The Gender Gap in the Care Economy is Larger in Highly Developed Countries: Socio-cultural Explanations for Paradoxical Findings

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Author Contributions.

The first 8 authors and the last author contributed to study design and hypothesis development. Dr. Block, Dr. Olsson, Dr. Van Grootel, and research assistant S. Wee and M. Sun oversaw data collection and prepared data for analysis. All authors collected data and checked questionnaires. Dr. Block spearheaded pre-registration of this particular project, data analysis, and preparation of the manuscript under the supervision of Dr. Schmader, Van Laar, and Martiny. All authors provided feedback on the paper and approved the final manuscript.

Competing Interest Statement.

None

Data Availability.

We pre-registered data cleaning procedure for Study 2, which uses a large consortium dataset, under: https://osf.io/pc8uf/?view_only=7e906d1587cb49f6b4afd9cc263a9a23

Hypotheses and analyses for this specific project were pre-registered under https://osf.io/aqfe9/?view_only=c1e1da78e39f473bb79d78da2dd9f92c. This link includes pre-registration, materials, data and analysis code available for reviewers. Upon publication, all data necessary to recreate our analyses will be publicly available in the project specific OSF repository (link 2).

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Abstract

Despite the growing demand for *care economy* employees (e.g., nurses, teachers, and social workers), men remain underrepresented in these careers. While economically developed countries support more equal rights for women and men, their labor markets are highly gender segregated (Charles 1992, 2003). We conducted a focused investigation of this paradoxical pattern in the care economy, testing whether gender gaps in care economy career interest are larger in more economically developed countries, and if so, what psychological and cultural factors underlie these patterns. We examined these questions with labor data from 70 countries (Study 1) and a pre-registered study of career interests among 19,240 university students from 49 countries (Study 2). Although more economically developed countries tend to promote greater gender equality, our results reveal the gender gap in care economy representation (Study 1) and interest (Study 2) is especially large in such countries. We did not observe parallel patterns for STEM representation or interest. Results from Study 2 supported an integrated theoretical account of this development paradox in care economy interest: Cross-national variation in the gender gap in care economy interest was predicted by country-level variation in economic development and individualism/collectivism but not by self-expression values or country-level gender equality, countering prior (controversial) claims of a *gender equality paradox*. Furthermore, larger gender gaps in communal values (e.g., men's lower valuing of helping and caring for others) were a proximal predictor of larger gender gaps in care economy interest in highly economically developed countries.

Keywords: gender differences, communal values, national gender roles, career interest, gender equality paradox

Public Significance:

Despite the growing global need for care economy employees (e.g., nurses and teachers), men remain disinterested and underrepresented in these careers. This pattern appears especially noticeable in countries in the global north that generally support gender equality. This paper examines cross-national patterns of gender segregation and finds that economic development and cultural values, rather than gender equality per se, drive such surprising patterns.

The Gender Gap in the Care Economy is Larger in Highly Developed Countries: Socio-Cultural Explanations for Paradoxical Findings

As the world's population grows larger and older, the growth of the global care economy (i.e., defined by the International Labour Organization as health, education, and social work professions that include nursing, teaching, and other social services; Addati et al., 2018) outpaces that of computing and engineering (Ratcheva et al., 2020). The COVID-19 pandemic highlighted the essential services of nurses, teachers, and other care workers (Guerrero et al., 2020). Despite pressing labor shortages in the care economy (World Health Organization, 2020), men are underrepresented in care-oriented jobs, with women comprising 66% of paid care workers globally, and over 75% in the Americas and Europe (Addati et al., 2018). Yet, less empirical attention is paid to men's underrepresentation in the care economy than to women's underrepresentation in science, technology, engineering, and mathematics (STEM; Croft et al., 2015).

Our goal is to advance the theoretical understanding of cross-national patterns of gender segregation by testing whether the (binary) gender gap in care economy representation (Study 1) and interest (Study 2) is culturally universal or – consistent with past sociological evidence (Charles & Grusky, 2004) – wider in more highly developed countries. We provide a novel social psychological account for why this "development paradox" exists in care economy careers and not in STEM careers, and thereby counter prior claims of a gender equality paradox.

Defining the Nature of Paradoxical Gender Segregation

Countries higher in economic development[1] (i.e., greater wealth, infrastructure, health, and education) tend to afford more equal legal rights and opportunities to women and men (Duflo, 2012). Intuitively, such gender equality efforts should foster gender balance across job sectors. Instead, evidence reveals paradoxical patterns whereby women and men in more economically developed countries self-segregate into different careers, despite greater gender equality (Charles 1992, 2003; Charles & Grusky, 2004; Estévez-Abe, 2006).

In seeking to explain such patterns, a number of researchers have focused on a so-called gender equality paradox in STEM, which is the tendency for women and girls – compared to men and boys – to perform more poorly, report lower interest in, and choose STEM degrees less often in more gender equal countries (e.g., Charles et al., 2014; Else-Quest et al., 2010; Stoet & Geary, 2018). Some theorists argue that offering more gender equal rights and opportunities causes larger STEM gender gaps, as men and women self-segregate into more divergent roles (Stoet and Geary, 2018). Although numerous papers on this paradox have been published (see Soylu Yalcinkaya & Adams, 2020), the strength of evidence for a gender equality paradox in STEM has been repeatedly critiqued (e.g., Berggren, 2022; Breda et al., 2020; Ilmarinen, & Lönnqvist, 2024; Marsh et al., 2020; Richardson et al., 2020). We argue that paradoxical patterns in occupational segregation are the result of economic development rather than gender equality per se, and that such paradoxical patterns may be especially robust in the care economy, as they are driven by post-industrial economies' structure and cultural individualism, which promote

[1] Note that the term "developed" is controversial because it connotes a value judgment about developed countries as superior. While we do not agree with this, we use this term because it corresponds to the label that prominent organizations (e.g., UN and ILO) and scholars have given to a specific constellation of economic and social structures that are relevant to our theoretical understanding of gender segregation of labor markets.

gender differences in communal values and interests. Next, we unpack how past research informs this novel theoretical perspective on gender segregation.

