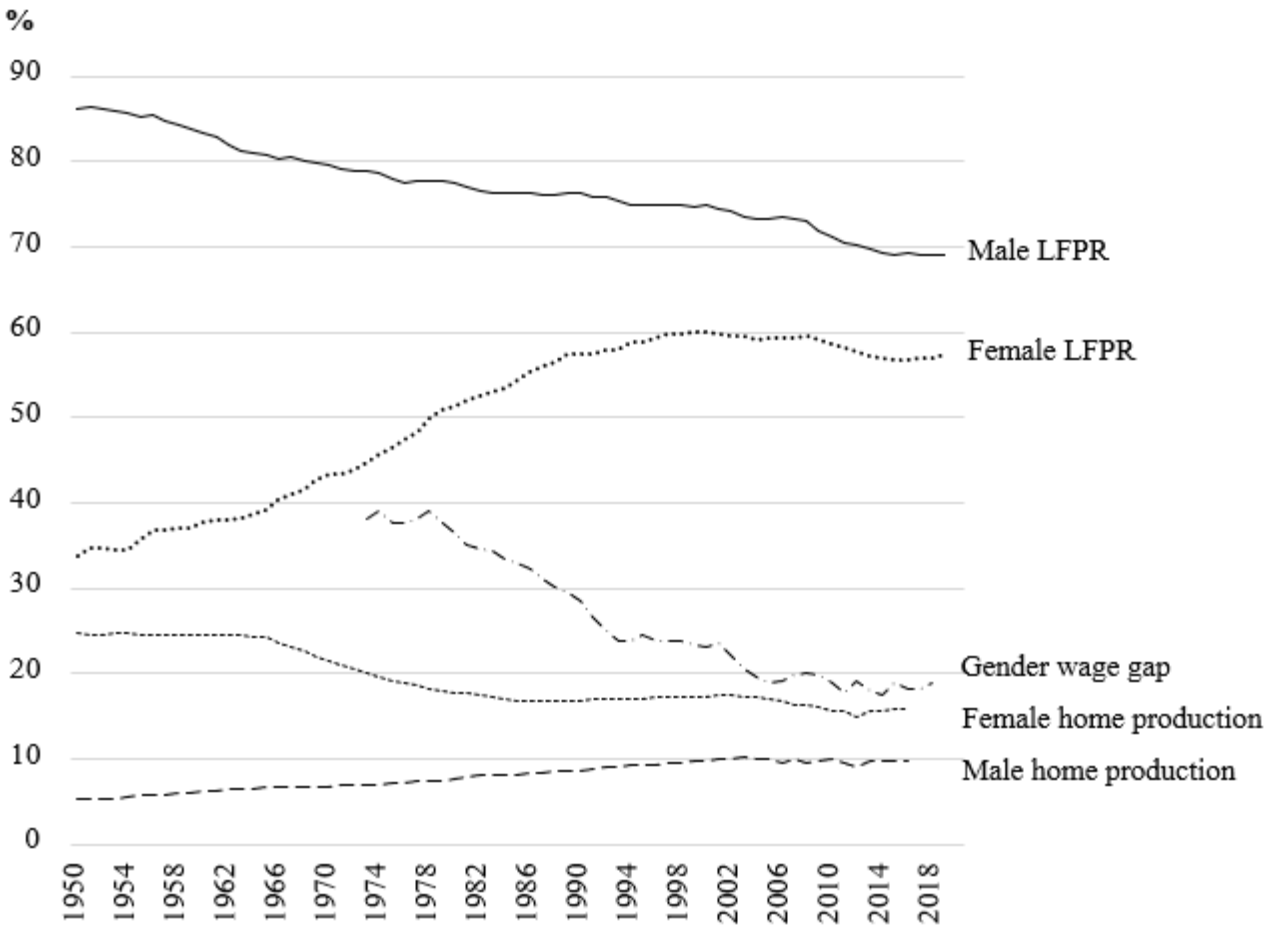
Our paper builds on the work by Galor and Weil (1996) and Yakita (2020), that develop macroeconomic models to examine the relationship between female labor supply, population change and economic growth. Galor and Weil (1996) introduced a neoclassical growth model with endogenous fertility to explore the mechanisms linking fertility and growth. The model's underlying assumption is that women's relative wages have risen due to technological change and capital accumulation favoring mental skill-intensive job growth over `brawn'-based job growth. Women respond by increasing their labor market participation. As a result, fertility rates fall and the declining rate of population growth increases the level of capital per worker in the economy, generating a positive feedback loop between the demographic transition and the output growth. Beyond addressing the relationship between fertility and output growth, Galor and Weil (1996)'s model has served as a framework to incorporate gender in a variety of macroeconomic models.

A recent example of this is Yakita (2020), who extends Galor and Weil (1996)'s model by incorporating elderly's long-term care needs. Yakita (2020) provides an additional channel whereby increases in women's relative wages increase the opportunity costs of women taking care of the elderly. Since women are assumed to provide all the informal or unpaid care in households, the declining gender wage gap generates a low supply of unpaid care. Consequently, the model predicts a progressive increase in the demand for market-provided eldercare.

[2] This is especially true in countries with feeble or non-existent public investment in eldercare services such as the United States.

We argue in this section that the linear aggregate trends in female relative wages and female labor force participation depicted in Figure 1 mask important trends within countries. While frameworks such as Galor and Weil (1996) are based on the assumption that rising female relative wages translate to increases in the female labor force participation, we show that the link between the gender wage gap and the female labor force participation cannot be established without considering gender norms. Unless gender norms change towards a more egalitarian division of labor, the prediction of Yakita (2020)'s model regarding the evolution of care work will not necessarily hold.

