

The Effects of Export Entry on Wage Inequality in Slovenian Firms

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Abstract

This paper examines how export entry affects both between-firm and within-firm wage inequality in Slovenian manufacturing firms, using linked employer–employee panel data from 2008 to 2022. Combining the synthetic control method with a dynamic difference-in-differences estimator, the paper shows that export entry has heterogeneous distributional effects. Between-firm wage inequality tends to increase in the long run following export entry, while within-firm wage inequality gradually declines relative to synthetic controls. The findings underscore the importance of targeted policies that promote export entry as a source of wage growth and reduced wage inequality.

Keywords: Export entry, Wage inequality, International trade

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1. Introduction

Wage inequality is shaped by several forces, including technological change, workforce composition, and internationalization (Piketty, 2014). Among these, exporting has attracted particular attention because exporting firms are typically larger, more productive, more capital-intensive, and more profitable, which can reshape wage structures (Bernard & Jensen, 1995; Helpman et al., 2017; Becker et al., 2025). Understanding how exporting affects wage inequality requires considering both between-firm wage inequality, which reflects differences in wage levels across firms, and within-firm wage inequality, which captures wage dispersion among workers within the same firm (Card et al., 2013;

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Song et al., 2019). The question is therefore not only whether exporting raises wages, but also how these gains are distributed between and within firms.

It is also important to consider how the effects of export entry evolve over time. Firms face search costs, learning frictions, and organizational constraints when entering foreign markets, while adjustment to globalization shocks is slow because reallocating workers across sectors and occupations is costly (Dorn & Levell, 2024). As a result, the distributional consequences of export entry may unfold over several years. In the short run, export entry may increase wage dispersion through skill upgrading, organizational restructuring, and the selective retention or hiring of high-performing workers (Becker et al., 2025). Over the longer run, however, the initial rise in wage inequality may attenuate as firms accumulate export experience, productivity gains diffuse more broadly across workers, and wage-setting practices stabilize. Examining effects over time therefore helps distinguish temporary adjustment from persistent changes in wage inequality.

Slovenia provides an informative setting for studying these dynamics. It is a small, open EU economy strongly integrated into international markets, yet its wage and income distributions remain comparatively compressed, with wage inequality declining over much of the post-transition period (Laporšek et al., 2021). According to World Bank data, Slovenia's Gini index has remained in the low to mid-20s over the past decade, placing it among the most equal countries globally. This creates an important empirical puzzle: whether export entry reshapes firm-level wage inequality even in such an egalitarian economy.

Motivated by these insights, this paper addresses an important gap in the literature by examining how export entry affects wage inequality between and within firms, and how these effects evolve over time. It contributes to the literature in two ways. First, while an extensive empirical literature documents the relationship between firms' export participation and wages (e.g., Klein et al., 2013; Helpman et al., 2017), we focus on the dynamic effects of export entry. Using an event-study framework, we examine how wage outcomes evolve following firms' transition into export markets. Second, building on this dynamic perspective, we examine wage differences across firms and wage dispersion within firms, providing a more comprehensive assessment of how the gains from export entry are distributed. Using linked employer–employee panel data for Slovenian manufacturing firms from 2008 to 2022, we show that export entry increases between-firm wage inequality in the long run, while within-firm wage inequality gradually declines after firms enter export markets.

2. Literature review

Classical trade theory links international trade to wage inequality through the Stolper–Samuelson theorem, which predicts that trade raises returns to a country's relatively abundant factor and lowers returns to its relatively scarce factor (Stolper & Samuelson, 1941). Under this framework, trade should reduce wage inequality in developing countries and increase it in developed economies. However, rising wage inequality in both groups of countries has challenged this prediction (Goldberg & Pavcnik, 2007), motivating a shift towards models that emphasize firm heterogeneity and labour market frictions (Bernard et al., 2007). These models show that export expansion may disproportionately benefit high-productivity firms and skilled workers, thereby increasing wage dispersion among firms and workers (Egger & Kreickemeier, 2009; Helpman et al., 2010; Sampson, 2014; Somale, 2022).

