Lost opportunities: Market work during high school, establishment closures and the impact on career prospects

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Abstract

In this paper, I study the importance of market work during high school for graduates' school-to-work transition and career prospects. Relying on Swedish linked employer-employee data over a 30-year period, I show that market work during school provides students with an important job search channel, accounting for 30 percent of direct transitions into regular employment. I use the fact that some graduates are deprived of this channel due to establishment closures just prior to graduation and labor market entry. I compare classmates from vocational tracks with the same field of specialization to identify the effects of the closures and show that lost job-finding opportunities due to an establishment closure lead to an immediate and sizable negative effect on employment after graduation. The lost employer connection have also persistent, but diminishing negative effects on employment and earnings for up to 10 years, but are not permanent. Parts of the effect appear to be driven by a process where graduates who are subject to a closure of a relevant employer before graduation have to find employment in an industry which is less relevant to their education.

Keywords: social contacts, young workers
JEL-codes: J01

Contents

1 Introduction

The school-to-work transition is a crucial time for high school graduates as an unsuccessful transition can have a long-lasting impact on future career prospects. Several studies show strong evidence of a negative impact of graduating during poor aggregate labor market conditions. These effects are visible in terms of lower job finding rates, relatively more employment in lower-level occupations and at lower-paying employers and persistent effects on future earnings during a decade or more (Raaum and Røed, 2006; Kahn, 2010; Oreopoulos et al., 2012). Less is known about the causal impact of shocks that affect individuals' specific job-finding opportunities.[1] In this paper, I use Swedish register data to study how graduates are affected in the short and long run when they are deprived of a very important job-finding channel, market work during high school, due to a plant closure just prior to graduation.

Aiming for a smooth transition, young workers often rely on social connections and informal networks in order to find their first job (see, for instance, Ioannides and Loury, 2004; Topa, 2011). One important source of such connections is provided through direct ties to employers from paid work during high school.[2] I show that such *in-school jobs* are very common in Sweden, a country where vocational high schools provide little workplace training. In-school jobs provide one of the most commonly used paths into the labor market, accounting for about 30 percent of direct transitions into employment after high school (see also Hensvik et al., 2017).

In this paper, I document the causal effect of employer connections at the time of labor market entry for the school-to-work transition and long term labor market outcomes. The identification strategy exploits exogenous variation in the access to employer connections that arises due to closures of former in-school establishments that occur just prior to graduation. I rely on Swedish employer-employee data spanning over a 30-year period to identify all vocational graduates, their former in-school work establishments (i.e. employers hiring students for market work during the last year of high school) and whether those establishments closed prior to graduation.

In the empirical model, I use those closures to compare students who have a sustained link to a former work establishment with classmates in the same vocational track who lost this direct sustained link due to the closure of the former work establishment. A feature of this approach is that it allows me to remove several confounding factors through the use of classmates as a control group; these are not only from the same school, but also trained in the same vocational track and face the same (local) labor market conditions at the time of graduation.

It is important to note that the loss of employer links is foremost a loss of opportunities. Establishment closures later in the career are directly disruptive to the individual's life and have been shown to have lasting negative effects on employment, earnings, health and marital

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[1] Exposure to early unemployment spells has a strong association with higher and persistent adult unemployment rates (Gregg, 2001; Burgess et al., 2003) and lower earnings (Arulampalam, 2008; Neumark, 2002; Skans, 2011).

[2] Another important source of connections is family networks (Kramarz and Skans, 2014).

stability (see e.g. Jacobson et al., 1993; Stevens, 1997; Browning et al., 2006; Eliason and Storrie, 2006, 2009; Sullivan and von Wachter, 2009; Huttunen et al., 2011; Eliason, 2012). In contrast, graduates who are affected by the closure of an in-school work establishment lose the opportunity to find the first real job at a site where they already have firm-specific human capital and the benefits of social connections, both of which are factors that can shorten and simplify job search.

The results show that students who are affected by a closure of a former establishment do significantly worse upon labor market entry. Such students are less likely to find a stable job upon graduation and have substantial earnings losses as compared to classmates with intact employer links. The results matter for long term career prospects and point to sizable, albeit smaller negative effects on stable employment and earnings for up to a decade before fading out. The effects are thus highly persistent, but not permanent. These findings are particularly interesting since first jobs are generally only transitory in nature, even though they are less so when found through employer links from pre-graduation market work. It is noteworthy that the effects of losing an employer link are similarly long-lived (but less severe) as compared to effects of job loss due to an establishment closure later in life, which further emphasizes the importance of a successful school-to-work transition.

I verify the validity of my approach with a set of alternative specifications and robustness exercises. I show that my results are not driven by selection of students into closing establishments and corroborate that finding by using placebo-like closures of in-school establishments that occur after, instead of prior, to graduation. Reassuringly, I do not find an effect of such placebo closures on employment in the year of graduation. Since there is evidence that closures might be more common in certain industries (Eliason and Storrie, 2006; Browning et al., 2006), I show that the estimates hold when I compare classmates with in-school jobs in the same industry as an alternative sets of fixed effects. The results are also robust to reducing my sample to students with in-school jobs in non-seasonal industries only.

In addition, I provide novel evidence on potential mechanisms and show that parts of the negative effects of a closure are driven by the loss of links to employers that offer job opportunities in industries that are relevant with regard to graduates' specialization in vocational school. Market entrants who lose a connection to an employer in a relevant industry not only suffer from worse employment outcomes, but also adjust by shifting towards jobs in industries that are less-relevant to their specialization in vocational school, leading to worse matches at least in the short run. On another margin, I also show that affected students adjust through higher reliance on their parents during the job search process.

The paper contributes to several strands of literature, particularly with regard to the use of social contacts and networks. While there is ample and compelling evidence of the importance of social networks for job finding (see e.g. Montgomery, 1991; Bayer et al., 2008; Beaman and Magruder, 2012; Kramarz and Skans, 2014; Dustmann et al., 2016), I add to the scarce literature that provides causal estimates based on exogenous variation in access to networks.

There are previous papers that have used plant or establishment closures to identify causal effects of networks, albeit with very different approaches. For instance, Eliason et al. (2018) use establishment closures in the network of a firm's incumbent workers as supply shocks directed towards the incumbent's firm and analyze the subsequent effects on firm outcomes. The other papers focus on the importance of network characteristics. Cingano and Rosolia (2010) use plant closures to show that an increase in the employment rate among former co-workers decreases unemployment duration. In a similar approach, Glitz (2017) uses the displacement rate among former co-workers as exogenous variation in network strength to analyze the effects on individuals' re-employment and wages. Saygin et al. (2014) extend a similar analysis by showing that firm-side hiring probabilities are higher for displaced workers who are connected through a former co-worker.

In contrast, I focus on variation in access to employer connections for a population that might be particularly prone to suffer long-lasting consequences in the absence of employer connections since previous research suggests that networks are particularly important for young and inexperienced workers (see e.g. Kramarz and Skans, 2014) and additionally provide new evidence on how those workers compensate for the loss of some type of contacts through others.

The paper also contributes to the literature on the returns to in-school and in-college jobs by discussing an additional channel through which in-school jobs might matter for labor market outcomes. Most of the existing literature focuses on the skill-enhancing aspect of in-school work and its effect on subsequent earnings (see Carr et al., 1996; Ruhm, 1997; Light, 2001; Hotz et al., 2002; Häkkinen, 2006). While early studies (see Carr et al., 1996; Ruhm, 1997; Light, 2001) consistently show that in-school work is associated with substantial and lasting positive effects on labor market outcomes, later papers such as Häkkinen (2006) or Hotz et al. (2002) put greater focus on assessing the robustness of this association. Häkkinen (2006) addresses possible selection into in-school work by instrumenting work experience with local unemployment rates and finds that the effect of work experience increases earnings immediately after labor market entry, but does not find any long term effects. The absence of long run effects is also in line with Hotz et al. (2002), who use a discrete choice model to account for selection.

The paper is structured as follows: Section 2 provides a discussion of the institutional background, followed by the empirical model in Section 3 and a detailed description of the data in Section 4. Short term results, validation exercises and robustness checks are presented in Section 5. In Section 6, I provide long term effects on labor market outcomes and discuss mechanisms. Section 7 concludes.

2 Institutional background

2.1 The Swedish school system

Following nine years of compulsory school, Swedish students can choose to enroll in upper secondary education, which is divided into several academic and vocational tracks. Students can apply to specific programs such as "childcare", "construction" or "business" based on their grade point average from compulsory school.[3] The vast majority of students enrolls in upper secondary education with roughly half of a cohort opting for academic tracks and the other half for vocational tracks and about 85% of a cohort graduates from high school. Vocational programs provide training for occupations such as construction worker, electrician or care worker with a limited amount of on-site training with employers that usually amounts to five weeks per year. In contrast to central Europe, there are no large scale apprenticeship programs in Sweden. The majority of vocational students enters the labor market upon graduation, while graduates from academic programs tend to enroll in college or university.

Today, academic and vocational programs are three-years long, however up to 1994, vocational programs were limited to two years. For cohorts graduating from 1995 onwards, the extension of vocational programs meant that vocational graduates were put on par with academic graduates with regard to eligibility for university admission. This did however not change the fact that the vast majority of vocational students enters the labor market directly after graduation and that transition rates to university remain low. Since I focus on the school-to-work transition, I limit the analysis to students in vocational tracks.

2.2 In-school market work

It is very common that Swedish students work during upper secondary school and the majority of those jobs are found through the ordinary labor market as opposed to jobs that are arranged through cooperation of schools and employers. In the analysis, I refer to market jobs during the year prior to graduation as in-school jobs. Most of the in-school work experience is gathered throughout the two months of summer vacation, but in my analysis I include any job that generated positive earnings during the twelve months prior to graduation (which takes place in June).[4]

My period of analysis also includes some of the most turbulent times for the Swedish economy. While unemployment rates were low throughout most of the 1970s and 1980s, Sweden was hit by a major recession in the early 1990s that led to soaring unemployment (see e.g.

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[3]Students who enroll in vocational programs have on average a somewhat lower compulsory GPA.

[4]While most in-school jobs are acquired through the regular labor market, municipalities also provide some summer jobs. These municipality-provided jobs are short-term (usually artificial) jobs that pay little and often provide few contacts to real employment opportunities (see Alam et al., 2015). In the analysis, I exclude jobs provided by municipalities since those jobs are not necessarily providing an "ordinary" contact to the labor market and since establishment closures in public sector are few.

Holmlund, 2003). Particularly young workers were hit and faced unemployment rates of up to 25 percent during the peak of the recession. Whilst recovery set in by the end of the 1990s, employment never reached pre-recession levels again.

In contrast, the financial crisis in the late 2000s led to a comparatively moderate increase in youth unemployment rates, albeit from much higher levels.

