Heterogeneous Disability Shocks and the Dynamics of Income, Employment, and Partial Insurance

By Robert Millard*

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Abstract

This study examines the long-run economic consequences of disability, distinguishing conditions by the activities they impair. Using linked Canadian survey and administrative tax data, I estimate the effects of disability onset on detailed income components over a ten-year horizon and assess gaps in partial income insurance across disability types. Mental–cognitive disabilities lead to larger and more persistent losses in market income than physical disabilities. Despite this, both groups experience similar levels of partial insurance and comparable declines in after-tax income. Importantly, substantial heterogeneity exists within these broad categories. Disaggregating physical and mental–cognitive disabilities into mutually exclusive activity-based subtypes reveals pronounced differences in income trajectories and access to insurance that are masked by aggregate classifications. While the tax–transfer system provides partial income protection overall, its effectiveness varies markedly across subtypes, offering especially limited support for mental health–related disabilities, particularly among younger and less-educated individuals.

JEL classifications: H30, I10, I14, I38, J14

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I Introduction

The onset of a work-limiting disability reduces the capacity to perform essential tasks in both work and daily life, undermining financial independence and imposing substantial societal costs associated with providing support. Consequently, disability-related economic inequalities are widespread in both developed and developing nations (Garcia-Mandico, Prinz and Thewissen, 2022). In Canada, working-aged adults with disabilities were more than twice as likely

*Assistant Professor, Department of Economics, Stony Brook University, 100 Nicolls Rd, Stony Brook, New York, USA, 11794. Email: robert.millard@stonybrook.edu.

This paper uses confidential data that are administered by Statistics Canada and cannot be made publicly available. Steps for data access can be found at `https://www.statcan.gc.ca/en/microdata/data-centres/access`. Supplementary files may be provided to replicate the analysis given access to these data. The author declares that he has no relevant or material financial interests that relates to the research described in this paper. I extend many thanks to Audra Bowlus, Nirav Mehta, Christopher Robinson, Todd Stinebrickner, Rory McGee, Naoki Aizawa, Baxter Robinson, David Wiczer, Kathleen McGarry, Steven Stern, Tom Triveri, Cecilia Diaz-Campo, and Marco Pariguana, seminar participants at the University of Western Ontario, Stony Brook University, St. Francis Xavier University, and participants at the 55th Annual meeting of the Canadian Economics Association, and the 2023 Stata conference in Stanford for helpful comments and questions, and for excellent RA help from Shafira Widjaja.

to be low-income (23% vs 9%).[1] Disability is a prominent risk to income stability for working-aged adults, many of whom will experience some form of disability before retirement.[2] However, the effects of work-limiting disability vary substantially across individuals. Identifying the sources of this variation is essential for designing insurance policies that allocate scarce resources toward those bearing the greatest burden.

A key source of heterogeneity in disability effects arises from differences in the tasks and functions that are impaired. Disabilities may stem from one or multiple physiological conditions and vary substantially in how they constrain daily activities and productive work. Classifying disabilities by the tasks they limit captures a critical intermediate link between health conditions and economic outcomes. This distinction is evident empirically; for example, 17% of Canadians with physical-sensory activity limitations are low-income, compared to 27% with mental-cognitive activity limitations (Wall, 2017). While sharing the commonality of impairing functionality, the economic effects of disabilities vary greatly depending on the importance of limited functions for work and daily life.

This paper provides a comprehensive analysis of heterogeneity in the income effects of disability types defined by activity limitations, focusing on disaggregated components of personal income. I examine how various sources of partial insurance mitigate declines in market income following disability onset, highlighting disparities in insurance coverage across types. I estimate effects in each of the ten years after disability onset using a standard two-way fixed effects estimator. The findings are robust to two alternative specifications that address distinct sources of bias inherent in treating disability as an intervention. First, the interaction-weighted (IW) estimator of Sun and Abraham (2021) corrects for bias arising from unobserved heterogeneity under staggered treatment timing. Second, a propensity score matching (PSM) approach mitigates bias stemming from the non-random nature of disability onset.

The analysis starts with distinguishing disabling conditions that affect physical activities from those affecting mental-cognitive activities. While this distinction is commonplace in the related literature, it masks important heterogeneity within these "aggregated" disability types.[3] Next, I conduct the analysis on more granular mutually exclusive activity limitations within the aggregated disability types. Within aggregate physical, I distinguish disabilities to one's kinetic ability (encompassing limitations to mobility, flexibility, and dexterity) from disabilities related exclusively

[1] A household is low-income if its members earn less than one-half of the median Canadian income, adjusted for household size. These statistics are derived from the 2014 wave of the survey dataset applied in this study. For additional details on low-income Canadians with disabilities, refer to Wall (2017). A comparable size poverty gap persists in the United States, where 25.2% of working-aged adults with disabilities lived in poverty in 2020, compared to a poverty rate of 11.9% for adults without a disability (Houtenville, Shreya and Rafal, 2021).

[2] Disability rates have been rising in Canada and in most developed nations. The percentage of working-aged Canadians with a disability rose from 12.4% in 2001 to 22.3% in 2017. This trend is likely to continue with an aging population as disability risk tends to increase with age. This increase may also be partially due to the evolution of the definition of what constitutes disability and changes in an individual's reporting behaviour. For more details on the economic position of Canadians with disabilities, see Morris et al. (2018). In comparison, the Social Security Administration estimates that three in ten individuals aged 20 years old will experience a disability before retirement (Autor, 2011).

[3] This sort of distinction is often seen in the literature on multidimensional health, such as Yi et al. (2015); Deshpande (2016); Wen (2022), and in the literature on multidimensional human capital, such as Poletaev and Robinson (2008); Yamaguchi (2012); Sanders, Taber et al. (2012); Lindenlaub (2017); Robinson (2018); Lise and Postel-Vinay (2020).

to pain.[4] Within mental-cognitive, I differentiate disabilities affecting cognitive functions (such as learning, memory, or concentration) from those associated exclusively with mental health conditions (like depression, anxiety, or post-traumatic stress disorder).

I use a Canadian dataset, the Longitudinal and International Study of Adults (LISA), to perform the analysis. LISA links a short panel survey containing detailed disability and demographic information with a panel of administrative tax records, known as the T1 family files (T1FF), derived from annual income tax filings. The tax records partition personal income into disaggregated components of market income, such as paid or self-employment income, and government transfers, which include a diverse range of federal and provincial policies and tax credits. This linkage enables direct comparisons of post-onset dynamics in market income with changes in government transfers, before- and after-tax income, and the income of other family members within the household.

This paper documents substantial heterogeneity in the dynamic income effects of disability onset, with the most pronounced disparities emerging across granular disability types. In the short run (within five years of onset), declines in wages, salaries, and commissions (WSC) are similar for physical and mental–cognitive disabilities. In the long run, however, income losses associated with mental–cognitive disabilities roughly double in magnitude, while losses for physical disabilities remain relatively stable. On the extensive margin, physical disabilities lead to a persistent 10 percentage-point reduction in labour market participation, whereas mental–cognitive disabilities are associated with continued workforce exit, reaching a 25 percentage-point decline ten years after onset. These averages conceal stark differences in both income losses and insurance mechanisms once conditions are disaggregated.

Market income losses are partially offset by increases in government transfers and reductions in taxes paid, though the composition of insurance differs by disability type. The magnitude of increase is similar for both aggregate physical and mental-cognitive. Family members' income shows limited average responses, indicating modest household spillovers. Despite these adjustments, after-tax income declines significantly for both disability types by a similar magnitude.

Although aggregate physical and mental–cognitive disabilities exhibit similar short-run declines in market income and government transfers, these averages mask stark differences in income losses and insurance mechanisms once conditions are disaggregated. Among physical disabilities, income losses and transfer responses are driven almost entirely by impairments to kinetic ability. These disabilities generate sizable reductions in market income and sustained declines in total household income, including family members' earnings, while also triggering meaningful increases in government transfers. In contrast, disabilities related exclusively to pain show small and largely statistically insignificant effects on both income and transfers, indicating that pooling pain-related conditions with other physical

[4] Kinetic ability describes the body's ability to move efficiently, exhibit agility, and perform tasks that require coordination and precision. Kinetic abilities include walking, running, jumping, bending, twisting, reaching, grasping, and manipulating objects.

impairments attenuates estimated effects.

Within mental–cognitive, disabilities affecting cognitive functioning experience the steepest declines in market income following onset, but also the largest increases in government transfers and reductions in net taxes paid. These channels provide substantial partial insurance to offset some losses in the long run. Mental health disabilities, however, receive little comparable support. Despite income losses similar in magnitude to those associated with kinetic impairments, individuals with mental health disabilities do not experience significant increases in government transfers or from family members. Instead, their only meaningful source of partial insurance comes through reductions in tax liabilities, which are insufficient to prevent large and persistent declines in after-tax income. Taken together, these results highlight a potentially severe gap in effective insurance for mental health–related disabilities. Unlike other disability types, mental health conditions combine substantial and long-lasting income losses with muted transfer responses, leaving affected individuals exposed to sustained reductions in resources available for consumption.

Finally, I analyze heterogeneity in the effects of disability onset by education and age. Lower-education individuals experience larger and more persistent declines in employment income and labour market participation, particularly for mental–cognitive disabilities, while higher-education individuals exhibit more limited employment exit and smaller income losses. Lower-education households also rely more heavily on public transfers, in line with the findings in Lundborg, Nilsson and Vikström (2015). Individuals experiencing a physical disability later in life are more likely to exit the labour force, whereas younger-onset individuals remain more attached to the labour market. Accordingly, older individuals receive larger increases in government transfers, reflecting eligibility rules in programs such as disability insurance that explicitly incorporate age-based criteria. These patterns for physical disabilities align with the findings in Humlum, Munch and Jorgensen (2023), while no clear age gradient emerges for mental–cognitive disabilities.

This paper contributes a comprehensive analysis of heterogeneity in the effects of disability shocks on market income and a range of partial insurance sources. First, it introduces a nuanced classification of disability types based on the specific activities they limit, revealing substantial heterogeneity that is obscured by conventional, coarse health categorizations. Second, it provides a detailed examination of the channels through which individuals partially insure income following disability onset, comparing insurance gaps across disability types and clarifying the roles of government transfers, family income, and the progressive tax system. This granular approach enables a sharper assessment of both the components of market income most affected by disability and the effectiveness of different insurance sources. Finally, the paper offers new evidence on the economic consequences of mental health disabilities, highlighting pronounced insurance shortfalls and underscoring the need for improved income protection within existing social support systems. The next section situates these contributions within the broader literature and clarifies their implications.

The data used in this study offer several advantages for analyzing disability shocks, a literature that has until recently focused primarily on the United States. First is the quality of the administrative income tax data. Access to income tax records is mostly restricted in the US, and research about health shocks frequently relies on large panel survey datasets, such as the Panel Study of Income Dynamics (PSID) or the Health and Retirement Study. The administrative tax records provide detailed income and transfer measures less susceptible to measurement error and under-reporting, two issues increasingly recognized as problematic in household surveys (Meyer, Mok and Sullivan, 2009, 2015). Second, my analysis facilitates cross-disability type comparisons with an internally consistent measure of disability, addressing the issues related to drawing comparisons across samples, datasets, methodologies, and studies. Lastly, Canada grants universal health insurance, unlike the US, where health insurance access is intertwined with disability policy. The Canadian setting allows for a cleaner analysis of the incentives from disability policies that are unconfounded by the added value of health insurance (Deshpande and Lockwood, 2022).

The remainder of the paper is organized as follows. Section II discusses the paper's contribution to the related literature. Section III describes the institutional features of disability policy in Canada. Section IV introduces the data and summarizes its key characteristics, including demographic composition and differences across disability types. Section V outlines the empirical framework. Section VI presents and discusses the main empirical results, and Section VII concludes.

II Literature Review

This study contributes to an extensive literature on the dynamic effects of permanent income shocks and the mitigating role of public programs. I document new insights into the sources of heterogeneity underlying health-related income shocks. Additionally, I assess the completeness of partial insurance in smoothing consumption across types, identifying relative insurance gaps. For instance, Blundell, Pistaferri and Preston (2008), Kaplan and Violante (2010), and Blundell, Pistaferri and Saporta-Eksten (2016) show how transfer programs, family resources, and the tax system play crucial roles in cushioning the impacts of transitory shocks and partially insuring against permanent income shocks in the PSID and Consumer Expenditure Survey. Unlike such previous studies using survey measures of income, my analysis uses administrative data from annual income tax filings, offering important advantages in data quality. Related studies employing administrative data include Blundell, Graber and Mogstad (2015), who investigated life-cycle income dynamics in Norwegian registry data, including income tax records. They highlight the role of the progressive tax-transfer system in attenuating the severity and persistence of income shocks, particularly for low-income groups. This paper differs by explicitly characterizing the sources of heterogeneity in income shocks, rather than treating shocks as homogeneous. By distinguishing disability types according to the specific activities they limit, the analysis provides a more precise account of why the effects of permanent income shocks vary across individuals. Moreover, because the social insurance system allocates resources through programs specifically designed to insure against disability-related risks, the paper directly links heterogeneity in shocks to heterogeneity in insurance responses.

This research contributes to the broader literature on the longitudinal effects of health and disability shocks on labour supply, income, and consumption (Stephens Jr, 2001; Charles, 2003; Singleton, 2012; Lundborg, Nilsson and Vikström, 2015; Polidano and Vu, 2015; Meyer and Mok, 2019; Fadlon and Nielsen, 2021; Collischon, Hiesinger and Pohlan, 2023; Humlum, Munch and Jorgensen, 2023). My analysis is distinguished by its use of rich disaggregated personal income measures from administrative tax records, robust empirical design, and its focus on heterogeneity in effects by disability types.

Several related studies also employ administrative data. For instance, Lundborg, Nilsson and Vikström (2015) use Swedish administrative registry data to demonstrate how the consequences of health shocks vary by education level. I build on their analysis by incorporating disability types and education to study heterogeneity in income effects, and by extending the scope beyond labour market outcomes to examine responses across multiple partial insurance channels. Autor et al. (2019) use Norwegian administrative data to study the insurance-incentive effects of disability insurance on incomes and consumption, but their analysis focuses on disability insurance applicants. Fadlon and Nielsen (2021) use Danish administrative data, but narrow their analysis on family labour supply responses following health shocks. More recently, Humlum, Munch and Jorgensen (2023) also use Danish administrative records to investigate the dynamic effects of workplace injuries on re-education and disability insurance applications but focuses their analysis on physical injuries. Collischon, Hiesinger and Pohlan (2023) use German administrative data to investigate how workplace task characteristics influence the effects of disability onset. My analysis focuses on a similar mechanism driving heterogeneity in disability shock but complements their study with the comprehensive analysis of the partial insurance system.