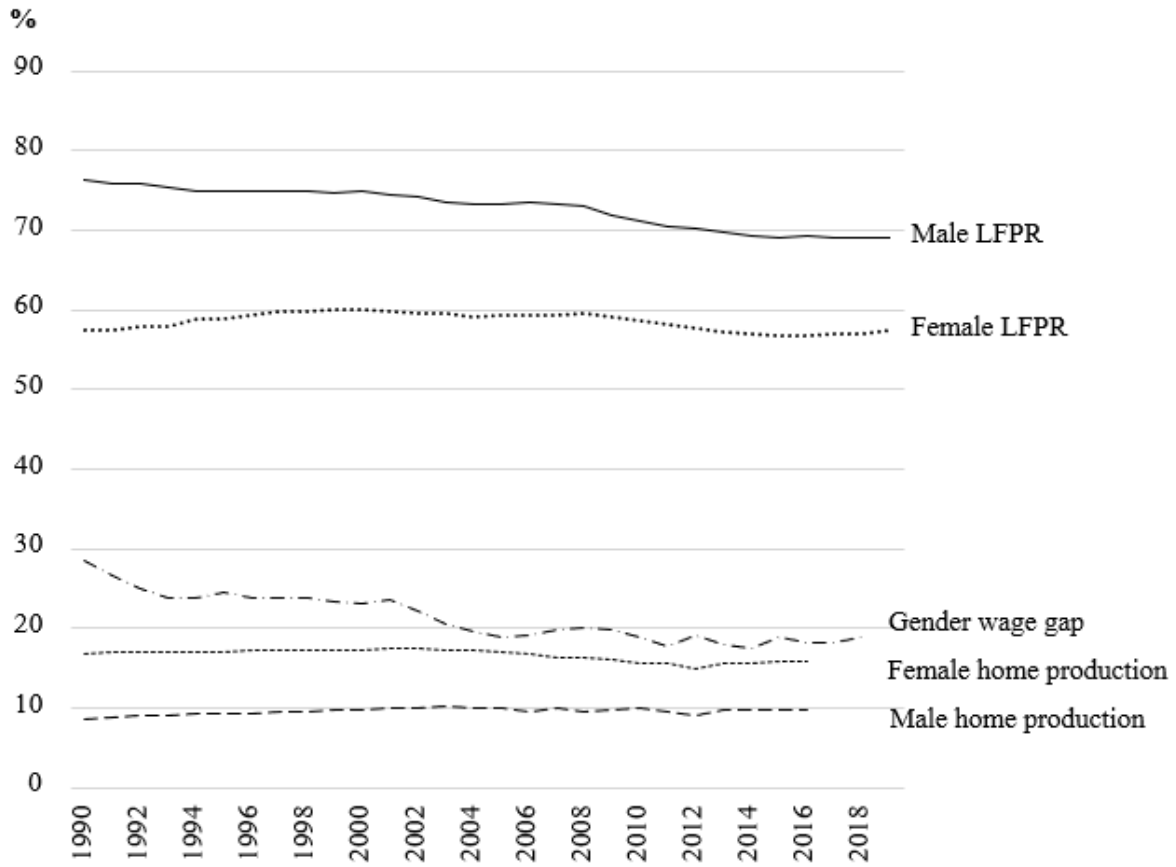
Figure 2: Trends in Market and Unpaid Work and Wages by Gender in the U.S., 1950-2019




Notes: The gender wage gap is defined as the difference between the median earnings of men and of women as a proportion of the median earnings of men for full-time employees. (OECD Data). The labor force participation rates, defined as percentage of the population ages 15-64 that is economically active, were retrieved from FRED, Federal Reserve Bank of St. Louis. Home production times are in percentage of weekly hours devoted to home production.

The gender wage gap has been decreasing on average since the 1960s and 1970s, but this trend has slowed or even stalled in recent decades. Globally, the gender wage gap is estimated to be 23 percent, i.e., women earn 77 percent of what men earn. Although some progress has been made in reducing the gender wage gap, these improvements are small. Blau and Kahn (2017) note that the United States and other high-income countries have had a substantial reduction in the gender wage gap in the long-term. However, the shorter term picture in the United States has been more mixed in that the strongest wage convergence between men and women occurred during the 1980s, and progress has been slower and more uneven since then. Figure 2 presents the long-run trends in female and male labor force participation rates and home production time in the US between 1950 and 2015. Figure 3 zooms in the periods from 1990 to 2018. It is clear that the convergence of the gender wage gap has slowed down since 1990 and the female labor force participation has been steady or falling from 1990 onwards. In Korea and Japan where the populations are aging (Figure A.1), the gender wage gap has been declining at a slower rate compared to other OECD countries (Figure A.2)

Figure 3: Trends in Market and Unpaid Work and Wages by Gender in the U.S., 1990-2019




Notes: Same as Figure 2

Similarly, the ILO's Global Wage Report (2018b) notes that progress in closing the gender wage gap worldwide has recently been slowing down, in spite of significant progress in women's educational attainments and higher female labor market participation rates in many countries. In almost all countries, the gender wage gap is higher when the estimate is based on monthly wages rather than hourly wages, reflecting the fact that women and men differ significantly with respect to working time, i.e. part-time work tends to be more prevalent among women than among men.

Longitudinal trends in household division of labor and women's time spent on care and housework have shown slower convergence in recent years. An important caveat to note is that to date, there is hardly any data or research on the trend in the division of eldercare provided by family members over time. We therefore rely on evidence provided by longitudinal studies on time spent by women and men in unpaid care work, which includes domestic chores and all forms of care work (i.e. childcare, sick care/disabled care and eldercare). Among high-income countries, large differences persisted in men's and women's time in paid and unpaid work but converged between the 1960s and 1990s (World Bank, 2011; Beneria, Berik, Floro, Berik and Floro, 2015; Sullivan, 2019). However, these trends have slowed down in recent years, for countries such as the United States or reversed as in the case of Australia. Figure 3 graphs the unpaid time spent on domestic and care work by gender in the U.S. in recent decades. Women have continued to spend more time on unpaid work compared to men and this trend has remained unchanged.

Using population weighted averages for 23 countries with longitudinal time use data, the ILO (2018b) finds that the gender difference in time spent on unpaid care work has only slightly narrowed. Between 1997 and 2015, population weighted averages show an almost unchanged pattern in the division of unpaid care work, with women's unpaid care work time decreasing only from 4 hours and 23 minutes to 4 hours and 8 minutes. Over the same period, men's unpaid care work on average did not increase, but instead diminished by 8 minutes. In fact, there has been a `levelling off' in men's contribution to unpaid care work between the late 1990s to early 2000s and the 2009-15 period in countries such as Australia, Belgium, Canada, Japan and the United States. An actual decline in the average contribution by men to unpaid care work has occurred in Thailand, France, Benin, South Korea and Germany. A growing number of studies acknowledge the importance of gender roles in understanding labor market outcomes such as female labor force participation (Seguino, 2007; Fleche, Lepinteur and Powdthavee, 2018).

We argue that gender norms constitute a crucial dimension to understanding the dynamics of long-term care and female labor supply. Akerlof and Kranton (2000) for example point out that social groups form attitudes and beliefs about the social roles of men and women that come to define their respective identities. Across cultures, men are expected to be

breadwinners; women are expected to be caregivers. Consequently, wives and daughters are three times more likely than sons to be primary caregivers to older parents (Bauer and Sousa-Poza, 2015). Evidence from several studies in the US and China indicate that women devote more time to parental caregiving and are more likely to be aging parents (or parent in-laws)' primary caregivers compared with men (Liu, Dong and Zheng, 2010; Luo and Chui, 2019; Henle, Fisher, McCarthy, Prince, Mattingly and Clancy, 2020).

What is not clear, however, is the extent in which these socially ascribed roles have changed as a result of the increase in women's labor force participation, and more specifically, the downward trend in gender wage gap. To date, the relationship between gender wage gap and household division of eldercare labor has not been examined directly. A few studies suggest that traditional gender roles continue to have significant influence in household division of labor despite a half- century labor market gains by women such as the decline in the gender gap in labor force participation and the gender gap in earnings. Akerlof and Kranton (2000) report that women in the United States do not undertake less than half of the housework even if they work or earn more than the husband, indicating that, ceteris paribus, in couples where the wife spends more time in work outside the home, she also spends more time on chores and childcare. Bertrand et al. (2015) provide further evidence using data from the American Time Use Survey (ATUS) and the Current Population Survey (CPS) covering 2003-2011 period. Their findings show that the gender gap in nonmarket work is greater when the wife earns more than the husband. This suggests that a reduction in the gender wage gap does not necessarily change gender roles within the household. Their study contributes to the explanation of why men had not increased their housework commensurately as women moved into paid employment and provides support for the idea that gender norms could have a more powerful influence on house-hold division of labor than trends in relative income or earnings.

