Return-to-Work Policies for Disability Insurance Recipients: The Role of Financial Incentives

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Abstract: What is the impact of reducing financial incentives of the AWP, a program that allows individuals on Disability Insurance (DI) to combine salary and benefits? Does this encourage employment resumption, or conversely, does it push individuals back into full benefit dependency? Using a rich set of administrative data, our study leverages a kink in the AWP's design and applies RKD to infer the causal impact of a 30% increase in marginal taxation rates on labor supply. Our findings reveal that, after crossing the kink, the probability of DI recipients to exit the AWP increases in 5.9%. Further analysis of exit paths indicates a 3% increase in the probability of returning to full DI and a 1.3% impact on the probability of full work resumption. We also show that men are more sensitive to taxation than women, and that women are more inclined to return to full DI. Individuals with mental health conditions tend to opt for full DI after the tax increase, while those with musculoskeletal conditions are more likely to return to full-time employment. Blue-collar workers and individuals on long-term DI exhibit a greater responsiveness to taxation changes. These findings hold significant relevance for the design of return-to-work policies for DI recipients, shaping a path toward more effective and inclusive strategies.

JEL Classification: I13, I38, J14, J22.
Key words: Disability Insurance, Return-to-Work Policies, Financial Incentives, Regression Kink Design.

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1. Introduction:

Disability insurance (DI) has been in the research agenda for long time, as it is one of the most important social protection programs in developed economies. Over the past four decades, the expenditure on DI programs within the OECD has remained stable at around 2% of GDP (OECD, 2023). DI is a matter of dual significance, impacting both society and individuals. On a societal level, it presents economic challenges in terms of social safety net expenditure and the sustainability of the welfare state. For individuals, long periods on DI elevates the risk of poverty and social exclusion, while also exerting a detrimental effect on overall life satisfaction. Given all these factors, several authors had studied DI in many different dimensions. For example, Maestas et al. (2013) investigate the causal effect of receiving DI benefits on employment. They do it using variation in examiners' allowance rates as an instrument for benefit receipt, by doing this they are able to compare the impact of receiving benefits in contrast to the case of the applicants for which they were denied. They find a substantial negative effect of benefit reception on labor supply. Moreover, they find heterogeneous effects depending on the severity of the health condition, where there is almost not a differential impact for individuals with more serious conditions and an important effect for entrants with less severe conditions. Autor et al. (2015) analyze the impact of the time out of the labor force on subsequent employment and find that the DI application process reduces the future labor supply of applicants, considering both the delay in the application due to appealing possible denials and the time receiving benefits. Kostol & Myhre (2021) focus their analysis on the factors that shape labor supply responses of individuals on DI, specifically aim to quantify the role of information friction and find that it accounts for at least 30% of the employment attenuation. From this literature we conclude that it is important to close the disability employment gap through a better design of DI schemes. Policies to reduce dependency on disability benefits can focus on restricting the entry of individuals into long-term disability programs by improving assessment procedures or on implementing policies to facilitate the reintegration of individuals with disabilities back into the labor market. On this paper we aim to delve into a deeper understanding of the factors influencing exits from DI programs.

Some countries have already implemented return-to-work (RTW) policies to help individuals on DI to reconnect with the labor market. These could take different forms such as supporting employment programs (Fontenay & Tojerow, 2022) or allowing individuals to work part-time while keeping part of their benefits (Kostol & Mogstad, 2014; Myhre, 2021). While the last aim to bolster the labor force within DI recipients, empirical evidence regarding their effectiveness report mixed findings (Zaresani, 2018). On the one hand, it is assumed that a graded return to work helps to retain and potentially accelerate the recovery of certain skills following injuries, and thus encouraging people to rejoin the workforce more promptly (Kools & Koning, 2019). On the other hand, some argue that these policies could be an unemployment trap, since they provide highly favorable conditions for individuals to work fewer hours while still receiving benefits, potentially discouraging them from returning to full employment. What is clear is that despite the implementation of these policies, there has not been a noticeable decline in the number of people on DI in Western economies. Specifically in Belgium, the count of individuals enrolling in long-term DI continued its upward trend over all these years (NIHDI, 2021). Notably, the most common conditions leading to entry into disability programs are often temporary, with an expectation of eventual recovery. However, the rates at which individuals exit from disability programs in OECD countries are lower than the expected (Koning et al., 2022). Some papers had already studied the role of financial incentives on labor force participation among DI recipients engaged in RTW programs (Kostol & Mogstad, 2014; Zaresani, 2019) and although they find a general positive effect, we still do not know how to boost an effective full employment reintegration and how to reduce benefit dependency.

In this paper, we examine the Belgian Adapted Work Program (AWP), a tool designed to facilitate a smooth return to work for individuals on DI by enabling them to have a part-time job while retaining part of their benefits. Our analysis focuses on the potential exit routes individuals may pursue when confronted with a reduction in the financial incentives of the program. Our objective is to discern whether this fact could boost a full employment reintegration or, conversely, push them back to a complete DI status. Additionally, we delve into the heterogeneous effects and the underlying mechanisms that drive these two potential outcomes. Despite the significant advantages of the AWP for DI beneficiaries, in 2013 it was utilized by only 3.84% of them (NIHDI, 2023). Under the AWP, a portion of their salary is subject to taxation, with this calculated amount deducted from their benefits. The program features changes in the marginal taxation rate at three determined wage thresholds. The kinked design of this program allows us to evaluate the effect of a higher marginal taxation, which reduces the financial incentives of the combination scheme, in the individual's labor supply decision.

Our empirical strategy exploits a kink in the combination scheme of the AWP that increases marginal taxation from 20% to 50% when daily salary is higher than 24.9€. Notably, and in contrast to previous literature (i.e., Myhre, 2021), recipients cannot strategically position themselves around this kink. This random assignment effectively addresses the selection-into-treatment issue, enabling us to employ quasi-experimental methods. Our dataset comprises comprehensive administrative records from the National Institute for Health and Disability Insurance (NIHDI), encompassing disability recognitions, employment details, as well as various socioeconomic and demographic characteristics of all participants in the AWP in 2013. We then estimate the effect of a reduction in financial incentives on the labor supply of individuals who are working part-time and combining salary with benefits.

Our first contribution is to confirm that a reduction of the financial incentives associated to a RTW policy will force people engaged into the program to abandon it. Specifically, we find that 1 euro increase in wages after crossing the kink where the marginal tax raises in 30%, decreases in 5.9% the probability of remaining in AWP by the end of the year.

Our second and more substantial contribution lies in understanding the trajectories these individuals pursue after exiting the program. We investigate whether this fact accelerates a complete reintegration into employment or, conversely, if it forces individuals to revert to a state of full DI, thereby increasing benefits dependency. We found that after leaving the AWP due to a decline in financial incentives, there is a 3% increase in the probability of transitioning back to complete DI and a 1.3% increase in the likelihood of returning to full employment.

Additionally, we add a third contribution to the existing literature by shedding light on these potential exit routes from the program. We rely on a simple theoretical model of labor-leisure choice, which uses the person's wage rate as the key economic variable that guides the allocation of time between the labor market and leisure. Which in this case helps us to explain why some agents decide to return to full-time employment or to a complete DI status – where all the time is dedicated to leisure but retaining a lower income level. We use the volume of work authorized through the AWP as a proxy variable for preferences towards work, which reflects the motivation expressed by the individual to the advisory doctor to return to work. This motivation to work may stem from various factors, including intrinsic personal preferences, health status, social norms, or past experiences. Therefore, we have further explored the heterogeneity of these results to discern which types of individuals are more responsive to the taxation and, if applicable, which exit paths from AWP they are more likely to take. This includes discerning whether they have stricter preferences for leisure, leading to a return to full DI, or conversely, if they prefer to resume work. We find that the effect on the exits from AWP is mostly driven by blue-collar workers and individuals in long-term DI (more than one year receiving benefits). Moreover, our results reveal that men are more sensible than women to changes in marginal taxation, as well as that both genders, but specially women, are more likely to come back to DI rather than to full employment. For them, returning to DI is the unique significant exit path. We also find that the individuals with mental health conditions are more susceptible to come back to a complete DI while individuals with musculoskeletal conditions tend to come back to full employment, when staying in AWP is not financially attractive anymore. We make an effort to explain the possible mechanisms playing a role behind these heterogeneous effects, drawing support from previous literature and existing theories.

Our paper contributes to the literature on the role of financial incentives of DI schemes. Previous research has already shown that individuals respond to financial incentives and that disability benefits may originate financial disincentives to return to work (Koning, Muller & Prudon, 2022; Marie & Vall-Castelló, 2022). Similarly, reducing or eliminating pre-existing financial disincentives to work increases labor force participation among DI recipients (Vall-Castelló, 2017). We contribute on the study of financial incentives of RTW policies and combination schemes for DI recipients. In this specific context the literature is scarcer, and it primarily focuses on the impact of increasing financial incentives to work to individuals receiving DI benefits, consistently finding a positive impact on labor supply. For example, Zaresani (2018) proves that the increase in incentives to work, induced by a policy change in April 2012, that raises in 8.9% real average monthly earnings, caused an increase in the labor supply of the beneficiaries of 1%. Olivo and Zaresani (2021) extend this research by examining the effect of variations in clawback regimes on the labor supply decisions in the extensive and intensive margins, and they find that a more progressive clawback regime causes an increase in the mean labor supply among both margins (the ones already working, work more, and the ones who were not working, start working). Similarly, Kostol & Mogstad (2014) also use a sample of DI recipients already engaged partly in the labor market and they find that a reform that improves the financial work incentives could increase labor supply, with an observed impact of only 0.6%. More recently, Myhre (2021) reveals that recipients subject to a higher exemption threshold are more likely to participate in the labor force, with his primary estimation exploiting recipients who locate themselves around the threshold. However, the present study delves into a previously unexplored area, investigating the effect of reducing financial incentives of the combination scheme on the probabilities of achieving full reintegration into the labor market and the impact on a potential complete resumption of DI. Despite previous studies had shown the positive relationship between financial incentives and labor supply within the framework of RTW policies. To the best of our knowledge, this is the first study disentangling these two possible answers to a decrease on financial incentives and quantifying the probability of an effective full employment reintegration (instead of an increase of the working hours) and the probability of a complete DI status resumption. Moreover, this study is the first to identify heterogeneous effects on behavioral responses based on gender, pathology, social status, and the duration of DI, while providing an explanation supported by existing literature for the potential mechanisms behind these effects. Through this heterogeneous analysis, we also contribute to the literature on gender differences in labor market outcomes. Extensive research indicates that women tend to reduce labor supply more than their male counterparts after a shock (Kleven et al. 2019; Farré et al. 2022), and inherent gender norms influence women's participation in the labor market. Our contribution lies in demonstrating that, following a reduction in financial incentives of the AWP, women are less likely than men to react. If they do, they are more likely to reduce their labor supply to zero rather than fully resuming employment. To a lesser extent, we also contribute to the limited existing literature that suggest a negative link between mental health conditions and labor market outcomes. Our study shows that individuals with mental health conditions are also more likely to leave the AWP to return to full DI after a shock.

Furthermore, our paper also contributes to a broader body of literature addressing unemployment traps and analyzing exiting policies from other social security programs and job entry. Apart from DI, extensive research has been conducted on policies designed to encourage individuals to re-enter the workforce after experiencing unemployment. De

Brouwer et al. (2023) study the effect of the Job Search Monitoring on individual labor market outcomes, a program designed to boost labor market reintegration for individuals in long-term unemployment, and they find that the policy increases exits from unemployment to DI without affecting transitions into employment. Arni & Schiprowski (2019) investigate the effects of job search requirements on effort provision and labor market outcomes, finding that the duration of the unemployment decreases by 3% if the requirement increases by one month application. Cockx & Dejemeppe (2012) evaluate the effect of a notification sent to long-term unemployed prior to actually verify their job search effort and find that it increases employment by nearly 9% prior to the first employment monitoring interview. Moreover, Card et al. (2018) summarize the estimates from over 200 studies of active labor market programs and conclude that, in the long run they tend to show a positive impact on employment and that there is also systematic heterogeneity by gender and length of unemployment.

The structure of the paper is as follows. We begin, in Section 2, describing the Belgian disability scheme and the Adapted Work program. In Section 3, we present the data. In section 4, we explain the empirical strategy used. In Section 5, we present the results and the heterogeneity analysis, in section 6, we do some robustness checks, and we conclude in section 7.

2. Institutional Setting

2.1. The Belgian Disability Insurance System

In Belgium, every worker, regardless of whether she is employed or unemployed at that moment[1], has the right to be insured through the payment of disability benefits if she become incapacitated for work due to a health reason. The insurance system in case of work incapacity is public and at the federal level[2]. The scheme depends on the duration of the sickness absence and the characteristics of the employer[3]. The start of sick leave is decided by the general practitioner on the first day of sickness and it contains a period of one month (14 days for blue-collar workers) of guaranteed wage[4]. After one month, the advisory doctor[5] decides whether the individual qualifies for the short-term work incapacity. During this period, the individual

[1] To be considered "worker" in this case and to have access to disability insurance, full-time workers and unemployed workers must have fulfilled a minimum of 180 working days (or active days of job search for the unemployed) during the last twelve months, part-time workers must have worked at least 800 hours over the last twelve months.

[2] The disability insurance that we describe in this article differs from the *Work Accident* and *Occupational Disease insurances*, which are covered by other institutions.

[3] Whether they are employed or unemployed and whether they are white-collar or blue-collar. The self-employed have a distinct sickness insurance program that we don't cover in this article.

[4] Period of guaranteed wage: *For white collars*: 30 days of guaranteed wage, not bounded and paid by the employer. *For blue collars*: from the 1st to the 7th day: guaranteed wage, not bounded and paid by the employer. From the 8th to the 14th day: 85,88% of the wage paid by the employer. From the 15th to the 30th day: 25,88% of the part of the wage below the limit fixed by the mutuality and 85,88% of the part of the wage over this limit paid by the employer + 60% paid by the mutuality.

