

Consumption Targeted Innovation for Women: From Principle to Practice?

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Keywords: Gender Mainstreaming, Inclusive Innovation, Consumption Targeted Innovation
for Women, EU, Horizon 2020, Austria, Israel

1. Introduction

Innovation policy primarily targets economic growth, but there is growing recognition in both policy and academic circles, that distribution-related implications of innovation should be taken into account when designing policy. Much attention is dedicated to increasing inclusiveness on the production side: among entrepreneurs and workers, primarily women, engaged in innovation. However, in both policy terms and as a research topic, the consumption side of inclusive innovation has been generally neglected. This paper hopes to fill this gap.

The paper studies innovation policy intended to support women as consumers and users of innovation, rather than as participants in the innovative workforce. We explore the meaning, development, and implementation of a new policy we term: Consumption Targeted Innovation for Women (CTIW). We ask what is CTIW and how is it related to established policies – primarily Gender Mainstreaming? Why did it emerge and how is it implemented? Finally, we discuss its limitations and prospects.

We examine the beginnings of such policy in a limited number of advanced economies: the EU, and in the specific cases of Austria and Israel. We investigate whether gender inclusive innovation policies are consistent with national gender equality performance in general.

To explore new policy developments, it is appropriate to deploy exploratory case studies in order to empirically explore new social or policy developments with a focus on why and how they emerge (see Yin, 2018). Following a preliminary survey of CTIW, we chose to focus on the Austrian-EU case as an example of CTIW that has already made some headway. This allows us to explore why and how the program evolved and operates. We use Israel, a country similar in size, and a leading innovator as a comparison: a country in which CTIW is yet to make any serious headway.

Methodologically, the research qualitatively analyzed policy documents produced by supra-national, national, and sub-national agencies. As a supplement, we conducted interviews with 17 relevant policymakers and researchers in the innovation and gender equality fields.

We find that CTIW emerged due to the efforts of policy entrepreneurs in the innovation policy field that took advantage of institutional windows of opportunity (Kingdon, 1995), especially in the EU and its Member States, to expand the gender mainstreaming agenda to the field of innovation. CTIW primarily focuses on the academic sector but is gradually making inroads into private sector directed policies, where the policy rationale tends to be framed in more economic terms than is the case for academic sector. Our inter-country comparison suggests, however, that policymakers' commitment to gender equality is a key determinant of CTIW adoption. In terms of implementation, CTIW is still largely in the shadows of a different gender

equality promotion policy: increasing women's participation in the innovation workforce. It is likely that the future development of CTIW largely depends on changing the status of CTIW from being an 'add-on' to an important policy in its own right.

This paper hopes to contribute to three distinct – yet intersecting – streams of scholarly investigation. First, it contributes to feminist literature by introducing a new policy intended to narrow the gender gap, exploring how it spreads and the barriers to its implementation. Second, for scholars of innovation and innovation policy, the discussion of consumer-directed policy is rare, and the discussion of concrete cases allows to go beyond a theoretical discussion to a deeper understanding of policy evolution dynamics. Third, for students of public administration, this study offers an intriguing case study of how a new policy evolves and spreads.

In what comes next, we begin with a general explanation on what consumer-targeted inclusive innovation policy is and why it is needed, followed by an application of this to the case of women. We then explore CTIW in practice in the EU and two selected states and finish with a discussion of our findings.

2. Consumer-Targeted Inclusive Innovation Policy

Innovation is affecting every aspect of our lives as pace of development has skyrocketed in recent decades (Brynjolfsson & McAfee, 2011). It is aimed at turning research results into new and better services and products and provide benefits for businesses, workers, and consumers (OECD, 2015; Gouardères, 2021). While there could be no doubt about the many social and economic benefits of innovation, growing evidence show that not all social groups equally enjoy them. Rather, innovation tends to increase social-economic disparities. Research has also shown that when innovation policy is formulated without concern for distributive outcomes, innovation can expand inequality (Zehavi & Breznitz, 2017).

The understanding that innovation is not always a positive force for change, has recently led policymakers to adopt specific measures to advance "Inclusive Innovation". This has primarily been done as regards the production side: increasing the inclusion of disadvantaged groups (e.g., people with disabilities) in employment and entrepreneurship. Policies that promote this goal are popular in many countries and include for example investing in education and training for such groups (LSE, 2018).

However, with few exceptions (see LSE, 2018; Foster & Heeks, 2015; Stanley et al., 2018), little attention is afforded to innovation's consumption effects: not those who participate in innovation creation, but rather the users of new goods and services. Innovation is assumed

appropriate for all, but in practice often mismatches the needs of marginalized groups (Foster & Heeks, 2015). Little attention is also afforded to policies that could generate innovations that address inequalities in consumption across different groups (Zehavi & Breznitz, 2017; Stanley et al., 2018).

As will be demonstrated for the case of women, from a theoretical perspective, information asymmetry type market failures are to blame due to producer “blind spots” regarding relevant differences between “mainstream” consumers and marginalized ones. Markets, in other words, often fail to take fully into account the specific contours, and therefore consumption needs, of certain groups. At the same time, as in other areas of policy, lack or poor recognition of marginalized groups needs and context, hence of consumer-targeted inclusive innovation’s importance, by governing bodies and institutions, means that there is little or no supportive sub-structure for its advancement (Foster & Heeks, 2015).

