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PROMOTING INCLUSIVE INNOVATION FOR PEOPLE WITH DISABILITIES: WHO DOES WHAT AND WHY?

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Abstract: Within the social investment approach, innovation policy plays an important role and People With Disabilities (PWD) are a central target category. However, we know very little about what governments do in this domain. This paper aims to offer a small step in bridging that research gap by investigating how innovation policy is employed for advancing the labor market inclusion of PWD. Specifically, we analyze two critical interrelated questions: *what* do governments do to guide innovation in this area? And *why* do governments pursue certain programs/policies while at the same time de-emphasizing others? Utilizing a qualitative comparative framework, we focus on Canada, Israel, Sweden and the United States. We find that policy across all countries is similar, especially in the emphasis on universal design. Additionally, differences between countries cannot be satisfactorily explained within the classical left-right ideological-partisan theoretical framework. Countries that are leaders in terms of social support for PWD – such as left-leaning Sweden - are not necessarily leaders in PWD-related innovation. This is particularly noticeable upon examination of government programs for support of Assistive Technology (AT) development. Governments that are more supportive of subsidizing AT purchases on behalf of PWD, are laggards in supporting its development and vice versa.

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Since the 1990s, a central goal for social policy is making society more inclusive. That is, offering individuals on the margins of society more and better opportunities at upward social-economic mobility (Lister 1998, Marlier, Atkinson et al. 2007).

Relatedly, governments across much of the developed world have gravitated during the 2000s to a 'social investment' approach. This approach focuses on social inclusion as a primary policy objective. Its advancement involves direct and indirect investments in the productive capacities of all individuals in society, but especially those that tend to populate the economic margins (Hemerijck 2013, Kvist 2015).

This emphasis on the economically marginalized entails that social investment policies focus on marginalized groups in society such as the low-educated young, lone mothers, ethnic minorities and People with Disabilities (PWD) (Morel, Palier et al. 2012, Zehavi and Breznitz 2018).

Innovation policy, which advances novelty and its implementation in society (Edler and Fagerberg 2017), could play an important role within a social investment approach. Ronchi, for instance, argues that: "Investing in R&D is in fact part and parcel of a Social Investment strategy centred on human capital in a knowledge-based economy, and was among the targets of the Lisbon Strategy." (2018: 467). Innovation policy could play an important role in shaping technology and organization in ways that would make future societies more equitable (Zehavi and Breznitz 2017).

In this article, we concentrate on government efforts to better integrate People With Disabilities (PWD) – a large and economically marginalized social category – into society and the labor force, specifically the role played by innovation policies that centre on supporting PWD through use of novel technologies. A study of PWD-related innovation policy is timely given many governments' growing emphasis on

social inclusion. Further, considering the fact that the share of PWD in society is growing, addressing this issue is becoming all the more urgent.

We ask two related questions: What do governments do to guide innovation, whether through regulation or finance, for the benefit of PWD? And *why* do governments pursue certain programs/policies while at the same time de-emphasizing others?

Clearly, answers to these questions are likely to depend on each government and country specific traits. Hence, it is important not only to generate cross-case generalizations, but also study differences and the factors that generate them. One traditional theoretical framework that guides such explorations of policy divergence is the left-right partisan policy thesis. Namely, left wing governments would show greater support than the right for inclusive and re-distributive policies (Esping-Andersen 1990, Huber and Stephens 2001). This anticipates that left-leaning governments/countries would support PWD-related innovation programs, as instruments of social inclusion, more than right-leaning counterparts.

However, there is reason to believe that this might not be the case. Until quite recently, not only was innovation policy not perceived as a social inclusion policy, its social-distributive aspects were ignored by both policy practitioners and academics. Innovation policy was understood and designed through frames that focused almost exclusively on its economic growth purpose (Schot and Steinmueller 2018). This suggests that practitioners of innovation policy might be reluctant to use it for purposes of social inclusion while proponents of social inclusion may miss innovation policy's transformative social potential.

We find that, largely as an expansion of the disability rights agenda, some headway was made in government involvement in PWD-related innovation in all countries,

however, this progress does not apply uniformly to all types of PWD-related innovation.

This paper makes two main contributions. First, it contributes to the disability policy literature that largely overlooks the significance and contours of government *policies* in support of PWD-related innovation despite the fact that the importance of innovation in its own right is widely recognized. We discuss three generic forms of government intervention – general workplace accessibility regulation, regulation for Universal Design, and financial support for Assistive Technology development – that together comprise PWD-related innovation policy.

