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Worker-Plant Matching and Ownership Change

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Abstract

Is ownership change an opportunity for new owners to make systematic changes in the workforce of the acquired plant? We document changes to the workforce along observable and unobservable dimensions of worker quality around ownership change using matched employer-employee data. We observe above average separations of workers around domestic acquisitions. This is associated with a decline in unobserved worker quality in the plant. Foreign acquisitions are not associated with above average worker turnover, instead new foreign owners share rents with the high skilled workers that are already in the plant before the acquisition.

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I Introduction

From the affected workers' point of view, takeovers – and in particular takeovers by new foreign owners – are often associated with fears over job losses.[1] Taking a different perspective, much of the literature on mergers and acquisitions (M&A) views M&As as a way to improve the allocation of resources towards more efficient firms and owners by enhancing the match between the firm and its plants (Lucas, 1978; Lichtenberg and Siegel, 1987; Maksimovic and Phillips, 2002; Jovanovic and Rousseau, 2008; Maksimovic et al., 2011). For example, Lichtenberg and Siegel (1987) argue that below-average productivity of a plant is a signal of a bad match and an indicator for the firm to sell the plant.[2] Siegel and Simons (2010) take this plant-to-firm matching perspective to the match between workers and plants and argue that new owners will recognize the opportunity to improve the sorting and matching of workers across plants, by separating from unproductive workers and by hiring new workers that better complement the technology of the firm. New owners may bring in new technology, new management practices, or new networks of suppliers and customers; and they may want to adjust the workforce, for example by skill upgrading, to complement these changes.[3] Dunning's (1981) OLI paradigm, whereby multinational firms need to have a specific advantage (ownership, location or internalisation, hence OLI) to invest abroad, implies that such changes may be more likely in the presence of new foreign owners. Hence, we distinguish between foreign and domestic acquisitions in our analysis.

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[1]Indeed, governments have intervened with the aim of preserving jobs in some of the larger foreign takeovers in recent years, such as the French government in the bid of General Electric for Alstom and the UK government in Pfizer's bid for Astra Zeneca. See, e.g., http://fortune.com/2014/11/05/France-gives-green-light-to-ges-alstom-acquisition/ for the Alstom case and for the Astra Zeneca case http://www.bloomberg.com/news/articles/2014-05-07/pfizer-has-cameron-channeling-hollande-amid-job-fears. The UK government intervened despite the absence of provisions for government intervention in the case of foreign takeovers in British law. Countries like the U.S., Canada, France and Australia have direct legal mechanisms to halt foreign acquisitions.

[2]Their argument for firm and plant matching in M&As is based on the theory of job turnover in Jovanovic (1979).

[3]Bloom and Van Reenen (2011) find that good management practice is strongly correlated with firm productivity.

In this paper, we explore the adjustments to the size and composition of the workforce that occur around ownership change, as such events are often assumed to go hand in hand with (typically unobserved) changes to technology, management practices, or the networks of the plant. We use comprehensive census and register data for Norwegian manufacturing plants and their employees for the period from 1996 to 2007 to answer the following questions: Is ownership change associated with above average worker turnover through excess separations and new hires? Does worker turnover result in systematic changes in the characteristics of workers who are employed by the plant after the ownership change relative to those employed before ownership change? As well as selecting workers based on *observable* worker characteristics plants are likely to screen workers along dimensions that are *unobservable* in research data sets. Our main contribution to the literature on ownership change is to provide a first assessment of trends in both observable and unobservable measures of the workforce around acquisitions.

In addition to hiring and separations, new owners may also (re)train the existing workforce and reallocate stayers to tasks that are a better match to each worker (Becker et al., 2018). Such changes are not observable in our data, but they may result in higher employee satisfaction manifested in the form of higher wage growth or in longer continuation tenure for stayers. We therefore also look for indirect evidence of an improved match for stayers in terms of tenure and wage growth.

Worker turnover is part and parcel of all labour markets. Many models of turnover in the labour market predict that job-to-job transitions typically are efficiency enhancing in that transitions tend to be in the direction of higher wages which is considered as evidence of better matches.[4] If ownership change is used as an opportunity to make changes to the quality of the workforce, as argued by Siegel and Simons (2010), we would expect to see *larger* improvements from before to after acquisitions compared to similar plants not experiencing

[4]See for example the theory of turnover by Jovanovic (1979), and empirical evidence on job-to-job transitions predominantly providing positive wage growth for movers in Jolivet et al. (2006).

ownership change.

We start by documenting changes in observable worker characteristics around ownership change. The empirical literature on employment effects of ownership change has focused either on whether employment increases or decreases after acquisitions (Lichtenberg and Siegel, 1990; Conyon et al., 2002; Bandick and Karpathy, 2011; Hijzen et al., 2013), or on whether acquisitions lead to changes in skill composition and wages (Almeida, 2007; Huttunen, 2007; Csengödi et al., 2008). As we have shown in earlier work, new foreign owners cherry-pick acquisition targets in terms of size, labour productivity and wages, whereas the plants subject to domestic acquisition are merely of above average size and are likely to be undergoing difficulties (Balsvik and Haller, 2010). In this paper, we do not find substantial changes in employment or skill shares around takeovers. In plants subject to domestic acquisition workers' average tenure as well as age decline relative to the development of these averages in plants not subject to acquisition, indicative of more separations of workers with long tenure and potentially some hiring.

Only a few studies using matched employer-employee data provide evidence on patterns of worker turnover around ownership change. Csengödi et al. (2008) document a substantially higher share of new workers in the year of foreign acquisition in Hungary than in the years before and after. Pesola (2009) finds increased job separation hazards following both domestic and foreign acquisitions in Finland. Davis et al. (2014) provide evidence of excess job reallocation following private equity buy-outs in the US. We find no evidence of higher than average worker turnover in plants subject to foreign acquisition, while we see a substantially higher probability of separation for medium- and high-skilled workers in the year of domestic acquisition.

Neither a change in employment levels nor above-average worker turnover are necessary conditions for making systematic changes to the quality of a plant's workforce. It is sufficient that the 'regular' turnover becomes more selective. As we do not find changes in observable

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worker characteristics, we turn to analysing unobservable worker characteristics. We use the worker-fixed effect from the wage decomposition proposed by Abowd et al. (1999) (henceforth AKM) as our measure of unobserved worker quality. The worker-fixed effect represents a measure of the wage premium that a worker earns across all employers and is considered a proxy for innate ability. As an alternative measure of the unobserved characteristics of workers, we use the match-specific wage component associated with each job spell.

Comparing the change in plant-level averages of worker-fixed effects around foreign and domestic acquisitions to the changes in non-acquired plants, we find a decline in unobserved worker quality from before to after domestic acquisitions, the estimated effect for plants subject to foreign acquisitions is positive but not statistically significant. As is the case in the related literature (Card et al., 2013; Bahar Baziki et al., 2016), the match-specific effects are very small relative to the worker-fixed effects, and we do not find a significant within-plant change in the overall average of match-specific effects from before to after acquisitions.

Thus, while new foreign owners would appear to have a higher potential for restructuring, in a sense there does not seem to be a need to. They acquire plants that are already doing well, and keep them on track at the very least. The takeover is not associated with higher than average worker turnover. A greater wage increase for changing employer for workers with otherwise similar characteristics hired after foreign acquisitions is indicative of selection on worker and/or plant unobservables, though the change in the quality of new hires from before to after acquisition is not statistically significant. New foreign owners focus on the existing workforce, which may or may not have been a reason in the choice of target firm. They pay rents to the high-skilled workers that were already in the plant before the acquisition in the form of higher wage growth. In turn, plants subject to domestic acquisitions are in difficulties already before the takeover. Over the short run the ownership change does not appear to alleviate these. The probability of leaving is especially high for the high skilled, unobserved worker quality at the plant decreases, and low-skilled workers who were already in the plant

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before the acquisition are less likely to remain in the plant afterwards.

In what follows, Section II introduces the data sets used in the analysis and provides descriptive statistics. In Section III we examine changes in observable workers characteristics at the plant level. Section IV documents changes in separations and new hires from the perspective of the plants subject to acquisitions. Section V looks at the extent of within-plant changes in unobserved worker characteristics around ownership change, with a particular focus on the selection in separations and new hires. Section VI presents indirect evidence on changes for workers who stay in the plant. Section VII summarises and concludes.