Linked employer–employee microdata have advanced empirical research by allowing wage dispersion to be studied at both the firm and worker levels (Helpman et al., 2017; Song et al., 2019; Criscuolo et al., 2020). A central finding is the exporter wage premium: exporting firms pay higher wages than non-exporters, even among observationally similar workers (Amiti & Davis, 2012; Helpman et al., 2017). This premium may arise both from the self-selection of more productive firms into export markets and from learning-by-exporting effects that improve firm performance after export entry (Clerides et al., 1998; De Loecker, 2013). The economic consequences of internationalization extend beyond wage inequality, as trade openness and foreign direct investment have also been linked to economic growth and income inequality (Bakari & Tiba, 2019; Nguyen, 2026).

Exporting affects wage inequality through mechanisms related to firm heterogeneity and labour market frictions (Helpman et al., 2010; Sampson, 2014; Wolszczak-Derlacz & Nikulin, 2022). An important channel is workforce composition, as exporters tend to employ workers with different skill levels and occupations, contributing to wage dispersion both between and within firms, as well as among skill groups (Klein et al., 2013; Baumgarten, 2013; Helpman et al., 2017; Georgiev & Henriksen, 2020). Within firms, wage gaps arise from differences in worker characteristics, returns to those characteristics, and pay-setting practices (Akerman et al., 2013; Wallskog et al., 2026). Between firms, wage inequality reflects firm-level differences in productivity, workforce composition, and rent-sharing practices (Amiti & Davis, 2012; Sampson, 2014).

While exporting is generally associated with higher wage inequality, its effects may evolve over time. Firms face search costs and learning frictions when entering foreign markets, making adjustment gradual rather than immediate (Eaton et al., 2025). Moreover, responses to globalization shocks are slow and incomplete because reallocating workers across sectors, occupations, and locations is costly (Dorn & Levell, 2024).

In the short run, inequality may increase through skill upgrading, organizational restructuring, and the selective hiring or retention of high-performing workers (Helpman et al., 2010). New exporters expand and add hierarchical layers. Although wages decline within existing layers, the addition of higher-paid managerial layers increases within-firm wage inequality (Caliendo & Rossi-Hansberg, 2012; Caliendo et al., 2015). Becker et al. (2025) highlight an organizational restructuring mechanism that follows export entry. Access to export markets increases firm scale and encourages a deeper internal division of labour, with more specialized occupations and narrower task ranges. While this improves worker–task matching and efficiency, it may also increase wage dispersion because workers differ in how well their abilities fit specialized jobs. Between firms, export entry widens wage gaps because new exporters experience productivity and revenue gains that are partly shared with workers through higher wages (Amiti & Davis, 2012; Helpman et al., 2017). Export entry may therefore increase wage inequality both between and within firms.

Over longer horizons, however, the initial rise in wage inequality may diminish as firms reorganize and accumulate export experience. Becker et al. (2025) show that trade-induced organizational adjustments can raise worker efficiency while having only modest effects on wage dispersion once adjustment is complete. This is consistent with theoretical work showing that trade responses unfold gradually and that short-run increases in wage inequality may attenuate as firms and workers adjust (Burstein & Melitz, 2013; Lechthaler & Mileva, 2019). Evidence on exporter dynamics supports the idea of gradual adjustment. New exporters typically begin with small shipments, expand export activity slowly, and face high exit rates in the first few years (Ruhl & Willis, 2017). Thus, wage inequality effects measured

immediately after export entry may reflect transitional restructuring rather than a new steady state. This motivates the following hypothesis:

Export entry increases both within-firm and between-firm wage inequality in the short run, but these effects attenuate over time.