Second, based on a comparative qualitative comparison of four country case studies – Canada, Israel, Sweden and the U.S. – we show that policy across systems is mostly similar. Moreover, differences between countries cannot be satisfactorily explained within the classical left-right ideological-partisan theoretical framework. Indeed, countries that are leaders in terms of social support for PWD – such as left-leaning Sweden – are not necessarily leaders in PWD-related innovation development policy. Innovation policy constitutes an awkward fit in the social investment agenda. This is particularly noticeable upon examination of government programs for support of Assistive Technology (AT) development. From a social policy-rights perspective, governments that are generally supportive of subsidizing AT purchases on behalf of PWD, show much less interest in supporting its development. From a policy logic perspective this could lead to serious failures because AT markets tend to be highly fragmented and therefore with limited profitability. Therefore, there is a clear case for government intervention necessary to fix market failures and achieve social good production. Accordingly, the fact that PWD-related innovation policy is a non-

ideological issue is a double-edged sword: while it could be supported by both right and left, it could also be neglected by both sides as well.

The paper proceeds as follows: we first explain the prospective importance of PWD-related innovation to PWD labor market participation and inclusion. We then expound on why the state should play a role in supporting such innovation and how it might do so through regulation and funding. After this, we present our case selection and methodology. The four country case studies are introduced next, followed by discussion of the findings.

The State and PWD

Comparing rates of PWD across countries is rife with problems. Indeed, there are cases in which different government agencies in the same country arrive at dramatically different PWD counts (Israel Ministry of Labor Social Affairs and Social Services 2017: 30). Still, what is amply clear is that PWD labor force participation rates are universally low when compared to those of the non-disabled (see Table 1).

Labor market participation rates, ages 20-64, for 2006-2007

	OECD average	Canada	Israel	Sweden	U.S.A
Non-disabled	71.3	75.9	67.6	80.9	74.5
PWD	43.6	43.7	44.2	62.3	35.5
Ratio	1.64	1.74	1.53	1.3	2.1

Source: Gal Zohar, (2011), "People with Disabilities in the Labor Market: Israel in Comparison to OECD Countries" Ministry of Trade, Industry and Labor (Israel – in Hebrew).
<https://employment.molsa.gov.il/Research/Seminars/Documents/X11506b.pdf>

Moreover, even if employed, PWD are more likely to hold a part time job than the non-disabled. Correspondingly, their income is lower on average and while in the OECD, the share of households in poverty in the mid-2000s was on average 14 percent, it was 22 percent for households that included a PWD (OECD 2010).

Low PWD labor market participation rates are, therefore, a social issue due to their association with low income and poverty. Considering that in almost all OECD countries the retirement age is rising, and disability rates are significantly higher among older age cohorts, it is clear that the problem of PWD low labor market participation rates is prevalent and set to grow more so.

Increasing PWD employment, particularly quality employment, depends on addressing different obstacles, such as low education rates and employer discrimination (OECD/ILO 2018). A critical obstacle is the physical workplace environment. Many workplaces fail to accommodate disabled workers in terms of the built environment or equipment/devices used. The application of existing and new technologies could play a critical role in making workplaces and society more accessible to PWD. For example, thanks to adaptations made to hand control modifications and lifts, people with lower limb disabilities are capable of operating tractors and combines (Hagberg 2017).

Technological innovations, whether they aid PWD in the workplace or elsewhere, could be roughly divided into two groups that differ in how they evolved. First, different types of AT help PWD function adequately in the workplace (Butler, Crudden et al. 2002).¹ AT is developed specifically for the purpose of aiding PWD

¹ The American federal definition of AT is: "any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is

and there is not necessarily any parallel technology serving the non-disabled (e.g., the cochlear implant for the hearing impaired). Governments in developed countries commonly *subsidize* the purchase of different AT for PWD.

The second group are technologies that fall under the heading of Universal Design (UD). These technologies are designed for general use, and as such are usable by PWD as well as others. For instance, software that automatically transcribes speech to text serves both the hearing impaired as well as those with flawless hearing in various tasks. Unfortunately, it is often the case that people with certain disabilities cannot use new technologies. While it is possible to 'correct' extant equipment and infrastructure – a practice known as 'retrofitting' – doing so requires an investment of both time and money. Universal (or inclusive) design is a response to the retrofitting challenge.

Innovation that follows the UD guidelines has the advantage of broad application and does not require retrofitting. With the rise of digital technologies, which are more easily amenable to UD, and legislation that requires workplaces to be PWD accessible, the concept and its application has spread (Steinfeld and Maisel 2012).