[5] The advisory doctors are the physicians from the Belgian mutuality funds. Their main objective is to assess whether a person is eligible for receiving benefits (from the National Institute for Health and Disability Insurances: NIHDI) due to a health-related work incapacity. They can also recommend the worker to gradually return to work and must give the official authorization.

will receive disability insurance (DI) benefits from their health insurance fund ("mutuality")[6]. For a regular employee, the benefits correspond to the 60% of their gross salary, irrespective of their work regime[7]. This amount is bounded by maximums and minimums which slightly differ depending on the family situation. In the case of the unemployed workers, they will receive from their mutuality the same amount that they used to receive from unemployment benefits. During the first year of illness, individuals are considered to be in short-term work incapacity and are covered by a program called "Primary incapacity". After one year of sickness, the advisory doctor decides whether the individual enters the long-term disability scheme, which is called "Invalidity". Despite this different designation, both programs are financed by the National Institute for Health and Disability Insurance (NIHDI), the main differences between them are the way in which the remaining ability to work is evaluated and the calculation of the replacement rate.
During the short-time work incapacity period, the individuals are examined by the general practitioner. To be recognized as "unable to work", the individuals must meet three criteria. First, the worker must have stopped all productive activity. Second, she must have stopped this productive activity as a direct consequence of a deterioration of health that is not directly linked to her professional activity[8]. And third, the applicant's ability to work must be reduced by at least 66% with respect to her previous occupation. After 6 months, this third criterium changes and the ability to work is then evaluated with respect to any occupation that the worker could perform given her age, education, and experience. After one year, for being accepted into the long-term work incapacity program, the general practitioner (who oversaw the applicant during the short-term period) submits the application to the NIHDI. At this point, an advisory doctor decides whether the person qualifies for long-term DI (invalidity). The doctor can either directly approve it based only on the files transmitted by the general practitioner or run its own evaluation.

The calculation of the replacement rate also differs between the short-term and the long-term work incapacity program. In contrast to the 60% of the last salary of the short-term scheme, in the long-term program, for the regular employees, this percentage rises to 65%, and it is still bounded and slightly differs depending on the family situation[9]. For the unemployed, in this case, it is considered their last wage payment before unemployment to apply the percentage. The long-term disability status is revised by the advisory doctor every two years.

[6] In Belgium, the health care system is financed both by social security contributions as well as by compulsory health insurance funds ("mutualities"). The last ones are funded by the National Institute for Health and Disability Insurance (NIHDI, in French: INAMI) and act as intermediaries between this institution and the disabled people. They are responsible for the reimbursement of medical expenses and the short-term disability benefits.
[7] the gross salary is calculated daily (week of 6 working days).
[8] This is to establish a distinction between the short-term disability program and other programs such as the occupational injuries fund and the occupational diseases fund.
[9] This percentage is 65% for individuals with dependents, 60% for single households and 40% for cohabitants, with defined floor and ceiling amounts.

2.2. The Adapted Work Program

In Belgium, any person who is on DI could start her (re)integration into the labour market by adapting her working time to her health state, as long as she has received approval from an advisory doctor from her mutuality. This is done through the Adapted Work Program[10] (AWP) from the NIHDI dedicated to salaried workers (for the self-employed, another regime applies). This program has as an objective the full employment reintegration of people with temporary or permanent illness in the labour market, yet it permits them to work part-time while combining the salary from the adapted work with disability benefits until they are fully recovered and prepared for the complete work resumption. The return to work could be in the same job that she used to have before the DI or in another job, as long as the type of work is compatible with the health condition.

The reintegration of an individual receiving short-term or long-term disability benefits in the labour market requires a disability of at least 50%[11] and the approval of an advisory doctor. If these conditions hold, and the selected job is compatible with the health status, the doctor can suggest to this person to start working part-time (i.e. entering into the AWP) and the individual can accept it or not. The individual could be also the one who proposes it, and, in this case, she should ask for the permission to the advisory doctor. When the individual enters into the AWP, she receives a combination of the income from labour and (reduced) disability benefits. The disability benefits will be reduced only if the labour income[12] exceeds certain limits.

The follow-up of an individual in the Adapted Work Program also depends on the advisory doctor, and the consent to work must be renewed every 2 years. This doctor will be the main contact for both the employer and employee to start a progressive reintegration trajectory. In the case that the worker wants to change their amount of permitted work, she will need to ask for a visit with the advisory doctor, who will re-assess her health status and approve, or not, the new agreement. This means that the number of working hours cannot be modified immediately, the adjustment process takes some time.

2.2.1 Financial Design of the AWP

The Royal decree of July 1965 implementing the law on compulsory health care insurance and benefits coordinated on 14 July 1994, is the law governing the way how disability benefits are reduced when a person works while on a claim in Belgium. Several reforms have been made to this law that may affect the incentives of some individuals to decide whether to keep in the program or not, nonetheless, this section describes solely the situation from 2013.

[10] "Reprise de travail adapté" in French.
[11] Based on a medical scale.
[12] Labor income = gross wage - contributions to the Social Security.

In January 2012, there was an update in the brackets to compute the amount that is deducted from the benefits. After some small actualizations during this year, in 2013 it becomes stable. Equation 1 defines the scheme applied in 2013, and Table A1 in the appendix reports all the actualizations on the brackets since 2012.

$$B_{AW} = \begin{cases} B_0 & if \quad \omega \leq 15.61 \\ B_0 - [(\omega - 15.61) \times 0.2] & if \quad 15.61 < \omega \leq 24.97 \\ B_0 - \begin{bmatrix} ((24.97 - 15.61) \times 0.2) \\ +((\omega - 24.97) \times 0.5) \end{bmatrix} & if \quad 24.97 < \omega \leq 34.33 \\ B_0 - \begin{bmatrix} ((24.97 - 15.61) \times 0.2) \\ +((34.33 - 24.97) \times 0.5) \\ +((\omega - 34.33) \times 0.75) \end{bmatrix} & if \quad \omega > 34.33 \end{cases} \tag{1}$$

where B_0 refers to the benefits received before starting the adapted work, B_{AW} the net benefits after applying the reduction, and ω is the salary from the adapted work. The calculations are made using the daily salary[13].

As indicated by Equation 1, the reduction in benefits is determined by a function of the daily salary, which exhibits kinks at three specific points. The daily salary is computed by dividing the monthly salary by 26, the officially recognized average number of working days in a month in Belgium. Consequently, the salary with which we work is not affected by differential daily working hours or weekly workdays. The drawback of this approach is that it does not allow us to differentiate between individuals working fewer hours with a higher salary and those working more hours with a lower salary. Nevertheless, it is important to note that this limitation does not affect to the applicability of our methodology.

A worker who is earning a daily salary from the AWP of 15.61€ or less, would not face any reduction on her benefits, and then B_0 =B_{AW}. The next 9.36€ would face a marginal tax rate of 20%, which means that for a worker earning a salary between 15.61€ and 24.97€, the first 15.61€ would not face any reduction, but from there (and until a cap of 24.9709€) the salary would be taxed at 20%, and this would represent the reduction amount in benefits. The subsequents 9.36€ would face a marginal tax rate of 50% and 75%. Figure 1 simulates the reduction in benefits of Equation (1) and illustrates the three kinks, Figure A1 in the appendix illustrates the marginal tax rate at each level of salary.

For the current analysis, we focus on the second kink, which is the one exhibiting the more salient change in the slope of the policy rule (0.3). As part of our robustness checks, we also examine the other two kinks. However, the first kink, in addition to having the smallest change in slope (0.2), is associated with a limited sample size. Furthermore, when we consider the

[13] Daily salary is computed by taking the monthly salary and dividing it by the official number of working days in the month (25 in the months of 28 or 30 days, and by 26 in the months of 31 days).

third kink (change of 0.25), we observe that it reflects a continuation or persistence of the effects seen at the second kink.

3. Data

3.1. Description of the Sample:

We use three administrative datasets from the National Institute for Health and Disability Insurance (NIHDI) that comprise data on payments for short and long-term disability insurances (DI), disability recognitions, and information related to the Adapted Work Program (AWP). The different datasets are linked at individual level using anonymized social security identifiers. We draw a large dataset covering all the salaried individuals who enter to and exit from the AWP in Belgium in 2013. Our data contains all the information related to (a) the work incapacity, such as dates of entrance and exit, payment amounts, pathology, and reason of exit, and (b) the information related to the adapted work program, such as dates of entrance and exit, salaries, and exit paths. Moreover, it also includes (c) a rich set of demographic characteristics, including gender, age, region and social status.

As we are interested in the effects of the financial incentives that stems from the combination of a salary from part-time work and disability benefits, we narrow the sample to salaried individuals. Therefore, we excluded the self-employed, since they are subject to a different return-to-work program, and the individuals working in a non-remunerated activity (i.e. voluntary work). The baseline results are compute using data from January to December of 2013, which constitute a sample of 47,775 individuals.

Thanks to the richness of the dataset, we are able to observe behavioural reactions to taxation of people in AWP in terms of labour supply and perform different heterogeneity analysis considering characteristics such as gender, age, region, social security status and pathology.

3.2. Descriptive Statistics

Table 1 presents the characteristics of the sample, indicating the means and, in parenthesis, the standard deviations. We also provide descriptive statistics of the "kink sample", which refers to all individuals in AWP with salary within 9.36 euros of the kink point, a subsample of 12,025 observations. In the next section we explain why this is our preferred bandwidth for the estimations. Figure 2 displays the distribution of daily salary relative to the kink. The bandwidth of 9.36 euros includes mostly individuals in the 2nd quartile of the salary distribution.

We can observe that there is a slight majority of women in the sample (63%), the average age is around 46 years old and, 55% of the individuals are blue-collar workers. We can also observe in the table that the mean daily salary is around 39€ and the mean daily benefits received are around 37€. An important observation is that the variability of salaries is significantly greater than the one of benefits, a fact that reflects how benefits are limited by minimums and maximums, thus reducing the deviation from the mean, while salaries are freely set. Table 1 also illustrates that 55% of the sample will remain in DI by the end of the year, and 63% will also remain in AWP. This table also report the same result for the subsample around the kink. From there one can observe that the percentage of women is slightly higher around the kink while age is very stable, reporting similar values. Not surprisingly, the ratio of blue-collar workers increases somewhat when we focus around the kink, since most white-collars should be earning higher salaries.

Table 2 illustrates other relevant insights from the sample, the most common pathologies among the AWP participants, their reason for exiting AWP, and the region where they live. This table also report the situation for the full sample and the subsample around the kink. Musculoskeletal disorders and mental health are the two main reasons for being disabled in both cases. In general, percentages of the prevalence for all conditions are stable through the two samples. There are not neither noticeable difference in terms of region. When looking at the reason of exit, although there are other reasons, the most common is to go back to full time work (40%) or back to full DI (24%). The reason of exit seems very susceptible to the being close to the kink, these two probabilities are almost the same, about 30%, which represents an important decrease of the labour market exit path confronted by an increase of the odds of returning to a full DI status. Table A2 in the Appendix report descriptive statistics around the other kinks.

4. Empirical Strategy

4.1. Regression Kink Design

The Regression Kink Design methodology was proposed by Card et al. (2012) and it exploits exogeneous changes in the slope of a policy rule. It requires an explanatory variable (in our case, the reduction in benefits) to be a deterministic and known function of an assignment (or running) variable (in our case, the daily salary through the AWP). This methodology is similar to the Regression Discontinuity Design, but instead of exploiting a discontinuity in the assignment rule, the policy rule is expected to be kinked (with a change in the slope when relating it to the assignment variable) in one or more points. One of the most typical scenarios to apply RKD is when a marginal tax rate shows discrete jumps, as it is our case.

The main idea of this methodology is to study the possible change in the slope of the relationship between the outcome of interest and the assignment variable when crossing the kink. It relies on the same basis of a RDD, assuming than individuals are randomly located around the kink, and their behavioral differences can be attributed only to the fact that they are on different sides of the kink (and therefore, they are affected differently by the policy). Thus, this methodology gives us the elasticity of the outcome depending on the changes in the policy. As in the RDD, RKD gives us local estimates and it relies on some assumptions.

4.2. Identifying Assumptions

A basic condition to implement RKD is that the function must have at least one kink point. This means that the function has segments where it is continuous and differentiable, but in at least one point, it is continuous but not differentiable, having unequal left and right derivatives. This condition is easy to identify from the policy rule and it is illustrated in Figure 1. Additionally, RKD also relies on two important assumptions (i) no sorting assumption and, (ii) smoothness assumption. In this subsection we explain and test these assumptions.

Assumption 1: No sorting. The density of the assignment variable is smooth around the kink. This means that individuals are unable to manipulate the assignment variable (i.e. their salary) to allocate themselves in the optimal part of the function, which in this case would be just before a kink. Observable bunching near kink points would invalidate this assumption. This local random assignment condition implies that individuals have not sorted around the kink by manipulating their earnings. It seems credible in our context because individuals cannot decide their salary. They might be able to adjust it by changing their number of working hours, but for doing it, they would need to have the agreement from the advisory doctor as well as from the employer, which may take long. Thus, it is very unlikely that individuals on this context can sort themselves in the salary distribution.

We start providing graphical evidence of the absence of bunching before the kink in Figure 2, but we even go one step further and, following the literature, we present below formal tests for this assumption (Kostøl & Mogstad, 2014; Card et al., 2015; Landais, 2015; Fontenay, 2022). By plotting the Kernel density function of the salary in AWP one can already see that the distribution looks smooth, and we cannot observe any discontinuity or bunching around the kinks. However, we also provide formal tests to the no sorting assumption. We start by providing the results of the McCrary test. McCrary (2008) presents a test of manipulation related to continuity of the running variable density function in RDD, a widely used methodology in the RDD and RKD literature. He explains that histograms and Kernel density estimations are badly biased and do not allow for point estimation or inference. The test that he proposed complements these methods by estimating potential discontinuities in the density functions of the assignment variable at the kink. Panel A of Figure 3 reports the result of the McCrary's manipulation test, which is insignificant and confirms the lack of continuity at the kink.