In this section we have discussed why analyses of long-term care and female labor outcomes cannot overlook norms around gender roles. In the following section, we present a tractable framework to study the impact of gender inequality on eldercare. Specifically, our model recognizes the importance of gender norms in shaping the (lack of) response of the female labor force participation to changes in female relative wages. The persistence of traditional gender norms may explain the perpetuation of unequal distribution of care work across genders.

## 3. A MODEL WITH LONG-TERM CARE AND GENDER

This section presents a dynamic model with gender inequality and care work. We extend the canonical overlapping generations (OLG) model with production (Diamond, 1965) to incorporate long-term care (LTC) and the provision of gender-based unpaid care. In Sections 3.1 to 3.3, we present the setup of the model focusing on the problem of the household and the distribution of care work. In Section 3.4, we characterize the equilibrium and explain the relevant results for the distribution of unpaid care work and the demand of market care services.

### 3.1 HOUSEHOLDS

We assume that each household consists of a woman and a man. Households live for two periods, a working adult period $t$ and a retired elderly period $t$+1, and receive utility from consumption and from providing care to their elderly relatives. The household cares for their elderly relatives using their time and external paid care services. Women and men are economically identical and both supply labor elastically in the labor market. There are gender norms that influence their unpaid and paid labor time within the household. The number of households increases at a positive rate n. Since the focus of the paper is the study of long-term care provision, we do not model child-rearing explicitly. However, the time allocation of child-rearing could be easily modelled using an extension of the setup described in this section.

The life-time utility function of a young household in period $t$ is:

$$u_t = u(c_t^y) + \gamma u(h_t) + \beta u(c_{t+1}^o) \quad (1)$$

Where $c_t^y$ and $c_{t+1}^o$ refer to household consumption in the first and second period respectively and $h_t$ refers to the amount of eldercare received by the current old generation. $\beta$ is a time discount factor and $\gamma$ represents the degree of altruism of young households towards their elderly relatives. Note that life-time utility in Equation (1) does not include the level of eldercare received by the current young generation when they are old, $h_{t+1}$ .This is because $h_{t+1}$ will be decided by the future young generation and it is not a choice variable of the current young generation. Given the form of the utility function, whether we include $h_{t+1}$ in the life-time utility function does not affect the outcome.

The total level of eldercare, $h_t$, equals the sum of unpaid family care, $h_t^h$, and the effective amount of external paid care services, $(h_t^m)^\mu$, measured in terms of unpaid care time:

(2)

$$h_t = h_t^h + (h_t^m)^\mu$$

where the exponent $\mu \in (0, 1)$ reflects that paid care does not necessarily provide the same level of utility as care provided by family. External long-term care $h_t^m$ is purchased in the market at price $p_t$ by working adults. Hence, $h_t^m$ is equivalent to an in-kind transfer from the working adults to their elderly relatives[3]. Since family care is unpaid, the cost associated to it is determined by the wages lost during the time spent carrying out the family care tasks. We follow the empirical work of Ichino, Olsson, Petrongolo and Thoursie (2019) and introduce gender norms in the provision of family care using a tractable CES specification that shapes the substitutability of care work inputs by men and women. Letting $h_{tf}^h$ stand for family care provided by the woman and $h_{tm}^h$ for family care provided by the man, the total production of family care $h_t^h$ results from the following CES function:

$$h_t^h = \left[ s\, h_{tm}^{h\ \frac{\sigma-1}{\sigma}} + (1-s) h_{tf}^{h\ \frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} \qquad (3)$$

Where $s \in [0,1]$ and $\sigma \in [0,1]$. Shares $s$ and $1-s$ are distributional parameters that could arise as outcomes from a bargaining process. In this regard, Equation (3) can be interpreted as a reduced form of a bargaining between the man and woman.[4] The parameter $\sigma$ measures the degree of substitutability between $h_{tf}^h$ and $h_{tm}^h$ in response to a change in the gender wage gap. It is a key parameter because it determines to what extent changes in the gender wage gap is translated into changes in the distribution of unpaid care work and the labor supply. High substitutability ($\sigma$ close to 1) indicates that the distribution of unpaid work responds strongly to changes in market incomes, whereas low substitutability ($\sigma$ close to 0) indicates that the distribution of unpaid work is more rigid or less sensitive to such changes. This parameter is a pivotal aspect of our model. Unlike previous literature (Galor and Weil, 1996), the relationship between the gender wage gap and hours worked by each gender is not proportional. We interpret $s$ and $\sigma$ as the level and elasticity of gender norms, respectively. Together with the gender wage gap, these parameters determine the distribution of time between men and women.[5]

Letting $w_t^f$ and $w_t^m$ denote the female and male wage rates, the first-period budget constraint of the household can be written as:

[3] We discuss later in the paper the implications of assuming that elderly relatives are the ones who directly purchase care services in the market.

[4] In standard macroeconomic models, the CES production function is used to model non-constant factor shares for capital and labor.

[5] Siegel (2017) uses a similar specification to model the distribution of home production and the evolution of fertility rates, although his interpretation is not in terms of gender norms.

$$c_t^y + a_t + p_t h_t^m = w_t^m(1 - h_{tm}^h) + w_t^f(1 - h_{tf}^h) \quad (4)$$

Where $a_t$ represents the savings for the retirement and $p_t$ refers to the price of market care.[6] The second-period budget constraint is

$$c_{t+1}^o = (1 + r_{t+1})a_t \quad (5)$$

Where $r_{t+1}$ stands for the return to savings in period $t + 1$.

The utility maximization problem of a young household is solved in two steps: a cost minimization problem that determines the distribution of unpaid eldercare within the household, and a utility maximization problem that solves the rest of the problem. The cost of providing family care $h_t^h$ is given by:

$$C_t = w_t^m h_{tm}^h + w_t^f h_{tf}^h \quad (6)$$

where $h_t^h$ is determined by the care production function in Equation 3. By minimizing the cost of providing family care $C_t$ subject to Equation (3), we obtain the following cost function:

$$C(h_t^h) = h_t^h \left[ s^\sigma \left(w_t^m\right)^{1-\sigma} + (1-s)^\sigma \left(w_t^f\right)^{1-\sigma} \right]^{\frac{1}{1-\sigma}} \quad (7)$$

To understand Equation 7, one can assume the (not so unrealistic) case in which $s = 0$, when all the family care is provided by women. In that case, the economic cost of providing a certain amount of family care $\bar{h}_t^h$ is equal to the forgone wages of women during the time devoted to care:

$$C(\bar{h}_t^h) = \bar{h}_t^h w_t^f$$

[6] Note that, for simplicity, Equation (4) abstracts from leisure time, by assuming that all the time that is not devoted to work is employed to carry out care tasks. The inclusion of leisure in the model would not change the main results.