3. Data

This paper uses linked employer–employee panel data covering Slovenian firms from 2008 to 2022. The administrative sources cover the population of Slovenian firms, but the estimation sample is restricted to manufacturing firms with at least five employees[†]. Firm-level data are obtained from the Agency of the Republic of Slovenia for Public Legal Records and Related Services (AJPES) and the Statistical Office of the Republic of Slovenia (SURS). AJPES provides financial statements, establishment dates, and primary economic activity classified according to NACE Rev. 2, while SURS provides information on firms' export activity.

Worker-level data are obtained from SURS and include wages, education, occupation[‡], nationality, age, and tenure. These data link each worker to their employer, allowing us to combine worker- and firm-level information into a linked employer–employee dataset. The wage data include only individuals who were employed full-time (defined as working at least 36 hours per week) in the same firm for the entire calendar year. They exclude part-time workers, student workers, individuals who changed employers during the year, and those who experienced employment interruptions due to unemployment, retirement, or other reasons. This restriction improves the comparability of wage measures but means that the sample primarily represents stable full-time employment. Since part-time employment in Slovenia remained close to 10% during the sample period, this restriction is unlikely to drive the results.

The treatment of interest is export entry. Treated firms are those that start exporting in year t_0 , having not exported in at least the preceding three years or having been established during that period. Because firms enter export markets in different years, the empirical setting corresponds to a staggered treatment design. The control group includes firms that never enter export markets during the observation period, as well as firms that exported in the past but have operated exclusively in the domestic market for at least six consecutive years and do not re-enter export markets thereafter. This construction provides a credible counterfactual for treated firms during the relevant pre- and post-entry periods.

Wage data are based on annual gross wages, recorded before tax deductions and social security contributions. To account for differences in working time, wages are adjusted for hours worked and expressed as gross hourly wages. Between-firm wage premia are estimated using workers' log hourly wages. Within-firm wage inequality is measured using the Gini coefficient and, as robustness checks, the variance of log wages and the 90th–10th percentile log wage gap. The analysis also includes a rich

[†] Wage inequality analysis requires a firm of sufficient size for the concept to be meaningful.

[‡] Occupations are coded using the Standard Classification of Occupations, which changes during the observation period. Until 2010, data were classified using SKP-V2 (aligned with ISCO-88), and from 2011 onward using SKP-08 (aligned with ISCO-08). To ensure consistency, we harmonized occupational codes across years using official transition tables provided by SURS.

set of worker- and firm-level controls. Worker-level controls are age, gender, nationality, education, occupation, and tenure. Firm-level controls include productivity (value added per employee), age, size (number of employees), and revenue. All monetary variables are expressed in constant prices. Wages are deflated by the Consumer Price Index, while exports and revenues are deflated by the 2-digit NACE Producer Price Index.

Table 1 presents the composition of the estimation sample across firms and workers. At the worker level, treatment status is determined by the export status of the worker's firm. Over the full period, the sample includes 4,364 control and 3,510 treated firm-level observations, and 64,609 control and 40,397 treated worker-level observations. The larger number of control observations reflects the fact that export entry is relatively rare.

Table 1 - Number of observations by year

	Firm-level		Worker-level	
	Controls	Treated	Controls	Treated
Full sample	4,364	3,510	64,609	40,397
2008	341	180	5,970	3,534
2009	308	198	4,511	3,636
2010	262	206	3,960	2,832
2011	244	223	4,675	2,927
2012	215	229	3,735	3,146
2013	187	236	3,433	3,081
2014	206	230	3,378	2,887
2015	223	239	3,305	2,701
2016	253	249	3,759	2,538
2017	284	254	3,829	2,442
2018	327	252	4,472	2,366
2019	348	257	4,770	2,241
2020	346	259	4,661	2,126
2021	387	253	4,957	2,108
2022	433	245	5,194	1,832

Note: Full sample reports the total number of observations for the full sample period, 2008–2022.