The second key contribution of this paper is the analysis of heterogeneity in effects by categorizing disabilities into distinct, mutually exclusive types. Related work on health shocks emphasizes the role of type-based heterogeneity in the consequences of distinct disabling or medical conditions.[5] However, the mechanisms underlying the effects of a specific health condition on behaviour and outcomes remain somewhat ambiguous. Focusing on the activity limitations caused by a given health condition helps to clarify the link between health conditions, productivity, and labour market outcomes.[6] Disability fundamentally alters a worker's human capital profile, creating a mismatch between their skill

[5]For instance, Von Wachter, Song and Manchester (2011) find heterogeneity in employment and earnings across types of disabling conditions in their analysis of rejected applicants to disability insurance, Maestas, Mullen and Strand (2013) study heterogeneity across different medical conditions in their analysis of the work incentives of disability insurance, Lundborg, Nilsson and Rooth (2014) finds heterogeneity in the lifetime effects of specific diseases or physiological conditions that occur in adolescence, and Black et al. (2024) study heterogeneity in the relationship between disability insurance and mortality by types of medical conditions.

[6]For instance, when left untreated, diabetes can result in a substantial physical impairment, which may restrict the set of physically demanding

set and the skill requirements of their work. A disability that limits certain tasks will have varying implications for labour market outcomes depending on the worker's proficiency in these tasks, their use in work, and the market's valuation of these tasks.

The distinction between physical and mental–cognitive disabilities is standard in both the health and human capital literatures. For example, Yi et al. (2015) define a capability vector comprising physical health, mental health, and cognitive functioning, while Deshpande (2016) studies how discontinuing youth from disability support differentially affects individuals with physical versus mental or intellectual disabilities. These studies focus on disabilities present in childhood and adolescence, whereas my analysis examines disabilities that arise during individuals' working lives, after most educational investments have been completed.

Other related work also highlights this distinction: Wall (2017) groups mental-cognitive and physical in their analysis of poverty and persons with disability in Canada; Wen (2022) separates physical and cognitive health in studying older workers' retirement decisions, Humlum, Munch and Jorgensen (2023) study how physical work accidents cause individuals to compensate by investing in their cognitive skills; and Collischon, Hiesinger and Pohlan (2023) partition disabilities into physical, sensory, or psychological in analyzing labour market effects. Furthermore, studies on multidimensional human capital often differentiate physical and mental-cognitive skills to capture how these distinct capacities influence earnings and skill accumulation (Poletaev and Robinson, 2008; Yamaguchi, 2012; Sanders, Taber et al., 2012; Lindenlaub, 2017; Robinson, 2018; Lise and Postel-Vinay, 2020). This study contributes by moving beyond aggregate classifications to consider more granular disability types, revealing substantial heterogeneity in how individuals are affected by different disabilities within these broad categories. To the best of my knowledge, no prior research has conducted a longitudinal analysis of both physical and mental-cognitive types across market income components and a complete set of partial insurance mechanisms within a unified framework.

Finally, this study contributes to a growing literature studying the economic consequences of mental health. Mental health's impact is increasingly recognized as a crucial determinant of economic success, particularly in the labour market.[7] Much of the existing economic research focuses on the costs and consequences of mental health conditions on employment, job selection, and earnings capacity (Moser, Biasi and Dahl, 2021; Wang, Frank and Glied, 2023; Jolivet and Postel-Vinay, 2024). Compared to other disability types, mental health can be equally or even more detrimental to these outcomes. For instance, Frank and Glied (2023) note that while advances in the treatment and accommodations of mental illnesses have sharply increased in cost, they have only modestly reduced functional losses, unlike other medical conditions where improvements in care have resulted in sizable reductions in functional losses.

tasks a worker can perform. However, with proper treatment, diabetes may not limit one's activities or productivity. Data on activity limitations can distinguish these two outcomes, but data on diabetes diagnoses alone can not.

[7] For a useful overview of this literature, see (Prinz et al., 2018).

Further, little is known about how and where individuals smooth their consumption following the onset of a mental health disability. This paper fills that gap by examining how individuals with mental health disabilities cope with income losses, identifying which sources of partial insurance are most important, and comparing insurance gaps to those observed for other disability types. The findings suggest that, outside of the buffering effect of the progressive tax system, these people are underinsured by traditional programs.

III Institutional Setting

The policy environment in Canada is comprised of various programs at the provincial and federal levels. Programs can be partitioned into social security programs for the retired and elderly, economic security programs for families, targeted insurance for specific economic shocks, and welfare programs to fight poverty.[8] Moreover, the Canadian tax system offers economic support for families and individuals with a disability through various tax credits and benefits.

For the population affected by disability, these programs provide income insurance for earnings lost because of their disability, rehabilitation for reintegration into the workforce, and welfare transfers for individuals unable to reintegrate (Torjman and Makhoul, 2016). Programs differ in their eligibility requirements, the screening of the population covered, the duration of aid provided, and the generosity of aid provided. In this paper, I distinguish transfers most relevant for individuals affected by disability. These "disability-relevant" programs include disability-specific tax credits and income replacement programs from worker's compensation, employment insurance, federal disability insurance, and provincial social assistance programs. This section outlines the features of these disability-relevant programs.

The federal pension program in Canada, the Canadian Pension Plan (CPP), administers disability insurance, which delivers monthly financial transfers to individuals that are deemed eligible for the program. Eligibility requires that recipients be younger than 65, are not currently receiving CPP retirement benefits, have made a predetermined number of contributions to CPP, and are markedly restricted by a physical or mental disability.[9] Importantly, to receive disability insurance, an applicant must prove that their disability is both prolonged and severe. A disability is prolonged if it is expected to be indefinite or likely to result in death.[10] The severity of the disability concerns the applicant's ability to engage in "substantial gainful activity" in the labour market, which is a subjective assessment of an applicant's perceived productivity in the labour market, given the barriers imposed by their disability.[11]

[8] My population of interest are working-aged adults, so I do not focus on social security and old-age security programs.

[9] The contribution requirement is that applicants must have contributed to the CPP in four of the previous six years or three of the previous six years if the applicant has contributed to the CPP for twenty-five years or more. Contributions are mandatory if employed and earning above a specified threshold. The size of contributions to CPP determines the generosity of disability insurance transfers. The contributory period begins at age 18 and ends at age 65 or the year of death and excludes years in which the applicant was receiving CPP-D benefits.

[10] Disability insurance is a program for long-term disabilities and not designed to insure against short-term injuries.

[11] That is, how productive a disabled individual is in a job they could be expected to hold given their qualifications relative to others doing the same work but who do not have a disability. Adjudicators account for an individual's personal characteristics when determining an individual's capacity for substantial gainful activity. Most notably, personal characteristics include age, education, and work experience.

The generosity of disability insurance equals the sum of two components. The first component is equal to 75% of the applicant's potential CPP retirement benefits at the date of application. Potential CPP retirement benefits are equal to 25% of the earnings index that summarizes an applicant's bounded average earnings over their contributory period.[12] The second component is a deterministic flat-rate benefit indexed by the CPI each year.

Another federal program is Employment Insurance (EI), which provides short-term income replacement for individuals laid off from their job. EI is typically allocated to individuals experiencing structural, seasonal, or cyclical employment. However, individuals unable to work for medical reasons can also apply, granted they prove their medical condition and inability to work. Beneficiaries can receive up to 55% of their earnings, to a maximum of $729 for 14 weeks, up to a maximum of 45 weeks, in 2025 (Employment and Social Development Canada, 2026) At the provincial level, Social Assistance (SA) programs provide means-tested antipoverty relief for individuals with barriers to sustained employment and who have insufficient or volatile sources of income. Each province separately administers its own SA program. As such, SA varies provincially in eligibility criteria and generosity of transfers. However, SA programs all share a similar structure (Employment and Social Development Canada, 2016). The generosity of aid is based on a means test, which calculates the net difference between an applicant's "assessed needs" and their financial assets. An applicant is deemed eligible if their assessed needs exceed the sum of their income and assets, up to an upper threshold. An applicant's "needs" may include living expenses, family size and composition, and disability status. On the other side of the means test, an applicant's financial assets include liquid assets, such as cash or convertible assets, and fixed assets, such as property. The combined fixed and liquid assets must not exceed a predetermined threshold, which varies by provincial jurisdiction. Assessed income combines all earnings from market activities, such as paid employment or self-employment, and transfers from other government programs, such as disability insurance.[13]

SA beneficiaries typically receive monthly financial transfers equaling a basic assistance amount and, in some cases, a special assistance amount. The basic assistance amount covers the costs of living, such as food, shelter, and clothes. A disability may create additional living expenses, and all provinces allocate additional resources available for individuals affected by a disability. Additional details on SA programs can be found in Employment and Social Development Canada (2016).

Workers' compensation (WC) provides income replacement for workers who experience injury, disability, or death arising from employment. In exchange for this insurance, workers forgo the right to sue their employer. In Canada, WC is administered by provincial and territorial workers' compensation boards (WCBs) and is financed through

[12]The earnings index is a similar object as the average indexed monthly earnings used by the Social Security Administration in the US. The minimum bound to their earnings has been $3,500 per year since 1996, and the maximum, which was $67,800 in 2025, is updated yearly based on a measure of average wages (Canada Revenue Agency, 2026*b*).

[13]Individuals may receive social assistance while earning from other sources, but this may reduce benefits according to the program's replacement rate. SA may be revoked if sufficient effort is not taken on the beneficiary's part to receive income support from other sources.

employer-paid premiums that vary by province, industry, and firm-level experience ratings reflecting workplace injury histories.[14] Payments to injured workers primarily take the form of earnings replacement and compensation for permanent disability.[15] Benefit generosity varies across jurisdictions and replacement rates typically fall between 75% and 90% of pre-injury earnings[16]

Disability insurance, EI and SA are the primary sources of income assistance for general disability shocks in Canada, and WC is the main program for workplace injuries. Another source of monetary support is the Disability Tax Credit. The disability tax credit is a non-refundable tax credit that reduces the income tax individuals with disabilities have to pay. Eligibility is similar to disability insurance in that applicants must show they have a severe and prolonged impairment, except the disability tax credit does not depend on employment histories.

Canada's second main category of government transfer programs are designed to aid families with the costs of raising children. At the federal level, parents may apply for tax-free monthly transfers through the Canada Child Benefit. This is a means-tested program, and the generosity of payments depends on the number of children, their ages, and the total income of the household. In 2025, beneficiaries could receive up to $666.41 per month for each child under the age of six and $562.33 for each child aged six to seventeen (Canada Revenue Agency, 2026*a*). Moreover, Canadian families may receive supplementary benefits from provincial governments.

Table 1 reports the composition of total government transfers in the year after disability onset (column 1), five years after onset (column 2), and ten years after onset (column 3). The composition of transfers shifts markedly over time following onset. EI accounts for a large share of transfers immediately after onset, reflecting high average payments per recipient, but its share declines in subsequent years as recipients exhaust eligibility or transition to longer-term programs. In contrast, the share of SA rises gradually, consistent with increasing reliance on means-tested support as market income remains depressed. The share from disability insurance also increases substantially with time since onset, reflecting delayed entry into disability benefits and the program's role as a longer-run source of income replacement.

More broadly, labour market institutions beyond social insurance can shape the employment and earnings effects of disability onset. Recent U.S. evidence shows that minimum wage policy interacts with disability status in important ways: Clemens, Gentry and Meer (2025) find that large minimum wage increases disproportionately reduce employment among individuals with severe disabilities, while Kim, Levere and Magenheim (2025) document null employment effects in nonprofit settings where employing individuals with disabilities is part of the firm's objective function. Although Canada lacks direct analogues to U.S. subminimum wage exemptions or the AbilityOne program,

[14] Premiums are assessed as a fixed amount per $100 of payroll and are pooled into accident funds used to finance wage-loss benefits, medical care, rehabilitation, and program administration.

[15] Benefits may also cover rehabilitation services or provide support to dependent spouses in cases of work-related death.

[16] The maximum insurable earnings across jurisdictions ranges from approximately $52,000 to unbounded.

Table 1: Composition of Government Transfers

	One Year Post-Onset	Five Years Post-Onset	Ten Years Post-Onset
Total Government Transfers ($)	2484	3366	3582
	Composition (Proportion of Total $)		
Total Non-Taxable Income	0.251	0.304	0.286
Social Assistance	0.119	0.094	0.153
Workers' Compensation	0.127	0.187	0.126
Net Federal Supplements	0.005	0.022	0.007
Disability Tax Credit	0.039	0.066	0.106
Canada Pension Plan (total)	0.054	0.245	0.301
CPP Disability Benefits	0.019	0.116	0.183
Employment Insurance	0.346	0.216	0.175
Tax Credits	0.046	0.028	0.030
Family Transfers and Credits	0.264	0.141	0.101

Notes: The sample reflects working age (25-55), living in the Canadians provinces, whose disability onset occurred in working life. Survey weights have been applied so the sample reflects the demographic composition of Canada in 2012. Non-Taxable Income is the sum of Social Assistance, Workers Compensation, and Net Federal Supplements. Tax credits combine non-disability related credits at both the federal and provincial level. Family transfers and credits combine the child tax benefit and various provincial programs.

these studies underscore how employer objectives and wage-setting institutions can mediate the labour market impacts of disability. Accordingly, the estimates in this paper should be interpreted in the context of Canada's relatively compressed wage structure and more limited scope for disability-specific wage exemptions.