In the second step, households choose the level of unpaid family care, the amount of external care services and consumption during the two periods, $c_t^y$ and $c_{t+1}^o$ to maximize life-time utility in Equation (1) subject to the following inter-temporal budget constraint:

$$c_t^y + \frac{c_{t+1}^o}{1+r_{t+1}} + p_t h_t^m = w_t^m + w_t^f - C(h_t^h) \tag{8}$$

The first-order conditions are

$$u'(c_t^y) = (1+r_{t+1})\beta u'(c_{t+1}^o) \tag{9}$$

$$p_t u'(c_t^y) = \mu(h_t^m)^{\mu-1}\gamma u'(h_t) \tag{10}$$

$$u'(c_t^y)C'(h_t^h) = \gamma u'(h_t) \tag{11}$$

Equation (9) is the standard Euler equation that solves the intertemporal savings problem. Equation (10) reflects the intratemporal optimal decision between consumption and paid care. A household that gives up $p_t$ units of consumption and loses $p_t u'(c_t^y)$ can purchase one more unit of external care services, which provides an effective increase in marginal utility of $\mu(h_t^m)^{\mu-1}\gamma u'(h_t)$. The optimal amounts of consumption and paid care equalize these two magnitudes, as stated in Equation (10). Finally, Equation (11) represents the intratemporal optimal decision between working and providing unpaid family care. A household that provides one more unit of unpaid care obtains an increase in effective utility of $\gamma u'(h_t)$. However, this decision involves an opportunity cost, represented by the lost of income $C(h_t^h)$ times the increase in utility $u(c_t^y)$ that would have been obtained with the use of that income. Again, the optimal amounts of labor and unpaid care equalize these two magnitudes.

## 3.2 GOODS SECTOR

We assume there are two sectors in the economy: a small long-term care service sector that only uses labor, and the rest of economy that uses capital and labor. [7] For the sake of simplicity, we shall refer to the rest of the economy as the goods sector. We also assume that the labor market is characterized by a certain degree of occupational segregation. In particular, we assume that the external or paid care sector only employs female labor. Therefore, all male labor is employed in the goods sector. We elaborate on this point below. Since we assume that women and men are economically identical, the total amount of labor employed in the goods sector is equal to the sum of male and female labor:

$$L_t^y = L_{tm} + L_{tf}^y$$

Where $\boldsymbol{L_{tm}}$ stands for aggregate male labor and $\boldsymbol{L_{tf}^y}$ stands for the number of female labor employed in the goods sector. The production technology of the goods sector is represented by a standard constant returns to scale (CRS) production function. Since $\boldsymbol{L_{tm}}$ is equal to the number of households, the production function in per-household basis is:

$$\frac{F(K_t, L_{tm} + L_{tf}^y)}{L_{tm}} = F(k_t, 1 + l_{tf}) \tag{12}$$

Where $\boldsymbol{k_t}$ denotes capital per unit of labor (household) and $\boldsymbol{l_{tf}}$ represents the ratio of female labor employed in the goods sector relative to male labor, $\frac{L_{tf}^y}{L_{tm}}$.

We assume that there is a positive gender wage gap in the goods sector, consistent with the data that shows persistent gender wage gaps within occupations even after controlling for education, years of experience and hours worked (Goldin, 2014; Blau and Kahn, 2017). We model the gender wage gap by assuming that men are paid the marginal productivity

[7] We assume that the long-term care sector is too small to affect aggregate outcomes, so the household problem in the above section does not include the wages and the labor time devoted to that sector.

of labor, but women only receive a fraction $0 < \xi < 1$ of it. Consequently, the optimal hiring conditions in the goods sector are:

$$F_k(k_t, 1 + l_{tf}) = 1 + r_{t+1} \tag{13}$$

$$\xi F_L(k_t, 1 + l_{tf}) = w_t^f \tag{14}$$

$$F_L(k_t, 1 + l_{tf}) = w_t^m \tag{15}$$

The gender wage gap, defined as $(w_t^m - w_t^f)/w_t^m$, is equal to $1 - \xi$, which equals zero if $\xi$ is equal to one.[8] Note that this simple way of modelling the gender wage gap, caused by a wedge or margin that reduces female wages, is based on the implicit assumption that the gap is institutionally driven and not related to technological or physical attributes, as has become standard in the literature (Galor and Weil, 1996; Yakita, 2020).

## 3.3 LONG-TERM CARE SECTOR

The long-term care service sector uses female labor and produces care services according to the linear function:

$$Q = \theta L_{tf}^Q \tag{16}$$

where $\theta$ stands for labor productivity in the care sector and $L_{tf}^Q$ is the number of female labor employed in the care sector. The profits of the sector are given by:

$$\pi^Q = p_t Q_t - w_t^{fQ} L_{tf}^Q \tag{17}$$

We assume that there is a certain degree of labor market power in the care sector. Because of constant returns to scale, the optimal profit condition satisfies:

[8] For simplicity, since the focus of the paper is the gender wage gap, we abstract from labor market power dynamics that jointly affect women and men, which have been the subject of study by the recent literature on monopsony power.

$$(1-\kappa)\theta p_t = w_t^{fQ} \tag{18}$$

Where $0 < k < 1$ reflects the presence of a labor market power rent that is specific to the care industry. Care workers retain all of their productivity only if$\boldsymbol{\kappa = 0}$. [9]

The assumption that only women work in the care sector is consistent with the empirical evidence of women sorting into lower-paid occupations, particularly the care sector. Sorting and segregation across industries and occupations by gender have been documented as contributors to the gender wage gap in many parts of the world (Blau and Kahn, 2017; Folbre and Smith, 2017; Borrowman and Klasen, 2020). In addition to the `gender penalty', many care workers experience a `care pay penalty', ranging from 4 to 40 percent of their hourly wages according to ILO (2018a). Female eldercare and childcare workers earn less on average than female workers in the non-care sectors of the economy. Care occupations are typically viewed as extensions of unpaid care work performed within households and carry low status and low pay.[10] Folbre and Smith (2017) highlight these features of care work that reduce workers' bargaining power over wages.

To be consistent with the additional penalty observed in the care services industry, we assume that wages in the care industry are lower than wages in the goods sector by a factor of $\alpha$:

$$w_t^{fQ} = \alpha w_t^f \tag{19}$$

Where $0 < \alpha < 1$. In fact, by preventing the equalization of wages across industries, Equation (19) implies that the labor market power rent persists due to the partial gender-based segmentation of the labor markets. Nonetheless, since we are assuming that there is a proportional relation between both wages in the two sectors, a decline in the gender wage gap in the goods sector also has a positive effect on wages in the care services sector.

## 3.4 THE EQUILIBRIUM ANALYSIS

[9] Monopsony could help to explain how discriminatory gender wage differences arise and persist if employers yield greater monopsony power over women than men. Black (1995) develops a model in which search costs give employers a degree of monopsony power. If there is discrimination against women, women will face higher search costs than men, increasing employers' monopsony power over them.

[10] According to OECD (2020), personal care workers of elderly constitute the bulk of the long-term care workforce (70%) in OECD and have very low entry requirements into the job.

