Mapping the Unpaid Care Economy in the Asia-Pacific Region[1]

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Abstract

Aging populations in Asia worry that they are facing a "care crisis" with many elders in need of care, but no one to care for them. However, we do not have a clear picture of current patterns of care: how much care is being consumed now, who is supplying that care? Are women and men serving equally as paid or unpaid caregivers? This paper explores methods to answer some of these basic empirical questions about unpaid care work using National Time Transfer Account (NTTA) which show that, far from being a large source of unpaid care demand, older persons are making net time transfers to other age groups up until the very oldest ages. On average in our group of Asian countries (Korea, Thailand, Mongolia, India, and Bangladesh), all of those time transfers are coming from women. NTTA are also combined with population projections to create care projections. This work allows policymakers to look at the care economy today, compare it with the population of tomorrow, and evaluate the future of the unpaid care economy based on data. For the countries analyzed here, the projections show no shortfall of potential childcare, some projected shortfall in care to adults and elders, and potential surplus of indirect care in the form of housework.

1. Introduction

Care sustains our societies and economies. It sees us into the world at birth when we would be helpless without the care of family, community, and possibly paid caregivers. It begins the creation of our human capital at this stage as well. As we grow, care keeps households running, puts food on the table and makes sure we have clean clothes for work and school. Finally, care sees us out of the world in old age as many of us experience failing health and lowered capacities that make us vulnerable and unable to sustain ourselves on our own. In a world with changing fertility and mortality that, over time, alters the shares of young and old persons in a population, the care economy is going to be a more important feature to understand if we want to maintain standards of living and the overall wellbeing of the population.

The Asia-Pacific region is aging rapidly, making it an important place to study the care economy and develop tools to project its future. As mentioned above, old age often comes with declining health, although with a great deal of individual-level heterogeneity, but eventually as we age most of us will require the care and help of others, certainly more than when we were at peak working ages. Some of

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this care takes the form of healthcare provided by professional doctors, nurses, or other medical personnel, but much of it is less intensive and more day-to-day and is provided by unpaid family caregivers. Elders may need help with activities of daily living like feeding and grooming, or managing tasks like shopping, household maintenance, and cleaning. It may be intermittent activities such as monitoring if elders are able to take care of their finances or manage medical conditions. High-quality care of this type enables elders to maintain their health and independence and have a good quality of life. In the face of population aging, many policymakers, advocates for elderly persons, and other stakeholders are trying to understand how care needs will change in the future, and specifically whether a "care crisis" is on the horizon, where there are many elders needing care but too few providers so that elders' care needs might not be met adequately or at all. Also, in many of the low fertility societies where population aging is expected to be quite rapid, issues of care for children can lack for attention. What will demand and supply of care look like across the age range?

How do we being to explore this issue of care availability in a population with changing age structure? We begin by looking at data on current patterns of the consumption and production of care. Given that the needs for care are so age dependent, we look at those patterns by age. Furthermore, given that care is a traditionally gendered set of tasks and skills associated with women, we also need to look at those current patterns by sex.

Treating current patterns of care production and consumption as representing supply and demand, we can project current patterns of our care economy by age and sex into the future to see how we expect care demand and supply to change. This paper will do that for one type of care – unpaid care work performed by unpaid family and community caregivers. Of course, market-based suppliers of care play an important role in the overall care economy, and this paper will mention preliminary efforts to include those aspects, but most of this paper will focus on unpaid care work only, as establishing the building blocks of documenting current patterns of care in both paid and unpaid sectors. This effort contributes to that documentation for the unpaid care work economy and can be combined with future work on the paid care economy and how they interact.

The focus of this work is further specified by confining its geographic scope to the Asia-Pacific region. The unpaid care work economy is going to have specific features in this region compared to others. Overall, Europe is currently the oldest region of the world, most of its population resides in wealthy countries. European governments, then, have more resources and potentially more flexibility to meet care needs through a combination of paid and unpaid providers. The demographic transition in Europe where the population has moved from a state of high to low fertility and mortality has also been much slower than in the Asia-Pacific region. So, Asia-Pacific is aging rapidly but with likely fewer resources relative to its population size compared to Europe and thus may than be less able to meet any increases in care demand through paid care. This makes the focus on unpaid care work essential in many countries in the region.

Given the importance of focusing on unpaid care work in Asia-Pacific countries, the first objective of this project is to document regional patterns of unpaid care. Time use surveys (TUS) provide the data necessary to establish how much unpaid care older persons consume in terms of units of time. To estimate the market value of unpaid care consumed, that time can be weighted by imputed replacement wages that would be earned if the person providing the care was an "average" market provider, although this paper will focus only on the time-valued estimates.

The National Transfer Accounts (NTA, www.ntaccounts.org) project is an international research network focused on understanding the age dimension of our economies and has contributed important insights into the study of the economics of aging (Lee and Mason, 2011). NTA is contributing to the understanding of unpaid care work through the development of National Time Transfer Accounts (NTTA). NTA are empirical estimates of how countries produce, consume, save, and share market-based resources by age and NTTA create the same empirical estimates for non-market unpaid care work. Furthermore, as unpaid care work has been traditionally thought of as "women's work," NTTA estimates are disaggregated by sex so that we can understand the gender dimension of the production and consumption of unpaid care work. The countries that have these estimates available in the Asia-Pacific region are Korea, India, Mongolia, Thailand, Bangladesh, Turkey, and Vietnam.

In a context of global population aging, estimates of unpaid care are relevant to nations seeking to understand what care is likely to be needed in the future. Thus the second objective of this project is to use the estimated patterns of current unpaid care work to project the demand and supply of care for older persons in the face of changing population age structures. These projections indicate whether, if age patterns of care production and consumption stay the same but the population age structure changes, there will be a mismatch between the supply of and demand for unpaid care work in the future. This approach – combining per capita participation estimates for some type of labor by persons with particular characteristics with population projections – is often used by policymakers seeking to understand the future labor force (Toossi, 2012). Here this standard method is applied to projecting the unpaid care labor force and the consumers of that labor.

The paper ends with a review of the results and a discussion of policy insights.

2. Data and Methods

2.1. NTTA Overview

National Time Transfer Accounts follow in the longstanding body of work of social scientists who have critiqued standard measures of economic activity for various reasons, one of which has been that they leave out unpaid care work (Economist, 2016; Waring 1999). National accounts (United Nations, 2009) is the system of cross-country comparative estimates of economic flows that is the basis for such well known economic aggregates as Gross Domestic Product. Since its start in the years after the Great Depression, it has become an incredibly influential part of the global practice of economics and finance research and monitoring. However, like any other system of measurement it has strengths and weaknesses and built-in assumptions. It includes some things as part of its definition of an economic flow but exclude others. It includes flows arising from the production and consumption of goods and services that are traded for money, usually referred to as "market goods and services." It is not exclusively market-traded goods and services, however, as national accounts do include some flows not traded in markets for money. The value produced by owner-occupied housing consumed by those living in that housing is included, as are some other types of financial transactions and services that are not bought and sold in markets, such as corporate "goodwill." These flows are not traded, so economists and accountants must use indicators of these flows and take an educated guess to impute their value in national accounts (U.S. Bureau of Economic Analysis, 2008). The production and consumption of goods produced by households for their own use, mostly the value of food grown by a household for its own

consumption, is another kind of flow that is not traded in a market but whose value is imputed into national accounting measures of total production and consumption. What is specifically left outside of the national accounts production boundary is the value of home-produced services.

There are many terms used for this type of production: unpaid care work, household production, unpaid household services, and others. I will use the term "unpaid care work" here. Unpaid care work (UCW) includes productive activity by persons that is not already accounted for in national accounts. It covers time spent in direct care activities such as taking care of children, elders, sick or disabled persons, and of the community through volunteer activities. It also includes indirect care activities of managing and maintaining a household. Cooking, cleaning, laundry, household management and maintenance are all examples of indirect care activities.

More and more, UCW is being recognized as a valuable economic activity. Statistical agencies and international measurement and monitoring bodies such as the ILO and the UN explicitly include it in their work plans, goals, and reporting. The United Nations includes aspects of unpaid care work as items in its set of sustainable development goals related to gender equality (https://sustainabledevelopment.un.org/sdg5). See also International Labour Organization (2018). In the ongoing effects of the Covid19 pandemic, new attention has been paid to the role of UCW in maintaining societies. School closures transferred a massive sector of the paid care economy from teachers to parents seemingly overnight while work from home orders meant that household production was no longer hidden all day from an adult working outside of the home. These and other pandemic impacts have given new importance to the study of the care economy.

Despite movement in recognizing UCW, we are still a long way away from having consistent, comparable data across countries on UCW that we have for measures like GDP and market labor force participation. In the meantime for this project, we create these measures for ourselves following the long-standing methodology that researchers have developed to estimate the production of UCW, by using time use surveys to gauge how much time people spend in this type of production (Landefeld et al., 2009; Abraham and Mackie, 2005).

What the NTTA approach brings to this methodology is a framework that explicitly acknowledges the role of age in determining much of the variation in UCW production. As UCW is largely driven by the age-determined processes of birth, marriage, household formation, aging, and death, a focus on the age dimension is necessary to understand UCW and make policies around it. Much work on UCW has focused on a particular age group with a very wide age band instead of focusing on how UCW patterns change by age. In some countries where age-dependent phenomena like marriage happen at specific ages with little variation across individuals, age group averages can obscure much of the UCW patterns we seek to understand.

In addition to an improved focus on age, the NTTA approach shows us the transfer of UCW between persons, however, not just production. To get the other side of the exchange, we can apply the National Transfer Accounts framework (Lee and Mason, 2011; United Nations, 2013), which has established methods for imputing the consumption of market goods and services to individuals from survey data showing the consumption only at the household level. Applying this methodology to unpaid care work services reveals the same system of transfers between persons in the UCW economy that NTA has revealed in the market economy – young and old in different countries and regions have different levels of "dependency" relative to the productive capacities of peak age workers, and those workers provide

for the needs of young and old dependents in different ways and with different generational arrangements.

So this is a hybrid methodology – combining household production satellite account estimates with the NTA framework to impute consumption and transfers. This hybrid methodology is called National Time Transfer Accounts (NTTA) and has been developed by the Counting Women's Work project (www.countingwomenswork.org; National Transfer Accounts, 2017). It brings more detail to the age dimension of UCW than previous research, making it amenable to the study of UCW in aging societies. Furthermore, it includes methodology to impute UCW consumption and transfers which would be much harder to observe directly.

2.2.   NTTA Production Estimates

To produce NTTA estimates, we follow in the long-standing research tradition behind household production satellite accounting (Pan American Health Organization, 2010). The methodology requires time use survey data. Some time use surveys are in the form of time diaries in which respondents are asked to account for all their activities, one after another, during some time window, usually 24 or 48 hours. These activities are then coded using a comprehensive coding scheme. Another type of time use survey data that is available is a comprehensive set of questions about how much time respondents spent on each of a set of specific activities. If the set of activities asked about are sufficiently detailed, then time spent on a full set of UCW activities and a comprehensive picture of UCW can be obtained.

In all of the ways a person could spend time, how to decide which activities qualify as UCW? We want NTTA to include activities that would be included in national income if they were performed for wages instead of by non-market labor. One way to determine if an activity meets this standard is the "third party criterion": you can pay someone else to do it and still receive the benefit from it (Reid, 1934). Activities like sleeping, eating, sports and leisure activities would not be included, as paying someone to do these things would not give you the benefit of them. Any home management or care activities, on the other hand, would qualify by the criterion as you could pay someone to do them and benefit from the service. Another way to think about which activities to include is that they must not be recorded as part of national income as currently constituted but could be if they were contracted for instead of unpaid.

Separating and defining different activities is an important part of the methodology, and there are many ways to classify activities. The countries in this study use different classifications, adapted to their own contexts and needs. The coding schemes and which activities qualify as UCW for each of the included countries are available in the Data Appendix. There is variation across the countries included in how detailed they can be when accounting for care. Usually, surveys distinguish between childcare and all other types of care. This reduces analytical power for studying eldercare, but fortunately we still have the age of the producer of the care, and the household structure, to give us clues on whether care is being produced or consumed by an elder. It is a limitation of the study, that time use survey coding schemes vary across time and place. Another potential source of uncertainty is the interpretation by respondents of what is being asked and of activity coders in applying a particular scheme.

Once all UCW activities have been identified, we can estimate the time spent by each respondent in each type of UCW, then compute the average respondent time by age and sex. As mentioned previously, the lifecycle nature of care phenomena highlights the need for the age detail. Separating production

estimates by sex acknowledges the historical division of labor between men and women. As will be demonstrated, there is no country in this study where women are not the main suppliers of UCW. As such, an "average" that is not gender disaggregated is bound to be misleading. We do smooth the sex-specific age schedules of care production with a cross-validation smoother called Friedman's Supersmoother (Friedman, 1984), to reduce sampling noise and make figures easier to view.

A final note on estimating UCW production involves the issue of supervisory care, also related to the issue of "multitasking." Some surveys try to evaluate the extent to which people are doing more than one activity at a time. They may query respondents to see if any activities were being done simultaneously, or if there was a secondary activity the respondent was also doing at the time they reported the first activity they indicate, or focus on a particular type of multitasking, such having supervisory responsibility for young children while also engaged in another task. Unfortunately, the variation in accounting for multitasking in the surveys means that they are not very comparable from country to country, so they will be left out of this analysis and only the primary activity indicated will be examined here. However, research that does include multitasking suggests that it is of large magnitude (Folbre, 2015). Another way to approach this issue is to infer supervisory time by assuming that parents are responsible for children any time they are in the same household (Suh & Folbre, 2016). This makes sense given the legal frameworks in some countries which would punish parents who were not either taking care of their children in person nor had made provision for others to supply supervisory care. Some similar supervisory care dynamic could impact estimates of eldercare. While this survey is not able to create estimates of multitasking or supervisory care which would be comparable across countries, hopefully time use surveys in the future will come to an accepted instrument to measure this additional need for care and future research will be able to include it in cross-country comparative work.