IV Data: The Longitudinal and International Study of Adults

To estimate the longitudinal effects of disability types, I use the Longitudinal and International Study of Adults (LISA) (Statistics Canada, 2012-2018). LISA is a panel survey of over 11,000 Canadian households aged 15 and older. LISA consists of four biennial survey waves, starting in 2012, that cover a broad range of topics, including health, education, the labour market, social participation, and income. These data allow me to identify individuals with disabilities, the types of activities limited by the disability, and the timing of onset. Moreover, LISA is supplemented with several administrative datasets. Most relevant are the T1 family files (T1FF), which contain rich disaggregated measures of personal income and transfer payments from individual annual income tax filings. These data are confidential and administered by Statistics Canada's Research and Data Center Network.[17]

The T1FF spans from 1982 to 2017 and is linked to each respondent in the main survey waves of LISA. These data contain details on an individual's demographic characteristics relevant to their tax filings, such as age, marital status, province of residence, and the number of children. A notable advantage of these tax records is that they are less likely to suffer from the measurement and coverage issues often associated with survey data. For instance, Meyer, Mok and Sullivan (2009) show that survey measures of public transfers often suffer from respondents under-reporting, which can lead to overestimation of total income declines following the onset of disability.

For this analysis, the outcomes of interest are the components of market income, government transfers, total before- and after-tax income, and income of family members. Within market income, I focus on paid employment income in the form of wages, salaries, and commissions (WSC), which are by far the largest component of market income and are the most directly related to one's human capital. I use this to define a measure of labour market participation, where I flag someone as a market participant if they report any positive WSC in that year. Within government transfers, I distinguish disability-relevant transfers, which are the sum of programs outlined in the institutional background section, from transfers that target families. Total before-tax income combines market income and government transfers, and total after-tax income represents the market income and government transfers individuals take home after taxation. The difference between these two reveals the buffering effects of the tax system. I use these measures to construct a measure of net taxes paid. Last, family total income combines total before-tax incomes for all members of one economic household. I also consider a measure of family members' income, which nets out an individual's total before-tax income from the family's total income. Refer to Section 2 of the Appendix for additional details on the income measures.

A notable limitation of these data is the lack of consumption measures, which provide direct insights into welfare changes following a disability shock. I focus on income dynamics, which may not track consumption when smoothing mechanisms, such as savings, public insurance, or credit markets, are readily accessible. However, given the permanence of income shocks under consideration and that I observe a rich set of smoothing mechanisms, I consider after-tax income dynamics as a reasonable proxy for consumption. This study concentrates on permanent disabilities, which, unlike transitory income shocks, are less "smoothable" via personal savings, borrowing, or short-term insurance (Blundell, Pistaferri and Preston, 2008).

[17] Confidentiality of data requires adherence to a set of restrictions for extracting statistics from the data center. Of note, it requires any statistics to be generated by a minimum number of observations.

IV.1 Measuring disability

The 2014, 2016, and 2018 survey waves of LISA include measures of activity limitations and other characteristics of health conditions used to derive disability status.[18] The set of limitations to daily activities included in LISA is derived from the short version of the "Disability Screening Questions," a survey model developed by Statistics Canada for use in general population surveys (Grondin, 2016). This model distinguishes five main areas of activity limitation: Seeing, Hearing, Physical, Cognitive, and Mental Health. Physical combines limitations to mobility, flexibility, dexterity, and pain. Cognitive disabilities combine developmental disabilities, limitations to learning, such as dyslexia or hyperactivity, and limitations to memory and concentration.[19] Mental health conditions encompass many emotional, psychological, and mental health conditions, including anxiety, depression, bipolar disorder, substance abuse, and anorexia. Additional details of the specific survey questions can be found in Appendix Section 1.1.

Activity limitations in LISA are self-reported and used to identify disability status in two steps. First, respondents indicate whether they experience limitations in specific activities. For example, respondents are asked if they have difficulty walking on a flat surface for 15 minutes without resting. Some cognitive limitations, such as learning or developmental disabilities, are initially identified based on diagnoses from medical professionals. Respondents who report positively are then asked how frequently they experience this activity limitation. I flag an individual for having a specific activity limitation if they report "sometimes," "often," or "always" to the frequency. Disability types are then defined based on the presence of these activity limitations. For example, individuals flagged for a mobility activity limitation are classified as having a kinetic ability disability.

For each respondent flagged for a disability type, I derive the age of onset from a self-reported question: "At what age did you first start having difficulty or an activity limitation?" Since disability status is not recorded in the income tax data, I do not directly observe transitions in disability status between its reported onset and its identification in the survey. Due to the retrospective nature of this question and the panel structure of the survey, some respondents report different ages of onset across waves. Following Meyer and Mok (2019), I take the minimum reported age of onset as the actual onset age in such cases.[20]

Many disabilities are not absorbing states and can fluctuate in severity and frequency over time. Because of data limitations, I remain agnostic about how disability evolves between the reported age of onset and its identification in the

[18] The 2012 wave comprises only a small set of questions about the disability. Notably, the 2012 wave excludes the variable determining the age of disability onset.

[19] It is important to note that developmental disabilities such as Down syndrome, Autism spectrum disorder, Asperger syndrome, or brain damage due to lack of oxygen at birth typically manifest early in life rather than as late-onset disabilities.

[20] Some measurement error in reported age of onset is unavoidable in survey data, particularly when individuals are asked to recall events that may have occurred decades earlier. To assess the extent of this issue, I examine within-person variation in reported age of onset across survey waves. The median within-person standard deviation is two years, suggesting that most individuals report a consistent onset age within a relatively narrow window.

survey. Appendix 3.2, Table 5 provides some evidence, using our measurement approach, regarding the permanence of disabilities, showing heterogeneity across limitation types. Notably, cognitive disabilities, particularly mental health conditions, tend to be less permanent than physical ones.

Moreover, the data do not capture disabilities that may have existed prior to survey entry but resolved before individuals were observed. As a result, the analysis focuses on relatively permanent disabilities rather than short-term health shocks. Accordingly, the estimates should not be interpreted as reflecting the effects of all health shocks, but rather those associated with more persistent conditions. I examine how individual characteristics vary with disability persistence in Appendix Section 3.2.

The first step of the empirical analysis distinguishes heterogeneity by two mutually exclusive aggregated disability types, aggregate physical and mental-cognitive. The distinction between conditions that inhibit physical activities from those impacting cognitive or socio-emotional activities is common in the literature on the heterogeneous effect of disability. However, this aggregation masks underlying heterogeneity across the specific activity limitations within these categories. The second step explores heterogeneity within the aggregate disability types. Within physical, I distinguish disabilities to one's kinetic ability, which combines activity limitations related to mobility, flexibility, and dexterity, from disabilities related exclusively to pain. Additionally, I separate mental-cognitive into disabilities related to cognitive functioning (learning, memory, or concentration), from disabilities related exclusively to mental health. The distinction along these margins of activity limitation is policy-relevant, as mental health-related disabilities and pain-related disabilities have driven rising applications to disability programs (Autor, 2011). Moreover, this study provides novel estimates on the effects of mental health conditions, which are becoming increasingly recognized as significant impediments to economic independence (Frank and Glied, 2023).

In some cases, respondents report limitations in multiple activity domains simultaneously. However, the data do not indicate whether these limitations began at the same time or whether one preceded the other. For this reason, the main analysis focuses on mutually exclusive disability types, and I leave the study of interaction effects across limitations to future research. I nevertheless include a supplementary analysis of concurrent disabilities in Appendix Section 4.2 to provide evidence on the economic effects of limitation in multiple dimensions.

The rate of disability in the population and the distribution of types is reported in Table 2. I find that 18.4% of the sample reports the onset of any activity limitation during their working life.[21] The majority of these are physical in nature, accounting for 58.7% of cases. Mental-cognitive disabilities make up 10.3% of disabilities, while 31.1% are concurrently physical and mental-cognitive.

The activity limitations underlying physical disabilities are highly correlated. I report the corresponding correla-

[21] I capture a relatively broad notion of disability in the population. For comparison, Meyer and Mok (2019) report disability rates between 11% and 15% in the calendar years of their empirical sample (1968-2015) from the PSID.

Table 2: Sample Distribution of Disability and Types

Prevalence of Disability	
No Disability	0.816
Disabled	0.184
Distribution of Types Within Disability	
Aggregate Physical	0.587
Kinetic Ability	0.366
Exclusively Pain	0.221
Mental-Cognitive	0.103
Cognitive Functioning	0.033
Exclusively Mental Health	0.070
Concurrent Physical and Mental-Cognitive	0.311

Notes: The sample reflects working age (25-55) Canadians, living in the provinces, whose disability onset occurred in working life. Survey weights have been applied such that the sample reflects the demographic composition of Canadians in 2012.

tion matrix in Appendix Section 1.1. Limitations to mobility, flexibility, and dexterity are often present simultaneously. Moreover, three-quarters of individuals with a physical disability report some degree of pain-induced limitation. Differentiating the limitations within aggregate physical disabilities into mutually exclusive groups reveals 37.7% of physical disabilities are due exclusively to pain, whereas 62.3% have some impairment to kinetic ability. Limitations due exclusively to mental health comprise approximately two-thirds of mental-cognitive disabilities. Disabilities related to cognitive functioning that onset in working life are less common, accounting for about one-third of mental-cognitive disabilities.

Studies on variation in the effects of disability often consider heterogeneity by the severity of their impairment.[22] Unfortunately, severity is only observed when respondents take the survey but not when the disability onset occurs. I flag disability based on any positively reported frequency of limitation, capturing a relatively broad coverage of the disabled population. This approach minimizes the type II error of incorrectly flagging someone as not disabled. However, the disabled sample will include individuals with milder conditions that may not be considered disabled in other settings or by policymakers. Consequently, I interpret my results as lower bounds to the average effects of the onset of a long-term disability.

Much research in health economics has focused on the validity of self-reported measures of one's health. One concern relates to the inherent subjectivity of how one assesses their own health. For example, two otherwise identical

[22] Some examples of studies estimating the heterogeneous labour market effects of disability by some measure of severity include Stern (1989), Acemoglu and Angrist (2001), Charles (2003), Baldwin and Johnson (2006), Low and Pistaferri (2015), Kostøl et al. (2019), and Meyer and Mok (2019).

individuals may differ in the reported severity of their disability. Additionally, critics of self-reported health measures argue that individuals may exaggerate the existence or severity of their health condition to justify poor economic outcomes or attachment to government programs, a phenomenon referred to as justification bias. The evidence on the endogeneity of self-reported health measures and the extent of measurement error are mixed (Black et al., 2017). Although, it is important to note that recent articles tend to find evidence for state-dependent reporting.[23]

The disability measure in this paper is derived from a respondent reporting any positive limitations to a specified activity and abstracts from the degree of impairment. This mitigates concerns related to subjectivity in the scale of impairment from a self-reported activity limitation, as I do not distinguish conditions along the severity margin. Moreover, much of the evidence on justification bias is based on broad questions about one's health or disability, such as "do you have a medical or physiological condition that impairs the type or amount of work you can do." The questions about activity limitations in this survey are linked to specific tasks, such as walking on a flat surface for fifteen minutes, grasping a small object like scissors, or experiencing ongoing memory problems or periods of confusion. Additionally, the presence of some activity limitations is elicited based on whether the respondent has been diagnosed with a specific condition, such as a learning or developmental disorder, by a healthcare professional.[24] Last, mental health is identified using specific examples of diagnoses, such as anxiety, depression, bipolar disorder, or anorexia. These approaches narrow the scope of justification bias to be anchored to the activities in question, bases the existence of a limiting condition on the diagnosis of a medical professional, or frame limitations related to mental health with specific examples of diagnoses. I follow much of the related literature and take the responses to questions on limitations to daily activities as given. However, I acknowledge the empirical concerns that are inherent to any self-reported measures of health.

In addition to justification bias, there is the related concern that disability onset itself is endogenous to the labour market outcome of interest. Notably, the onset of mental health disabilities may result from deteriorating economic conditions (De Quidt and Haushofer, 2016). In such scenarios, it is difficult to discern if mental health drives labour market outcomes or vice versa. To address this potential confounding factor, I leverage information about the reasons for disability onset to conduct robustness checks, as described in Section 5 of the Appendix. In this robustness exercise, I exclude individuals who attribute the cause of their activity limitation to work-related factors. This selection criterion is aimed at ensuring a more accurate assessment of the impact of mental health on labour market outcomes, free from

[23]It has been found that self-reported disability is close to exogenous, may actually under-represent the extent of the disabled population, and may even underestimate the true impact of disability on relevant labour market outcomes (Stern, 1989; Bound and Burkhauser, 1999; Burkhauser et al., 2002). Others have found evidence of justification bias related to labour market states inflating the prevalence of health conditions (Benítez-Silva et al., 2004; Baker, Stabile and Deri, 2004; Black et al., 2017). Moreover, alternate approaches to identify individuals with disabilities, for instance, by using disability insurance beneficiaries to define the population with a disability, have been found to under-represent the population of individuals who are limited enough in the labour market to be classified as "disabled" (Bound, 1989)

[24]This type of question has been used to assess the validity of self-reported health measures in Baker, Stabile and Deri (2004)

the bias introduced by work-related disability onset.

IV.2 Sample Selection

I observed detailed information on disability types and onset in the 2014, 2016, and 2018 survey waves. I retain the 2012 wave to extract relevant demographic information and survey weights that are representative of the Canadian population in 2012.[25] I choose to omit individuals who are blind or deaf because of small sample counts and only focus on the mental-cognitive and physical types of disabilities. I restrict my sample to individuals aged 22-61 who have been observed for at least four years. I replace missing demographic information using adjacent survey waves and drop observations that are missing key demographics. I drop observations whose reported onset is younger than 23 or greater than 56 to focus on disability shocks in working life and abstract from retirement incentives. Additionally, I drop individuals whose disability onset occurred before 1984, and I trim year observations more than ten years after disability onset. I exclude observations living in the Canadian Territories. I include both males and females in my sample to increase the size of the ever-disabled sample, and I include rich controls for sex in the empirical framework. The final sample includes 14717 working-aged individuals living in the Canadian provinces that ever and never become disabled, the latter serving as the control group.

Table 3 presents descriptive statistics by disability status and across the aggregate disability types. The first two columns compare individuals with disabilities and the never-disabled control sample. Individuals who ever experience a disability shock have lower average education levels, are more likely female, and have a lower likelihood of marriage. The lower section of Table 3 reports the predicted average labour market outcomes before onset from models controlling for age and age squared and evaluated at age 40. Individuals who ever experience a disability shock exhibit lower employment levels, less employment income from WSC, and receive more government transfers.