The Role of Economic Development

According to sociologists (Charles, 2003; Charles & Grusky, 2004), post-industrial economies have larger hierarchically-structured organizations, a larger service-sector (e.g., clerical and social service occupations), higher education levels, and greater labor force participation by women. These economic conditions afford women more opportunities for paid employment and leadership, decreasing *vertical gender segregation* (i.e., underrepresentation of women in positions of status and power; Wong & Charles, 2020). At the same time, increases in economic development set the stage for a shift from smaller family-run businesses (where men and women contribute in the same sector) to a hierarchical labor structure with greater job differentiation. Particularly the increasing demand for labor in the service sector is disproportionately filled by women, also because these careers offer more flexibility (e.g., part-time opportunities) for caretakers of young children (i.e., women). Furthermore, wealthier countries have larger welfare systems that create more jobs in the care economy, which also get disproportionately filled by women (Estévez-Abe, 2006). Taken together, these processes are theorized to increase *horizontal gender segregation* (i.e., clustering of women and men in occupations of comparable status but with differing demands; Wong & Charles, 2020).

These patterns of segregation broadly reflect two basic dimensions of social values, traits, and behaviors – communion and agency (Martin & Slepian, 2020). Communion emphasizes caring for and connecting with others, whereas agency emphasizes self-interest, individual achievement, and dominance (Abele & Wojciszke, 2007; Bakan, 1966). Segregation into gendered roles shapes stereotypes of men and women (Eagly, 1987). Thus, in wealthier

countries, a decrease in vertical segregation might correspond to closing gender gaps in agency stereotypes, as women gain more power and status. Increased horizontal segregation, however, might promote larger gender gaps in communion stereotypes as women disproportionately enter the service sector (Eagly et al., 2019; Gartzia, 2022). Gender stereotypes then ensure that new generations are socialized to conform to gendered roles. We particularly theorized that paradoxical patterns of gender segregation are linked to the relationship between communal values and career interests through their connections with cultural ideology.

The Role of Cultural Ideology

Economic development shapes the cultural climate that defines the values people embrace (e.g., Muthukrishna et al., 2020; Triandis, 2001). To examine possible socio-cultural explanations for the development paradox in the care economy, we examined two distinct, but not mutually exclusive, cultural value dimensions: self-expression/autonomy (vs. survival) and individualism (vs. collectivism).

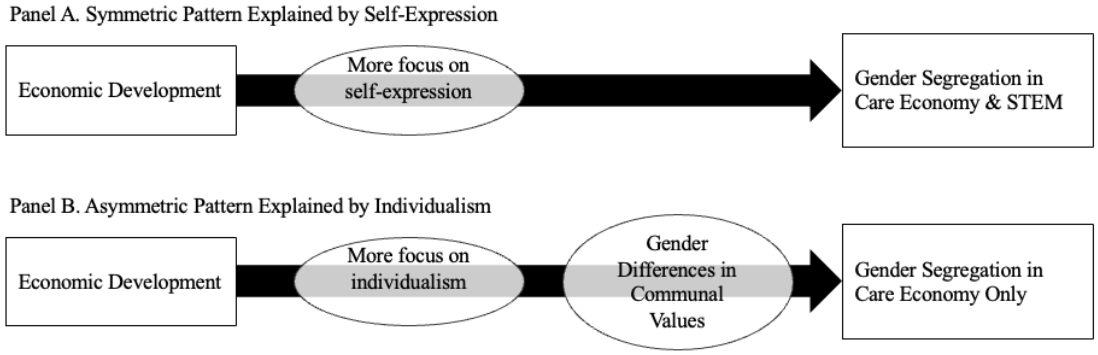
Self-Expression. As countries increase in wealth, education levels, and meet the basic needs of citizens, cultures shift away from survival values toward self-expression and autonomy values. Self-expression values refer to cultural norms and beliefs that prioritize personal autonomy, freedom to express personal differences, and pursuit of individual passions. Whereas survival values prize economic and physical security, obedience, and conformity, self-expression values encourage self-actualization, creativity, and following one's unique path in life (Inglehart, 2020; Li et al., 2021; Schwartz et al., 2012).

In some accounts of the gender equality paradox in STEM, greater economic wealth or gender equality afford people the autonomy to follow their passions (i.e., prioritize self-expression), fostering more gendered career choices by encouraging men and women to follow

their differing motivations (Siy et al., 2023). These accounts assume universal gender differences in underlying motivations or interests that are more freely revealed in cultures high in self-expression values. Depending on the theorist, these gendered motivations reflect innate sex differences (Stoet & Geary, 2018), learned but gender-essentialized self-views (Charles & Bradley, 2009; Soylu Yalcinkaya & Adams, 2020), or motives for group distinctiveness (Vishkin et al., 2022). Setting aside their differing explanations for why gender differences exist initially, these views make no theoretical claims that effects should be specific to the choices of only one gender. Thus, a self-expression account suggests a symmetrical pattern wherein greater economic development (or gender equality) predicts greater gender gaps across occupations dominated by women (i.e., the care economy) and men (i.e., STEM; see Figure 1, Panel A). Yet prior research has not empirically tested whether existing measures of country-level self-expression culture predict a wider gender gap in either STEM or care economy interest.

Figure 1

Predicted Patterns of Gender Segregation by Different Theoretical Accounts



Individualism. Although individualism is highly correlated with self-expression values (Inglehart & Oyserman, 2004), we examined it as a distinct cultural construct that provides an alternative account for paradoxical patterns of career interest. Cultures vary in individualism (a focus on the needs of the individual, independence, and personal agency) versus collectivism (a

focus on the needs of the group, collective harmony, and communion; Triandis, 2018). As increases in economic development promote societal stability, countries tend to deemphasize collectivistic (and survival) values in favor of more individualistic (and self-expressive) ones (Santos et al., 2017). However, distinct from the symmetrical predictions that flow from a contrast of a self-expression with survival, individualism-collectivism suggests an asymmetric pattern of gender segregation where larger gender gaps occur in the care economy (not necessarily in STEM).

This hypothesized asymmetry stems from evidence that individualism promotes larger gender differences in the communal values, which underlie people's interest in care economy careers. In particular, because men represent the cultural default in a society (Cheryan & Markus, 2020), men in more individualistic countries are stereotyped as higher in self-oriented/agentic traits and lower in communal/collectivist traits (Cuddy et al., 2015). The individualism account thus suggests that economic development fosters a devaluation of collectivism, which spurs men's distancing from traits, values, and roles associated with care, including care economy careers. Given that greater economic development and individualism are associated with narrowing gender gaps in agency (Diekman et al., 2005), alongside wider gender gaps in communion (Kosakowska-Berezecka et al., 2022), we hypothesized an asymmetrical pattern consisting of a development paradox in care economy interest, but not necessarily in STEM.