3   Empirical Method

My goal is to identify the short and long run labor market effects of losing the opportunities associated with an intact in-school (market work) employer connection at labor market entry. The identifying variation in my empirical model stems from closures of establishments that employed graduates and that closed within the twelve months prior to graduation. As such, I compare graduates from the same graduation cohort and class (defined as attending the same school and vocational track) that only differ in access to an employer link upon graduation due to an establishment closure.

I estimate the following baseline model:

$$Outcome_{ic(t+n)} = \mu_{ct} + \beta\, plant\, closure_{ict} + \delta X_i + \varepsilon_{ict}, \tag{1}$$

where μ_{ct} are class x graduation year fixed effects. X_i are individual characteristics including age, gender, grade rank from high school and immigrant background. Additionally, the vector includes average monthly in-school job earnings in $t-1$ to proxy work experience and to make sure that any effect is not driven by differences in the amount of work experience that was acquired prior to labor market entry. β captures the effect of losing one's direct connection to a former in-school employer due to an establishment closure between $t-1$ and t. I distinguish between short and long run outcomes defined as: $Outcome_{ic(t+n)}$ with $n = 0$ measures (1) the probability of having a (stable) job in graduation year t and (2) earnings. $Outcome_{ic(t+n)}$ measures (1) and (2) in each year $t+n$ after graduation for up to 15 years.

I keep all students who had any positive earnings from a job in the year prior to graduation.[5] Class fixed effects are included, such that the identifying variation occurs between classmates. A feature of this approach is that peers from the same class are identified by a common school and vocational track identifier, implying that classmates do not only resemble each other in terms of location and school environment, but also in their choice of a prospective future career path and subsequent specialized education in that field. Examples of such specialization are fields such as "auto-mechanics" or "care work". Another advantage of using graduation class fixed effects is that this approach mitigates concerns that labor market outcomes are affected by differences in the national or local unemployment rate by the time of graduation since I

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[5]Students with jobs in the public sector are excluded due to few establishment closures and to avoid confusion with municipality-provided jobs.

only compare classmates who graduate in the same calendar year and who therefore face the same labor market conditions at the time of graduation as well as each subsequent year in the analysis.

A causal interpretation relies on the assumption that there are no other factors that simultaneously affect graduates' propensity to work at an establishment that closes and that affect employment outcomes. I interpret an establishment closure as an exogenous shock to students' opportunities. To be precise, this includes both the loss of an employer link as well as the fact that students may have acquired (firm-specific) human capital during the in-school job that is no longer of relevance.

A possible concern could be sorting into closing establishments by student quality; e.g. high school students who are employed by establishments that will eventually shut down are more likely to have certain characteristics that also lead to worse employment outcomes. Also, closures do not occur randomly across all establishment sizes and industries. I address this issue early on by the discussion of the balance tests in section 5. To make sure that my results are not driven by selection of the establishment type that closes, I will show that any such sorting patterns are negligent in size and disappear once I take into account establishment characteristics. I show that limiting my variation to classmates within the same earnings tercile and/or industry of in-school work establishment confirms my findings and does not impact the magnitude or significance of my main results.

I confirm that sorting does not appear to be a concern by using a second approach that uses future closures of former in-school establishments that occur in year $t + n$ after graduation to test for systematic differences of students with jobs at establishments that close and those that remain in business. In addition, I also provide evidence for the robustness of my estimates by focusing on non-seasonal industries only and by using different restrictions on establishment size.

4   Data and description

4.1   Data sources

In the analysis, I use matched employer-employee register data from Statistics Sweden. The graduate population of interest is defined by the Upper Secondary School graduation register, which entails information on all students who graduated from upper secondary school each year. The register allows me to identify my sample of all vocational students (at age 18 or 19) who graduate in a given year.

Figure 1 shows the number of high school graduates for each year as well as the share of graduates in vocational tracks. During my period of analysis from 1986-2015, 2,147,307 students graduate from upper secondary school of which 1,066,715 graduate from vocational tracks.

Figure 1: Fraction of vocational graduates
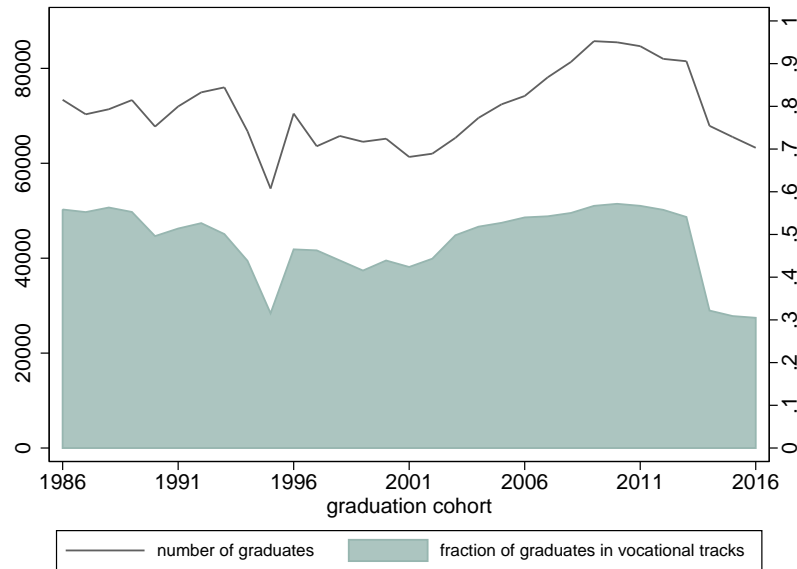
The graduation registers are linked with register data containing information on demographic characteristics as well as with matched employer-employee data covering Sweden's entire working age population (aged 16-69). This data includes detailed information on individuals' earnings received from employment as well as the time period each employment spell lasted. I use this data set to identify whether and where graduates have work experience from an in-school job in the year prior to graduation. I keep all jobs that generated positive earnings.

4.2   Post-graduation employment

A main concern is to identify students' employment outcomes after graduation. As in Kramarz and Skans (2014) and Hensvik et al. (2017), I focus on the concept of "stable jobs" in order to capture a level of labor market attachment that clearly exceeds that of in-school jobs. In the register data, post-graduation employment status is measured 5 months after graduation, i.e. in November of the same year. I identify stable jobs as employment spells that lasted for at least four months during a calendar year including the month of November and that generated total earnings of at least the equivalent of three times the monthly minimum wage as defined by the 10th percentile of the wage distribution.[6] If there are several spells that exceed that threshold, I keep the spell that generated the highest earnings.

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[6]This time series is obtained from Lönestrukturstatistiken, see Statistics Sweden (http://www.statistikdatabasen.scb.se).

4.3   In-school market jobs

Figure 2 shows the share of graduates with any in-school job experience. Between 60 and 90 percent of all (vocational) students obtained some work experience. However, given that I include jobs that generated very little income that is not surprising. Still, when applying the restriction of only including jobs that generated at least $0.5\times$ the monthly minimum wage (as measured by the 10th percentile of the wage distribution), the levels decrease to 40 to 80 percent, but follow the same pattern over time.[7]

Figure 2: Fraction with in-school job experience
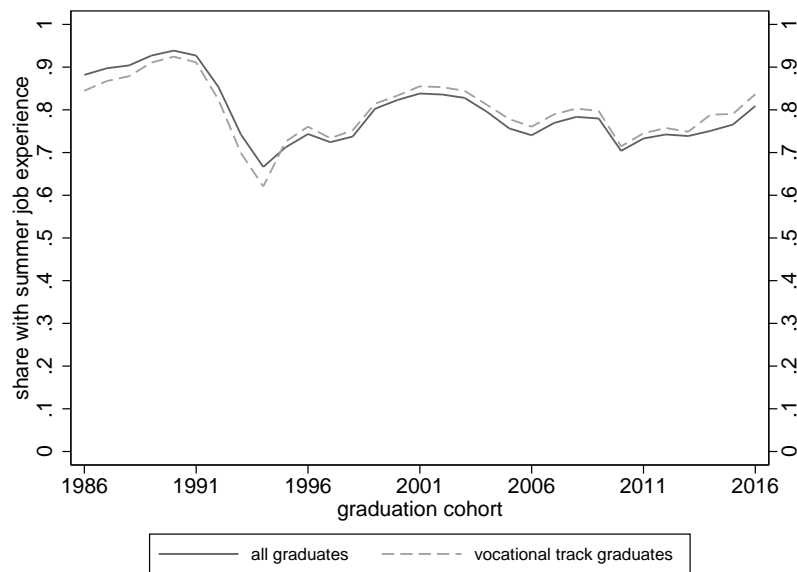
Notes: In-school job experience includes all graduates with positive earnings from a job in the year before graduation.

The importance of in-school jobs for labor market entry is reflected in figure 3. Around 15 percent of all vocational students find their first job at a former in-school job establishment. When I account for direct transitions only, the number increases to about 30 percent (see Figure A.1), which corresponds to the recall share of more experienced displaced workers (see e.g. Fujita and Moscarini, 2017).[8]

However, are these jobs leading to future careers within the same firm or are they stepping stone jobs from which individuals tend to move on quickly? Figure 4 shows the share of each graduation cohort that is employed at a former in-school establishment for up to 15 years after graduation. In-school jobs seem to be short term jobs that are most important during the first

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[7]Main results are very similar when I apply this restriction.

[8]Fujita and Moscarini (2017) find that 30 percent of separated workers in the US, including those that leave the labor force, are recalled to their last employer. Shares are even higher for those that separate into unemployment. The share of graduates returning to their previous in-school employer in Sweden is even higher if I relax restrictions on the length and earnings of the post-graduation employment spell, implying that an even higher share returns to their previous employer if I include very short and low-paying employment spells.

Figure 3: Fraction returning to in-school work establishment after graduation
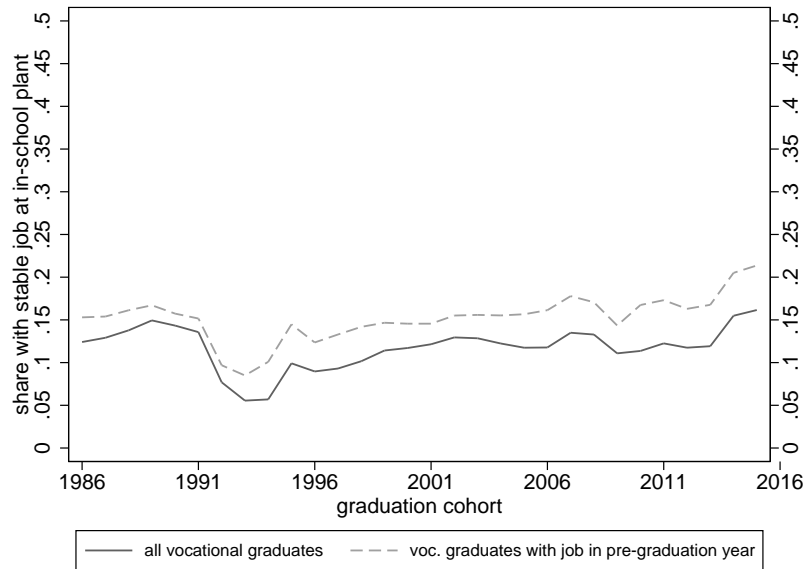
few years after graduation. Five years after graduation, the share working for a former employer decreases with two thirds and levels out at around 4 percent after 15 years.