2.3. NTTA Consumption Estimates

We do not directly observe people consuming the value of the time that is documented in the NTTA production account. Instead, we use assumptions to allocate the value of that time to consumers in the household.

For general housework activities, also called "indirect care," the time produced is divided equally among all household members. For example, a household with four members has a time use survey respondent who reports producing one hour of cooking on the survey day. The consumption of cooking time for the four people in this household on this day, including the survey respondent, is assumed to be fifteen minutes each. This makes the most sense theoretically because the consumption of these activities is generally uniform across the household, or at least the data to make finer consumption distinctions such as which family member consumed how much at each meal, or how many hours each household member spent at home, is not available in a similar way across multiple countries.

For direct care activities within the household this equal allocation would not be reasonable. The very young and very old consume much more in direct care than those in mid-life. Instead of the equal allocation method, we use a regression approach that uses the association between care production and household structure to create care consumption weights by age and sex. These weights are applied to household care produced in order to apportion the amount of direct care produced in a household to the individuals within that household.

Specifically, if households are observed to each produce some amount of childcare, we estimate a household-level regression model on the survey data for each producer of direct care. We regress that producer's amount of childcare produced on the number of household members in each child age/sex group. The regression coefficients on each age and sex group then become weights that can be used to apportion the household amount of childcare produced in each household by each time use respondent to each child in that household. Similarly for adult care, we regress the household production of adult care by each time use respondent and number of adults in each age/sex group. Note that for either type of care, the producer of the care is not included in the household structure data that goes into the regression estimation even if he or she is in the target age group because he or she is not a potential target of the care. (The coding of self-care is different in all activity schemes from care for other persons.) This regression approach is limited because it relies only on detecting variability between households of different age and sex composition and cannot detect differences within households where individuals of similar age and sex may actually receive different levels of care. This is most relevant as regards to the sex differences in care consumption estimates. Our ability to detect different amounts of care given to close-age males and females sharing the same household is minimal. Overall, then, our estimates here of sex differences in care consumption must be considered a lower bound.

To be more specific about the regression method for imputing consumption, a regression equation is estimated for each potential care producer (that is, for each household member who was asked to fill out the time use survey questionnaire) and for each type of direct care as follows:

$$X_j = \sum_a \sum_s \alpha(a, s) E_j(a, s) + \varepsilon_j$$

where X_j is the amount of a particular type of direct care time produced by survey respondent j, $E_j(a, s)$ is the number of members age a and sex s in the household of the survey respondent where those household members are "enrolled" in the care target age group, i.e. they are in that age group. Age a is grouped in 2-year groups to reduce noise. The regression coefficients pick up the extent to which more care of a particular type is produced in households that have more members in a particular age/sex group. The positive $\alpha(a, s)$ coefficients that come out of the regression are then assigned to the relevant age and sex groups and used as weights to distribute the producer's time produced to household members as consumption.

For time caring for persons outside of the household, we impute the production as consumed by all persons in the target population, using the age profile of consumption of care provided to household members as weights. This assumes that care provided by non-household members is consumed in the same relative amounts as when care is provided by co-resident household members.

Once all of the production is imputed to consumers, producing the age- and sex- profiles is a matter of taking the age- and sex-specific average amounts of imputed consumption for the persons in the time use survey. We smooth the sex-specific consumption schedules by age just as for the production schedules.

2.4.   The household roster

In the previous section, the imputation of consumption of UCW was shown to lean heavily on household structure. For some time use surveys, that household structure data is available with the time use data

that is collected, in the form of a complete roster of household members by age and sex regardless of whether they were selected as time use respondents or not.

For other time use surveys, the full household roster is not available. This is the case for Bangladesh and Thailand in the set of countries included in this study. For those cases, an alternate source of household structure data was used: census samples available from the IPUMS International Database (Minnesota Population Center, 2018)[2]. These samples provide complete listings of household members by age and sex which can be combined with the time use data on production of UCW activities. The time use surveys and census household rosters are done by identifying as many matching variables as possible – household size, household head characteristics such as age, sex, marital status, education, and any other variable which is asked in a similar enough way between the two data sources to be a match. The average amount of production of UCW activities is calculated from the time use survey in cells defined by all categories of the matching variables and then imputed onto individuals in the census sample with the same categories of the matching variables. This puts the time use production estimates for Bangladesh and Thailand into a context where the full household roster is available and makes it possible to estimate consumption of UCW time.

2.5.   NTTA Transfers

We make the simplifying assumption that UCW time is consumed at the same time it is produced, therefore total production of UCW time must equal its total consumption and no aggregate net transfers are possible. This is true for the total population but not for any individual or group with the population. To estimate transfers, we distinguish between indirect and direct care.

For direct care, all production is consumed by others by definition (care for self is classified differently from care for others and does not satisfy the third-party criteria mentioned earlier). Thus the transfer outflow of direct UCW equals the production and the transfer inflow of direct UCW equals the consumption.

For indirect care activities like general housework, transfer outflows are not the same as production. Because we assume that all indirect UCW benefits all individuals in the household equally, a producer does transfer all his own production of indirect UCW but rather consumes some of it himself. The transfer outflow is therefore the portion of the production the producer does not consume herself, and the transfer inflow is the portion consumed that the producer did not produce herself. Referring back to the example of the cooked meal produced in one hour of a household member's time and shared by himself and three other household members, the cook produces one hour of cooking, but only transfers 45 minutes of that time to other household members. He consumes 15 minutes himself which is not a transfer.

2.6.   Care support ratios and population projections

Once we are grounded in the empirical facts of the current UCW economy through the age profiles of UCW production, consumption, and transfers, we wish to then imagine how that economy might shift in

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[2] The author wishes to acknowledge the statistical offices that provided the underlying data included in IPUMS International making this research possible: Bangladesh Bureau of Statistics, Bangladesh; and National Statistical Office, Thailand.

the future. One way to do that is with the thought experiment "what if the care economy stayed as it is currently in terms of the average production and consumption by age and sex, but the numbers of people in those categories changed?" This is a straightforward calculation holding the NTTA production and consumption estimates constant while using a population projection into the future to change the population age and sex structure.

The population projections come from the United Nations World Population Prospects database (United Nations DESA, 2019) and the "medium variant" projection is used. The estimated population at 2020 is the starting point and the population by age and sex is projected to 2100. These projections continue the trajectory of population aging for most countries, with continuing gradual mortality decline and longer lives, and continuing gradual fertility decline for countries with above replacement fertility levels, and gradual fertility increases to replacement level for countries with below-replacement fertility. In our sample of six countries, all of them start the projection period in 2015 with at or above replacement fertility except Thailand and Korea, which start below replacement. Thus, all countries but Thailand and Korea are projected to have gradual fertility declines over the period, while Thailand and Korea have a slight increase.

The calculation described above, weighting per capita UCW demand and supply curves by changing populations, creates an unpaid care work support ratio. These types of support ratios are a more empirically informed version of dependency ratios which are just ratios of population age groups. Support ratios have been used extensively to understand population aging's impact on the market economy by the National Transfer Accounts project (United Nations DESA, 2017), and suggested for the care economy as well, in other versions (Robine et al., 2007).

Specifically, the calculation for the unpaid care work support ratio in year y ($UCWSR_y$) is as follows:

$$UCWSR_y = \frac{\sum_a \sum_s UCWP(a,s) \, N(a,s,y)}{\sum_a \sum_s UCWC(a,s) \, N(a,s,y)}$$

where $N(a,s,y)$ is the projected population count of persons age a, sex s, in year y from the UN WPP database, $UCWP(a,s)$ is the average amount of time produced by persons age a, sex s as estimated using the NTTA methodology for the most recent year available for a particular country and $UCWC(a,s)$ is the average amount of time consumed by persons age a, sex s also estimated as in the NTTA methods, for the most recent year available

The UCWSR is basically a ratio of projected aggregates of production and consumption of unpaid care work, used to represent a future look at supply relative to demand. If the age groups that supply and demand care shift in the future, the market may be out of balance. If there is more projected demand than supply, there may not be enough care available for those in need. If the opposite arises, then time in the future may be freed up for other uses than providing care.

These basic projections are done at different levels, including only care for older persons, or only direct care, or all types of care combined. Each analysis reveals a different aspect of the care economy which may face demographic pressure in the future.

3. Results

3.1. Measuring the UCW Economy

Following the methods discussed in the previous section gives a full picture of the unpaid care work economy in a small, diverse group of countries. To learn what these pictures reveal, the results discussion will follow a series of comparative figures showing the same estimates across age groups for the seven countries included in this study. The figures proceed as follows: the amount of time spent on work by age, gender aspects of work by age, unpaid care work production, consumption, and transfers, projected changes in population age structures, and finally projected care support ratios over time.

3.1.1. Work time by type

To start with Figure 1, it shows each of the seven Asia-Pacific countries with smoothed lines for the average amount of time spent on unpaid care work in the solid lines or market work in the dashed lines, in hours per week. Market work includes time spent earning wages, but also time spent working for a household-owned enterprise or farm, even if the person did not receive a wage for this work. Such unpaid family workers in market-based enterprises are already considered in many statistical systems as market workers and their production is imputed into existing national accounting frameworks. The market work estimates also include time related to market work, such as commuting time or time spent looking for work. This time is generally not paid but is necessitated by a job or job search and thus is unavailable for other activities like leisure, self-care, or education. Further, it effectively lowers the hourly wage that the worker actually ends up receiving.

The unpaid care work estimates (solid lines) include time spent providing direct and indirect care. As defined earlier, indirect care includes general housework such as cooking, cleaning, laundry, household maintenance and management, and errands such as shopping for goods or purchasing services for household use. Direct care includes care interactions for children or adults, or care for the community through volunteering or taking care of non-household members. As mentioned in the methodology discussion, only primary activities are included.

Each country's time use survey has some age cut off for children, below which children's data is not collected either from them or through a second-hand report by an older household member. It is assumed for the purposes of this analysis that children in these unobserved age groups produce no work at all. For some of the countries here, that is going to be very inaccurate, but without more data, it is a necessary simplification. Collecting accurate time use data for younger children is possible and shows that children are doing a lot of work in some contexts, both unpaid care work and paid work or work for family-owned farms and businesses (Morrow & Boyden, 2018). However, those data collection methods end up being different than the time use survey data available used here.

For several of our countries here (Bangladesh, Mongolia, Turkey, and Vietnam, and Korea at oldest ages), we see age groups in which people are spending as much time, if not more, producing UCW as producing market work. For India, Thailand, and working ages in Mongolia and Korea, however, market work is greater but there is still a large amount of UCW being produced in these age groups. This finding is important because it shows the impact of the "invisibility" of unpaid care work in both official

statistics like labor force participation and in people's ideas of what work is. It renders a large part of the work people do unimportant because uncounted in official definitions of work.

For the oldest age groups, UCW is generally greater than market work. In the countries with steeper declines in market work with old age – in other words, countries where retirement from all market labor or at least a significant reduction in work hours with age is common – UCW time still maintains a similar level from working ages. Again, we can imagine the impact of the "invisibility" of UCW given how much of it older persons are doing. We tend to think of labor market withdrawal as marking the end of work lives for older persons, but these UCW patterns show us that when we count all work our work lives continue.

Excepting Bangladesh and India, it is common to see a double hump shape in the solid line showing UCW time. The first peak generally follows age groups that are in the most time-intensive period of bearing and raising young children. Slightly older age groups experience a trough when children grow and require less care then begin to leave home. Then age groups 10-20 years older than the trough are having another peak. As we will see later, some of that is grandparents caring for grandchildren, some is the care for an aging spouse in poor health. Some of it is from indirect care work that takes longer due to lower productivity brought on by an aging body.

In contrast to the double hump shape of UCW, market work generally has a single hump shape and in India and Bangladesh both UCW and market work have a single peak. With the exceptions of Bangladesh and Turkey, none of the countries seems to have the same age group with the maximum hours spent in both market work and UCW. Instead, ages of peak work intensity differ by type, possibly indicating practices of sharing work burdens across age groups in families.

One note of caution in interpreting these figures and comparing the difference from country to country is warranted, before we move on. There is an obvious issue in interpretation that the time use survey data available for each country comes from different years. Most are recent and from a fairly concentrated number of years, but India is an important exception. For many years, the 1999 survey for India has been the only comprehensive, nationally representative time use survey in India. It has most certainly changed by now, although we can at least note that India's female labor force participation has not gone up but has in fact fallen since 1999. A new survey has been conducted in the past few years, and data had been tentatively scheduled to be released to researchers in 2020[3] but slowed by pandemic impacts. Some researchers have been able to access the data and work is beginning to create NTTA estimates with these new survey data. The estimates from the 1999 survey shown here will serve as a baseline to understand how the unpaid care work economy in India has changed over two decades once the new estimates are available.

Beyond the samples coming from different years, some of the variation from figure to figure for the different countries could be artifacts of different types of surveys done in each country or of different understanding of the survey instrument in different cultural settings. Therefore, it is a more reliable approach to evaluate whether internal patterns of difference within each country – by age, by gender, by type of work – vary across the sample of seven than it is to make much of the absolute differences in the point estimates of a particular age/sex group between two countries.

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[3] See https://www.data2x.org/wp-content/uploads/2018/03/Data2x-TUS-Case-Studies-India.pdf for details.

3.1.2. Gender differences in work time by type

As mentioned earlier, part of what we want to understand about unpaid care work is how it fits in with the gendered economy – the system of norms, laws, preferences, and any other social or political institution which differentiates how men and women and girls and boys participate in economic life. This means setting aside ideas of an "average" person to observe patterns by males and females separately.

Figure 2 shows the same information as in Figure 1, but with each black line for average work by age separated into a line for men in blue and a line for women in red. Market work is still a dashed line, unpaid care work still a solid line. Separating the work lines by gender reveals very different gender economies in the seven nations. We have examples like Bangladesh where men and women are very closely mirroring each other in terms of work hours by age, but in exactly opposite sectors. Turkey is also somewhat like this. Then there are countries like Vietnam where the genders look more similar by age in terms of their work lives.