3. Consumption Targeted Innovation for Women (CTIW)

Generally, there has been some progress in advancing gender equality. However, no country has succeeded in closing the gender gap in all aspects of life. Globally, women still face discrimination and infrastructural disadvantage throughout their lives (Raday, 2019; World Bank, 2021).

In the context of gender inclusive innovation, efforts across developed countries have predominantly taken the form of trying to increase female participation in innovation production. LSE (2018) found that in general, inclusive innovation “is largely conceptualised as the promotion of women in technology-related activities”, and “[w]omen’s participation in innovation activities and entrepreneurship is the predominant aim for inclusive innovation activities, with diversity in terms of ethnicity, age, sexuality and disability receiving less attention, respectively” (p. 8). This aspect is connected to a broader discussion on women’s positioning in income generating economic activities of employment and entrepreneurship and is highly relevant in the context of the future of work (WEF, 2021). It could be that the focus on participation is because it is easily understood as realization of the right to equality in the economic sphere, that is protected in legal systems and in International Human Rights Law.

Nevertheless, participation is only one side of the story. It is not only that women are not equally represented in terms of their participation in innovate fields (WEF, 2021; Raday & Oksenberg, forthcoming; OECD, 2018); from a consumption perspective, innovation does not benefit women and men equally. Innovation in different fields was found to be gender biased (Lee & Pollitzer, 2016; UN Women, 2017; Schiebinger et al., 2011-2021). This is because, by

default, men are taken as the norm, as the one-size-fits-all, and lack of consideration – whether deliberately or by neglect – of relevant differences¹ on grounds of sex and/or gender constitute bias, and result in direct or indirect discrimination of women. This effect is accentuated when gender intersects with other groups affiliations like race (see e.g., Hunt & Schiebinger, 2021). Innovation outcomes are gender biased although women represent half of the world's population (World Bank, 2019), have become an important engine of the world's economy, and their right to equality is guaranteed under legal systems and International Human Rights Law. This is not only harmful to women but affects the whole of society: it leads to waste of money and missed market opportunities (Schiebinger et al., 2011-2021; EC, 2013; UN Women, 2017). The following examples demonstrate how market failures play out in this regard.

The most intuitive innovative field to demonstrate this is health, where factors such as body and organ size, proportion of fat tissue and hormones, influence women's disease processes as well as their tolerance, side effects and benefits from medication and treatment, in a significantly different way than men (EC, 2020; Tannenbaum et al., 2019). Most basic scientific research with animal models frequently focusses on males and excludes females, resulting in generalization to females without justification and less knowledge about disease processes in females (EC, 2013, p. 15). In addition, despite the existence of state regulations, drug testing has been conducted predominantly on males, from preclinical research in rodents to clinical trials (EC, 2020; Lee & Pollitzer, 2016). As a result, women are often mis- and under-diagnosed (UN Women, 2017, pp. 3-4), and report more than men unwanted drug side effects (EC, 2020).

In the engineering field, for example, initially, pregnant women were encouraged to use seatbelts, but little laboratory research in seatbelt design for pregnant women had been conducted. It turned out that even if the women were not injured, the traditional three-point seatbelts were hazardous to the fetus (UN Women, 2017, p. 4). In the case of Artificial Intelligence (AI), researchers have shown that although reliability and robustness are being improved, these systems often discriminate based on characteristics such as gender and race and their intersections. Buolamwini & Gebru (2018) for example, found that darker-skinned women were often misclassified when they measured the accuracy of commercial gender classification systems.

¹ Focusing on the ways women differ from men in the context of this research **doesn't** mean developing innovative outcomes that are based on "typical women's interests", that reinforce gender inequalities.

Another problem is spillover effects. Innovation, especially when it involves technology, reproduces harmful gender stereotypes about the role of women in society and the type of work women perform (Tannenbaum et al., 2019). For instance, in the case of relatively new virtual assistants and chatbots that are often gendered as female in name, voice and personality, based on a stereotypical justification that users prefer female voices over male voices, especially when support is being provided in an unlimited way. The best-known virtual assistants, as Apple's Siri, Amazon's Alexa, and Microsoft's Cortana, are styled female. Such virtual assistants are often harassed, and they do not fight back because they "have often been programmed to respond to harassment with flirty, apologetic and deflecting answers ... Researchers ... concluded that these evasive and playful responses reinforce stereotypes of 'unassertive, subservient women in service positions...'" (EC, 2020, pp. 150-151; see also Adams & Ni Loideain, 2019).

3.1. Why the production side is not enough?

The correlation between women's participation and gender-responsive outcomes is widely invoked (e.g., VINNOVA et al., 2011; UN Women, 2017). Other than income and power outcomes for women, participation is also considered a key for allowing women's perspectives and possible different life experiences to be taken into consideration. Indeed, there is evidence showing that it is more likely that members of social groups create inventions targeted toward their own group's needs and interests, or in other words who benefits from innovation depends on who gets to invent (Koning et al., 2021).

This relationship between participation and outcome gender appropriateness also came up in interviews we conducted. As a senior ministerial official commented: "*I think it's more an interaction between participation and content. One is not possible without the other, they necessitate and strengthen each other*" (interview 1, February 7, 2022).