From the figure, it may appear that those jobs are stepping stone jobs that last for only a short period of time, but they are in fact less short term than jobs that are found through other channels at the same career stage (see also Hensvik et al. (2017) for a similar analysis). Table 1 shows the estimation results of a simple regression comparing the probability of remaining with the first employer after graduation for students from the same class who worked for the employer already prior to graduation and for those who did not. The probability to stay with the first employer is notably higher for students who had worked for the same employer even prior to graduation. Estimates remain higher even ten years after labor market entry, amounting to half of the mean outcome. An implication is that jobs found through in-school employers provide graduates with better long term prospects (unless they would lock students into jobs that do not match their qualifications, but as shown in section 6.2, results do not suggest that such lock-in effects are present).

Figure 4: Fraction of vocational track graduates working at in-school establishment
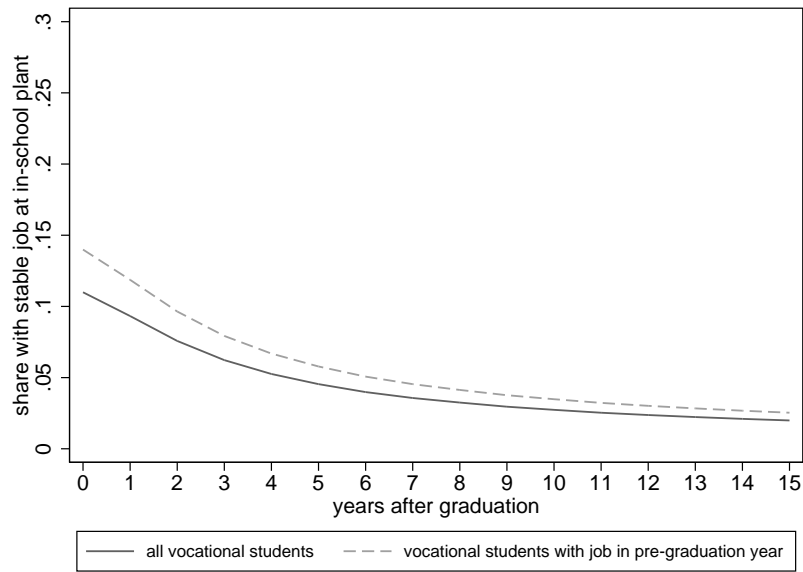
Table 1: Graduates stay longer if first job is found at former in-school employer

	Probability of staying in first job		
	(1)	(2)	(3)
Remain in establishment in	t+3	t+5	t+10
Former in-school employer	0.031***	0.027***	0.023***
	(0.001)	(0.001)	(0.001)
Female	-0.015***	-0.013***	-0.009***
	(0.001)	(0.001)	(0.001)
Age	-0.001	-0.001	-0.002*
	(0.002)	(0.002)	(0.001)
Immigrant background	-0.022***	-0.016***	-0.012***
	(0.001)	(0.001)	(0.001)
Grade percentile rank	0.005***	0.004***	0.002
	(0.002)	(0.001)	(0.001)
Mean outcome	0.089	0.065	0.042
Observations	654,588	596,307	448,363
R-squared	0.182	0.155	0.126
controls	yes	yes	yes
class FE	yes	yes	yes

4.4 Defining establishment closures

Students who lose their connections to a former employer right before entry into the labor market are left with fewer opportunities than their peers with an intact connection. This notion captures both the loss of firm-specific human capital that was acquired on the job as well as social contacts to the previous employer. In order to capture a true loss of this type of opportunities as consequence of a closure, I want to capture closures of established employers that resulted in the ceasing (and not transfer) of business activities and that occurred close to the graduation date of any former student employees and thus impacted students' possibilities to establish ties to new employers after the closure, but prior to graduation.

I impose three restriction in order to define what constitutes an establishment closure. First, I identify all cases in the employer-employee register where an establishment's identifier disappears between the year prior to graduation $t-1$ and the year following graduation $t+1$. Second, closures should occur between October in the year prior to graduation and June in the graduation year (i.e. the last employment spell at a closing establishment should end within nine months prior to graduation in June). Third, no more than 30 percent of the stable workforce[9] at the ceasing establishment should be found at another establishment in year t+1. I apply this restriction following Hethey-Maier and Schmieder (2013) and Eliason et al. (2018) in order to reduce the probability of mergers or dispersals being wrongly defined as an actual closure. Application of this rule also leads to the exclusion of closures of establishments with fewer than four employees.[10]

Workers are deprived of the opportunities that arise from in-school work if they were employed at an establishment that satisfies the above three criteria.

Figure 5 shows the number of establishment closures for each year during my analysis period.[11] The bulk of the variation in establishment closures occurs during the time period during the first half of the 1990s when Sweden was hit by a severe recession. During the rest of the time period, the number of closures has been relatively stable with around 2000-3000 establishments closing each year.

Figure 6 shows the share of all vocational graduates that has been affected by the closure of a former in-school job establishment (conditional on having positive income from an in-school job). Generally, between 1 and 1.5 percent of (vocational) graduates were affected by a closure by the time they graduated and fluctuations mirror the changes in the number of closures in the previous figure. While the share might seem small, it should capture the cases where opportunities were in fact lost and should be relevant for a larger segment than just these 1-1.5 percent.

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[9]Stable workforce refers to those employees who had a continuous employment spell at the closing establishment that meets the criteria of what constitutes a stable job. Thus, summer workers or short term substitutes are not counted as part of the stable workforce.

[10]I verify that my results hold when I use different cutoffs for establishment size (see section 5.2.4).

[11]Closures in the public sector are excluded due to the selection of the sample without students with jobs in the public sector.

Figure 5: Number of establishment closures

Notes: The graph shows the number of establishment closures in the economy in a given year.

Notably, the share of affected students was highest during the recession in the early 1990s. It also increased during the recession in 2008, but has followed a slight downward trend since the 2000s.

Figure 6: Share of graduates affected by in-school establishment closures
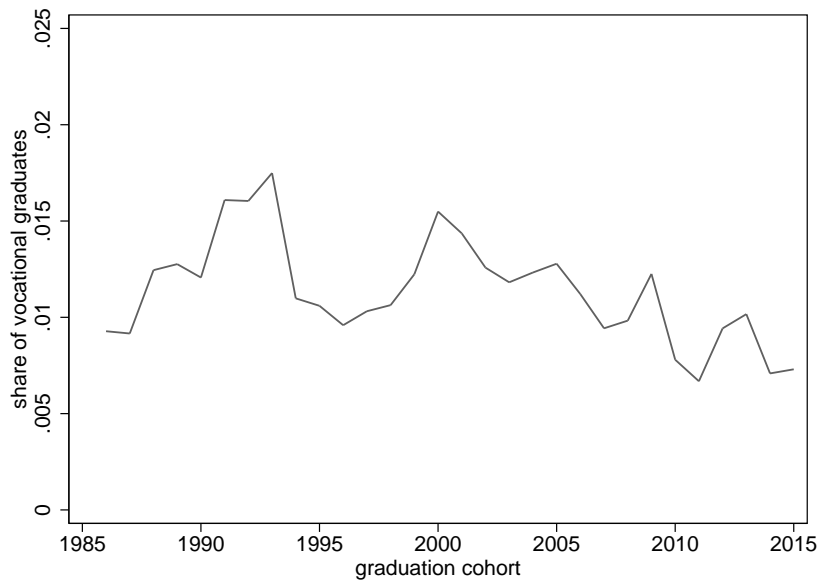
Notes: Sample: all graduates with a summer job. The graph shows the share of graduates who had a summer job at a plant that closed in graduation year t.

4.5 Summary statistics

Table 2 shows summary statistics for the analysis sample. The statistics are displayed separately for graduates with an in-school job at an establishment that did not close and graduates who were employed by establishments that closed just prior to graduation. The panels are fairly balanced even though women and graduates with an immigration background are slightly over-represented among graduates at closing in-school job establishments. Students who were affected by a closure also attend somewhat larger classes. Students who do not have connections to a former employer due to a closure have notably lower employment rates upon graduation.

Table 2: Descriptives by closure status of in-school establishment

	(1) Closure=0		(2) Closure=1	
	mean	sd	mean	sd
Female	0.449	0.497	0.486	0.500
Grade percentile rank	0.510	0.286	0.499	0.287
Age	18.749	0.434	18.722	0.448
Immigrant mother	0.058	0.233	0.086	0.281
Immigrant father	0.073	0.260	0.111	0.314
Immigrant background	0.087	0.281	0.127	0.333
Class size	33.607	32.563	37.458	35.743
Income from in-school job	16716.721	15867.748	16045.982	15289.515
Average monthly wage	3411.056	3988.789	2750.823	2959.082
Size of in-school establishment	314.392	1124.876	246.761	3078.196
Stable job after graduation	0.414	0.493	0.353	0.478
Observations	701356		7876	

Notes: The analysis sample consists of all vocational graduates 1986-2015 with some positive earnings from a job in the year prior to graduation and non-missing values for the controls.

With regard to establishment characteristics, we see that closing establishments are, in line with the literature, smaller in terms of number of employees (see Eliason and Storrie, 2006). Likewise, the income that an in-school job at a closing establishment generates in the pre-graduation year is slightly smaller, even though this might simply reflect the fact that in-school jobs are cut short by the establishment closure.

I provide balance tests for the baseline model and different specifications in the next section.

5 Short term results

5.1 Main results

In this section, I examine the short run consequences for labor market entry for students who lost the opportunities from previous employer connections due to an establishment closure. I estimate the effect of a closure on the probability of finding a stable job in the year of graduation by gradually introducing the baseline model (1) and several modifications.

Table 3 shows the estimation results. I start out by estimating the model using cohort fixed effects only. Column (1) shows the estimated impact of an establishment closure on the probability of finding a stable job. In this setup, a closure is related to a 5.4 percentage points decrease in the probability to find employment in the graduation year.

However, cohort fixed effects do not account for regional differences in background and labor market characteristics. In columns (2)-(4), I therefore use class fixed effects to estimate the model, which allows me to compare students who obtained the same education directed towards a specific profession. The impact of a lost employer connection is now associated with a 3.5 percentage point decrease in the probability of finding a stable job and is reduced to 2.7 percentage points after I include individual and establishment level controls. Note that column (3) corresponds to the baseline model set out in the empirical model section. All controls are highly significant and of the expected sign. Students with higher monthly earnings are more likely to find stable employment after graduation. The entire reduction in the size of the estimate that occurs between columns (2) and (3) is driven by the inclusion of the control for average monthly log earnings, while individual background characteristics or plant size controls do not appear to matter, suggesting that the class fixed effect do a good job in controlling for background characteristics. However, the effect is still substantial and accounts for about 7 percent in relation to the mean. It corresponds to half of the estimated effect of having an immigrant background, which is one of the most important factors explaining variation in employment rates.

