Employment effects of new rail infrastructure: A study of the Hanzelijn railway in the Netherlands

In the Netherlands, as in many other countries, substantial investments in rail infrastructure have been made in recent decades. These investments are frequently justified on the grounds that they will improve commuting networks by providing better connections between workers and jobs. It is therefore often seen as a plausible policy lever to improve employment outcomes, as less time-consuming commutes generally increase the geographical job search areas of workers which, in turn, may improve the job matching process (Gobillon et al., 2007). However, while the investment costs of rail infrastructure are relatively easy to compute, there is generally little known about the hypothesised employment effects that improved commuting would bring about. It is increasingly important to establish this relationship, given the current policy attention in the Netherlands and other countries for new rail investments, often motivated by its assumed labour market effects.

To our knowledge, this is the first study within the context of the Netherlands to examine the impact of new rail infrastructure on individual-level employment outcomes. The subject of our study is the opening of the railway station in Dronten on 6 December 2012 as part of the newly constructed Hanzelijn railway, which connects the city of Lelystad, via the town of Dronten, with the economically important Zwolle city-region. The Hanzelijn was built in order to decrease travel times between the Randstad area and the north-east of the Netherlands. Since the shortest possible travel time between Lelystad and Zwolle was considered of great importance, a trajectory was chosen in which the town of Dronten was designated a railway station as "*it is located on the straight line Lelystad-Zwolle*" (NS, 1996: 5). The opening of the station resulted in a substantial reduction in travel times both from Dronten to Zwolle (from 66 to 18 minutes) and from Dronten to Lelystad (30 minutes to 12 minutes), with trains running every half hour and no increase in travel fares. Furthermore, job accessibility within a 45 minutes' public transport journey from Dronten increased by 246 percent after the opening of the railway station. Hence, the opening of the railway station in Dronten seems well suited to examine the effect of an increase in public transport job accessibility on individual employment outcomes, using a quasi-experimental approach.

Theory suggests that improved transport linkages between home and work locations could improve people's ability to participate in the labour market (e.g. Kain, 1968, Wachs and Kumagai, 1973, Geurs and van Wee, 2004). Lower commuting times or costs may expand people's job search horizons (Gobillon et al., 2007) and this may improve their job matching opportunities as workers can reach more potential jobs and thus are more likely to find better employer matches which may result in higher wages (Rosenthal and Strange, 2004). Shorter commutes may also affect the productivity of workers through reducing their commuting-effort (Zenou, 2002) and increasing the flexibility between work and other activities (Ross and Zenou, 2008). In turn, this could make workers more interesting for employers (Gobillon et al., 2007).

In line with that literature, we hypothesize that the opening of the railway station in Dronten, which substantially decreased public transport commuting times to the regional employment centres, may have increased employment probabilities and wages of affected workers. However, there are several reasons why this effect is likely to be small. Dronten is located in a rural area where many people tend to use private instead of public transport to travel to work. Further, in the Netherlands, trains are mainly used by middle- and higher educated groups, who are more often employed and typically have access to private transport means. Therefore we mainly expect employment effects in terms of better job matching (i.e. increase in hours/days worked or wages), rather than an increase in employment levels.

To examine exogenous changes in public transport job accessibility on employment outcomes, we combine a difference-in-difference approach with a matching strategy to estimate how labour market outcomes of treated individuals in Dronten changed over time in comparison with a matched control group, based on an administrative monthly panel dataset spanning the period 2006 to 2018. While matching ensures a balanced treatment and control group in terms of observed covariates, our difference-in-differences approach controls for unobserved but temporally invariant characteristics remaining after matching (Heckman et al., 1997).

The formal decision to construct the Hanzelijn followed in 2005, which then actually started in January 2007 (Hanzelijn monitor, 2012). After a construction period of 5 years, the railway became operational on 6 December 2012. All main transport infrastructure other than the Hanzelijn in and around Dronten and in the wider region remained largely unchanged from 2006 until 2018. The announcement of the Hanzelijn trajectory in December 2003 raises the issue of residential self-selection. That is, people may have anticipated the opening of the new railway station by moving to Dronten before the opening in December 2012. Descriptive statistics show, however, that although Dronten had experienced a relatively high positive migration balance in the period before the opening of the station, (1.9% as compared to 0.8%, 0.3% and 0.2% in the neighbouring cities of Lelystad, Kampen and Emmeloord respectively), this was mainly caused by in-migration of young people who moved to Dronten to study at the Agricultural Polytechnic located. Exclusive of these students, the migration balance in Dronten before and after the opening of the station was similar to

Using various administrative datasets retrieved from Statistics Netherlands, we compiled an individual-level monthly panel dataset for the period 2006 to 2018. The dataset contains information of all individuals on the 28th of each month, providing detailed demographic and socio-economic characteristics, including place of residence at neighbourhood level and workplace of each individual at municipal level (available for December of each year). We constructed three dependent variables for each monthly observation:

- Employment status: a dummy variable that equals one if the individual is (self-)employed and equals zero if the individual is not (self-)employed (both unemployed and those outside the active labour force such as students, ill/disabled.
- Days worked: total number of full-time working days in the previous 12 months.
- Hourly wage: the natural logarithm of the monthly contractual gross wage relative to the monthly number of contractual hours worked, corrected by yearly inflation figures, measured for all employed individuals for whom we had reliable hourly wage data (excluding self-employed and assisting family members (1.1%).