Figure 3 highlights the gender differences by plotting the difference between the male and female line for each type of work. Differences are expressed as female minus male estimates, so lines above zero indicate that women are doing more of this work than men, while lines below indicate men are doing more than women.

The lines in Figure 3 for UCW (solid green) are generally all above zero at every age (there is a tiny exception for the oldest Vietnamese persons) showing the broad pattern of female specialization in UCW. The lines for market work (dashed green) are generally all below zero at every age indicating male specialization in market work. The solid black line is the gender difference in total work, and it is the sum of the UCW and market work lines.

Gender differentiation is highest at ages 20 to 40 and lowest at youngest and oldest ages, consistent with the lifecycle process of bearing and raising children which drives the largest level of demand for UCW. This is a significant finding to keep in mind when seeking to understand older persons and work: while the magnitude of gender differences in work is less for the oldest age groups compared to peak working ages, those older persons likely spent their adult lives in a much more gender segregated world and thus will still feel the effects of the gendered economy even if actual work differences are less.

The gendered economy of female specialization in UCW and male in market work is incredibly consistent across countries, but the level of gender differentiation varies. Bangladesh, India, and Turkey show the largest magnitude of differences between male and female, and thus the greatest degree of gender specialization by sector. Mongolia, Thailand, and Vietnam have much less, Korea is in the middle. If we consider the widest gap in the UCW versus market work gender differences as an indicator of gender segregation in economic life, then the seven countries in order of greatest to least segregated are India, Bangladesh, Turkey, Korea, Mongolia, Thailand, and Vietnam. Some of the largest gender gaps in total work in Figure 3 (the solid black lines) are in Mongolia and Vietnam, however, indicating that lack of gender segregation is not associated with an "advantage" of less total work.

Indeed, what Figures 2 and 3 seem to show is three different gender systems for work. In Bangladesh and Turkey, we might say that the picture is symmetric but segregated: women are producing UCW hours in almost the same amounts by age as men are producing market work and similarly with men

producing UCW hours in the same amounts as women produce market hours. The gender difference in total work is small in Bangladesh, with women having slightly more total work than men on average when young but it reverses with oldest ages. In Turkey, females' greater total work is more consistent across age groups. It may be notable that these two countries share the characteristic of being predominantly Muslim with a historical legacy of cultural practices that favored separation of genders for persons not in the same family.

In Mongolia and Vietnam, we see a "second shift" pattern where market work looks more gender equal but UCW is quite unequal. These two countries share the characteristic of communist regimes, currently or historically, which emphasized gender equality in market labor force participation, but apparently did not stress the role of worker equality within the household with the same vigor. Similar patterns have been documented in former communist countries in Europe, such as Slovenia and Hungary (Sambt, et al., 2016).

Finally, in Thailand and India, we see what may be a pattern consistent with growing economies that are more amenable to letting women work in the market but still hold very traditional ideas about what work is appropriate for men. Thus, in these two countries women's work lives look more evenly divided between UCW and market work while men's work lives are almost completely segregated to market work alone. Korea seems also to be in this category, with women in many age groups spending about the same amount of work hours on UCW and PCW, while the lines for men are sharply differentiated and men do very little UCW. It is interesting to find Korea in this group as it is the wealthiest and most highly industrialized of the countries included, yet shares gendered economy patterns along more traditional lines, at least for men.

It is interesting to note that the fertility levels of each country in the year of the time use survey are not related to the degree of economic gender segregation. Certainly India's 1999 TFR of 3.38 children per women is the highest in this group of countries and tracks with its high gender segregation, but Mongolia at 2.64 children per woman is the next highest in fertility but has far less economic gender segregation than Bangladesh with a lower TFR of 2.24. Turkey's TFR of 2.07 is close to Vietnam's of 1.96, but their gender segregation is quite different. Thailand at 1.51 TFR has relatively low fertility for the group but gender segregation similar to higher fertility Mongolia. Korea has the lowest fertility of the group of seven at 1.20 but its degree of gender differentiation in work is roughly similar to Turkey's with fertility in the middle of the group. (Fertility rates are from the World Bank's World Development Indicators database, World Bank, 2017 and the fertility mentioned is for the time use survey year for each country.) This suggests that there is nothing biologically determinative about gender gaps in work, as our role in fertility is the most biologically determined aspect of our lives. In other words, the gendered economy is not necessitated by biological aspects of childbearing and childrearing, or it would look the same in countries with the same fertility. While the overall type of gender specialization is the same in all seven countries -- women doing more UCW than men and men doing more market work than men – but there is great dispersion around that central tendency which comes from different histories and cultures, as well as different policy choices each country has made that influence firms, households, and individuals.

Bringing the focus to the lives of older persons, we see that in all countries, older persons spend less time working than those in the peak working ages, but they still put in substantial amounts of work. In most of the countries in this sample, the greatest work allocations for persons age 80 and older is for

women doing UCW. India is an exception where we see men doing substantial market work at those ages, and in Vietnam men's and women's UCW is about the same for the oldest groups. We also see that the concentration of work by sector shifts away from market work and toward UCW for older persons. This is another reminder of the impact of the invisibility of unpaid care work –invisibility of the economic reality of older persons. Considering the gender differences in work at older ages, note that the shift in working life toward more UCW is a larger change for most aging men than for most aging women. Men in some contexts may experience this change as negative if their culture has strict expectations on what is acceptable work for men.

3.1.3. Including consumption and transfers

We now include the consumption side of the care economy in Figure 4, which shows the age patterns of production, consumption, and net transfers of UCW. The production lines in blue of Figure 4 are the same as the lines for unpaid care work in Figure 1, but now we include estimates of who consumes those UCW services by age. (The scales are different for the two figures as well, because net transfers can be negative, so the UCW production lines will not look exactly the same.) The consumption line is shown in green.

Because we make the simplifying assumption that UCW is consumed at the same moment it is produced, the difference between the production and consumption lines equals the net transfers of UCW, shown by the dashed purple line. This is one distinguishing facet of the UCW economy compared to the market economy: in the market economy, instruments exist to so that the time of production does not have to be the same as the time of consumption. We can take out loans to consume today but pay back with earnings from a later time. We can produce today and save that production through physical or financial resources and use those resources to consume at a later time. UCW services, however, are generally consumed at the moment they are produced – we eat the meal right after it is cooked. Certainly there are small time differences, such as consuming a clean house after it is cleaned, but generally the service is consumed close to the moment of production and there is no way to save or borrow UCW other than through informal obligations to transfer with other individuals.

Looking at the green consumption lines, we see that the greatest consumers of UCW are children, but the level of that consumption varies across countries. (Note that the green consumption line merges with the purple transfer line at youngest ages because children are not producing any care themselves. All of their consumption is a transfer from older age persons.) Vietnamese and Korean infants are estimated to consume over 60 hours per week of UCW while Bangladeshi infants consume just over 20 hours per week. Part of this is the mathematics of the consumption imputation – care work produced in a household is divided among the persons in that household, or the children in the household for childcare specifically. Thus, more potential consumers per household, as you would have in higher fertility countries with more young children, lead to smaller shares for each person. Household structure overall will thus have a significant impact on the consumption estimates, but that is not just artifactual. Households are the major structure through which private transfers flow from net producers to net consumers. Larger household sizes, more household complexity, is partly a strategy to share resources, not just a mathematical fact.

After about age 15, the consumption curves flatten out in most countries. UCW consumption is somewhat higher for older age groups compared to working ages in Turkey, Mongolia, Korea, and Vietnam, but there is not much difference in the other countries.

It is important to distinguish consumption from transfers. Age groups that consume care but produce about the same amount will be making no net transfers to other age groups. Individuals in those age groups may be transferring a great deal of UCW services to others, but if net transfers are zero then they are able to produce about the same amount of UCW as others provide to them for their consumption. Children are the only significant receivers of net transfers in any of the figures. Net transfers are slightly positive at the oldest ages in all countries (the dashed purple lines cross over from positive to negative at the oldest age groups). This means that the oldest persons in each country are receiving net transfers but the magnitude is much less than transfers to young children. A final observation on transfers is that adults age 20 to 40 are the largest net producers of UCW time, their dashed purple line has the largest negative magnitudes.

What this picture tells us, then is that children are much more costly than elders in terms of UCW time. This is not because elders consume so little care, in fact they consume about as much as working age adults or at least not much more. Instead elders in the UCW economy are so very different from children because they produce about as much as they consume in UCW time, requiring on average only small net transfers at the oldest ages. This finding would indicate no support for the idea that an aging society is heading for an imminent "care crisis." It also does not support the idea that the oldest persons in these countries consume massive amounts of care.

These conclusions are very tentative, however. Such a result should be examined carefully and will require much replication before it is taken as fact. Other explanations will need to be ruled out. For example, it may be that care for elders is much harder to measure than care for children. This could be the case if adult children classified activities like phone calls or visits with elderly relatives as social or leisure activities when they also involve caretaking activities like cleaning or doing household chores for an elder, or just checking up on their wellbeing and household conditions. Ideally, we would want a chance to consider the secondary caretaking activities involved with the primary activity of socializing, but many surveys do not contain these types of data.

Another important qualifier on these results is that they are averages for age groups, which can mask a great deal of difference for groups within the average. This was discussed before in the case of sex: the "average" person does not really exist in a context where so much population-level variability is determined by the sex of the person. There are certainly other characteristics, such as region or urban/rural status of the household, or socioeconomic status, that may also mark sharp dividing lines in the shape of the care consumption age profiles.

3.1.4. Gender differences in transfers of unpaid care work

In the previous section, it seemed as though elders were largely providing for their own care needs, at least on average. We now want to understand how that "average" is influenced by the gendered economy. Figure 5 shows the same net transfers line as in Figure 4 but disaggregated by sex. What was the overall average dashed purple line in Figure 4 is now a dashed red line for female, and a dashed blue line for male.

As a note of caution, the interpretation of the sex-specific time transfers in Figure 5 must be qualified based on the limitations of the methodology. Recall that net transfers are the difference between production and consumption. Sex differences in UCW production come directly from the time use survey where we can observe how people spend their time and we also know their sex from the survey data. The consumption estimates come from dividing all housework produced in the household equally among household residents with known age and sex and from numeric methods that devise age- and sex-specific weights to divide direct care produced in the household among those in the household. Thus, these estimates will be limited in detecting UCW if there is within-household sex differences in care consumption among persons of the same age. They will also be limited if there are types of care that might not be recognized as "care" by survey respondents such as the socialization with elders mentioned above.

Given these limitations, we must interpret the sex differences in net transfers as a "lower bound" on the true difference in transfer for males and females. Even with that limitation, however, we see in all countries women are making net transfers of UCW and men are receiving them. Only in Vietnam is there any age group of men making net transfers of UCW to other age/sex groups. Older women make net transfers of UCW even to the very oldest age group in most of the countries shown, or the net transfers are about zero indicating that they are producing as much UCW as they are consuming. In India, Vietnam, and Mongolia, the oldest women receive small net transfers. No country shows older men making significant net transfers of UCW.

Thus, the previous suggestion that there may not be a care crisis in an aging society because older persons largely provide for their own care needs changes based on these results: there may not be a care crisis because older women provide much of older persons' care. This is a very important finding for aging societies. Population aging is certainly an indicator of many positive trends in reducing mortality and enabling persons to have the number of children they choose when they choose to have them, but it requires adaptation to a new reality. Given older women's role as an important source of UCW our ability to adapt older population age structures will succeed or fail to the extent that older women keep providing care and experience that care provision as meaningful rewarding work instead of an unending and depleting burden, or that other age and sex groups take a greater part in providing care, whether on a paid or unpaid basis. Another possibility may be that less care will be needed by future elders if health gains lead to more years of healthy aging, but no matter how many of those years we gain, death is inevitable even if we can postpone it. The time before death will still likely require care.

Figure 6 shows the detail behind Figure 5, breaking each line into transfers of direct versus indirect UCW. Direct care work is shown in the solid lines, labeled as "care." This consists of time spent on direct care for children, adults, or the general community. Indirect care work is shown in dashed lines, labeled as "housework" and consists of cooking, cleaning, household maintenance and management, and other general activities. As in Figure 5, work time for men is shown in blue, for women in red. All of the lines shown are net transfers, the different between production and consumption of UCW. Lines above zero indicate age- and sex-groups who are net receivers of UCW time. Lines below zero are net producers. We see in this figure that males at all age groups including the oldest old are net receivers of housework services, except for a small age range in Vietnam. Women provide these net transfers at almost every age, except the oldest women in India and Thailand and a very little bit in Korea. Children

receive the most net care, provided mostly by women aged 20 to 40. The largest transfers of UCW at older ages are of housework, going to older men.

Vietnam is the sole exception to the gender segregation pattern, in which men provide significant net care around age 20-30. While intriguing, this result comes from a small-scale survey and requires replication in a larger sample in order to be considered a solid finding. (Vietnam is currently planning to add a time use module in one of its large, nationally representative household surveys.)

Focusing exclusively on the solid lines for direct care, it is an intriguing result that the lines for men are so close to zero in all of the countries except Vietnam. Not even at age 85+ do we see men and women on average requiring substantial net transfers of care at the population average level. As mentioned previously, this result raises the issue of care measurement: is our thinking about what constituted "care" so different for children versus elders that we are not able to measure them accurately with our current tools? Or are elders generally much healthier and more self-sufficient than we tend to think? If indeed elders' needs for assistance are more concentrated in housework than in direct care, then that may mean an easier path for policymakers to help fill any "care gaps" with market-based suppliers. It is less expensive to subsidize the provision of housework than of help with more intimate activities such as bathing and dressing, among others (Osterman, 2017).

