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SINGAPORE'S NATIONAL TIME TRANSFER ACCOUNTS: THE LIFE CYCLE OF NON-MARKET ECONOMIC PRODUCT

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Sep 2026
IPS Working Papers No. 76

Institute of Policy Studies

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SINGAPORE'S NATIONAL TIME TRANSFER ACCOUNTS: THE LIFE CYCLE OF NON-MARKET ECONOMIC PRODUCT

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September 2026

IPS Working Papers No. 76 (September 2026):
Singapore National Time Transfer Accounts: The Life Cycle of Non-Market Economic Product by Tan, P.L., Gee, C., Ortega, E., Tay, A. X., Ho, H. S., and Tan, D.

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SINGAPORE'S NATIONAL TIME TRANSFER ACCOUNTS: THE LIFE CYCLE OF NON-MARKET ECONOMIC PRODUCT

Abstract

This paper presents the first set of National Time Transfer Account (NTTA) estimates for Singapore, using individual-level data from the NCSS-NAK 360 Panel Study (Time Use Study) to produce national-level, age- and gender-delineated estimates of non-market economic production, consumption and transfers of time. The NTTA framework supplements the broader National Transfer Accounts (NTA) project by incorporating unpaid work such as housework, caregiving and volunteering to obtain a more comprehensive picture of how economic production varies by age and gender.

The results reveal substantial gender gaps in unpaid work across the life cycle. Women in their 40s and 50s perform an average of 15 more hours of housework per week than men of the same age and are net producers of household work for most of their adult lives. Older women aged 65 and above contribute 22.4 per cent of all unpaid work. The estimated economic value of unpaid work in 2023 amounted to S$51 billion, with women contributing S$39 billion. Compared with 14 European countries, Singaporeans do more paid work and less unpaid work, with a smaller gender gap in unpaid work at younger ages.

These findings highlight the need for policies that support women and older adults in their substantial but often unrecognised care contributions.

SINGAPORE'S NATIONAL TIME TRANSFER ACCOUNTS: THE LIFE CYCLE OF NON-MARKET ECONOMIC PRODUCT

1. BACKGROUND AND OBJECTIVES

The rapid pace of population ageing in Singapore has resulted in rising pressures on the informal care infrastructure, with implications for the sustainability of economic growth and national productivity, as well as broader societal wellbeing. This paper uses anonymised, individual-level data from the NCSS-NAK 360 Panel Study (Time Use Study) (thereafter "Time Use Study") conducted in Singapore and methodology based on the National Time Transfer Account (NTTA) framework within the broader National Transfer Accounts (NTA) project to produce estimates of generational non-market economic production in Singapore in the form of national-level age-delineated consumption, production and transfers of time, which can highlight sources of vulnerability and opportunity in the informal care and other domains of non-market work.

The NTA project is a systematic framework of accounting for economic flows from one age group or generation to another. It uses principles that are consistent with the System of National Accounts, the international statistical standard of macro-economic accounts developed by the United Nations. To date, around 70 countries worldwide have or are in the process of producing NTA calculations to analyse the economic impact of demographic change. To supplement the NTA framework, which focuses on market-based economic

flows between age groups, NTTA methodology has more recently been developed and grafted into the larger NTA framework, to include non-market transactions and hence obtain a more comprehensive picture of how production and consumption of all economic production, whether monetary or non-monetary, varying by age and gender.

International NTTA research has been used to more accurately estimate the cost of childbearing, provide insight into the economic contributions and dependency of the elderly, and produce projections of the impacts on total production and consumption due to changing demographics (Donehower, 2014; Renteria et al. 2016; Zanella, 2016). The results in this paper represent the first set of NTTA estimates for Singapore, with policy-relevant implications in critical areas such as marriage and parenthood policy, employment support for women and the elderly, and long-term elderly formal care systems.

Our specific research questions are as follows:

- What are the age patterns of gender gaps in the non-market economy, in the form of production, consumption and transfers of unpaid work?
- To what extent do women and the elderly contribute to Singapore's total economic production through their participation in the non-market economy?

2. DATA AND METHODOLOGY

Data for this project are obtained through the Time Use Study, a three-year longitudinal study conducted by the Singapore University of Social Sciences (SUSS) with funding from the National Council of Social Service (NCSS) and Ngee Ann Kongsi (NAK). The study collected retrospective data on time use on two 24-hour periods (i.e., the most recent weekday and most recent weekend day[1]) from a nationally representative sample size of 3,000 respondents between October 2021 and August 2024. All members of a household aged 10 years and above, including migrant domestic workers,[2] were invited to participate in the study.

Individual-level data on time spent on primary activities — including paid market labour and non-market activities such as household production, travel, care work, education, sleep and leisure activities — were collected and re-categorised, loosely based on the categorisation used by the American Time Use Survey. In this paper, we present data on sex-specific age profiles for three broad key categories of time use: unpaid work, which includes housework, household-related travel and purchase, childcare, adult care and volunteering; paid work, which includes time spent commuting[3]; and personal time, which includes sleep, personal care and leisure activities such as exercise, socialising

[1] For example, if an interview was conducted on a Sunday, the most recent weekday would be Friday, while the most recent weekend day would be a Saturday.

[2] Results provided in this working paper do not include the time production and consumption of migrant domestic workers.

[3] Time spent on travel was assumed to be time spent commuting if the respondent reported working outside of the home on that day; otherwise, it is assumed to be household-related travel.

and religious activities. Children aged nine years and below were not included in the survey. A household is assumed to have children in the 0–9 years age band if (a) its household size[4] exceeded its number of respondents, and (b) at least one member reported positive values for child care on a weekday or weekend day. For such households, the estimated number of young children was the difference between household size and number of respondents, capped at two, to better approximate national distributions of households by number of children.[5] This estimate was then recoded as zero if family structure indicators[6] suggest that no children were present in the household. Due to low values for hours of sleep for some observations, sleep duration was censored to meet a minimum of five hours on weekdays and weekends. Time use data were re-adjusted to equate to 24 hours in a day for observations, which fell in the range of 20 to 28 hours (97.26 per cent of weekday observations and 95.04 per cent of weekend observations) and discarded otherwise. The total number of observations with valid time use values is 4,062, based on 2,118 household members in 836 households.