II   Data and Definitions

We use five different annual data bases from Statistics Norway for the years 1996–2007. All of these are censuses that can be linked to each other through firm or plant identifiers. Our starting point is the Norwegian manufacturing statistics, where plants are the units of observation. We keep only plants that are observed for at least three years during 1996–2007 and do not have more than two missing years during their time in the panel. We then link the income tax files to the plant level. These files contain information on workers' job spells as well as the earnings associated with each job spell. We also use register data which identifies the main employer and includes total annual earnings and individual characteristics like age, gender and education for the whole population. We only include workers that are linked to the same plant in both data sources.

We identify foreign acquisitions by using the register of foreign ownership interests in Norwegian firms (the SIFON register), and define a plant as being subject to a foreign acquisition in year t if the largest foreign ownership share is above 50% in year t, but was below this threshold in $t - 1$.[5] We are further interested in plants that experience a change

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[5]The smallest change in foreign ownership share that we observe in the year of foreign acquisition is a change of 5 percentage points, for almost half of foreign acquisitions the change is from 0 to 100%, and the average change in the year of takeover is 90 percentage points.

of ownership from one Norwegian owner to a different Norwegian owner. In order to identify these domestic acquisitions, we look for changes in the firm identifiers of the plants in our panel. While the plant identifiers are connected to a specific location with production in a specific industry, the firm identifier is associated with the legal owner.[6] A domestic takeover occurs in year t if a plant changes firm identifier from $t-1$ to t. Further, the plant must not be defined as foreign owned in either year t or $t-1$. Finally, we use firm-level customs data to identify whether a plant belongs to a firm that exports and/or imports and use this information as part of our controls for plant characteristics in regressions.

Our starting sample of plants that are observed more than three years and without long lapses of missing observations, account for 97% of total production value in the manufacturing statistics for the period of analysis. First, we drop plants with on average less than three employees. This reduces the number of plant-year observations by more than half, while the share of total production drops by only three percentage points to 94%. We further drop plants to which we cannot match workers and we keep only workers who work fulltime more than 80% of their time in the panel. We also drop always foreign-owned plants (for which we do not observe ownership change), and plants with two ownership changes that are close in time.[7] The reference group in our analysis are, thus, domestic plants (and workers in these plants) not experiencing ownership change. After these cleaning procedures (detailed in Table A1 of the online appendix), we are left with about 86,000 plant-year observations from 9,900 different plants with 1.6 million worker-year observations for the period from 1996 to 2007. The plant-year observations in our plant-panel account for 56% of total production value recorded in the full manufacturing statistics for this period, and our worker-year observations account for 58% of the initial number of worker-to-plant matches.

Table 1 shows, by year, the number of plants, their average size and total number of workers in these plants. Our plant panel consists of between 6,300 and 7,500 plants each

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[6]According to Statistics Norway, firm identifiers cannot be changed at will.

[7]In our final plant-panel 61 plants undergo two ownership changes which are more than four years apart.

Table 1: Plants and workers involved in ownership change, by year

	All plants			Foreign acquisitions			Domestic acquisitions		
	No.	Employment		No.	Employment		No.	Employment	
Year		Mean	Total		Mean	Total		Mean	Total
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1996	6346	20	129791						
1997	6909	20	140751	24	48	1161	122	29	3542
1998	7403	20	147651	38	66	2495	137	21	2929
1999	7319	19	141018	54	42	2278	135	34	4531
2000	7461	19	139315	81	42	3366	139	24	3340
2001	7428	19	139567	54	45	2431	136	23	3101
2002	7459	18	135375	38	32	1232	120	32	3834
2003	7424	18	131802	44	25	1098	141	16	2269
2004	7370	18	130284	28	26	738	118	22	2595
2005	7371	18	131173	35	31	1094	98	18	1793
2006	7100	19	132180	86	27	2327	129	29	3769
2007	6702	19	130577	48	38	1832	93	20	1815
Avg.	7191	19	135790	48	38	1823	124	24	3047

year, employing on average about 19 workers, amounting to 130,000–147,000 workers per year (columns 1–3). Columns 4–6 provide the same information for plants subject to foreign acquisition and columns 7–9 for plants subject to domestic acquisition. In total, we observe 530 foreign acquisitions and 1,368 domestic acquisitions.[8] The total number of workers in acquired plants in the year of acquisition ranges from 738 to 3,366 in foreign acquisitions and from 1,793 to 4,531 in domestic acquisitions.

Table 2 presents summary statistics on the workers. The average daily wage over the period was NOK 770, and is calculated by dividing total wages paid by the employer during a job-spell by the total number of days between the start and stop dates of the spell. Outliers in terms of the daily wage are likely to come from inaccuracies in employers' recording of start

[8]In earlier work we also identified domestic plants that were taken over by Norwegian multinationals (Balsvik and Haller, 2010). In our final panel we only observe around ten such cases and therefore do not include this category in our analysis. The few studies that are able to identify domestic multinationals when looking at ownership change typically find that the impact on firm performance is rather similar whether a domestic or a foreign multinational acquires a local firm (Heyman et al., 2007; Criscuolo and Martin, 2009; Bandick and Görg, 2010).

Table 2: Descriptive statistics on worker panel

	All workers		Foreign acq		Domestic acq	
	mean	SD	mean	SD	mean	SD
	(1)	(2)	(3)	(4)	(5)	(6)
Daily wage (NOK)	768.6	297.2	810.3	296.9	735.1	272.9
- low skilled	651.7	238.1	681.4	229.8	640.3	227.2
- medium skilled	769.9	266.6	800.9	257.7	744.6	248.8
- high skilled	1033.2	371.1	1073.2	361.2	983.2	359.2
Annual earnings (1000 NOK)	297.2	283.9	311.0	252.7	281.1	159.0
- low skilled	244.5	109.0	254.1	92.3	239.1	108.2
- medium skilled	294.8	167.1	304.7	263.5	284.8	140.1
- high skilled	425.8	663.7	430.9	345.4	393.2	286.3
Age	40.5	11.8	40.9	11.4	39.9	12.0
Tenure	7.6	7.2	8.1	7.3	7.9	7.3
Low skilled (%)	29.6	45.7	27.7	44.7	32.2	46.7
Medium skilled (%)	57.2	49.5	56.2	49.6	57.6	49.4
High skilled (%)	13.2	33.8	16.1	36.8	10.2	30.3
Females (%)	20.2	40.1	19.3	39.5	21.3	40.9
Obs	1,629,484		209,035		341,076	

Note: Statistics on foreign and domestic acquisitions are for workers in plants ever subject to an acquisition. Summary statistics for daily wage are based on 1,597,580 observations.

and stop dates. We therefore drop the top and bottom percentile of day-wage observations in all regressions where wage or wage growth based on the daily wage is our dependent variable. Our alternative wage measure is total annual earnings (which includes earnings from all employers), with an average of NOK 297,000.[9] Workers in plants ever subject to a domestic acquisition earn less than average, while workers in plants ever subject to a foreign acquisition earn above average. This pattern also holds for average annual earnings as well as across different skill levels.[10] The share of low-skilled workers in plants subject to domestic acquisition is higher than the overall average, whereas the share of high-skilled workers is lower. In contrast, plants subject to foreign acquisitions have higher shares of high-skilled

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[9]The average annual earnings of NOK 297,000/365 gives a daily wage of 813, thus the two wage measures are closely related. Statistics Norway reports the nominal average annual wage of fulltime manufacturing workers in 1998 to be 261,000, while the nominal average for 1998 in our data is 276,000.

[10]Skill groups are defined by years of education: low-skilled workers have less than 10, medium-skilled workers have 10-13 and high-skilled workers have more than 13 years of education.

workers than the overall average.

In most of our analysis, we study within-plant changes in outcomes from before to after acquisitions, and therefore need to be able to observe plants both before and after ownership changes. For all our analysis at the plant level we focus on plants that we can observe for at least two years before and two years after the acquisition event and, correspondingly, non-acquired plants that we observe for five consecutive years. Thus, our analysis effectively focuses on the acquisitions taking place between 1998 and 2005 that we observe for five consecutive years.