However, it cannot not be assumed that merely having more women will lead to more gender-sensitive innovation outcomes. Participation does not guarantee by default the advancement of women's needs and equality and there are various examples of this (Raday, 2019; Wroblewski, 2016; Best et al., 2016). As one interviewee from the scientific community who advised the EU and founded several successful gender initiatives, commented:

"It is the kind of easy and lazy idea ... that simply if you put more women ... everything will be fine ... it's historically the most dominant argument that has been around ... Somehow it seems that people are sure that women have some knowledge that men don't

have. ... But the science that they've been trained on will be exactly the same science that everybody else is trained on” (interview, August 19, 2021).

Women operate in organizations that are gendered. Persistent gendered power structural asymmetries take the form of not only the underrepresentation of women, but also in institutional practices that determine whose claims are heard and which priorities are set (Acker, 1992; Acker, 1990; Lerer & Ben-Eliyahu, 2011). Focusing only on the production side, fails to capture how gender acts as an organizing principle of society and its institutions, innovation field included (Schiebinger & Schraudner, 2011; EC, 2012).

This is theoretically anchored in the general Gender Mainstreaming approach, that aims at advancing equality between women and men by the systematic integration of the respective situations, priorities and needs of women and men in the “mainstream” of activities (EC, 2012; UN, 2002; UN Women, 2020), looking at power and hierarchy (Ylöstalo, 2016), and paving the way to challenge institutional structures (Caglar, 2013), and to integrate a gender perspective into content through gender analysis tools (EIGE, 2019a).

In addition, it is important to note that while steps to increase participation of women in the innovative workforce are, as mentioned, widely adopted, they have not yet yield dramatic results or translated into a real difference across the board. Women remain underrepresented in science, technology, engineering and mathematics (STEM) and information and communication technologies (ICT) disciplines and in ownership and decision-making positions, both in the public and private sectors (Raday & Oksenberg, forthcoming).

4. CTIW in practice

CTIW has rarely been investigated in academic studies. There is however a body of research that addresses the issue of gender and/or sex bias in knowledge creation in the field of academic research, which, as an activity that can generate innovation, is of relevance. This has been advanced by several dominant female figures, mainly from North America and Europe. Amongst them is Londa Schiebinger, who has established an approach she terms “Gendered Innovation” or “fix the knowledge”: overcoming bias by introducing gender and/or sex (and recently also intersectional) analysis into all phases of research. Using educational styled peer-reviewed established case studies, she shows how this approach is a positive resource to advance creativity and achieve excellence in science (Schiebinger, 2021; Schiebinger & Schraudner, 2011; Hunt & Schiebinger, 2021), especially outside the relatively more established gender-conscious context of health research (Schiebinger et al., 2011-2021; Tannenbaum et al., 2019).

Observing the origins and instrumental nature of this line of action, an interviewee commented:

“[I]n science, the main principle for existence is to produce excellent science ... the argument [of] 50% of population ... It's a social justice argument ... [that] does not play right when the principal is excellent science. ... since we targeted specifically the scientific community, ... the only argument that will work is the one of a scientific evidence” (interview, August 19, 2021).

Schiebinger stresses that Gendered Innovation approach should be applied in the three infrastructural pillars of science: funding agencies, peer-reviewed journals, and universities (Schiebinger, 2021; Schiebinger & Schraudner, 2011). Several studies of Gendered Innovation implementation in the context of public research funding organizations were recently published (Wroblewski, 2016; Hunt & Schiebinger, 2021). The rationale of focusing on public funding was clearly articulated as driven by distributive justice considerations by a prominent advisor to the EU:

“[I]f you are getting money from a public funding agency ..., and you're using taxpayer dollars, it's very important that your research benefit everyone and not ... the privileged few” (interview 1, August 31, 2021).

In addition to this body of research, there is an exceptional German study that recognizes the marketable product value of accommodating both men and women in reference to their needs, preferences, and perspectives. However, it found that no comprehensive studies from a CTIW perspective were conducted and that gender considerations are barely integrated in this way (Best et al., 2016).

4.1. The EU Case

Gender mainstreaming has been one of the major strategies adopted by the EU and its Member States for advancing gender equality, including in the area of research and innovation (R&I) (EC, 2012). As an implementation of gender mainstreaming in R&I, the European Commission (EC) emerged as a global leader in advancing what it terms the integration of the gender and/or sex dimension into research and innovation content (EC, 2020) (hereafter “the gender content dimension”).

Tracing how this policy emerged, and following John Kingdon’s multiple streams theory (Kingdon, 1995; Greer, 2016), we will show how policy entrepreneurs from the academic field took advantage of “windows of opportunity” to spread their preferred policy solution in the context of funding and research, yet this couldn’t have been further developed without top-down commitment. While the “excellence science” argument mentioned above, is widely

employed in favor of this policy, we examine other EU policy justifications associated with CTIW. Lastly, challenges that emerged during implementation offer some insights as to prospects and limitations moving forward.

4.1.1. The rise of the gender content dimension: bottom-up and top-down

Already in the 1999 Communication of the Commission on Women and Science, EU committed to “encourage research ‘by women’, ‘for women’, and ‘on women’, thereby tackling the problem of women’s underrepresentation in science and promoting research that addresses both women’s needs and gender issues” (Mergaert & Lombardo, 2014, p. 9). In the EC 6th Framework Programme (2002-2006),² the gender content dimension was included to some extent, but this did not produce significant progress because of resistance to gender initiatives within the EC Directorate General for Research and Innovation (ibid).