The rightmost three columns in Table 3 compare mutually exclusive aggregate disability types. The average age of individuals with a physical disability is higher, and the onset of physical disabilities occurs at older ages relative to mental-cognitive disabilities.[26] Mental-cognitive and concurrent disabilities drive lower marriage rates or common law status rates among the population with disabilities. However, this difference may be related to other characteristics, such as the age of those with cognitive disabilities. Individuals experiencing mental-cognitive disability tend to have higher education levels than those with aggregate physical disabilities and the never-disabled sample.

Individuals experiencing an aggregate physical disability are less likely to be employed and earn less than those who never receive a disability. Conversely, individuals who experience a mental-cognitive shock exhibit similar em-

[25] This is a necessary choice as survey weights are unavailable for the T1FF records and vetting unweighted results is restricted.

[26] The average age of onset for concurrent disabilities falls in between physical and cognitive disabilities. However, I do not observe which condition occurred first or if both types of disabilities occurred simultaneously.

Table 3: Summary Statistics by Disability Status and Aggregate Type

	No Disability	All Disability	Aggregate Physical	Mental-Cognitive	Concurrent
Panel A. Demographics					
Age	37.6	38.6	39.8	34.6	37.8
	(8.7)	(7.1)	(7.1)	(6.3)	(6.7)
Age of Onset	-	42.1	43.5	37.6	40.7
	(-)	(9.4)	(9.1)	(9.2)	(9.2)
Female	0.488	0.578	0.563	0.592	0.601
	(0.50)	(0.50)	(0.54)	(0.49)	(0.48)
Dropout	0.064	0.117	0.119	0.041	0.138
	(0.24)	(0.33)	(0.34)	(0.20)	(0.34)
High School	0.181	0.209	0.203	0.172	0.231
	(0.38)	(0.41)	(0.42)	(0.38)	(0.41)
Post Secondary	0.750	0.667	0.674	0.783	0.618
	(0.43)	(0.48)	(0.49)	(0.41)	(0.48)
Married	0.719	0.647	0.722	0.634	0.510
	(0.45)	(0.49)	(0.46)	(0.48)	(0.49)
Number of Children	0.8	0.7	0.7	0.9	0.6
	(1.1)	(1.0)	(1.0)	(1.1)	(0.9)
Panel B. Pre-Onset Labour Market Statistics					
Labour Market Participation Rate	0.845	0.796	0.808	0.843	0.756
Wages, Salaries, and Commissions	46,770	37,389	37,998	42,022	34,648
Any Government Transfers	0.510	0.605	0.594	0.539	0.650
Total Government Transfers	2,181	3,038	2,778	2,380	3,806
Disability Relevant Transfers	1,188	1,857	1,683	1,229	2,429
Family Transfers	900	1,044	976	1,053	1,189
Family Total Income	102,909	80,518	82,396	90,931	73,253
After-Tax Income	44,271	36,482	36,860	40,318	34,485

Notes: The sample reflects working-age Canadians (25–55) living in provinces, whose disability onset occurred during working life. Survey weights have been applied so that the sample reflects the demographic composition of Canada in 2012. In Panel A, standard deviations are reported in parentheses. In Panel B, pre-onset statistics are predictions from regressing each outcome measure on a second-order polynomial in age, evaluated at age forty. As variation is conditioned away in the prediction, standard deviations cannot be calculated. All income measures other than transfers are top-coded at the 99th percentile.

ployment and pre-onset earnings as the never-disabled group. These patterns are consistent with different exposure risks associated with various occupations and demographics. Individuals experiencing mental-cognitive disabilities tend to work more, have higher earnings prior to onset, and receive fewer disability-related transfers.[27]

In Table 4, I contrast differences by the more granular disability types.[28] Within aggregate physical, individuals with exclusively pain-related conditions tend to have higher levels of education and earn more through employment

[27]Note the positive amounts of disability-relevant transfers reflect the inclusion of SA programs, which is available for individuals that are not disabled.

[28]Demographic characteristics and pre-onset incomes and employment are very similar across mobility, flexibility, and dexterity activity limitations.

Table 4: Demographic Summary Statistics By Disability Types Within Aggregate Groupings

	Exclusively Mental Health	Cognitive Functioning	Kinetic Ability	Exclusively Pain
Panel A. Demographics				
Age	33.8	36.3	40.9	37.9
	(6.1)	(6.4)	(7.15)	(6.51)
Age of Onset	36.9	39.3	44.5	41.9
	(9.1)	(9.3)	(8.74)	(9.47)
Female	0.646	0.477	0.576	0.540
	(0.48)	(0.50)	(0.52)	(0.51)
Dropout	-	-	0.149	0.070
	(-)	(-)	(0.37)	(0.26)
High School	0.213	0.226	0.219	0.178
	(0.41)	(0.42)	(0.43)	(0.39)
Post Secondary	0.787	0.774	0.630	0.746
	(0.41)	(0.42)	(0.50)	(0.45)
Married	0.645	0.611	0.700	0.758
	(0.48)	(0.49)	(0.48)	(0.44)
Number of Children	0.9	0.8	0.59	0.8
	(1.1)	(1)	(0.95)	(1.07)
Panel B. Pre-Onset Labour Market Statistics				
Labour Market Participation Rate	0.857	0.819	0.811	0.804
Wages, Salaries, and Commissions	43,444	40,933	36,011	41,587
Any Government Transfers	0.537	0.507	0.624	0.542
Total Government Transfers	2,192	2,739	3,005	2,391
Disability Relevant Transfers	1,066	1,534	1,884	1,333
Family Transfers	1,029	1,115	984	967
Family Total Income	92,579	89,162	78,634	88,788
After-Tax Income	41,314	39,809	35,855	40,340

Notes: The sample reflects working-age Canadians (25–55) living in provinces, whose disability onset occurred during working life. Survey weights have been applied so that the sample reflects the demographic composition of Canada in 2012. In Panel A, standard deviations are reported in parentheses. In Panel B, pre-onset statistics are predictions from regressing each outcome measure on a second-order polynomial in age, evaluated at age forty. As variation is conditioned away in the prediction, standard deviations cannot be calculated. All income measures other than transfers are top-coded at the 99th percentile.

prior to the onset of their disabilities. The opposite is true for disabilities related to kinetic ability. This observation is intriguing because it shows opposite signs for a socioeconomic status-health gradient among individuals experiencing limitations to their kinetic ability compared to exclusively pain.

Within mental-cognitive, disabilities due exclusively to mental health limitations tend to manifest earlier in working life than cognitive functioning. Additionally, a higher proportion of females experience mental health disabilities, but there are no noticeable differences in family composition between the two groups. In terms of socioeconomic factors, both mental health and cognitive disabilities have comparable levels of education, employment, and income before the onset of their disability. However, there are notable differences in the attachment to government programs before the reported onset. Individuals limited in cognitive functioning tend to rely more on disability-related transfers provided by the government.

In sum, there are important differences in demographic characteristics and pre-onset incomes across disability risk groups and disability types. These differences likely reflect variation in underlying risk factors that affect the likelihood of onset for specific types of disabilities. The empirical section discusses how these differences are addressed in the main analysis and through robustness exercises.

V Empirical Approach

This paper measures the change in economic outcomes from disability onset using the following two-way fixed effects design,

$$y_{it} = \alpha_i + \gamma_t + X_{it}\beta + \sum_g \sum_k \delta_k^g A_{kit}^g + \epsilon_{it}, \quad (1)$$

where y_{it} is the dependent variable of interest for individual i at time t. The variables A_{kit}^g are indicator variables equaling one for a disability type g in year $t \in \{1982,\ ...,\ 2017\}$, and $k \in \{-5, ..., 10\}$ years relative to its onset. The coefficients of interest are δ_k^g, which are interpreted as the average level effect relative to the average trend in y_{it} more than five years prior to its onset. For each model, I use an event window of five pre-onset and ten post-onset periods, as in Meyer and Mok (2019) and Collischon, Hiesinger and Pohlan (2023).

The model includes an individual fixed effect, α_i, and a time fixed effect, γ_t, that control for unobserved individual-specific and common time-varying factors. The inclusion of individual fixed effects mitigates bias arising from time-invariant unobserved heterogeneity, for example, systematic differences between individuals who experience disability onset earlier versus later in life.

In addition, equation (1) includes a rich set of time-varying controls, X_{it}, to help isolate the effect of disability onset on the outcome of interest. In all specifications, X_{it} includes province indicators (with Ontario omitted), marital status, the number of children under age 18, and indicators for educational attainment. I control flexibly for life-cycle effects using a second-order polynomial in age, interacted with education, marital status, and number of children. To capture secular changes over time, I further interact education, marital status, sex, and number of children with a second-order polynomial in time since 1982. These controls account for pre-disability differences in skills and for family characteristics that influence both labour market outcomes and eligibility for taxes and transfers. The estimation sample includes a control group of individuals that do not report any disability to improve the precision on estimates of age, education, and the other control variables. Lastly, ϵ_{it} is a potentially serially correlated error term.

V.1 Robustness Exercises

I follow the workhorse approach in this literature: an event-study (dynamic difference-in-differences) design implemented using a two-way fixed effects (TWFE) model (Stephens Jr, 2001; Charles, 2003; Singleton, 2012; Lundborg, Nilsson and Vikström, 2015; Polidano and Vu, 2015; Meyer and Mok, 2019; Fadlon and Nielsen, 2021; Collischon, Hiesinger and Pohlan, 2023). However, a large recent literature shows that TWFE estimators can be biased when treatment effects are heterogeneous and treatment timing varies across individuals (Borusyak and Jaravel, 2017; De Chaisemartin and d'Haultfoeuille, 2020; Callaway and Sant'Anna, 2021; Goodman-Bacon, 2021; Imai and Kim, 2021; Sun and Abraham, 2021; Baker, Larcker and Wang, 2022; Rambachan and Roth, 2023). Disability onset occurs in different calendar years across individuals, and cohort-specific heterogeneity is plausible given changes over time in job composition, skill valuation, and disability policy parameters. To assess robustness to these concerns, I re-estimate the models using the interaction-weighted (IW) estimator of Sun and Abraham (2021), which delivers longitudinal treatment-on-the-treated estimates robust to staggered adoption and heterogeneous effects.

Moreover, disability onset is a nonrandom event that may depend on individuals' characteristics and past choices. The empirical sample includes many individuals who never become disabled and serve as a comparison group. This group provides a valid counterfactual only under a parallel trends assumption. To mitigate potential violations, I include a rich set of time-varying controls, so identification relies on parallel trends between treated and control individuals conditional on covariates.[29] Nevertheless, nonrandom onset may still generate differences in pre-onset characteristics or trajectories that compromise comparability. To address this concern, I follow the literature in adopting a quasi-experimental propensity score matching (PSM) approach (Polidano and Vu, 2015; Fadlon and Nielsen, 2021; Collischon, Hiesinger and Pohlan, 2023).

Finally, I conduct several additional robustness exercises within the TWFE framework to assess sensitivity to alternative sample selections and model specifications. The main findings remain robust when (1) restricting the treatment sample to respondents observed for the full ten post-onset years, (2) excluding individuals who report their disability as work-related, (3) conditioning on sex (the longitudinal paths and cross type comparisons mostly hold, although magnitude of point estimates do differ by sex), and (4) specifying the estimating equation as in Collischon, Hiesinger and Pohlan (2023).

Details of the IW and PSM procedures, along with the corresponding results, are reported in Appendix Section 5. Additional robustness checks based on alternative sample selection criteria are described in Appendix Section 5.4.

[29] Including covariates implicitly assumes linear trends in these controls. I therefore incorporate polynomial terms for several covariates to allow for flexible, nonlinear trends.

VI Results

I begin by examining the results for market income. I then explore how government transfers and family members' income partially mitigate the impact on market income. Finally, I assess the role of the tax system as an alternative mechanism for smoothing consumption following disability onset. Throughout the discussion, I distinguish between short-run effects (defined as five or fewer years post-onset) and long-run effects (defined as six to ten years post-onset).

To illustrate the results, I present figures showing point estimates of the average effect of each disability type over the years $k \in \{-5, ..., 10\}$, relative to the reported onset year. Each figure reports estimates from the standard two-way fixed effects model, with shaded regions denoting 95% confidence intervals. Where relevant, I reference comparison results from the IW and PSM models, which are reported in the Appendix Section 5.3.

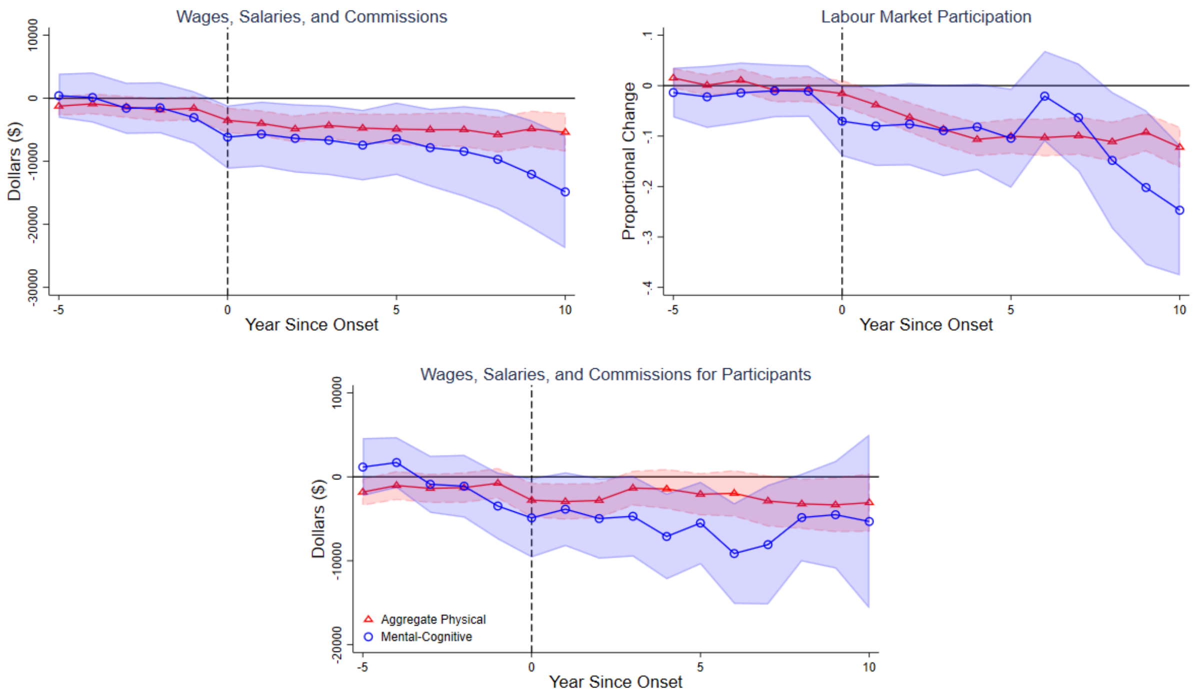
VI.1 Market Income

Market income includes all earnings from market activities, with the largest component being paid employment income in the form of wages, salaries, and commissions (WSC). Because employment income is directly tied to productivity, changes in employment income following disability onset reflect the importance of task limitations for productive capacity. Figure 1 presents estimates of δ_k^g from models where the dependent variables are: unconditional WSC (top left), labour market participation (top right), and WSC conditional on participation (bottom row). In each panel, triangles denote estimates for the aggregate physical disability type, while the circles denote estimates for a mental-cognitive disability type.