III   Observable plant and worker characteristics around acquisition

It is well established that plants targeted for acquisition by new foreign owners are larger, more productive and pay higher wages already before the takeover. To document differences between plants subject to acquisitions and non-acquired plants, we run the following regression at the plant level

$$ Y_{jt} = \sum_{\tau=t-2}^{t+2} \alpha_{F\tau} \text{For acq}_{j,\tau} + \sum_{\tau=t-2}^{t+2} \alpha_{D\tau} \text{Dom acq}_{j,\tau} + (\beta \ln emp_{jt}) + \lambda_t + \gamma_s + \delta_r + \epsilon_{jt}. \tag{1} $$

Y_{jt} is the variable of interest in plant j in year t. For $\text{acq}_{j,\tau}$ is a set of dummy variables equal to one if the observation of plant j is two years before foreign acquisition, one year before foreign acquisition, the year of foreign acquisition, and so on, until two years after foreign acquisition. We construct a similar set of indicators around domestic acquisitions, Dom $\text{acq}_{j,\tau}$. λ_t, γ_s and δ_r are year, 3-digit industry and region fixed effects (five broad regions).[11] Hence, the coefficients $\alpha_{F\tau}$ and $\alpha_{D\tau}$ above are identified relative to the industry-region-year mean of

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[11]Log employment is not included as a control in the regression where employment is the dependent variable.

non-acquired plants as well as the small set of observations for plants subject to acquisition that are not within two years of an acquisition.

Figure 1 plots the estimates from equation (1) for, in turn, log employment (as reported in the manufacturing statistics), log labour productivity measured as the log of sales per employee, shares of low-, medium- and high-skilled workers, the log wage (daily wage rate) by skill group, average worker age and average years of tenure in the plant. The figures show that plants subject to foreign acquisition are on average larger, have higher labour productivity and pay higher wages than the industry-region-year mean. Plants subject to domestic ownership change are larger, but are otherwise much less likely to differ significantly from the industry-region-year average of non-acquired plants in terms of any of the measures of interest.[12]

In the year of acquisition there is a drop in average wages in both types of acquisition plants. This drop in daily wages is likely to be related to the Norwegian temporary layoff scheme. Employers may use temporary layoffs if they do not have 'profitable' work for their employees for what is expected to be a temporary period. During the first ten days employers have to pay wages, but after that the state pays the equivalent to unemployment benefits; it is likely that workers are recorded as employed during temporary layoffs. Thus wages from the employer (depicted in Figure 1) go down, but total annual earnings are less affected as unemployment benefits are included in this earnings measure. The figures for annual earnings are depicted in Figure A1 of the online appendix along with figures for the share of females and the share of non-Norwegian nationals at the plant level. Larch and Lechthaler (2011) argue that plants that are part of a multinational firm may have access to a larger pool of workers as they may be able to recruit from their plants abroad. We find no evidence to suggest that foreign acquired plants start recruiting significantly more foreign-born workers after takeovers.

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[12]The trends shown in Figure 1 look similar if we do not restrict the sample to plants that we observe for five consecutive years.

Figure 1: Characteristics of plants subject to acquisitions
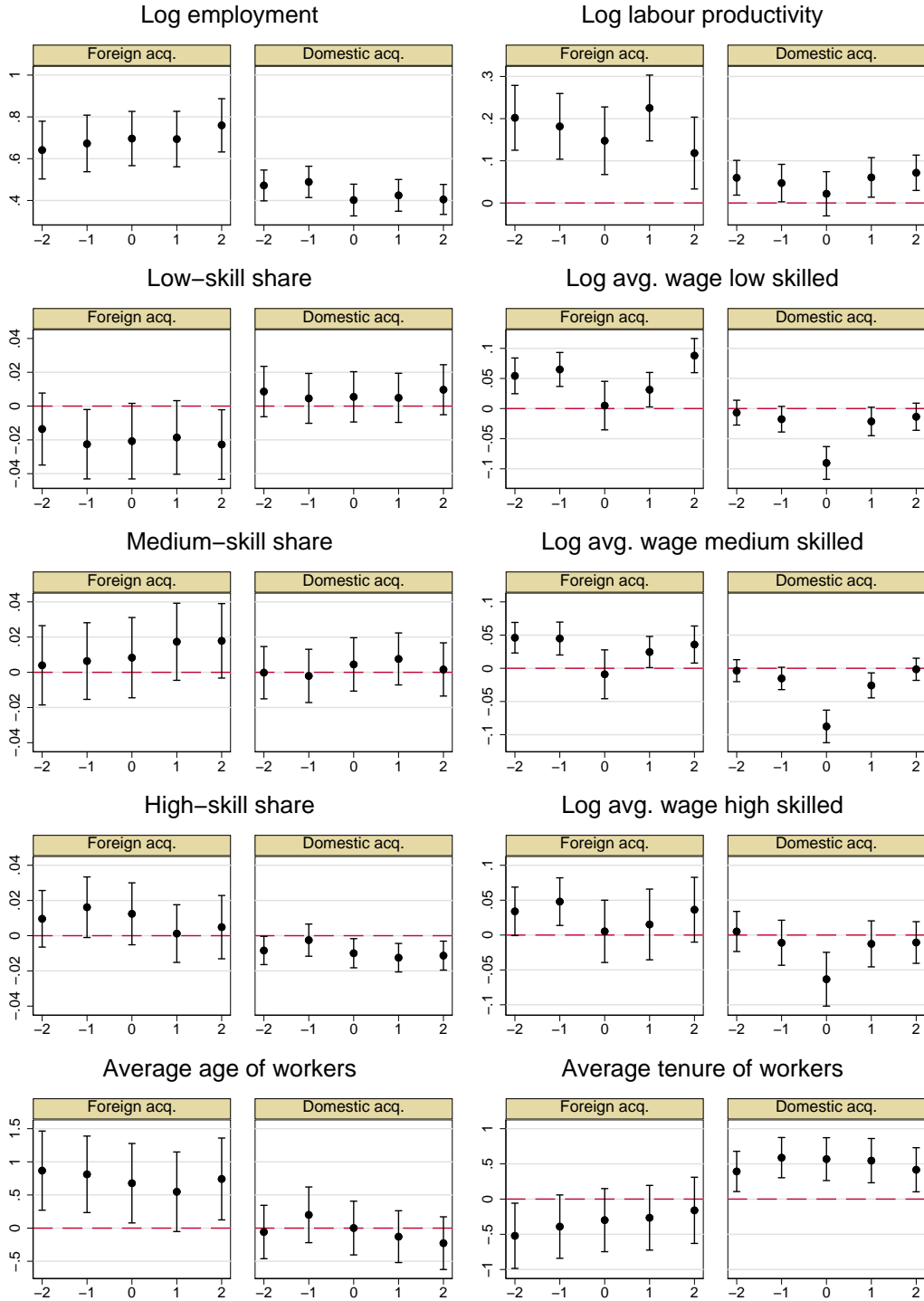
Note: Graphical representation of regression results for equation (1). Time 0 is the year of acquisition. The reference line at zero represents the industry-region-year mean. The bars indicate 95% confidence intervals (standard errors are adjusted for clustering at the plant level).

We also estimate difference-in-difference (DiD) regressions for the change from before to after acquisition relative to the changes in non-acquired plants. To do this we keep data for periods $\tau = t-2, t-1, t+1, t+2$ around acquisition year t, define the indicator $A_\tau = I(\tau > t)$, and then estimate

$$Y_{j\tau} = DD_F \text{For acq}_j \times A_\tau + DD_D \text{Dom acq}_j \times A_\tau + \psi_j + \lambda_t + \epsilon_{j\tau} \tag{2}$$

The plant fixed effects capture the base effects of For acq$_A$ and Dom acq$_A$ and the time dummies λ_t pick up the base effect of A_τ.[13]

These results are presented in Table 3, with regressions for different outcomes in each row. Few of the estimated coefficients are statistically significant, which indicates that the changes in outcomes from before to after ownership change are not significantly different from the average changes in outcomes for non-acquired plants. The exceptions are that around domestic acquisitions average age and tenure decline relative to that of non-acquired plants. In foreign acquired plants the share of high-skilled employees decreases somewhat as do average wages for the medium-skilled. The changes in outcomes from before to after acquisitions differ significantly between foreign and domestic acquisitions only for average wages of the medium-skilled and for average tenure.

IV   Worker Turnover

To the extent that ownership change is a type of event where - as postulated in the literature - the opportunity and the need to make changes to the workforce is particularly large, this can be achieved through hiring and separations. In this section we study turnover and start by looking at two-year retention rates in Table 4. The retention rate for workers in plants never

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[13]Note that the sample of non-acquired firms that constitute the base group in equation (2) is different from that of equation (1) as the base group is restricted to be observed for five year windows parallel to the five-year windows of interest for acquired plants.