The Role of Communal Values

Whereas economic development and cultural ideology provide the distal socio-cultural predictors of paradoxical patterns of occupational gender segregation, we expected gender differences in personal values to provide a proximal explanation. Gender differences in traits and

values are partly shaped by gender stereotypes that arise from gender segregation in roles (Eagly, 1987): women are socialized to internalize the communal values needed for care-oriented roles, whereas men are socialized to internalize agentic values to match their positions of power (Charles, 1992; Wood & Eagly, 2002). Given a tendency to choose roles that are congruent with one's values (Diekman et al., 2017), gender differences in communion should reinforce gender gaps in the care economy. Indeed, gender differences in communal (but not agentic) values partially account for North American boys' and men's weaker interest in care-oriented roles, such as nursing (Block et al., 2018a, 2018b; Diekman et al., 2017). Further, higher economic development is linked to larger gender gaps in prosocial preferences (Falk & Hermle, 2018), benevolence and universalism values (Schwartz & Rubel-Lifschitz, 2009), and communal traits (Kosakowska-Berezecka et al., 2022; Lippa 2010; Schmitt et al., 2008). Thus, we expect the development paradox in care economy interest to be mediated by wider gender gaps in communal values predicted by individualism (see Figure 1, Panel B). We had no specific predictions about agentic values.

Advancing Evidence Beyond the Gender Equality Paradox in STEM

We prioritized testing hypotheses about gender gaps in care economy representation/interest given that past evidence for the gender equality paradox in STEM is mixed at best, and illusory by some accounts. Most studies that document a paradoxical pattern in STEM analyzed UNESCO data on university degrees, not occupational data, and many studies do not replicate the paradoxical pattern for STEM majors (see Soylu Yalcinkaya & Adams, 2020). In addition, when economic development is included as a predictor of occupational gender segregation, the gender equality paradox is sometimes eliminated (Richardson et al., 2020). Finally, the gender equality paradox in math self-concepts disappears in multilevel

models that control for within-country reference group effects (Marsh et al., 2020). Yet, paradoxical patterns of gender segregation are evident in sociological labor market analyses, indicating that a development paradox should exist for some occupational sectors (Charles 1992, 2003; Charles & Bradley, 2009; Charles & Grusky, 2004). Based on this mixed evidence and our own theorizing, we preregistered a hypothesis for a paradoxical pattern in the care economy, but were agnostic regarding STEM segregation.

Current Research

The current project innovates by carrying out a pre-registered analysis of the gender gap in care economy careers (and comparing this to STEM). We addressed limitations of past work (see Charles & Bradley, 2009; Marsh et al., 2020) by using a clear operationalization of the care economy (Addati et al., 2018), analyzing archival occupational data in Study 1 and replicating effects on measured career interests among 19,240 university students from 49 countries in Study 2, controlling for country-level confounds (Studies 1 and 2) and including individual-level demographics in multilevel models (Study 2) to avoid reference group effects.

We tested whether gender differences in occupational representation (Study 1) and interest (Study 2) in care economy (and possibly STEM) careers are larger in more economically developed countries (H1). Study 2 reports the results of a unique cross-national data collection effort that further investigated the psychological underpinning of this paradox. We tested whether more economically developed countries exhibit larger gender gaps in communal values (H2) that (rather than agentic values) partially account for greater gender differences in care economy interest in such developed countries (H3). Further, we provide the unique empirical test of two distinct theoretical accounts for the development paradox (depicted in Figure 1): individualism and self-expression/autonomy values.

Study 1 Method

Transparency and Openness. Data and analysis code (R) for Study 1, as well as a detailed pre-registration, data, and analysis code for Study 2 are available at [https://osf.io/aqfe9/?view_only=c1e1da78e39f473bb79d78da2dd9f92c]. Study 2 was part of a larger cross-national data collection project for which we pre-registered sample size and data cleaning procedures [https://osf.io/pc8uf/?view_only=7e906d1587cb49f6b4afd9cc263a9a23].

A goal of Study 1 was to first establish evidence of a development paradox in occupational data improving upon earlier sociological research. Analyzing educational data from the 1990's, Charles and Bradley (2009) found that in more economically developed countries, men were overrepresented among STEM majors whereas women were overrepresented in 'health/other' majors. However, this 'health/other' category included several male-dominated fields (trade, craft, transport, architecture, agriculture), rendering an ill-defined measure of care economy interest. Study 1 provided a more direct test of recent trends in occupational data by analyzing country-level data (N=70) on the percentages of women in care economy and STEM occupations. Full ranges of country-level scores for the following variables are available in Supplementary Information (SI).

Percentage of Care Economy- and STEM-related Workers who are Women

Per country, we calculated the percentages of women among health and social work professionals (ISCO-8 code 22), health and social work associates (ISCO-8 code 32), and teaching professionals (ISCO-8 code 23)[2]. The country-level percentage of women in care economy fields ranged from 43.60% to 90.26%. We also calculated the percentages of women in

[2] Note that there is no category for "teaching associates" in the ILO data.

science and engineering professionals (ISCO-8 code 21), and science and engineering associates (ISCO-8 code 31). The country-level percentage of women in STEM fields ranged from 3.45% to 35.74%.

Economic Development

We operationalized economic development using the 2017 Human Development Index (HDI; range = 0-1; United Nations Development Programme, 2020), as it combines gross national income, life expectancy, and education (thus tracking national investment in core aspects of the care economy). See SI for supplemental analyses yielding similar results using other indices (e.g., GDP).

Percentage of Women in the Labor Force

To control for country-level variation in gender differences in labor force participation, we calculated the percentage of the labor force that is women (International Labour Office, 2017; range = 19.49%-51.69%).

Gender Equality

To examine whether cross-national patterns were driven by economic development, rather than gender equality in a country, we used the global gender gap index (GGGI, 2017; range = 0-1; Schwab et al., 2017), which captures country-level gender gaps in health, education, economy, and politics (range = 0.58-0.88).