More recently, Cattaneo et al. (2020) had developed a novel discontinuity in density testing procedure that we also implement on this study. This procedure is based on their proposed local polynomial density estimator, and it is fully data-driven: bandwidth selection methods are formally implemented along with inference methods based on robust bias correction. Panel B of Figure 3 presents the density of the assignment variable on both sides of the kinks as well as the formal result for the Cattaneo et al. (2020) manipulation test, which confirms that we cannot detect manipulation around the kink.

Taking all together, both the graphical evidence and the formal tests results, suggest that the no sorting assumption holds on this setting, indicating that individuals are not able to manipulate their earnings to locate at one or the other side of the kink.

Assumption 2: Smoothness. In the absence of the kinks in the benefit function, there would be a smooth relationship between the outcomes and the assignment variable.
If this assumption holds, evidence of a change in the slope would imply a causal effect of the benefit amount on the outcome.

Assumption 2, however, is not empirically testable, as we cannot infer how the counterfactual would be in absence of the policy rule. What we can do, instead, is to perform some approximations. One option is to test the smoothness of different control variables at the kinks, if we find that covariates do not behave smoothly around the kinks, this assumption fails. This procedure is commonly used in RDD literature (Imbens & Lemieux, 2008), but also applicable to the RKD context (Fontenay, 2022). Figure 4 illustrates how a variety of control variables evolve smoothly around the kink.

Taking all together, we can rely on the validity of the methodology since the necessary assumptions hold in our context. We can therefore move to describe the formalities of the methodology.

4.3. Formal Model

The causal effect in RKD is calculated as the ratio of the change in the slope of the outcome variable (we start investigating the probability of remaining in AWP by the end of the year) and the exogeneous change in the slope of the policy rule (marginal tax rate). Therefore, it is a fraction with one numerator, which is an estimation, and one deterministic denominator.

Formally, let Y_i be a dichotomous variable taking 1 if the individual $i \in \{1, 2, \ldots, n\}$ is in AWP by the end of the year, w the daily salary in AWP, B_0 benefits before the reduction, B_{AW} benefits after the reduction, and R the reduction:

$$\left.\begin{array}{l} B_{AW} = B_0 - R \\ R = f(w) \end{array}\right\} B_{AW} = B_0 - f(w) \qquad (2)$$

Where $f(w)$ is a defined function of the salary at the kink we are investigating, w_k=24.97.

Our parameter of interest would be the change in the slope of the conditional expectation function:

$$\mathrm{m}(w)=\mathrm{E}[Y_i \mid w_i=w], \text{ at } w=w_k \tag{3}$$

Thus, the probability of staying in AWP by the end of the year for individual *i*, depending on their salary (which determines the marginal tax rate she faces). And this term, divided by the change in the slope of the deterministic (known) function:

$$R = f(w), \text{ at } w=w_k \tag{4}$$

The general model of interest is of the form:

$$Y_i=a(w_i,R,\varepsilon_i) \tag{5}$$

which explains the probability of staying in AWP by the end of the year depending on the salary, the reduction in benefits (which also depend partly on salary), and an error term.

Card et al. (2012) show that τ, the average marginal effect of R $=f(w)$, is identified at $w=w_k$ if the following assumptions hold:

(i) $Y_i=a(w_i, R, \varepsilon_i)$ and its derivatives with respect to w_i and R, are continuous,
(ii) $f(w)$ has a kink, and
(iii) the density of w is smooth at w_k.

Under these assumptions, $E[\varepsilon_i \mid w_i=w_k]$ is a smooth function, and

$$\beta = \frac{D_+\, m(w_k) - D_-\, m(w_k)}{D_+\, f(w_k) - D_-\, f(w_k)} \tag{6}$$

where,

$$D_j\, m(w_k) = \lim_{w \to w_k^j} \frac{d\, m(w)}{dw},$$

$$D_j\, f(w_k) = \lim_{w \to w_k^j} \frac{df(w)}{dw}, \qquad j \in \{+,-\}$$

j∈{+,-}means just the left and the right sides of the threshold.

The full equation will be:

$$\beta = E\left[\frac{dY}{dB}|w = w_k\right] = \frac{\lim_{w\to w_k^+} \frac{d\,E[Y|w=w_k]}{dw} - \lim_{w\to w_k^-} \frac{d\,E[Y|w=w_k]}{dw}}{\lim_{w\to w_k^+} \frac{dR(w)}{dw} - \lim_{w\to w_k^-} \frac{dR(w)}{dw}} \quad (7)$$

where β is the weighted average of marginal treatment effects across the population. The weight is the relative likelihood that an individual has w_i=w_k, given ε_i. The individuals that have a higher likelihood of being at the threshold receive higher weights. One can apply weights in different ways, depending on the chosen Kernel function.

From this equation, one can see that the RKD estimator is a ratio of two terms, the numerator is the change at the kink point in the slope of the relationship between the outcome Y (probability of staying in AWP) and the salary (w). The denominator is the change at the kink point in the slope of the reduction function. The resulting estimate can be interpreted as a local treatment-on-the treated (TT) parameter, as we are aware that it may exist some selection into the program.

The numerator of the equation β is estimated semi-parametrically using the following local power series estimation[14]:

$$\mathrm{E}[Y_i|w_i = w] \approx \alpha_0 + \sum_{p=1}^{p}\left[\alpha_p(w - w_k)^p + \beta_p D_i(w - w_k)^p\right] \quad (8)$$

where p is the chosen polynomial and D is the treatment status: $D_i(z)=1$, if z>0, $D_i(z)=0$ otherwise (it coincides with the two sides + -). The power series is a local approximation of *m(w).*

Note that $|w-w_k| \leq h$, where h is the bandwidth chosen for the estimation. The denominator of the equation is the change of the slope of the deterministic policy rule *f(w)* at the kink point. As we can trust that NIHDI enforces the rules for the benefit reduction and it does not exist any situation for which an individual in AWP is exempted of this reduction, we can follow Landais (2015) and proceed with a sharp RKD.

4.4. Implementation

The kink in the outcome and treatment variable are measured by estimating local polynomial regression of order p to the left and right of the kink, with bandwidth h and defining a Kernel density function K. These are the three key parameters that we should decide when applying an RKD.

[14] Local power series estimation: we can approximate a function by a polynomial, at least locally. Linearization of a function gives a good approximation for points close to the point of tangency (with p(2) and p(3) we can also find other things…) in order to exactly represent an analytical function, we'll need to take infinitely many terms, we'll need a power series. (i.e. Taylor series).

Choose of polynomial order:
In previous literature, it was assumed that in RKD context, a local quadratic approach is preferred to the local linear because it is expected to give an asymptotically smaller bias. However, Card et al (2017) warm against making the quadratic model a universal choice and argue that one should also take into account the characteristics of the data set of interest, including the sample size. In fact, some studies had shown that, in their context, the local linear polynomial performs better (Fontenay, 2022). We chose the linear polynomial as our preferred specification, but in section 6 we show results of the quadratic specification too.

Choose of Kernel:
Cheng et al. (1997) show that the triangular Kernel is boundary optimal, but later on, Card et al. (2017) show that the losses from using a uniform Kernel (i.e. no weighting) are small, and that eases the RKD implementation. Most of the literature, therefore, apply uniform Kernel. We also choose the uniform distribution as our preferred specification, but we show results applying a triangular density function as a robustness check in section 6.

Choose of bandwidth:
The bandwidth chosen must be the result of a trade-off between variance and bias. If we increase the size of the bandwidth, thus including more observations, we reduce the variance. In the other way around, if we reduce the bandwidth and include less observations, the bias is reduced. Bandwidth choices that are "too large" lead to a non-negligible bias in the estimator of the confidential expectation function. But at the same time, as Landais (2015) warns, RKD does pretty poorly with small samples, and therefore is quite demanding in terms of bandwidth size compared to RDD. What is important in our context is to avoid the intersection between kinks, because this would confound the results, thus, we would choose bandwidths up to 9.36, being the latter our preferred.

5. Results

In this section, we present our findings on the effect of an increase in marginal taxation on the AWP. We begin by providing graphical evidence and then proceed to the empirical results. As our baseline estimation, we investigate the impact on the continuity of the program by analyzing the probability of remaining in the AWP by the end of the year, as well as the number of days an individual stays in the program throughout the year. Additionally, we broaden our analysis by investigating the exit paths of individuals who leave the AWP. Subsequently, we present a simple theoretical model that helps us to understand how preferences for labor and leisure shape individuals' decisions after leaving the AWP. Finally, we delve into a more detailed analysis by examining heterogeneity in preferences based on gender, pathology, social status, and length of disability.

5.1. Impact of Taxation on the Probability to Remain in AWP

Graphical Evidence:

Once decided the key parameters, first step when implementing a RKD is to assess the graphical evidence. We start analyzing the probability to stay in AWP by the end of the year depending on the salary, and hence on the taxation faced. Figure 5 shows the relationship between the probability for an individual to continue in AWP in December of 2013 and the assignment variable at the kink.

Using a bandwidth of 9.36 euros, which ensures that the effect of other kinks does not interact with the kink analyzed here, bins of one euro, and displaying a linear trend at each side of the kink, we can evaluate graphical evidence. At first sight, one can find a sharp reversal in the slope of this relationship at the kink, suggesting a significant behavioral response. The probability to remain in the program was positively related to salary until reaching the kink, after the increase in the marginal tax rate, the probability of remaining in AWP by the end of the year decreases with salary.

Figure 5 suggests a sharp change in the kink, where the tax raises from 20% to 50%, providing supportive evidence for the identification of an effect of a higher taxation, which depends on salary, on the labor supply through the AWP of DI recipients. To confirm this graphical evidence, we estimate treatment effects empirically and report results in the next subsection.

Baseline Empirical Results:

In this subsection, we present the results for the baseline estimation. We assess how the reduction in benefits, depending on salary, impacts the probability of individuals remaining in AWP by the end of the year.

Table 3 reports the results for the baseline estimation of equation (7)[15]. The table starts indicating the value of the deterministic denominator in the first stage, and then the treatment effects. In each line, we report the estimated coefficient β in the RKD analysis, which is a result of dividing the estimated treatment effect by the known denominator, the robust confidence interval, the calculated mean of the dependent variable within the defined bandwidth around the kink, and the number of observations. Together with the estimated coefficients we also report the associated significance level and standard errors.

Panel A in the table reports the deterministic coefficient of the first stage, which is the 0.3 enforced by the policy rule. This is the coefficient indicating the increase on the marginal

[15] We have estimated parametrically equation 8, and we divided by the deterministic value in the first stage (0.3) to get the value in equation 7.

taxation rate. Columns 1 & 2 evaluates the impact of the kink, the former does not include covariates in the regression while in column 2 we introduce age, gender, region, and social state as additional control variables. We have information on the pathology only for people in long-term disability, thus if including pathology as a control variable we lose several observations (11,851). Results for this regression do not differ significantly depending on this variable, thus, in the regressions here, the set of covariates does not include pathology, but results controlling for this are reported in Table A3 in the appendix. In the next subsection, we analyze separately the samples for short- and long-term disability recipients and we are able to evaluate differential effects by pathology.

Our main coefficient of interest is β, which explains that the estimated effect of 1 euro increase in salary after crossing the kink, decreases by 5.6%-5.9% the probability to stay in AWP by the end of the year. In the cases where marginal tax is 20%, people does not seem to be discouraged to continue offering some labor capacity while keeping part of their disability benefits, we can even detect an increase on the labor supply as salary growths. This fact changes when arriving to the kink, a marginal tax of 50% implies that from any extra euro earned, half of it would be deducted from benefits. At this point both graphical representation and estimated coefficients show strongly significant evidence of a reverse in this trend. From this point, labor supply through AWP decreases with every extra euro earned.

To improve the robustness of our analysis, we employ an alternative variable to assess the participation in AWP: the total number of days an individual works through the program in the whole year. The findings using this variable align with those previously obtained and are detailed in the Appendix. Figure A2 illustrates a notable decline in the average number of days worked through the program after crossing the kink. Table A4 show that the estimated effect of 1 euro increase in salary after crossing the kink, is associated with a decrease of 9% of the number of days, on average, that an individual remains in AWP through the whole year.

Empirical results confirm graphical evidence and are in line with previous literature insights: financial disincentives of the return-to-work policies reduce the participation on it. However, this finding raises an important question about the behavioral responses affecting labor supply: Where do these individuals who exit AWP go? Do they return to full DI or to a complete work resumption?

5.2. Impact on Exit paths

We thus extend the analysis by investigating the impact of the change in the marginal tax rate on the probability of going back to full DI and on the probability to full-time work resumption. These results extend the existing literature providing novel insights on the effect of financial (dis)incentives on effective work resumption and benefits dependency.

As we proceed before, we start by providing graphical evidence. Panel A of Figure 6 illustrates the relationship between the probability for an individual who was in AWP but leave it because of the lower financial incentives, to go back to full time job and the assignment variable. We can see a significant change on the trend of this relationship at the kink. Panel B illustrates the relationship between the assignment variable and the probability to go back to full DI, the impact of the kink is also noticeable.

Graphic on Panel A of Figure 6 explains to us that, the higher the salary, the higher the probability to work resumption, in the plot we can observe a positive relationship, but this was quite modest before the kink. After crossing the kink, trend line gets sharper, explaining us that the positive relationship become stronger. We saw in the former section that with a higher marginal taxation, the probability of exiting AWP increased, and this plot shows that the probability of returning to work also increases at this point. Similarly, looking at the other graphic, in panel B, we can determine that, in the other way around, the probability of going back to full DI decreases with salary, the trend line illustrate a significant negative relationship between these two variables, but this line becomes flatter when arriving to the kink, explaining us that after an increase in marginal taxation, the probability of leaving the program increases, and the probability of going back to full DI is also higher than in the situation before the kink.