Table 3: Changes in plant characteristics around acquisition (DiD)

Dep. variable	$DD_{\text{For acq}}$	$DD_{\text{Dom acq}}$	P-value (1)=(2)	Obs	Plants
	(1)	(2)	(3)	(4)	(5)
Log Employment	0.013 (0.019)	-0.019 (0.013)	0.173	73279	7304
Log labour productivity	-0.012 (0.021)	0.019 (0.013)	0.202	73145	7302
Low-skill share	0.002 (0.006)	-0.002 (0.005)	0.629	73347	7304
Medium-skill share	0.008 (0.006)	0.003 (0.005)	0.486	73347	7304
High-skill share	-0.009 (0.005)*	-0.001 (0.003)	0.102	73347	7304
Log avg wage all	-0.013 (0.008)$^{(*)}$	0.004 (0.006)	0.079	73159	7304
- low skilled	-0.009 (0.009)	0.006 (0.008)	0.212	57714	6645
- medium skilled	-0.014 (0.008)$^{(*)}$	0.008 (0.006)	0.039	68943	7181
- high skilled	-0.016 (0.018)	0.001 (0.011)	0.405	35849	4727
Avg age of workers	-0.054 (0.150)	-0.217 (0.125)$^{(*)}$	0.402	73347	7304
Avg tenure of workers	-0.058 (0.095)	-0.289 (0.076)**	0.058	73347	7304
Log avg ann earnings all	0.006 (0.020)	0.001 (0.013)	0.818	73347	7304
- low skilled	-0.006 (0.009)	0.005 (0.009)	0.337	58102	6664
- medium skilled	-0.028 (0.010)**	0.002 (0.006)	0.010	69228	7185
- high skilled	-0.002 (0.015)	-0.009 (0.012)	0.750	36179	4746
Share non-Norwegians	0.003 (0.004)	-0.003 (0.002)	0.219	73347	7304
Female share	-0.001 (0.004)	-0.001 (0.003)	0.994	73347	7304

Note: $^{(*)}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$. Standard errors clustered at the plant level in parentheses. Regressions as in equation (2). The estimated $DD_{\text{For acq}}$ and $DD_{\text{Dom acq}}$ are based on 271 foreign and 734 domestic acquisitions. The number of observations, plants and acquisitions is lower for regressions where the outcome variable is split by skill group as some plants do not employ all skill groups.

subject to acquisition is on average 73%. Of the non-retained workers, 19% are employed and 8% are not working. Table 4 also shows average retention rates calculated over different three-year periods relative to the year of ownership change (t). The worker retention rate is on average 70% for workers in plants that will be acquired by foreign owners the coming year. The retention rate is particularly low for plants in the period just before (65%) and the period around the time (66%) of a domestic ownership change.

To examine whether workers have a higher probability of being hired or separated from

Table 4: Average two-year retention rates for workers in manufacturing plants

Workers in plants	Work in same plant	Work in other plant	Not working
	(1)	(2)	(3)
never subject to acq.	0.73	0.19	0.08
before for. acq. $(t-3$ to $t-1)$	0.72	0.20	0.08
around for. acq. $(t-1$ to $t+1)$	0.70	0.21	0.08
after for. acq $(t+1$ to $t+3)$	0.72	0.19	0.09
before dom. acq. $(t-3$ to $t-1)$	0.65	0.21	0.15
around dom. acq. $(t-1$ to $t+1)$	0.66	0.24	0.10
after dom. acq $(t+1$ to $t+3)$	0.71	0.19	0.10

Note: Column 1 shows the average two-year retention rate calculated as the share of workers present in a plant who are still employed in the same plant two years later. Year t = year of acquisition. For workers classified as not working we either do not observe a plant id in our employer-employee data files (unemployed or out of the labour force) or their total annual earnings are below NOK 30,000.

plants around acquisitions in more detail, we estimate the following regression

$$
y_{ijt} = \sum_{\tau=t-2}^{t+2} \alpha_{F\tau}\text{For acq}_{j,\tau} + \sum_{\tau=t-2}^{t+2} \alpha_{D\tau}\text{Dom acq}_{j,\tau} + X_{it}\beta + X_{jt}\gamma + \theta_j + \lambda_{ts} + \epsilon_{ijt}, \quad (3)
$$

where y_{ijt} - when looking at separations - is the indicator variable $leave_{ijt}$ which is equal to one if worker i is observed in plant j in year t, but will not be observed in this plant the following year. For acq$_{j,\tau}$ and Dom acq$_{j,\tau}$ measure time around acquisition from $t-2$ to $t+2$. As we are interested in the within-plant effect of an acquisition, we include plant-fixed effects (θ_j) in these regressions. This implies that our coefficients are identified relative to the average of periods within the plant that are not captured by acquisition dummies. Time-varying observable worker and plant-level traits may affect the probability of separation, hence we include vectors of worker (X_{it}) and plant (X_{jt}) characteristics. X_{it} includes experience, tenure, their square terms, skill dummies, interactions of all of these with a female dummy, and union membership, while X_{jt} includes the shares of medium- and high-skill workers, log employment, log sales, the share of unionised workers, exporter, importer and multi-plant dummies. We also include 3-digit industry-year interaction terms (λ_{ts}) to make sure our

results are not confounded by separations or ownership change being correlated with industry-specific shocks. Standard errors are adjusted for clustering at the plant level. The estimated coefficients on the indicator variables for the years around ownership change are represented graphically in Figure 2 and in numerical format in Table A2 in the online appendix.

The upper left panel of Figure 2(a) indicates that the probability of leaving a plant is somewhat lower for workers who are employed in a plant subject to foreign acquisition in the year of the acquisition than in periods further from an ownership change. This is driven by separation patterns for the medium-skilled workers. Workers in plants that experience domestic ownership change have for all skill types a higher probability of separation in the year of acquisition.[14] The estimated effects range from an 18% increase in the probability of separation for the low skilled to a striking 35% increase for the high skilled.[15] Unfortunately, our data does not allow us to distinguish between voluntary and involuntary separations, thus we are unable to tell whether the separation of high-skilled workers in the year of domestic acquisition is a choice on the part of the workers or on the part of the plant. Further, we are unable to determine whether these workers leave just before or just after the acquisition.

We also assess whether the probability of being new to a plant is higher around acquisition than at other times by re-estimating equation (3) using new_{ijt} as dependent variable. This indicator variable equals one if worker i is observed in plant j in year t, but was not observed in this plant the year before.[16] Figure 2 (b) does not show any statistically significant deviations

[14]In our data, employees are registered as matched to their main employer at a date in November of each year, thus when we observe a worker in plant j in year t (for the sake of example: the year before a takeover), but the worker is not in the plant in year $t+1$, we will think of the workers as leaving the plant in year $t+1$ (i.e. in the year of the takeover), although it is possible that the worker left the plant towards the very end of year t. Note, however, since we do not know the exact date of the ownership change we cannot be certain whether the worker leaves just before or just after the takeover. The timeline in Figure 2 (a) reflects the fact that a worker who is last observed in a given plant in November in a given year, most likely leaves the plant the subsequent year.

[15]The estimated coefficient for the probability of separation is 0.063 for the high skilled. Compared to an average propensity of separation for the high skilled of 0.18, this gives a 35% increase in the probability of separation.

[16]Note that since we are doing our analysis at the plant level, our new hires could come from a different plant within the same firm. As reallocation of workers across plants is one way to improve the composition of the workforce of a given plant, this is turnover that we want to capture in our analysis. The share of

from normal hiring rates in years close to foreign acquisitions. In the case of plants subject to domestic acquisition, the probability of being newly hired is significantly lower one year before the takeover compared to other years for these plants. Compared to the average rate of new hires in our sample of 15%, the estimated coefficient of 2.3% in the upper left panel of Figure 2 (b), implies a 15% lower hiring rate in the year before acquisition.

