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A Cultural Perspective on Gender Inequity in STEM: The Japanese Context

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To understand gender inequality in STEM, Miner et al. (2018) illustrate how an individual lens and a social-structural lens provide complementary perspectives. They indicate that gender inequality in STEM should not be simply understood from an individual lens concerning individual choices and responsibilities but also a social-structural lens concerning societal structures, processes, and meanings associated with gender. In this commentary, we would like to bring a cultural perspective to the consideration of the STEM field. Specifically, we focus on gender inequity in STEM in Japan and elaborate how Japanese culture, which emphasizes masculinity, collectivism, and a tight culture, imposes a stronger social-structural influence on gender inequality in STEM and at the same time strengthens the use of the individual lens to explain the phenomena, making the issue of gender inequality more prominent.

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Below we first briefly describe gender inequality in STEM in Japan and then indicate societal structures in Japanese culture that contribute to such inequality. Next, we explain why Japanese culture strengthens the use of an individual lens to explain gender inequality despite the fact that the impact of societal structures is so obvious. To illustrate our point, we focus on the myth that women are not ideal workers due to their gender roles (Myth 3 in Miner's article), a myth that relates strongly to Japanese culture. While elaborating the role of Japanese culture, we also indicate what industrial and organizational (I-O) psychologists can do to address the gender inequality issue from an individual angle, using a bottom-up approach. Overall, using the Japanese context as an example, we indicate the potential role of culture in shaping gender inequality in STEM, which could further explain general inequality across countries with different cultural backgrounds.

Gender Inequality Among Japanese STEM Workers

Japan is well-known for limited female participation in leadership roles in society. For example, the World Economic Forum (2017) ranks Japan 114th among 144 countries in the Gender Equality Index, positioning it as one of the least gender equal of the developed countries. Despite making considerable progress over recent years, which has been supported by government policies, the share of women in leadership positions in Japanese society remains limited; for example, women occupy only 13% of management positions in companies in Japan, whereas the share is 43.4% in the U.S. (Cabinet Office, 2017). The low representation of women is the same in STEM areas. Among university researchers, women occupy 14.2% of positions in science and 10.2% in engineering, whereas they represent 35.9% of positions in the humanities/arts and 24.7% in social sciences (Statistics Bureau, 2016). The presence of women is even lower in R&D activities in businesses, with the percentage of women among all researchers being 13.3% in science-related fields and 5% in engineering-related fields (Statistics Bureau, 2016). Organisation for Economic Co-operation and Development (OECD) data (2017a) suggest the proportion of women among science/engineering researchers (including those in universities, businesses, and other institutions) is lowest in Japan (15.3%).

A large-scale survey of professionals in science- and technology-related fields, led by a cross-disciplinary association of academic researchers (EPMEWSE, 2016), suggests that the proportion of women is even smaller in the upper layers of organizational hierarchies and that women's career progress is generally slower than that of men; women start to lag behind men in promotion in their early 30s, and the lag increases as they move into their 50s. The data also suggest that a significant number of women are paid less (approximately 20%) and have limited access to research budgets in

both industry and academic institutions. Women in their 30s and 40s tend to work shorter hours than their male colleagues, while the gap is not significant among women in their 50s, and women work longer hours than men in their 60s. These data suggest that family responsibility, particularly child rearing, prevent female workers in the STEM fields from spending as much time working in the critical period of career development compared to their male counterparts. Supporting this interpretation, more than 40% of female participants said they chose to have fewer numbers of children than they wanted due to a concern with balancing career and child rearing, whereas only 12% of men responded in this way.