We consider the *treatment group* to be all individuals who were between 20-55 years old and lived on 28 November 2012, a few days prior to the opening of the station, in Dronten. The maximum distance from any given neighbourhood within the town of Dronten to the railway station is less than 4500 meter, which is well within bus and bicycle service area of the station. As *control group* we selected the same group of individuals residing on 28 November 2012 in the towns and villages of the adjacent municipalities of Noordoostpolder and Urk (henceforth referred to as Noordoostpolder). These towns are part of the same labour market region as Dronten (Zwolle), but were not subject to the Hanzelijn railway or any other major transport infrastructure changes.

All individuals in our treatment and control groups were traced backwards to the first month of 2006 and forward to the last month of 2018. In line with Rotger and Nielsen (2015) and Aslund et al. (2017), we assume that a period of 6 years before and after the opening of the station is sufficient to detect short- and long-term effects of the Hanzelijn on changes in employment outcomes. The

number of individuals was 12,309 and the corresponding number for our control group was 26,549 individuals. If individuals moved out of the treatment or control area or deceased in the post-treatment period (0.01%), they dropped out of the panel. For 67% of the individuals we have observations for each month in the period 2006 and 2018. Only 30 individuals moved from the control group to our treatment group after the opening of the station, thus, our results unaffected by part of the control group being exposed to the treatment.

T-tests indicate statistically significant differences in the mean covariate values between our treatment and control groups. On average, a larger share of the treated individuals are higher educated, has a migration background, a permanent contract and more contracted working hours per week. We also found some differences between the treatment and control group in pre-treatment trends, in particular for employment rate. To control for these differences between our treatment and control group, we combine our difference-in-differences approach with a matching strategy.

We applied Coarsened Exact Matching (CEM) using the following matching variables: gender (women/men), age group (20-29, 30-39, 40-49 and 50-55 years), migration background (0/1), educational level (low/middle/high), having a partner with income (1/0), firm industry (eight broadly defined job industries including non-working) and in the hourly wage model we also included job contract (permanent/temporary) and contracted working hours per week. We matched separately for the employment/days-worked models (all observations) and for the hourly wage model. Since CEM does not lead to complete matching, the matched samples slightly reduced to 12,258 treated individuals for employment/days-worked and 8,356 treated individuals for our hourly wage (matching rate of 99.6% and 99.4% respectively). After matching, the difference in mean covariate values between our treatment and control group are much smaller and statistically insignificant for all matching variables.

The impact of the new station was estimated with a multiple time periods DID regression that provides month-specific estimates (Imbens and Wooldridge, 2009). Since demographic and socioeconomic characteristics may differ between our treatment and control group, which could lead to an estimation bias, we included individual-specific fixed effects.

In all model estimates the effect of the difference-in-difference variable (treated multiplied by month) are insignificant and close to zero in the pre-treatment period 2006-2012, indicating that the pre-treatment trends in employment rate, days worked and hourly wages of our matched treatment and control group were comparable in the period before the railway station opened.

Our empirical results, however, also indicate that the opening of the railway station had no impact on the employment probabilities of the treated population in Dronten, as our difference-in-difference estimator had no statistically significant effect in any of the months after December 2012. We did find a statistically significant increase in the number of days worked. The estimates gradually increase from an extra 0.4 days worked directly after the opening of the station, to 5.4 additional days worked after five years, which becomes smaller again towards the end of 2018. In terms of hourly wage, we find a 0.6-0.7% increase in hourly wage. These results seem to support our hypothesis that the opening of the railway station induced job matching opportunities, rather than increasing employment probabilities.

We found differential employment effects for various subpopulations. For days worked, we found larger effects and over a longer period for men, young people, people without access to household vehicles, and among those with flexible job contracts. In terms of educational level, we only found

significant estimates for higher educated, which seems to reconfirm the sensitivity to train services among this group. For hourly wage, we only found significant effects for young people, middle- and lower educated, and among people with flexible job contracts, which seems to indicate that these groups (also) benefited from the new railway station in terms of job matching.

While theory suggests that improved commuting networks could hypothetically increase the likelihood for workers to more easily find good employer matches and to expect higher wages (Rosenthal and Strange, 2004; Gobillon et al., 2007), our study of the opening of the Dronten railway station provides mixed support for this hypothesis. Possibly, public investments in new (light) rail infrastructure are likely to yield larger effects in urban areas, where people more often depend on public transport services to travel to work. Further case study research would be needed to understand the employment benefits of rail infrastructure investments in those areas.