Both AT and UD innovation are important for PWD, and it is widely recognized that they complement each other (Basas 2013). What, however, is discussed far less is how such innovation comes about and governments' role in promoting it.

What would motivate governments to promote PWD-related innovation?

First, economic motivations could be key. Increasing PWD employment is good for the economy and potentially leads to reductions in welfare dependency. No less

used to increase, maintain, or improve functional capabilities of individuals with disabilities."(ECTA 2019)

importantly, a common argument is that there is a lucrative global market for PWD-related technologies. Accordingly, governments should encourage domestic firms to develop such technologies as part of their economic growth export-oriented policies (Ashington 2010).

Social and ideological reasons could also constitute an impetus. The spread of the equal access norm, due to the global emergence of the disability rights movement, pushed governments everywhere to adopt accessibility appropriate regulation (Pettinicchio 2013). Demands for PWD-related innovation policy might be viewed as an expansion of the disability rights agenda.

While the emergence of the disability rights movement is a global phenomenon, it is likely that different governments respond in diverse ways to it. Past studies have demonstrated that right and left differ in their approach to issues of distribution and inclusion (Esping-Andersen 1990, Huber and Stephens 2001). Left-leaning governments tend to pursue egalitarian and inclusive policies more than their right-leaning counterparts, for both ideational and political reasons. While this relationship has weakened somewhat in recent decades, it is worth noting that even today the high social investment countries – primarily the Scandinavian countries – lean strongly to the left (Hemerijck 2013, Ronchi 2018). Accordingly, one might expect that greater receptiveness to the disability rights agenda and greater policy attention to PWD-related innovation would be found in countries to the left of the ideational spectrum.

However, there is reason to question the notion that left-leaning governments employ innovation policy as a social policy instrument. Schot and Steinmueller argue that innovation policy is designed almost exclusively from an economic perspective (2018). Zehavi and Breznitz (2017) find that while innovation policy has significant

distributive implications, it is an expert-dominated apolitical field and as a result left-right differences account for little. While based on the left-right thesis, left-leaning countries/governments would be more supportive of PWD-related innovation, according to the apolitical innovation policy approach PWD-related innovation policy would be mostly detached from social concerns.

Even if innovation policy is apolitical this does not mean that governments would not support PWD-related innovation. As mentioned above, government might view PWD-related innovation as an economic investment. There appears to be a sizeable market opportunity in focusing technological innovation for PWD. In 2015, for instance, the global AT market was valued at \$14 billion and is predicted to reach as high as \$26 billion by 2024 – primarily due to the increase in the population share of the elderly (McCue 2017). However, PWDs are a niche market. The market appeal of serving PWD is reduced by the fact that they constitute less than 20 percent of the population. More importantly, thinking of PWD as a single market is misleading. There are infinitely different ways in which individuals might experience their disabilities. For example, disabilities impact mobility, hearing, vision, or any combination of the three. This implies that even if in the aggregate PWD constitute a large share of the population, their specific disabilities fragment them into many different market niches which require the development of different products (Mandelstam 1997).

Case selection and methods

To investigate government motivation, approaches, and shortcomings with respect to PWD-related innovation, we conducted comparative policy case studies of four countries: Canada, Israel, Sweden, and the U.S. These countries were chosen to fit

two different criteria. First, we chose economically developed countries that are also technological innovation leaders. Clearly, PWD innovation is relevant primarily in countries that demonstrate high innovation capacity in general. According to the World Economic Forum, (2016), in terms of number of patent applications per capita, Sweden is ranked 2nd, Israel 5th, the US 10th and Canada 19th. In ICT specifically, all four countries are concentrated among the top 12.

Second, the choice of these four countries offers variation in terms of ideological orientation. According to Esping-Andersen's welfare regime classification, the U.S. and Sweden represent very different types of welfare states. While Sweden is a social democratic welfare state that prioritizes state sponsored social protection and strives for greater equality, the U.S. is a liberal welfare state that prioritizes free markets over equality (Esping-Andersen 1990). Canada also belongs to the liberal welfare state group. Israel has moved along the ideological continuum from left to right (Zehavi and Breznitz 2017). Correspondingly, in the realm of disability policy, Sweden is considered a leader while the U.S. and Canada are relative laggards in both income maintenance and support of labor market integration (Böheim and Leoni 2018).