In order to confirm the graphical evidence and to quantify which of these possibilities exhibits a greater effect, we pass to estimate treatment effects empirically, which are reported in Table 4.

Probability of Returning either to Full Employment or to Full DI Status:

Panel A in Table 4 reports the deterministic coefficient of the first stage, which is the same as in Table 3, the increase in the policy rule. Column 1 assesses the effect of the kink on the probability of returning to full-time employment, while Column 2 evaluates its impact on the likelihood of returning to full DI. The main coefficient of interest is β, which indicates that a 1-euro increase in salary after crossing the kink results in a 1.3% rise in the probability of resuming work and a 3.0% increase in the probability of returning to full DI by the end of the year. Both coefficients exhibit high levels of statistical significance. We therefore conclude that an increase in marginal taxation for DI recipients working part-time through the AWP program compels them to exit the program. This leads to a substantial increase in the probability of returning to full DI. Additionally, it exerts an impact, albeit of somewhat smaller magnitude, on the probability of returning to full employment. Other potential paths out of AWP, to a lesser extent, include categories such as pensions, program exclusion, unemployment, and mortality.

These findings are of considerable interest and prompt the exploration of a novel inquiry: What factors influence the choice between two distinct trajectories after deciding to leave the

AWP? Specifically, we seek to clarify the determinants that make individuals to opt for either returning to full DI or to reentering the workforce when the combination scheme is less financially attractive. We rely on a basic labor supply decision model to shed light on it.

5.3. Preferences towards labor and leisure:

Based on the neoclassical model of labor-leisure choice, we know that after a change in the budget constraint, individuals will reallocate their number of hours dedicated to leisure and labor, and that this decision will depend on their preferences.

To simplify, we distinguish two types of agents, the ones with greater preferences towards leisure, and the ones with greater preferences towards consumption, thus towards labor. The first ones will have a more vertical indifference curves and, after an increase of taxation (which traduces into a flatter budget constraint), will gain more utility by jumping to a status of complete DI. The second group have more horizontal indifference curves and after the change in the budget constraint will prefer to go back to full employment.

In order to corroborate the insights from the model, we use a variable available in our data to proxy the preferences towards labor. We can not see the amount of time that each individual is actually working, but we know the volume of work authorized by the doctor. This decision tends to be made between the doctor and the patient jointly and the motivation for working is a key determinant for the amount authorized. The volume of work authorized can reflect preferences towards work, conditioned not only by pure intrinsic preferences, but also by the health state of the individuals, among other reasons. The better someone feels, the more eager they are to resume work. By running simple regressions (table A5 in the appendix) we find that the volume of work authorized positively explains the probability to go back to full employment after leaving the AWP and, in the other way around, it negatively explains the probability of reversing to a complete DI status. When analyzing the complete sample, we can detect a majority of individuals with preferences towards work at the right tail of the salary distribution and preferences towards leisure at the left tail of the salary distribution. However, when analyzing the cohort around the kink, we observe that the range of authorized volume of work is wide, indicating that there are individuals with both types of preferences at those salary levels. In fact, as the empirical findings indicate, we can find both types of responses after crossing the kink.

To further understand the determinants that may shape the preference of these agents, in the next subsection, we extend our analysis by conducting a thorough examination of heterogeneous effects, aiming to discern whether specific personal or socioeconomic characteristics may shape these decisions.

5.4. Heterogeneous Effects:

We have examined heterogeneous effects related to the likelihood of individuals choosing to return either to full employment or to full DI after crossing the threshold where the marginal taxation rate increases by 30% in the AWP. We conducted distinct regression analyses, segregating the data by gender, pathology, social status, and the time that individuals had already stayed in disability before entering in AWP. We present the significant differences we have found depending on these characteristics in Table 5 and the graphical evidence is reported in figures from A3 to A6 in the Appendix. Below, we describe the results, and we discuss the possible intuition behind them.

By Gender:

We conducted four separate regression analyses to investigate the influence of gender on individuals' exit paths after leaving the AWP due to a marginal taxation increase. The results for both male and female subgroups are presented in Panel A of Table 5. Our findings indicate that males are more responsive to the increase in marginal taxation compared to females. Specifically, for men, the probability of returning to full DI increases by 5.5% after the rise in marginal taxation, while the probability of returning to full employment increases by 2.1%. These results align with the trends observed in the overall sample reported in Table 4, even higher in magnitude. In contrast, for women, the probability of returning to full DI increases by 2.0%, but we do not find significant impact on the probability of returning to work. This indicates that women have stricter preferences towards leisure, and their associated indifference curves tend to be more vertical. In the case of men, however, we can detect both types of representative agents, with individuals exhibiting both horizontal and vertical indifference curves. These gender-specific results shed light on distinct responses to changes in marginal taxation rates between males and females within the AWP context.

One plausible explanation for these gender-specific findings is that, on average, women tend to have higher rates of part-time employment compared to men (OECD, 2022). Consequently, they may exhibit a lower responsiveness to changes in taxation rates, as it is more likely for them that the alternative of work resumption is to work part-time, but without any benefits. Therefore, for these women, the optimal choice is to maintain part-time work, even in the face of a higher reduction in benefits. As a result, if not keeping in AWP, their primary response to an increase in taxation is to transition back to full DI. In contrast, males are generally less inclined to engage in part-time employment, which renders them more sensitive to changes in taxation rates. This heightened sensitivity can drive them to opt for either full DI or, to a lesser extent, full employment when faced with increased taxation, depending on their associated indifference curves. However, the higher incidence of part-time work among women is not the unique identified channel behind these gender disparities. In fact, a substantial body of literature extensively documents gender inequality in the labor market. For example, Altonji

& Blank (1999), Bertrand (2011), Blau & Kahn (2017), and Olivetti & Petrongolo (2016) have explored gender gaps on labor supply, focusing on the roles of human capital, occupation, and discrimination. Similarly, Kleven et al. (2019) highlight gender inequality in the child penalty, revealing that women experience a higher reduction in earnings after having a child, as a result of a decrease in labor supply, than men. They also explain that the decision on labor supply reduction is a cause of social norms, which are transmitted across generations. Cortés & Pan (2023) also document the impact of childbirth on reducing women's labor earnings, for the United States. Several studies emphasize that inherited gender norms significantly influence women's labor market outcomes (Fernández, Fogli, Olivetti, 2004; Bertrand, 2011; Alesina, Giuliano, Nunn, 2013; Olivetti, Patacchini, Zenou, 2020). Women not only reduce their labor supply after having a child, there is also literature documenting gender gap differences after other economic shocks. Farré et al. (2022) investigate gender disparities during the COVID-19 pandemic, finding that, during lockdowns, the probability of working outside the house decreased by 17 percentage points among men and 26 percentage points among women, with no compensatory increase in hours devoted to unpaid work. Building on the insights of previous studies, there is a consensus in the literature that social pressure or conformity significantly influences women's lower participation in the labor market. Some women may perceive utility gains by aligning their labor market decisions with social norms, even if it contradicts mainstream expectations and incurs financial penalties (Akerlof & Kranton, 2000).

Thus, our findings align with existing literature, explaining the mechanisms that contribute to the tendency for women, more than men, to reduce labor force participation after a shock. We contribute to this research by demonstrating that, following a reduction in financial incentives of a combination scheme, women are less likely than men to react. If they do, they are more likely to reduce their labor supply to zero rather than fully resuming employment.

By Pathology:

We also conducted a heterogeneous examination, taking into account the specific pathology leading individuals to DI. We specifically analyzed the differential effects observed among individuals with mental health disorders and musculoskeletal disorders, as these two pathologies collectively constitute a significant portion, approximately 60%, of the entire sample, as shown in Table 2. In Panel B of Table 5, our findings reveal distinct tendencies based on the type of pathology. Individuals with mental health conditions exhibit a greater inclination to choose a return to full DI rather than complete work resumption when they face an increase in taxation. Specifically, those with mental health disorders are 3.6% more likely to opt for full DI status after encountering the taxation kink, and we do not observe any significant impact on the probability of returning to full employment in this group. In contrast, individuals with musculoskeletal disorders display a higher propensity to opt for full work resumption subsequent to the taxation increase. For this group, the probability of returning to full employment increases by 2%, and we did not discern any significant impact on the probability of reverting to a full DI status. These results suggest that among the type of agents showing vertical indifference curves, indicating stricter preferences for leisure, most of them are on DI due to a mental health disorder, while among those with horizontal indifference curves, indicating stricter preferences for labor, the majority should be disabled due to a musculoskeletal condition.

The existing body of literature has already established a clear negative link between mental health and employment. Shen (2023), analyzing Canadian data, demonstrates the significant impact of poor mental health on employment outcomes. Similarly, Ringdal & Rootjes (2022), using data from the Netherlands, arrive at the same conclusion. Insights from this literature suggest that the primary challenges faced by individuals with mental health issues in the labor market stem from a decline in cognitive abilities, including difficulties in concentration, motivation, and social interactions. Furthermore, Noordik et al. (2011) present a qualitative study describing the barriers to a full return to work for individuals with mental health conditions. They explain that, although most of the patients aimed for a full return to work, it exists a critical intention-behavioral gap between solutions and intentions for this type of patients. Our study aligns with this literature by demonstrating that, in the context of the AWP, after a decrease in financial incentives, individuals with mental health-related conditions are less likely to fully return to work.

By Social Status:

In our exploration of heterogeneous effects based on social status, we segmented our sample into blue-collar and white-collar workers. Interestingly, when we conducted regressions for white-collar workers, we did not find statistically significant results. However, for blue-collar workers, we observe significant findings. This suggests that individuals with blue-collar occupations are more prone to respond to changes in taxation compared to those with higher social status.

It is worth noting that the prevalence of blue-collar workers is higher in the sample around the kink, as illustrated in Table 1. White-collar workers are more likely to be positioned towards the right tall of the salary distribution. The sample size of white-collar workers around the kink might not be sufficient to thoroughly analyze the impact of the taxation kink on this group.

For blue-collar workers, our results indicate that they are 3.5% more likely to return to full DI and 1.6% more likely to resume full-time employment when crossing the taxation kink. This implies that among blue-collar workers, we can identify both types of representative agents, although there are more individuals whose indifference curves tend to be vertical rather than horizontal.

By Type of Disability:

We distinguish the individuals who are in the "primary incapacity" program and those in the "Invalidity" program. The key differentiator between these two groups, as explained in section 2, is that the first category is for individuals who have been incapacitated for work for one year or less, whereas the second category refers to individuals who have been on DI for over a year. Our findings report significant results exclusively for individuals who were on long-term DI prior to entering AWP. This finding holds particular relevance because these individuals represent the cohort that policymakers should prioritize. They have a longer history of disability, and the hazard rate out of DI decreases with it. Therefore, policies aimed at facilitating the return to work for individuals on long-term disability are more valuable than targeting individuals who stay short periods in DI.

Notably, we find that this group of individuals is responsive to changes in the financial incentives associated with return-to-work policies. However, they are more inclined to return to full DI (an increase of 2.5%) rather than pursuing full work resumption (an increase of 0.09%). This means that among individuals on long-term DI, a majority exhibit stricter preferences towards leisure rather than consumption. This could be indicative of a poorer health status or a prolonged comfort in the program. Moreover, we know that individuals on short-term DI are more likely to maintain the same job where they used to work before the DI spell. This fact makes these individuals to have stronger sense of attachment to the workplace, resulting in financial incentives exerting less influence on their decision to maintain a particular level of labor supply, compared to the situation where someone who has been disconnected from the labor market for years begins to offer some workforce in a new workplace, where it is difficult to feel rooted, especially when starting with an AWP.

The labor supply of individuals on long-term DI is more elastic to changes in financial incentives compared to those who have been on DI for a shorter duration. This suggests that in order to encourage these individuals to continue on their path toward labor force participation, allowing them to retain a larger portion of their benefits at the current salary levels could be a critical determinant of the return-to-work policy design.

6. Robustness Checks

In order to ensure the reliability and validity of our findings, we conduct a series of robustness checks. By performing these checks, we aim to enhance the overall credibility and robustness of our research, providing a more comprehensive understanding of the relationships and patterns we have identified. In this section, we detail the specific checks we conduct, which are standard in the RKD literature, and explain how they contribute to the overall rigor of our analysis.

Sensitivity analysis for the functional form: As explained in section 4, results in RKD are sensitive to a choice of several parameters, one of them is the functional form. Our baselines results rely in a linear polynomial, but in this section, we present results using a quadratic specification. We began by assessing the graphical evidence, which is reported in figure A7 in the appendix, the trends estimated with the quadratic polynomial are similar to the one reported in figures 5 and 6, but we provide also estimates for the treatment effects of the outcomes explored in this paper using a quadratic functional form. Results are presented in table A6 in the appendix. Columns 1 reports the results with the selected bandwidth of 9.36€, column 2 reports it with a slightly wider bandwidth of 13€. Using a bandwidth of 9.36€ and using a quadratic specification, we do not find statistically significant results; however, as we increase the bandwidth to 13€, we begin to observe a shift towards significance. This suggests that the quadratic functional form, while informative, exhibits slightly reduced precision and benefits from a wider bandwidth to capture meaningful relationships. In essence, by expanding the bandwidth, we can enhance the reliability and robustness of our results, providing a more accurate portrayal of the underlying patterns in the data. However, if we want to stick to the 9.36€ bandwidth, which ensures that the next kink does not interact with the study of each kink, it is convenient to rely on the linear specification for our baseline results.

Sensitivity analysis for the density function: We will now analyze the effect of changing the chosen density function. Table A7 in the appendix presents the results obtained by employing both the triangular density function and the Epanechnikov density function. Remarkably, our findings remain robust to these two alternative density functions, with the exception of the back to full employment coefficient, which loses significance when changing the functional form. This indicates that the probability to stay in AWP and to go back to full DI scheme are consistent and not significantly influenced by the choice of density function, while the coefficient related to the probability of going back to full employment may be more sensitive to the chosen functional form.