Study 1 Results and Discussion

Using linear regression analyses with standardized predictors, we tested country-level variation in economic development (HDI) as a predictor of country-level percentages of women in care economy and STEM careers. Results revealed a development paradox for care economy

participation (see Figure 2A). This relationship was robust to controlling for women's labor market participation (see Table 1). Further, we tested whether economic development, and not gender equality per se, is the strongest predictor of a country's gender segregation in the care economy: Additional regression analyses controlling for gender equality (GGGI) showed that HDI remained a significant predictor, and GGGI did not account for unique variance in care economy segregation. As a robustness check, we repeated these analyses with several different measures of country-level gender equality: the GGGI health sub-indicator, GGGI political representation sub-indicator, Gender Equity Index (GEI; European Institute for Gender Equality, 2017), and the Gender Inequality Index (GII; United Nations Human Development Programme, 2017). All analyses reached the same conclusion: economic development, and not gender equality, robustly predicts a higher percentage of women in care economy careers (detailed analyses in SI – Section 2).

In contrast to prior evidence of paradoxical patterns for STEM majors (Charles & Bradley, 2009), we found that countries higher in HDI had greater (not lower) percentages of women in STEM occupations (see Figure 2B). However, when controlling for women's labor force participation, this relationship was no longer significant. GGGI was unrelated to women's STEM participation (Table 1).

Figure 2A

HDI Predicting % of Women in Care Economy

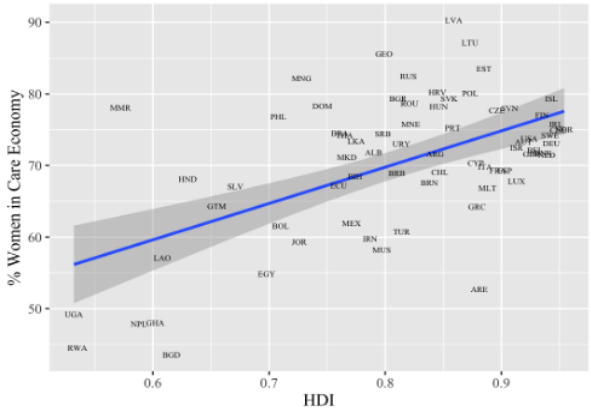
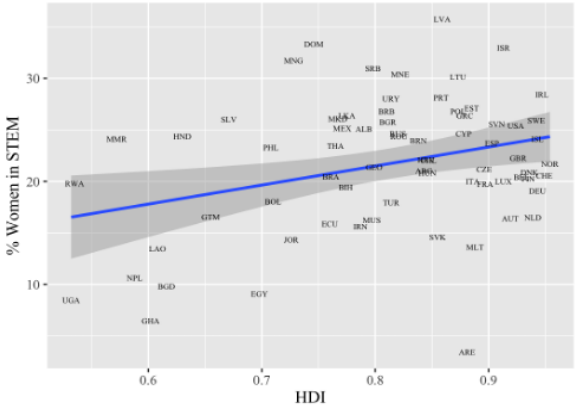


Figure 2B

HDI Predicting % of Women in STEM



Note. Figures plot raw scores without control variables.

Having documented a robust development paradox in the care economy, Study 2 aimed to test for these same paradoxical patterns in young adults' ratings of career interest and more closely examine the role of cultural ideology (individualism and self-expression) and personal values (communion and agency) as mediators of these relationships.

[Insert Table 1 here]

Study 2 Method

Participants and Procedure

Seventy-five collaborating teams surveyed 25,979 university students either online (n = 25,163) or on paper (n = 816) in their main language of instruction. To achieve adequate statistical power for multilevel models (Maas & Hox, 2005), we pre-registered minimum sample sizes of 50 women and 50 men in each country after exclusion. Participants were excluded for: failing at least one of two attention checks (15.17%), survey completion under 10 minutes (1.08%), coming from a university we did not sample (1.45%), having moved to the sample country after age 14 (6.18%), not falling into the age range of 17-30 (2.44%), and not

self-identifying as a man or woman (2.16%). The final sample included 19,240 university students (7,175 men) from 125 universities in 49 countries.

Measures

Only measures relevant for the current analyses are described. See SI for additional details on translation, sample sizes, covariates, and demographics. To deal with missing data on publicly available cross-national variables ($n_{HDI} = 1$, $n_{self\text{-}expression} = 14$, $n_{individualism} = 11$), we ran multiple imputations ($n = 10$) with a larger dataset of 151 countries with 81 country-level variables using Amelia II in R (Honaker et al., 2011). More details on imputations can be found in SI.

Country-Level Indices of Economic Development and Gender Equality

As in Study 1, economic development and gender equality were assessed with the HDI and GGGI, respectively. See SI for parallel analyses that largely replicate effects using alternative measures of economic development and gender equality.

Country-Level Indices of Individualism/Collectivism Culture

Individualism (vs. collectivism) was operationalized using Hofstede's widely-used dataset (range 6-91; data from 1967, 2001; Hofstede & Minkov, 2010).

Country-Level Indices of Self-Expression Culture

Self-expression values were operationalized by standardizing and averaging two related ($r(48) = .53$, $p < .001$) indicators (frequently used in prior research; e.g., Barceló, 2017; Chan, 2020): (a) self-expression (vs. survival) from the World Values Survey (WVS wave 4, collection years 1999-2004; Inglehart et al., 2014; e.g., "Respondent gives priority to economic and

physical security over self-expression and quality of life"; reverse-coded) and (b) intellectual autonomy[3] (collection years 1988-2007; Schwartz, 2008; e.g., rated value of "freedom") .

Country-Level Measure of Gender Differences in Values

Participants rated the personal importance of three communal values (*helping others*, *caring for others*, *attending to others*) and six agentic values (three assessing dominance: *having power*, *having status, demonstrating superiority*; three assessing competence: *being competent*, *being accomplished*, *being successful*) from 1 (*not important*) to 7 (*extremely important*). We computed country-level gender differences for each value by extracting the country-level random effect of gender from a multilevel model that nested data within country and university, controlling for participant major, age, subjective SES, and degree progress as well as (collaborator ratings of) university status.

Individual-Level Measures of Career Interest

Participants rated their interest in three care economy careers (social worker, elementary school teacher, and nurse) chosen for: (a) fitting the ILO's definition of occupations in the paid care sector (i.e., "education" and "health and social work,"), (b) involving directly caring for others, (c) being salaried positions outside the home, typically requiring post-secondary training, and (d) having been used in prior gender segregation research (Diekman et al., 2017). Participants also rated their interest in three STEM careers (mechanical engineer, electrical engineer, computer programmer) chosen for being highly male-dominated STEM fields requiring post-secondary training (Cheryan et al., 2017).