According to the left-right thesis, these ideological-political differences are likely to have an effect on the degree to which a government is willing to guide its innovation policy to address the needs of disadvantaged social groups, PWD withstanding (Zehavi and Breznitz 2017). A reasonable expectation would be that left-leaning Sweden, which is also a disability rights policy leader, would pay greater attention to PWD-related innovation policies than Canada and Israel, and certainly more than right-leaning America. In addition, in interviews, we asked about perceived differences between political right and left support for PWD in general, and PWD-related innovation policy *within* each country.

Qualitative casework is uniquely suited to investigating policy programs and the considerations that shape them (McNabb 2015). For the purposes of this study, we employed both archival work and semi-structured interviews. We analyzed documents produced by all four governments, relevant NGOs, and conducted 24 semi-structured interviews (during 2016-2019) with both government administrators and representatives of leading PWD-associated NGOs from the four countries. In the interviews, we asked about PWD policies in the country, the operation and motivation for employing PWD-related innovation programs/instruments, and the interviewees' views regarding the effectiveness and shortcomings of the government's approach.

As both the U.S. and Canada are federal countries, we moved beyond the federal to the state level. For similar reasons the Swedish case was supplemented by research into European Union regulatory policy regarding PWD, which influences member state practices.

Case studies

In each of the following sub-sections, we describe the situation on the ground in each of our four case studies. First, we present relevant background for each country. Then we discuss both UD and AT policies. Throughout this instrument/program anchored examination, we present the motivations for introducing these policies/programs, but also mention what were found to be non-factors in the policy process.

The United States

In the field of PWD-related innovation, the U.S. is a clear leader. In an analysis of the number of patent families filed for patents associated with AT for the visually and

hearing impaired, it was found that in the post-war era, the U.S. was the clear global leader (and the other three countries in this study all featured in the top 20) (Solomon and Bhandari 2015).

The U.S. is also a pioneer in terms of legislation intended to advance PWD. The American with Disabilities Act 1990 (ADA), which was passed with bipartisan support, extends civil right protections to PWD. Title I specifically requires employers to avoid PWD discrimination by providing reasonable accommodation to PWD workers. Such accommodation could include the provision of AT that enables PWD to perform their jobs properly. The ADA soon became a model for PWD rights legislation in other countries (Shapiro 2015).

Accessibility legislation that imposes accessibility standards on employers could *indirectly* spur PWD-related innovation. A federal officeholder with over three decades of experience in the PWD policy field explained that PWD-related technology policy design arises from an interactive process involving both government standard-setting agencies and private sector firms (Interview, February 22, 2017). The Access Board, which is in charge of setting standards for a broad set of technologies, cannot do so in a unilateral manner. New regulations are subject to a cost-benefit analysis administered by the Office of Management and Budget. This process leads to standards that balance PWD needs with those of employers. Many of the standards are functional rather than precise technical specifications. This relatively open-ended nature of standards, while not necessarily requiring technological innovation for PWD, leaves significant room for innovation geared at finding higher quality and/or more cost-effective ways of satisfying extant standards.

Nevertheless, as explained to us by a government interviewee that deals with AT at the state level, not only is innovation not mandated, state governments tend to be satisfied with virtually any technology that serves the 'reasonable accommodation' purpose mentioned in the ADA. Unfortunately, the equipment used by both employers and government to meet the accommodation requirement tends to be the cheapest and oldest available, and therefore outdated (interview, February 15, 2017).

While the U.S. has been a disability rights pioneer in some respects, in others it is a laggard. In 2006, the United Nations adopted the Convention on the Rights of Persons with Disabilities (UNCRPD) with the active support of disability rights groups (Sabatello and Schulz 2014). Most countries ratified the convention within five years of its adoption – including the three other countries in this study – but not the U.S. (United Nations Treaty Collection 2019). Although the ADA was passed with bipartisan support, in the 2000s, support for disability rights among Republicans waned with frequent reference to the argument that regulation undermines business competitiveness (Pettinicchio 2019).

The non-ratification of the UNCRPD is not inconsequential as UNCRPD obligates government to regulate for UD and thus to avoid, in advance, the complications associated with retrofitting workplaces to the needs of PWD. Nevertheless, the U.S. regulatory system does not completely ignore UD. In 2010, Congress passed the Twenty-First Century Communications and Video Accessibility Act (CCVA). Although previous legislation – including the ADA – applied to ICT infrastructure, it did not provide a sufficient remedy for the time lag problem: the laws failed to keep up with fast-paced technological change in the ICT field. Consequently, technology for PWD always seemed to be behind. The CCVA requires communication firms to employ UD to avoid such technology lags.