In column (4), I allow for more flexible firm level controls in terms of logged earnings and plant size. The results suggest that the functional form does not matter and the estimate is almost identical.

As mentioned earlier, a concern is that results may be driven by differences in the industry of the in-school establishments. This concern is addressed in columns (5) and (6), which re-estimates the baseline model (with and without controls) with class-industry fixed effects. The identifying variation occurs between classmates with an in-school job at an establishment in the same 2-digit industry. The estimated effects are remarkably similar to the ones obtained using class fixed effects only and thus confirm the validity of the baseline model. Lost employer connections become slightly more important for short term employment prospects with an estimated impact of 3.1 percentage points after including the controls; implying that post-graduation employment rates are higher among students with in-school jobs in industries that are affected by more closures. While the results are still precisely estimated, this approach is of course much more demanding of the data and the standard errors for this specification almost double.

In column (7), I go one step further. Since average monthly earnings is driving the reduction in the estimate, I narrow my comparison group to students in the same earnings tercile within a given class and the same in-school job industry. While this specification might be too demanding of the data, it does reassuringly yield a significant and even slightly larger estimate

of the effect, but at the cost of less precision.

The estimates are in a similar range throughout a number of specifications and imply that graduates who lost an employer connection due to the closure of a former in-school job establishment have a notably less successful school-to-work transition than their classmates.[12] Table 4 illustrates that the negative effect on employment corresponds to the share of graduates that cannot compensate the loss of a re-employment opportunity by finding employment in a new establishment. Column (2) displays the effect of an establishment closure on the probability of working at a former in-school establishment upon graduation. I estimate the baseline model laid out in section 2 with the new outcome of having a stable job at the previous in-school establishment. Graduates who were affected by a closure are on average 13 percentage points less likely to be stably employed by a former in-school establishment.

In column 3, I change the outcome to having a stable job at an establishment that is not the in-school establishment. A lost employer connection increases the probability of working for a new employer by 10.5 percentage points, implying that about 80 percent of the effect in column (2) is driven by replacement jobs and the other 20 percent by non-employment, which corresponds to the main effect in column 1 (compare to table 3, column 3).

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[12]In Hensvik et al. (2017), we show that high school graduates are also significantly more likely to get employed at establishments to which co-workers from previous in-school jobs have relocated, even though these contacts are in comparison far less decisive for where students find employment as compared to the direct employer connections from an in-school job. However, this means that co-workers who relocate as a consequence of a closure might offset some of the negative effects of a lost direct connection to an employer and that this effect is included in the estimates. This would likely mean than the estimates would be even larger in size if the closure would not generate new connections through relocated former co-workers.

Table 3: Main results: Effect on stable employment in graduation year

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Closure	-0.054***	-0.035***	-0.027***	-0.029***	-0.035***	-0.031***	-0.037**
	(0.005)	(0.006)	(0.006)	(0.006)	(0.011)	(0.011)	(0.018)
Female			-0.016***	-0.017***		-0.013***	-0.012**
			(0.002)	(0.002)		(0.004)	(0.006)
Age			0.036***	0.036***		0.040***	0.041***
			(0.003)	(0.003)		(0.005)	(0.008)
Immigrant background			-0.057***	-0.057***		-0.056***	-0.054***
			(0.002)	(0.002)		(0.004)	(0.006)
Grade percentile rank			0.041***	0.041***		0.037***	0.033***
			(0.003)	(0.003)		(0.005)	(0.007)
log monthly earnings			0.046***	0.077***		0.053***	0.041***
			(0.001)	(0.004)		(0.001)	(0.003)
log plantsize			-0.013***	0.007***		-0.002**	-0.001
			(0.000)	(0.002)		(0.001)	(0.002)
sq log monthly earnings				-0.002***			
				(0.000)			
sq log plantsize				-0.002***			
				(0.000)			
Mean outcome	0.41	0.41	0.41	0.41	0.41	0.41	0.41
Fixed effects	cohort	class	class	class	class-industry	class-industry	class-ind. earn. tercile
Observations	709,232	709,232	709,232	709,232	709,003	709,003	709,003
R-squared	0.054	0.233	0.245	0.245	0.604	0.610	0.759

Notes: *** p<0.01, ** p<0.05. Robust standard errors clustered on classes. Sample includes all vocational track graduates from 1986–2015 with a job that generated positive earnings in the pre-graduation year. Monthly earnings refers to the average monthly earnings from the pre-graduation year at the in-school job establishment. Immigrant background is an indicator variable for whether either parents is born outside of Sweden. The model in column (1) is estimated using cohort-fixed effects, columns (2)-(4) using class fixed effects, columns (5)-(6) using class-industry fixed effects and column (7) class-industry-earnings tercile fixed effects.

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Table 4: Composition of main effect

	(1) Stable job	(2) Stable job at in-school est.	(3) Stable job at non-in-school est.
Closure	-0.027***	-0.131***	0.105***
	(0.006)	(0.002)	(0.006)
Mean outcome	0.41	0.15	0.26
Controls	yes	yes	yes
class FE	yes	yes	yes
Observations	709,232	709,232	709,232
R-squared	0.150	0.198	0.096

Notes: *** p<0.01, ** p<0.05. Robust standard errors clustered on classes. Sample includes all vocational track graduates from 1986-2015 with an in-school job that generated positive earnings in the pre-graduation year. Controls include sex, immigrant background, grade percentile rank, average monthly log earnings and log plantsize.

5.2 Validation exercises & robustness checks

5.2.1 Balance tests

A main concern is that student sorting into closing establishments is not random and that students who are employed at such establishments have worse labor market outcomes for other reasons.

Table 5 estimates the differences in characteristics of Table 2 using the baseline model with class-fixed effects and the controls as dependent variable. While differences in individual characteristics are precisely estimated, they are tiny: having worked in an establishment that closes decreases the grade rank by 1.8 percentiles. The probability to have an immigration background increases with two percentage points for students whose in-school workplace was affected by a closure.

The covariates that do matter for the magnitude of the estimated effect of a closure are the control for the characteristics of the closing establishments, mainly average monthly earnings and size of the establishment (measured as the number of employees). In Table A.1, I gradually introduce first individual controls and in a second step average monthly earnings and establishment size in both the class FE and the class-industry FE model. While the introduction of the individual's background characteristics do not matter for the size of the estimate, we see that the reduction in the magnitude is indeed driven by the earnings and size controls, indicating that selection in individual characteristics is of little concern in practice.

For re-assurance, I also provide balance tests for the model using class-industry fixed effects in the second column of Table 5. The estimates in column (2) show that differences in

Table 5: Balance tests

	(1) class FE-model	(2) class-industry FE-model	(3) class-industry-tercile FE-model
Female	0.002	-0.013	-0.014
	(0.005)	(0.009)	(0.016)
Age	0.009***	0.014**	0.016
	(0.003)	(0.007)	(0.011)
Immigrant background	0.023***	0.010	0.012
	(0.004)	(0.008)	(0.013)
Grade percentile rank	-0.018***	-0.021***	-0.020
	(0.003)	(0.006)	(0.010)
Log avg monthly wage	-0.175***	-0.062**	-0.043
	(0.015)	(0.028)	(0.024)
Log plant size	-0.141***	0.029	0.000
	(0.018)	(0.030)	(0.047)
Observations	709,232	709,003	709,003

Notes: *** $p<0.01$, ** $p<0.05$. Note: Robust standard errors clustered on classes. The table shows the results of using the control variables of the preferred model from equation (1) as outcome variables using the indicated set of fixed effects.

immigration background are driven by differences in the industries of closing firms and not significantly different by closure status of the establishment, thus further mitigating concerns about selection.

In the third column, I provide the same balance test, while making use of the fact that monthly earnings do matter. In this setup, I only use variation within in-school establishment industry among classmates in the same earnings tercile, which however leads to a loss of precision. None of the covariates are significantly different by closure status. Reassuringly, using those class-industry-earnings tercile fixed effects to estimate the effect on having a stable job in the year of graduation provided significant and even slightly larger estimates of the main effect (see Table 3, column 7).[13] As a whole, the above tests show that selection is highly unlikely to be driving the main results.

5.2.2 Placebos

I corroborate that conclusion that selection is unlikely to be driving the results by employing an alternative strategy using placebo closures. The idea is that immediate employment outcomes upon graduation should not be affected by closures of former in-school establishments that occur in the future. We would expect that such placebo closures should have no, or at least a smaller impact, on the probability to find stable employment after graduation.

It is of course possible that a future closure in the years following graduation might already diminish students' opportunities to some extent before it occurs. However, even in that case we

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[13]Note also that average earnings are closely correlated with the size of the establishment. Using variation between classmates with an in-school job in the same industry and establishment size category provides similar balance tests and estimates of the effect on stable employment as using earnings terciles.

would expect smaller effects. Any sizable negative effect of such placebos would suggest that students are negatively selected into ceasing establishments.

Table 6: Placebos: Effect of closure in t+i on stable employment in graduation year

	(1)	(2)	(3)
Placebo closure in $t+1$	0.009		
	(0.006)		
Placebo closure in $t+2$		0.008	
		(0.007)	
Placebo closure in $t+3$			0.009
			(0.007)
Mean outcome	0.41	0.41	0.41
Additional controls	yes	yes	yes
class FE	yes	yes	yes
Observations	674,149	647,176	618,795
R-squared	0.244	0.244	0.244

Notes: *** $p<0.01$, ** $p<0.05$. Robust standard errors clustered on classes. t refers to the year of graduation. Placebo analysis uses maximum years available after restricting on plants closing in future years.

In practice, I identify in-school establishments that close during the three years following graduation. I then estimate the effects of such future placebo closures on the probability of having a stable job during the graduation year.

Table 6 shows the effect of such placebo closures during the first three years after graduation. In all cases, the estimates are close to zero (compare to the baseline in table 3, column (4)) and not statistically significant, suggesting that there is no evidence for sorting of worse-performing students into ceasing establishments.

5.2.3 Removing Seasonal Industries

A caveat to the interpretation of the results is the fact that the nature of in-school jobs varies widely. In the analysis, I do not make a distinction between the relevance of in-school jobs for future career prospects, implying that certain types of jobs are included that have little potential for providing future opportunities of finding a stable job. This might particularly apply to jobs in seasonal industries, such as ice cream vendors or farm workers during harvesting season.