To summarize, our results do not indicate higher than average worker turnover around foreign acquisitions, but pretty much business as usual. If anything, these plants have even lower than average separation rates in the year of acquisition. For plants subject to domestic acquisitions, we see very high separation rates in the year of ownership change. This is consistent with the below average retention rates around domestic acquisitions in Table 4 and the decrease in average tenure in Table 3. It seems that especially the workers with outside options leave the plant. Schwerdt (2011) finds that the high-skilled workers are the first to leave in "the shadow of plant death." While we do not observe a higher probability of exit for plants subject to domestic acquisition, the high separation rate in domestic acquisitions suggests more uncertainty for the workers. If the plants are in distress, this is not surprising.

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new hires in our sample that come from another plant within the same firm is relatively small (11%). On average, the share of new hires in the year of foreign acquisitions and the two following years that could be characterised as intra-firm mobility is 12.8%, while the share for new hires in corresponding years close to domestic acquisitions is 8.6%.

Figure 2: Worker's probability of separation/being newly hired to a plant
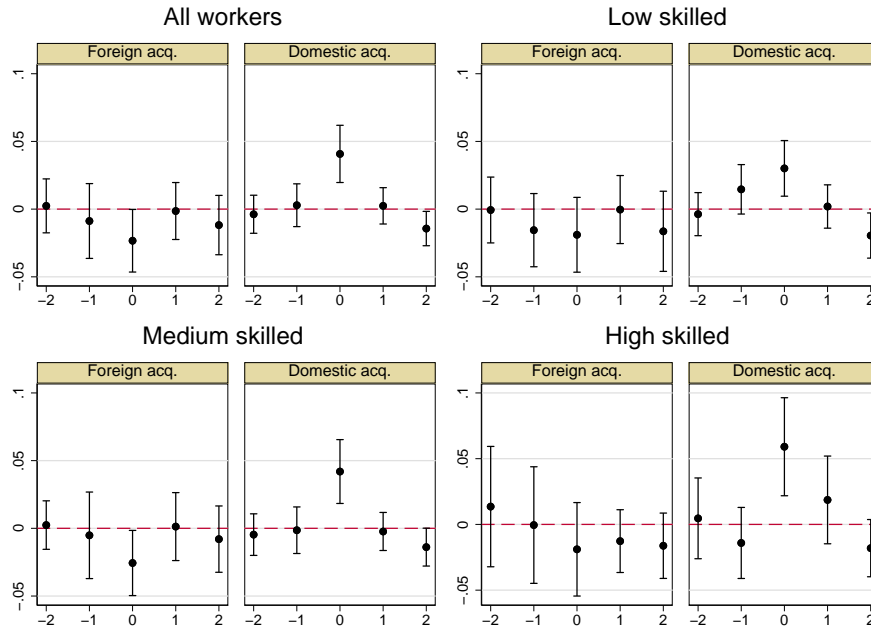
(a) Probability of separation from plant
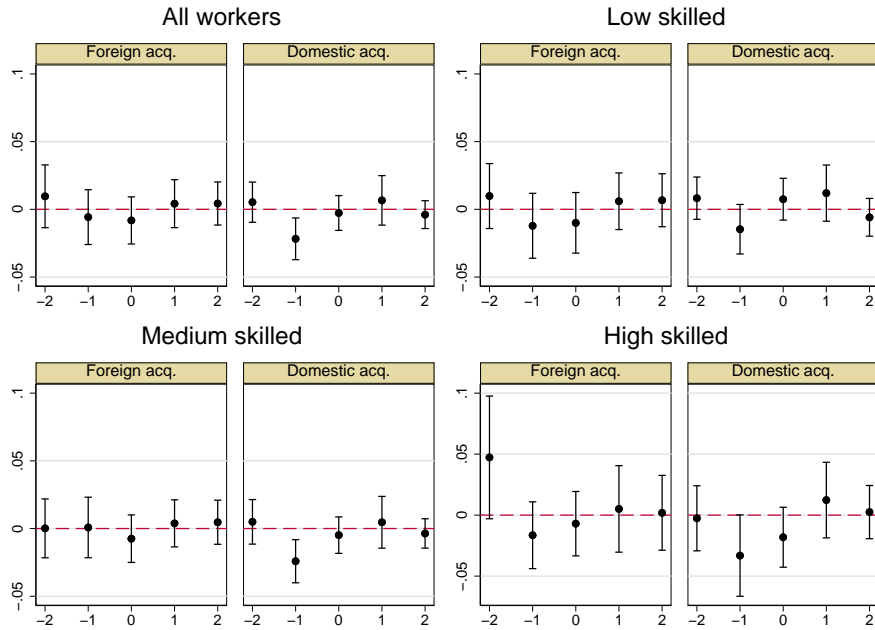
(b) Probability of being newly hired to the plant

Note: Graphical representation of regression results for equation (3) with the dependent variable being an indicator for separation from the plant in panel (a) and an indicator for new hire to the plant in panel (b). The bars indicate 95% confidence intervals (standard errors are adjusted for clustering at the plant level). Time 0 is the year of acquisition. The horizontal line at zero represents the mean of years observed for a plant in years without acquisition dummies.

18

V Selection in separations and new hires

As firms may select workers based on criteria which we do not observe, in this section we explore whether the process of new hires and separations becomes more selective around ownership change. We do this by documenting how the unobservable characteristics of a plant's workforce change around acquisitions, and by analysing wage growth for new hires.

As our main measure of the unobserved quality of the workforce, we use the worker-fixed effects derived from the wage decomposition proposed by Abowd et al. (1999), in short AKM:

$$y_{ijt} = \mu + x'_{it}\beta + \gamma_{ts} + \alpha_i + \theta_j + \epsilon_{ijt}, \tag{4}$$

where the outcome variable, y_{ijt}, is the log daily wage of worker i at plant j in period t, and x'_{it} is a vector of observable time-varying covariates for the worker.[17] The fixed effects for the worker and the plant, respectively, are α_i and θ_j. We also include industry-year-fixed effects γ_{ts} to take account of potentially different industry trends in real wages.

The identification of the worker- and plant-fixed effects relies on mobility of workers between plants, we use the largest group of connected plants and workers, which includes around 95% of our sample, for this estimation. It is well known that the estimated worker- and plant-fixed effects may be subject to "limited mobility bias" (Andrews et al., 2008), we therefore estimate (4) and (5) on a sample of workers that are observed for more than three years, and plants that have more than 20 movers during their period in the sample. This reduces the largest group of connected plants and workers by about 25%, we report results without this mobility restriction as part of our robustness checks.

As discussed in Card et al. (2013), identification of worker- and plant-fixed effects when estimating the additive AKM-model in equation (4) requires orthogonality between the included regressors and fixed effects, and the error term, ϵ_{ijt}. In part B of the online appendix

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[17]We follow Card et al. (2013) and include age^2, age^3 and both of these interacted with six highest-level-of-education dummies, in addition we include dummies for hours worked.

we follow Card et al. (2013) in assessing this assumption. In line with their estimates for Germany, we find that the additive model also fits our Norwegian data well.

As an alternative measure of the unobserved characteristics of workers, we use a measure of the match-specific wage premium associated with each job spell. The unobserved match-specific effect represents an idiosyncratic productivity component associated with each match, where workers receive some share of the rents generated from the match.[18] We obtain the unobserved match-specific effect in two steps. First, we estimate the following wage regression

$$y_{ijt} = \mu + x'_{it}\beta + \gamma_{ts} + \eta_{ij} + \epsilon_{ijt}, \tag{5}$$

where the only difference to equation (4) is that we replace the worker- and plant-fixed effects with a fully saturated vector of spell-fixed effects, η_{ij}.[19] The spell-fixed effects in equation (5) subsume the worker- and plant-fixed effects, and in a second step we decompose the spell-fixed effects into worker- and plant-fixed effects by regressing the estimated spell-fixed effects on worker- and plant-fixed effects.[20] The residual from this regression represents the unobserved match-specific effect. A variance decomposition of the spell-fixed effects from equation (5) following the same logic as Card et al. (2013, pp. 992-993) indicates that 99.7% of the variation in the spell fixed effect is due to the worker fixed effect, 1.3% to the plant fixed effect, -1.2% to the covariance between the two and 0.1% to the residual. This indicates that the estimated worker- and spell-fixed effects are almost equal, while the match-specific effects are essentially zero and have very little variation. These effects tend to be small also in estimates for other countries, see Bahar Baziki et al. (2016) for Sweden and Card et al. (2013) for Germany. A match-specific wage premium essentially requires that workers have individual bargaining power in their firms and are able to keep some of the match-

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[18]For example, the matching model of Mortensen and Pissarides (1994) also includes a match-specific wage component.