[3] Exploratory analyses with Schwartz's "affective autonomy" measure yielded the same patterns (SI – Section 9).

For each occupation, participants rated their interest on two items from 1 (*strongly disagree*) to 7 (*strongly agree*): "In another life, I could imagine [career] being an interesting career for me,"[4] and "A career in [career] would match my values."[5] Multilevel confirmatory factor analysis suggested a good fit for this career interest measure and its ability to distinguish care economy from STEM interest across countries (see SI, Section 3). Thus, we standardized and averaged occupational ratings across each item separately, and then standardized and averaged the two composites to create a measure of *care economy interest* (average $\alpha = .82$; range = .60-.91) and a measure of *STEM interest* (average $\alpha = .88$; range = .82-.92). Interest ratings on care economy and STEM were positively (albeit weakly) related, $B = 0.16$, $SE = 0.02$, $t(43.20) = 10.30$, $p < .001$ (average individual-level effect across countries).

Study 2 Results

We pre-registered all hypotheses and analyses (minor deviations detailed in SI). Multilevel models were run with lme4 (Bates et al., 2015), where *p*-values were extracted with the lmerTest (Kuznetsova et al., 2017). Participant data ($N = 19{,}240$) were nested within universities ($n = 125$), and countries ($n = 49$) with random intercepts. As pre-registered, all models controlled for participants' age, degree progress, subjective SES (all of which were university-mean centered), and major (effect coded). To account for reference group effects – and thus avoid spurious explanations for the paradox (Marsh et al., 2020) – we also grand-mean-

[4] These items were preceded by the following pre-amble "People can have interests in many different things, including things they are not currently doing themselves. Even if we choose one career for ourselves, there might be other careers we could imagine for ourselves. In this question, we are NOT asking which profession you currently expect to have in your future. Instead, we would like you to consider each career on this list separately and think about whether you could imagine that career being of interest to you."

[5] Results replicated when omitting the value-fit item due to concerns about construct overlap.

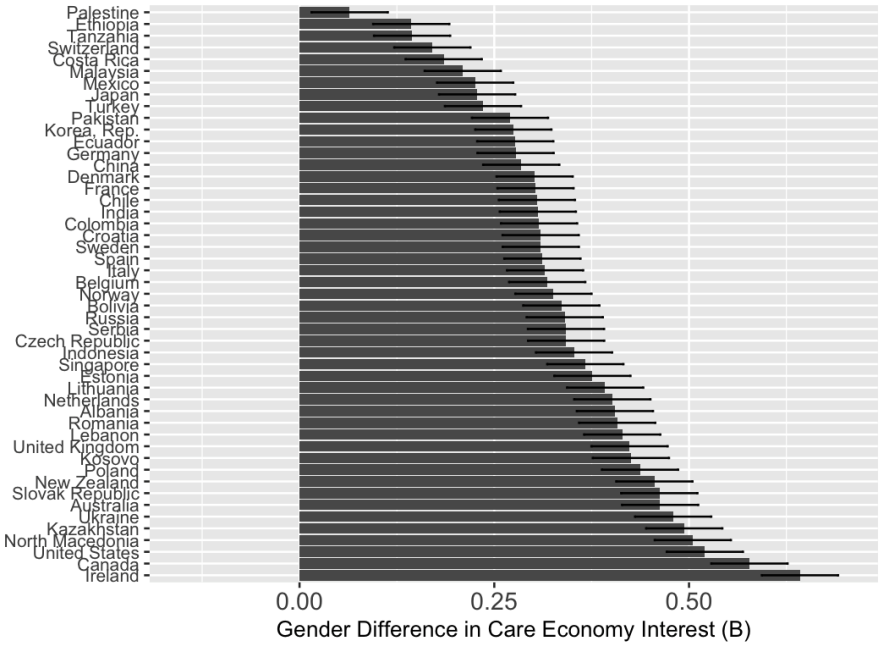
centered university averages of age, degree progress, and subjective SES, as well as within-country university status (Enders & Tofighi, 2007). Gender was specified as a random effect (0 = men, 1 = women; Heisig & Schaeffer, 2019). We tested but found no evidence that country-level differences in career interest were confounded with country-level career-specific degree requirements (see SI).

Country-Level Gender Differences in Care Economy Interest

As expected, a multilevel model predicting care economy interest from gender revealed that, on average, men were less interested in care economy careers than were women, $B = 0.34$, $SE = 0.02$, $t(45.55) = 13.70$, $p < .001$, $CI_{.95}$ [0.30, 0.38], even after controlling for individual- and site-level demographics. However, the estimate of this gender gap (random effects conditional mean difference) varied considerably across countries ($SD = 0.12$; see Figure 3).

Figure 3

Country-Level Gender Gap in Care Economy Interest



Note. Scores are country-level estimates of gender differences in care economy interest (controlling for individual- and site-level demographics). Values above 0 indicate that women reported more interest in care economy careers than men. Error bars represent 95% confidence intervals.

Is the Gender Gap in Care Economy Interest Predicted by Development?

Next, to test whether country-level economic development (IV1) predicted gender differences (IV2) in care economy interest (DV), we added HDI (grand-mean centred), and the gender by HDI interaction to the above model. Supporting H1, and replicating findings from Study 1 (see Figure 4A), HDI moderated country-level gender differences in care economy interest, $B = 0.64$, $SE = 0.22$, $t(52.00) = 2.98$, $p = .005$, $CI_{.95}$ [0.21, 1.07]: The gender gap in care economy interest was larger in more developed (+1 *SD*, HDI of .93), $B = 0.41$, $SE = 0.03$, $t(41.76) = 12.55$, $p < .001$, $CI_{.95}$ [0.35, 0.47], compared to less developed (-1 *SD*, HDI of .72), $B = 0.27$, $SE = 0.04$, $t(59.03) = 7.52$, $p < .001$, $CI_{.95}$ [0.19, 0.35] countries.