A major step occurred when gender equality in R&I was set as a European Research Area (ERA) priority.³ The ERA Communication 2012 framework called to advance: (1) gender equality in scientific careers; (2) gender balance in decision making; and (3) the integration of the gender dimension into the content of R&I (EC, 2017). Member States were invited to develop national action plans for gender equality and mainstreaming in R&I (EC, n.d.).

Under the EC 7th Framework Programme (2007-2013), and in the preparation for Horizon 2020 (2014-2020),⁴ several projects were funded that resulted in enhanced integration of the gender content dimension in EU’s R&I policy. This included the genSET project (2009-2012) that created a dialog forum encompassing European leading scientists, gender experts and decision-makers on the implementation of gender mainstreaming in research. Through a series of seminars and workshops, in 2010 those high-level science leadership participants formed recommendations that suggested “how European science can benefit from integrated action on gender” (Portia Ltd., 2014, p. 6). These included a recommendation to improve the quality of “Science Knowledge Making” by the “integration of sex and gender analysis into basic and applied knowledge production within scientific institutions” (ibid, p. 9). An interviewee shed some light on how these science leaders approached the EC with their recommendations and their influence:

² Framework Programmes are the financial and strategic tools that support EU’s R&I policies.

³ Launched in 2000 as part of the Europe 2020 strategy, the ERA is the ambition to create a single, borderless market for research, innovation and technology across the EU.

⁴ From 2014 the EC’s Framework Programmes for the ERA were called Horizon.

“Because the letter came from ... top science leaders, the EU responded. ... [these] kind of arguments have been around here and there ... But they were vocalized by women's groups or women scientists, or gender scholars, ... the timing was very very good because the European Commission was just preparing a proposal to the European Parliament for Horizon 2020. ... we looked at this initial proposal, the gender equality had only like a one, tiny little paragraph ...

The European Parliament was obviously discussing the budget for Horizon 2020, and it was quite clear that for Parliament and politicians ... what matters is how much science costs? ... I really had this fear that they can quite easily say, well, there is so much gender equality in Europe ... maybe we don't need to spend money on doing gender equality in Horizon 2020. So, we went to the European Parliament and managed to persuade the group of MPs ... And indeed, I think it was quite ... persuasive and out of the little paragraph, ... it grew to several paragraphs in the proposal” (interview, August 19, 2021).

However, while this may have been initially pushed from below, top-down commitment and actions were required for policy adoption and development. Indeed, another interviewee attested that the EC *“was very positive, they never rejected, or they always, in my experience, agree to those changes”* (interview 2, August 31, 2021). Another interviewee said that in the EU, *“the leadership understands”* and *“backs up”* policy (interview 1, August 31, 2021). Clearly, the political and policy leadership are highly receptive to both the gender mainstreaming agenda in general and its application to R&I in particular.

Indeed, the EU has significantly supported and invested billions of euros in the creation of knowledge, tools, and resources both for research performance and funding organizations and in the development of networks and evaluation processes that constitute a basis for policy recommendations and best practices sharing. This has generated a highly developed discourse with extensive policy documentation.

Additional important funded work under the 7th Framework Programme was carried out when in 2011 the EC convened an Expert Group named *“Innovation Through Gender”*, that joined the American Stanford University’s *“Gendered Innovation”* project. According to Schiebinger (2021), who was the group chairperson:

“The great leap forward [was]... in 2011 when representatives from the European Commission ... arrived in my office to propose funding a group of experts from across Europe and North America to advance Gendered Innovations. The EC sought intellectual foundations and resources for its planned Horizon 2020 funding framework

(2014–2020) that would strengthen what Europeans call the ‘gender dimension in research content’” (p. 5).

The goal of the group was to provide practical methods for sex and gender analysis, and to develop case studies as concrete illustrations of how such analysis leads to new ideas and excellence in research (EC, 2013). The materials were presented at the European Parliament, and the EC published this work in a report entitled “Gendered Innovations: How Gender Analysis Contributes to Research” (2013).

4.1.2. Policy justifications

The attempt to build a case for the gender content dimension is clear in EC documents, and while the excellence argument is strongly made, social and economic explanations appear as well, given that “[i]gnoring ... sex and gender ... will create barriers to the full realization of the benefits that society expects from its investment in science and engineering” (EC, 2012, p. 15). On a broader scale the integration of the gender content dimension is “crucial to secure Europe’s leadership in science and technology, and to support its inclusive growth” (EC, 2020, p. 7). In her opening words to the 2013 Gendered Innovations report, the former EC Commissioner for Research, Innovation and Science wrote:

“... the report will have real impact. ... It really is a win-win situation: gender analysis ... results in products and services that all members of society need and demand. Innovation lies at the heart of the Europe 2020 Strategy for smart growth, and the Innovation Union flagship aims at making Europe a global leader in solving societal challenges. It is, therefore, essential to support innovations that improve the lives of women as well as men” (EC, 2013, pp. 5-6).