To characterize the equilibrium of the model, we use the following utility function:

$$u_t = \ln(c_t^y) + \gamma \ln(h_t) + \beta \ln(c_{t+1}^o) \tag{20}$$

Using Euler equation and the second-period budget constraint, we obtain a tractable expression for savings:

$$a_t = \frac{\beta\left(w_t^m + w_t^f - C(h_t^h) - p_t h_t^m\right)}{1+\beta} \tag{21}$$

Both family care and paid care reduce savings because they are both provided by the young generation. While paid care reduces savings by the value of the services purchased in the market, unpaid care diminishes savings by the amount of wages lost during the time devoted to family care provision, represented by $C(h_t^h)$. The capital market equilibrium is given by:

$$K_{t+1} = a_t N_t \tag{22}$$

Where $\alpha_t$ is given by Equation (21).

We can combine the first order conditions from Equations (10) and (11) to obtain the demand for external care services, $h_t^m$. Using the utility specification in Equation (20), we obtain the following rule:

$$\left[s^\sigma \left(w_t^m\right)^{1-\sigma} + (1-s)^\sigma \left(w_t^f\right)^{1-\sigma}\right]^{\frac{1}{1-\sigma}} = \frac{p_t}{\mu(h_t^m)^{\mu-1}} \tag{23}$$

This optimal rule equalizes the effective costs of provision of the two different types of care. We can use this equation to characterize the demand for paid care. If, for example, the left side of the equation is greater than the right side of the equation, the opportunity cost of providing unpaid care is too high relative to the effective cost of purchasing market care. The demand for market care $h_t^m$ would increase, pushing the left side of the equation upwards, and replacing part of family care, up to the point in which the opportunity cost of unpaid care is equal to the effective cost of paid care. The opposite would happen if the effective cost of purchasing care were greater than the cost of providing unpaid care. Also note that we refer to the effective cost, not merely to the price of paid care. This is because

the economic cost $p_t$ is scaled by $\frac{1}{\mu(h_t^m)^{\mu-1}}$, which measures the extent to which a marginal increase in paid care is valued relative to the same amount of unpaid care. We can use Equation (23) to obtain an explicit demand for market care services:

$$h_t^m\left(w_t^f, w_t^m, p_t\right) = \left(\frac{p_t}{\mu}\right)^{\frac{1}{\mu-1}} \left[s^\sigma \left(w_t^m\right)^{1-\sigma} + (1-s)^\sigma \left(w_t^f\right)^{1-\sigma}\right]^{\frac{1}{(\sigma-1)(\mu-1)}} \quad (24)$$

where we see that the demand for paid care depends positively on the female and male wage rates (as they raise the opportunity cost of unpaid care) and negatively on the price of market care services.

The most relevant aspect of our model is the way in which we model the provision of unpaid care $h_t^h$ which occurs according to Equation (3). Combining the first order conditions with respect to $h_{tm}^h$ and $h_{tf}^h$ one observes that the distribution of unpaid care work and, hence, the relative labor supplies of women and men, respond to the following equation:

$$\frac{h_{tf}^h}{h_{tm}^h} = \left[\frac{(1-s)}{s}\frac{w_t^m}{w_t^f}\right]^\sigma \quad (25)$$

Given the male and female wages characterized in Equations (14-15), we can rewrite Equation (25) as

$$\frac{h_{tf}^h}{h_{tm}^h} = \left[\frac{(1-s)}{s}\right]^\sigma \left(\frac{1}{\xi}\right)^\sigma \quad (26)$$

This implies that the division of unpaid care work by gender depends on the distributional parameter $s$ the gender wage gap parameter $\xi$ and the gender norm parameter $\sigma$. Parameters $s$ and $\sigma$ fully determine the relative share of time that are devoted to unpaid care by men and women when there is no gender wage gap (i.e. $\xi = 1$). For example, suppose that $s = 1 - s = 0.5$. This would be equivalent to the outcome of a bargaining where the man and woman have the same bargaining power. In the absence of a gender wage gap, each gender would devote the same amount of time to providing family care, or

the ratio $\frac{h_{tf}^h}{h_{tm}^h}$ would be equal to one. For simplicity, we can refer to *s* and 1 - *s* as the initial allocation of care time. [11]

The parameter $\sigma$ measures the extent to which the relative amount of unpaid carework provided by women responds to changes in the gender wage gap. When the gender wage gap 1- $\xi$ falls (i.e. $\xi$ increases), female relative wages increase and the household will allocate a larger share of unpaid care work to the man, as shown in Equation 26. However, the reallocation of men's time from market to home, and women's time from home to market, depends also on the value of $\sigma$. Patriarchal gender norms correspond to low values of $\sigma$ as there is little response of $\frac{h_{tf}^h}{h_{tm}^h}$ to changes in the gender wage gap. In this case, the decline in the gender wage gap hardly translates into a more egalitarian distribution of carework time within the household. We claim that this is an appropriate approach to rationalize the trends described in Section 2 in a macroeconomic model. If $\sigma = 1$, as implicitly assumed in most of the literature, the response of $\frac{h_{tf}^h}{h_{tm}^h}$ is proportional to the change in the gender wage gap. That would indicate a case of flexible gender roles and high substitutability between female and male household labor, which is at odds with the data.

The key point that a declining gender wage gap does not translate directly into a more equal sharing or division of household work is supported by some evidence in the literature. For example, Bertrand et al. (2015) show that among US couples where the wife earns more than the husband, the wife spends more time on household chores. Fengdan, Xuhua, Bruyere and Floro (2016) find evidence that husbands with higher bargaining power, proxied by the education gap between spouses, spend less time on housework. Folbre (2018) argues that caregivers have relatively little bargaining power because they cannot easily threaten to withdraw their services or personally claim all the value they create. Washbrook (2007) shows that the way in which men and women respond to economic incentives is highly asymmetric. That is to say, higher-wage earners spend more time in market work at the expense of both domestic production and leisure. These studies suggest that more egalitarian gender norms are needed in order to obtain a more equal division of care work, and that economic incentives, though necessary, are not a sufficient condition.

[11] We use the expression "initial allocation" to indicate that this is the allocation of care work that would emerge in the absence of a gender wage gap. Hence, this allocation is related to the unequal distribution of power within the household. Note, however, that the term is not completely satisfactory, as the distribution of care work in the absence of the gender wage gap also depends on $\sigma$. Only when $\sigma$ equals one, will the allocation of care time be exclusively given by *s* and $1 - s$.