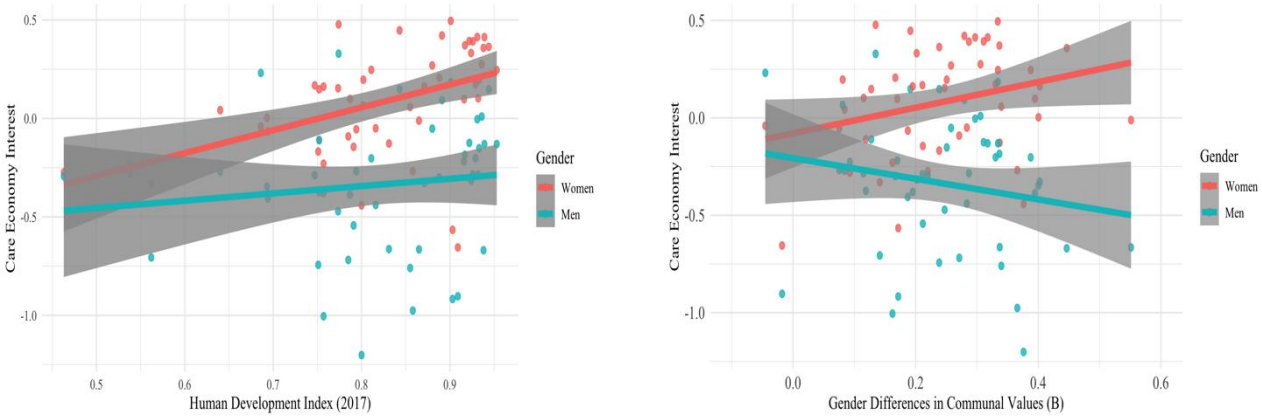
In simple slope analyses, HDI predicted care economy interest for women, $B = 1.01$, $SE = 0.31$, $t(49.101) = 3.21$, $p = .002$, $CI_{.95}$ [0.40, 1.62]; but not men, $B = 0.37$, $SE = 0.35$, $t(46.28) = 1.03$, $p = .306$, $CI_{.95}$ [-0.32, 0.37]. There was no evidence that country-level gender equality indices predicted country-level gender differences in care economy interest better than HDI (see Table S7). The gender by HDI interaction was also robust to controlling for population size, STEM interest, the relative perceived pay of the careers (within-country), and the exclusion of an outlying country (see SI - Table S8 for details).

Figure 4A

HDI predicting the Gender Gap in Care Economy Interest

Figure 4B

Gender x Communal Values Predicting the Gender Gap in Care Economy Interest



Note. Plotted are the raw averaged care economy interest scores (not accounting for individual- and site-level demographics). Bands indicate 95% confidence intervals of the regression line.

Parallel Analyses on STEM

Parallel analyses on STEM interest revealed that, on average, women were less interested in STEM careers than men, B = -0.24, SE = .03, $t(43.96) = -9.42$, $p < .001$, $CI_{.95}$ [-.30, -.18] (Figure S1). As in Study 1, we found no evidence that the gender difference in STEM interest was significantly related to either economic development (HDI), B = -0.11, SE = 0.23, $t(47.33)$ = -0.47, p = .643, $CI_{.95}$ [-.56, .34], or gender equality (GGGI), B = 0.22, SE = 0.47, t(45.90)=0.48, p = .639, $CI_{.95}$ [.70, 1.14], even tested in separate models. This null finding casts further doubt on the robustness of the gender equality paradox in STEM.

Do Gender Differences in Values Underlie the Development Paradox in Care Interest?

We next tested whether gender differences in communal (but not agentic) values were also larger in more developed countries (H2), as found with other prosocial preferences (Falk & Hermle, 2018). Three multilevel models predicted communal, dominance, and competence

values respectively from gender, HDI, and their interaction, controlling for individual- and site-level demographics. Overall, women endorsed communal values more, $B = 0.24$, $SE = 0.03$, $t(42.76) = 9.39$, $p < .001$, $CI_{.95}$ [0.18, 0.30], and dominance values less, $B = -0.13$, $SE = 0.02$, $t(48.25) = -6.53$, $p < .001$, $CI_{.95}$ [-0.17, -0.09], than did men. There were no significant gender differences in valuing competence, $B = 0.02$, $SE = 0.02$, $t(45.90) = 1.17$, $p = .246$, $CI_{.95}$ [-0.02, 0.06]. There was substantial cross-national variability in these gender effects ($SD_{communal} = 0.15$, $SD_{dominance} = 0.10$, $SD_{competence} = 0.10$; see Figures S2-S4).

As hypothesized (H2), the gender gap in communal values was predicted by HDI, $B = 0.57$, $SE = 0.23$, $t(49.26)$, $p = .014$, $CI_{.95}$ [0.12, 1.02]. Gender differences in communal values were larger in more developed (+1 *SD*, $B = 0.30$, $SE = 0.03$, $t(40.03) = 8.82$, $p < .001$, $CI_{.95}$ [0.24, 0.36]) compared to less developed (-1 *SD*, $B = 0.17$, $SE = 0.04$, $t(55.62) = 4.69$, $p < .001$, $CI_{.95}$ [0.09, 0.25]) countries (see Figure S5). However, when examining simple slopes by gender, HDI did not significantly predict communal values for either men, $B = -0.52$, $SE = 0.37$, $t(46.05) = -1.41$, $p = .167$, $CI_{.95}$ [-1.25, 0.21], or women, $B = 0.05$, $SE = 0.35$, $t(46.82) = 0.14$, $p = .887$, $CI_{.95}$ [-0.64, 0.74]. There was no significant gender by economic development interaction predicting dominance, $B = 0.06$, $SE = 0.19$, $t(55.01) = 0.32$, $p = .752$, $CI_{.95}$ [-0.31, 0.43], or competence, $B = 0.10$, $SE = 0.18$, $t(50.99) = 1.08$, $p = .293$, $CI_{.95}$ [-0.25, 0.45] values (see Figures S6 and S7).

Finally, additional analyses (see Table S13) confirmed H3, that country-level gender differences in communal (but not dominance or competence) values predicted country-level gender differences in care economy interest even when controlling for HDI. As shown in Figure 4B, women were more interested than men in care economy careers in countries with larger (+1 *SD*, $B = 0.43$, $SE = 0.03$, $t(52.27)$, $p < .001$, $CI_{.95}$ [0.37, 0.49]) compared to smaller (-1 *SD*, $B = 0.25$, $SE = 0.03$, $t(55.96)$, $p < .001$, $CI_{.95}$ [0.19, 0.31]) gender differences in communal

values. After adding country-level gender differences in communal values to the model, HDI's relationship to gender differences in care economy interest became non-significant. While correlational evidence for mediation is inconclusive (Bullock et al., 2010), these results support a goal congruity account for the role of values as a proximal predictor of career interest. These effects were robust to controlling for population size, STEM interest, relative estimated pay of the careers, and the exclusion of an outlying country (Table S9).