To estimate consumption and time transfers, data on household composition, along with standardised assumptions, were used to impute allocations of consumption to individual household members. Children too young to be

[4] In cases where different household sizes were provided by different respondents in the same household, the largest modal value was used.

[5] According to Singapore Department of Statistics (2025), first, second, third and higher parities constituted 46.4, 36.3, 11.9 and 5.5 per cent of births in 2023 respectively, compared to 46.0, 36.2, 11.0 and 6.8 per cent for the estimated distribution of household by number of children aged 0–14 years in the 2023 survey.

[6] Households were assumed to have no young children if the family structure is ever identified as “living with no family” or “married with no kids”.

interviewed were assumed to perform no household production activities. General household cleaning and maintenance were assumed to be consumed equally among all household members. Childcare activities, modelled separately for weekdays and weekends, were assigned only to individuals aged 0–17 years. To allocate childcare time among multiple caregivers, a regression based on age (single 10-year age band for ages below 10 and one/two year ranges up to age 17) and sex composition, excluding the caregiver, was used. Transfers across age and gender were calculated, where transfer inflows were equal to consumption less production and transfer outflows.

Estimates for consumption and transfers outflows were adjusted to ensure that consumption must equal production, and inflows must equal outflows at the household and aggregate levels. To increase national representativeness, estimates were weighted by day of week,[7] whether the day fell on a national holiday, and age and sex composition using 2023 resident population counts obtained from the Department of Statistics (2026). Due to relatively small sample counts for respondents aged 80 years and above, results are presented as a single age band for this group. Smoothed age profiles were generated using Friedman's super smoother based on local linear regression with adaptive bandwidths and re-adjusted to ensure that consumption equalled production and inflows equalled outflows at the aggregate level.

[7] In cases where no survey date was provided, modal household values were used, and the day was assumed to be a non-holiday.

Finally, to provide estimates of the economic value of non-market production, we follow the replacement cost approach proposed by Donehower (2014) using replacement cost specialist hourly wages based on gross monthly pay of broad occupations published by the Ministry of Manpower (2026a), divided by estimated hours of work per month based on usual hours worked per week by occupations (Ministry of Manpower, 2026b) for 2023. Table 1 provides the estimated market-equivalent wages used in this paper. It should be noted that these values exclude non-hourly additional payments from bonuses, Additional Wage Supplement (AWS), tips, employer's contributions to CPF, etc., are not age- or gender-differentiated, and are presented in this paper to permit a quantification of the economic value of unpaid work and how it compares with paid work if wage rates were standardised by age and gender.

Table 1. Market-equivalent wages by activity used in estimating economic value of production

Activity	Basis	Market-equivalent wage (S$/hour)
Paid work	Median wage, divided by hours worked at the annual average	27.81
Non-care housework	Gross hourly pay for "Housekeeper and related worker", divided by hours worked by "Personal Service Workers"	15.79
Care work	Gross hourly pay for "Educarer", divided by hours worked by "Personal Care Workers	15.52
Volunteer work	Average of gross hourly pay non-care and care work	15.66

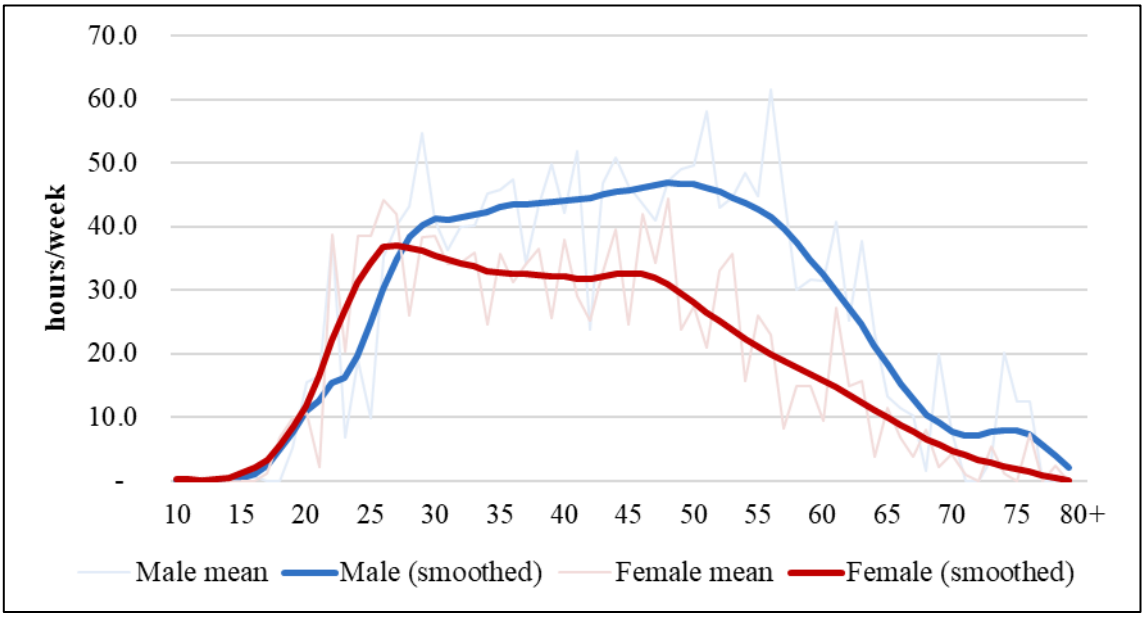
Sources: Ministry of Manpower (2026a); Ministry of Manpower (2026b)

3. RESULTS AND DISCUSSION

Figures 1 to 4 reveal expected gender gaps in the production of paid and unpaid work (including housework, care and volunteering) as measured in hours each week. Men and women contribute similar number of hours to paid work until age 30, around the time of marriage and childbearing, after which men contribute more hours for most of the remainder of the life cycle (Figure 1). The gender gap as measured in time for paid work peaks at around age 55 years.