The results for total WSC reveal differences in the longitudinal effects of physical and mental-cognitive disabilities following onset. The onset of an aggregate physical disability leads to significant reductions in WSC that persist into the long run, with average post-onset losses of $4,880. In contrast, the onset of a mental-cognitive disability results in an immediate short-run decline of $6,513, with losses continuing to grow to $14,853 ten years after onset. However, the point estimates for mental-cognitive disabilities are relatively imprecise, and an F-test fails to reject the null hypothesis that the set of post-onset estimates are equal across physical and mental-cognitive disabilities.

Further, while the point estimates on the pre-onset indicators are not significantly different from zero, it can be difficult to visually discern whether there is a deviation in trend post-onset. The empirical design specifies the reference period as k<-5 periods prior to reported onset, and the estimated coefficients on the pre-onset indicator variables provide a visual assessment of whether there are leading effects prior to onset. To address this, I conduct tests of whether the set of post-onset estimates is significantly different from the leading estimate at k=-1. I find that the set of post-onset coefficients for physical disabilities is not jointly significantly different from the k=-1 leading estimate (p

Figure 1: Effect of Aggregate Disability Types on Market Income



Notes: Figures present point estimates of the effects of disability onset in the $k \in \{-5, ..., 10\}$ periods relative to its reported onset. The triangles correspond to estimates of aggregate physical types, and the circles correspond to estimates of mental-cognitive types. The 95% confidence intervals for the point estimates are represented by the dashed and solid-edged shaded region for aggregate physical and mental-cognitive, respectively. Data on WSC is top-coded at the 99th percentile. Estimates and standard errors used to generate these figures are reported in Section 7 of the Appendix. Statistical Tests: F-tests reject the null of jointly zero post-onset effects for both physical (p = 0.002) and mental–cognitive disabilities (p = 0.011), and reject equality of post-onset participation effects across the two types (p = 0.005). Conditional on participation, post-onset treatment paths for WSC are jointly significant for both physical (p = 0.008) and mental–cognitive disabilities (p = 0.002), though I fail to reject equality across types. I find that the set of post-onset coefficients for physical disabilities is not jointly significantly different from the k=-1 leading estimate (p = 0.159), and that the set of post-onset coefficients for mental-cognitive disabilities is significantly different from the k=-1 leading estimate (p=0.054). For WSC conditional on participation, I fail to reject the null hypothesis that the post-onset estimates are jointly significantly different from the k = -1 leading estimate for physical disabilities (p = 0.285), but reject it for mental-cognitive disabilities (p = 0.042).

= 0.159), and that the set of post-onset coefficients for mental-cognitive disabilities is significantly different from the k=-1 leading estimate (p=0.054).

To better contextualize the magnitude of estimated effects on WSC, I express them as a percentage of pre-onset earnings, using average pre-onset WSC previously reported in Table 3.[30] Relative to aggregate physical disabilities, mental–cognitive disabilities result in larger losses both in levels and as a share of pre-onset income, with particularly pronounced differences in the long run. The implied percentage changes for aggregate physical and mental–cognitive disabilities are plotted in Section 4.1 of the Appendix. The percentage effect of a mental–cognitive disability decreases from -14% in the year following onset to -35% ten years after onset, a decline that is nearly 20 percentage points larger

[30] A more direct approach would involve a log transformation of the dependent variable or estimation using a Poisson regression. However, both approaches result in the loss of observations across dependent variables, generating small differences in estimation samples. This creates a residual disclosure risk that prevents releasing results from the Statistics Canada Research Data Center, as dropped observations are not consistent across income measures.

than that associated with physical disabilities at the ten-year horizon.

The effects on WSC may arise from labour supply responses along either the intensive or extensive margin. As the return to work declines, individuals may reduce hours worked or exit the labour market altogether. Disabilities can distort work incentives through several channels: they may reduce productivity, raise reservation wages through eligibility for disability programs within the social insurance system, and impose additional costs or barriers to work, such as the need for workplace accommodations. The top-right panel of Figure 1 examines the extensive margin by plotting the estimated effects of disability onset on labour market participation. The bottom row of Figure 1 reports the estimated effects of onset on WSC conditional on participation, capturing the combined effects on wages and the intensive margin.

In the short run, extensive-margin effects are of similar magnitude for both disability types, although labour market exit is more gradual for physical disabilities. For physical disabilities, participation rates remain relatively stable into the long run, at approximately 10 percentage points below the pre-onset level. In contrast, mental-cognitive disabilities exhibit continued labour market exit, reaching a 25 percentage point decline in participation ten years after onset.

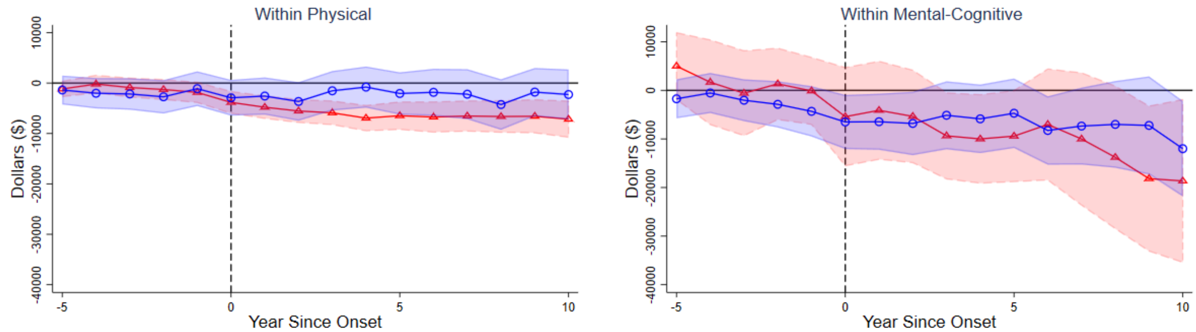
Conditional on participation, the estimated declines in WSC are more than twice as large for mental-cognitive disabilities as for physical disabilities, both in the short run (-$2,123 vs -$5,224) and in the long run (-$2,894 vs -$6,376). However, the estimates are imprecise, and I fail to reject the null hypothesis that post-onset estimates are equal across disability types. Moreover, I fail to reject the null hypothesis that the post-onset estimates are jointly significantly different from the leading estimate at k = -1, indicating no significant deviation from the pre-onset trend. For mental-cognitive disabilities, WSC conditional on participation rebounds approximately seven years after onset, coinciding with the sharp labour market exit observed for this group. This pattern suggests that declines in unconditional WSC are driven by reduced earnings among those who remain employed in the short run, and by the exit of lower-productivity individuals from the labour market in the long run.

In several cases, I fail to reject equivalence in post-onset estimates between physical and mental-cognitive disabilities, reflecting the imprecision of the estimates. To further investigate the sources of heterogeneity underlying these aggregate patterns, the next set of results examines more granular physical and mental–cognitive disability types. The left column of Figure 2 presents point estimates for disabilities related to kinetic ability (triangles) and disabilities related exclusively to pain (circles). The right column presents point estimates for disabilities related to cognitive functioning (triangles) and disabilities related exclusively to mental health (circles).

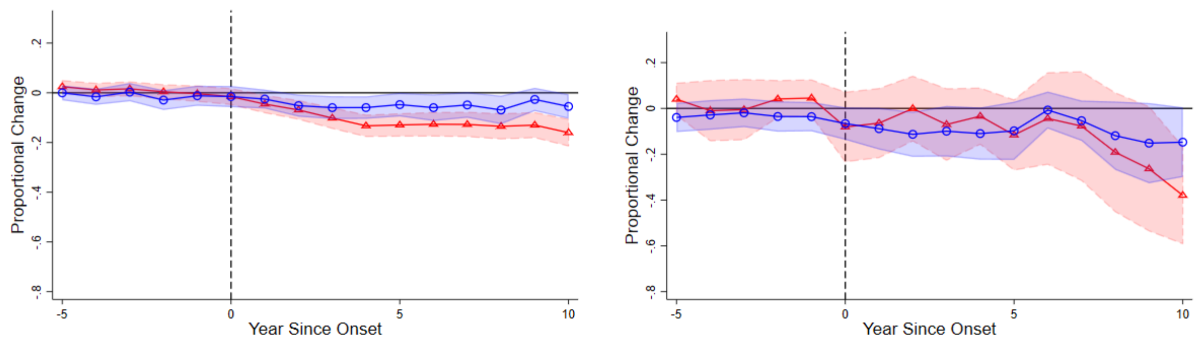
The impact of physical disabilities on market income is driven primarily by kinetic ability impairments. Point estimates for unconditional WSC, labour market participation, and WSC conditional on participation closely mirror those of the aggregated physical disability group but are larger in magnitude. In contrast, estimates for disabilities

Figure 2: Effect of Disability Within Aggregate Types on Market Income

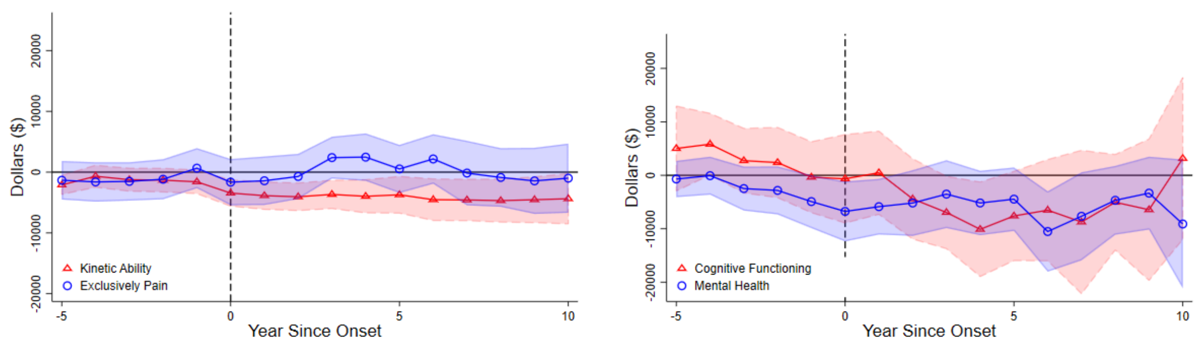
Wages, Salaries, and Commissions (Level)



Labour Market Participation



Wages, Salaries, and Commissions for Participants



Notes: Figures present point estimates of the effects of disability onset in the $k \in \{-5, ..., 10\}$ relative to the reported onset year. In the left panel, triangles denote estimates for kinetic ability types, while circles denote estimates for exclusively pain-related types. In the right panel, triangles denote estimates for cognitive functioning types, and circles denote estimates for mental health types. The 95% intervals are shown by shaded regions, with dashed and solid edges corresponding to triangle and circle point estimates, respectively. WSC is top-coded at the 99th percentile. Estimates and standard errors used to construct these figures are reported in Appendix Section 7.

Statistical Tests: Within physical disabilities, post-onset effects of kinetic ability and exclusively pain disabilities on WSC are jointly significant (p = 0.000) and (p=0.075), respectively. However, I fail to reject the null hypothesis that the post-onset estimates are jointly different from the leading estimate at k = -1 for exclusively pain disabilities (p=0.141), but reject it for kinetic ability (p=0.001). F-tests reject equality of post-onset paths between kinetic ability and exclusively pain-related types for WSC (p = 0.023), labour force participation (p = 0.054), and WSC for participants (p = 0.064). Within aggregate disability types, post-onset WSC paths differ between cognitive functioning and kinetic ability (p = 0.085) and between cognitive functioning and pain-related types (p = 0.001), but not between cognitive functioning and mental health types. Post-onset effects on WSC of cognitive function disabilities are jointly significant (p=0.000) and mental health disabilities are jointly significant (p = 0.021); however, the latter are not significantly different from the k = -1 leading estimate (p=0.256), and equality with kinetic ability post-onset path is not rejected. For labour force participation, post-onset paths differ significantly between cognitive functioning and both kinetic ability (p = 0.000) and exclusively pain types (p = 0.039). Post-onset employment effects for Mental health are not jointly significant at 10% (p = 0.166). While post-onset WSC effects conditional on participation are jointly significant (p = 0.060), I fail to reject their equivalence with the k=-1 leading estimate (p=0.464).

stemming exclusively from pain are considerably noisier and generally statistically insignificant. As a result, including individuals whose limitations arise exclusively from pain attenuates the estimated effects of physical disabilities overall, and can even obscure the statistical significance of the post-onset trend, as was the case when rescaling to k=-1.