Sensitivity analysis for the choice of bandwidth: The next sensitivity analysis explores the effect of the choice of bandwidth. As mentioned before, it is a very sensible parameter and there is not much guidance in the literature for the choice of this parameter. The Table A8 in the appendix presents the results using different bandwidths, ranging from 7€ to 13€. The results are robust when using bandwidths from 7.5 to 13. This indicates that the results are very stable and consistent within this range. Below 7.5, the results no longer show statistical significance, but we are aware that the RKD is quite demanding in terms of data (Landais, 2015). In the case of expanding the bandwidth, the results are significant at all values, even reaching a bandwidth of 30€. These results also enhance the robustness of our specification.

Test on the functional dependence: In Section 4, we have previously explained that the RKD relies upon the assumption that the underlying connection between the assignment variable and outcomes (when there is no kink) should exhibit a degree of smoothness. A valid point of contention might be whether the effects detected by the RKD arise due to nonlinearities in this association. The visual evidence we provided earlier appears to dispel this potential concern, but one way of test it is to include different controls in our regressions, to account for possible nonlinearities. Fontenay (2022) does the same in his analysis and explain that controlling for relevant covariates should reinforce the credibility of RKD. Table 3 and Table A3 include baseline results with and without covariates, and we observe no significant differences in the outcomes when employing these two types of specifications. The covariates we have selected (pathology, region, gender, age, and social state) are likely to be correlated with both the assignment variable and the outcomes of interest. In fact, they may be determinants since they influence an individual's income level. In Table 3, we have already seen that the results remain consistent whether these covariates are included or excluded.

In a nutshell, after subjecting our analysis to a comprehensive battery of tests and examinations, we can trust that our findings, pointing out how after crossing the salary kink that raises up the marginal tax rate to 50% have a significantly negative impact on the participation in the adapted work program and at the same time, it influences an increase of full work resumption but also an increase on the odds to be back to a complete benefit dependency, have proven to be robust.

7. Conclusions

DI represents the higher social expenditure in modern economies. Addressing the increasing trend of individuals in DI through effective return-to-work policies is of primary importance, with financial incentives playing a pivotal role in their design. In Belgium, the Adapted Work Program (AWP) may serve as a policy tool aimed at pushing DI recipients back in the labor market reintegration. However, we document that a decrease in financial incentives for remaining in the AWP does not necessary boost full employment reintegration; it also has an impact on reverting people to full benefit's dependency.

Our study leveraged a kink in the AWP scheme and applies Regression Kink Design (RKD) to infer the causal impact of a 30% increase in marginal taxation rates on the likelihood of the individuals of remaining in or leaving this program. Our findings reveal that, after crossing the kink, the probability of DI recipients to exit the program increases in 5.9%. Further analysis of exit paths indicates a 3% increase in the probability of returning to full DI and a 1.3% impact on the probability of full work resumption due to the increase in the marginal tax rate. Delving into heterogeneity within these responses, we observed that men are more sensitive to taxation than women, and both genders are more inclined to return to full DI rather than full employment. Individuals with mental health conditions tend to opt for full DI after the tax increase, while those with musculoskeletal conditions are more likely to return to full-time employment. Blue-collar workers exhibit a greater responsiveness to taxation changes than their white-collar counterparts, and individuals on long-term disability are more reactive compared to those on short-term disability. A wide set of robustness checks validate these findings.

This study expands the literature on the role of financial incentives of DI on labor supply and RTW policies, since it delves into a previously unexplored area, investigating the effect of lowering financial incentives of RTW programs on an effective full employment reintegration and on benefit dependency. Additionally, it considers gender and pathology differences, which is novel in this context. Moreover, our paper also contributes to a broader literature on unemployment traps and exiting policies from other welfare programs. The implications derived from this research hold significant relevance for the design of such policies and can be extrapolated to other EU countries that have implemented or are contemplating return-to-work initiatives for DI recipients.

As a promising avenue for future research, we could investigate whether the return-to-work exit path after the decrease in financial incentives might be a premature return to work, and whether it leads to higher percentages of relapses and work-related accidents, as Marie & Vall-Castello (2022) find. This would provide valuable insights into the long-term effects of return-to-work policies, which may complement the present findings for the short-term.

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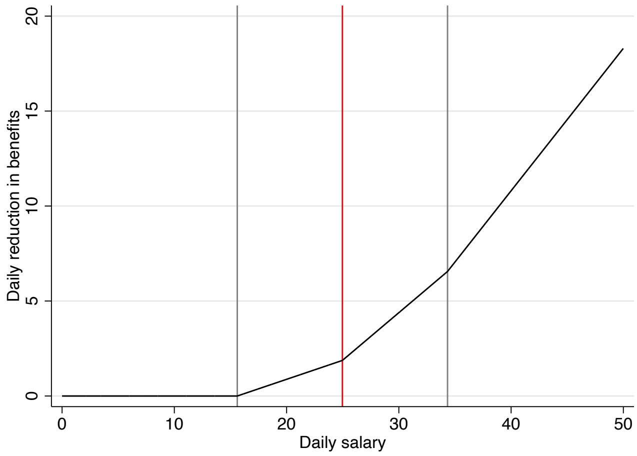
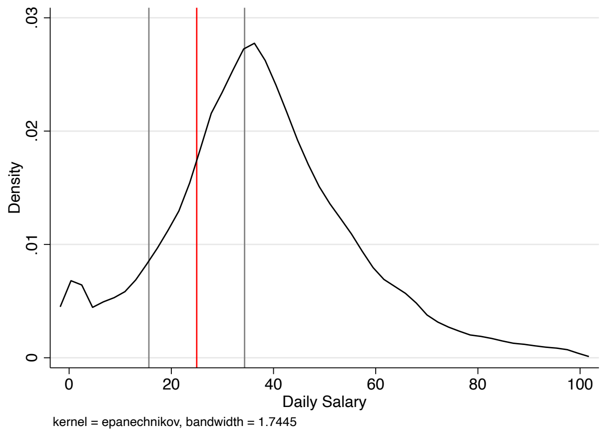
Figure 1. Kinks in the reduction in benefits.



Notes: This graphic simulates the reduction in benefits based on the rules set by the NIHDI, which is the result of applying a marginal tax rate on salary of 20% after crossing the threshold of 15.6068€/day, 50% after the threshold of 24.9709€/day, and 75% from 34.335€/day.

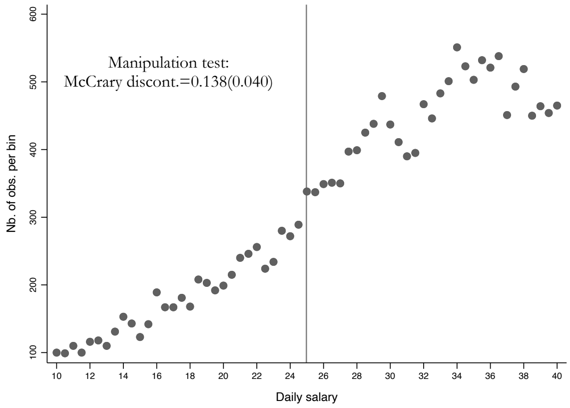
Figure 2. Density distribution of the average daily salary.



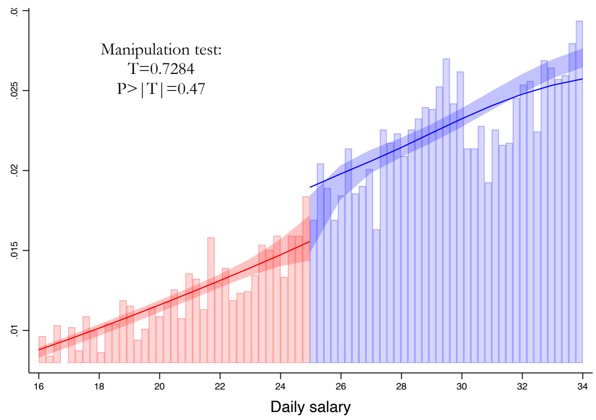
Notes: This graphic assess the validity of the assumption 1 in RKD. Blue line represents the kernel density function distribution of the average daily salary. The red line indicates where the kink in the policy rule is located. Grey lines indicate the bandwidth of 9.36€. The absence of bunching around the kink visually supports the assumption of no sorting.

Figure 3. Manipulation tests.

Panel A: Frequency distribution of assignment variable and McCrary's (2008) test.

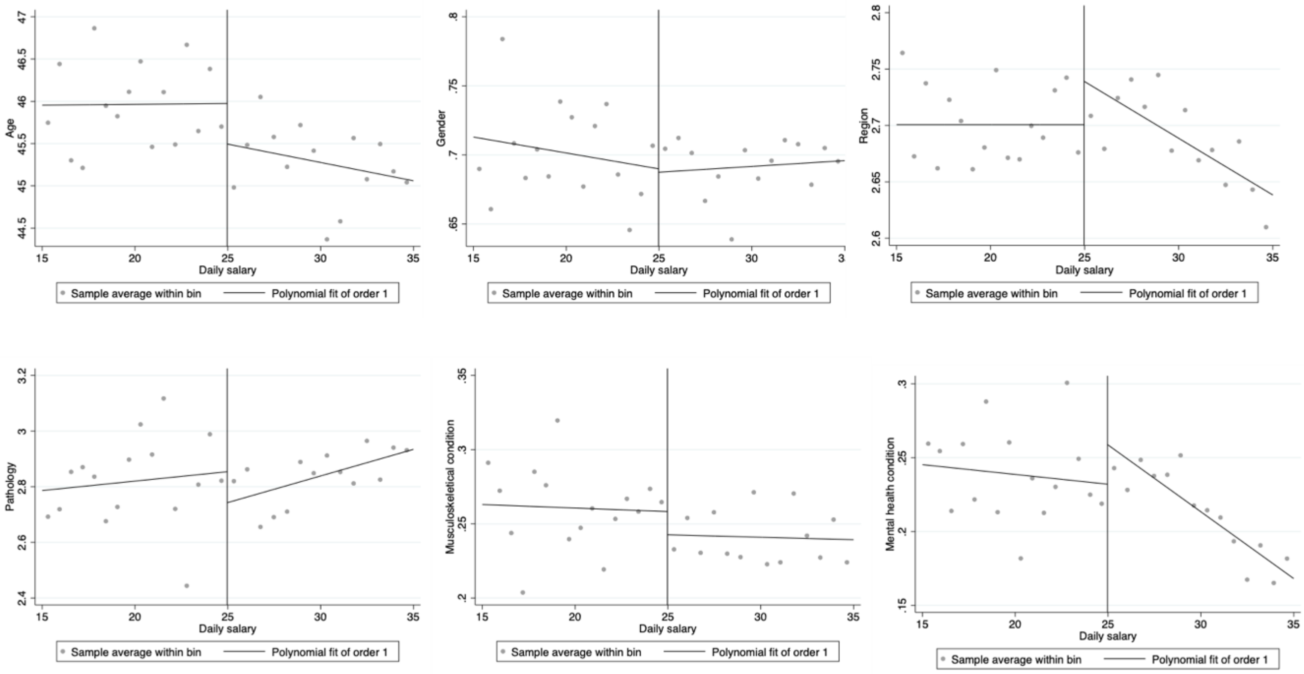


Panel B: Manipulation testing using local-polynomial density estimation.



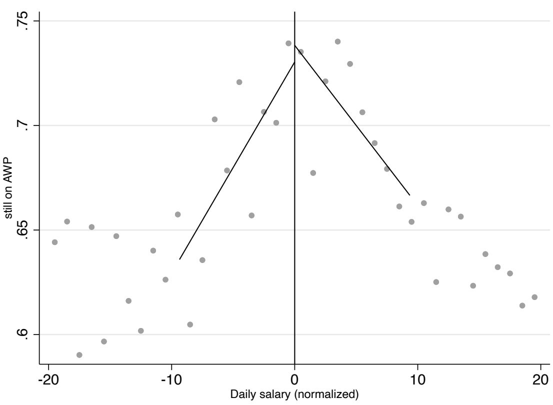
Notes: The graphics assess the validation of RKD assumption 1 of no sorting. Panel A shows the frequency distribution of the daily salary in 50 euros cents bins. The graph also displays two manipulation tests: the standard McCrary test (McCrary, 2008) that checks for a "jump" in the probability density function of the assignment variable, and the extension proposed by Card et al. (2015) to test that the first derivative of the p.d.f. is also continuous at the kink. We report the coefficients for both tests, as well as the corresponding standard errors in parentheses. Panel B represent the p.d.f of the daily salary around the kink, estimated using local polynomials, as proposed by Cattaneo et al., (2020), it includes the manipulation T- test coefficient and their corresponding p-value. Graphical evidence and the formal test suggest no manipulation of the assignment variable.

Figure 4. Distribution of control variables around the second kink.



Notes: The horizontal axis plots daily salary in euros in bins of around 1 euro, with a bandwidth of 10. Vertical line indicates where the second kink is (24.9709€). The straight lines at both sides of the kink display the underlying linear relationship between the assignment variable and each of the control variables analysed here, they are estimated using local nonparametric regressions. The control variables represented are: age (continuous variable), gender (dichotomic variable), region (categorical variable: Brussels, Wallonia, Flanders), pathology (categorical variable), and a binary variable indicating the prevalence of both mental health and musculoskeletal conditions, which are the two more frequent pathologies in our sample.