Table 7: Removing jobs in seasonal industries

| | Excluding industries with $> X\%$ seasonal spells | | |
| | >70% | >50% | >30% |
	(1)	(2)	(3)
Outcome: stable employment in graduation year			
Closure	-0.026***	-0.031***	-0.037***
	(0.006)	(0.006)	(0.007)
Female	-0.016***	-0.017***	-0.016***
	(0.002)	(0.002)	(0.003)
Age	0.037***	0.040***	0.050***
	(0.003)	(0.003)	(0.004)
Immigrant background	-0.058***	-0.058***	-0.061***
	(0.002)	(0.002)	(0.003)
Grade percentile rank	0.041***	0.042***	0.055***
	(0.003)	(0.003)	(0.003)
log avg monthly earnings	0.048***	0.055***	0.068***
	(0.001)	(0.001)	(0.001)
log plantsize	-0.011***	-0.008***	-0.004***
	(0.000)	(0.000)	(0.001)
Observations	675,328	594,993	393,340
R-squared	0.248	0.257	0.275
class FE	yes	yes	yes

Notes: *** p<0.01, ** p<0.05. Robust standard errors clustered on classes. Sample includes all vocational track graduates from 1986-2015 with an in-school job that generated positive earnings in the pre-graduation year and that worked in seasonal industries. Seasonal industries are defined as those industries, in which more than the indicated share of employment spells occurs during the three months long summer season. Average monthly earnings is the average monthly earnings from the pre-graduation year at the in-school job plant. Immigrant background is an indicator variable for whether either parents is born outside of Sweden.

As a robustness check, I re-run the baseline model from Table 3 after excluding jobs in mainly seasonal industries. In order to avoid arbitrariness in the definition of seasonal industries, I use a data-driven approach instead of manually excluding industries. I first calculate the length of all students' employment spells within the same industry to arrive at the share of employment spells within a given industry that only last throughout the three months of summer.

If the industry share of seasonal spells is larger than a given cutoff, I define those industries as seasonal and exclude them from the analysis.

Table 7 shows the results of this exercise. The different columns correspond to different cutoffs with regard to the share out of all jobs that only occur during the summer season. Using the definition in column (1), the point estimate is as good as identical to the one obtained in the baseline model. Applying a more restrictive definition of a seasonal industry in columns (2) and (3), the point estimates are highly significant and larger than previously, hence implying that a lost employer connection due to an establishment closures might have an even greater impact in industries that are not subject to strong seasonality.

5.2.4   Restrictions on establishment size

Table 8: Restrictions on establishment size

Excluding establishments with	< 10 employees	
	(1)	(2)
Outcome: stable employment in graduation year		
Closure	-0.030***	-0.028**
	(0.006)	(0.012)
Female	-0.008***	-0.006
	(0.002)	(0.004)
Age	0.037***	0.043***
	(0.003)	(0.006)
Immigrant background	-0.057***	-0.056***
	(0.002)	(0.004)
Grade percentile rank	0.035***	0.029***
	(0.003)	(0.005)
log avg monthly earnings	0.046***	0.055***
	(0.001)	(0.001)
log plantsize	-0.017***	-0.007***
	(0.000)	(0.001)
class FE	yes	no
class-industry FE	no	yes
Observations	619,479	619,359
R-squared	0.254	0.623

Notes: *** $p<0.01$, ** $p<0.05$. Robust standard errors clustered on classes. Sample includes all vocational track graduates from 1986-2015 with a job that generated positive earnings in the pre-graduation year at an establishment with at least 10 (columns 1-2) employees. Average monthly wage is the average wage earned in the pre-graduation year at the in-school job plant. Immigrant background is an indicator variable for whether either parents is born outside of Sweden.

Due to the rule that not more than 30 percent of the workforce should be employed at the same new establishment following a closure, I exclude establishments with less than four employees from the analysis. I confirm that other size restriction on establishments as commonly

applied in the literature do not affect the validity of the results.

I use two cutoffs and exclude establishments with less than 10 employees following the more recent literature on plant closures that typically excludes very small establishments using a cutoff of 10 employees or fewer (see, for instance, Eliason and Storrie, 2009; Eliason et al., 2018; Hethey-Maier and Schmieder, 2013; Huttunen et al., 2011).

Table 8 re-estimates the main model using both class and class-industry fixed effects, while excluding establishments with less than ten employees. The results confirm the validity of the main results and the estimates are indeed very similar to the ones obtained in Table 3, although the effect is slightly larger using the class fixed effects model as opposed to the class-industry fixed effects model when applying the cutoff of at least 10 employees.

5.3 Heterogeneous effects

Previous research has suggested that the benefits of social contacts vary by individuals' characteristics, providing evidence that social contacts might be more important for the less-educated and men (see, for instance Pellizzari, 2010; Corcoran et al., 1980; Datcher, 1983; Elliot, 1999). Consequently, the impact of an establishment closure has the potential to vary across individuals' characteristics. Likewise, Hensvik et al. (2017) have shown that employer contacts are more predictive of where young workers start their careers during recessions.

I test for heterogeneous results in those dimensions by using a pooled regression with separate fixed effects and covariates for each gender, grade quartiles, below and above average unemployment years and establishment size. The pooled regressions are estimated using both class fixed effect and class-industry fixed effects. Overall, the results suggest (with few exceptions) little evidence of systematic heterogeneity and results are therefore confined to the appendix.

Using the class fixed effects model, the effects are very similar to the baseline estimate for almost all groups (see Tables A.2 and A.3) and there are no significant differences by gender, grade quartiles or unemployment rates. However, note that in the latter case (unemployment), the mean outcome is lower during above average unemployment years, suggesting that the impact of losing an employer connection is relatively bigger during downturns. There are also no significant differences by the size of the in-school work establishment (see panel D), even though the results are indicative that losing a connection matters more for students employed at an in-school establishment with less than 50 employees.

Note also that estimates are greater for low-grade when using class-industry fixed effects (see appendix, Tables A.4 and A.5). In line with the literature, the magnitude of the effect is larger for low-grade students (relative to students in the middle of the grade distribution) and during times of high unemployment. The fully interacted model does however come at the cost of precision and does not allow to statistically differentiate between the estimates.

Table A.6 (and A.7, using class-industry fixed effects) shows heterogeneous results for some of the most common fields of specialization in vocational tracks[14] as the usefulness of employer links might vary across the field of specialization. A caveat to the interpretation of this approach is, of course, that there might be differences across tracks in the degree to which students find in-school jobs in an industry that is relevant to their field of specialization and thus results have to be interpreted with caution.

While limiting the sample to the students in a specific track leads to less precision, the results still indicate that the loss of an employer links has a negative effect on employment regardless of the chosen vocational track, but is larger in magnitude for students in construction, automechanics and electronics.

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[14]Since the analysis focuses on private sector in-school jobs as I could not identify a specific physical work establishments for students who were employed by municipalities, I exclude two of the most common vocational tracks (health care and childcare) that typically lead to employment by a municipality.

6 Long term results and mechanisms

6.1 Long term results

The previous section established that immediate employment rates are lower for graduates who are affected by a closure of an in-school job establishment. Most of those jobs are only used as stepping stones to ease the transition into the labor market, but do seldom lead to long-lasting careers. As such, one could expect the effects of such establishment closures to be temporary. At the same time, the scarring literature suggest that even short unemployment spells at the beginning of one's career can have a lasting impact for up to a decade.

Figure 7 shows that the latter is indeed the case with regard to lost opportunities from establishment closures. The figures show the estimated effect of an establishment closure on the probability of having a stable job (a) and log earnings (b) for each of the 15 years following graduation.

The effects on stable employment are strongest immediately after graduation. By the second year after graduation, they are reduced by more than half in magnitude, but persist for about a decade before they fade out.

Figure 7: Long term effects of closure in year t+i after graduation

(a) Effect on having a stable job   (b) Effect on log earnings
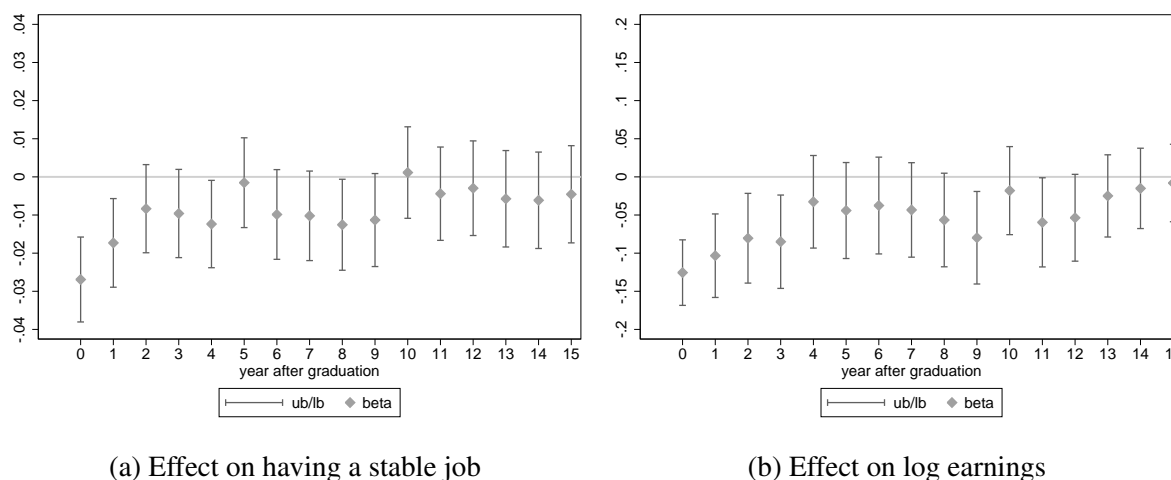
Notes: Sample includes all vocational track graduates from 1986-2016 with an in-school job that generated positive earnings in the pre-graduation year and that can be followed for the indicated number of years after graduation. Estimates correspond to estimating the model in column (3) in table 2. 95 percent confidence intervals are displayed. Standard errors are clustered on classes.

The reduction in stable employment shares comes hand-in-hand with earnings losses (see Figure 7, b) . Immediately upon graduation, students who worked for an establishment that closed prior to graduation suffer from earnings losses of around 13 percent. In a similar pattern as for the stable employment outcome, losses in the subsequent years are notably smaller, but still sizable with up to 10 percent during the first three years and around or less than 5 percent thereafter. Earnings losses are persistent for around a decade before they level out.[15]

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[15]For completeness, I estimate the effect of a closure over a 10-year follow-up period using a balanced sample

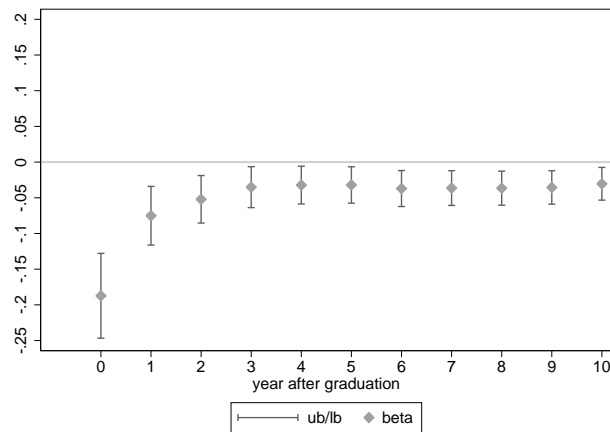Figure 8: Long term effect of closure on accumulated earnings

Notes: Sample includes all vocational track graduates from 1986-2005 with an in-school job that generated positive earnings in the pre-graduation year and that can be followed for the indicated number of years after graduation. Estimates correspond to estimating the model in column (3) in table 3 and are displayed with the corresponding 95% confidence intervals. Standard errors are clustered on classes.