An increase in the female relative wages not only affects the way unpaid care work is distributed within the household, but also the marginal cost of providing unpaid care. To see this, we can use the gender wage gap in the cost function Equation (7) to obtain a simplified expression for the marginal cost:

$$C_{h_t^h}(h_t^h) = w_t^m \left[ s^\sigma + (1-s)^\sigma \xi^{1-\sigma} \right]^{\frac{1}{1-\sigma}} \tag{27}$$

Consequently, a decline in the gender wage gap, 1 – ξ, has the following (marginal) effect on unpaid care costs:

$$\frac{\partial C_{h_t^h}(h_t^h)}{\partial \xi} = w_t^m \left[ s^\sigma + (1-s)^\sigma \xi^{1-\sigma} \right]^{\frac{\sigma}{1-\sigma}} \frac{1}{\xi^\sigma} (1-s)^\sigma \tag{28}$$

The bigger the initial share of female unpaid care, 1 – *s*, the bigger the effect of a decline in the gender wage gap in the marginal cost, which causes, ceteris paribus, a stronger response for paid care demand, as reflected in Equations (23-24). Obviously, this depends on the extent to which male unpaid labor is substituted for female unpaid labor, which depends on the gender norm $\boldsymbol{\sigma}$. The partial derivative:

$$\frac{\partial h_{tf}^h / h_{tm}^h}{\partial \xi} = -\sigma \left[ \frac{(1-s)}{s} \right]^\sigma \left( \frac{1}{\xi} \right)^{\sigma+1} \tag{29}$$

indicates that the impact of the gender wage gap on the distribution of unpaid care work is bigger when the relative women's initial allocation of care time 1 – *s* is high, but the ultimate effect depends on its interaction with. According to this framework, societies with strong and persistent gender inequalities within the household, which barely respond to changes in wage incomes, are characterized by high values of 1 – *s* and low values of $\boldsymbol{\sigma}$.

In general equilibrium, higher female wages not only increase the opportunity cost of unpaid care, but also increase the price of purchasing market care via increasing costs in the care industry. By combining Equations (18) and (19), we obtain an expression for the relative price of market care services:

$$p_t = \frac{\alpha w_t^f}{\theta(1-\kappa)} \tag{30}$$

where, unsurprisingly, the price depends positively on $w_t^f$. Using the expression for the gender wage gap and combining Equations (23) and (27), we get:

$$\left[s^\sigma + (1-s)^\sigma \xi^{1-\sigma}\right]^{\frac{1}{1-\sigma}} = \frac{\alpha\xi}{\theta(1-\kappa)} \frac{1}{\mu(h_t^m)^{\mu-1}} \tag{31}$$

where, in a similar manner, we observe that the effective cost of purchasing market care services (the right side) depends negatively on the gender wage gap (i.e. positively on $\xi$) and positively on the labor market segmentation parameter $\alpha$. This result should not be used to conclude that a general decline in the gender wage gap or an increase in the relative wages of the care sector will necessarily dampen the replacement of unpaid care by paid care. To see this, note that the price of market care in Equation (30) and its effective cost in the right side of Equation (31) also depend on the productivity in the care sector $\theta$ and the market power rent $\kappa$. An increase in productivity reduces the cost of market care services, raising its demand and fostering the replacement of unpaid care. The decline in the market power rent $\kappa$ also has a positive effect in the reduction of the cost of market care services.

Our model suggests that policies aiming to reduce the burden of unpaid care should focus on developing more egalitarian gender norms, reducing the gender wage gap and labor market segmentation. Although we do not model market power in the long-term care market, the same logic holds: an increase in market power in the care sector would increase the price of paid care services and perpetuate reliance on unpaid care. Our model suggests that for external care services to help meet long-term care needs, it is crucial to regulate firms and reduce market power rent and to make external care services accessible and productive via public investment in care that leads to higher wages, more training, and better quality care.

## 4. NORMS, CARE WORK AND DIVISION OF LABOR: ROLE OF POLICIES

There is by now extensive evidence that show the link between stalled progress in the expansion of female labor supply and economic growth and women's heavy unpaid care and domestic work, including looking after the elderly. Addressing this concern entails a comprehensive approach to care provisioning and gender equality. Not only is the systemic

undermining of equitable economic growth rooted in the persistence of patriarchal norms, they are also indicative of the many disadvantages faced by girls and women both within and outside the labor market including unequal division of care work within households. These interlinkages strongly suggest that measures to address the growing demand for eldercare should be embedded in a broader gender equality strategic plan involving care, macroeconomic, social protection, and labor policies.[12]

One of the key pillars for reducing and redistributing unpaid care work is the role of public investment in quality care services and care relevant infrastructure. This is related to our model's implications that improving the productivity in the care sector is needed to decrease the households' effective costs of purchasing paid care services. This has become more urgent with recent demographic shift towards aging populations worldwide. Although East Asian countries such as Japan, South Korea, Taiwan and Singapore share a gender ideology that defines care as a female family member's responsibility, the last few decades saw a growing acknowledgment on the need for government involvement and support in eldercare. Public investment in eldercare has taken varied forms and different arrangements. They range from supporting eldercare services through the expansion of public eldercare systems such as Long Term Care Insurance (LTCI) in Japan and Korea to supporting familial care responsibilities by enabling families to purchase private care services through government-employer sponsored individual savings plan, tax support for adult child-elderly parent, and immigration policy support for foreign domestic/care workers in Singapore (Peng and Yeandle, 2017). In Germany, the socialized LTCI eldercare system financed through pay-as-you go insurance premiums payable into LTCI funds, complements the private insurance (for higher earners) and state welfare funds (Peng and Yeandle, 2017). LTC is provided and primarily financed in Finland through its municipalities, which have significant tax raising powers.

A common feature of these various long-term care systems is the creation of fiscal space by governments to fund care policies through progressive and redistributive tax structures. Creating fiscal space is feasible even in low-income countries by improving the efficiency of tax collection and introducing taxes on financial transactions, which can then be used to fund social and care policies. Recent studies have demonstrated the economic benefits of public investment in child care and elder care services (Elson, 2017; ILO, 2018b; Ilkkaracan and Kim, 2019). The UK Women's Budget Group simulation analysis of the impact of investing 2% of GDP in public provision of child care and elder care services demonstrate substantial increases in employment, ranging from 1.2% to 3.2%. In the U.S., such investment would create nearly 13 million new jobs, almost twice the impact of investing 2% of GDP in the construction sector (Elson, 2017; Women's Budget Group, 2016, 2017).

[12] The ILO (2018b) report lays out a comprehensive set of policy recommendations in order to achieve what it calls as `a high road to care work'.

Equally important is the systematic encouragement of gender-egalitarian social norms. We have shown in our model that division of unpaid care work by gender depends on not only the gender wage gap, but also gender norms. Moreover, more equitable sharing of unpaid care work between men and women can free up time for women to increase their labor supply. Women's labor market choices have been attributed to the imbalances in unpaid care work and family responsibilities, lack of affordable quality care services and flexible working-time policies. Cross-country studies, for example, have found a strong relationship between types of welfare regimes and the total workload of spouses and the distribution of housework between them (Fuwa, 2004; Goodin, Rice, Parpo and Eriksson, 2008; Galvez-Muñoz, Rodriguez-Modroño and Dominguez-Serrano, 2011; Kan, Sullivan and Gershuny, 2011).

Egalitarian norms can also be encouraged by provision of tax-funded paid parental leave for fathers as well as mothers.[13] They are also promoted by workplace leave policies that enable workers to be caregivers while continuing their professional achievements. These include not only flexible work hours and paid family leave, but also the creation of workplace cultures that respect the caregiving responsibilities of both women and men.