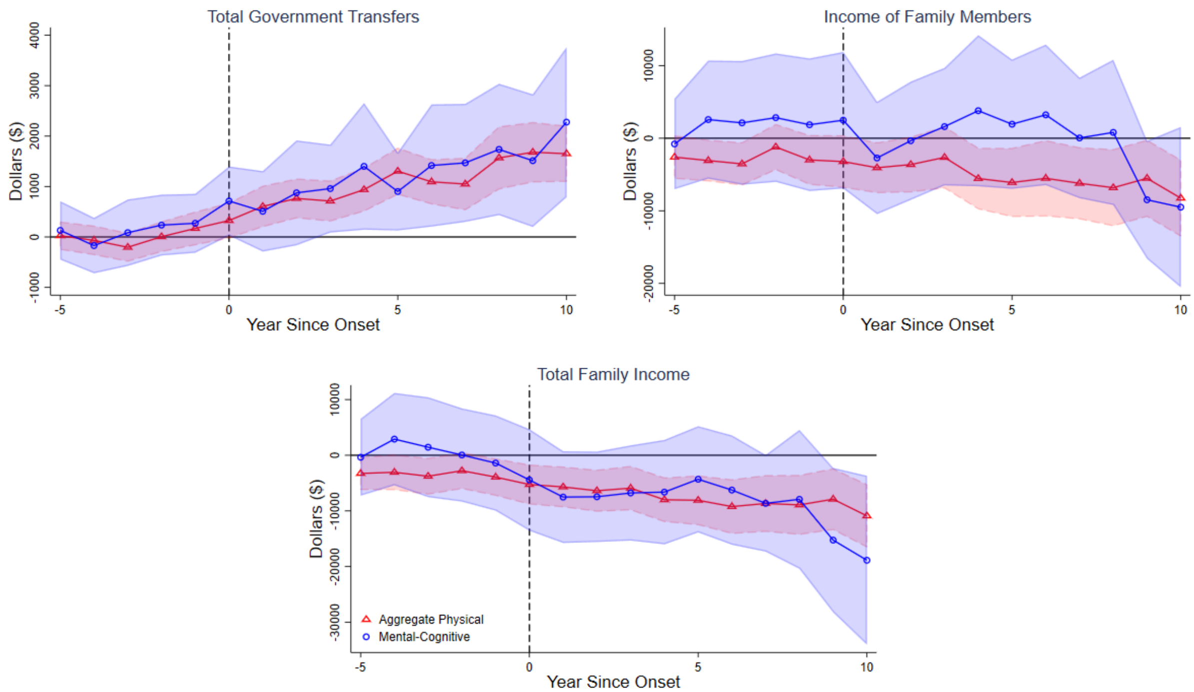
Disabilities related to cognitive functioning exhibit large and worsening effects on WSC over time. In the short run, income declines by an average of $7,651, with losses deepening to $18,649 ten years after onset. Labour market participation falls by an average of 19 percentage points in the long run, although short-run participation effects are not statistically significant. Conditional on participation, WSC declines by an average of $5,888 in the short run but rebounds in the long run, coinciding with increased labour market exit among this group.

The estimated effects of exclusively mental health disabilities on WSC are similar in magnitude to those associated with kinetic ability impairments, averaging -$5,793 in the short run and -$8,369 in the long run. Labour market participation declines by approximately 10 percentage points over the ten years following onset, although estimates are imprecise. WSC conditional on participation falls in the short and medium run but begins to rebound approximately seven years after onset. It is worth noting that, while pre-onset estimates are not significantly different from zero, there appear to be some leading effects prior to the age of reported onset. Mental health disabilities may be more periodic and may fluctuate in their extent of limitation over time (see Appendix 3.2, Table 5). As such, it may be harder to pin down the date of onset for these disability types. For instance, the effect on WSC may persist for a couple of years before an individual reports their date of onset. When testing whether the joint set of post-onset estimates is significantly different from the k=-1 leading estimate, I fail to reject equality (p=0.226). Further, I fail to reject equivalence of the full set of post-onset coefficients from the k=-1 leading estimate for WSC conditional on participation (p=0.464). However, the PSM model, which effectively corrects for the pre-trend issues (see Appendix 5.3 Figure 11), shows significant post-onset effects of similar magnitude for WSC.

VI.2 Government Transfers and Family Income

The results for market income show significant and heterogeneous effects on WSC and labour market participation across disability types. This section examines how government transfers and family members' income respond to disability onset. Government transfers, which form the backbone of Canada's social safety net, provide income assistance and tax credits to individuals facing barriers to economic independence. As productivity declines following disability onset, labour market exit is often accompanied by increased participation in these programs, which are designed to mitigate the financial consequences of disability-related shocks. Differences in the uptake of government transfers, relative to a given income decline, reflect variation in coverage and eligibility criteria across disability types, as well

Figure 3: Effect of Aggregate Disability Types on Government Transfers and Family Income



Notes: Figures present point estimates of the effects of disability onset in the $k \in \{-5, ..., 10\}$ periods relative to its reported onset. The triangles correspond to estimates of aggregate physical types, and the circles correspond to estimates of mental-cognitive types. The 95% confidence intervals for the point estimates are represented by the dashed and solid edged shaded region for aggregate physical and mental-cognitive, respectively. Total Family Income is top-coded at the 99th percentile. Estimates and standard errors used to generate these figures are reported in Section 7 of the Appendix.
Statistical Tests: The set of post-onset estimates on total government transfers is significantly different from zero (p = 0.000) and from the k = -1 leading estimate (p = 0.000) for aggregate physical. For mental-cognitive, the set of post-onset estimates is not significantly different from zero (p = 0.119) and not significantly different from the k = -1 leading estimate (p = 0.410). For aggregate physical, an F-test rejects the null that post-onset effects are jointly equal to zero for the income of other family members (p = 0.028) and total family income (p = 0.014). I further reject equivalence of the post-onset estimates with the k = -1 leading estimate for the income of other family members (p = 0.010) and total family income (p = 0.058). For mental-cognitive, an F-test fails to reject the null that post-onset effects are jointly equal to zero for total family income and the income of other family members.

as differences in take-up rates, which may arise from factors such as administrative burden. In addition, the earnings of other household members may provide an additional layer of financial insurance. To capture this mechanism, the analysis estimates the effects of disability onset on both total family members' income and the combined income of all household members.

Figure 3 presents results from models in which the dependent variables are total government transfers (top left), income from other family members (top right), and total family income (bottom row). The increase in total government transfers following the onset of a mental-cognitive disability is similar in magnitude to that observed for physical disabilities. For physical disabilities, government transfers rise immediately and significantly, averaging $865 in the short run and increasing to $1,408 in the long run. Mental-cognitive disabilities exhibit comparable increases, with transfers averaging $929 in the short run and $1,682 in the long run. For both disability types, these increases are driven primarily by disability-specific transfer programs. Other family-related transfer programs, typically means-tested and triggered by income declines, do not appear to play a substantial role (see Figure 2 in Section 4.1 of the Appendix).[31]

Following the onset of a physical disability, there is a significant decline in the income of other family members and total family income. These patterns are consistent with the hypothesis that family members substitute market work with home care provision, as discussed in Fadlon and Nielsen (2021). The average reduction in total family income after the onset of a physical disability closely mirrors the decline in unconditional WSC.

In contrast, the onset of a mental-cognitive disability does not generate a statistically significant change in the income of other family members. This absence of a detectable effect may reflect income support from family or friends, such as siblings or adult children, who are not dependents and therefore are not observed through tax records. Nonetheless, total family income declines steadily following onset, with an average long-run reduction of $11,389.

Results for the more granular disability types, presented in Figure 4, reveal stark differences in government transfers when decomposing aggregate physical and mental-cognitive disabilities. Within aggregate physical disabilities, increases in government transfers are driven entirely by disabilities related to kinetic ability. In contrast, the onset of a disability stemming exclusively from pain does not generate a statistically significant increase in government transfers.[32] For kinetic ability impairments, government transfers increase by an average of $1,379 in the short run and $2,159 in the long run. As with aggregate physical disabilities, I find a significant response in total family income closely mirrors the reduction in unconditional WSC.

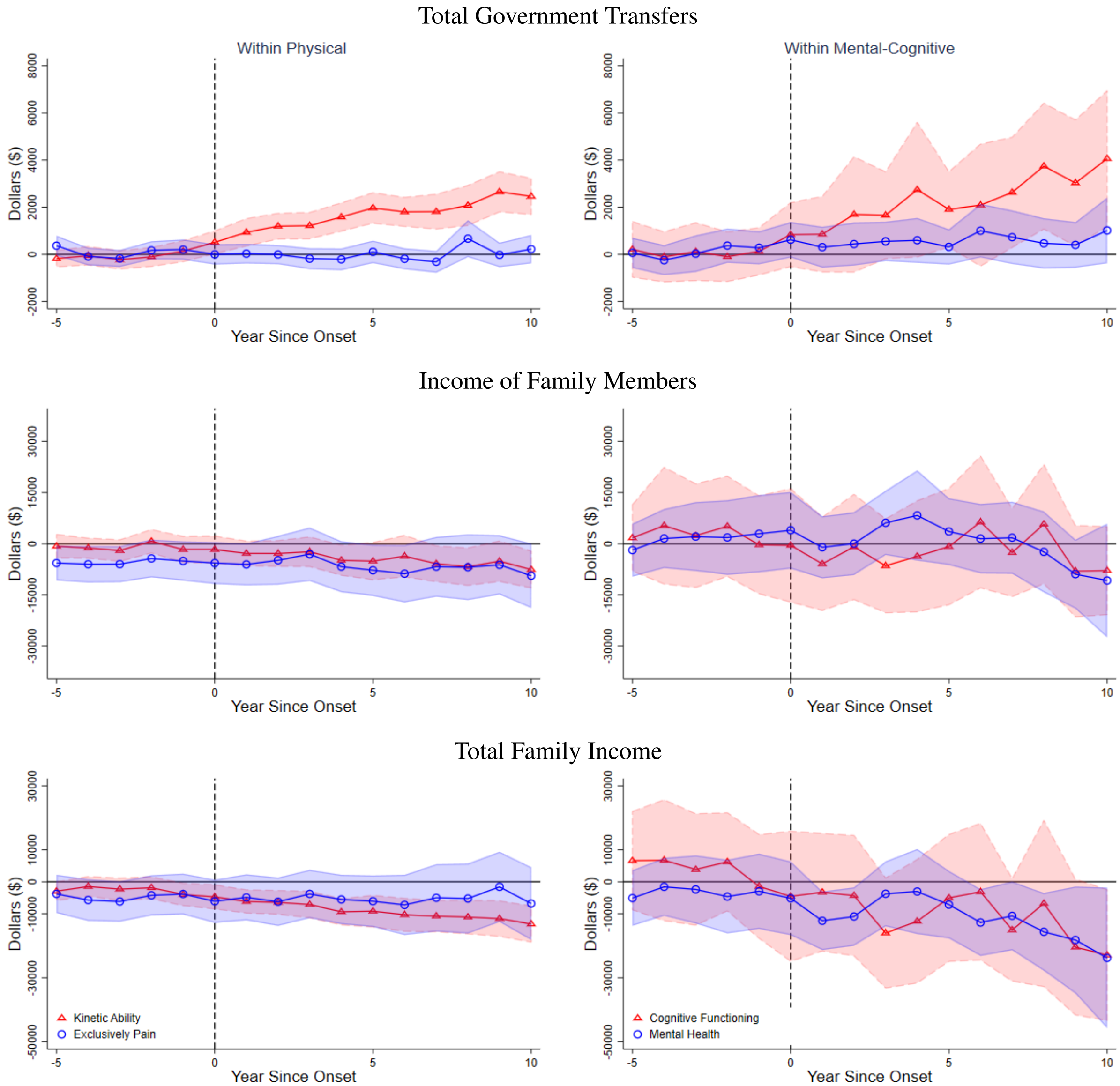
In the long run, the onset of a disability related to cognitive functioning leads to a substantial increase in government transfers, reaching $4,059 ten years after onset. As for other disability types, this increase is driven primarily by disability-specific programs (see Section 4.1 in the Appendix). In contrast to physical disabilities, there is little evidence of a decline in the income of other family members, however total family income declines significantly.

By contrast, the onset of a mental health disability does not lead to a significant increase in total government transfers, despite effects on WSC that are comparable in magnitude to those associated with kinetic ability impairments. In the absence of transfer support, affected individuals appear to remain attached to the labour market despite deteriorating health, consistent with the insignificant change in labour market participation. There is no statistically significant response in the income of other family members following mental health onset. As a result, total household income declines sharply, averaging $5,636 in the short run and deepening to $18,521 ten years after onset.

[31] Although, these programs are relatively more important for mental-cognitive types, I do not recover a clear deviation in trend after reported onset.

[32] The absence of a significant response for exclusively pain-related disabilities is consistent with the results for total WSC and may also reflect difficulties in verifying pain-related conditions.

Figure 4: Effect of Disability Within Aggregate Types on Government Transfers and Family Income



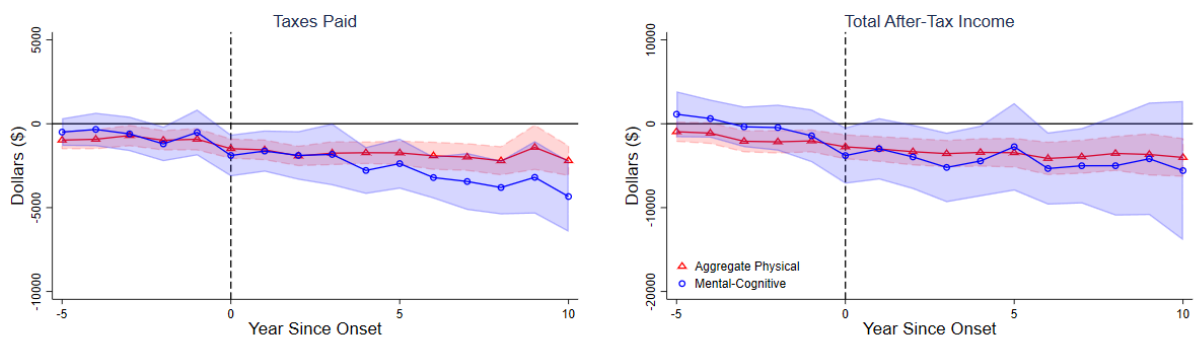
Notes: Figures present point estimates of the effects of disability onset in the $k \in \{-5, ..., 10\}$ relative to the reported onset year. In the left panel, triangles denote estimates for kinetic ability types, while circles denote estimates for exclusively pain-related types. In the right panel, triangles denote estimates for cognitive functioning types, and circles denote estimates for mental health types. The 95% intervals are shown by shaded regions, with dashed and solid edges corresponding to triangle and circle point estimates, respectively. Data on Family Income is top-coded at the 99th percentile. Estimates and standard errors used to generate these figures are reported in Section 7 of the Appendix.