Students who were affected by the closure prior to graduating have on average 3 percent lower accumulated earnings over the entire 10-year period following graduation than their peers (see Figure 8).

The long-term effects are even large in relation to the consequences of suffering from job loss due to an establishment closure later in life. Using the same population of graduates, Figure 9 shows the long term effects of such a closure on stable employment and earnings. Since the loss of an actual job is arguably much more disruptive, we would expect the impact to be greater than that related to the missed opportunities due to the closure of an in-school establishment.

As opposed to many previous papers that have focused on the effect of plant closures for male and more tenured workers, I focus on the same sample of graduates (as in the main analysis) five years into their careers as a relevant comparison group, without placing restrictions on gender, tenure or labor market attachment at the time the closure occurs. A comparison of the effects of a closure of a former in-school establishment and a closure of a workplace five years after graduation shows that the estimated effects are indeed much larger in the latter case (albeit in relation to considerably higher employment rates five years after graduation) and particularly with regard to stable employment. Effects on employment and earnings persist for a similar time period as the effects from an in-school establishment closure, but decline more quickly before they level off.

The results thus reinforce the picture that the negative effects from lost opportunities of a

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as well (see Figure A.2), which reduces my original sample by about a third. The immediate effect on finding stable employment is slightly smaller in the sample with 10-year follow-up period (around .023 as compared to .027), but larger thereafter. The effects on log earnings are also a bit larger in magnitude, but confirm the general pattern and persistence of the effects in both cases.

Figure 9: Effects of job loss due to an establishment closure later in life

(a) Effect on having a stable job

(b) Effect on log earnings

Notes: Sample consists of all graduates with a summer job 1986-2001. Estimates correspond to estimating the main model using a closure in year 5 after graduation and are displayed with the corresponding 95% confidence intervals. Standard errors are clustered on classes.

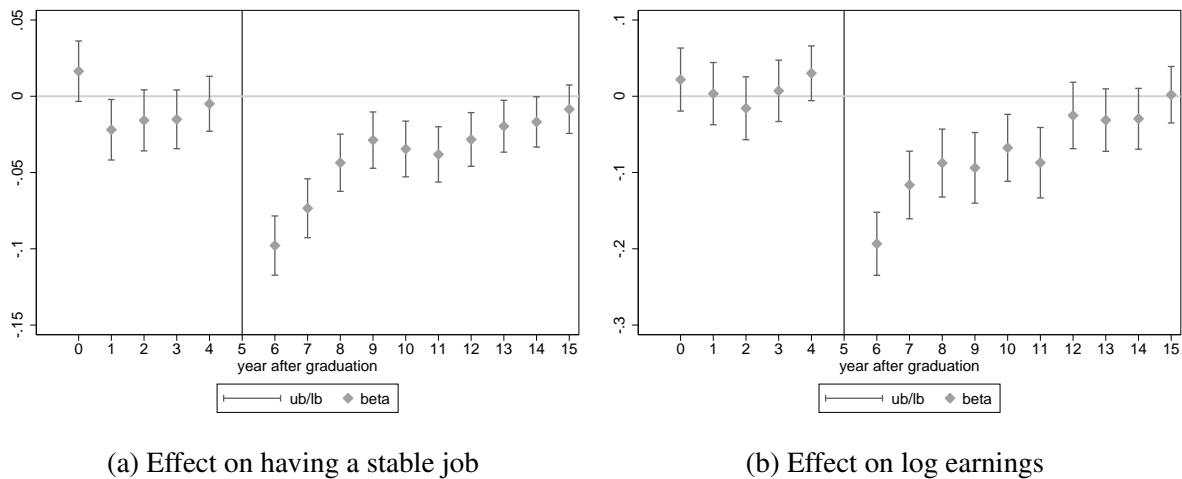closure prior to graduation take notably long to subside completely and can even be considered large given that only a third of students is making use of their opportunities in the baseline.

6.2 Match quality and industry adjustments

So far I have shown that graduates who lose an employer link just prior to entering the labor market have worse employment outcomes. We would expect the importance of those links to vary dependent on whether students worked in an industry that was related to the vocational track or not. As the data does not allow to directly identify industries that correspond to a given vocational track, I rely on a statistical criteria instead of manually matching vocational tracks and industries in order to avoid arbitrariness in measuring whether the industry of an in-school establishment is related to a vocational track. For students in each vocational track, I identify the two most common industries that the graduates worked in in five years after graduation. In-school jobs are defined as relevant with respect to the vocational track if the in-school establishment operated in either of these two most common industries.

Table 9 shows the results from a pooled regression with separate fixed effects and covariates for students working in an industry related and unrelated to the vocational track they are enrolled in.[16] The effect of a closure on stable employment is negative in both cases, but four times larger if the industry of the in-school job was related to the vocational track, indicating that the majority of the effect is driven by closures in relevant industries (panel A). Connections to establishments in other industries appear to be less helpful in finding stable employment; likely because they only provide employer links to industries with worse career prospects given the field of specialization and therefore less desirable job options. After ten years, the

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[16]Table A.8 shows the results using class-industry fixed effects.

employment effect subsides regardless of whether the in-school job was in an industry related to the field of specialization.

Table 9: By relevance of in-school job

	Non-relevant in-school industry (1)	Relevant in-school industry (2)	Difference (2)-(1) (3)
A. Stable job in t			
Closure	-0.012*	-0.049***	-0.038***
	(0.007)	(0.012)	(0.014)
Mean outcome	0.385	0.480	
Additional controls		yes	
Class FE		yes	
Observations		709,232	
R-squared		0.299	
B. Stable job in t+10			
Closure	0.005	0.002	-0.002
	(0.008)	(0.013)	(0.015)
Mean outcome	0.771	0.783	
Additional controls		yes	
Class FE		yes	
Observations		474,241	
R-squared		0.299	

Notes: *** p<0.01, ** p<0.05, * p<0.10. Robust standard errors clustered on classes. t indicates graduation year. All results are from a pooled regression with separate fixed effects for in-school jobs in industries that are/ are not related to the vocational track field. Lincom is used to calculate estimates and test for differences. Sample includes all vocational track graduates from 1986 to 2015 (Panel A)/2005 (Panel B) with a job that generated positive earnings in the pre-graduation year.

The results show that the closure of a former in-school establishment matters more if the industry of the establishment is related to the field of specialization of the affected student. Students who lose the link to an employer in a relevant industry do not only lose the chance of re-employment at the same establishment, but might also be at a disadvantage in entering another establishment in a relevant industry and might instead be forced to consider jobs in industries with worse career prospects in order to avoid unemployment. The closure of an in-school establishment could thus shift students from the industry of the in-school establishment towards different industries.

Table 10 shows the effect of a closure on the probability of being employed in an 2-digit industry other than the 2-digit industry of the in-school establishment directly upon graduation and ten years after graduation using the full sample in column (1) and the sample of graduates from 1986-2005 that I can follow for a 10-year period in (column 2).[17] The model is estimated

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[17]Estimating the immediate effect in (column 1) for the sample 1986-2005 leads to an estimated effect of 0.019*

Table 10: Industry adjustments

	All	Non-relevant in-school industry	Relevant in-school industry	Difference (3)-(2)
	(1)	(2)	(3)	(4)

A. Stable job in different industry in t

Closure	0.015*	0.004	0.029***	0.025
	(0.008)	(0.013)	(0.011)	(0.017)
Mean outcome	0.185	0.226	0.091	
Additional controls	yes	yes		
Class-industry FE	yes	yes		
Observations	709,001	709,001		
R-squared	0.663	0.663		

B. Stable job in different industry in t+10

Closure	0.022*	0.021	0.025	0.004
	(0.013)	(0.017)	(0.021)	(0.027)
Mean outcome	0.611	0.674	0.439	
Additional controls	yes	yes		
Class-industry FE	yes	yes		
Observations	448,134	448,134		
R-squared	0.559	0.559		

Notes: *** p<0.01, ** p<0.05, * p<0.10. Robust standard errors clustered on classes. t indicates graduation year. Results in columns 2-3 are from a pooled regression with separate fixed effects for in-school jobs in industries that are/ are not related to the vocational track field. Lincom is used to calculate estimates and test for differences. Sample includes all vocational track graduates with a job that generated positive earnings in the pre-graduation year. Sample includes graduates from 1986 to 2015 (panel A) and 1986-2005 (panel B). In panel B, the sample is also restricted to cases in which I can identify a consistent industry ten years later.

using class-industry fixed effects, indicating that students in the same track and with an in-school job within the *same* industry are 1.5 percentage points more likely (significant at the ten percent level) to switch industries upon graduation if they were affected by a closure (see panel A). The entirety of the short run effect is driven by industry adjustments of graduates who had an in-school job in an industry relevant to their field of specialization and the effect is about a third in relation to the mean. Adverse effects of a closure are thus magnified for graduates who lost a link to an employer in a relevant industry; not only are they less likely to be employed in the short run, but they also end up in worse matches if they find a stable job.[18]

In fact, industry adjustments are not only temporary, but persist even ten years after gradu-

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(0.010) of a closure.

[18]Short term effects are larger when conditioning on employment status, but less well identified (see table A.9). About half of employed graduates find their first stable job in an industry different from the one of the in-school job.

ation (see panel B), though inference by relevance of the in-school job industry is limited due to the smaller sample size for the 10 year follow-up period.

6.3   Replacement contacts

I have shown that graduates who lost the opportunities provided by an intact employer connection at the time of graduation have worse employment outcomes in the short run as compared to their their peers with an intact connection. However, the negative employment effect might be partly offset if graduates are able to replace missed opportunities from the in-school establishment closure with alternative methods of job finding. A potential strategy could be to substitute lost employer connections with greater reliance on other existing social contacts. Social contacts that might be readily available for young workers are parents and other family members or displaced co-workers from the in-school establishment who have found another job following the closure of their former work establishment. In a first step, I will focus on parental links, whose importance for the school-to work transition has been documented by Kramarz and Skans (2014), showing that students who find their first job through their parents enter the labor market faster and remain longer in their jobs while experiencing faster wage growth.

I start out by letting the effect of a closure vary by the presence of a parent at the in-school establishment. In table 11, I extend model (1) by adding an interaction between closure status and having a parent present at the in-school establishment and examine the effects on short and long run employment and accumulated earnings after ten years.

Even though I measure the effect of a parent who is present at the in-school establishment as opposed to at the first job after graduation, the general effects of working at the same establishment as a parent are well in line with Kramarz and Skans (2014). Graduates who worked with one of their parents prior to graduation fare better with respect to short and long run employment outcomes as well as accumulated earnings.