Japanese Culture

As noted above, we posit that Japanese culture plays a significant role in shaping gender inequality in STEM fields and in Japanese society more broadly. In this section, we briefly explain three key aspects of Japanese culture that we think relate to this issue: masculinity, collectivism, and cultural tightness. First, Japan is considered to have a highly masculine culture, which emphasizes different gender roles in society (Hofstede, Hofstede, & Minkov, 2010). First, although the U.S. has a moderately strong masculine culture, Japan's masculine culture is even stronger (Hofstede et al., 2010). In masculine societies, women face the strong social expectation "to be concerned with taking care of the home, of the children, and of people in general" (p. 138), whereas men are expected "to be assertive, tough and focused on material success" (p. 140). Second, Japanese culture shows higher levels of collectivism than the U.S. (Hofstede, 2010; House et al., 2004). Collectivistic societies emphasize the pursuit of collective interests and playing one's role in a group (e.g., family) over individual interests (Triandis, 1995). Third, Japanese culture is characterized by high levels of tightness (Chan, Gelfand, Triandis, & Tzeng, 1996). Cultural tightness, in contrast to cultural looseness, refers to the strength of social norms and sanctioning (Gelfand, Nishii, & Raver, 2006). In a tight culture, social norms are expressed very clearly and unambiguously, and violators face severe sanctions, whereas in a loose culture, deviant behaviors tend to be tolerated.

These three aspects of Japanese culture jointly shape gender inequality in Japan and the discourse that surrounds it. Masculinity signifies gender-based role expectations for both men (as breadwinners) and women (as primary caregivers) in society, and collectivism leads women to feel a strong responsibility to play their expected role in their family, which is to take care of home and children, putting aside their own career progress. Although Miner et al. point out such feelings also exist among female workers in the U.S., the Japanese culture is likely to signify it. The cultural tightness further makes it hard for individuals to challenge the pervasive social norms, such as

gender-role expectations and putting collective interests above individual interests. Both female and male workers socialize and internalize the Japanese culture, and thus, the culture affects their attitudes, career choices, and behaviors. In the next section, we illustrate the impact of societal culture on gender inequality in STEM fields in Japan, structuring the discussion with reference to three career stages of female workers: prework education, early career choice, and working as a mother.

Societal Structures Contributing to Gender Inequality in STEM

Echoing the situation in the U.S., the low representation of women in STEM fields has its roots in education. For example, the proportion of female students in universities is much lower for engineering (3.9% in 2013, the same for the following data) and science (1.6%) than for other fields such as humanities/arts (66.1%) and social sciences (36.8%; World Bank 2017). In the U.S., the proportion is slightly lower in engineering (1.9%) but significantly higher in science (7.0%). Hence, in total, the inclination to study non-STEM fields among female students is equally strong or even stronger in Japan compared to the U.S. The lack of preference for STEM fields can already be observed among female students in secondary education, and research suggests that the attitudes of adults surrounding students (i.e., parents and teachers), who tend to consider STEM subjects for boys rather than for girls, significantly contribute to their attitudes (Muramatsu et al., 2004). Although Miner et al. (2018) point out that a similar gender-based preference to study particular subjects also exists in the U.S., the strong masculinity and tightness of Japanese culture might make such a tendency more prominent and persistent in Japanese society. Masculinity encourages members of society, such as teachers and parents, to set different goals for boys and girls, and cultural tightness guides children to follow the (implicit and explicit) expectations of surrounding adults.

Female students who choose and complete education in STEM fields also face challenges pursuing their career in these fields while fulfilling their family responsibilities. As noted above, the masculine culture creates strong social expectations for women to be the primary caregivers in their families. In addition, collectivism discourages women from putting their career over their family's welfare and their role at home, and the tight Japanese culture makes it difficult for them to deviate from such social expectations. Hence, it is not surprising that many women become concerned about how to manage their careers alongside family responsibilities well before they get married and/or have children: They expect to spend much more time fulfilling family responsibilities than their partner will, and thus they try to avoid a career choice that will make such role-fulfilment difficult. For example, many female new graduates consider well- established family-

friendly programs as a key, necessary condition when choosing the companies they want to work for. Furthermore, some even choose peripheral jobs with limited salary and career opportunities because such jobs allow them to avoid long working hours, which is prevalent in Japan (we will elaborate this point in the next paragraph), and to avoid relocation to other offices that will disrupt their family life (note: core workers in Japanese firms often experience extensive rotation across different locations; cf. Aoki, 1990; Beachler & Yang, 1994). As noted by Miner et al., a career in the STEM fields typically requires a lot of devotion in the early stages of one's career. Hence, strong social expectations on women to play the role of primary caregiver are likely to discourage women from entering and continuing such a career.