We are all familiar with stories in the media or from our own lives or communities of older persons requiring constant care from family members, managing their day to day lives, getting them professional care in a health crisis, assisting in activities of daily living on a constant basis. These stories are compelling, but at the population average level, we do not see evidence that this is a pervasive situation. What could explain this? One set of issues discussed previously is methodological: are persons providing elders this type of care simply not coding these activities as "care?" This hypothesis could be examined by comparing results from general time use surveys to those from specialized surveys of older persons such as the Health and Retirement Survey (HRS) from the United States, the China Health and Retirement Survey (CHARLS), or the Japanese Study of Aging and Retirement (JSTAR).

The problem with this method is that those specialized surveys are generally only available in higher income countries. For lower- and middle-income countries one possibility is to use the same time use surveys analyzed here but look carefully at the time use of household members sharing a household with an elderly person. Do we see patterns of time use that could possibly also be care, such as social time spent with the elder, or time spent accessing services which might be for the elder, but the time use instrument is insufficiently detailed for us to isolate those codes? This is an important avenue for future research.

3.1.5.   Patterns of direct care by type of care recipient

For this next set of results, Vietnam and Turkey results were not available because the microdata do not support separation between types of direct care with the necessary specificity, so only five countries will be shown. Figure 7 is a two-part figure that shows average production of UCW by type in the top panel, consumption of UCW by type in the bottom panel. Results combine both sexes into one average line by age, with general housework shown in black, and three types of direct care in the other lines: childcare shown in blue, adult care shown in red, and community care shown in orange. "Community" care includes volunteering activities which benefit community members generally as well as direct care

activities benefiting persons but those persons are not co-resident household members nor were the activities coded as being specifically care for children or care for adults.

Figure 7 shows clearly that that indirect care/housework is the major UCW production activity, with childcare less but still visible. Care for adults and community members, however, are barely visible on average. As discussed above, this may be a real finding, but it also is likely affected by measurement differences. People may have a much clearer idea of childcare as a type of work, while care for adults could also be combined with leisure activities. Eldercare is also likely less frequent than the daily duties of childcare, so eldercare measured in a survey will have higher variance than childcare. Older persons consume and produce mainly housework, with only tiny amounts of direct care shown consumed at oldest ages in India and Mongolia. Figure 7 and the large amounts of indirect compared to direct care also call to mind the potentially major blind spot of this analysis that might occur because supervisory time is not considered. Much of the housework time is likely also time responsible for children. This complicates the conclusions we can draw by seeing the small amounts of direct care time.

Figure 8 shows net transfers of direct care by type of care, which is the difference between the consumption and production lines in Figure 7, but also adds the dimension of sex. We see in all five countries that the magnitude of net transfers of community care and adult care are tiny compared to transfers of childcare. We also see that women make net transfers of childcare up to very old ages, although certainly the volume of time transfer is less at older ages than at peak childbearing ages for these countries. Still, it appears that grandmothers are likely an important part of the supply of childcare. Men in Mongolia and Korea seem to be making childcare transfers as well, which was obscured when those data were combined with indirect care, which men produce in only small amounts.

3.2.   Projections of the UCW Economy

3.2.1.   Changing populations with fixed UCW system

We have seen in the previous set of analyses how much time societies spend on unpaid care work, as much if not more than they spend on market work. Given UCW's vital role in creating future human capital and sustaining society, wellbeing, and the market labor force, one of the main reasons to study it is to gauge whether or not the supply of UCW will be sufficient in the future. A way to begin that study is to project the supply and demand for UCW into the future and take their ratio to see if there is any mismatch. If the supply of care in the future looks like it will not meet demand, that implies the need to find new sources of care. If the supply of care in the future looks like it will exceed the demand, that represents an opportunity to use care time for other things, or to care more intensively than we are able to today. We know from the exploration in the previous section that the demand and supply patterns are heavily influenced by age and sex, so a starting point to projecting UCW into the future is to project how our future populations will change by age and sex, combine that projection with our current UCW system, and see how projected demand and supply compare in this imagined future.

Before moving to the demand and supply projections, we can review briefly how the population age distributions are expected to change over the next fifty years in the seven countries considered here. Figure 9 shows population age distributions for 2020 in red and 2070 in blue, according to the UN World Population Prospects 2019 projections (United Nations DESA, 2019). All of these countries are projected

to age, demonstrated by the cross-over in the blue and red lines. The crossovers are all showing decreasing shares at the youngest ages (red lines above blue lines) and increases at oldest ages (blue lines above red lines). For the countries that are further along in the aging process, the crossover is at older ages (Korea, Thailand). For the youngest countries the crossover is at younger ages (Bangladesh, India, Mongolia). As mentioned before, there is some evidence of the UN projection's assumption of long-term reversion to replacement level fertility in the Korean chart which shows about equal shares of newborns in 2020 and 2070. This is only possible if fertility stops its downward trend in Korea over recent decades and fertility rises. It is a matter of debate whether this is realistic at all, but for purposes here note that it implies a stability in the share of young children over the next 50 years which is very speculative.

Figure 10 shows the UCW support ratios you get when various age- and sex-specific schedules of different types of UCW production and consumption are weighted by population the projected population age distributions in Figure 9. (While Figure 9 shows a one sex age distribution projection, there are changes in the expected sex ratios as well, but of much less magnitude than changes in the age distribution.) The ratio calculations are performed for six different groupings of types of UCW shown in separate panels of Figure 10: all UCW combined, general housework only, direct care only, direct care for children only, direct care for adults only, and finally community care activities. Note that the detailed care sub-type data necessary to include Vietnam and Turkey in the bottom row of graphs in Figure 10 for different types of direct care is not currently available. All ratios are scaled to 1.0 in 2020 to better highlight the relative change over time compared to the starting period.

Looking across each of the six panels shows that different types of care production or consumption favor particular age groups and those groups grow at different rates in the projected population. Recall that the per capita age/sex care schedules stay fixed in these calculations to the current "snapshot" estimated for each country in the most recent year in which data were available to compute the NTTA estimates. Thus, Figure 10 constitutes a thought experiment: what if the care economy stayed as it is currently in terms of the average production and consumption by age and sex, but the numbers of people in those categories changed? Taking the ratio of production/consumption is a support ratio. Increases in the ratio indicate that a given level of consumption becomes easier to support because there are more units of available supply relative to demand. Decreases mean that the current per capita consumption patterns are not sustainable.

The overall UCW support ratio in 10.a. is relatively stable over time in all countries, demonstrated by the relatively flat trends of all the lines. Most countries have a slight increase, with Korea being the only nation trending down overall. This overall UCW stability is achieved because of the flat or slightly decreasing housework (indirect care) support ratios in 10.b. combined with increases in the direct care support ratios in 10.c. The average leans more toward the trend for indirect care because the majority of UCW time is indirect. The increasing support ratios for direct care mean that it becomes easier to supply the necessary care over time. Comparing the three pieces of direct care in the three panels in the second row of Figure 10 shows us why. Figure 10.d. shows that most countries will have more care than demanded by children because children are very expensive in terms of UCW and aging populations have relatively fewer of them over time. Korea is the notable exception here, but that is all because of the population projection's built-in assumption of a fertility increase toward replacement levels compared to the very low levels currently. Figure 10.e. shows that it becomes more difficult over time to provide the necessary care to adults because the average age of the adult care consumer is

significantly older than of the adult care producer. Because the net transfers of UCW to adults are so much smaller than to children, however, the overall UCW support ratio is largely unaffected. Finally, in Figure 10.f., we see that the support ratios for community care are fairly flat. This is because both the consumption and production of this type of care is shared across many different age groups, so changing age distributions are not such a factor.

What to make of this result? Overall, it does not appear that changing population age structures will strain the care provision system, but this is the case only if childcare and care for elders and adults can be substituted for one another. In other words, direct care support ratios are only flat because the time projected to be "freed up" through increases in the childcare support ratio is greater than the additional time adults and elders will need in 2070 that would not be supplied if the care economy remains as it is in 2020.

This type of calculation – combining childcare with other types of care – makes the implicit assumption that all direct care is fungible across care recipients. This is a strong assumption. NTTA estimates demonstrated that women in their peak childrearing ages are the main suppliers of care to young children. Will the young women of future generations be willing to switch their care supply from the young children they "did not have" to the elderly parents they do have? Those young women will certainly have more education than previous generations of women, with smaller gaps relative to their male peers. They will likely have more similar career aspirations compared to their male peers as well, which could mean higher female market labor force participation and less time for caregiving.

This is an achievement to celebrate, representing a great effort on the part of many nations, families, and individuals to educate girls and women. and should certainly not be seen as anything to attempt to reverse in terms of policy. It does mean, however, that the UCW labor supply of women which has long been taken for granted should not be. Even though there does not seem to be an overall demand/supply mismatch, policymakers and those concerned with elders' wellbeing would do well to keep their eye on data on caregiving for elders specifically. New suppliers of care, whether they are men who would take a greater role in UCW, or paid caregivers, may be needed.

3.2.2.   The UCW system of the future under "quantity-quality tradeoff"

In the previous section, the thought experiment was that the UCW economy is fixed as it is today and only population changes. We now turn to one scenario in which the UCW economy might change along with population change. What if fertility falls and parents, instead of switching their care of children to other types of care, kept the amount of care they produce at the same level but spent more time with each child? This dynamic is related to a theory of fertility behavior called the "quantity-quality" tradeoff wherein parents choose between child quantity where more children are more expensive, and child quality where greater inputs are given to each child which also makes them more expensive. In some instances, parents may choose to increase child quality which means spending more on each child and thus will also choose to have fewer of them because there is some budget constraint limiting how much of quantity and quality a household can afford (Becker, 1993). We have empirical evidence that this dynamic occurs in terms of both market goods and services and in terms of time when comparing countries in cross-section (Vargha and Donehower, 2019). Across countries, we see a roughly similar amount spent on market goods and services and UCW time for all of a household's children combined,

on average, relative to each country's level of income. This means that parents in countries with fewer children spend more on each child.

How can we model this type of dynamic in the form of unpaid care support ratios? We keep the projected production of direct childcare produced by each caregiver constant but allow the projected consumption of direct childcare to change so that aggregate childcare produced is equal to aggregate childcare consumed. In this scenario, then, aggregate consumption and production of childcare is always the same, as at the beginning of the projection period, but the per child endowment changes.

Figure 11 shows the results of this scenario, the thought experiment of population aging allowing greater per capita investments in children while not increasing overall unpaid childcare demand or supply. This scenario implies that, the unpaid care work support ratio for childcare remains always constant. Thus, scaling support ratios to 1.0 in 2020, we see in panel 11.d, a horizontal line at 1.0 throughout the projection period. In this scenario population aging does nothing to decrease the pressure on the care economy by freeing up time in less childcare, so the greater mismatch in eldercare demand and supply over time as shown in panel 11.e. has a greater impact on the overall direct care support ratio in panel 11.c. However, direct care as seen is still a much smaller part of the overall UCW economy than indirect general housework activities. Thus we still have the overall effect on the projected UCW economy in 11.a. that there does not seem to be a looming crisis or coming time crunch in the overall UCW economy even without the substantial time saving that might be realized through population aging reducing relative demand for childcare.

What level of care time increase might children see under a quantity-quality tradeoff scenario? Figure 12 shows how much the age profile of childcare consumption would change, for ages 0-18, over time, if the dynamics of the quantity-quality tradeoff were followed given projected population change. The blue line shows the unpaid childcare consumption age profile at the beginning of the period for each country, the red line shows how that schedule would look half-way through the projection period in 2045 if it were equal in aggregate to the projected production of childcare, and the green line follows the concept forward to 50 years later in 2070. The magnitude of the care increases under this scenario varies from country to country. Mongolia would see significant gains, more than an hour a day on average, by 2070. Thailand and India much less, and Bangladesh barely any increase in up to 2070. Notably, Korea would actually see the average consumption of care go down. This is because of the projection assumption of fertility increases. This assumption in the quantity-quality tradeoff scenario implies that Korean parents would choose more children on whom they would spend less time each, although the same amount of time in total.

This QQ tradeoff 0scenario, in which caregivers maintain fixed per capita care production schedules but time per child varies would be one way to achieve a different type of demographic dividend than is usually discussed if fertility is falling. The more common notion of demographic dividends is that during the demographic transition from high to low mortality and fertility age structures shift temporarily to favor age groups with greater market productivity, thus raising overall productivity rates and economic growth without needing changes in the underlying technology or market (see UN DESA, 2017 for a discussion). This is often referred to as the first demographic dividend, but there is also the idea of a second demographic dividend where population aging shifts toward age structures with greater savings and wealth, enhancing capital supply and promoting productivity-enhancing investment that make future workers more productive. A quantity-quality tradeoff in investments of UCW may function in a

similar way, if the greater per capita UCW time children receive makes them more productive when they eventually enter the market labor force.

Of course, it is not certain that more time with children would mean higher child quality. As with any investment there must be diminishing returns at some point, and time spent with multiple children at the same time may not mean that each child receives less. But it does suggest another way in which population change may impact other outcomes. This type of demographic dividend, operating through enhanced non-market investment in children's human capital, is generally ignored in the literature. It is paid in time rather than money and it should be investigated further for its potential to ameliorate some of the growth-depressing dynamics of population aging on the market economy.

This discussion of UCW support ratios offers a way to explore one type of demographic dividend in unpaid care work, but there are more scenarios that could be investigated. The "freed up time" from relatively fewer time-expensive children can only be spent in three ways: more time for market work, more time for non-work, or increase the per child time investment (as in the quantity-quality tradeoff). All would be welfare improving, but specific tools are needed to judge what the optimal outcome might be and what policy levers could be developed to achieve a particular outcome.

4. Conclusions

4.1. What have we learned?

This work has been mainly descriptive, with the aim of understanding unpaid care work as produced and consumed in a group of Asia-Pacific countries. To sum up what the descriptive exercise has yielded, the following points describe the overall patterns and insights from the work.