The female profile of paid work shows the expected M-shape found in many developed economies in East Asia (Goldin & Mitchell, 2017) and in Europe and the US (Anxo et al., 2011), with an initial peak in the mid-20s and a later peak in the mid-40s.

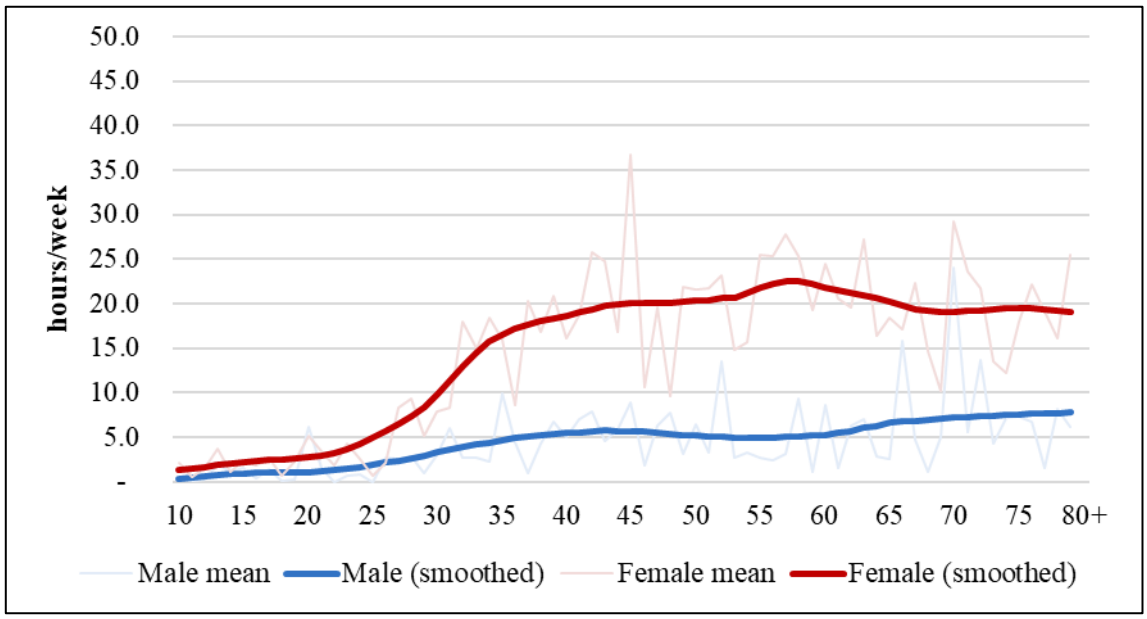
Figure 1. Gender-specific age profiles of production of paid work, 2023



Note: Authors' calculations based on data from the Time Use Study

Large differences in household production by gender are also evident throughout the life cycle. Women do more unpaid housework for most of their lives, with the gender gap for unpaid work peaking at age 57 (Figure 2). Women in their 40s and 50s do 21 hours of housework on average, 15 hours more than men of the same age.

Figure 2. Gender-specific age profiles of production of unpaid work (housework, care, volunteering), 2023



Note: Authors' calculations based on data from the Time Use Study

Figures 3 and 4 further show that apart from housework, women also do slightly more unpaid volunteer work at ages below 30 years.

Figure 3. Gender-specific age profiles of production of unpaid housework (housework and care), 2023

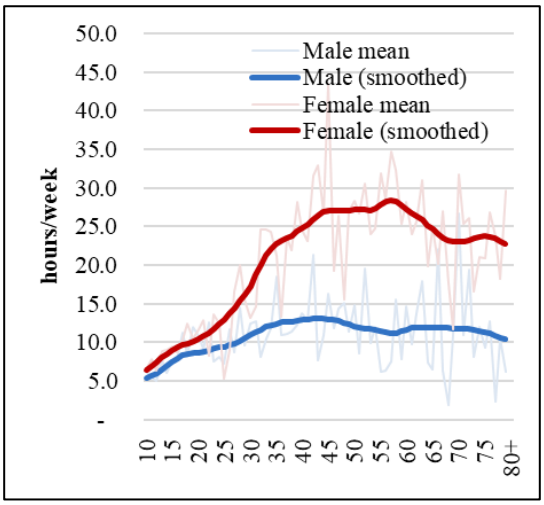
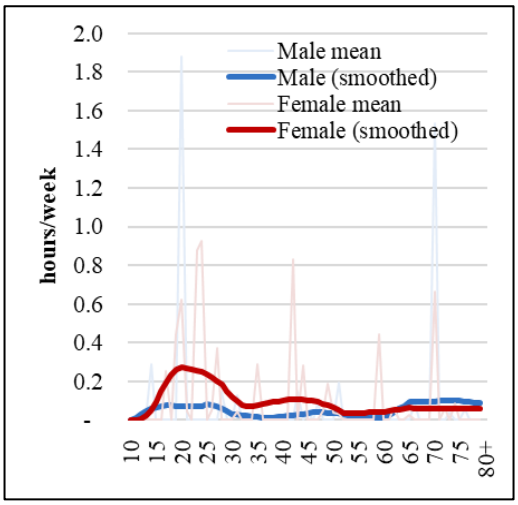