Disability rights groups have been influential in advocating for UD in government and in the business world (National Disability Rights Network 2017). At times, private sector firms take the lead on UD. This is especially true of ICT giants such as Apple and Google that embraced a disability mainstreaming approach (interview, December 2, 2016).

What about government support for customized AT innovation?

The federal government supports PWD-related innovation through regulation, but also via finance. Different government agencies offer grants for PWD innovation.

Headlining this effort is the National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR). The NIDILRR was established in two stages during the 1970s with the intention of promoting research on disability, primarily in its social context. This evolved into practical research focused on developing AT that would allow PWD to participate in society and the labor market (NIDILRR 2015).

NIDILRR's main program for developing AT is the Rehabilitation Engineering Research Centers (RERC). The Centers' technological focus is on rehabilitation therapy, communication and cognition, and mobility, and they are affiliated with higher education institutions and nonprofits (Reinkensmeyer, Blackstone et al. 2017).

External evaluation reports have found that the research products have generally been of 'good and better' technology quality and have been successfully disseminated (National Research Council 2012). Indeed, the RERCs are oriented toward technology development and application and have accordingly created programs for technology transfer from the centers to private American firms that otherwise would not benefit from sufficient R&D (Bauer 2003).

This combination within NIDILRR of AT development and transfer along with a focus on training constitutes a practical model for effective creation and dissemination of AT that could serve other countries interested in promoting PWD-related innovation (Hobbs, Close et al. 2009). However, the scale of NIDILRR is modest at best. Its overall budget for FY 2015 was around \$104 million of which the RERC program received less than 14 percent (NIDILRR 2015). Moreover, the NIDILRR budget has declined at least since the beginning of the millennium (National Research Council 2012). Given that the budget in 2009 was \$109 million and it remained at the same nominal level in 2019, one might conclude that the program is fiscally stable. When adjusted for inflation, however, the budget declined by nearly 20 percent over this period (Administration of Health and Human Services 2019).

Although one American interviewee attributed declining support to Republican economic thinking that ignores the social value of programs such as the RERC, other interviewees did not mention partisanship as a problem; rather general lukewarm government and advocacy interest in AT development.

Canada

The Accessible Canada Act was approved in June 2019. Under it, accessibility standards and regulation affect both the federal government and private sector businesses subject to federal jurisdiction (e.g., banks). One of the legislation's goals is to boost PWD employment in Canada (Disabled World 2019). However, at least to date, most activity on the PWD policy front, PWD-related innovation withstanding, occurs on the provincial level. For this reason, we delve into the case of Ontario, which is not only Canada's most populated province, but also considered a disability

rights trailblazer due to the passing in 2005 of the Accessibility for Ontarians with Disabilities Act: a law that construes accessibility as a human right.

In both Ontario, and now more broadly in Canada as a whole, the main regulatory emphasis is on UD. A senior figure in a national-level NGO supporting innovation for PWD, explained why UD is a priority.

"On the one hand, we can see technology's potential and promise to benefit lives of PWD, yet if technologies aren't designed in a way that PWD can use them, they quickly lose their promise. So we started working on solutions to render these technologies useful to PWD, but by the time we designed reverse-engineered solutions, the technology would have already evolved into something else. We still do some of that [with our R&D group], but we are now primarily focused on working with regulators and government at all levels around policies, as well as directly with industry, in helping them to understand the advantages and ways of designing in an inclusive way."

(interview, December 21, 2016).

How is regulation formulated? One Canadian government official stressed that standard setting must be done in coordination with the private sector firms that would be affected (Interview, December 20, 2016). Standards should be demanding but avoid imposing undue hardships. In this context, interviewees also stressed the importance of harmonizing Canadian with international – primarily American – standards. The adoption of international standards helps Canadian firms to innovate and produce technologies that meet market requirements in other parts of the world.

A couple of our Canadian interviewees made it clear that government's role should be the setting and enforcement of UD standards, but not much more. Other interviewees, however, argued that government should play a more expansive role in fostering

PWD-related innovation. Most importantly, the government offers grants for PWD-related research and design in higher education institutions. Thus, for example, in Ontario, the Inclusive Design Research Centre at the Ontario College of Art and Design (OCAD) and the University of Toronto Intelligent AT and Systems Lab benefit from government grants.