Although some women still choose to pursue careers in STEM fields, Japan's collectivistic culture further poses challenges for women when they start raising children. According to the Labour Force Survey (Statistics Bureau, 2016), male employees with indefinite employment contracts worked, on average, 45.8 hours per week in 2016 (which suggests, on average, that they work nearly 2,400 hours per year, well above the average hours in the U.S., which is approximately 1,800 hours in 2016 according to OECD data [2017b]), and 33% of them work more than 49 hours.[1] After female workers leave the office at 5 p.m. or 6 p.m. to pick up their children from nursery (because of the strong emphasis on gender roles, this is typically considered a female role in Japan), it is very likely that their boss and colleagues, who are typically male in the STEM field and in other areas, will continue working for some or many more hours. Due to the collectivistic culture, which emphasizes the pursuit of collective interests over individual interests, their boss and colleagues may also consider female workers as putting individual interests (fulfilling their role as a mother) over collective interests (of their workplace). At the same time, female workers may feel guilty for not contributing equally to the workplace as their male colleagues. On the other hand, if female workers decide to stay longer in the workplace, leaving children in nursery until late or asking someone (e.g., a partner, friends) to pick up their children, they can be blamed for or feel guilty about putting individual interests (pursuit of career) over collective interests (of their

[1] The same OECD data suggest that Japan's average working hours are slightly above 1,700 hours. However, there is a question among Japanese scholars about the accuracy of the data reported to the OECD. The OECD data are based on survey responses from firms, and some point out that the data do not include nonrecorded (and thus nonpaid) overtime work, which is widely practiced among Japanese firms (Ooki & Taguchi, 2010). Therefore, we cite another statistic provided by the Japanese government based on responses from workers. We cite working hours of male workers because of the significant gender discrepancy in working hours. According to the same statistics, female workers in indefinite contracts work, on average, 36.3 hours per week, which translates to slightly less than 1,900 hours per year.

family). Due to Japan's tight culture, deviation from social norms—long working hours and women being the primary caregiver at home—can lead to severe sanctions. As such, the collectivistic culture, along with the tight culture, exacerbates the pressures of membership to two social groups (i.e., the family and the workplace) and makes it difficult for women to get a sense of role-fulfilment or self-efficacy in both their work and their family. As a result, female workers in STEM fields typically choose either to limit their work commitment to secure time for children or have fewer children than they might want to avoid conflict between their career and their family responsibilities, as the survey data we mentioned earlier (EPMEWSE, 2016) suggest. Furthermore, many female workers in Japan choose to leave their work to solely focus on family, resulting in lower labor participation among women in their 30s and 40s (Cabinet Office, 2017). These choices, reinforced by societal structures, are quite likely to lead to the view that women are not ideal workers for STEM jobs or for other jobs that require intense effort.

The Individual Lens in Japan

So far, we have illustrated how Japanese culture shapes societal structures that contribute to gender inequality in STEM. Although it is obvious that societal structures account for gender inequality in society, we argue that the individual-based explanation, which Miner et al. (2018) pointed out as being prevalent in relation to inequality in the U.S., is also common in Japan. In essence, the individual-based explanation is an approach that attributes inequality to women's characteristics. It is an explanation related not to the individual per se but to women as a social group. As such, Japanese culture can actually promote the use of the individual lens, whereas Miner et al. pointed out that individualism in the U.S. fosters the use of an individual lens to explain (or even justify) gender inequality in the STEM field. Collectivists generally tend to exhibit stronger in-group bias (Fisher & Derham, 2016; Yamagishi, Jin, & Miller, 1998), and the discussion of gender inequality highlights gender as a source of social categorization. This context leads men—who dominate the Japanese STEM community and society in general—to evaluate men (the in-group) more favorably than women (the out-group) and use this general view to assess all women in society. We thus argue that supporting the individual-based explanation concerning women's choices and responsibilities can be a way for Japanese men to distinguish themselves as a social group from women, thereby highlighting the favorable evaluation of men over women and reinforcing the view that women are not ideal workers. In other words, the individual lens may serve as a way for men in Japan to maintain their masculine values and social status, which in turn reinforces the social-structural impact on gender inequality in the STEM fields. As such, we suggest that in order to better understand the use of the

individual lens in a society, we need to consider the social structure, because different social structures might equally strengthen the use of the individual lens through different mechanisms.