The report also refers to industry benefits, stating that:

“Inventions that incorporate the smartest aspects of gender can open new markets and enable innovation in products, processes, services, or infrastructures. Gender expertise - whether developed internally or brought in by consultants - can help industry identify new markets, develop technologies, and bring new ideas to market. Products that meet the needs of complex and diverse user groups enhance global competitiveness and sustainability” (ibid, p. 42).

4.1.3. Horizon: mainstreaming the gender content dimension in funding requirement

Eventually, Horizon 2020 was the first Framework Programme to set gender as a cross-cutting issue. One of its main objectives was to integrate the gender content dimension. Under Horizon

2020, applicants were asked to describe, where relevant, how sex and/or gender analysis is considered in content, and evaluators were advised to assess this inclusion (EC, 2017, p. 10). According to Schiebinger (2021), a “*group of us honed the one-sentence guideline prompt for all applicants seeking public funding over dinner one evening for nearly two hours... [it] had to include ‘where relevant,’ since it might not apply to certain areas, such as theoretical physics or pure mathematics*” (p. 6). In addition, call topics for which this integration was an explicit requirement were gender-flagged for easy identification (EC, 2020).

Despite being a “leap”, Horizon 2020 wasn’t successful in effectively advancing the integration of the gender content dimension in ERA. Horizon 2020 interim evaluation found that fewer funded research proposals than expected incorporated sex and gender analysis (EC, 2017). The evaluation attributed this result to lack of applicants’ knowledge about how to effectively consider a gender perspective and conduct gender and sex analysis, confusion regarding gender balance in research teams, in addition to the absence of training on gender issues. The evaluation process of applicants was also found to be weak due to deficiencies in gender expertise. The 2018 ERA progress report concluded that “[e]fforts to... better integrate the gender dimension in R&I content are still needed in order to achieve gender equality and gender mainstreaming in the ERA” (EC, 2019, p. 10).

Interviewees expressed disappointment and argued that the policy’s imprint was weak either due to stakeholders’ lack of interest or knowledge. In addition, one interviewee claimed that in the gender-flagged calls, the EC made a major mistake by connecting gender to ethics which resulted in the latter obscuring the former (interview 2, August 31, 2021). And another interviewee commented that there was little incentive for applicants to consider the gender content dimension as they weren’t granted extra points for addressing this (interview, August 19, 2021).

4.1.4. Gender content dimension reinforcement

In 2020, for the new ERA, the EU doubled down on its commitment to support gender equality and mainstreaming efforts in the integration of the gender content dimension in research, including under the new Horizon Europe Framework Programme (2021-2027) (GENDER-NET Plus, 2022; EC, n.d.), as well as in the new EC Gender Equality Strategy 2020-2025 (EC, 2020).

It is notable that the current EU Commissioner for Innovation, Research, Culture, Education and Youth, stresses that:

“[H]olding gender equality matters very close to my heart, I am determined to step up our efforts to make sure that the integration of the gender dimension into R & I content is a cornerstone of Horizon Europe, and that it is fully acknowledged in the European Research Area” (EC, 2020, p. 6).

Horizon Europe breaks new ground in several ways. Most importantly it makes the integration of the gender dimension into R&I content a default requirement across the whole Programme. It also presents a new funding eligibility criterion to support institutional change: starting from 2022, public bodies, research organizations and higher education establishments are required to have a gender equality plan (GEP) in place. This requirement is strongly oriented towards increasing women’s participation. In terms of content, however, the EC went no further than to recommend that applicants GEPs will address the “integration of the gender dimension into research and teaching content” (EC, 2021).

Yet, interviewees expressed some optimism as regards these changes, and consider the integration of the gender dimension as being more widely accepted than before and knowledge regarding proper practice is now more readily available (interview, August 19, 2021; interview 1, August 31, 2021; interview 2, August 31, 2021).

4.1.5. What lies beyond the Horizon?

Outside the context of Horizon, little evidence exists on the integration of the gender dimension into R&I content, its implementation, and effects, as opposed to the empirical evidence that is more available for the issue of participation (Wroblewski, 2016; Palmén & Kalpazidou Schmidt, 2019). The evidence that exists mainly focuses on the public funding context (Wroblewski, 2016; Hunt & Schiebinger, 2021; Global Research Council, 2021; Håkansson & Sand, 2021; GENDER-NET plus, 2022). Funding may take the form of introducing gender criteria in research funding (mainstreaming it in existing funding) or specific funding to support programs that further the consideration of gender in research (targeted funding) (Wroblewski, 2016). A European gender policy evaluation expert interviewee claimed that while Horizon 2020 didn’t change *“the research landscape, ... it strengthened approaches in institutions or actors in institutions pursuing the gender dimension in content ... it is more and more difficult to ignore it in the in the context of funding”* (interview, January 12, 2022).

However, while progress was made in supporting the individual careers of female researchers and in addressing the under-representation of women in decision-making positions, there has been less progress with respect to advancing the gender content dimension (Lipinsky, 2014;

GENDER-NET, 2015; Palmén et al., 2020; GENDER-NET plus, 2022). This is also evident outside of Europe (Global Research Council, 2021).

In what follows, we investigate two specific advanced economies with the aim of expanding the discussion on whether and how CTWI approach plays out in the funding context and outside of it, using the EU as an important background given its status. Analyzing interviews, we examine the influence of two factors on policy as it applies to different sectors. The first factor is the interaction between different policy levels: the EU on a supra-national level, governments and specific ministries on a national level, and research performing and funding organizations on a sub-national level. The second factor is the national commitment to gender equality.