Nevertheless, interviewees not only complained that government support declined in recent years, but also went further and argued that what was lacking was specific and sustained attention by government to AT development and that the government should *institutionalize* such support. One senior official in a national NGO argued:

"The two questions – innovation and disability – have not been put together in the past, at least not in a policy context. I think there may be a lot of small companies in the country that are working on devising technological aids/devices for PWD. They themselves are doing an excellent job. But in a policy context, it's almost a void. The innovation agenda and the disability agenda have not crossed paths."

She continued:

"Typically, the government identifies sectors – like clean tech and agriculture – as areas they want to support for their innovation. Disability supports would be a fantastic area to look at." (Interview, March 20, 2017).

In an article describing the evolution of the RERCs in the U.S., Hobson mentioned that the Canadian government established four research centers dedicated to innovation in prosthetics in the 1960s on the backdrop of the thalidomide crisis that involved the birth of mobility-disabled children due to the use of thalidomide by

pregnant women. By the mid-1970s, however, the government closed down these centers (Hobson 2002).

The proximity of Canada to the U.S. raises the question of why invest in AT innovation when the world's AT powerhouse is right next door? In response to a question about whether it was important to do PWD-related innovation in Canada, most interviewees answered in the affirmative. One reason mentioned is the importance of fostering local innovative capacity. Given disability's multifarious nature, there is always a need for individual-level technology adaptations – something that is easier to do where there is relevant local engineering and design capacity.

Canadian disability advocacy groups generally pay little attention to innovation policy and to the extent that they do, the focus is on UD, not promoting AT. One interviewee – as was also the case in the U.S. – discerned some differences between political right and left. He argued that politicians and parties from the left tended to be supportive of PWD and their reasons were often rights-based. Right-leaning politicians and parties were less 'social' and to the extent they supported PWD-related innovation, they did so for economic reasons: mostly fostering what they viewed as a lucrative market.

This view, however, was a minority view in both the U.S. and Canada. Most interviewees argued that personal experience with disability was much more likely to influence views on PWD-related innovation policy, than political-ideological orientation.

Sweden

As a member of the European Union (EU), Sweden is subject to EU law. In general, Sweden is considered a PWD rights leader as demonstrated in its ratification of the UNCRPD in 2008, two years earlier than the EU's 2010 ratification. Disability rights

leadership is expressed not just in legislation that bans discrimination (Lejeune 2017), but also in wage subsidies for PWD-hiring employers and significant labor market activation policies targeting PWD. Consequently, Sweden's PWD employment rate is high relative to the EU average (Kuznetsova and Yalcin 2017). Moreover, the Swedish Disability Federation has been engaged in government policy and implementation with a special emphasis on PWD labor market integration for years (Lejeune 2017).

European regulations and standards tend to be 'functional,' that is, allowing for more leeway, than specific technical regulation, in deciding how best to meet accessibility standards. Nevertheless, it would be a mistake to think that the standardization process is smooth. One interviewee who works for the European Disability Forum – a network of disability-associated European NGOs that interacts with the European Commission – described pushback from commercial concerns:

"But in the end, they see this as more regulation, they don't want to be regulated, they prefer flexibility, they basically want to be free to come up with whatever they want and whatever they feel is suitable for PWD." (Interview, December 13, 2017).

Clearly, the costs of PWD accessibility are a concern for private entities as has been shown to be the case in Sweden as well (Kuznetsova and Yalcin 2017). Cost effective PWD-related innovation could, in principle, help reduce costs, not just for employers, but also for the Swedish government that subsidizes PWD employment.

Vinnova, Sweden's agency in charge of applied R&D policy, has adopted a UD approach: it is expected that government-supported innovation should follow UD principles when possible (interview, February 12, 2018). Vinnova also supports

discrete AT projects (for example, see: <https://www.vinnova.se/en/p/seamless-affordable-assistive-technology-for-health-saath/>). What Vinnova does not sponsor, however, is a specific program/institution dedicated to PWD-related innovation that focuses on AT.

When specifically questioned about it, interviewees failed to detect any significant differences between right and left on PWD-related innovation policy. There appears to be universal support for UD, however, there is no real advocacy for establishing a dedicated AT program.

Israel

Although Israel ratified the UNCRPD in 2012, its accessibility legal framework is relatively underdeveloped with only sporadic use of the 'equal human rights' approach (Rimmerman, Soffer et al. 2015). UD specifically, is mostly on the margins of policy discourse and practice. This state of affairs is surprising in a country that was forced to deal with a significant share of disabled due to war and immigration from its very beginning as well as having an economy boasting a highly advanced high-tech sector (Holler 2014).