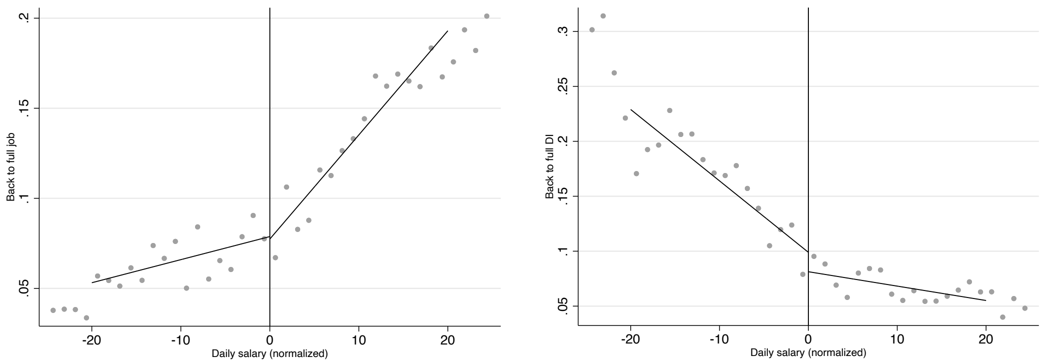
Figure 5. Relationship between the outcome and salary level.



Notes: Horizontal axis plots normalized salary from the adapted work (relative to the kink), using 1 euro per bin and a bandwidth of 9.36 euros. The vertical axis plots the mean of the outcome variable (the probability to stay in AWP by the end of the year, which is a dummy variable taking value 1 if the individual is still on AWP in December 2013 and 0 otherwise) in each bin. The straight lines display the underlying relationship on each side of the kink. Vertical line indicates the salary kink.

Figure 6. Relationship between the outcome and salary level.

Panel A: Probability of going back to full job Panel B: Probability of going back to full DI



Notes: Horizontal axis plots normalized salary from the adapted work (relative to the kink) in 1-euro bins at each side of the cut-off. The vertical axis plots the mean of the outcome variable (the probability to go back to full job, or the probability to go back to full DI) in each bin. The straight lines display the underlying relationship on each side of the kink. Vertical line indicates the salary kink.

Table 1. Main descriptive statistics for the sample in 2013.

	Full sample Mean (SD)	**Kink Sample Mean (SD)**
Gender (women=1)	0.63 (0.48)	0.69 (0.46)
Age	45.91 (9.31)	45.53 (9.32)
Social State (blue collar=1)	0.55 (0.50)	0.71 (0.45)
Days in AWP	169.25 (108.73)	184.31 (102.59)
Daily salary	39.37 (31.47)	26.83 (5.14)
Daily benefits	37.29 (27.35)	36.97 (14.45)
Observations	47,775	12,025

Notes: The table report the mean value and, in parentheses, the standard deviation of all the salaried individuals in the AWP in 2013. The kinks samples include the same statistics around the three kinks, using a bandwidth of 9.3641..

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Table 2. Other descriptive statistics for the sample in 2013.

	Full Sample Total (%)	Kink Sample Total (%)
Pathology		
Musculoskeletal disorders	7,899 (29.37%)	2,785 (32.73%)
Mental health	7,755 (28.83%)	2,544 (29.89%)
Cancer	3,395 (12.62%)	834 (9.80%)
Nervous system	1,735 (6.45%)	517 (6.08%)
Circulatory system	1,692 (6.29%)	459 (5.39%)
Trauma and poisoning	1,555 (5.78%)	472 (5.55%)
Other	2,856 (10.62%)	898 (10.55%)
Unknown	9 (0.03%)	1 (0.01%)
Reason of exit AWP		
Back full-time work	5,563 (40.42%)	1,120 (30.63%)
Back full DI	3,318 (24.11%)	1,135 (31.04%)
Unemployment	88 (0.64%)	33 (0.90%)
Death	67 (0.49%)	15 (0.41%)
Exclusion	1,416 (10.29%)	492 (13.46%)
Other	1,287 (9.35%)	385 (10.53%)
Unknown	2,025 (14.71%)	476 (13.02%)
Region		
Brussels	2,137 (4.51%)	417 (3.49%)
Wallonia	12,267 (25.86%)	2,829 (27.16%)
Flanders	33,028 (69.63%)	8,704 (72.84%)

Notes: The table reports some additional descriptive statistics for all the salaried individuals in the AWP in 2013. The kinks samples include the same statistics around the three kinks, using a bandwidth of 9.3641. The total value and the percentage of the total sample in parentheses.

Table 3. Baseline results.

Panel A:		
First stage	0.3	
Panel B:	(1)	(2)
Treatment effects	No covariates	With covariates
β	-0.059***	-0.056***
	(0.003)	(0.003)
Robust CI	[-0.073, 0.092]	[-0.061, 0.102]
Mean	0.696	0.696
Observations	36,778	36,503
Eff observations	12,016	11,942

*Notes: all the coefficients reported are calculated from independent local polynomial nonparametric regressions, using a linear trend (polynomial of order 1), a defined symmetric bandwidth of 9.36 (to avoid interacting kinks) and uniform kernel functional form. The column first stage reports the deterministic marginal tax change, 0.3 (0.5-0.2) for the kink located at the salary level of 24.97€. Treatment effects coefficient report result of equation (7), which is the result of dividing the coefficient estimated by RKD of equation (8) by the deterministic first stage value. The coefficients show the estimated effect of a 1 euro increase in daily salary in AWP on the probability to stay in AWP by the end of the year. Standard errors are in parentheses. I report robust confidence intervals. The column "mean" reports the average of the dependent variable within the defined bandwidth. Covariates include: region, age, gender and social state. Significance levels: ***p<0.01, **p<0.05, *p<0.1.*

Table 4. Exit path results.

	(1)	(2)
	Back to full job	Back to full DI
Panel A:		
First stage	0.3	
Panel B:		
Treatment effects		
β	0.013**	0.030***
	(0.006)	(0.007)
Robust CI	[-0.061, 0.036]	[-0.053, 0.055]
Mean	0.093	0.094
Observations	36,778	36,503
Eff observations	12,016	12,016

*Notes: all the coefficients reported are calculated from independent local polynomial nonparametric regressions, using a linear trend (polynomial of order 1), a defined symmetric bandwidth of 9.36 and uniform kernel functional form. The column first stage reports the deterministic marginal tax change, 0.3 (0.5-0.2) for the kink located at the salary level of 24.97€. Treatment effects coefficient report result of equation (7), which is the result of dividing the coefficient estimated by RKD of equation (8) by the deterministic first stage value. The coefficients show the estimated effect of a 1 euro increase in daily salary in AWP on the two different outcomes. Standard errors are in parentheses. I report robust confidence intervals. The column "mean" reports the average of the dependent variable within the defined bandwidth. Covariates include: region, age, gender and social state. Significance levels: ***p<0.01, **p<0.05, *p<0.1.*

Table 5. Heterogeneous effects

Panel A) By Gender

	Male		Female	
	Back full job	Back full DI	Back full job	Back full DI
Panel A: First stage	0.3		0.3	
Panel B: Treatment effects	(1)	(2)	(3)	(4)
β	0.021**	0.055***	0.008	0.020**
	(0.010)	(0.014)	(0.008)	(0.009)
Robust CI	[-0.159, 0.006]	[-0.022, 0.174]	[-0.040, 0.080]	[-0.094, 0.033]
Mean	0.07	0.10	0.10	0.09

Panel B) By Pathology

	Mental Health		Musculoskeletal	
	Back full job	Back full DI	Back full job	Back full DI
Panel A: First stage	0.3		0.3	
Panel B: Treatment effects	(1)	(2)	(3)	(4)
β	0.011	0.036**	0.020**	0.017
	(0.007)	(0.017)	(0.008)	(0.015)
Robust CI	[-0.038, 0.076]	[-0.110, 0.127]	[-0.056, 0.059]	[-0.165, 0.051]
Mean	0.03	0.11	0.04	0.09

Panel C) By Social Status

	White Collar		Blue Collar	
	Back full job	Back full DI	Back full job	Back full DI
Panel A: First stage	0.3		0.3	
Panel B: Treatment effects	(1)	(2)	(3)	(4)
β	-0.002	0.010	0.016**	0.035***
	(0.014)	(0.015)	(0.007)	(0.009)
Robust CI	[-0.164, 0.055]	[-0.035, 0.180]	[-0.054, 0.053]	[-0.093, 0.032]
Mean	0.11	0.11	0.08	0.09

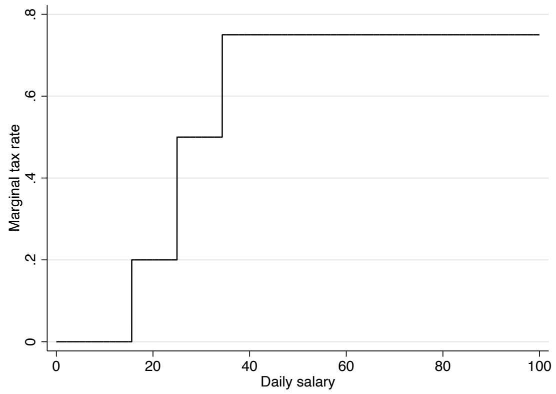
Panel D) By Type of disability (short- vs. long-term)

	Short-term DI		Long-term DI	
	Back full job	Back full DI	Back full job	Back full DI
Panel A: First stage	0.3		0.3	
Panel B: Treatment effects	(1)	(2)	(3)	(4)
β	-0.000	0.025	0.009**	0.025****
	(0.020)	(0.016)	(0.004)	(0.009)
Robust CI	[-0.182, 0.129]	[-0.047, 0.184]	[-0.025, 0.034]	[-0.084, 0.046]
Mean	0.27	0.11	0.02	0.09

*Notes: all the coefficients reported are calculated from independent local polynomial nonparametric regressions, using a linear trend (polynomial of order 1), a defined symmetric bandwidth of 9.36, and uniform kernel functional form. The column first stage reports the deterministic marginal tax change, 0.3 for the kink, located at 24.97€. Treatment effects coefficient report result of equation (7). The coefficients show the estimated effect of a 1 euro increase in daily salary in AWP on the different outcomes depending on the indicated characteristic. Standard errors are in parentheses. I report robust confidence intervals. Significance levels: ***p<0.01, **p<0.05, *p<0.1.*

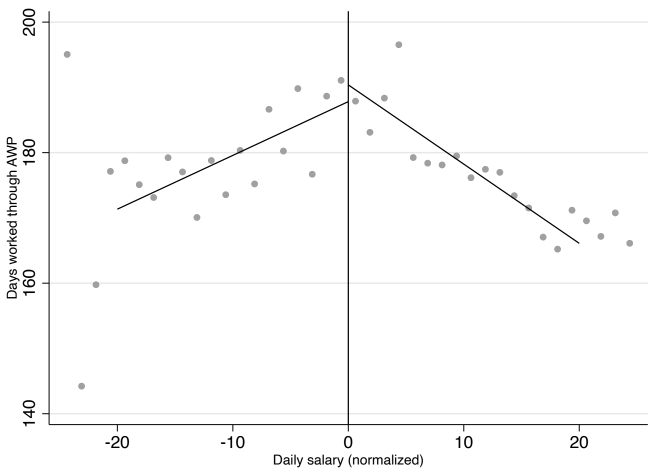
APPENDIX:

Figure A1. Marginal tax rate at each level of salary



Notes: This graphic represents the marginal tax rate applied at each level of salary. Horizontal axis represents the daily salary and in the vertical axes we have the corresponding marginal tax rate. There are three jumps, indicating the three changes of marginal tax rate (20%, 50% and 75%)

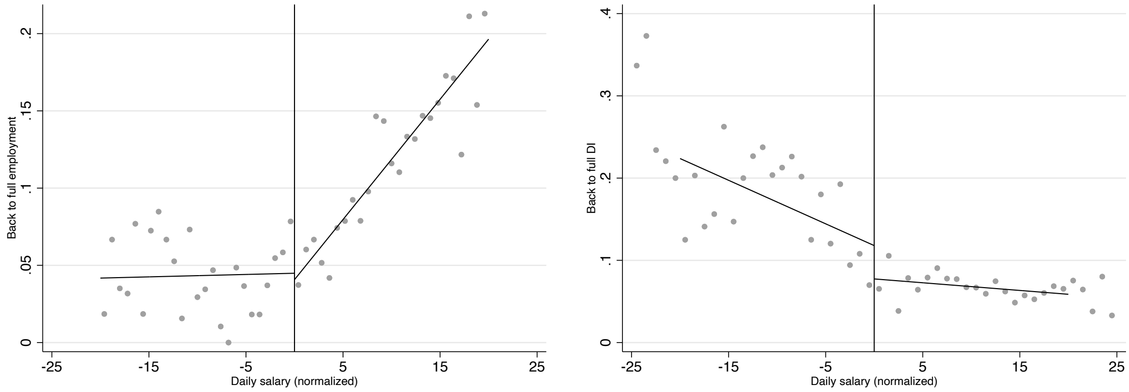
Figure A2. Relationship between days worked through AWP and salary level



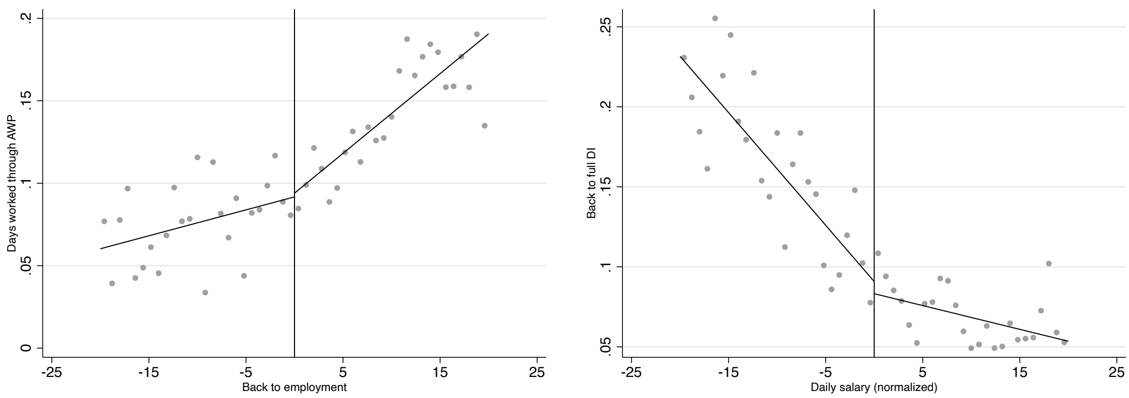
Notes: Horizontal axis plots normalized salary from the adapted work (relative to the kink) in 20 bins at each side of the cut-off, using 1 euro per bin and a bandwidth of 9.36 euros. The vertical axis plots the mean of the outcome variable (number of days worked through AWP in 2013) in each bin. The straight lines display the underlying relationship on each side of the kink. Vertical line indicates the salary kink. The plot is normalized at the salary kink (24.9709€/day, representing a change in taxation from 20 to 50%).