4.2. State Case Studies

4.2.1. Austria

Austria has a history of advancing gender equality in R&I, and particularly as regards the public research sector (interview 1, February 7, 2022; interview, January 31, 2022; interview, January 12, 2022). Such efforts began back in the 1970s and involved politicians and administrators mainly from two Federal Ministries that are currently called the Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (hereafter “The Innovation Ministry”) and the Ministry of Education, Science and Research. Female academics specializing in law or science have also been involved as well as NGOs. The discourse that developed exerts a policy impact that is unique compared to other German speaking countries (interview, April 14, 2022).

Gender equality promotion in R&I is anchored in constitutional and legal frameworks that have generally supported the institutionalization of gender mainstreaming (EIGE, 2019b), although there is backlash from conservative governments and very slow increase when it comes to measurable outputs (interview, January 31, 2022; interview, January 12, 2022; interview, April 14, 2022).

Interviewees claimed that European guidelines were adopted in Austria because of the country’s commitment to the EU, and because the EU has played, and still plays, an important role in Austria's gender equality policy (interview 1, February 7, 2022; interview 2, February 7, 2022; interview, January 12, 2022). It is noteworthy that Austrian representatives also took part in EU advisory frameworks. In 2015, the Austrian Government’s Council of Ministers confirmed the implementation of the Austrian ERA Roadmap, which led to the prioritization of gender issues in internal ministerial budgets and strengthened related ministerial cooperation

between the two ministries mentioned above (interview, January 12, 2022; interview 1, February 7, 2022).

Austria's public research sector has long recognized not only the importance of participation but also the gender content dimension in some form (interview, January 12, 2022). EU policy strengthened national trends and is used to advance further national action in a more coherent way. It has also allowed for the "expansion" of R&I gender policies from academia to non-university and business private research areas (interview, January 12, 2022; interview, April 14, 2022).

However, the production side remains the predominant focus, and the integration of the gender content dimension has not made much progress. At the public universities, interviewees argue that EU policy didn't have meaningful impact on advancing the content objective, and while researchers generally accept the need for gender equality in participation, they often resist any intervention in freedom of research, reject the excellence argument (interview, January 31, 2022), and perceive the attempt to integrate the gender content dimension as ideological encroachment (interview 1, February 7, 2022).

However, there seem to be some promising recent policy changes, which were strengthened by EU's policy changes. These include for example the recent refocusing of the Ministry of Education, Science and Research, on the gender content dimension in research and teaching, as expressed in its performance agreements with public universities. Interestingly, this is viewed by the Ministry as a way to contribute, along with institutional change, to women's participation (interview 1, February 7, 2022). Nonetheless, in general, sanctions for noncompliance imposed on universities are not substantial (ibid; interview, January 31, 2022). Another change occurred in Austria's central funding organization for basic research, the Austrian Science Fund: following recommendation that were made already in 2005 by the Ministry of Education, Science and Research, the Fund has undertaken an institutional examination of gender issues. After a three years' trial in specific flagship programs, the fund decided in 2018 that it will require applicants and evaluators across all funding programs to reflect on the gender content dimension starting as of 2019 (interview, April 28, 2022).

In addition, there is a recent example of an Austrian regional private nonprofit funding organization that is considering the integration of the gender dimension in content through its whole funding cycle (interview 3, February 7, 2022). In relation to funding, it is clear from the interviews that the Austrian research community has gradually adapted to the gender dimension content requirement (ibid; interview, April 14, 2022; interview, April 28, 2022).

4.2.1.1. The FEMtech Research Projects program

The Austrian case is of relevance to CTIW because of a declared best practice program, unique both to Austria and internationally, called FEMtech Research Projects (EFFORTI, 2019; Wroblewski, 2016; interview 2, February 7, 2022). The program is run since 2008 by the Innovation Ministry and administered through the Austrian Research Promotion Agency (the FFG), which is the national funding agency for industrial research and development (EIGE, 2019b).

Generally, FFG has been institutionally committed to advancing gender equality for the past 20 years. FFG operates several gender-specific programs, under the “Talents” umbrella-program to which FEMtech Research Projects belongs. The others address participation. In addition, already in 2011 FFG mainstreamed across all programs a requirement to consider the gender content dimension in funded research when it involves human use or influence (interview, April 14, 2022; FFG, n.d.).

As opposed to this mainstreaming requirement, FEMtech Research Projects is a targeted or explicit funding scheme for gender specific research that deals with the different needs and requirements of men and women (EFFORTI, 2019; FFG, n.d.). It is aimed at projects that fall into industrial or experimental R&D categories and applicants come from technology-intensive companies, non-university research institutions, and universities (Wroblewski, 2016; Palmén et al., 2020).