In 2015, an Israeli Ministry of Labor and Welfare publication stated that every year the Israeli economy loses 5 billion Shekels (or slightly less than 0.5% of GDP) due to low PWD employment rates (2015). Interestingly, however, a top official in the very same ministry doubted whether integrating more PWD into the labor market was cost effective given the combination of limited average PWD productivity and the costs of accommodation (Interview, June 18, 2018). In general, there are unfortunately very few studies that analyze the cost-effectiveness of PWD accommodation in the workplace and these few are far from conclusive (Padkapayeva, Posen et al. 2017).

Until recently, AT innovation appeared to be very much on the margins as well.

However, in 2012, Israel's R&D agency, the Office of the Chief Scientist (OCS, now the Israeli Innovation Authority) established a program for PWD-related innovation that is currently named the Assistive Technology for the Disabled Incentive Program, or *Ezertech* in Hebrew.

Despite the fact that the OCS, in principle, pursues solely economic objectives, it established *Ezertech* for 'social' reasons (Interview, April 28, 2014; Zehavi and Breznitz 2017). In fact, the reason the program was created was due to the fact that all the companies developing PWD-related innovation that received OCS grants before failed. Failure was attributed to the fact that PWD target market were small. OCS administrators therefore concluded that it would be a mistake to treat PWD-related innovation as a normal business (Office of the Chief Scientist 2014).

Because *Ezertech* sponsors projects that in most cases are not considered economically viable, this program follows different rules than other Israel Innovation Authority programs. First, it sponsors non-profits and not only commercial companies. Second, projects are supported at a higher rate (85 percent of R&D budget instead of the usual 50 percent cap) than usual and are exempt from the obligation to pay back the grant in case of commercial success. Finally, the screening process involves not just a professional technological and economic assessment of proposed projects, but also a PWD needs-centered assessment that is conducted by National Institute of Insurance personnel. However, the resources devoted to the program are modest: in 2018, *Ezertech* supported 16 projects at a total cost of 10 million shekel (about USD 3 million) (Israel Innovation Authority 2019).

This program was very much an internal bureaucratic initiative. Disability rights groups were not involved and did not advocate for such a program. Indeed, one senior government official argued that many PWD activists not only did not care about supporting PWD-related innovation to advance PWD labor market participation, but were also hostile to government efforts to advance PWD labor market participation in general. The reason being that such efforts were viewed as undermining efforts to increase disability benefits (Interview, June 18, 2018).² None of our interviewees noted any differences between right and left.

Discussion

A consideration of what constitutes PWD-related innovation policy across the four countries highlights the importance of both government regulation and direct intervention in the innovation process itself. On the regulation side, there is both an indirect and direct effect. The indirect effect operates via regulation, which requires that workplaces guarantee PWD accessibility. This creates demand for new, or better, technologies that would help accommodate PWD needs in the workplace or elsewhere. While this indirect regulatory effect was noted, it received relatively little attention.

Government UD requirements constitute the direct regulatory effect. This is an intervention on the supply side in which governments do not guide innovation in general; rather, they mandate that whatever technologies are created be usable by all. On the finance side, governments support innovation that leads to the creation of AT. This type of innovation is largely customized. In all four countries governments offer

² See Gilad and Rimmerman 2014 for a similar observation.

support for specific AT projects and non-government AT development centers. In some countries, there are dedicated government programs that focus on AT development.

Variation across the countries exists, but is not very significant. This is especially true in the case of regulation for UD. The UNCRPD requires governments to commit to UD. Three out of four countries, the U.S. being the one exception, have ratified the UNCRPD. How this works in practice is yet too early to say. 'Undue hardship' could lead to many an exemption, and if enforcement is lax, firms could simply ignore UD requirements altogether. Moreover, in both North America and Europe, interviewees testified that there is business pushback to such regulation and governments are attentive to business demands. On the other hand, due largely to the activities of the disability rights movement, some UD occurs regardless of the UNCRPD. Most notably, the U.S. promotes UD as manifested in the CCVA. American commitment to UD is especially significant from a disability perspective considering the fact that the U.S. is an innovation global leader in digitized technology. There are numerous examples in each of the countries of government grants in support of AT development. However, the U.S. and Israel have dedicated government AT programs while Canada and Sweden do not.