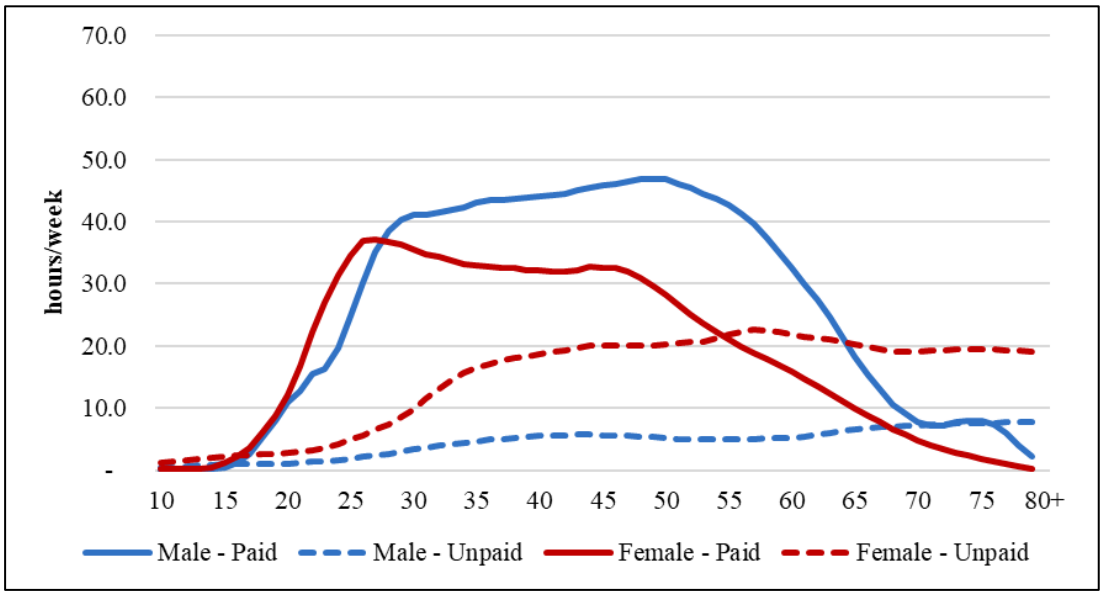
Figure 4. Gender-specific age profiles of production of unpaid volunteer work, 2023



Note: Authors' calculations based on data from the Time Use Study

Figure 5 combines the age profiles of production of paid and unpaid work by gender and shows that in aggregate, men and women spend similar time in market and non-market production, with 2.3 times more time in market production than non-market production.

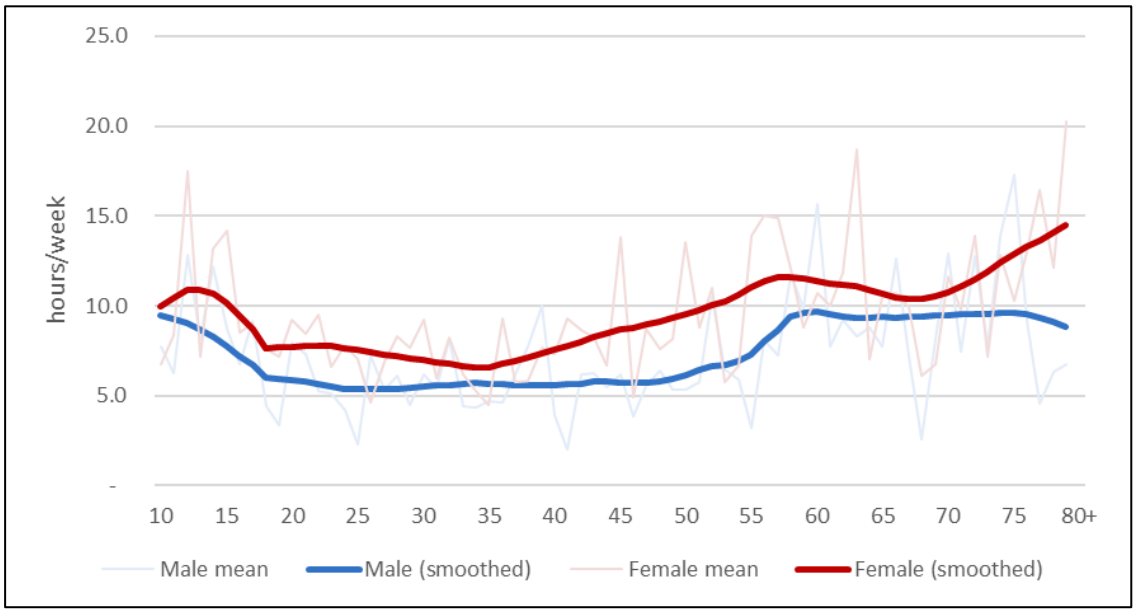
Figure 5. Gender-specific age profiles of production of paid work and unpaid work, 2023



Note: Authors' calculations based on data from the Time Use Study

The gender difference in the age profiles of the consumption of housework is small and is more equal over the life-course, with women consuming slightly more household production over the life cycle, likely because they spend more time at home (Figure 6).