A Bottom-Up Approach to Gender Inequality

Although it is difficult for Japanese women to challenge the status quo of gender inequality in STEM fields and at work more broadly, there are ways that I-O psychologists can help to overcome such barriers. As mentioned earlier, the societal structure in Japan leads women to avoid expanding their role at work to secure time for family. Such a tendency is particularly strong among working mothers, and it begins well before women actually have children. This leads to a vicious cycle: women restrict their contributions, leading to a sense of guilt and low evaluation, which further discourages them. Inspired by research on proactivity, one potential approach is to encourage women to actively shape their work environment so that they can contribute to the workplace without working excessively long hours. This individual-led and bottom-up approach is important because initiating a change in social structure takes time, although the Japanese government has pushed policies to promote women's participation in STEM fields and in society more broadly, whereas Japanese firms have responded to the governments' call for action (Cabinet Office, 2017). Equipping working mothers with the knowledge to initiate changes in work procedures and arrangements in and around the workplace will ease the pressure of long working hours and reduce women's sense of guilt about leaving the workplace early. In the long run, this might lead more women to adopt leadership roles in STEM and other fields due to their stronger commitment to work and their improved performance evaluations. It might also contribute to changes in gender-based role attributions in society.

Following this idea, the second author of this commentary (Kokubo) launched workshops for working mothers who take maternity leave. In the workshops, the working mothers engaged in case discussions designed to broaden the participants' perspectives on work and the work environment and encourage them to think about various alternative approaches to improve the performance of their organizations. This was useful in shifting participants' focus from the efficient execution of their own narrowly defined role in the workplace, which involved them withdrawing from interactions in the workplace, to proactive engagement in the improvement of work procedures and arrangements, thereby reshaping their own role in the workplace. Although too early to make a conclusive evaluation of the effect of these workshops, preliminary analysis of feedback from participants and their supervisors suggest a recognizable improvement is made in the performance and career ambitions of working mothers. Although Japanese

female workers tend to take longer maternity leave than their counterparts in other countries such as the U.S. (more than 70% of Japanese working mothers take maternity leave lasting 6 months or longer according to a survey by Intage Research [2014] commissioned by the Ministry of Health, Labor, and Welfare), use of the maternity-leave period as an opportunity for learning might turn around the potential detrimental effect of such a long break from work.

Conclusions

Overall, in this commentary, we aimed to bring a cultural perspective to the understanding of gender inequality in STEM fields and at work more broadly. The culture perspective not only provides a deeper analysis for explaining gender inequality in a given society or country but also provides a potential lens for understanding gender inequality across societies or counties. For example, countries such as Japan with a strongly masculine, collectivist, and tight culture may have higher gender inequality in the STEM fields or at work more broadly than countries that do not have these cultural characteristics. For countries with pluralistic societies such as the U.S., we also speculate that there would be cultural difference between groups based on ethnocultural origin, with some groups maintaining more masculine and collectivistic cultural values than others. In this context, cultural diversity should be taken into account when analyzing and confronting the issue of gender inequality.

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Gender Disparity in STEM Across Cultures

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Miner et al. (2018) claim that focusing on individual factors to understand gender inequity in the fields of science, technology, engineering, and mathematics (STEM) provides an incomplete explanation of the phenomenon. They challenge the appropriateness of individual-level explanations that hold women responsible for the injustices they experience, suggesting that this perspective fails to consider larger social-contextual influences. Instead, to explain gender disparity in the STEM fields, Miner et al. offer a social-structural lens through which to view the situation that relies on commonly held beliefs about women in society. The inequality that characterizes these fields, however, is a worldwide phenomenon that spans societal boundaries.

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