- Unpaid care work is a large part of the economy and a substantial part of all work performed by people. Leaving this type of work out of economic observation and analysis obscures much of how people spend their productive time. This is especially true for older persons for whom market work decreases in prevalence with age while UCW increases.
- Although both men and women perform UCW and market work, women do the majority of UCW and men of market work in all countries observed and this holds for most age groups. There is, however, a great deal of variation across countries in the degree to which men's and women's economic lives are segregated by market versus household sector.
- Children are by far the largest consumers of UCW time. With the tools and data used here, we see no evidence that the average adult or older person consumes anywhere near the amount of UCW time that average child does.
- In most countries the oldest ages consume about the same amount of UCW time on average compared to working ages. However, this finding is qualified by significant concerns about existing time use survey's ability to measure UCW consumed by elders in a comparable way to UCW time consumed by children.
- Older women provide much of the care consumed by older persons as well as making substantial UCW time transfers to younger family and community members.

In addition to documenting current patterns, a further analysis speculated on whether these current patterns of care demand and supply would be sustainable in a future likely to have population age structures which are much older than they are today. The conclusions from that exercise include the following:

- Current per capita levels of care demand are sustainable with projected population aging under two conditions:
  - The methods used here are able to measure care consumption of older persons accurately, and
  - Time spent producing UCW for children that is not needed in the aging future can be used to care for the oldest age groups which will have increased needs because they will constitute a larger portion of the total population.
- Even if the production of UCW for children does not go down, there may only be a small shortage of UCW for older persons. This conclusion is also contingent upon their not being a great deal of UCW consumption by elders that is not measured in time use survey data. It is also contingent upon older women continuing to make UCW transfers to their older husbands.

4.2. How is this relevant to policy?

One of the most important messages from this work is simply that policymakers must become aware of the role of UCW in their economies and societies and provide resources to measure and understand UCW. For too long, UCW has been invisible in policy spheres, taken for granted as something that would always just get done somehow, by families and mainly by women, at no cost to the state and needing no support from or monitoring by the state. Populating aging is doing much to change that picture as policymakers in low-fertility countries worry about the role of UCW demands in possibly keeping people from having the number of children they want. The potential care needs of aging societies all over the globe are also focusing policy attention on UCW.

The work discussed in this paper was able to shed light on many of those issues, but only for those countries with a high-quality time use survey. The more surveys done in more countries, especially low-income countries where this these surveys are less common and less frequent, the more we can shape a discussion based on fact rather than speculation. Policymakers also need to support data gathering and research focused specifically on the care needs of older persons so we can be sure we are not underestimating the scale of potential needs.

Policy concerns around UCW also often focus on gender equality issues and child welfare. Certainly the analysis here has relevance in those areas and suggests that the main question for policymakers who work on care issues in the Asia-Pacific region is the role of older women in providing UCW. That older women are at the heart of UCW provision for older persons is both an equity issue – is it fair that older women are doing so much more of this type of work than older men – and a welfare issue – is this type of work compatible with a good quality of life? In many countries older men are doing as much market work as older women are doing UCW, so the system may be "fair" on the basis of total hours worked by men and women, but this ignores potential asymmetries between the two types of work. There may be compensating asymmetries with market work having some advantages and some disadvantages relative to UCW. For example, the greater hazards of market work compared to UCW may be compensated for

by access to money, and UCW may generate social standing and satisfaction in equal measure to that available through market work in certain cultural contexts.

One of the main potential problems is if older women's UCW production leaves them vulnerable to lack of resources for themselves once an older husband passes away. If women specialized in UCW all their working lives, they would not have access to pension income. Policymakers would then need to know if survivor benefits adequately protected widows after a husband's death. Also, changing family systems which may have more divorce now than when policies on survivor's benefits and inheritance were formulated may leave older women unprotected. Setting aside issues of access to income, who provides care to the older women when they enter the oldest age groups and need care themselves? At the least, policymakers should discuss how to monitor the welfare of this vulnerable population and make sure they have ways to reach out for support when it is needed.

If we treat UCW as truly productive work, then the men and women who produce UCW are vital parts of the labor force. This role should be recognized and supported, and programs the support caregivers can be understood to be productivity enhancing, not just welfare enhancing. If we think about the specific case of older persons, while the empirical estimates discussed here did not find huge demand for eldercare which has the potential to swamp the supply in the future, health policies that bring down elders' rates of disability will enable them to contribute more to social functioning, productivity, and wellbeing into the future.

There are many directions that can take this work into more informative and potentially more useful results. In modeling the care support ratios, other scenarios than the ones already discussed here are certainly possible to imagine, given the tools created in this work. Future research may be able to consider scenarios of changing disability prevalence and/or disability-related care needs for older persons, changing participation in paid work, or changing policy around pensions, retirement, and support for market or family caregiving.

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Data Appendix

Bangladesh

Time use survey data from Bangladesh are from the Bangladesh Pilot Time Use Survey of 2012, conducted by the Bangladesh Bureau of Statistics. The author wishes to thank colleagues from the National Transfer Accounts/Counting Women's Work research team at the University of Dhaka for sharing their estimates.

Details on the survey are available here:

http://bbs.portal.gov.bd/sites/default/files/files/bbs.portal.gov.bd/page/96220c5a_5763_4628_9494_9 50862accd8c/TUSReport2012.pdf

This survey is a 24-hour time diary survey, coded using the 2003 version of the International Classification of Activities for Time Use Statistics. The full coding scheme is available in Annex 21 of the Guide to Producing Statistics on Time Use: Measuring Paid and Unpaid Work (United Nations Department of Social and Economic Affairs, 2005), which can be accessed here:

https://www.un.org/development/desa/capacity-development/tools/tool/guide-to-producing-statistics-on-time-use-measuring-paid-and-unpaid-work/

Codes (from survey dataset variable "act5") included in activity groups:

- Market work: 1111-5900
- Indirect care (general housework): 6111-6900
- Direct care for household children: 7111,7112,7113,7114
- Direct Care for household adults: 7121,7122,7123
- Direct care for household others (includes age not specified): 7200,7900
- Direct care, volunteering: 8000-8999, except 8116 and 8117
- Direct care for non-household children: 8116
- Direct care for non-household adults: 8117

India

Time use survey data are from India's Pilot Time Use Survey, conducted in 1998-1999 by the Ministry of Statistics and Programme Implementation (MOSPI). They include data from six states (Haryana, Madhya Pradesh, Gujarat, Orissa, Tamil Nadu and Meghalaya). The author wishes to thank colleagues from the National Transfer Accounts/Counting Women's Work research team at the International Institute for Population Sciences for sharing their estimates.

Details on the survey are available here:

http://mail.mospi.gov.in/index.php/catalog/130

This survey is a 24-hour time diary survey, coded using a scheme developed for the survey.

Codes (from survey documentation) included in activity groups:

- Market work: 111-329, 892
- Indirect care (general housework): 411,421,431,441,461,471,481,491
- Direct care for household children: 511,521,531,561,571
- Direct care for household adults: 541,551,562,572
- Direct care for household others (includes age not specified): 591
- Direct care, volunteering: 611-691
- Direct care for non-household children: not available
- Direct care for non-household adults: not available
- Direct care for non-household members: 581

Because codes for non-household children and adults were not available separately, they were grouped into a single set of activities and their consumption was distributed proportionally to the household adults and household children age profiles.

Korea

Time use survey data from the Republic of Korea are from the Korean Time Use Survey of 2014, conducted by Statistics Korea (KOSTAT). The author wishes to thank Dr. Bongoh Kye, Professor of Sociology at Kookmin University for applying the NTTA methodology to Korean data and sharing his estimates.

Details on the survey are available here:

http://kostat.go.kr/portal/eng/pressReleases/11/6/index.board?bmode=read&aSeq=347182&pageNo=&rowNum=10&amSeq=&sTarget=&sTxt=

This survey is a 24-hour time diary survey. The following variables are used for each activity group:

- Market work: B110, B120, B130, B140, B150
- Indirect care (general housework): D320, D340, D360, D220, D240, D120, D140, D160, D420, D440, D520, D640, D920, D940, D960, D990, D620, H420, H520, H540, H720, D720, D740, D760, D780, D790, D180, D280, D460, D480, D540, D660
- Direct care for household children: E120, E140, E160, E180, E190, E220, E240, E260, E290
- Direct care for household adults: E320, E390, E420, E490, E520, E590
- Direct care for household others (includes age not specified): not available
- Direct care, volunteering: E720, E790, F220, F240, F260, F290, F320, F340, F360, F390
- Direct care for non-household children: not available
- Direct care for non-household adults: E620, E690
- Direct care for non-household members: not available

Mongolia

Time use survey data from Mongolia are from the Mongolian Time Use Survey of 2015, conducted by the National Statistical Office (NSO) of Mongolia.

Data are freely available online and data and details on the survey are available here:

http://web.nso.mn/nada/index.php/catalog/108

This survey is a 24-hour time diary survey, coded using an early version of the International Classification of Activities for Time Use Statistics (ICATUS). While the ICATUS has been updated since Mongolia began conducting time use surveys, they have continued to use this version. A report on a previous survey, with the coding used in that survey and the 2015 version can be accessed here:

https://unstats.un.org/unsd/demographic/sconcerns/tuse/Country/Mongolia/sourcemng2000.pdf

Codes included (from variable "activity_code") in activity groups:

- Market work: 0-199
- Indirect care (general housework): 211-299
- Direct care for household children: 311-319
- Direct Care for household adults: 321-339
- Direct care for household others (mainly travel related to care): 380, 390
- Direct care, volunteering: 411-499, except 416 and 417
- Direct care for non-household children: 416
- Direct care for non-household adults: 417

Thailand

Time use survey data from Thailand are from the Thailand Time Use Survey of 2014, conducted by the National Statistical Office of Thailand.

Details on the survey are available here:

http://web.nso.go.th/eng/stat/timeuse/time_use.htm

This survey is a 24-hour time diary survey, coded using an adapted version of the 1997 International Classification of Activities for Time Use Statistics, which is very similar to the version used in Bangladesh. The full coding scheme is available in Annex 21 of the Guide to Producing Statistics on Time Use: Measuring Paid and Unpaid Work (United Nations Department of Social and Economic Affairs, 2005), which can be accessed here:

https://www.un.org/development/desa/capacity-development/tools/tool/guide-to-producing-statistics-on-time-use-measuring-paid-and-unpaid-work/

Codes (from survey dataset variable "ICATUS_A") included in activity groups:

- Market work: gen paidwk= 1111-5999
- Indirect care (general housework): hwk= 6000-6999
- Direct care for household children: 7111,7112,7113,7114
- Direct Care for household adults: 7121,7122,7123
- Direct care for household others (includes age not specified): 7200,7900
- Direct care, volunteering: 8000-8999, except 8116 and 8117
- Direct care for non-household children: 8116
- Direct care for non-household adults: 8117

Turkey

Completed estimates for Turkey are included courtesy of the National Transfer Accounts/Counting Women's Work research team and were calculated using the same methodology. For details see the Counting Women's Work project website at www.countingwomenswork.org .

Vietnam

Completed estimates for Vietnam are included courtesy of the National Transfer Accounts/Counting Women's Work research team and were calculated using the same methodology. For details see the Counting Women's Work project website at www.countingwomenswork.org .

Figure 1. Average time spent working at each age by type of work, hours per week. See Data Appendix for time use survey source details.
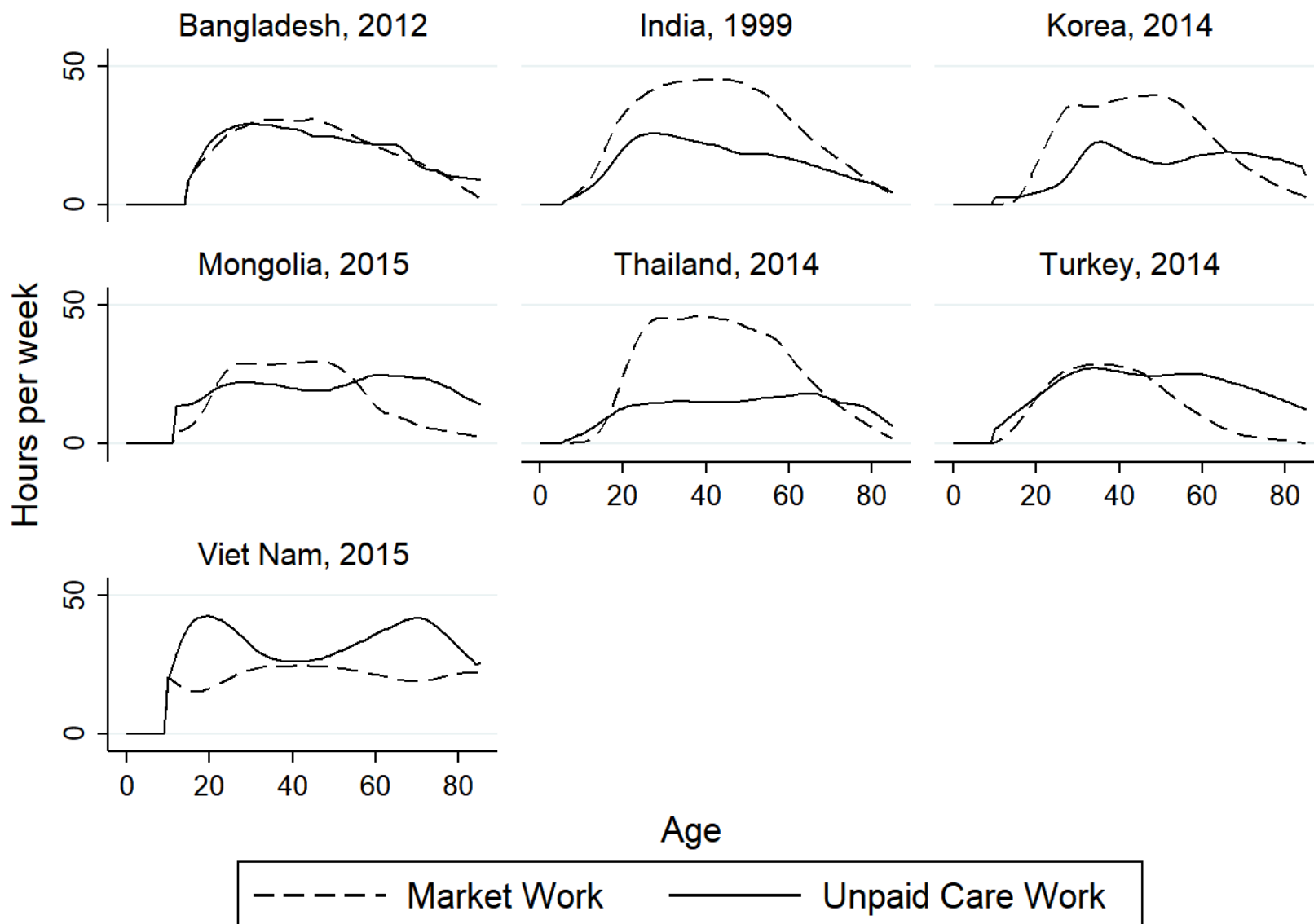
Figure 2. Average time spent working by type of work and sex, hours per week. See Data Appendix for time use survey source details.