Figure A3: Heterogeneous Effects by Gender

Panel A) Male



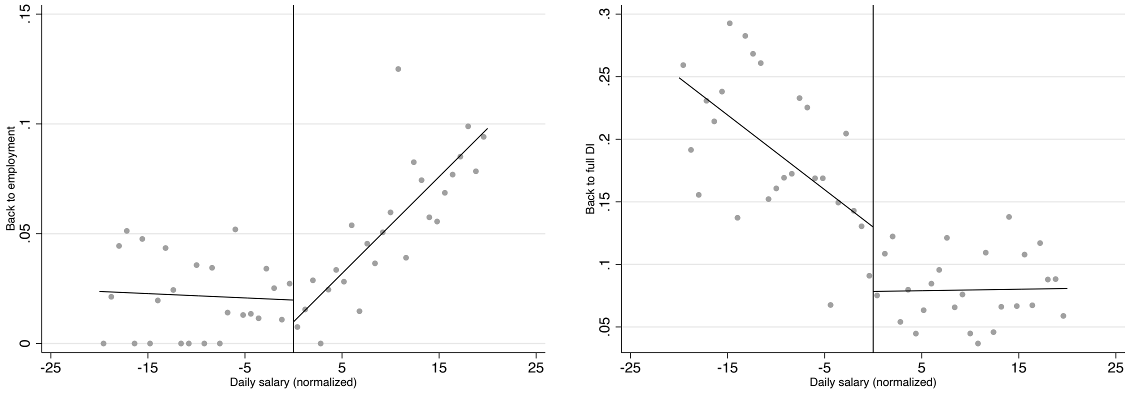
Panel B) Female



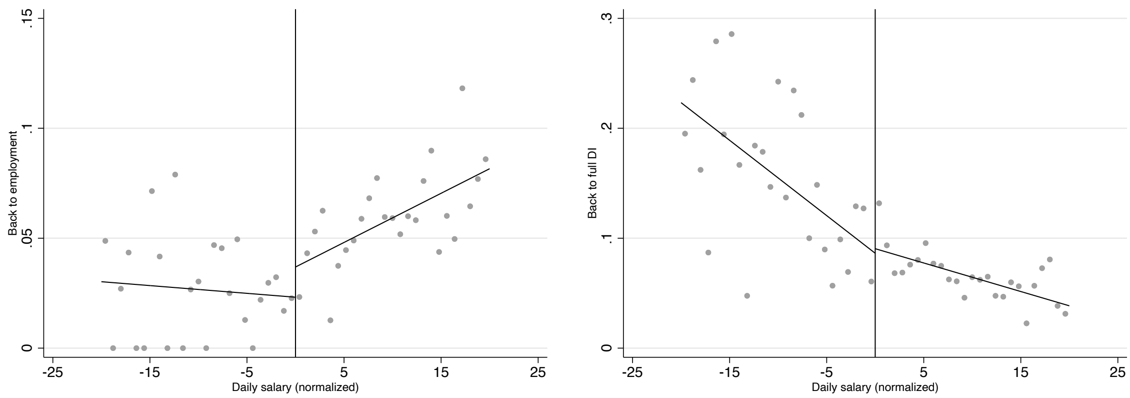
Notes: Horizontal axis plots normalized salary from the adapted work (relative to the kink) in bins of 1 euro at each side of the cut-off. The vertical axis plots the mean of the outcome variable (the probability to go back to full job, or the probability to go back to full DI) in each bin. The straight lines display the underlying relationship on each side of the kink. Vertical line indicates the salary kink.

Figure A4: Heterogeneous Effects by Pathology

Panel A) Mental Health Condition



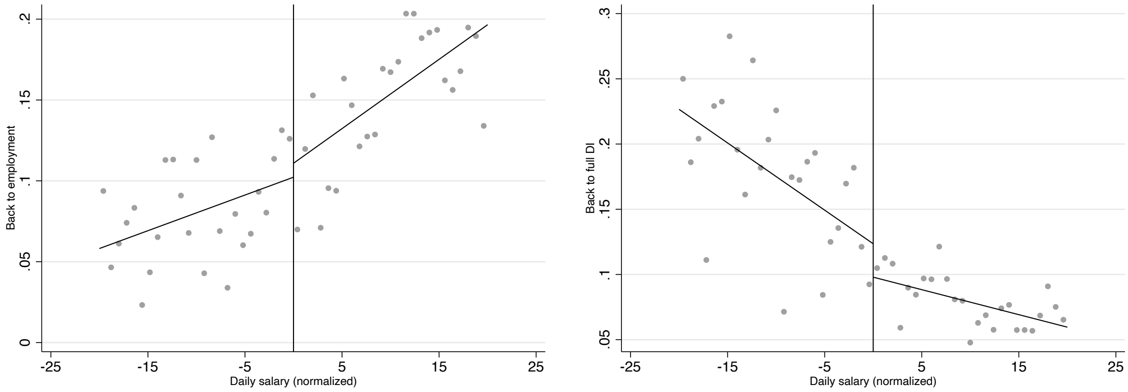
Panel B) Musculoskeletal Condition



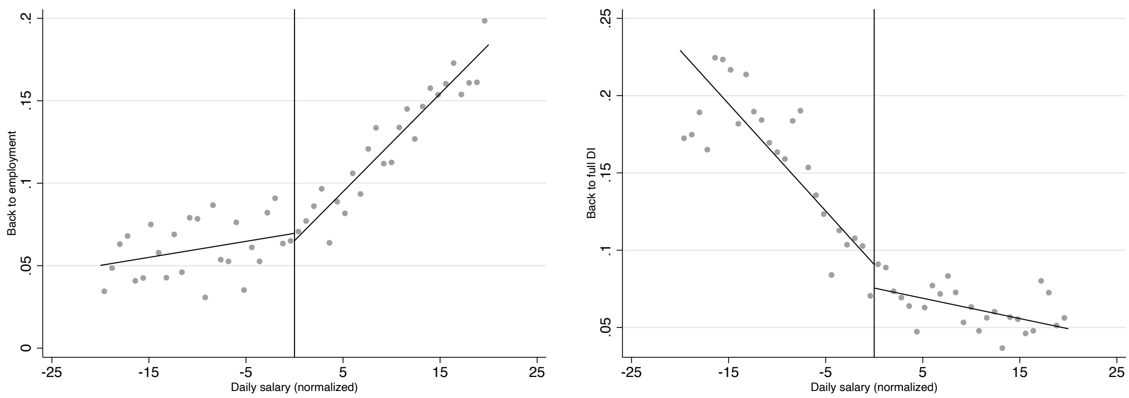
Notes: Horizontal axis plots normalized salary from the adapted work (relative to the kink) in bins of 1 euro at each side of the cut-off. The vertical axis plots the mean of the outcome variable (the probability to go back to full job, or the probability to go back to full DI) in each bin. The straight lines display the underlying relationship on each side of the kink. Vertical line indicates the salary kink.

Figure A5: Heterogeneous Effects by Social Status

Panel A) White Collar Workers



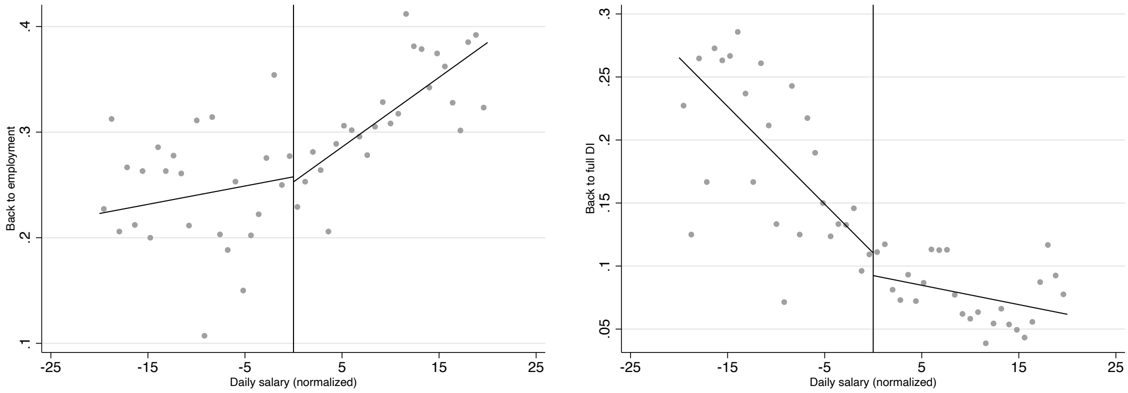
Panel B) Blue Collar Workers



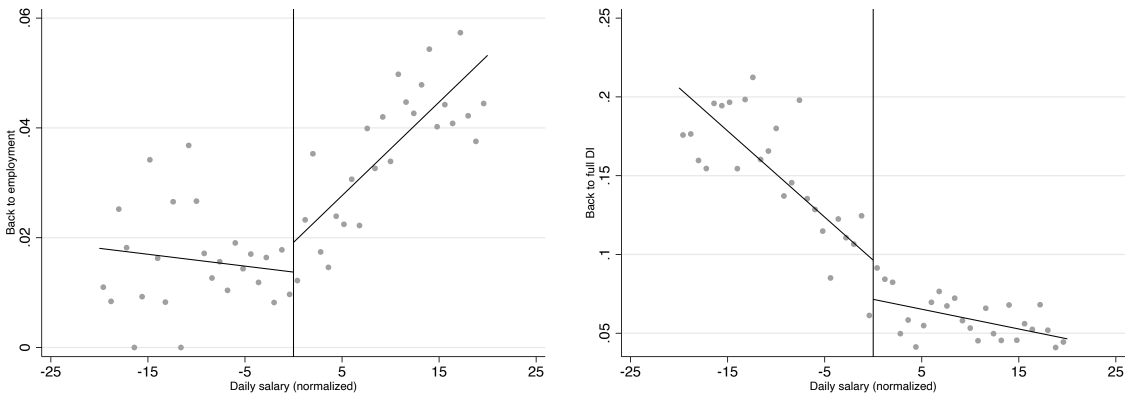
Notes: Horizontal axis plots normalized salary from the adapted work (relative to the kink in bins of 1 euro at each side of the cut-off. The vertical axis plots the mean of the outcome variable (the probability to go back to full job, or the probability to go back to full DI) in each bin. The straight lines display the underlying relationship on each side of the kink. Vertical line indicates the salary kink.

Figure A6: Heterogeneous Effects by Type of Disability

Panel A) Short-term DI



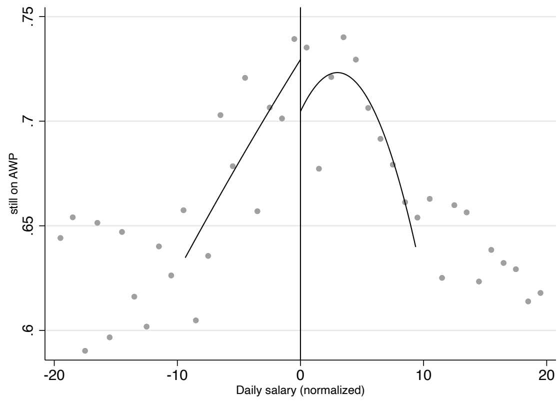
Panel B) Long-term DI



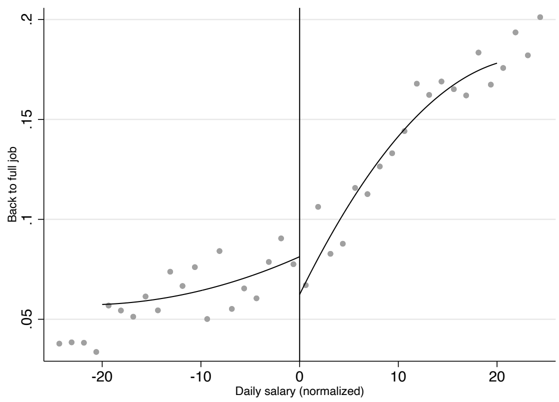
Notes: Horizontal axis plots normalized salary from the adapted work (relative to the kink) in bins of 1 euro at each side of the cut-off. The vertical axis plots the mean of the outcome variable (the probability to go back to full job, or the probability to go back to full DI) in each bin. The straight lines display the underlying relationship on each side of the kink. Vertical line indicates the salary kink.

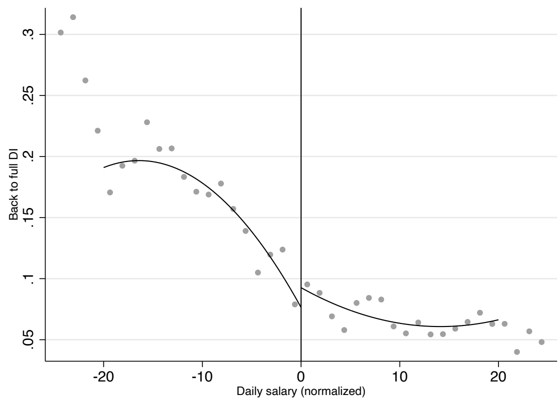
Figure A7: Sensitivity analysis for the functional form: Graphics using quadratic polynomial.