The negative effects of a closure on finding a stable job in the year of graduation are indeed magnified by the presence of a parent at the in-school establishment and are in fact three times as large as the baseline effect, implying that the loss of a strong direct employer connection through a parent matters more. However the presence of a parent at the closing plant matters only in the beginning of the career and does not seem to magnify the effects in the long run.

In Table 12, I explore whether students who lost an employer connection try to offset the lost opportunity through finding employment with a parent.

I revisit the results in Table 4, showing how a closure affects the probability of having a stable job at the previous in-school establishment (see column 1) and at an establishment other than the in-school establishment.

As already shown, graduates who were affected by a closure are on average 13 percentage points less likely to be stably employed by a former in-school establishment. About 80 percent of the effect in column (1) is driven by replacement jobs (and the other 20 percent by non-

Table 11: Parental contacts

VARIABLES	(1) Stable job in t	(2) Stable job in t+10	(3) Accumulated earnings t+10
Closure	-0.021***	0.003	-0.023*
	(0.006)	(0.007)	(0.012)
Closure*parent at job	-0.048***	-0.010	-0.033
	(0.017)	(0.018)	(0.034)
Parent at in-school job	0.011***	0.012***	0.040***
	(0.001)	(0.002)	(0.003)
Female	-0.015***	-0.123***	-0.283***
	(0.002)	(0.002)	(0.004)
Age	0.036***	-0.019***	-0.062***
	(0.003)	(0.003)	(0.005)
Immigrant background	-0.056***	-0.072***	-0.209***
	(0.002)	(0.003)	(0.005)
Grade percentile rank	0.041***	0.077***	0.179***
	(0.003)	(0.003)	(0.005)
log avg monthly earnings	0.046***	0.011***	0.051***
	(0.001)	(0.001)	(0.001)
log plantsize	-0.013***	-0.005***	-0.013***
	(0.000)	(0.000)	(0.001)
Observations	709,232	474,241	448,363
R-squared	0.245	0.127	0.290
class FE	yes	yes	yes
SE clustered on	classes	classes	classes

Notes: *** p<0.01, ** p<0.05, * p<0.10. Robust standard errors clustered on classes. Sample includes all vocational track graduates from 1986-2015 (column 1) or 1986-2005 (columns 2-3) with an in-school job that generated positive earnings in the pre-graduation year. Average monthly earnings refers to the average earnings in the pre-graduation year at the in-school establishment. Immigrant background is an indicator variable for whether either parent is born outside of Sweden. Closure*parent at job is an interaction between the closure dummy and the dummy for whether a parent is present at the in-school job establishment.

employment). In column 3, I check whether those replacement jobs occur at a parent's work establishment by estimating the baseline model and defining a dummy variable as the outcome that takes on the value 1 if a graduate works at the same establishment as one of the parents (and other than the in-school establishment) upon graduation. A closure is associated with a 1.4 percentage point increase in the probability to simultaneously work with either parent, which corresponds to about five percent of replacement jobs. This suggests that graduates rely in part on their parents to substitute for the loss of employer connections.

Table 12: Alternative job finding channels

	(1) Stable job at in-school est.	(2) Stable job at non-in-school est.	(3) Stable job at new plant with parent
Closure	-0.131***	0.105***	0.014***
	(0.002)	(0.006)	(0.002)
Mean outcome	0.153	0.260	0.020
class FE	yes	yes	yes
Observations	709,232	709,232	709,232
R-squared	0.150	0.198	0.096

Notes: *** $p<0.01$, ** $p<0.05$. Robust standard errors clustered on classes. Sample includes all vocational track graduates from 1986-2015 with an in-school job that generated positive earnings in the pre-graduation year.

7 Conclusion

In this article, I examine the impact of losing the connection to a former in-school employer just prior to labor market entry. I contribute to the the literature on social connections and informal networks by exploiting exogenous variation in such connections that is generated by closures of former in-school establishments that occur just prior to labor market entry and show that graduates' short term employment outcomes are negatively affected if they entered the labor market without an intact employer connection.

A conclusion is that the loss of idiosyncratic job search opportunities diminishes the chances of a smooth transition into the labor market, which in turn can affect longer term labor market outcomes. Indeed, there appear to be scarring effects that mimic those arising from poor aggregate labor market conditions at the time of market entry. There are sizable effects on both stable employment and earnings for up to a decade. As such, the persistence of the effects is well in line with effects of entering the labor market during a recession (see Kahn, 2010; Oreopoulos et al., 2012).

The results may seem surprising with regard to the transitory nature of first jobs as the loss of a job that usually is only a stepping stone should likely not yield grave consequences in the long run. However, graduates who find their first jobs at a former in-school establishment seem to be better matched to their employers as they are more likely to remain there longer than graduates who find their first job through other means.

The negative effects of losing an employer link as the consequence of a closure are driven by the loss of links to employment opportunities in industries that are relevant to the field of specialization in vocational school. Students who lose such relevant links suffer the consequences twofold: not only do they miss out on re-employment opportunities, but, upon the loss of such a opportunity, they are also more likely to adjust by shifting to first jobs in other

less-relevant industries, at least in the short term.

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Appendix

Figure A.1: Direct transitions: Fraction returning to in-school work establishment after graduation
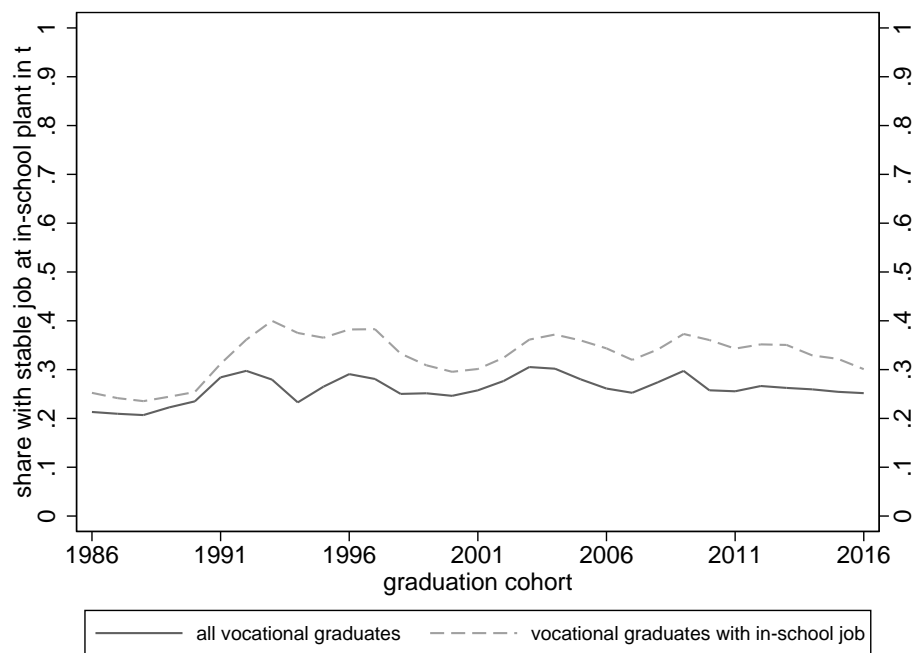
Notes: In-school job experience includes all graduates with positive earnings from a job in the year before graduation. Share returning to in-school establishment refers to the share of all vocational graduates/vocational graduates with in-school jobs that find their first employment after graduation at a former in-school establishment **conditional on having a stable job after graduation**.

Table A.1: Gradual introduction of controls

	(1)	(2)	(3)	(4)	(5)	(6)
Outcome: Effect of closure on having stable job in t						
Closure	-0.035***	-0.033***	-0.027***	-0.035***	-0.034***	-0.031***
	(0.006)	(0.006)	(0.006)	(0.011)	(0.011)	(0.011)
Female		-0.021***	-0.016***		-0.017***	-0.013***
		(0.002)	(0.002)		(0.004)	(0.004)
Age		0.044***	0.036***		0.049***	0.040***
		(0.003)	(0.003)		(0.005)	(0.005)
Immigrant background		-0.064***	-0.057***		-0.059***	-0.056***
		(0.002)	(0.002)		(0.004)	(0.004)
Grade percentile rank		0.052***	0.041***		0.048***	0.037***
		(0.003)	(0.003)		(0.005)	(0.005)
log avg monthly earnings			0.046***			0.053***
			(0.001)			(0.001)
log plantsize			-0.013***			-0.002**
			(0.000)			(0.001)
Mean outcome	0.41	0.41	0.41	0.41	0.41	0.41
Observations	709,232	709,232	709,232	709,003	709,003	709,003
class FE	**yes**	**yes**	**yes**	**no**	**no**	**no**
class-industry FE	**no**	**no**	**no**	**yes**	**yes**	**yes**
R-squared	0.233	0.236	0.245	0.604	0.605	0.610

Notes: *** p<0.01, ** p<0.05. Robust standard errors clustered on classes. Sample includes all vocational track graduates from 1986-2015 with a job that generated positive earnings in the pre-graduation year. Average monthly earnings is the average earnings in the pre-graduation year at the in-school job plant. Immigrant background is an indicator variable for whether either parents is born outside of Sweden. The model in column (1)-(3) is estimated using class-fixed effects and in columns (4)-(6) using class-industry fixed effects.

Table A.2: Heterogeneous Effects: Effect of closure on having stable job in graduation year

	(1)	(2)	(3)
A. By gender:	Men	Women	Difference
Closure	-0.028***	-0.022***	0.006
	(0.008)	(0.008)	(0.012)
Mean outcome	0.443	0.377	
B. By grade quartiles:	Lowest	Highest	Difference
Closure	-0.022*	-0.026**	-0.004
	(0.013)	(0.013)	(0.018)
Mean outcome	0.406	0.375	

Notes: *** $p<0.01$, ** $p<0.05$, * $p<0.10$. Robust standard errors clustered on classes. Results are from a pooled regression with separate fixed effects and covariates for men and women (panel A), grade quartiles (panel B).Lincom is used to calculate estimates and test for differences. Sample includes all vocational track graduates from 1986-2015 with a job that generated positive earnings in the pre-graduation year.

Table A.3: Heterogeneous Effects: Effect of closure on having stable job in graduation year

C. By unemployment rates:	Below avg UR	Above avg UR	Difference
Closure	-0.026***	-0.027***	-0.002
	(0.009)	(0.007)	(0.011)
Mean outcome	0.486	0.356	

D. By establishment size:	Less than 50	50-100	Difference
Closure	-0.037***	-0.033*	0.004
	(0.009)	(0.017)	(0.019)
Mean outcome	0.423	0.416	
	Less than 50	More than 100	Difference
Closure	-0.037***	-0.025**	0.012
	(0.009)	(0.012)	(0.015)
Mean outcome	0.423	0.400	

Notes: *** p<0.01, ** p<0.05, * p<0.10. Robust standard errors clustered on classes. Results are from a pooled regression with separate fixed effects and covariates for above and below average unemployment years (panel C) and establishment size respectively. Lincom is used to calculate estimates and test for differences. Sample includes all vocational track graduates from 1986-2015 with a job that generated positive earnings in the pre-graduation year.