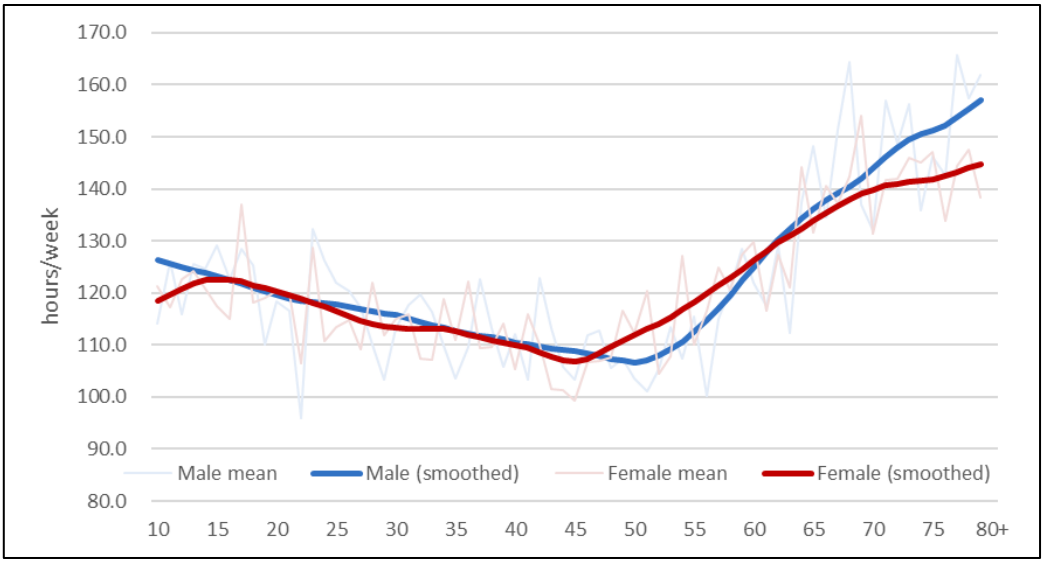
Figure 6. Gender-specific age profiles of consumption of household production, 2023



Note: Authors' calculations based on data from the Time Use Study

Taken together, consistent with Figure 5 which shows similar hours spent on paid or unpaid work, men and women have similar levels of personal time in terms of own care and leisure over the life cycle (Figure 7). The trough for both men and women in terms of personal time come in the mid-40s to early 50s, and is largely the inverse of the age profile of the market and non-market production.

Figure 7. Gender-specific age profiles of personal time (own care and leisure), 2023

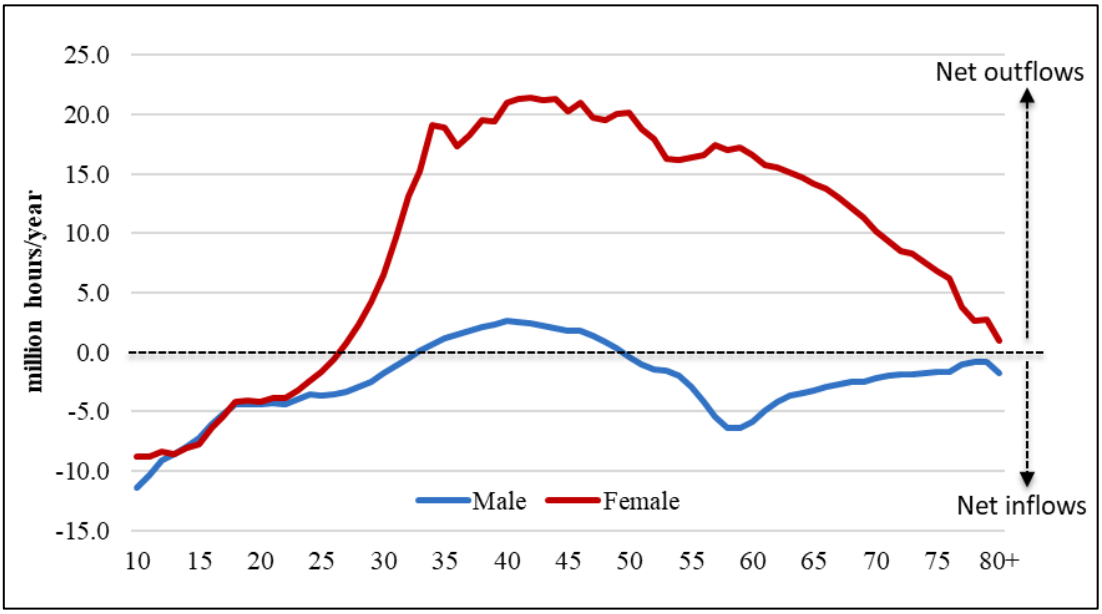


Note: Authors' calculations based on data from the Time Use Study

Net time transfers are the difference between how much unpaid household work a person produces and how much they consume at each age, where positive figures mean they give more than they receive (i.e., net transfer outflows), and negative figures mean they receive more than they give (i.e., net transfer inflows).

Figure 8 shows that over the life cycle, women are net producers of household work while men are net consumers. By age, the young are net consumers — for men up to 32 years and for women up to 26 years. Above 27 years, women produce more than they consume at least until their 80s, while men produce more than they consume from ages 33 to 49 years.

Figure 8. Net time transfers of household production, 2023



Note: Authors' calculations based on data from the Time Use Study

This study allows us to quantify the extent to which women and the elderly contribute to Singapore's total economic production, for both market (i.e., paid) and non-market (i.e., unpaid) work. The gender gap in the market economy where men produce more than women is reversed in the non-market economy in which women are net producers over much of their adult lives.

Figure 10. Share of unpaid work by broad age cohorts, 2023

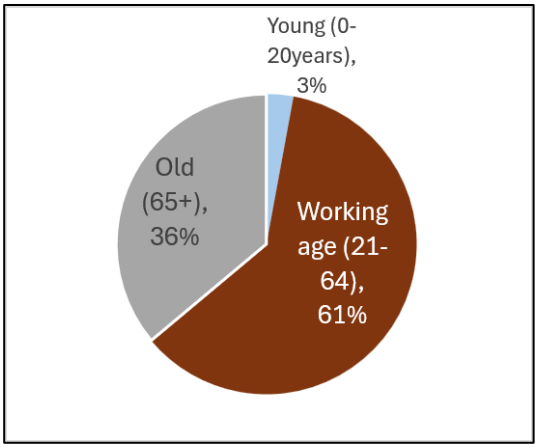
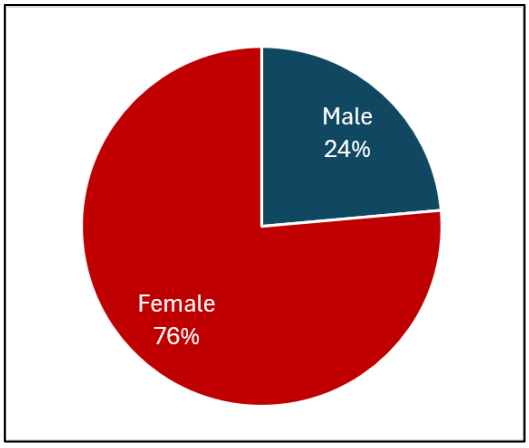