## 5. CONCLUDING REMARKS

This paper provides a tractable way of introducing gender norms in a macroeconomic model. They are crucial in explaining the dynamics of gender wage gap, labor force participation and care work. Our model articulates the fact that social norms are endogenous to policies. Patriarchal norms in particular prevent a fairer distribution of housework and care work, even if the gender wage gap falls. The unfair division of unpaid care work in turn increases the gender wage gap and creates gender-unequal equilibrium outcomes. Moreover, the use of paid vs. unpaid care work to meet long-term care needs depends not only on savings and gender norms, but also on wages and productivity in the paid care sector. We conclude with a discussion of policies that promote gender equality in households and labor markets and that enhance quality (productivity) in paid care services, which are conducive to a gender-equal equilibrium.

[13] In 2015, statutory paternity leave entitlements for fathers were provided in at least 94 countries of 170 with ILO data (Elson, 2017). These are not helpful however since paid paternity leave has an average of seven days against an average length of 106 days for mothers.

## REFERENCES

Agénor, Pierre-Richard, "A Theory of Social Norms, Women's Time Allocation, and Gender Inequality in the Process of Development," Technical Report 237, Economics, The University of Manchester 2018. -and Madina Agenor, "Infrastructure, women's time allocation, and economic development," Journal of Economics, 2014, 113 (1), 1-30.

Akerlof, George A. and Rachel E. Kranton, "Economics and Identity," Quarterly Journal of Economics, August 2000, 115 (3), 715-753.

Ameriks, John, Joseph Briggs, Andrew Caplin, Matthew Shapiro, and Christopher Tonetti, "Long-Term-Care Utility and Late-in-Life Saving," Technical Report w20973, National Bureau of Economic Research, Cambridge, MA February 2015.

Barigozzi, Francesca, Helmuth Cremer, and Kerstin Roeder, "Caregivers in the Family: Daughters, Sons and Social Norms," SSRN Electronic Journal, 2017.

Bauer, Jan Michael and Alfonso Sousa-Poza, "Impacts of Informal Caregiving on Caregiver Employment, Health, and Family," Journal of Population Ageing, September 2015, 8 (3), 113-145.

Beneria, Lourdes, Günseli Berik, Maria Floro, Günseli Berik, and Maria Floro, Gender, Development and Globalization : Economics as if All People Mattered, Routledge, July 2015.

Bertrand, Marianne, Emir Kamenica, and Jessica Pan, "Gender Identity and Relative Income within Households," The Quarterly Journal of Economics, May 2015, 130 (2), 571-614.

Black, Dan A., "Discrimination in an Equilibrium Search Model," Journal of Labor Economics, April 1995, 13 (2), 309-334. Publisher: University of Chicago.

Blau, Francine D. and Lawrence M. Kahn, "The Gender Wage Gap: Extent, Trends, and Explanations," Journal of Economic Literature, September 2017, 55 (3), 789-865.

Borrowman, Mary and Stephan Klasen, "Drivers of Gendered Sectoral and Occupational Segregation in Developing Countries," Feminist Economics, September 2020, 26 (2), 62-94.

Bueren, Jesus, "Long-Term Care Needs: Implications for Savings, Welfare, and Public Policy," 2017.

Burda, Michael, Daniel S. Hamermesh, and Philippe Weil, "Total work and gender: facts and possible explanations," Journal of Population Economics, January 2013, 26 (1), 239-261.

Curtis, Chadwick C., Steven Lugauer, and Nelson C. Mark, "Demographic Patterns and Household Saving in China," American Economic Journal: Macroeconomics, April 2015, 7 (2), 58-94.

Diamond, Peter A., "National Debt in a Neoclassical Growth Model," The American Economic Review, 1965, 55 (5), 1126-1150.

Elson, Diane, "Recognize, Reduce, and Redistribute Unpaid Care Work: How to Close the Gender Gap," New Labor Forum, May 2017, 26 (2), 52-61. Publisher: SAGE Publications Inc.

Fengdan, Shi, Pan Xuhua, Caryn Bruyere, and Maria S. Floro, "Bargaining power and the household division of labour: Evidence from 2008 China time-use survey," Asia-Pacific Population Journal, October 2016, 31 (1), 63-85.

Fleche, Sarah, Anthony Lepinteur, and Nattavudh Powdthavee, "Gender Norms and Relative Working Hours: Why Do Women Suffer More Than Men from Working Longer Hours Than Their Partners?," AEA Papers and Proceedings, 2018, 108, 163-68.

Folbre, Nancy, "The Care Penalty and Gender Inequality," in Susan L. Averett, Laura M. Argys, and Saul D. Ho_man, eds., The Oxford Handbook of Women and the Economy, Oxford University Press, July 2018, pp. 748-766.

-and Smith, "TheWages of Care: Bargaining Power, Earnings and Inequality.," Political Economy Research Institute, University of Massachusetts, Amherst and Washington Center for Equitable Growth, Washington DC, 2017.
Fuwa, Makiko, "Macro-Level Gender Inequality and the Division of Household Labor in 22 Countries," American Sociological Review, 2004, 69 (6), 751-767. Publisher: [American Sociological Association, Sage Publications, Inc.].

Galor, Oded and David N. Weil, "The gender gap, fertility, and growth," The American Economic Review; Nashville, June 1996, 86 (3), 374. Goldin, Claudia, "A Grand Gender Convergence: Its Last Chapter," American Economic Review, September 2014, 104 (4), 1091-1119.

Goodin, Robert E., James Mahmud Rice, Antti Parpo, and Lina Eriksson, Discretionary Time: A New Measure of Freedom, Cambridge University Press, February 2008. Google-Books-ID: bMXP7au9D2MC.

Gálvez-Muñoz, Lina, Paula Rodriguez-Modroño, and Monica Dominguez-Serrano, "Work and Time Use By Gender: A New Clustering of European Welfare Systems," Feminist Economics, October 2011, 17 (4), 125-157. Publisher: Routledge eprint: https://doi.org/10.1080/13545701.2011.620975.

Henle, Christine A., Gwenith G. Fisher, Jean McCarthy, Mark A. Prince, Victoria P. Mattingly, and Rebecca L. Clancy, "Eldercare and Childcare: How Does Caregiving Responsibility Affect Job Discrimination?," Journal of Business and Psychology, February 2020, 35 (1), 59-83.

Ichino, Andrea, Martin Olsson, Barbara Petrongolo, and Peter S Thoursie, "Economic incentives, home production and gender identity norms," CEPR Discussion Paper, 2019.

Ilkkaracan, Ipek and Kijong Kim, "The Employment Generation Impact of Meeting SDG Targets in Early Childhood Care, Education, Health and Long-Term Care in 45 Countries," Technical Report, International Labour Organization, Geneva 2019.

ILO, "Care Work and Care Jobs: For the Future of Decent Work," International Labour Organization report, 2018. "Global Wage Report 2018/19 - What lies behind gender pay gaps," 2018, p. 172.

Kan, Man Yee, Oriel Sullivan, and Jonathan Gershuny, "Gender Convergence in Domestic Work: Discerning the Effects of Interactional and Institutional Barriers from Large-scale Data," Sociology, 2011, 45 (2), 234-251.