Parallel Analysis on STEM

Gender differences in STEM interest were not predicted by country-level gender differences in dominance or competence values (see Table S12), nor by communal values, entered either alone, B = -0.12, SE = 0.22, t(45.92) = -0.55, p = .586, $CI_{.95}$ [-.55; .31], or with HDI, B = -0.09, SE = 0.23, t(42.12) = -0.38, p = .708, $CI_{.95}$ [-.54; .36], (see Table S12).

Does the Cultural Context Underlie the Development Paradox in Care Economy Interest?

Individualism

Country-level individualism (without HDI) predicted gender differences in care economy interest, B = 0.002, SE = 0.001, t(42.67) = 2.75, p = .014, $CI_{.95}$ [.00004, .004]; gender differences in care economy interest were larger in more individualistic (+1 SD, B = 0.40, SE = 0.03, t(37.67) = 12.58, p < .001, $CI_{.95}$ [0.34, 0.46]), than less individualistic (-1 SD, B = 0.28, SE = 0.03, t(50.83), p < .001, $CI_{.95}$ [0.22, 0.34]) countries. In addition, individualism (without HDI) predicted gender differences in communal values, B = 0.003, SE = 0.001, t(43.08) = 2.73, p = .011, $CI_{.95}$ [0.001, 0.005]. The gender gap in communal values was larger in more individualistic (+1 SD, B = 0.31, SE = 0.03, t(38.30) = 9.06, p < .001, $CI_{.95}$ [0.25, 0.37]), than less individualistic (i.e., more collectivistic) (-1 SD, B = 0.17, SE = 0.04, t(50.80) = 4.75, p

< .001, $CI_{.95}$ [0.09, 0.25]) countries[6]. Importantly, individualism was not correlated to gender gaps in competence or dominance values (see Table S5). Finally, the interactions of gender x HDI and gender x individualism, while significant predictors of care economy interest and communal values alone, become non-significant when added together in models predicting either care economy interest or communal values (see Tables S14 and S15). Given the strong correlation between HDI and individualism, $r(48) = .70$, $p < .001$, they likely explain overlapping cross-national variance (Fog, 2021). Thus, although only partially supporting our hypotheses, these findings are consistent with the theory that as wealthier countries increasingly prioritize individualism over collectivism, the gender gap in specifically communal values (rather than other values) widens in ways that may exacerbate gender differences in interest for care economy careers.

Self-expression

Gender differences in care economy interest were not significantly predicted by cross-national variation in self-expression/autonomy values (contrary to previous theorizing). Although country-level self-expression was correlated with HDI, $r(48) = .71$, $p < .001$, it did not predict (even without HDI in the model) gender differences in communal values, $B = 0.04$, $SE = 0.03$, $t(43.81) = 1.45$, $p = .162$, $CI_{.95}$ [-0.02, 0.10], or gender differences in care economy interest, $B = 0.01$, $SE = 0.03$, $t(45.57) = 0.30$, $p = .725$, $CI_{.95}$ [-0.05, 0.07]. Similarly, self-expression culture was not correlated with gender gaps in competence or dominance values (Table S5). When including the gender-by-HDI interaction, country-level self-expression actually predicted smaller

[6] Note however, that in simple slope analyses, individualism did not significantly predict men's, $B < 0.001$, $SE = 0.002$, $t(46.31) = -.08$, $p = .702$, or women's, $B = 0.002$, $SE = 0.001$, $t(45.57) = -.08$, $p = .131$, communal values.

gender differences in care economy interest, B = -0.10, SE = 0.04, t(53.17) = 2.74, p = .016, $CI_{.95}$ [-0.18, -0.02], whereas the previously-documented gender-by-HDI interaction remained significant, B = 1.19, SE = 0.29, t(57.48) = 4.12, p < .001, $CI_{.95}$ [0.62, 1.76]. Results were similar when using Schwartz's measures of "intellectual autonomy" or "affective autonomy" (see Tables S10a and S10b).

General Discussion

Documenting the (Asymmetric) Development Paradox

The present study is the first to document and systematically test socio-cultural underpinnings of men's underrepresentation (across 70 countries in Study 1) and relatively low interest (across 49 countries in Study 2) in care economy careers. We found robust evidence for a development paradox of gender segregation in the care economy. Analyses of labor market data in Study 1 suggested that care economy careers are especially dominated by women in more economically developed countries, even when controlling for women's labor market participation and country-level gender equality. Analyses of university students' career interests in Study 2 replicated these patterns, controlling for demographics. We found support for an integrated model to explain these patterns: Relative to men, women reported more interest in care economy careers as predicted by gender differences in communal values and individualism. Importantly, we did not observe a development (or a gender equality) paradox for STEM representation (N = 70 countries, Study 1) or STEM interest (N = 49 countries, Study 2), an asymmetrical pattern that points to the following novel theoretical insights.

Economic Development, Not Gender Equality, is the Key Predictor

First, these patterns of gender segregation in the care economy are linked more strongly to indices of economic development and individualism than to gender equality *per se*. Drawing

from past work (Charles, 1992, 2003; Charles & Grusky, 2004), economic development is thought to foster gender segregation by encouraging women's labor market participation (resulting in decreases in vertical segregation) but funneling them more into care-oriented jobs (resulting in increases in horizontal segregation). Greater economic development also co-occurs with increasing individualism and decreasing collectivism (Santos et al., 2017). Such a cultural shift promotes the feminization of communion as men (as the cultural default) become more associated with self-focused, individualistic attributes and less with other-focused, collectivist attributes (Cuddy et al., 2015). Although causal relationships cannot be confirmed from the available data, the integration of these different theoretical viewpoints fits the available evidence and questions the assumption that women's greater equality in a society directly elicits these paradoxical patterns of gender gaps.