4. Methodology

To estimate the dynamic effects of export entry on wage inequality, we combine the synthetic control method (SCM) (Abadie et al., 2010) with the dynamic difference-in-differences (DID) estimator of de Chaisemartin and D'Haultfœuille (2026). The key identifying assumption is that, in the absence of export entry, wage inequality among future exporters would have evolved similarly to that in comparable non-exporting firms. Estimation proceeds in two stages. First, SCM constructs synthetic controls based on pre-treatment covariates and outcome trajectories. The method assigns weights to control firms so that the weighted outcomes of non-exporters closely match the pre-export trajectory

of treated firms, strengthening the plausibility of the parallel-trends assumption. Second, the event-study DID estimator traces dynamic treatment effects. This estimator is well suited to staggered treatment settings with heterogeneous treatment effects, where conventional two-way fixed effects event-study regressions may be biased.

In the within-firm analysis, we construct synthetic controls for each firm that starts exporting in year t_0 by selecting potential donors from firms operating in the same 2-digit NACE industry. Each synthetic control is constructed by matching treated firms to a weighted combination of non-exporting firms based on pre-treatment values of the outcome variable (three lags) and firm characteristics, including revenue, productivity, age, and size measured in the year prior to export entry ($t_0 - 1$). In the between-firm analysis, we do not use SCM because treatment occurs at the firm level, while the outcome is observed at the worker level. Constructing a credible synthetic control would require matching treated workers to observationally similar workers in comparable non-exporting firms, which is difficult to implement reliably in this multidimensional setting. We therefore rely solely on the event-study DID estimator described below.

We estimate dynamic treatment effects by comparing outcome changes for treated units with contemporaneous changes for untreated units. To ensure comparability, comparisons are restricted to units within the same 2-digit NACE industry and, in the between-firm analysis, also within the same 2-digit ISCO-08 occupation group, gender, and age. Let g denote the observational unit: a firm in the within-firm analysis and a worker in the between-firm analysis. For a unit g first treated in year t_0 , the estimator compares the change in the outcome from the year prior to treatment, $t_0 - 1$, to event time l , with the corresponding change among control units belonging to firms that never enter exporting. The group-specific DID comparison is given by:

$$DID_{g,l} = Y_{g,t_0+l} - Y_{g,t_0-1} - \frac{1}{N_{t_0+l}^g} \sum_{g' \in C(g,l)} (Y_{g',t_0+l} - Y_{g',t_0-1}) \quad (1)$$

where $Y_{g,t}$ denotes the outcome of interest for unit g in year t , $C(g,l)$ is the set of control units belonging to firms that never switch into exporting during the sample period and that satisfy the relevant comparability restrictions, and $N_{t_0+l}^g$ denotes the number of control units in $C(g,l)$. Dynamic treatment effects at event time l are obtained by averaging the DID estimates across treated units. With this normalization, $l = 0$ denotes the export-entry year, while $l < 0$ and $l > 0$ indicate the pre- and post-treatment periods, respectively. For ease of interpretation, we classify the estimated effects into short-run ($l = 0$ to $l = 3$) and long-run ($l \geq 4$) horizons.

For the within-firm analysis, bootstrap standard errors are obtained by resampling treated–synthetic pairs with their full observed histories and re-estimating the DID. We report pointwise 95% confidence intervals conditional on fixed SCM weights, excluding uncertainty arising from the estimation of those SCM weights.

5. Results

This section presents the main empirical findings. Table 2 reports pre-matching summary statistics and shows clear differences between treated and control units. Treated firms exhibit slightly higher within-firm wage inequality and tend to be economically stronger, with higher revenue, larger size, and greater productivity. Workers in treated firms earn lower hourly wages and are slightly younger than employees in control firms, while education levels are similar across groups. Treated firms also employ a larger share of female workers, as indicated by the lower mean of the gender variable. These differences suggest that simple unconditional comparisons may be affected by selection bias, which motivates the use of a matching procedure to construct a more appropriate counterfactual.