Figure 11. Share of unpaid work by gender, 2023



Note: Authors' calculations based on data from the Time Use Study

Illustrating this, Figures 10 and 11 show the shares of unpaid work by broad age cohorts and by gender, while Table 2 provides the shares both by broad age cohort and gender together. Older women aged 65 years and above contribute 22.4 per cent of the unpaid work, nearly three times of that by older men of the same age.

Table 2. Share of unpaid work by broad age cohorts and gender, 2023

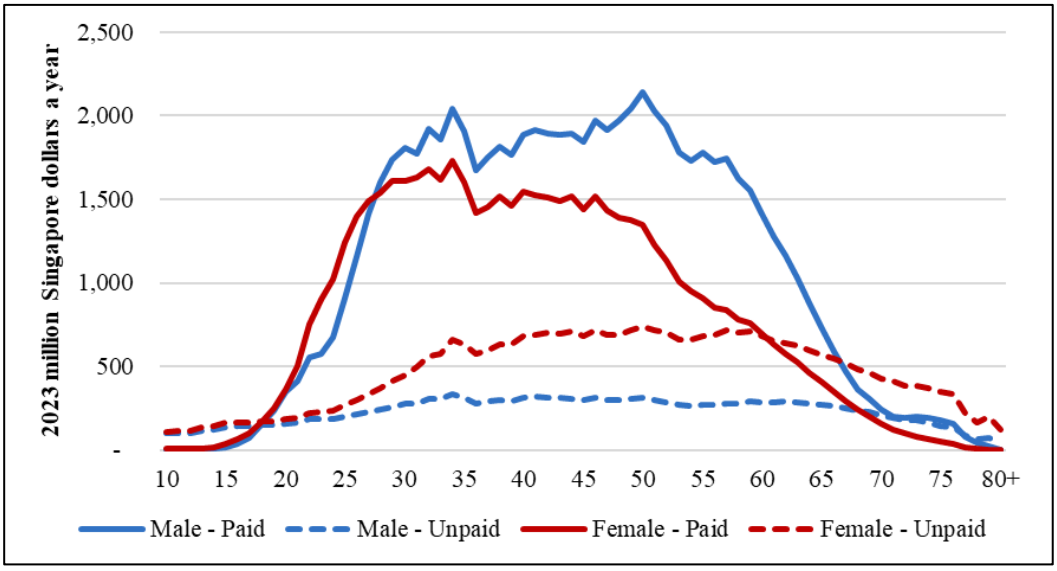
Age cohorts	Male	Female
Young (0–20 years)	0.7%	1.7%
Working age (21–64 years)	14.4%	52.3%
Old (65 years and above)	8.5%	22.4%

Note: Authors' calculations based on data from the Time Use Study

All the results above are time-based in either hours per week or millions of hours a year. Applying the market-equivalent wages to the relevant categories of unpaid and paid work by hour spent by age and gender, Figures 12 and 13 provide estimates of the economic value of non-market production.

The economic value of unpaid work in 2023 amounted to S$51.0 billion on this basis, of which S$34.3 billion was contributed by women of all ages. The economic value of unpaid work by those aged 65+ is estimated at S$10.4 billion, of which S$7.2 billion was contributed by women aged 65 years and above.

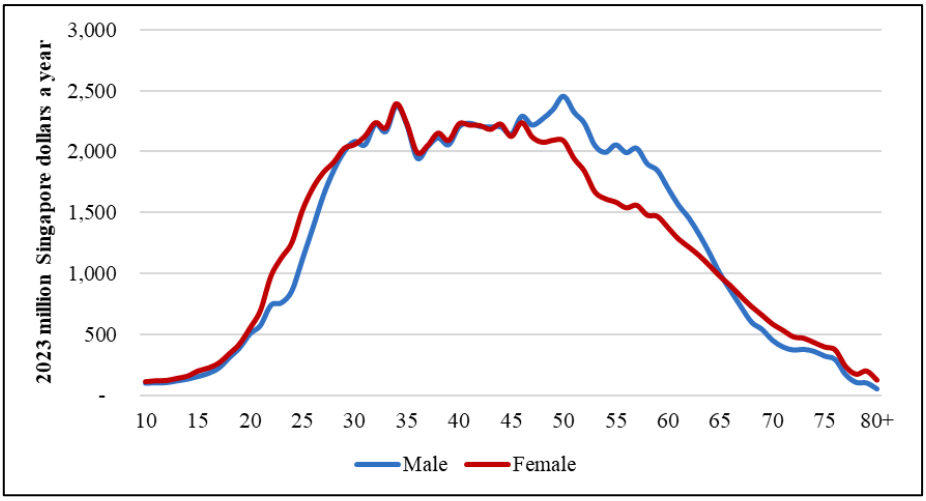
Figure 12. Economic value of production of paid work and unpaid work by age and gender, 2023



Note: Authors' calculations based on data from the Time Use Study

The economic value of all work paid and unpaid amounted to S$183 billion, roughly evenly distributed between men and women. Of this total, S$16.4 billion was the economic value of all production by those aged 65 years and above.