The program has a strong consumption economic rationale rather than advancing quality knowledge creation in the context of academic research. According to information provided by the Innovation Ministry, “[b]y considering the relevance of gender within the project, innovations are supported and new market potential is generated”; “precisely tailored, innovative solutions” are developed, and this will “improve the quality and capability of solutions, products and technologies to meet the needs of all customers”, as well as “provide ideas for others” and increase “economic prospects for success” (interview 2, February 7, 2022). According to an interviewee from the FFG:

“[I]t brings you economic advantages, so that’s one of the main ‘selling points’ of FEMtech Research Projects because we say that the results are better ... if you focus on women, you focus on consumers and then you will focus on different ... categories of ... Intersectionality ... the idea is once you start focusing more on what you will develop and for whom, it will be more suitable for the market” (interview, April 14, 2022).

Another unique characteristic of the program, in line with general Austrian impact-oriented monitoring policy, is that it was reviewed in 2016 and in 2020, and this precipitated changes. The program enjoys a good reputation, it is competitive and typically oversubscribed as only a few projects are chosen each year (interview, January 12, 2022; interview 2, February 7, 2022; interview, April 14, 2022). Applicants tend to be repeat FFG clients that already considered the gender dimension in previous research and are aware of it (interview, April 14, 2022; EFFORTI, 2019).

Until recently, gender equality legal requirements were only applied in Austria to the public research sector and even there existing implementation is considered limited in the context of content (interview, January 31, 2022). FEMtech Research Projects is leading change by making the non-university sector aware of the importance of gender-responsive innovation outcomes (interview, January 12, 2022). One interviewee, a European gender policy evaluation expert, shared an example of her favorite project that included the development and adaptation of tools for working with wood, that were originally developed with men in mind and hence were very big and too heavy for safe use by women (or men) with smaller hands (ibid).

Interviewees were asked about the benefits of a targeted program, as opposed to general mainstreaming of gender content dimension requirements for all funding applicants. One answered:

“Due to the complexity of the issue, a whole set of measures is needed to advance gender equality in R&I”; “Optimally, ... minimum requirement should increase more and more until the targeted programs are no longer necessary.”

However, *“[t]argeted programs can create innovative projects and raise the state of the art. Pioneers receive the financial means to implement them”* (interview 2, February 7, 2022).

Another interviewee commented that while mainstreaming is important, on its own it is unsatisfactory: *“you don't get the edge, you don't get the ... innovation height, you get, ... a little bit of a mediocre result”* (interview 2, August 31, 2021).

Interestingly, while originally there was bottom-up push for such a program from the research community, political commitment has played an important role in its development and continuity for more than a decade, despite the conservative's power in national politics (interview, January 12, 2022; interview, April 14, 2022; interview 2, February 7, 2022). “The funding offer still has a unique selling point in European and international comparison and is still innovative despite its long duration”, however, “[i]t has always been challenging to provide the program with sufficient funding” (interview 2, February 7, 2022), which hasn't quite

changed over the years (interview, April 14, 2022). Nevertheless, political commitment has supported the discourse and raises visibility, and FEMtech is considered a showcase program – internally and internationally (interview, April 14, 2022; interview 2, February 7, 2022; Wroblewski, 2016). This was also influenced by the exposure it received due to the EU’s policy which made programs like FEMtech “more powerful” (interview, January 12, 2022).

4.2.2. Israel

Israel is widely considered a world leader in innovation (Zehavi & Breznitz, 2017; WIPO, 2021). Yet, while Israel is ranked 15 out of 132 on the WIPO Global Innovation Index 2021, Austria is ranked not far behind at 18 (ibid). There is, however, an evident gap between their gender equality ranking: on the WEF (2021) Global Gender Gap Index 2021 for instance, out of 156 countries Austria is ranked 21 while Israel – 60.

In the area of R&I Israel’s discourse and policy on gender equality is underdeveloped: it is still in a rhetoric stage that focuses on the production side, and even in the public academic context policy steps and progress are lagging. For instance, limited information that exists as regards gender in Israeli leading public funding agencies only addresses participation and representation (Academic Committee of the Council for the Advancement of Women in Science and Technology, 2019).

Key policy and academic interviewees weren’t familiar with the EU’s content objective in research. Moreover, the promotion of the content dimension was perceived as excessive given that women still struggle to secure their place as participants in the R&I workforce, especially in STEM fields, unlike the “evolved” EU (interview, February 20, 2022).

Israel has been associated with the EU’s R&I Framework Programmes since 1996 with very high participation rates (Research and Innovation, 2021). This participation allows Israel to integrate into European research infrastructure and is essential to strengthening Israeli academic and industrial excellence (Israel Innovation Authority, 2022). Israeli funding for participation in Horizon is provided by the Ministry of Innovation, Science and Technology (hereafter “The Israeli Ministry”), the Innovation Authority and the Israeli Council for Higher Education (ibid).

The Israeli Ministry’s Council for the Advancement of Women in Science and Technology represents Israel in various EU frameworks on gender equality (Council for the Advancement of Women in Science and Technology, 2020). According to the recent GENDER-NET Plus (2022) report, the Israeli Ministry has a gender equality strategy that includes the objective of increasing “awareness to gender dimension in research”, and a policy requiring funded

applicants to specify whether they consider sex and/or gender in their research proposals (that is applied without giving scores), as well as guidelines on the gender dimension of R&I for evaluators (pp. 26-27, 73).