Market, Men

Market, Women

Unpaid Care, Men

Unpaid Care, Women
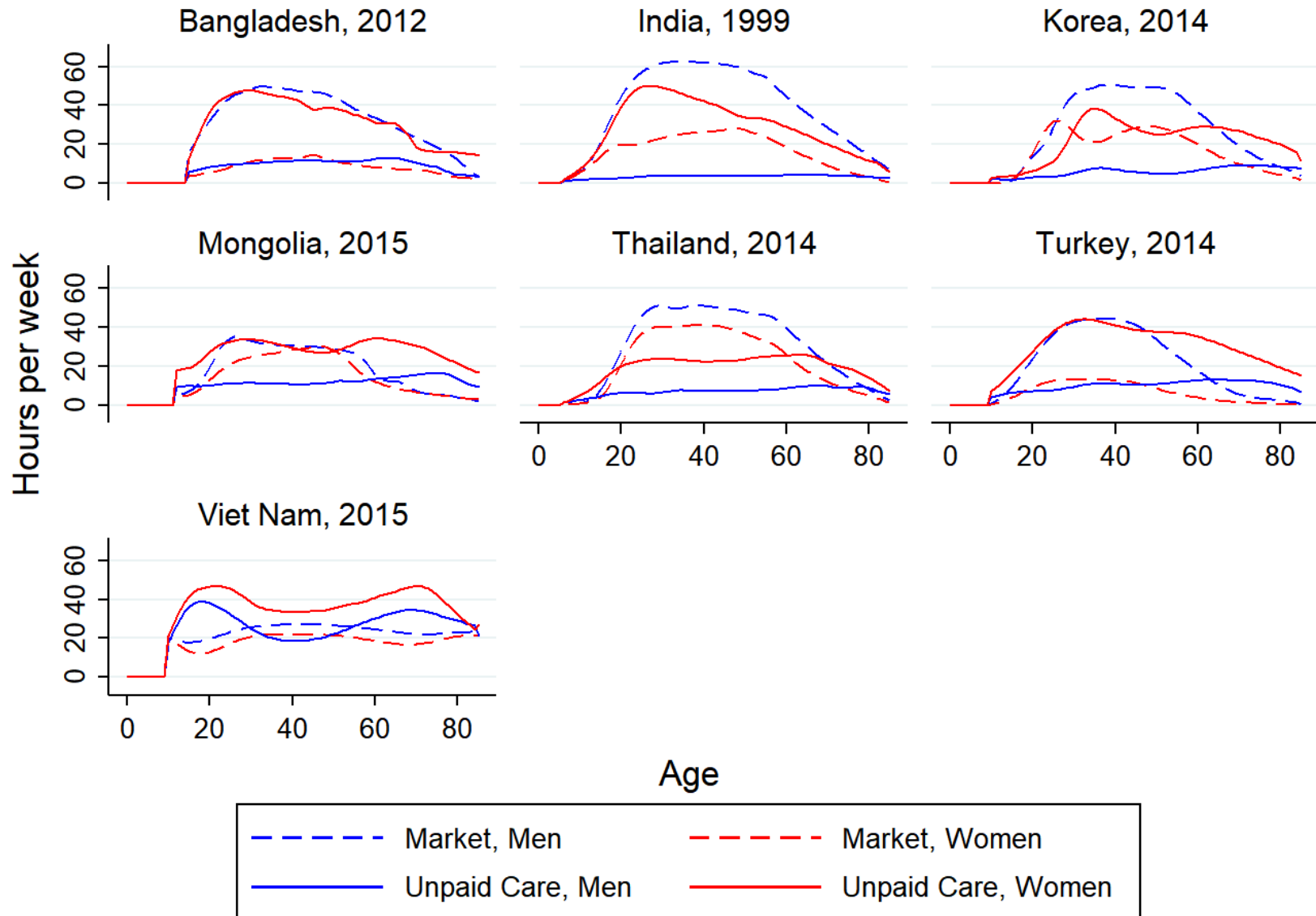
Figure 3. Gender differences in average time spent working at each age by type of work, hours per week for females minus males. Values above zero indicate greater female time spent, below zero greater male time spent. See Data Appendix for time use survey source details.
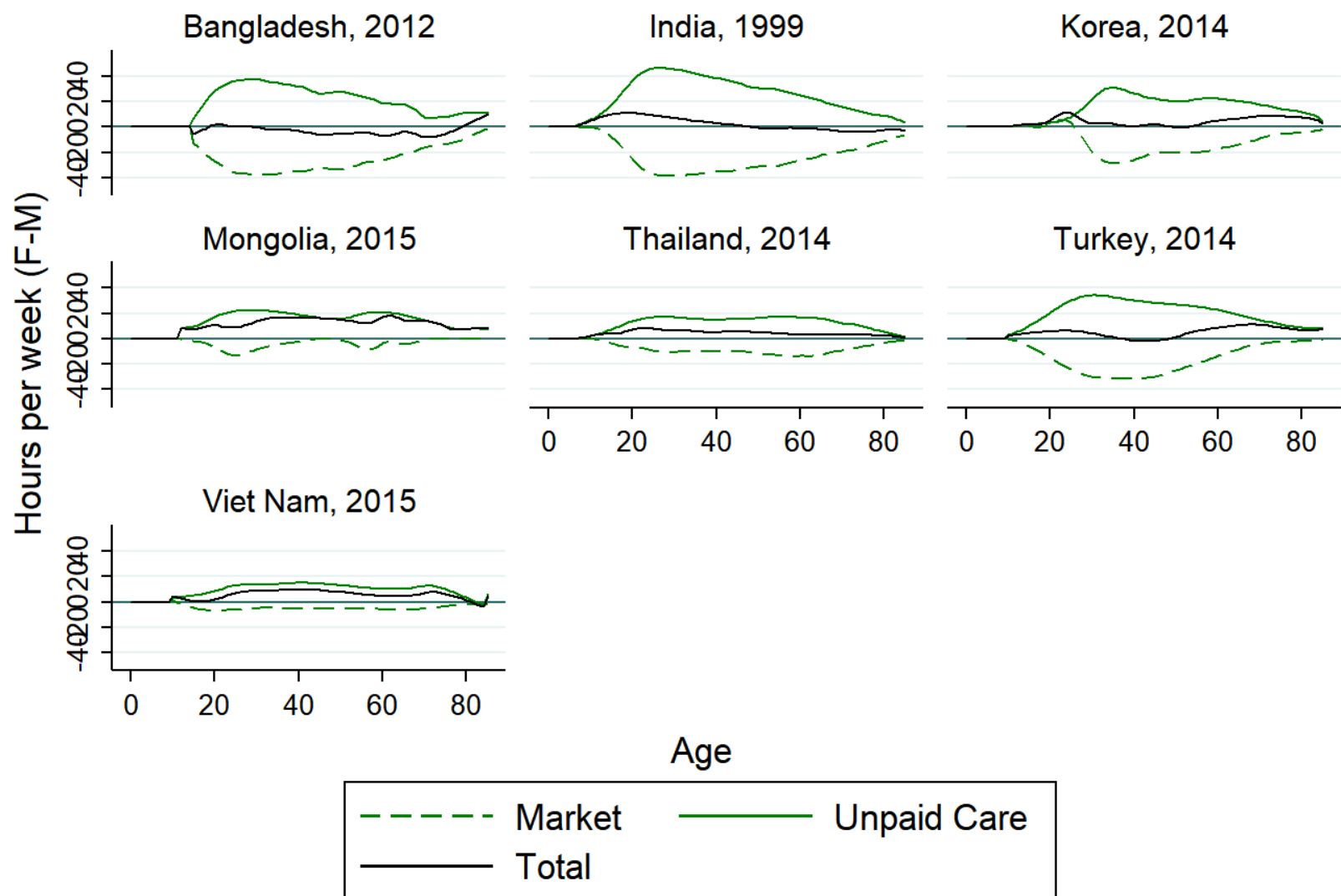
Gaps are expressed as Female - Male.