This is surprising. We hypothesized that left-leaning governments are likely to be more supportive of PWD-related innovation than right-wing counterparts are. Indeed, Sweden not only has in general more expansive welfare programs than the other three countries, but also stands out specifically in terms of its investment in disability rights. Specifically in the case of AT innovation, all countries sponsor such innovation. However, it is the right-leaning U.S. and Israel – a regulatory infrastructure laggard – that established programs for this purpose (the RERC and

Ezertech), not enlightened left-leaning Sweden. An international comparison of the U.S. (right) and Sweden (left) fails to offer clear support for the left-right thesis. Moreover, interviewees in Israel and Sweden did not discern any partisan differences on this issue within their countries and most Canadian and American interviewees disagreed with this hypothesis.

Nevertheless, it appears that in the U.S. over the last decade some differences have emerged between Democrats and Republicans regarding how to strike a balance between PWD rights and business (Pettinicchio 2019). These differences might ultimately affect PWD-related innovation as well.

A 'no-advantage-for-the-left' outcome appears consistent with the apolitical innovation policy thesis: innovation policy experts think about innovation as economic policy and those interested in social policy tend to ignore innovation. Indeed, while disability rights advocates push for government support for the purchase of extant AT devices, very little attention is paid to government involvement in innovation. To the extent that PWD-related innovation attracts attention, it is primarily in the form of regulation for UD – not AT. UD holds the promise of equal access with no more retrofitting while, at least for some, AT is associated with a bygone era in which PWD were socially marked as 'damaged' and AT devices were means of partial correction of physical faults (see, for example, Dahl et al. 2013).

Even if innovation policy makers approach PWD-related innovation as primarily an economic issue, they might find reasons to promote it. One economic rationale for doing so is that this will indirectly help boost PWD employment and therefore the economy. However, while PWD technologies could increase employment, the degree

to which such investment is worthwhile based on a purely utilitarian calculus is yet to be examined (Padkapayeva et al. 2017).

The second, and more prevalent, rationale is that PWD-related technologies, whether in the form of UD or customized AT, could appeal to a significant global market.

Market size is set to increase with population aging. The fact that there is a longstanding private AT industry is testament that profits could be made in this area. Moreover, as we heard in both North America and Europe, government efforts at regulation harmonization are intended to facilitate global market penetration for local firms working in this field. However, not only is innovation fraught with uncertainty in general, the multifarious nature of disability implies that these markets are considerably shallower than aggregate PWD incidence figures would suggest. As much was said by several of our interviewees that doubted whether without government support – either directly for innovation or indirectly through government procurement/subsidy of AT – AT innovators would survive. In fact, the Israeli Innovation Authority *Ezertech* program was established in response to the ongoing commercial failure of companies innovating in the AT field.

Given weak support from the disability rights community and the tepid economic case for them, it is clear why government AT development programs are either weak and suffer from declining funds – the American and Israeli cases – or do not exist to begin with.

Conclusion

Social investment policies aim to increase inclusion by enhancing the productive capacities of individuals leading to both more and better employment opportunities.

Innovation policy is an important component of the social investment toolbox while PWD are a central target category. Hence, we should expect that governments intent on social investment prioritize PWD-related innovation policy.

Despite the importance of such policies, we have little knowledge of what governments actually do. An examination of relevant policies across four innovation leaders demonstrates that government involvement takes the form primarily of regulation for UD and funding for AT. UD is still in its infancy, but governments appear committed to advancing it. Support for PWD-related innovation is not based on a left-leaning social investment coalition, but a more specific disability rights movement that exists in all countries.

Interest in AT development policy, which has a longer history than UD, is relatively weak as manifested in low and declining government funding levels for dedicated programs in the U.S. and Israel and the absence of such programs in Canada and Sweden. The left-right ideological thesis offers little purchase in understanding this state of affairs. Relative government, or country, position on the left-right continuum is not associated with policy. Indeed, for those interested in social policy, AT development policy is very much a blind spot. Conversely, from a purely economic perspective centered on prospective returns on investment, however, it is not self-evident that PWD-related innovation merits government investment.

To guide technological progress in a direction in which it would be helpful to PWD, policymakers should expand UD regulation and systematize support for AT innovation – especially in leading innovation economies. The latter requires the institutionalization of dedicated programs supporting AT innovation. It is likely that internationally inter-connected PWD innovation centers that are generously and

consistently funded would be able to accelerate PWD-related innovation, its dissemination and application. This could ultimately lead to significant growth in international AT markets and PWD employment rates. For now, the economic case for such programs appears weak and the social case does not receive widespread support. Progress toward equality in access therefore demands a growing awareness among policy makers – politicians and bureaucrats – and other stakeholders of the social importance of PWD-related innovation and the value of supporting its different strands.

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