Figure 13. Economic value of production of all work by age and gender, 2023



Note: Authors' calculations based on data from the Time Use Study

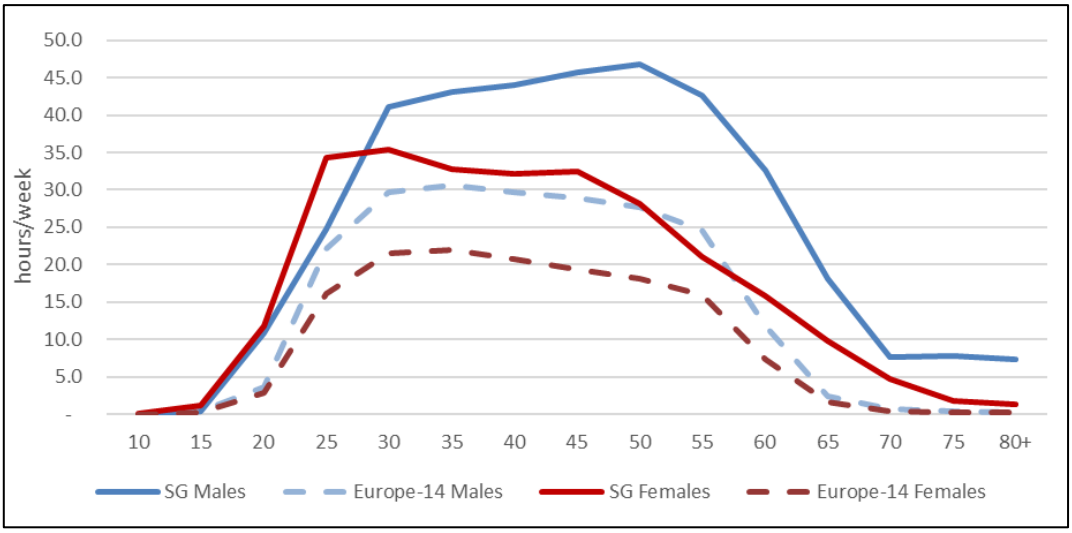
3.1 A comparison of unpaid and paid work: Singapore and 14 European countries[8]

We can compare Singapore's age and gender profiles of unpaid and paid work with 14 European countries for which NTTA has been produced (Vargha et al,

[8] The 14 European countries analysed by Vargha et al. (2017) are Belgium, Bulgaria, Estonia, Finland, France, Germany, Italy, Latvia, Lithuania, Poland, Slovenia, Spain, Sweden, and the United Kingdom.

2017). Singaporean men and women do more paid work at all ages than those in Europe (Figure 14). Men in Singapore spend more time in paid work than their European counterparts even at older ages, with the peak in hours spent in paid work in the mid-50s for Singaporean men.

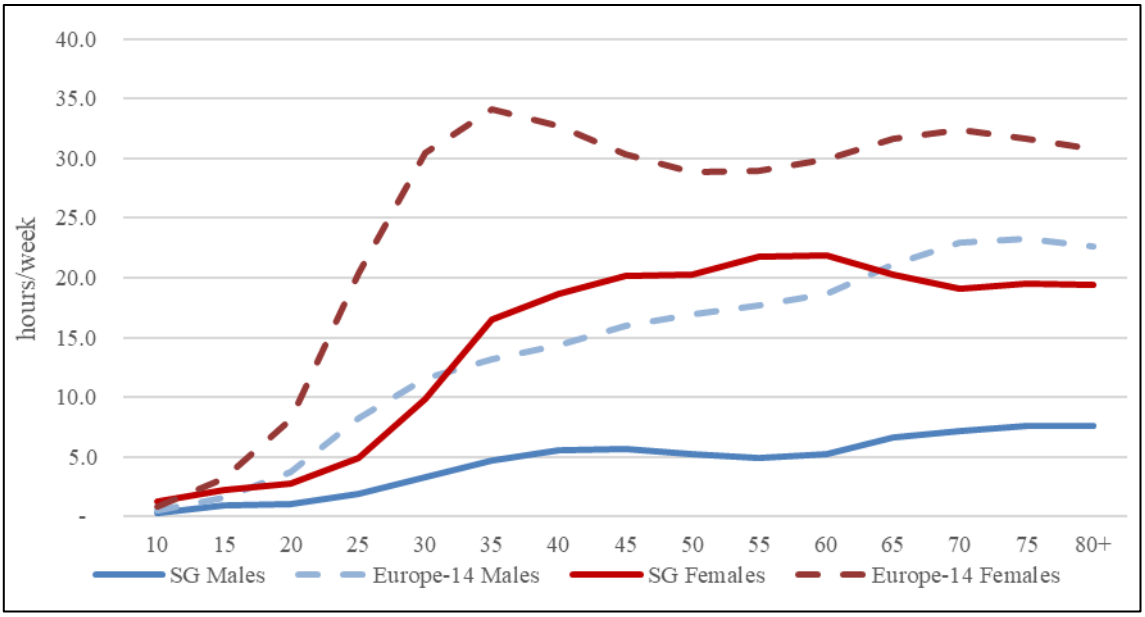
Figure 14. Paid work by age and gender: Singapore and 14 European country aggregate



Note: Authors' calculations based on data from the Time Use Study and data on 14 European countries from AGENTA Data Explorer based on work by Vargha et al. (2017).

The pattern is reversed for unpaid work. Similar to the European countries, Singapore's gender gap shows the expected pattern with women doing more unpaid work across the life cycle, although both men and women in Singapore undertake less unpaid work than those in Europe (Figure 15).