Figure 4. Age profiles of production, consumption, and transfers of unpaid care work, average hours per week. For time transfers, values above zero indicate that the age group receives net transfers, below zero that they make net transfers to other age groups. See Data Appendix for time use survey source details.
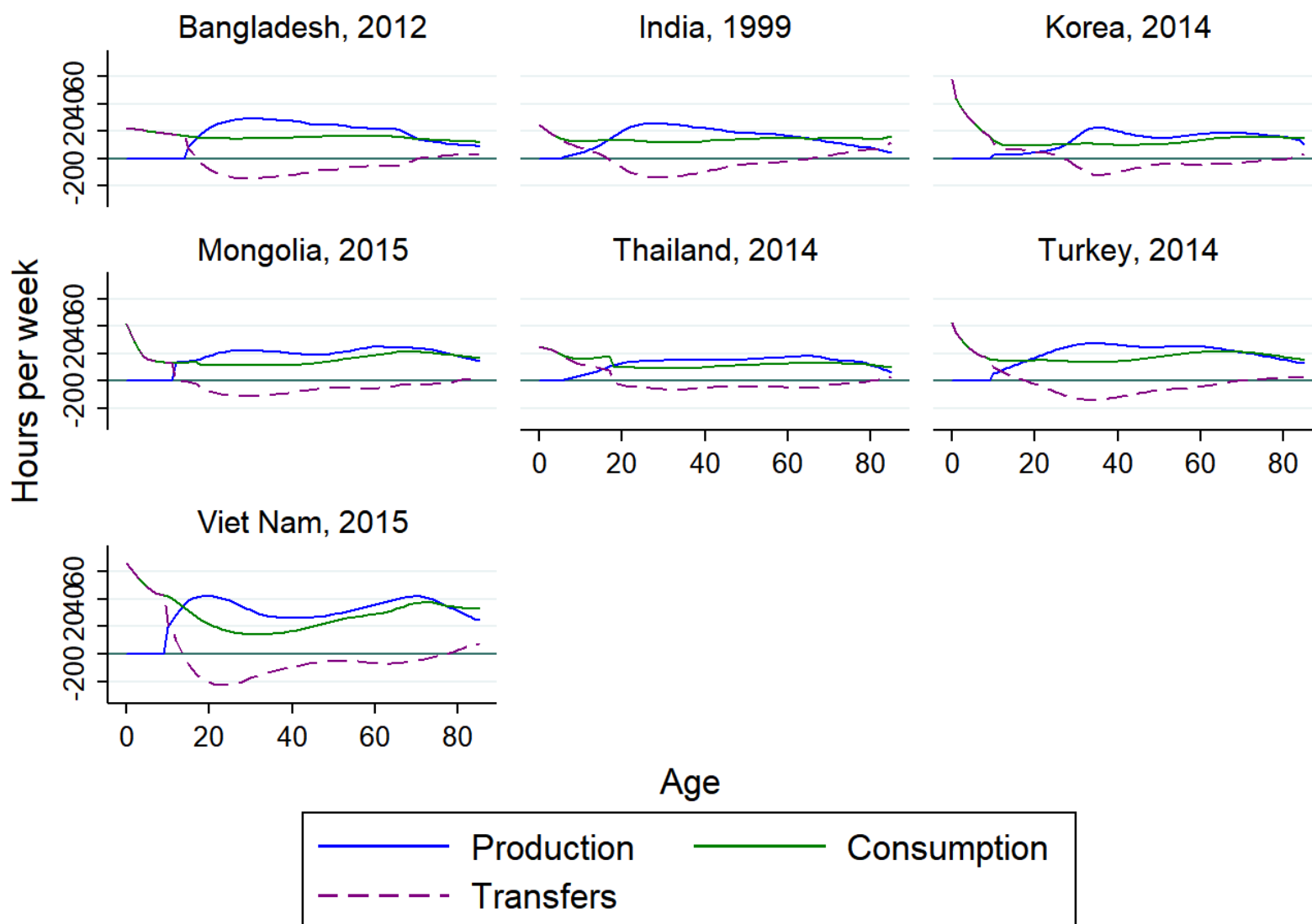
Figure 5. Age profiles of net transfers of unpaid care work, average hours per week, by sex. Values above zero indicate that the age/sex group receives net transfers, below zero that they make net transfers to other age groups. See Data Appendix for time use survey source details.
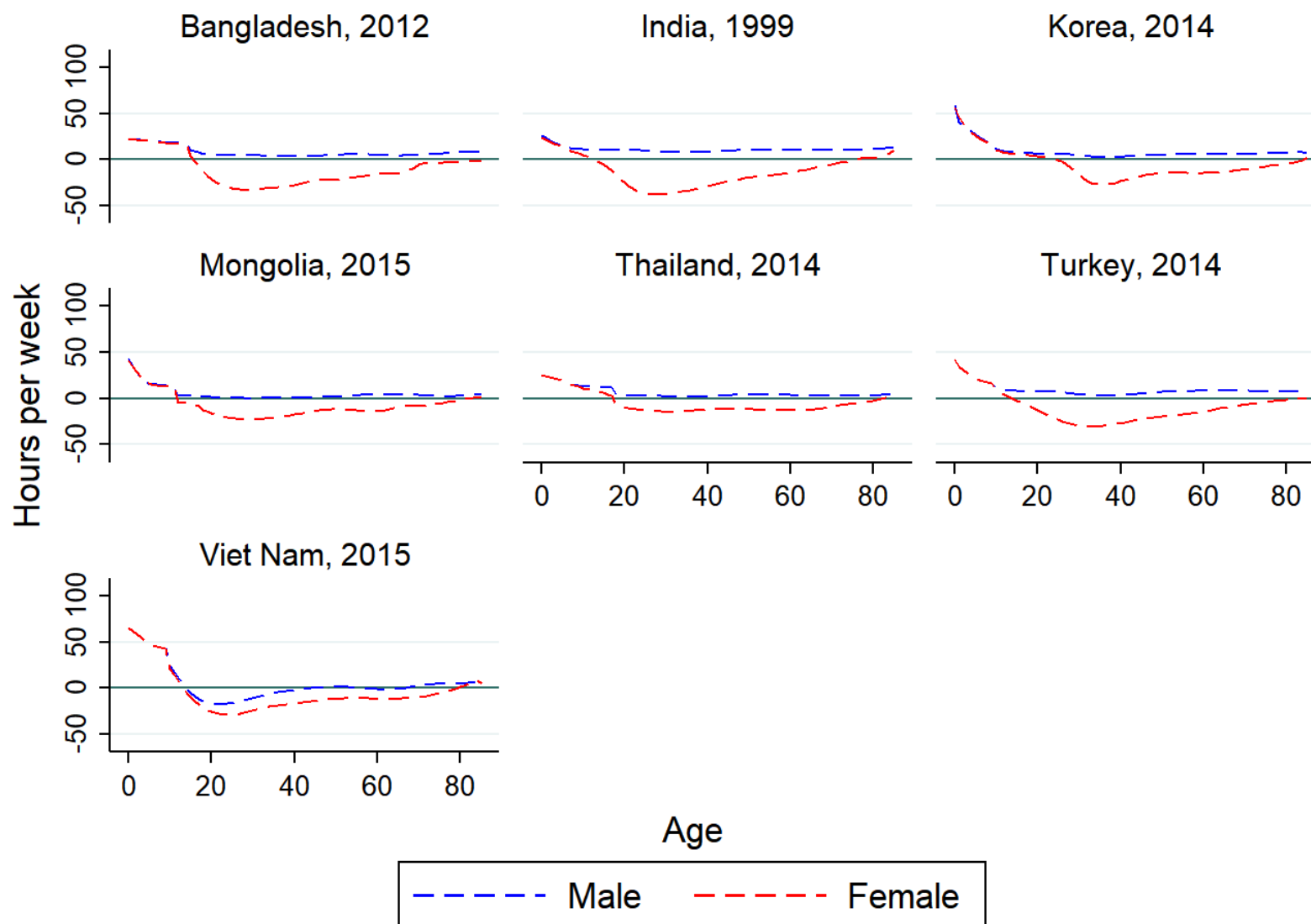
Figure 6. Age profiles of net transfers of unpaid care work, average hours per week, by sex and type. Values above zero indicate that the age/sex group receives net transfers, below zero that they make net transfers to other age groups. Dashed lines are for general housework activities, solid lines for direct care of persons. See Data Appendix for time use survey source details.
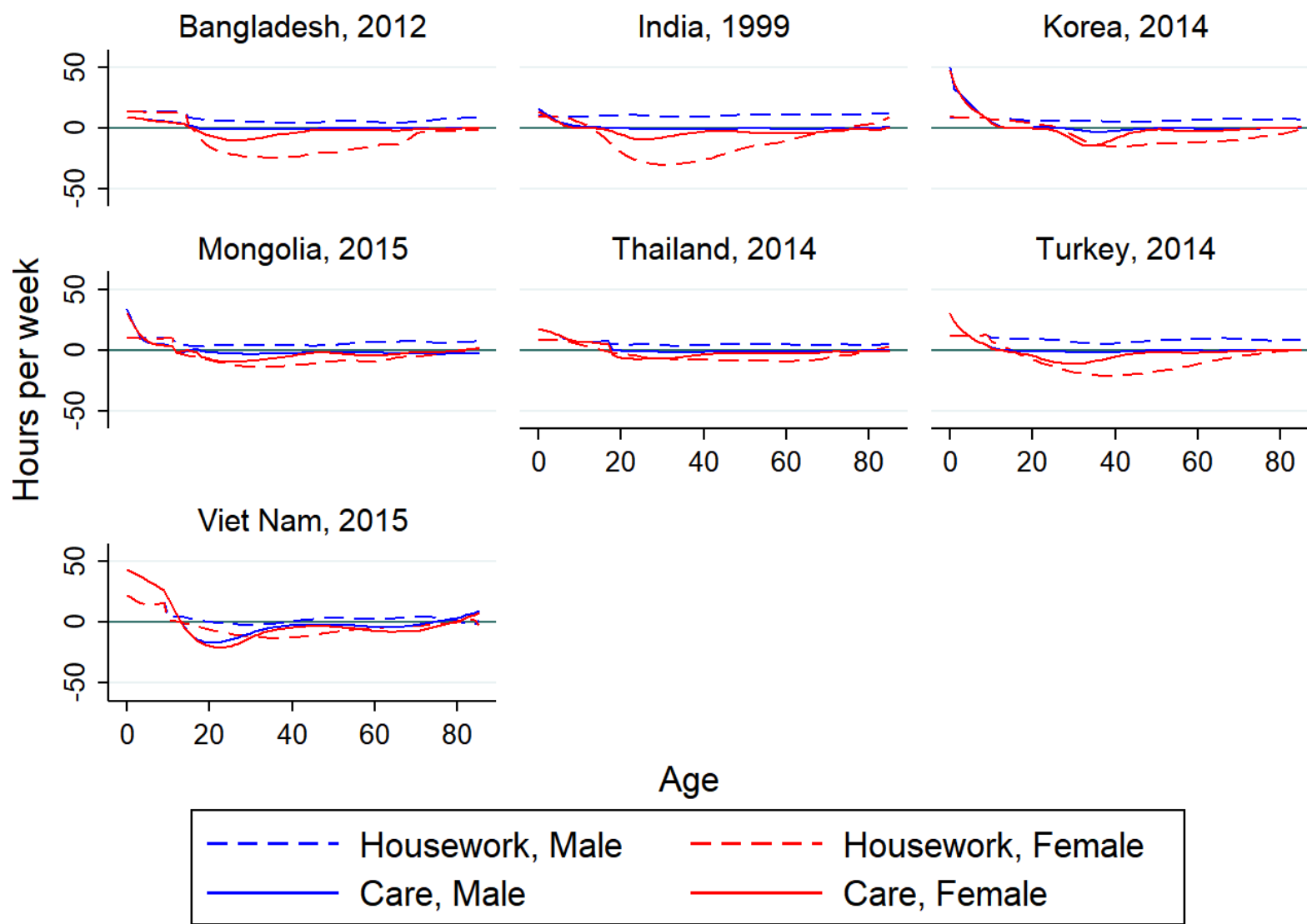
Figure 7. Age profiles of production and consumption of unpaid care work, average hours per week, by type. Indirect care (housework) is shown in black, while direct care is divided into three types by the type of care recipient (children in blue, adults in red, community in orange). See Data Appendix for time use survey source details.

a) Production
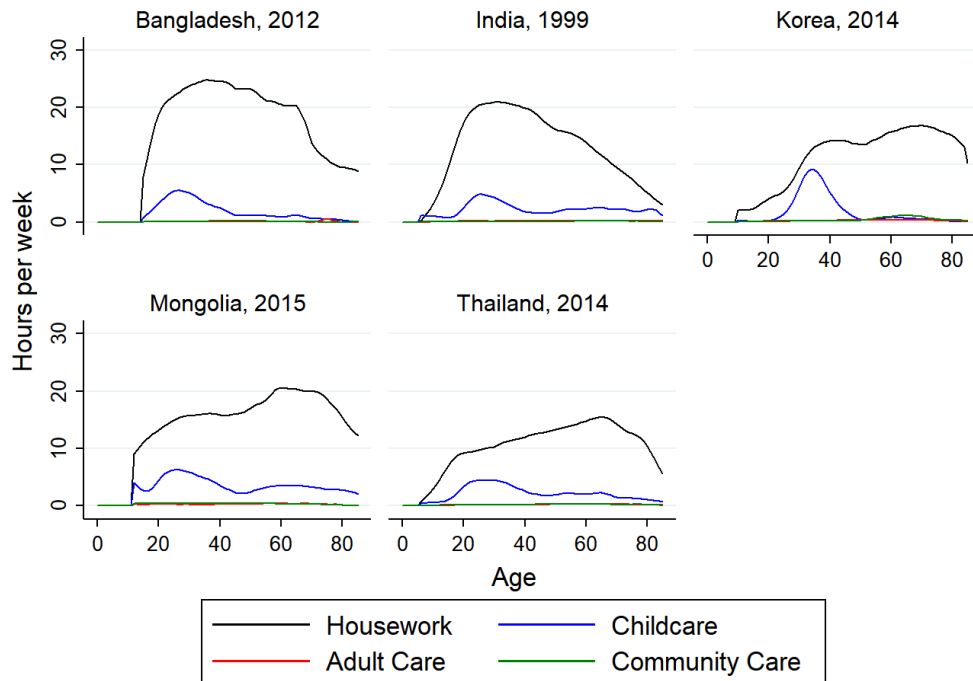
b) Consumption
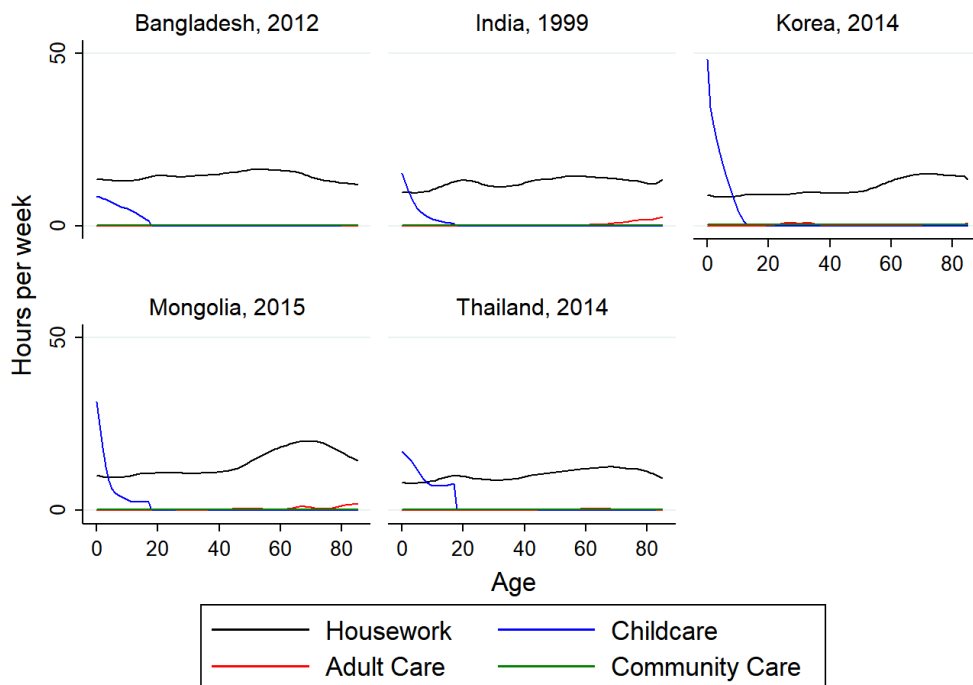
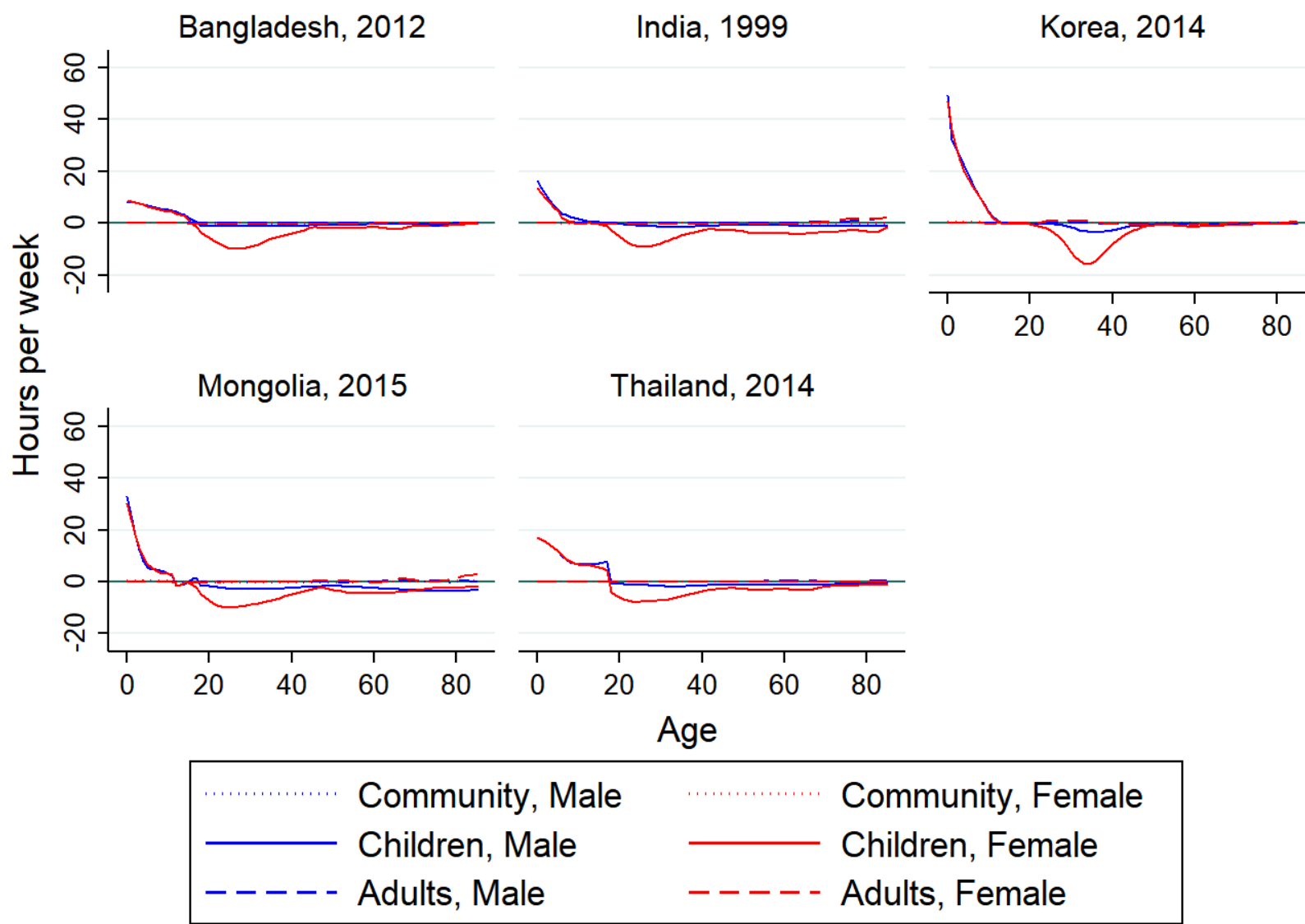Figure 8. Age profiles of net direct care transfers by sex and type of care recipient. See Data Appendix for time use survey source details.