[19]The estimates from equations (4) and (5) are reported in Table A3 of the online appendix.

[20]In this regression, each spell-fixed effect enters into the regression with the number of times a worker is observed in each job-spell.

specific rents. The relatively prominent role of centralized wage negotiations in Norwegian manufacturing during our period of analysis may be another contributing factor to the match-specific effects being small. Alternatively, there could be worker-plant complementarity in levels which would not be picked up by our log-specification. In the following, our main measure of unobservable worker quality is the worker-fixed effect from equation (4); we report on results for the spell- and match-fixed effects as part of our robustness checks.

For the quality of the unobserved worker component to improve within a plant, new hires need to have above plant-average unobserved worker quality and/or the unobserved quality of separating workers needs to be below the plant average. To investigate the within-plant change in unobserved worker quality from before to after acquisition relative to changes over a similar five-year period in non-acquired plants, we calculate the plant-level average of the estimated worker-fixed effects from equation (4) and estimate difference-in-difference regressions as specified in equation (2). The results are reported in Table 5. In the first row of the top panel of Table 5 we look at the development of the plant average of unobserved worker fixed effects obtained from equation (4) for all workers. Here, the coefficient on foreign acquisition is positive, but the change in unobserved worker quality around foreign acquisitions is not statistically significant. Also when we look at these changes in average unobserved fixed effects of newly hired workers (first row in the middle panel of Table 5) or leavers (first row in the bottom panel of Table 5) we find no significant effects in plants subject to foreign acquisition (standard errors are large).[21] Thus, relative to non-acquired plants, for foreign acquisitions we are unable to identify a significant change in hiring strategy along unobservable worker characteristics based on this methodology.

In plants subject to domestic ownership change we find a significant decline in average worker quality from before to after acquisition when looking at all workers (top panel of Table 5). The middle and bottom panels of the table show that for these plants, the change in the

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[21]To be included in these regressions plants need to have new hires (leavers) in at least one of the two years prior to acquisition and in at least one of the two years after acquisition.

selection of separations or new hires does not differ from the average change in non-acquired plants. The worker turnover in the year of acquisition will be captured in the overall change in worker-fixed effects in the estimate for all workers in the top panel. Thus, the overall decline in unobserved worker-fixed effects around domestic acquisitions is likely to be related to the excess separations of workers in the year of acquisition documented in Figure 2.

In the remaining rows of the three panels in Table 5 we report robustness of these results to using alternative measures of unobserved worker quality and different specifications of the estimation of the worker fixed effects. In the second row, we use the change in the average of unobserved spell-fixed effects from estimating equation (5). In the third row, we use the whole sample of workers in the largest group of plants and workers connected by mobility when estimating equation (4) rather than restricting the sample to workers with many observations and plants with many movers. In the fourth row we include time-varying plant characteristics in the Mincer wage regression. In order to take account of the possibility that in particular the calculated daily wage could be affected by inaccurate reporting of start and stop dates of job spells, we also include dummies for the year a person is newly hired and a dummy for the year of separation. In the fifth row we allow for the plant-fixed effect to change in the acquisition year. In this case, we limit the sample to plants with only one ownership change. To check that our results are robust to using an alternative wage measure, the sixth row estimates equation (4) with annual earnings as our wage measure instead of the calculated daily wage. In the last row we use the change in average match-specific effects at the plant level as our dependent variable. In all cases, a similar picture to that of the base specification in the first row of each panel emerges. Although the top panel of Table 5 shows a negative and significant change in average worker quality from before to after domestic acquisitions relative to non-acquired plants, and the estimated coefficients for foreign acquisitions are mostly positive but not significant, given the large standard errors none of the estimated differences between foreign and domestic acquisitions are statistically significant.

Table 5: Within-plant changes in unobserved worker-to-plant match quality

Dep. variable	$DD_{\text{For acq}}$	$DD_{\text{Dom acq}}$	P-value (1)=(2)	Obs	Plants
	(1)	(2)	(3)	(4)	(5)
All workers					
wFE, base	0.010 (0.019)	-0.029 (0.015)$^{(*)}$	0.103	32987	3190
spell FE, base	0.007 (0.016)	-0.022 (0.013)$^{(*)}$	0.161	32963	3189
wFE, full sample	-0.012 (0.020)	-0.031 (0.015)**	0.470	63627	6325
wFE, incl. plant char.	0.010 (0.018)	-0.028 (0.014)$^{(*)}$	0.108	32987	3190
wFE, acq. changes plant FE	0.004 (0.019)	-0.022 (0.016)	0.287	32547	3152
wFE, ann. earnings	0.018 (0.032)	-0.045 (0.025)$^{(*)}$	0.124	33022	3190
match FE	0.000 (0.001)	0.001 (0.001)	0.460	32963	3189
New hires					
wFE, base	-0.010 (0.061)	-0.010 (0.050)	0.997	20765	3120
spell FE, base	0.003 (0.058)	0.014 (0.049)	0.888	19000	3110
wFE, full sample	0.012 (0.059)	-0.036 (0.040)	0.490	35190	6069
wFE, incl. plant char.	-0.009 (0.059)	-0.010 (0.048)	0.990	20765	3120
wFE, acq. changes plant FE	-0.005 (0.062)	-0.015 (0.054)	0.898	20389	3083
wFE, ann. earnings	-0.045 (0.105)	-0.025 (0.085)	0.877	20867	3120
match FE	-0.004 (0.005)	0.005 (0.003)	0.126	19000	3110
Leavers					
wFE, base	-0.004 (0.078)	-0.010 (0.058)	0.945	20399	3108
spell FE, base	-0.010 (0.072)	0.040 (0.055)	0.579	18419	3089
wFE, full sample	-0.044 (0.068)	-0.046 (0.050)	0.982	34453	6020
wFE, incl. plant char.	-0.003 (0.075)	-0.010 (0.055)	0.939	20399	3108
wFE, acq. changes plant FE	0.009 (0.079)	0.003 (0.063)	0.951	19981	3068
wFE, ann. earnings	-0.010 (0.129)	0.036 (0.094)	0.771	20759	3114
match FE	-0.002 (0.004)	-0.001 (0.003)	0.725	18419	3089

Note: $^{(*)}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$. Standard errors clustered at the plant level in parentheses. Regressions as in equation (2). wFE base results for all workers are based on 198 foreign and 469 domestic acquisitions; for new hires on 177 foreign and 429 domestic acquisitions; and for leavers on 182 foreign and 422 domestic acquisitions. The base worker fixed effects (wFE) are obtained from estimating equation (4) using log daily wage as the dependent variable and restricting the sample to workers that are observed for more than three years and to plants that have more than 20 movers.

An alternative approach to study the extent of selection in new hires is to look for a premium in wage growth for mobile workers. For those who change jobs, the wage growth from the old to the new job may capture to what extent the job change results in an improved match from the perspective of the worker. To investigate this, we identify workers who in

two years' time will be employed by a different plant. For these workers we calculate the three-year change in log wages from the year before they leave the old plant to the year after they are first observed in the new plant. We keep only these moving workers in our sample and regress their wage growth on four indicators of whether the plant they are moving to is just before or just after an ownership change:

$$
\begin{aligned}
w_{ij(t+3)} - w_{ikt} \quad = \quad & \alpha_1 \text{Before For acq}_j + \alpha_2 \text{After For acq}_j \\
& + \alpha_3 \text{Before Dom acq}_j + \alpha_4 \text{After Dom acq}_j + X_{it}\beta + X_{kt}\gamma + \epsilon_{ikt},
\end{aligned}
\tag{6}
$$

where $w_{ij(t+3)}$ is the log wage of worker i in her new plant j and w_{ikt} is the log wage in her old plant k. Before For acq$_j$ is an indicator variable equal to 1 if worker i is hired to plant j one or two years before the plant is subject to a foreign acquisition. After For acq$_j$ is an indicator variable equal to 1 if the new plant of worker i experienced a foreign acquisition this year or in one of the two previous years. Before Dom acq$_j$ and After Dom acq$_j$ are defined similarly for workers hired to plants subject to domestic acquisition. X_{it} and X_{kt} are, respectively, vectors of worker and plant characteristics measured at plant k, which is the plant the worker has left. In addition, we include region and industry-year interaction dummies. Note that we include only one observation of wage growth for each worker in these regressions: the wage growth from before to after job change.