Table A.4: Heterogeneous Effects: Effect of closure on having stable job in graduation year

	(1)	(2)	(3)
A. By gender:	Men	Women	Difference
Closure	-0.038**	-0.032*	0.006
	(0.019)	(0.017)	(0.025)
Mean outcome	0.443	0.377	
B. By grade quartiles:	Lowest	Highest	Difference
Closure	-0.043	-0.017	0.026
	(0.038)	(0.031)	(0.049)
Mean outcome	0.407	0.375	

Notes: *** p<0.01, ** p<0.05, * p<0.10. Robust standard errors clustered on classes. Results are from a pooled regression with separate class-industry fixed effects and covariates for men and women (panel A), grade quartiles (panel B). Lincom is used to calculate estimates and test for differences. Sample includes all vocational track graduates from 1986-2015 with a job that generated positive earnings in the pre-graduation year.

Table A.5: Heterogeneous Effects: Effect of closure on having stable job in graduation year

C. By unemployment rates:	Below avg UR	Above avg UR	Difference
Closure	-0.027*	-0.034**	-0.007
	(0.016)	(0.015)	(0.022)
Mean outcome	0.486	0.356	

D. By establishment size:	Less than 50	50-100	Difference
Closure	-0.052***	-0.028	0.023
	(0.019)	(0.043)	(0.047)
Mean outcome	0.423	0.416	
	Less than 50	More than 100	Difference
Closure	-0.052***	-0.022	0.030
	(0.019)	(0.030)	(0.036)
Mean outcome	0.423	0.400	

Notes: *** $p<0.01$, ** $p<0.05$, * $p<0.10$ Robust standard errors clustered on classes. Results are from a pooled regression with separate class-industry fixed effects and covariates for above/below average unemployment years (panel C) and establishment size (panel D) respectively. Lincom is used to calculate estimates and test for differences. Sample includes all vocational track graduates from 1986-2015 with a job that generated positive earnings in the pre-graduation year.

Table A.6: Heterogeneous effects: by vocational track specialization

	(1) Construction	(2) Electricity	(3) Hotel/restaurant	(4) Business	(5) Auto	(6) Machinery	(7) Electronics
Closure	-0.036*	-0.009	-0.018	-0.034**	-0.099***	-0.004	-0.052**
	(0.020)	(0.028)	(0.015)	(0.017)	(0.027)	(0.029)	(0.022)
Female	-0.133***	-0.021	-0.006	-0.012***	-0.116***	-0.053***	0.005
	(0.011)	(0.017)	(0.005)	(0.005)	(0.016)	(0.011)	(0.011)
Age	-0.044***	0.012	0.036***	0.046***	-0.064***	-0.027**	0.013
	(0.009)	(0.011)	(0.011)	(0.008)	(0.012)	(0.012)	(0.010)
Immigrant background	-0.060***	-0.078***	-0.037***	-0.074***	-0.054***	-0.062***	-0.044***
	(0.009)	(0.009)	(0.007)	(0.006)	(0.011)	(0.010)	(0.008)
Grade percentile rank	0.245***	0.068***	0.185***	0.059***	0.137***	0.006	-0.110***
	(0.009)	(0.011)	(0.009)	(0.008)	(0.012)	(0.011)	(0.010)
log monthly earnings	0.035***	0.034***	0.056***	0.061***	0.033***	0.030***	0.035***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
log plantsize	-0.016***	-0.018***	-0.001	-0.014***	-0.017***	-0.012***	-0.013***
	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)
Observations	59,981	48,788	54,477	64,514	38,543	45,397	46,872
R-squared	0.254	0.232	0.134	0.168	0.265	0.273	0.201
class FE	yes	yes	yes	yes	yes	yes	yes

Notes: *** $p<0.01$, ** $p<0.05$, * $p<0.10$. Robust standard errors clustered on classes. Sample includes all graduates from 1986-2015 who attended the indicated vocational track and with a job that generated positive earnings in the pre-graduation year. Average monthly earnings is the average monthly earnings in the pre-graduation year at the in-school job plant. Immigrant background is an indicator variable for whether either parents is born outside of Sweden. The model is estimated using class-fixed effects.

Table A.7: Heterogeneous effects: by vocational track specialization

|	(1) Construction	(2) Electricity	(3) Hotel/restaurant	(4) Business	(5) Auto	(6) Machinery	(7) Electronics
Closure	-0.076**	0.021	-0.016	-0.101***	-0.159**	0.027	-0.090
	(0.031)	(0.064)	(0.021)	(0.031)	(0.066)	(0.066)	(0.063)
Female	-0.137***	-0.014	-0.010	-0.016*	-0.108**	-0.025	0.004
	(0.017)	(0.035)	(0.008)	(0.008)	(0.042)	(0.018)	(0.030)
Age	-0.057***	0.007	0.026*	0.049***	-0.067**	-0.009	0.013
	(0.013)	(0.024)	(0.015)	(0.014)	(0.030)	(0.023)	(0.027)
Immigrant background	-0.059***	-0.079***	-0.034***	-0.071***	-0.061**	-0.065***	-0.025
	(0.013)	(0.020)	(0.011)	(0.011)	(0.026)	(0.018)	(0.021)
Grade percentile rank	0.240***	0.076***	0.180***	0.052***	0.100***	-0.022	-0.115***
	(0.013)	(0.025)	(0.013)	(0.014)	(0.029)	(0.022)	(0.025)
log monthly earnings	0.036***	0.038***	0.064***	0.074***	0.039***	0.031***	0.035***
	(0.004)	(0.005)	(0.003)	(0.004)	(0.007)	(0.006)	(0.006)
log plantsize	-0.004	-0.011**	0.009***	0.005	-0.007	-0.011**	-0.005
	(0.003)	(0.005)	(0.003)	(0.003)	(0.006)	(0.005)	(0.005)
Observations	59,960	48,780	54,467	64,462	38,524	45,375	46,859
R-squared	0.535	0.660	0.433	0.543	0.715	0.651	0.707
controls	yes	yes	yes	yes	yes	yes	yes
class FE	no	no	no	no	no	no	no
industry x class FE	yes	yes	yes	yes	yes	yes	yes

Notes: *** p<0.01, ** p<0.05, * p<0.10. Robust standard errors clustered on classes. Sample includes all graduates from 1986-2015 who attended the indicated vocational track and with a job that generated positive earnings in the pre-graduation year. Average monthly earnings is the average monthly earnings in the pre-graduation year at the in-school job plant. Immigrant background is an indicator variable for whether either parents is born outside of Sweden. The model is estimated using class-industry fixed effects.

Figure A.2: Long term effects of closure in year t+i after graduation
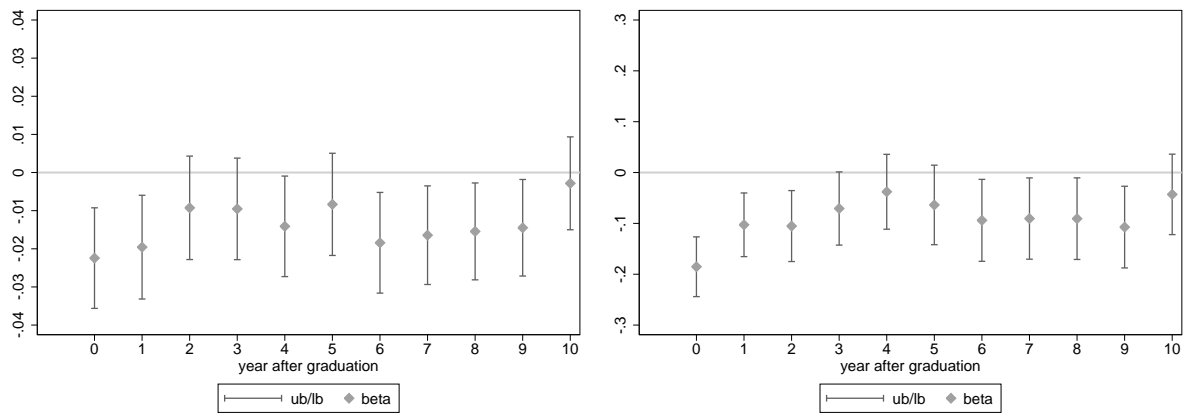
(a) Effect on having a stable job

(b) Effect on log earnings

Notes: Sample includes all vocational track graduates from 1986-2005 with an in-school job that generated positive earnings in the pre-graduation year and that can be followed for the indicated number of years after graduation. Estimates correspond to estimating the model in column (3) in table 3. The corresponding 95% CI are displayed. Standard errors are clustered on classes.

Table A.8: By relevance of in-school job

	Non-relevant in-school industry (1)	Relevant in-school industry (2)	Difference (2)-(1) (3)
A. Stable job in t			
Closure	-0.019	-0.045***	-0.026
	(0.014)	(0.016)	(0.022)
Mean outcome	0.385	0.480	
Additional controls		yes	
industry x class FE		yes	
Observations		709,001	
R-squared		0.606	
B. Stable job in t+10			
Closure	0.015	0.002	-0.013
	(0.016)	(0.018)	(0.024)
Mean outcome	0.771	0.783	
Additional controls		yes	
industry x class FE		yes	
Observations		474,012	
R-squared		0.523	

Notes: *** p<0.01, ** p<0.05, * p<0.10. Robust standard errors clustered on classes. Results are from a pooled regression with separate fixed effects for in-school jobs in industries that are/ are not related to the vocational track field. Lincom is used to calculate estimates and test for differences. Sample includes all vocational track graduates from 1986-2015 with a job that generated positive earnings in the pre-graduation year. Average earnings is the average monthly earnings in the pre-graduation year at the in-school establishment. Immigrant background is an indicator variable for whether either parent is born outside of Sweden.

Table A.9: Industry adjustments, alternative samples

	(1) Stable job in t in diff industry	(2) Stable job in t+10 in diff industry
Closure	0.091***	0.026**
	(0.022)	(0.013)
Female	-0.005	-0.007
	(0.006)	(0.005)
Age	0.005	0.008
	(0.006)	(0.005)
Immigrant background	-0.003	0.013**
	(0.007)	(0.005)
Grade percentile rank	-0.012*	0.011**
	(0.007)	(0.006)
log avg monthly wage	-0.047***	-0.014***
	(0.002)	(0.002)
log plantsize	-0.002	0.005***
	(0.002)	(0.001)
Mean	0.479	0.832
Observations	273,830	329,034
R-squared	0.815	0.626
class-industry FE	yes	yes
Sample	All with stable job	Until 2005 & stable job in t+10

Notes: *** p<0.01, ** p<0.05, * p<0.10. Robust standard errors clustered on classes. Sample includes all vocational track graduates from 1986-2015 (column 1)/1986-2005 (column 2) with a job that generated positive earnings in the pre-graduation year and with a stable job in the outcome year. Average earnings is the average monthly earnings in the pre-graduation year at the in-school establishment. Immigrant background is an indicator variable for whether either parent is born outside of Sweden.