Panel A) First outcome: probability to stay in AWP by the end of the year



Panel B) Second outcome: Exit paths





Notes: Horizontal axis plots normalized salary from the adapted work relative to the kink, in bins of 1 euro at each side of the cutoff and a bandwidth of 9.36. The vertical axis plots the mean of the outcome variable (Panel A: the probability to stay in AWP by the end of the year, which is a dummy variable taking value 1 if the individual is still on AWP in December 2013 and 0 otherwise. Panel B: probability to go back to full employment or to complete DI) in each bin. The quadratic lines display the underlying relationship on each side of the kink, using a polynomial of order 2. Vertical line indicates the salary kink.

Table A1: all the actualizations on the brackets from 2011 to 2020.

Time	01/01/2011 to 30/04/2011	01/05/2011 to 31/08/2011	01/09/2011 to 31/12/2011	01/01/2012 to 31/01/2012	01/02/2012 to 30/06/2012	01/07/2012 to 31/08/2012
1st bracket	11.2652	11.4899	11.4899	15.0000	15.3004	15.3004
Next brackets	11.2652	11.4899	11.4899	9.0000	9.1803	9.1803

Time	01/09/2012 to 30/11/2012	01/12/2012 to 31/12/2012	01/01/2013 to 31/03/2013	01/04/2013 to 30/04/2013	01/05/2013 to 31/08/2013	01/09/2013 to 30/04/2014
1st bracket	15.3004	15.6068	15.6068	15.6068	15.6068	15.6068
Next brackets	9.1803	9.3641	9.3641	9.3641	9.3641	9.3641

Time	01/05/2014 to 31/08/2014	01/09/2014 to 31/03/2015	01/04/2015 to 30/04/2015	01/05/2015 to 31/08/2015	01/09/2015 to 31/12/2015	01/01/2016 to 31/03/2016
1st bracket	15.6068	15.6068	15.6068	15.6068	15.6068	15.6068
Next brackets	9.3641	9.3641	9.3641	9.3641	9.3641	9.3641

Time	01/04/2016 to 31/05/2016	01/06/2016 to 31/07/2016	01/08/2016 to 31/12/2016	01/01/2017 to 30/04/2017	01/05/2017 to 31/05/2017	01/06/2017 to 31/08/2017
1st bracket	15.6068	15.9190	15.9190	15.9190	15.9190	16.2372
Next brackets	9.3641	9.5514	9.5514	9.5514	9.5514	9.7423

Time	01/09/2017 to 30/09/2017	01/10/2017 to 31/12/2017	01/01/2018 to 30/04/2018	01/05/2018 to 30/06/2018	01/07/2018 to 31/08/2018	01/09/2018 to 31/12/2018
1st bracket	16.2372	16.2372	16.2372	16.2372	16.2372	16.5613
Next brackets	9.7423	9.7423	9.7423	9.7423	9.7423	9.9368

Time	01/01/2019 to 28/02/2019	01/03/2019 to 30/04/2019	01/05/2019 to 30/06/2019	01/07/2019 to 31/07/2019	01/08/2019 to 31/08/2019	01/09/2019 to 31/12/2019
1st bracket	16.5613	16.5613	16.5613	16.5613	16.5613	16.5613
Next brackets	9.9368	9.9368	9.9368	9.9368	9.9368	9.9368

Time	01/01/2020 to 29/02/2020	01/03/2020 to 30/04/2020	01/05/2020 to 31/12/2020
1st bracket	16.5613	16.8925	16.8925
Next brackets	9.9368	10.1355	10.1355

Notes: Source: NIHDI (2023).

Table A2: Descriptive statistics for all the kinks subsamples.

Panel A) Main descriptive statistics:

	Full sample Mean (SD)	1st Kink Sample Mean (SD)	2nd Kink Sample Mean (SD)	3rd Kink Sample Mean (SD)
Gender (women=1)	0.63 (0.48)	0.68 (0.47)	0.69 (0.46)	0.68 (0.47)
Age	45.91 (9.31)	46.24 (9.26)	45.53 (9.32)	45.29 (9.34)
Social State (blue collar=1)	0.55 (0.50)	0.73 (0.45)	0.71 (0.45)	0.63 (0.48)
Days in AWP	169.25 (108.73)	181.49 (102.19)	184.31 (102.59)	178.51 (106.14)
Daily salary	39.37 (31.47)	17.63 (5.21)	26.83 (5.14)	34.55 (5.13)
Daily benefits	37.29 (27.35)	39.17 (12.99)	36.97 (14.45)	36.55 (23.26)
Still in AWP in December	0.63 (0.48)	0.67 (0.47)	0.70 (0.46)	0.67 (0.47)
Still in DI in December	0.55 (0.50)	0.82 (0.39)	0.79 (0.41)	0.74 (0.44)
Observations	47,792	6,176	12,025	16,498

Panel B) Other descriptive statistics:

	Full Sample Total (%)	1st Kink Sample Total (%)	2nd Kink Sample Total (%)	3rd Kink Sample Total (%)
Pathology				
Musculoskeletal disorders	7,899 (29.37%)	1,534 (32.73%)	2,785 (32.73%)	3,500 (32.90%)
Mental health	7,755 (28.83%)	1,415 (30.19%)	2,544 (29.89%)	2,781 (26.14%)
Cancer	3,395 (12.62%)	445 (9.49%)	834 (9.80%)	1,269 (11.93%)
Nervous system	1,735 (6.45%)	271 (5.78%)	517 (6.08%)	685 (6.44%)
Circulatory system	1,692 (6.29%)	235 (5.01%)	459 (5.39%)	685 (6.44%)
Trauma and poisoning	1,555 (5.78%)	252 (5.38%)	472 (5.55%)	634 (5.96%)
Other	2,856 (10.62%)	533 (11.37%)	898 (10.55%)	1,081 (10.16%)
Unknown	9 (0.03%)	2 (0.04%)	1 (0.01%)	2 (0.02%)
Reason of exit AWP				
Back full-time work	5,563 (40.42%)	428 (20.79%)	1,120 (30.63%)	2,211 (40.52%)
Back full DI	3,318 (24.11%)	918 (44.58%)	1,135 (31.04%)	1,129 (20.69%)
Unemployment	88 (0.64%)	16 (0.78%)	33 (0.90%)	47 (0.86%)
Death	67 (0.49%)	12 (0.58%)	15 (0.41%)	19 (0.35%)
Exclusion	1,416 (10.29%)	237 (11.51%)	492 (13.46%)	711 (13.03%)
Other	1,287 (9.35%)	213 (10.34%)	385 (10.53%)	543 (9.95%)
Unknown	2,025 (14.71%)	235 (11.41%)	476 (13.02%)	797 (14.61%)
Region				
Brussels	2,137 (4.51%)	237 (3.86%)	417 (3.49%)	634 (3.87%)
Wallonia	12,267 (25.86%)	1,420 (23.11%)	2,829 (27.16%)	4,485 (27.38%)
Flanders	33,028 (69.63%)	4,487 (73.03%)	8,704 (72.84%)	11,260 (68.75%)

Notes: The tables report some additional descriptive statistics for all the salaried individuals in the AWP in 2013. The kink samples include the same statistics around the three kinks, using a bandwidth of 9.3641. The total value and the percentage of the total sample in parentheses.

Table A3: Baseline Results: including pathology among the covariates

Panel A:		
First stage	0.3	
Panel B:	(1)	(2)
Treatment effects	No covariates	With covariates
β	-0.059***	-0.061***
	(0.003)	(0.011)
Robust CI	[-0.073, 0.092]	[-0.086, 0.078]
Mean	0.696	0.696
Observations	36,778	24,927
Eff observations	12,016	8,957

*Notes: all the coefficients reported are calculated from independent local polynomial nonparametric regressions, using a linear trend (polynomial of order 1), a defined symmetric bandwidth of 9.36 (to avoid interacting kinks) and uniform kernel functional form. The column first stage reports the deterministic marginal tax change, 0.3 (0.5-0.2) for the kink located at the salary level of 24.97€. Treatment effects coefficient report result of equation (7), which is the result of dividing the coefficient estimated by RKD of equation (8) by the deterministic first stage value. The coefficients show the estimated effect of a 1 euro increase in daily salary in AWP on the probability to stay in AWP by the end of the year. Standard errors are in parentheses. I report robust confidence intervals. The column "mean" reports the average of the dependent variable within the defined bandwidth. Covariates include: region, age, gender, social state and pathology. Significance levels: ***p<0.01, **p<0.05, *p<0.1.*

Table A4: Baseline Results using days worked through AWP as an outcome

Panel A:		
First stage	0.3	
Panel B:	(1)	(2)
Treatment effects	No covariates	With covariates
β	-9.003***	-8.737***
	(2.428)	(2.358)
Robust CI	[-20.806, 15.973]	[-18.050, 17.789]
Mean	184.31	184.31
Observations	36,778	36,503
Eff observations	12.016	11,942

*Notes: all the coefficients reported are calculated from independent local polynomial nonparametric regressions, using a linear trend (polynomial of order 1), a defined symmetric bandwidth of 9.36 (to avoid interacting kinks) and uniform kernel functional form. The column first stage reports the deterministic marginal tax change, 0.3 (0.5-0.2) for the kink, located at the salary level of 24.97€. Treatment effects coefficient report result of equation (7), which is the result of dividing the coefficient estimated by RKD of equation (8) by the deterministic first stage value. The coefficients show the estimated effect of a 1 euro increase in daily salary in AWP on the average number of days worked through AWP. Standard errors are in parentheses. I report robust confidence intervals. The column "mean" reports the average of the dependent variable within the defined bandwidth. Covariates include: region, age, gender, and social state. Significance levels: ***p<0.01, **p<0.05, *p<0.1.*

Table A5: Simple Regression model (OLS) using the volume of work authorized.

	Back to full job		Back to full DI	
Outcome variable:	(1)	(2)	(3)	(4)
β	0.002***	0.001***	-0.003***	-0.005***
	(0.000)	(0.000)	(0.000)	(0.000)
Demographic controls	No	Yes	No	Yes
N	36,991	36,312	36,991	36,312

*Notes: OLS estimations are reported with robust Standard Errors in brackets. ***,** and * indicate significance at the 1%, 5% and 10% levels. The set of demographic controls includes: gender, social state and type of disability.*

Table A6: Sensitivity analysis for the functional form: Regressions using quadratic polynomial.

Panel A) First outcome: probability to stay in AWP by the end of the year

	Still AWP	
First stage	0.3	
Treatment effects	(1)	(2)
	h=9.36	h=13
α	0.010	-0.118*
	(0.042)	(0.070)
Observations	36,778	36,778
Eff observations	12,016	16,650

*Notes: all the coefficients reported are calculated from independent local polynomial nonparametric regressions, using a quadratic trend (polynomial of order 2), a defined symmetric bandwidth of 9.36 (to avoid interacting kinks) and 13 (to increase the number of observations) and uniform kernel functional form. Treatment effects coefficient report result of equation (7), which is the result of dividing the coefficient estimated by RKD of equation (8) by the deterministic first stage value and separating regressions by gender. The coefficients show the estimated effect of a 1 euro increase in daily salary in AWP on the two different outcomes. Standard errors are in parentheses. Regressions do not include covariates. Significance levels: ***p<0.01, **p<0.05, *p<0.1.*

Table A7: Sensitivity analysis for the density function.

	Triangular functional form			Epanechnikov functional form		
Outcome:	Still AWP	Back job	Back DI	Still AWP	Back job	Back DI
First stage		0.3			0.3	
Treatment effects						
α	-0.046***	0.008	0.024***	-0.047***	0.008	0.026***
	(0.014)	(0.008)	(0.009)	(0.013)	(0.008)	(0.008)
Observations	36,778	36,778	36,778	36,778	36,778	36,778
Eff observations	12,016	12,016	12,016	12,016	12,016	12,016

*Notes: all the coefficients reported are calculated from independent local polynomial nonparametric regressions, using a linear trend (polynomial of order 1), a defined symmetric bandwidth of 9.36 (to avoid interacting kinks) and both triangular and Epanechnikov functional form. Treatment effects coefficient report result of equation (7), which is the result of dividing the coefficient estimated by RKD of equation (8) by the deterministic first stage value and separating regressions by gender. The coefficients show the estimated effect of a 1 euro increase in daily salary in AWP on the three different outcomes. Standard errors are in parentheses. Regressions do not include covariates. Significance levels: ***p<0.01, **p<0.05, *p<0.1.*

Table A8: Sensitivity analysis for the choice of bandwidth.

	Results for the second kink. First stage: 0.3					
Treatment effects	(1)	(2)	(3)	(4)	(5)	(6)
	h=7	h=7.5	h=8	h=9	h=10	h=11
Panel A: Still on AWP by the end of the year						
α	-0.026	-0.038*	-0.044***	-0.060***	-0.058***	-0.054***
	(0.017)	(0.015)	(0.014)	(0.012)	(0.010)	(0.008)
Observations	36,778	36,778	36,778	36,778	36,778	36,778
Eff observations	8,845	9,499	10,137	11,462	12,824	14,177

	Results for the second kink. First stage: 0.3		
Treatment effects	(1)	(2)	(3)
	h=12	h=13	h=30
Panel A: Still on AWP by the end of the year			
α	-0.050***	-0.045***	-0.017***
	(0.007)	(0.005)	(0.001)
Observations	36,778	36,778	36,778
Eff observations	15,452	16,650	30,655

*Notes: all the coefficients reported are calculated from independent local polynomial nonparametric regressions, using a linear trend (polynomial of order 1), a wide range of different defined symmetric bandwidths, and uniform Kernel functional form. Treatment effects coefficient report result of equation (7), which is the result of dividing the coefficient estimated by RKD of equation (8) by the deterministic first stage value and separating regressions by gender. The coefficients show the estimated effect of a 1 euro increase in daily salary in AWP on the two different outcomes. Standard errors are in parentheses. Regressions do not include covariates. Significance levels: ***p<0.01, **p<0.05, *p<0.1.*