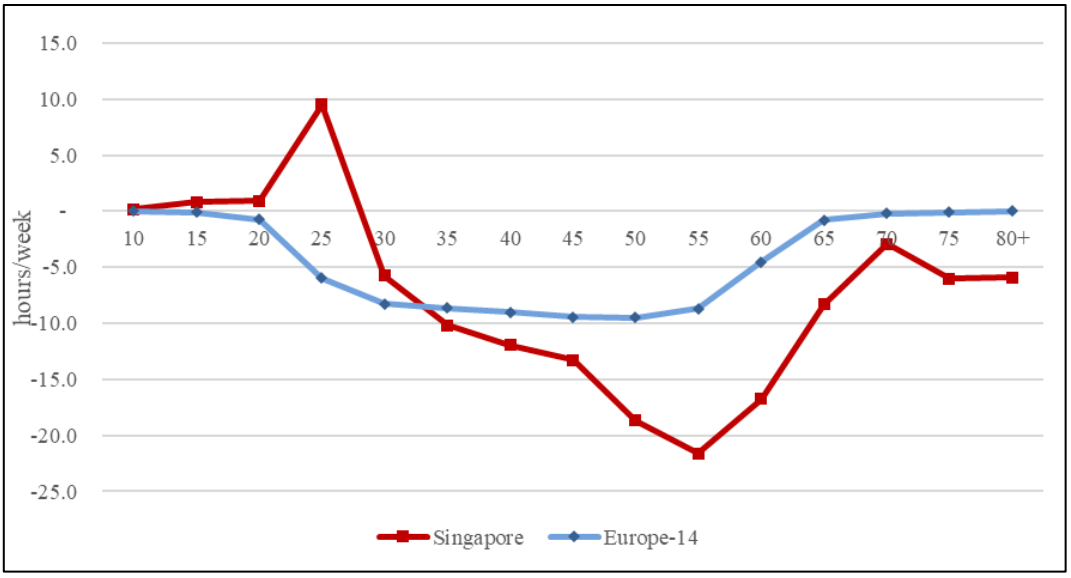
Figure 15. Unpaid work by age and gender: Singapore and 14 European country aggregate



Note: Authors' calculations based on data from the Time Use Study and data on 14 European countries from AGENTA Data Explorer based on work by Vargha et al. (2017).

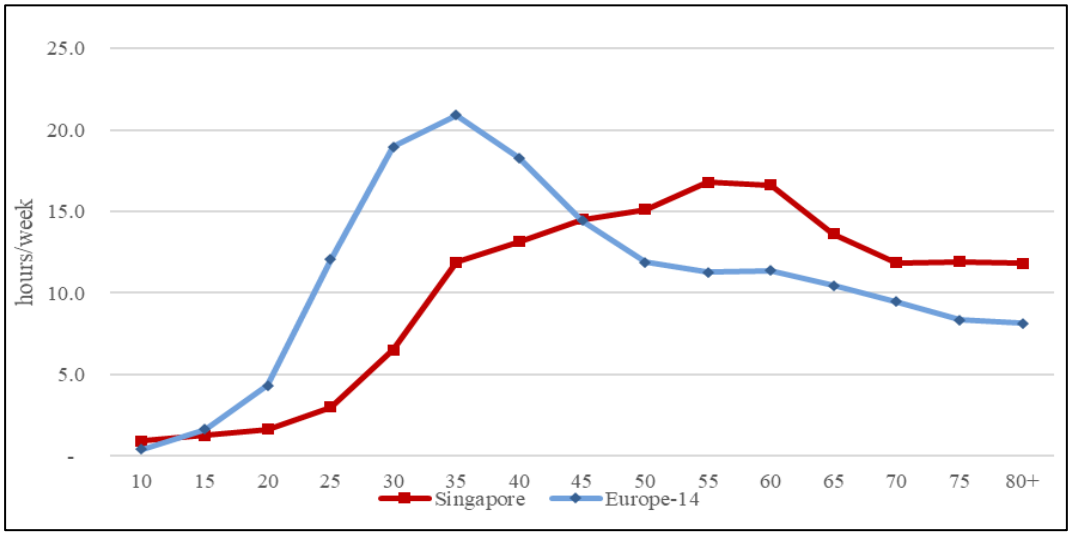
Finally, Figures 16 and 17 show gender gaps in paid and unpaid work respectively. The gender gap in unpaid work is lower at younger ages in Singapore as compared to Europe, likely reflecting cohort effects from rising female educational attainment over the past five decades, and consequently higher labour force participation amongst women in their 20s and 30s as compared to Europe. The lower gender gap in unpaid work in Singapore may also be due to a stronger dual-income household norm as compared with Europe, and also to the supply of household work by foreign domestic workers.

Figure 16. Gender gap in paid work: Singapore and 14 European country aggregate



Note: Authors' calculations based on data from the Time Use Study and data on 14 European countries from AGENTA Data Explorer based on work by Vargha et al. (2017).

Figure 17. Gender gap in unpaid work: Singapore and 14 European country aggregate



Note: Authors' calculations based on data from the Time Use Study and data on 14 European countries from AGENTA Data Explorer based on work by Vargha et al. (2017).

4. CONCLUSION

The findings from this study showcase the importance of intergenerational ties and support in financing consumption across all age groups, including the contributions of women and the elderly in the provision of unpaid housework and childcare. The results point to the central role that families play in meeting care and household needs at vulnerable life stages, and the importance of intragenerational and intergenerational solidarity.

In particular, the study highlights two population groups facing high unpaid care demands that could benefit from more support. First, women in their 40s and 50s contributed most to unpaid household and care production, suggesting that earlier and targeted support to this group may help prevent cumulative caregiver burden. Second, older adults — particularly older women — continue to contribute substantially to unpaid care and household production well into later life. These findings underscore the importance of designing services and policies that enable and support their existing care contributions, rather than merely aiming to substitute them with formal services.

Acknowledgements

The authors thank the National Council of Social Service for access to the data from the Time Use Study, which was funded by the National Council of Social Science and Ngee Ann Kongsi. Any errors are the authors' own.

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