Statistical Tests: The set of post-onset effects on total family income is significant for kinetic ability (p=0.000), and significantly different from the k=-1 leading estimate (p=0.010). The set of post-onset estimates are not jointly significant for the income of family members (p=0.142), but are significantly different from the k=-1 leading estimate (p=0.037). An F-test rejects equality of post-onset government transfer paths between mental health and kinetic ability disabilities (p = 0.019). For total family income, an F-test rejects the null that post-onset estimates are jointly equal to zero for mental health disabilities (p = 0.018) and cognitive functioning disabilities (p = 0.014). Post-onset estimates are significantly different from the k = -1 leading estimate for mental health (p = 0.057) and cognitive functioning (p = 0.000). I reject equality of post-onset paths between mental health and cognitive functioning disabilities on total family income (p = 0.040). The set of post-onset estimates on the income of family members for either type within mental-cognitive is not significantly different from zero.

These findings point to substantial gaps in the partial insurance provided by government transfers for mental health–related disabilities. Unlike kinetic impairments, which are more readily observable, mental health conditions are often harder to verify and their effects on work may be less transparent. Only recently have mental health conditions received broader recognition for their economic and labour market consequences. As a result, individuals who experience mental health disabilities during their working years may need to rely on alternative mechanisms to smooth consumption.

VI.3 Total Income Before and After Taxation

Figure 5: Effect of Aggregate Disability Types on Taxes Paid and Total After-Tax Income



Notes: Figures present point estimates of the effects of disability onset in the $k \in \{-5, ..., 10\}$ periods relative to its reported onset. The triangles correspond to estimates of aggregate physical types, and the circles correspond to estimates of mental-cognitive types. The 95% confidence intervals for the point estimates is represented by the dashed and solid edged shaded region for aggregate physical and mental-cognitive, respectively. Data on Total before-tax and after-tax income is top-coded at the 99th percentile. Estimates and standard errors used to generate these figures are reported in Section 7 of the Appendix.
Statistical Tests: For total after-tax income, the post-onset estimates are jointly significantly different from zero for aggregate physical (p = 0.014) but not significantly different from the k = -1 leading estimate (p = 0.069). For mental-cognitive, post-onset estimates are jointly significantly different from zero (p = 0.088) and significantly different from the k = -1 leading estimate (p = 0.037). For taxes paid, the post-onset estimates are jointly significant for aggregate physical (p = 0.000) and significantly different from the k = -1 leading estimate (p = 0.026). For mental-cognitive, post-onset estimates are significant (p = 0.000) and significantly different from the k = -1 leading estimate (p = 0.001).

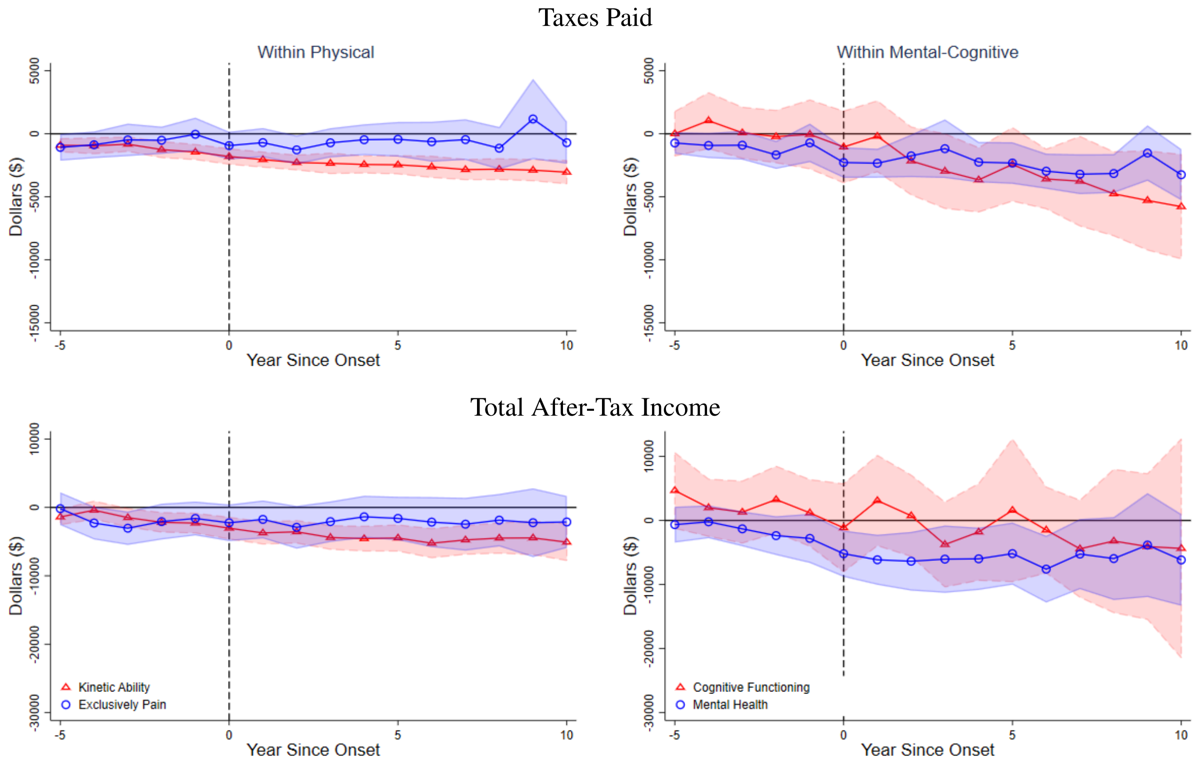
To measure partial insurance provided by the tax system, Figure 5 presents estimated effects on net taxes paid.[33] The figure also reports effects on total after-tax income, capturing changes in take-home resources following disability onset. For mental–cognitive disabilities, net taxes paid decline steadily and substantially after onset. For aggregate physical disabilities, the leading estimates are statistically different from zero at 95% confidence, indicating violations in the parallel trends assumption for both outcomes. As shown in Appendix Section 5.3, these pre-trend violations are corrected in the PSM model. The point estimates of treatment effects from the PSM are very similar in magnitude.

Results from the PSM model indicate that the unbalanced control group, on average, pays higher taxes and has higher after-tax income than the treatment groups. This pattern is consistent with summary statistics showing that

[33] Net taxes paid are defined as total before-tax income minus total after-tax income.

individuals who experience disabilities generally have lower earnings than those in the non-disabled sample. Across specifications, physical disabilities are associated with a more modest but persistent reduction in taxes paid over the ten years following onset. Although both aggregate physical and mental–cognitive disabilities benefit from partial insurance through the tax and transfer systems, total after-tax income nonetheless declines persistently in the years after onset.

Figure 6: Effect of Disability Within Aggregate Types on Taxes Paid and Total After-Tax Income



Notes: Figures present point estimates of the effects of disability onset in the $k \in \{-5, ..., 10\}$ *relative to the reported onset year. In the left panel, triangles denote estimates for kinetic ability types, while circles denote estimates for exclusively pain-related types. In the right panel, triangles denote estimates for cognitive functioning types, and circles denote estimates for mental health types. The 95% intervals are shown by shaded regions, with dashed and solid edges corresponding to triangle and circle point estimates, respectively. Data on total after-tax income is top-coded at the 99th percentile. Estimates and standard errors used to generate these figures are reported in Section 7 of the Appendix.*
Statistical Tests: The post-onset estimates for kinetic ability and mental health on after-tax income are significantly different from zero (p = 0.000) and (p = 0.013), respectively. However, the post-onset estimates are not significantly different from the k = -1 leading estimate (p = 0.168) and (p = 0.114) for kinetic ability and mental health, respectively. An F-test rejects equality of post-onset after-tax income paths between mental health and cognitive functioning disabilities (p = 0.050), between physical and cognitive functioning disabilities (p = 0.048), and between pain-related and cognitive functioning disabilities (p = 0.067), but fails to reject equality between kinetic ability and mental health disabilities. Post-onset effects on taxes paid are jointly significant for mental health (p=0.000), cognitive functioning (p=0.000), kinetic ability (p=0.000), and exclusively pain (p=0.079). However, post-onset estimates are not significantly different from the k=-1 leading estimate for exclusively pain (p=0.155).

The final set of plots, presented in Figure 6, reports the effects of the more granular disability types on net taxes paid and total after-tax income. Results for kinetic ability impairments closely mirror those for the aggregate physical disability group. Disabilities related to kinetic ability generate clear reductions in net taxes paid, reflecting increased non-taxable income, and the tax system partially buffers the associated income losses. In contrast, disabilities stemming exclusively from pain yield small and largely statistically insignificant point estimates. As with the aggregate physical results, there are significant pre-onset differences in taxes paid and total after-tax income for kinetic ability types. These differences are addressed in the PSM model (see Appendix Section 5.3 Figures 15 and 16), where the magnitude of the estimated effects is comparable.

Individuals with cognitive functioning disabilities receive meaningful partial insurance through a combination of reduced net taxes and increased government transfers. Although after-tax income declines in the long run for this group, the estimates are imprecise and not statistically significant. By contrast, individuals with mental health disabilities receive little partial insurance from the progressive tax system in the years following onset. Among the granular disability types, this group experiences the largest short- and long-run declines in after-tax income.

Table 5: Effect of Disability on Before and After-Tax Incomes

	Aggregate Physical	Mental-Cognitive	Kinetic Ability	Exclusively Pain	Mental Health	Cognitive Functioning
Short Run						
Total Before-Tax ($)	-5091	-5964	-6459	-2665	-7909	-2304
Total After-Tax ($)	-3353	-3864	-4145	-1945	-5942	-25
% Reduced	0.34	0.35	0.36	0.27	0.25	0.99
Long Run						
Total Before-Tax ($)	-5798	-8616	-7642	-2519	-8578	-8148
Total After-Tax ($)	-3856	-5021	-4802	-2166	-5759	-3513
% Reduced	0.33	0.42	0.37	0.14	0.33	0.57

Notes: Figures present the average of point estimates of the effects of disability onset in the short run ($k \in \{1, ..., 5\}$ periods relative to its reported onset) and long run ($k \in \{6, ..., 10\}$ periods relative to its reported onset). Data on total before-tax and after-tax income is top-coded at the 99th percentile. Estimates and standard errors used to generate these figures are reported in Section 7 of the Appendix. Statistical tests failed to reject equivalence between total before-tax and after-tax incomes for each comparison.

The final set of empirical results examines effects on total before-tax and after-tax income. Canada's tax and transfer system is progressive and therefore mitigates the impact of negative income shocks on take-home resources. First, the tax system exempts several sources of income, including many government transfers, thereby reducing individuals' tax burdens when they substitute toward these non-taxable sources following an income shock. Second, because the tax system is progressive, income declines that place individuals in lower tax brackets reduce marginal tax rates, further cushioning the effects of income losses.

Table 5 reports average total before-tax and total after-tax income in both the short and long run. Comparing these measures provides insight into the overall buffering role of the combined tax and transfer system. To quantify this buffering for each disability type, I calculate the percentage reduction in the income shock attributable to taxes and transfers.[34] While differences in before- and after-tax income are not statistically significant, the percentage reductions nonetheless provide a useful descriptive summary of how the tax and transfer system offsets income losses across disability types.

Overall, the tax and transfer system attenuates the income effects of disability across all types examined. For physical disabilities, it offsets approximately one-third of the before-tax income loss in both the short and long run. Mental-cognitive disabilities experience a similar short-run offset that grows in percentage terms over the long run. However, disaggregating by more granular disability categories reveals substantial heterogeneity. Individuals with kinetic ability disabilities experience a 36% offset of before-tax income losses, while those with disabilities stemming exclusively from pain experience small and statistically insignificant offsets. Individuals with mental health disabilities have a low percentage offset in both the short and long run and experience the largest average declines in after-tax income. This disparity in the share of before-tax income losses insured is even more pronounced in the PSM model, which accounts for the nonrandomness of disability onset, as shown in Table 11 of Appendix Section 5.3.

These findings point to a concerning lack of insurance against income losses following the onset of mental health disabilities. The patterns documented in this section can be interpreted through the conceptual lens of the optimal social insurance framework developed by Baily (1978) and Chetty (2006), without requiring a formal calibration of the model. In that framework, the welfare value of insurance depends on the extent to which income losses translate into reductions in resources available for consumption, weighed against the behavioural responses induced by benefit generosity. Although this paper does not observe consumption or estimate the relevant elasticities, the estimated declines in after-tax income provide a transparent and policy-relevant summary of how effectively existing institutions insulate individuals from disability-related income risk.[35] The pronounced heterogeneity in these declines across disability types therefore offers informative evidence on the relative completeness of insurance embedded in the current system.

Viewed in this way, the results are strongly suggestive of uneven insurance coverage across disability types. In particular, individuals experiencing mental–cognitive and mental health–related disabilities face substantially larger and more persistent declines in after-tax income than those with physical disabilities, despite access to the same broad set of tax and transfer programs. Even allowing for smoothing through savings, borrowing, or informal family support, sustained reductions in resources available for consumption over a decade-long horizon point to meaningful gaps in effective insurance. From a policy perspective, these findings suggest that existing disability-related programs may be better aligned with the income risks associated with some forms of functional limitation than others. Without making

[34] Specifically, this is calculated as *% reduction = 1 - (total after-tax)/(total before-tax)*.

[35] An example of how we may conduct such an exercise is included in Appendix Section 6.

claims about optimal benefit levels, the evidence highlights mental health–related disabilities as a group for which observed income losses are large relative to available public insurance, indicating scope for improved targeting or redesign of disability support within the current institutional framework.

These findings also point to concrete directions for improved benefit targeting. A natural implication is that disability programs may need to place greater weight on the nature of functional limitations, rather than relying primarily on broad severity or work-capacity criteria that may differentially disadvantage certain conditions. In particular, mental health–related disabilities often involve episodic or less visible impairments that nonetheless generate large and persistent income losses. Consistent with this interpretation, Canadian policy and administrative evidence suggests that individuals with mental health conditions face greater hurdles in accessing contributory disability benefits, reflecting challenges in demonstrating that impairments are both "severe" and "prolonged."[36] If similar institutional frictions operate in the setting studied here, they provide a plausible explanation for the muted transfer responses and sustained after-tax income declines observed for mental health–related disabilities. From a policy perspective, the results highlight scope for reforms that better align eligibility criteria and benefit design with the economic risks associated with these conditions, without conditioning support on complete labour market exit.