Ko, Ami, "An equilibrium analysis of the long-term care insurance market," 2016.
Kydland, Finn and Nick Pretnar, "The Costs and Benefits of Caring: Aggregate Burdens of an Aging Population," Working Paper 25498, National Bureau of Economic Research January 2019.

Lagerlöf, Nils-Petter, "Gender Equality and Long-Run Growth," Journal of Economic Growth, December 2003, 8 (4), 403-426.

Liu, Lan, Xiao yuan Dong, and Xiaoying Zheng, "Parental Care and Married Women's Labor Supply in Urban China," Feminist Economics, July 2010, 16 (3), 169-192. Publisher: Routledge eprint: https://doi.org/10.1080/13545701.2010.493717

Lockwood, Lee M., "Incidental Bequests and the Choice to Self-Insure Late-Life Risks," American Economic Review, September 2018, 108 (9), 2513-2550.

Luo, Meng Sha and Ernest Wing Tak Chui, "Trends in women's informal eldercare in China, 1991-2011: an age-period-cohort analysis," Ageing and Society, December 2019, 39 (12), 2756-2775.

McGrattan, Ellen R., Kazuaki Miyachi, and Adrian Peralta-Alva, "On Financing Retirement, Health Care, and Long-Term Care in Japan," Staff Report 586, Federal Reserve Bank of Minneapolis June 2019.

Mommaerts, Corina, "Long-Term Care Insurance and the Family," Job Market Paper, 2015, p. 70. OECD, "Who Cares? Attracting and Retaining Care Workers for the Elderly," OECD Health Policy Studies, OECD Publishing, Paris., 2020.

Peng, Ito and Sue Yeandle, "Eldercare policies in East Asia and Europe: Mapping policy changes and variations and their implications," Technical Report 2017. Library Catalog: www.unwomen.org.

Seguino, Stephanie, "PlusCa a Change? evidence on global trends in gender norms and stereotypes," Feminist Economics, April 2007, 13 (2), 1-28.

Siegel, Christian, "Female relative wages, household specialization and fertility," Review of Economic Dynamics, March 2017, 24, 152-174.

Song, Zheng, Kjetil Storesletten, Yikai Wang, and Fabrizio Zilibotti, "Sharing High Growth across Generations: Pensions and Demographic Transition in China," American Economic Journal: Macroeconomics, April 2015, 7 (2), 1-39.

Sullivan, Oriel, "Gender inequality in work-family balance," Nature Human Behaviour, March 2019, 3 (3), 201-203.

Tabata, Ken, "Population aging, the costs of health care for the elderly and growth," Journal of Macroeconomics, September 2005, 27 (3), 472-493.

Washbrook, Elizabeth, "Explaining the Gender Division of Labour: The Role of the Gender Wage Gap," 2007.

Women's Budget Group, "Investing in the Care Economy - A gender analysis of employment stimulus in seven OECD countries," Technical Report 2016.

-, "Investing in the Care Economy - Simulating employment effects by gender in countries in emerging economies," Technical Report 2017.

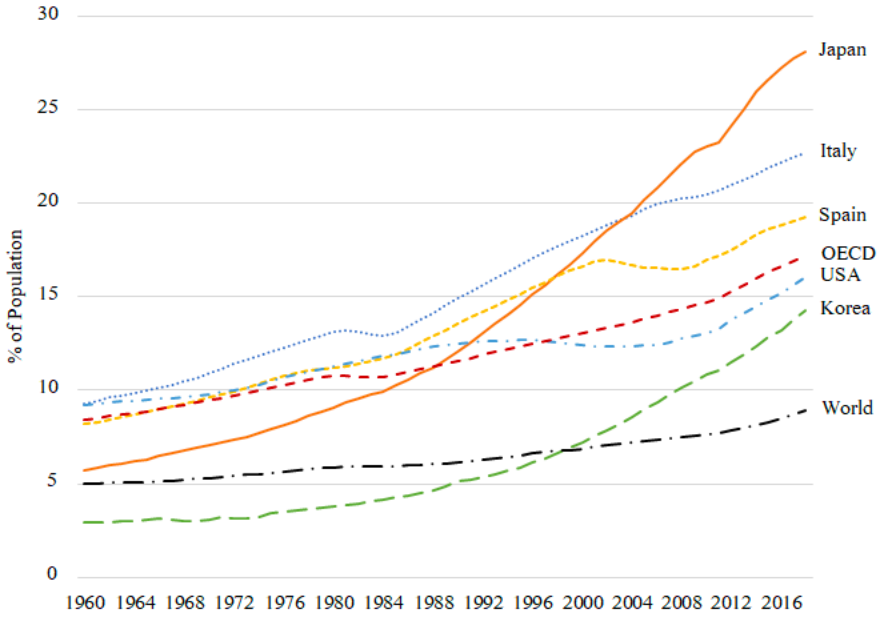
World Bank, "World Development Report 12: Gender equality and development," Technical Report, World Bank, Washington, DC 2011. OCLC: 762210346.

Yakita, Akira, "Economic development and long-term care provision by families, markets and the state," The Journal of the Economics of Ageing, February 2020, 15, 100210.

# APPENDIX

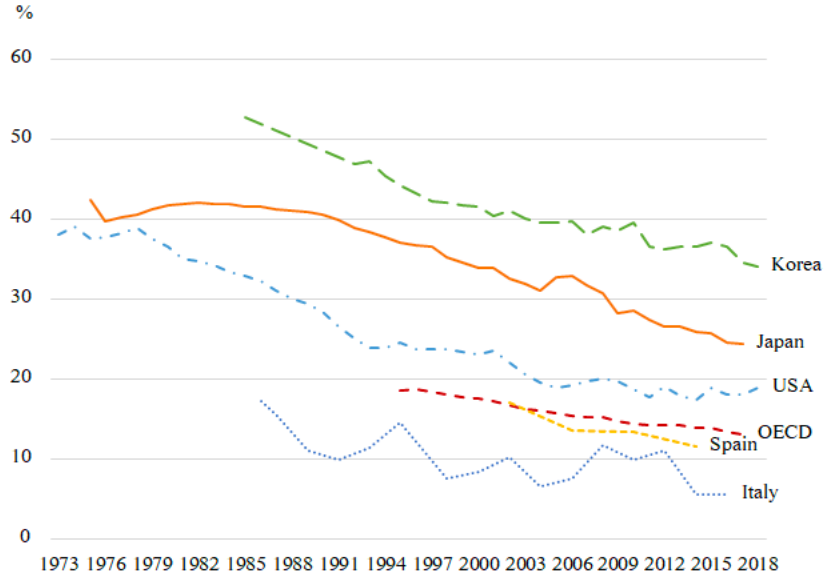
## A. Figures

Figure A.1: Rising Share of Elderly Population




Source: OECD Data

Figure A.2: Gender Wage Gaps of Full-Time Employed Workers (1973-2018)




Note: The gender wage gap is defined as the difference between median earnings of men and women relative to median earnings of men. (Source: OECD Data)