The results from estimating equation (6) are presented in Table 6. The base category in these regressions are new hires to non-acquired plants. In column 1 we include worker controls in addition to region- and industry-year dummies, while from column 2 we also add plant controls. Columns 3-5 provide estimates by skill group. Movers to plants that were just acquired by foreign owners exhibit significantly higher wage growth than movers to non-acquired plants. The average three-year wage growth of new hires is around 10%, thus an additional wage growth of over seven percentage points for movers to foreign acquired plants (column 2) is a relatively large effect. When splitting these regressions by skill group

Table 6: Wage growth for new hires

Dependent variable:	3-year wage growth from old to new plant for...				
Sample	All workers		Skill level		
			Low	Medium	High
	(1)	(2)	(3)	(4)	(5)
...workers first observed in the new plant					
a) 1 or 2 years before foreign acq.	0.018	0.025 (*)	0.029	0.034 (*)	0.035
	(0.015)	(0.015)	(0.041)	(0.019)	(0.029)
b) 0, 1 or 2 years after foreign acq.	0.070 **	0.074 **	0.075 *	0.077 **	0.072 (*)
	(0.019)	(0.019)	(0.036)	(0.021)	(0.042)
c) 1 or 2 years before domestic acq.	-0.039 *	-0.036 *	0.019	-0.048 *	-0.088 *
	(0.015)	(0.015)	(0.027)	(0.019)	(0.041)
d) 0, 1 or 2 years after domestic acq.	0.003	0.004	0.006	0.004	0.021
	(0.010)	(0.010)	(0.019)	(0.012)	(0.026)
Obs	24649	24649	6900	14756	2993
R^2 adj	0.107	0.111	0.172	0.083	0.110
Worker controls	yes	yes	yes	yes	yes
Plant controls		yes	yes	yes	yes
Avg wage growth	0.103	0.103	0.139	0.084	0.114
P-value a)=c)	0.003	0.004	0.847	0.002	0.016
P-value b)=d)	0.001	0.001	0.078	0.002	0.288

Note: (*) $p < 0.10$, * $p < 0.05$, ** $p < 0.01$. Standard errors adjusted for clustering at the plant level in parentheses. The sample contains one observations for each worker who changes plants. The dependent variable captures the difference in log wages from the last year before leaving the old plant to the year after hire in the new plant. The omitted category are new hires to non-acquired plants. Worker controls: experience, experience^2, tenure, tenure^2, skill dummies and interactions of these with a female dummy, union membership. Plant controls: plant age, shares of medium- and high-skilled workers, log employment, log sales, share of unionised workers, exporter, importer and multiplant dummies. Other controls: region, 3-digit industry-year interaction terms.

there is no difference between skill groups in the wage-growth premium for movers to these plants. The wage growth of new hires to plants recently acquired by new domestic owners does not differ from that of new hires to non-acquired plants, while new hires before domestic acquisitions experience on average four percentage points lower than average wage growth; with high-skilled workers faring worst.

In sum, for plants subject to domestic acquisition, we find a decline in the average of unobserved worker-fixed effects around domestic acquisitions which is consistent with the

excess departure of (high-skilled) workers in the year of acquisition. From the unobserved worker fixed effects we are unable to identify increased selection by new foreign owners after acquisition among new hires and separations. However, new hires to newly foreign acquired plants earn a large premium for their job-mobility relative to other workers moving between employers in our sample. This may be due to foreign owners being more attractive employers or alternatively a foreign wage premium.[22] It could also be due to worker unobservables which the worker fixed effects do not pick up or a combination of plant and worker unobservables.

VI   Improvements for stayers?

Workers who stay in acquired plants from before to after acquisition cannot contribute to changes in unobservable characteristics of the workforce at the plant level, but new owners may (re)train their existing workforce, or reallocate stayers to tasks that are a better match to each worker (Becker et al., 2018). A possible result could be higher job satisfaction in the form of higher wage growth or in the form of longer continuation tenure for stayers. We start by looking at wage growth and estimate the following regressions:

$$w_{ij(t+\tau)} - w_{ijt} \quad = \quad \alpha_D \text{ For acq}_{jt} + \alpha_F \text{ Dom acq}_{jt} + X_{it}\beta + X_{jt}\delta + \epsilon_{ijt}, \tag{7}$$

where $w_{ij(t+\tau)} - w_{ikt}$ is the difference in log wages for stayers over the next τ years, where $\tau = 2, 3, 4$. The set of stayers is restricted to workers who are present in a plant for five consecutive years. For (dom) acq$_{jt}$ is an indicator variable equal to one in years one or two before foreign (domestic) acquisition. X_{it} and X_{jt} are our usual vectors of worker and plant characteristics measured in year t. In addition, we include region and industry-year

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[22]In unreported regressions we check whether new hires earn higher wages in levels in plants just before or after domestic or foreign ownership change. New hires do earn higher wages in plants after foreign acquisition controlling for plant and worker characteristics. This premium disappears, however, when controlling for plant fixed effects.

interaction dummies.

Results are presented in Table 7. The reference group in these regressions are stayers in non-acquired plants. The only group experiencing consistently higher than average wage growth are high-skilled stayers in plants subject to foreign acquisition. They experience around 3-4 percentage point higher wage growth than stayers in non-acquired plants, indicative of rent sharing. This is in line with Heyman et al. (2011) who find that wage dispersion increases after cross-border acquisitions due to wage increases for CEOs and managers. Note, however, that wage growth may be an imperfect indicator of improved match quality. If firm characteristics such as productivity increase after acquisition wages may also rise.

Potential changes in the plant implemented by the new owners may result in increased job satisfaction which, of course, we cannot measure. What we can observe though is how long workers stay in a plant. If job satisfaction increases, this may prompt workers to remain in the plant for longer. To investigate this possibility, we look at continuation tenure as an alternative indicator of an improved match between the stayers and the plant.

In Table 8 we look at the probability of workers who are present in this plant in the year after acquisition to remain in the plant for another 2, 3, or 4 years, conditional on having worked in the same plant also in the two previous years (i.e. from at least the year before acquisition). The results suggest that low- and medium skilled workers in plants subject to domestic acquisitions are less likely to remain in the plant for another two years relative to workers in non-acquisition plants, for the low-skilled workers the effect is significant also over the three- and four-year horizon. For workers in plants subject to foreign acquisitions we do not see significant differences in the probability of remaining in the plant relative to workers in non-acquired plants with the exception of a lower probability of low-skilled workers to stay over the four-year horizon. Thus, to the extent that we can approximate increased job satisfaction with the likelihood of remaining in a plant after an acquisition, low-skilled workers in plants subject to domestic acquisition are disgruntled.

Table 7: Wage growth for stayers

	Wage growth over the subsequent			
	2 years	3 years	3 years since	4 years
	(1)	(2)	(3)	(4)
All workers				
for acq$_{t-1}$	-0.001 (0.006)	0.005 (0.014)		
for acq$_{t-2}$			-0.002 (0.007)	0.003 (0.013)
dom acq$_{t-1}$	-0.004 (0.006)	0.013 (0.006)*		
dom acq$_{t-2}$			-0.013 (0.005)**	0.001 (0.005)
Obs	552019	550903	550903	546595
R^2	0.062	0.065	0.065	0.072
Avg. wage growth	0.058	0.074	0.074	0.088
P-value for = dom	0.656	0.203	0.599	0.876
Low skilled				
for acq$_{t-1}$	-0.011 (0.008)	-0.010 (0.023)		
for acq$_{t-2}$			-0.005 (0.008)	-0.005 (0.020)
dom acq$_{t-1}$	-0.009 (0.009)	0.017 (0.009)$^{(*)}$		
dom acq$_{t-2}$			-0.010 (0.007)	0.008 (0.008)
Obs	158348	158182	158182	156654
R^2	0.077	0.085	0.085	0.090
Avg. wage growth	0.059	0.071	0.071	0.080
P-value for = dom	0.893	0.598	0.296	0.556
Medium skilled				
for acq$_{t-1}$	-0.003 (0.006)	0.004 (0.011)		
for acq$_{t-2}$			-0.007 (0.007)	0.001 (0.011)
dom acq$_{t-1}$	-0.000 (0.006)	0.012 (0.006)*		
dom acq$_{t-2}$			-0.013 (0.005)*	-0.002 (0.005)
Obs	330665	330205	330205	328186
R^2	0.057	0.057	0.057	0.064
Avg. wage growth	0.055	0.071	0.071	0.086
P-value for = dom	0.741	0.499	0.538	0.828
High skilled				
for acq$_{t-1}$	0.030 (0.010)**	0.038 (0.013)**		
for acq$_{t-2}$			0.030 (0.014)*	0.035 (0.016)*
dom acq$_{t-1}$	-0.020 (0.013)	0.007 (0.015)		
dom acq$_{t-2}$			-0.022 (0.011)*	-0.003 (0.010)
Obs	63006	62516	62516	61755
R^2	0.082	0.083	0.083	0.093
Avg. wage growth	0.074	0.099	0.099	0.121
P-value for = dom	0.002	0.003	0.120	0.045

Note: $^{(*)}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$. Standard errors adjusted for clustering at the plant level in parentheses.