VI.4 Heterogeneity by Age and Education

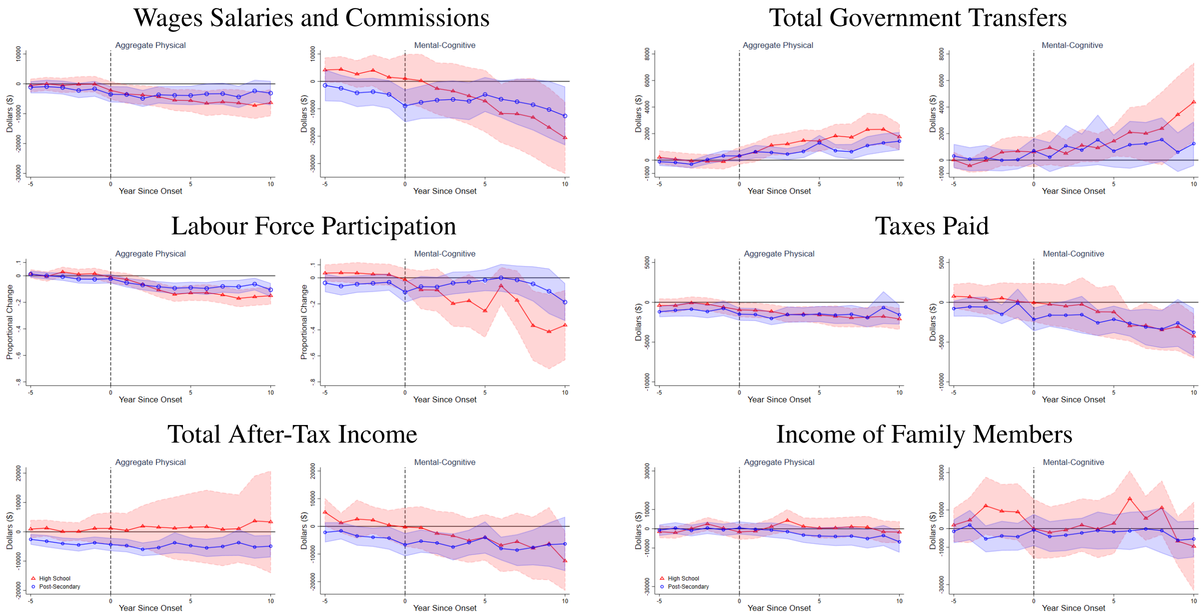
This section examines heterogeneity in the effects of disability types by education and age, two dimensions that are closely linked to labour market opportunities and eligibility for income support programs. Education is associated with differences in job flexibility, task requirements, and access to workplace accommodations, while age shapes adjustment capacity, retraining prospects, and eligibility for disability and retirement benefits. Examining disability effects along these margins helps clarify which groups experience more persistent income losses and how effectively existing insurance mechanisms respond. I therefore stratify the sample by education and, separately, by age, estimating the effects of disability onset using aggregate physical and mental–cognitive disability classifications.[37]

Figure 7 reports results by education. Individuals are classified as low education if they have at most a high school diploma and as high education if they report any post-secondary credential. Circles denote estimates for the high-education group and triangles for the low-education group. As in Lundborg, Nilsson and Vikström (2015), the point estimates generally indicate larger adverse effects following disability onset among lower-education individuals.

[36] Canadian policy and administrative evidence suggests that individuals with mental health conditions face greater barriers in accessing contributory disability benefits. Reports from Employment and Social Development Canada document lower allowance rates and longer adjudication times for CPP-D applications citing mental health conditions (Employment and Social Development Canada, 2019). Analyses by the Canadian Institute for Health Information show that individuals with mental health–related functional limitations are less likely to receive contributory disability benefits and more likely to rely on tax-based relief or means-tested assistance (Canadian Institute for Health Information, 2023). In parallel, policy discussions by the Mental Health Commission of Canada emphasize that existing disability eligibility frameworks are poorly suited to episodic or partial impairments, which are common in mental health–related disabilities (Mental Health Commission of Canada, 2017).

[37] The results for the disaggregated disability types are in Appendix Section 4.1.

Figure 7: Heterogeneity in Effect of Aggregate Disability Types by Education



Notes: Figures present point estimates of the effects of disability onset in the $k \in \{-5, ..., 10\}$ periods relative to its reported onset. The triangles correspond to the sample with at most a high school degree, and the circles correspond to the sample with post-secondary education. The 95% confidence intervals for the point estimates is represented by the dashed and solid edged shaded region for aggregate physical and mental-cognitive, respectively. Data on WSC, Family Income, and after-tax income are top-coded at the 99th percentile. Estimates and standard errors used to generate these figures are reported in Section 7 of the Appendix.

While estimates are imprecise, the results reveal several patterns. For aggregate physical disabilities, WSC declines for both education groups, with larger losses among those with lower education. For mental-cognitive disabilities, WSC declines continuously for the low-education group. Labour market exit is substantial for both education groups following physical disability onset, though somewhat smaller among higher-education individuals. For mental-cognitive disabilities, lower-education individuals exhibit a larger and increasingly persistent likelihood of labour market exit, whereas higher education does not show significant exits.

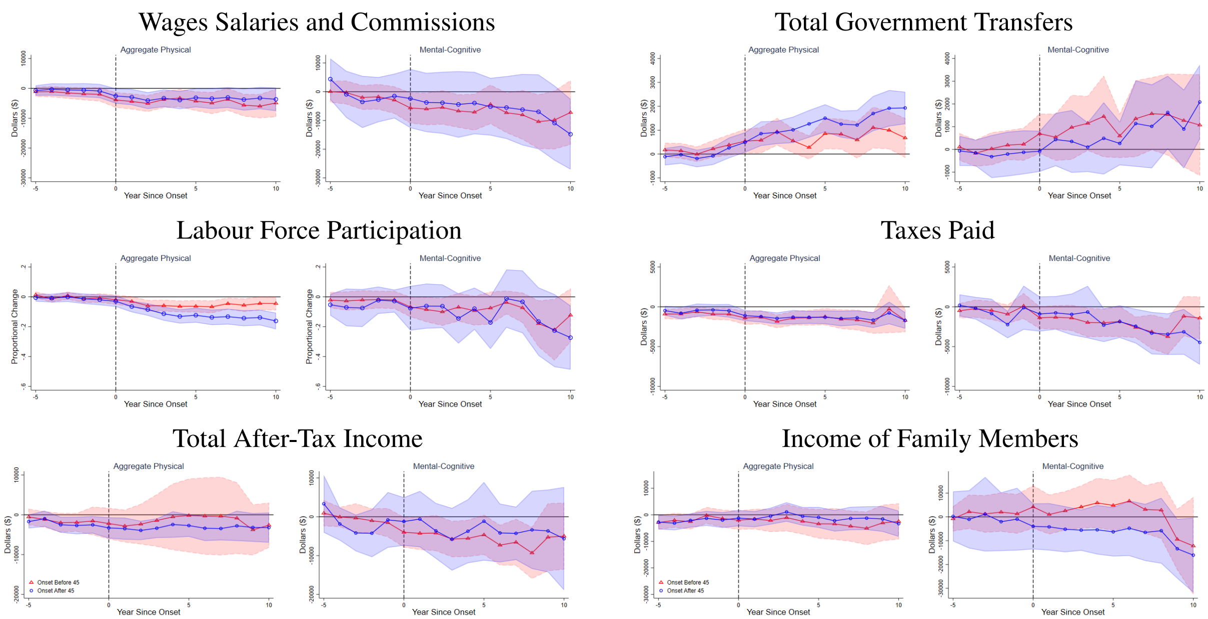
Government transfers rise for aggregate physical disabilities in both groups, with larger increases among lower-education individuals. For mental-cognitive disabilities, transfers significantly increase only for the low-education group. Responses in family income vary little by education, except for high-education individuals with physical disabilities, whose family members' income declines significantly in the long run. Total taxes paid decline across all disability types, with little variation by education level. Together, these patterns indicate that lower-education households rely more heavily on public transfers while facing greater vulnerability in private income sources. After-tax income estimates are noisy and complicated by pre-trends, but they suggest no clear changes for aggregate physical disabilities and declines for mental-cognitive disabilities among lower-education individuals.

Further exploration of subtypes within the aggregate disability categories is presented in Appendix Section 4.1.

Overall, the results indicate that trends for aggregate physical disabilities are primarily driven by limitations to kinetic ability, while pain-related disabilities are largely insignificant. Kinetic disabilities are associated with significant declines in after-tax income, and the inflated standard errors observed for the aggregate physical category are driven by heterogeneity within exclusively pain-related disabilities.

Interestingly, the onset of a mental health disability among individuals with post-secondary education does not significantly affect WSC or labour force participation, although total after-tax income does decline for this group. Instead, much of the adverse impact of mental health disabilities on market income is concentrated among lower-educated individuals. Despite these adverse effects, affected individuals receive little income from partial insurance sources. Taken together, these results indicate that lower-education individuals face more severe and persistent economic consequences following disability onset, particularly for mental–cognitive conditions.

Figure 8: Heterogeneity in Effect of Aggregate Disability Types by Age of Onset



Notes: Figures present point estimates of the effects of disability onset in the $k \in \{-5, ..., 10\}$ *periods relative to its reported onset. The triangles correspond to the sample whose disability onset before age 45, and the circles correspond to the sample whose disability onset by age 45 or older. The 95% confidence intervals for the point estimates is represented by the dashed and solid edged shaded region for aggregate physical and mental-cognitive, respectively. Data on WSC, Family Income, and after-tax income are top-coded at the 99th percentile. Estimates and standard errors used to generate these figures are reported in Section 7 of the Appendix.*

To examine heterogeneity by age at onset, I split the sample according to whether disability onset occurred before age 45 (triangles) or at age 45 or older (circles). Figure 8 shows that WSC trajectories are similar across age groups for both aggregate disability types, suggesting that the immediate functional impact of disability does not vary substantially with age at onset. Labour market responses, however, differ more clearly for aggregate physical disabilities, as individuals experiencing onset at age 45 or older are more likely to exit the labour force. This pattern is consistent with reduced scope for occupational adjustment or retraining later in the working life, as well as stronger incentives to transition toward retirement as eligibility thresholds approach. For mental–cognitive disabilities, I find little evidence of age-related heterogeneity. This null result is difficult to interpret, as it may reflect genuinely similar effects across age groups or simply insufficient statistical power due to smaller sample sizes within each age stratum; the data do not permit distinguishing between these explanations.

Figure 8 also reports responses in key sources of partial insurance. Government transfers rise substantially for aggregate physical disabilities with later onset, while increases are more modest for earlier-onset cases. Net taxes paid fall significantly for both age groups, indicating partial buffering through the tax system, with little difference by age at onset. For mental–cognitive disabilities, there is suggestive evidence of partial insurance through government transfers and reduced tax liabilities, although estimates are noisier and there is no discernible gradient by age of onset. Overall, the patterns for physical disabilities are consistent with the findings in Humlum, Munch and Jorgensen (2023).

When considering more granular disability types, the results again show that aggregate physical effects are driven primarily by kinetic limitations. After-tax income declines more sharply for younger individuals with kinetic disabilities, and much of the noise observed in the aggregate physical estimates reflects heterogeneous effects among younger individuals with pain-related disabilities. Interestingly, the adverse impact of mental health disability onset on market income is larger for younger individuals than for older individuals, whereas the opposite pattern holds for cognitive disabilities. This suggests that mental health disabilities may impede early-career skill formation and stable labour market attachment, while cognitive disabilities may disproportionately affect older workers facing tighter constraints on job mobility and retraining, highlighting the importance of age-targeted policy responses.

VII Conclusion

This paper offers a comprehensive analysis of how disability dynamically affects the components of personal income. It categorizes disability into mutually exclusive types based on the specific productive tasks that are impaired. The onset of a disability induces a permanent shock to income, and the welfare implications of this shock vary considerably across these types. The empirical results provide fresh insights into the considerable variation in how disability impacts earnings, employment, and sources of partial insurance.

Disabilities that impair physical tasks cause significant declines in market income, driven by both labour market exit and lower earnings for those who remain employed. After onset, government transfer payments, primarily from disability-relevant programs, steadily rise, and individuals pay less in taxes, providing partial insurance against lost market income. In contrast, the onset of a mental-cognitive disability results in relatively larger declines in market income, and a similar increase in government transfers. There is not a substantial difference in after-tax income between these two disability classifications in the short run. However, I show these aggregate types mask important sources of underlying variation.

I show that important heterogeneity exists within the aggregate disability types. Within physical, disabilities that impair kinetic ability are the driving force in the effects on market income and government transfers. Disabilities exclusively related to pain do not significantly affect wages, salaries, commissions, or government transfers, although they do result in modest exit from the labour market. Disabilities that hinder cognitive functions lead to the largest drop in market income and a considerable rise in transfer payments from disability-relevant programs, coinciding with a sharp long-run decline in labour force participation. In contrast, mental health disabilities do not receive significant partial insurance via transfers, the tax system, or household income adjustment from family members, despite having similarly large impacts on market income as kinetic ability disabilities. The results highlight a potentially severe gap in effective insurance for mental health–related disabilities. In particular, the onset of a mental health condition is most detrimental for the incomes of younger individuals and for individuals with low education.

This analysis sheds light on how disability relates to the various skill components highlighted in task-based human capital research. Although it provides novel estimates of the effects of different disability types, the paper does not directly capture skill heterogeneity or the specific tasks performed at the time of disability onset. A more comprehensive examination that integrates skills, job requirements, and multidimensional disability types is left for future work. Furthermore, because the data cannot adequately support analyses of interaction effects across multiple dimensions, this study focuses on mutually exclusive disability types. Future research into such interaction effects remains crucial for understanding how health comorbidities reduce productivity across different aspects of human capital.

VIII Declaration of generative AI and AI-assisted technologies in the writing process.

During the preparation of this work the author(s) used ChatGPT, Claude, and Microsoft Pilot in order to copy edit the written text in the paper. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the published article.

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