Individualism is the Central Cultural Variable of Importance

Second, in line with our theoretical account, we find evidence that individualism predicts these cross-national patterns of gender differences in care economy interest. Not only are economic development and individualism closely associated (Santos et al., 2017), but both predicted significantly larger gender gaps in communal values and, correspondingly, in care economy interest. This is consistent with our assertion that post-industrial labor structures along with individualism foster greater gender gaps in communal values that drive care economy interest.

Contrary to prevailing explanations for paradoxical gender gaps in STEM (Schmitt et al., 2017; Soylu Yalcinkaya & Adams, 2020; Stoet & Geary, 2018), we found no evidence that country-level self-expression values (or autonomy values, using widely-used measures of each) predicted the size of gender differences in care economy interest. Indeed, when accounting for

economic development, cultural self-expression values predicted a smaller gender gap in care economy interest. This finding is unexpected and needs to be replicated by future research with more face-valid measures of self-expression culture. Nonetheless, our correlational findings cast some doubt on the notion that the freedom of choice characteristic of wealthier countries explains their greater gender segregation.

Gender Differences in Communal Values, not Dominance or Competence

Our findings support goal congruity theory (Diekman et al., 2017), as men's relatively low communal values in highly economically developed countries partially accounted for the larger gender gap in care economy interest in those countries. We found no evidence that the development paradox is explained by gender differences in agentic values (or country-level perceptions of career salaries). As such, there is no evidence that men primarily avoid care economy careers in economically developed countries because they see them as lower paying careers that do not align with their agentic values. The present findings thus provide the first evidence of communal goal congruity in understanding country-level patterns of horizontal gender segregation.

In addition, in North American samples, those who value communion often assume that STEM jobs will not afford their communal values (Diekman et al., 2011). Thus, we also tested whether gender differences in communal values would predict gender differences in STEM interest. However, country-level gender gaps in communal values only predicted gender gaps in care economy, but not STEM interest. People from different countries might choose STEM careers for different reasons, obscuring cross-national patterns (e.g., Soylu Yalcinkaya & Adams, 2020). For example, in some cultures, choosing a lucrative STEM career could be seen as a communal act that benefits one's family.

The Care Economy, Not STEM, is Where the Paradox is Most Evident

Finally, by providing support for our novel integrated model, the phenomenon known as the gender equality paradox in STEM is perhaps less puzzling. Adding to previously raised skepticism of these effects (Marsh et al., 2020; Richardson et al., 2020), we found no evidence for a paradoxical pattern either in STEM occupations (Study 1) or career interest (Study 2). In past work, the most robust gender equality paradox effects are found on college majors or degrees, but these patterns do not always replicate (Soylu Yalcinkaya & Adams, 2020), or persist when controlling for economic variables or reference group effects (Marsh et al., 2020). Notably, the paradoxical pattern we found in the care economy is not subject to the critiques raised by Marsh et al. (2020) and Richardson et al. (2020), as we found the same robust pattern both on objective data in Study 1 and on self-report data in Study 2, which models within-country gender gaps and controls for SES – thus accounting for previously documented reference group effects.

Limitations and Future Directions

The present data provide the first robust evidence for a development paradox in the care economy, as revealed in two distinct datasets. Nevertheless, several limitations are notable. First, to the best of our knowledge, Study 2 is the largest cross-national dataset of individuals' care economy interest to date, and yet our sample of 49 countries still constrains our ability to test more complicated interactions or mediation chains (Fritz & Mackinnon, 2007).

Second, although we were able to sample a diverse set of countries with a wide range of economic development levels, the sample was still dominated by countries from the higher end of the HDI spectrum. Some work suggests that the segregation of college majors might show different dynamics in developed versus developing countries (Charles & Bradley, 2009). Future

studies should therefore investigate patterns of gendered career interest in larger samples that represent a greater range in development and collectivism. In addition,
research on these questions would benefit from an intersectional and class-based lens.

Third, Study 2 measured the preferences of university students to assess interest among individuals still making career decisions (Bono & McNamara, 2011). However, university students are not representative of the population. While interest is an excellent predictor of career choice (Hanna & Rounds, 2020; Nye et al., 2017), our data do not directly speak to how patterns of gender differences in interest (Study 2) transition to the labor market (Study 1).

Fourth, these studies are limited by their correlational design, and third variable explanations remain a possibility. Our theoretical interpretation is that economic development and cultural individualism might exacerbate gender gaps in communal values and care economy interest, but alternative and recursive relationships remain possible. For example, having fewer men in the care economy itself reinforces gender differences in communion (Wood & Eagly, 2002). Although the gold standard for confirming mediation is experimentation, links between these country-level variables would be difficult if not impossible to test experimentally.

Despite these limitations, the current findings provide novel and large-scale cross-national evidence of the factors contributing to gender gaps in the care economy. Study 1 documents robust evidence of a development paradox in care economy participation. Study 2 provides a theoretical understanding of these gender gaps. We suggest that what was previously touted as a gender equality paradox instead stems from the correlation of gender equality with specific economic and socio-cultural variables. The presented findings support our theorizing that in more economically developed and individualistic countries, wider gender gaps in

communal values are associated with greater gender differences in interest for care-oriented roles like nursing or teaching.

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Table 1

Study 1: Linear Regression Analyses Predicting Country-Level Labor Force Data from Economic Development (HDI) and Gender Equality (GGGI; N=70)

	% Women in Care Economy				% Women in STEM			
	B	***SE***	**95% CI**	***p***	***B***	***SE***	**95% CI**	***p***
Step 1								
HDI	**5.60**	**1.00**	**3.61 – 7.59**	**<.001**	**2.04**	**0.74**	**0.56 – 3.52**	**.008**
Step 2								
HDI	**4.42**	**0.96**	**2.50 – 6.33**	**<.001**	1.17	0.72	-0.26 – 2.60	.107
% women in labor force	**3.69**	**0.96**	**1.77 – 5.60**	**<.001**	**2.72**	**0.72**	**1.29 – 4.15**	**<.001**
Step 3								
HDI	**4.59**	**0.97**	**2.65 – 6.54**	**<.001**	1.17	0.73	-0.29 – 2.63	.115
% women in labor force	**4.39**	**1.17**	**2.05 – 6.73**	**<.001**	**2.71**	**0.88**	**0.95 – 4.47**	**.003**
GGGI	-1.22	1.18	-3.57 – 1.13	.302	0.01	0.88	-1.76 – 1.77	.993