Yet, according to a senior official in the Israeli Ministry (interview, March 24, 2022), Europeans are provided with “the information they want to hear”, and in reality, there is no real attempt to address content dimensions. Sex analysis of the proposals list (submitted and winner) is done for appearances sake to get “money from Brussels”. The Council is merely “window dressing”. The Ministry considers gender as a construct relevant only to “delusional” sociologists. There is interest in advancing women’s participation in the income generating high-tech sector. However, excellence and economic arguments fail to gain traction in Israel. While these have purchase in Europe because of an ideationally favorable social environment, in Israel the limited social discourse on gender and the weakness of the institutional infrastructure in support of gender equality constrains the potential for progress.

The Israel-Europe Research and Innovation Directorate (ISERD), that operates through the Innovation Authority, serves as the official contact point with the EU for all the activities of the Framework Programmes (ISERD, n.d.). ISERD has no past experience in implementing the EU’s funding gender equality requirements since this will only be enforced starting with the 2022 calls. In October 2021, ISERD held an “Horizon Europe - Gender Equality Plan (GEP) Info Day” with presentations to provide Israeli institutions with information on the new mandatory Gender Equality Plan requirement (ISERD, personal communication, December 21, 2021).

One interviewee who advises Israel and participates in EU frameworks (interview, December 30, 2021), commented that ISERD has no gender agenda, not even as regards female applicants’ participation (although underrepresentation exists). However, because EU calls involve a gender “obstacle” for applications, ISERD is forced to deal with it. Hence, the new EU Gender Equality Plan’s requirement can be a positive steppingstone for institutions that haven’t considered gender before; especially in Israel, where only universities are at all familiar with the idea of gender-focused institutional interventions, and even they rarely address gender inequality in practice.

Since 2011 there have been several committees operating under the Planning and Budgeting Committee of the official authority for higher education in Israel, the Israeli Council for Higher Education, as regards the advancement of gender equality in higher education. These produced policy recommendations focused on participation (Solomon, 2019; Committee for the Advancement and Representation of Women in Higher Education Institutions, 2015). The

integration of the gender content dimension in research, however, is not addressed. In 2020 the Planning and Budgeting Committee introduced the new “*Kav Mashve*” program that for the first time will provide budgetary incentives for institutions to advance women, according to quantitative participation and representation goals. Although there is also a qualitative assessment, it focuses on institutional aspects that contribute to participation (e.g., leadership workshops) (Planning and Budgeting Committee, 2020).

According to one interviewee, holding positions both in the academic scientific and the policy worlds (interview, February 20, 2022), the gender inequality discourse in Israeli academia has become legitimate only quite recently. Israel is still at a preliminary stage of the “fight”: “we are trying to float above water, we can’t look at the sky”. The interviewee views knowledge creation, content dimension and users experience as a concern for a much later stage, given that women’s under-representation is yet to be satisfactorily addressed. In addition, she expressed concern that application of the Horizon Europe new default policy would be in scientific areas in which gender content is irrelevant (e.g., mathematics) and would result in excessive and redundant requirements without achieving real results.

5. Discussion and Concluding Remarks

Our research showed that CTIW policy is required because de-facto innovation systematically is biased against women, either because the state invests less in such innovation, or the market pays less attention to the needs of women (or other disadvantaged groups). Hence, purposive action beyond production-side interventions is needed to overcome bias.

Both the EU and the Austrian cases provide an example of Kingdon’s theory of how the three streams of policy, politics, and problem come together to create a “window of opportunity”: policy entrepreneurs promote a favored policy (CTIW in this case) as a response to a perceived problem (gender inequality in R&I) and they receive political backing (in the EU and some of its Member States) leading to a new policy reality (Kingdon, 1995; Greer, 2016). In the process of conducting this research, it became quite evident that there is a group of prominent experts who are an active force, creating and maintaining the discourse and advancing policy. The policy may have been initially pushed from below (by academic figures), but ultimately its implementation depends on top-down actions by supra-national and national government. This reinforces Palmén & Kalpazidou Schmidt (2019) findings that top-leadership commitment is a facilitating factor in implementation of gender equality interventions in R&I.

Despite a highly developed discourse and EU commitment, initiatives across Europe and beyond are isolated, and do not ensure consistency and sustainability. While some states and

organizations have made progress, some are lagging, leading to “different levels of importance for the gender dimension in ... different countries from the ERA” (GENDER-NET Plus, 2022, p. 57). The interaction between the different policy supra-national, national, and sub-national levels shapes the direction the policy takes and leads to some commonalities, such as the funding focus or a preoccupation with the academic intuitional context. There are also important differences: in Austria, as opposed to Israel, top-level leadership and a gender equality supporting cultural-institutional environment emerged as important factors in explaining policy adoption, including as regards the private sector, as in the case of the FEMtech Research Projects program (see also Lasinger et al., 2019).

Our research indicates different policy challenges for CTIW. First, policy primarily targets public research performing institutions (i.e., the academic sector) and public funding organizations. Clearly, the private sector is no less significant but more difficult to influence. Second, CTIW is still very much in the shadows of more established and easier to measure innovation-centered policies that focus on the production side. Third, mainstreaming is an important policy tool, but as argued in the context of the Austrian FEMtech program, it is no substitute for government or institutional efforts to specifically target innovation for women in areas in which women require unique goods or services. Fourth, there are important questions of appropriate scope for the policy, as applying the policy broadly to all innovation areas may lead in some fields (e.g., mathematics) to unnecessary red tape.

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