Worker controls: experience, experience^2, tenure, tenure^2 skill dummies and interactions of these with a female dummy, union membership.

Plant controls: plant age, shares of medium- and high-skill workers, log employment, log turnover, share of unionised workers, exporter, importer and multiplant dummies.

Other controls: region, 3-digit industry-year interaction terms.

Table 8: Linear probability of stayers to remain in the plant for 2, 3 or 4 more years

	All	Low-skill	Medium-skill	High-skill
	(1)	(2)	(3)	(4)

Probability of staying for at least 2 years in a plant that was subject to

	All	Low-skill	Medium-skill	High-skill
for acq in previous year	0.012 (0.018)	-0.002 (0.021)	0.021 (0.020)	0.012 (0.019)
dom acq in previous year	-0.051 (0.016)**	-0.054 (0.016)**	-0.052 (0.017)**	-0.031 (0.030)
Constant	-0.732 (0.034)**	-0.797 (0.035)**	-0.656 (0.039)**	-0.739 (0.069)**
Obs	1048778	313554	594855	140369
R^2	0.47	0.46	0.49	0.44
P-value for = dom	0.008	0.048	0.004	0.234

Probability of staying for at least 3 years in a plant that was subject to

	All	Low-skill	Medium-skill	High-skill
for acq in previous year	-0.001 (0.013)	0.005 (0.017)	-0.000 (0.014)	-0.007 (0.015)
dom acq in previous year	-0.016 (0.013)	-0.023 (0.013)(*)	-0.014 (0.014)	-0.012 (0.013)
Constant	-0.538 (0.027)**	-0.565 (0.028)**	-0.501 (0.031)**	-0.564 (0.053)**
Obs	1048778	313554	594855	140369
R^2	0.43	0.42	0.45	0.40
P-value for = dom	0.387	0.213	0.489	0.798

Probability of staying for at least 4 years in a plant that was subject to

	All	Low-skill	Medium-skill	High-skill
for acq in previous year	-0.020 (0.010)*	-0.029 (0.012)*	-0.018 (0.011)	-0.010 (0.015)
dom acq in previous year	-0.016 (0.008)(*)	-0.023 (0.009)**	-0.013 (0.009)	-0.009 (0.010)
Constant	-0.351 (0.019)**	-0.350 (0.020)**	-0.343 (0.022)**	-0.375 (0.038)**
Obs	1048778	313554	594855	140369
R^2	0.39	0.37	0.42	0.36
P-value for = dom	0.735	0.678	0.712	0.958

(*) $p < 0.10$, * $p < 0.05$, ** $p < 0.01$. Standard errors adjusted for clustering at the plant level in parentheses.

Dependent variable is indicator equal to one if a worker has been in the plant for the past two years and is still present in the same plant 2 or more, 3 or more or 4 or more years later; and zero otherwise.

Worker controls: experience, experience^2, tenure, tenure^2, skill dummies and interactions of these with a female dummy, union membership.

Plant controls: plant age, shares of medium- and high-skill workers, log employment, log turnover, share of unionised workers, exporter, importer and multiplant dummies.

Other controls: region, 3-digit industry-year interaction terms.

Sample restricted to plants that are still in business in 4 years' time.

Taken together, our results suggest that new foreign do not (detectably) select leavers or new hires on unobservable worker characteristics, but do pay new hires a wage premium possibly due to plant unobservable characteristics. New foreign owners also share rents with the high skilled workers that are already in the plant before the acquisition. In turn, plants subject to domestic acquisition are likely undergoing difficulties. Workers - especially the high-skilled - have a high probability of leaving, unobserved worker quality decreases, and

low-skilled workers who were already in the plant before the acquisition are less likely to stay on afterwards.

VII   Summary and concluding remarks

From a management perspective, ownership change presents an opportunity for restructuring as new owners may bring in new management practices, new technology, or access to new networks of suppliers and customers. New owners may want to complement such changes by engaging workers with different skills, experience or other characteristics than the current workforce. We explore changes to the composition of the workforce in terms of both *observable* and *unobservable* characteristics, distinguishing between plants subject to domestic and foreign acquisitions. As multinationals are well known to outperform local firms in terms of - among other dimensions - productivity, wage levels or organisational capital, multinationals may arguably have a higher potential to make such changes. Within-plant changes in observable characteristics of the workforce, will come primarily from hiring and separations. Worker turnover can also be at the root of within-plant changes to unobservable worker quality, but new owners may also (re)train existing workers or reallocate them to tasks that they are better suited for. In a difference-in-difference setting we explore whether the changes in observable and unobservable worker characteristics around ownership change are larger than in similar plants that do not experience ownership change.

In terms of observable characteristics of the workforce, we find little evidence of new owners of either type effecting significant changes to the workforce. The most salient exception is the decline in average tenure relative to non-acquired plants in plants subject to domestic acquisitions. This is consistent with the probability of separation being especially high for workers employed in plants that are acquired by another domestic owner, indeed about 30% higher than the average separation rate in our sample. This effect is largest for high-skilled

workers. Whether the separations are voluntary or not is not observable from our data. We do not find evidence of above average turnover close to the acquisition in plants subject to foreign acquisitions.

A common theme in models of matching in the labour market is that firms of different types match with different types of workers. For example, if worker skills and technology are complements, improvements in technology would imply that plants shift towards more skilled workers. What constitutes a preferred 'worker type' from the perspective of the plant could be associated with criteria which we do not observe. One commonly used measure of unobserved worker type are the worker-fixed effects estimated from wage regressions proposed by Abowd et al. (1999). Exploring whether the process of hiring and separations becomes more selective around ownership change in terms of unobserved worker quality, we find that plants subject to domestic acquisitions exhibit a decrease in average worker-fixed effects from before to after acquisition. This is consistent with the above-average separation rates, especially for high-skilled workers, in the acquisition year. The change in unobserved worker quality around foreign acquisitions is positive but not significant. There is no detectable change in unobserved worker quality between new hires before and after foreign acquisition, yet newly hired workers after a foreign acquisition experience higher job-to-job wage growth than those hired before.

The workers that stay in a plant around acquisition cannot contribute to a change in the unobserved worker-fixed effects. It is still conceivable that worker training/retraining or reassignment within the plant improves the fit between the worker and the plant. We consider wage growth and job satisfaction measured by longer continuation tenure as indirect measures of such changes. We find a lower probability of continuation tenure for low-skilled stayers after domestic acquisitions. In plants subject to foreign acquisitions the probability of continuation tenure does not differ from that of workers in non-acquired plants, but wage growth is higher for high-skilled stayers.

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Thus, while new foreign owners would appear to have a higher potential for restructuring, in a sense there does not seem to be a need to. They acquire plants that are already doing well, and keep them on track at the very least. The takeover is not associated with higher than average worker turnover or larger changes to observable or unobservable characteristics of the workforce relative to non-acquired plants. A greater wage increase for changing employer for workers with otherwise similar characteristics hired after foreign acquisitions is indicative of selection on worker and/or plant unobservables, though we are unable to detect significant changes in the unobserved quality of new hires from before to after acquisition. New foreign owners focus on the existing workforce, which may or may not have been a reason in the choice of target firm. They pay rents to the high-skilled workers that were already in the plant before the acquisition in the form of higher wage growth. In turn, plants subject to domestic acquisitions are in difficulties already before the takeover. Over the short run the ownership change does not appear to alleviate these. The probability of leaving is especially high for the high skilled, unobserved worker quality at the plant decreases, and low-skilled workers who were already in the plant before the acquisition are less likely to stay on afterwards.

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