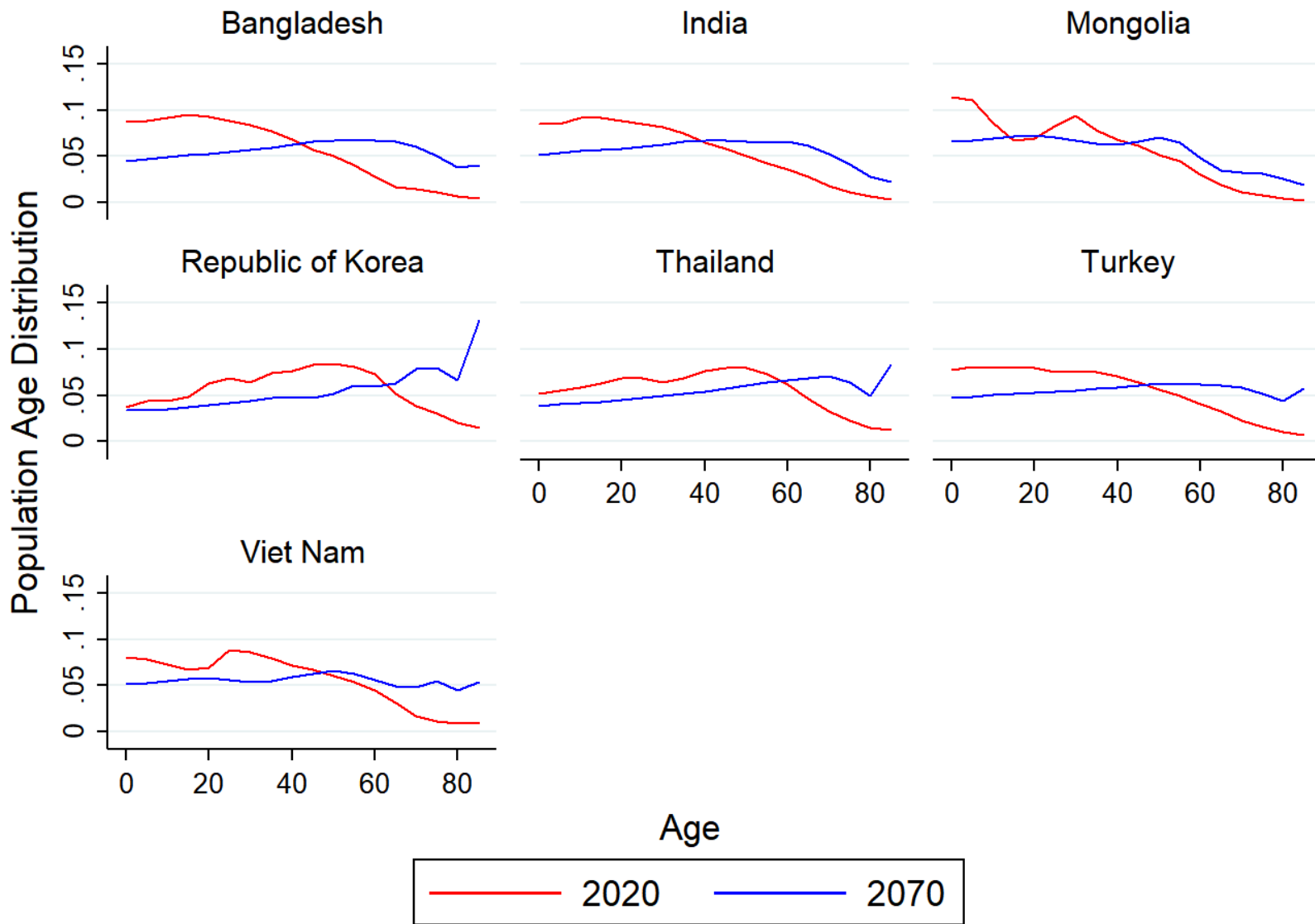Figure 9. Population Age Distributions, 2020 and 2070.

Figure 10. Unpaid Care Work Support Ratios, by country and type of unpaid care work. Ratios are projected units of UCW production per unit UCW consumption.
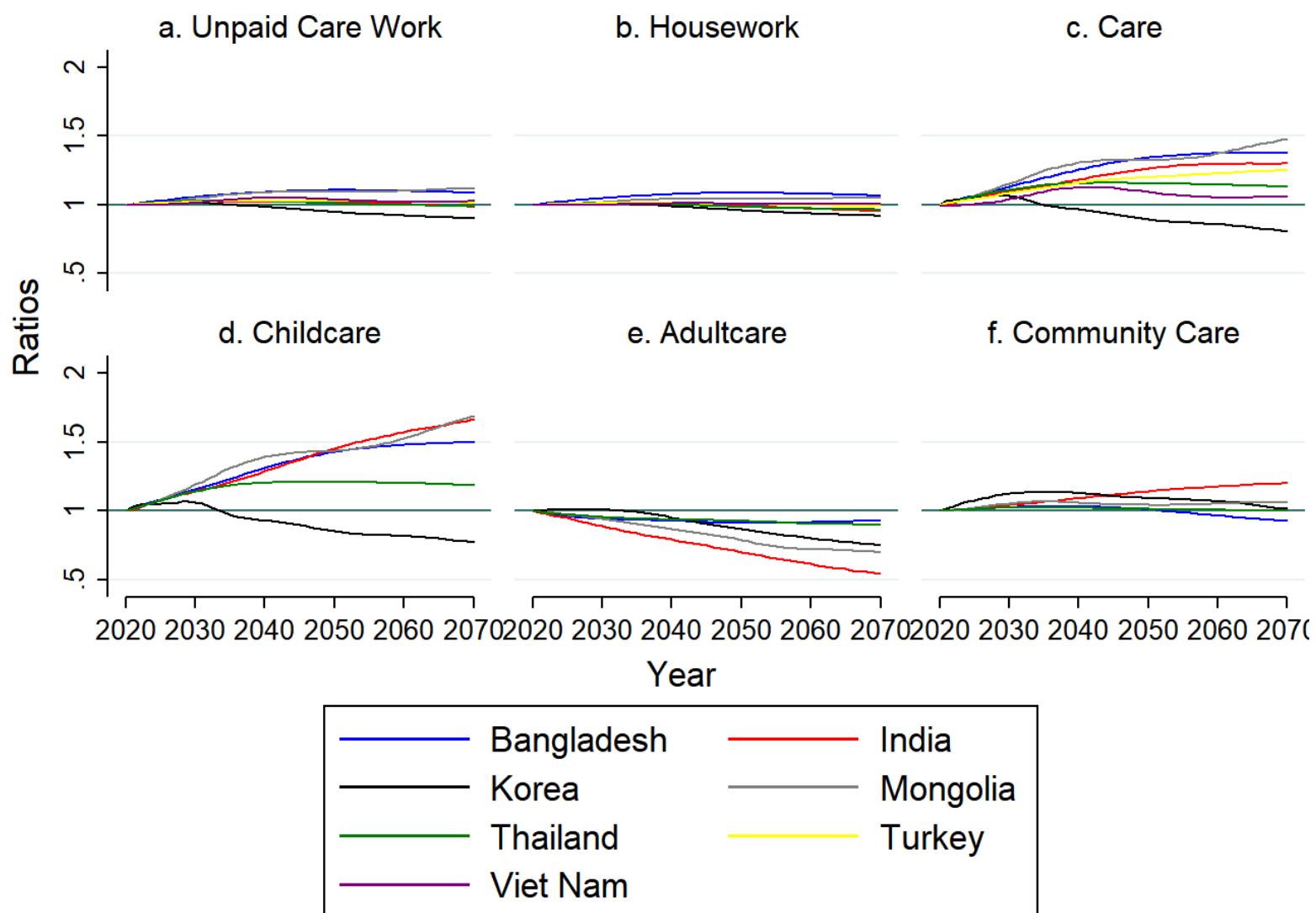
Figure 11. Unpaid Care Work Support Ratios, by country and type of unpaid care work, allowing per capita childcare consumption to shift so that it matches aggregate childcare production. Ratios are projected units of UCW production per unit UCW consumption.
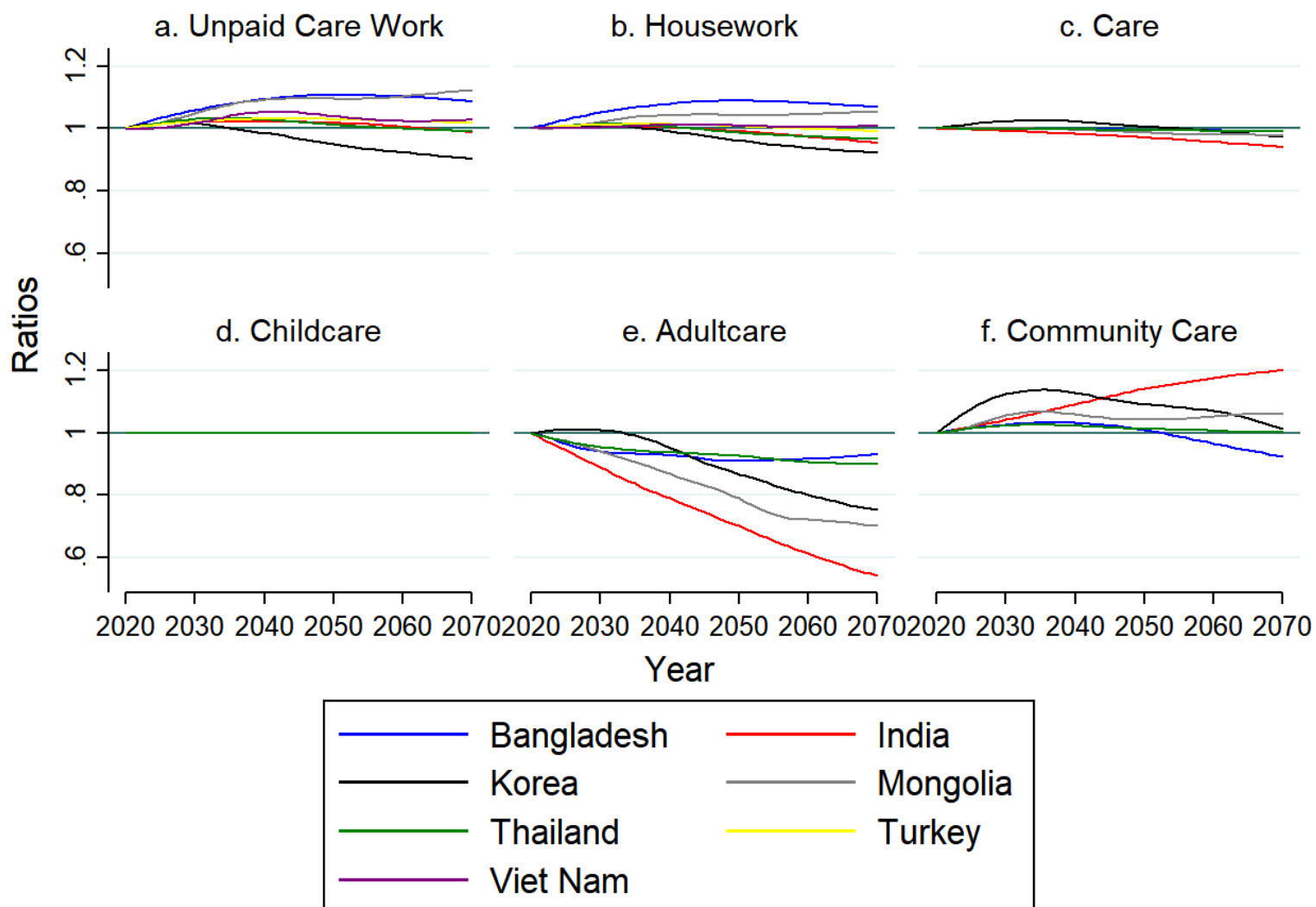
Figure 12. Average consumption of unpaid childcare, ages 0-18, for current year and then projected so that aggregate consumption of childcare matches aggregate projected production.