Table 2 - Pre-matching comparison of firm and worker characteristics in treated and control firms

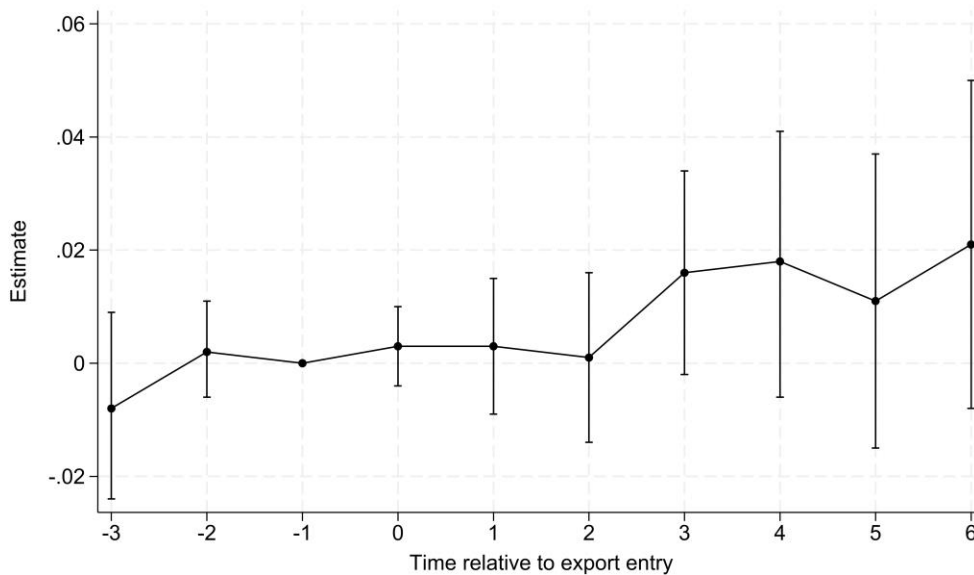
	Treated		Control
	t_0	$t_0 - 1$	
Firm-level			
Within-firm wage inequality	0.13	0.13	0.12
Revenue	14.17	14.08	13.69
Age	13.40	12.40	12.88
Size	23.80	22.66	20.25
Productivity	10.61	10.58	10.36
Worker-level			
Hourly wage	2.10	2.08	2.17
Tenure	6.09	5.16	5.83
Age	42.06	41.01	42.20
Gender	0.58	0.58	0.75
Education	0.10	0.09	0.09

Note: Revenue, productivity, and hourly wages are reported in logarithmic form. Productivity is measured as value added per employee, and firm size is measured by the number of employees. Gender is coded as 0 for female and 1 for male. Education is coded as 1 for individuals with tertiary education and 0 otherwise. Within-firm wage inequality is measured using the Gini coefficient.

Appendix Table A1 compares treated firms with their synthetic controls after SCM. Pre-treatment differences are small and statistically insignificant, suggesting that SCM improves comparability between treated and control firms before export entry. Statistically significant differences emerge only after entry, indicating that divergence occurs mainly after firms enter export markets.

Figure 1 presents the estimated effect of export entry on between-firm wage inequality. In the short run, the estimates become positive but remain small and statistically insignificant, providing little evidence of an immediate change following export entry. Over time, the point estimates gradually increase, although they remain statistically insignificant. By year 6, the estimated wage gap between workers in treated and control firms reaches approximately 0.021 log points, corresponding to about 2.1%. Although the estimates suggest a gradual widening of wage differences between workers in treated and control firms, the lack of statistical significance means that this pattern should be interpreted with caution. The small and statistically insignificant pre-treatment estimates are consistent with the parallel-trends assumption. Robustness checks using five-year age groups, further restricting comparisons by education, and limiting the sample to a balanced panel of workers who remain with

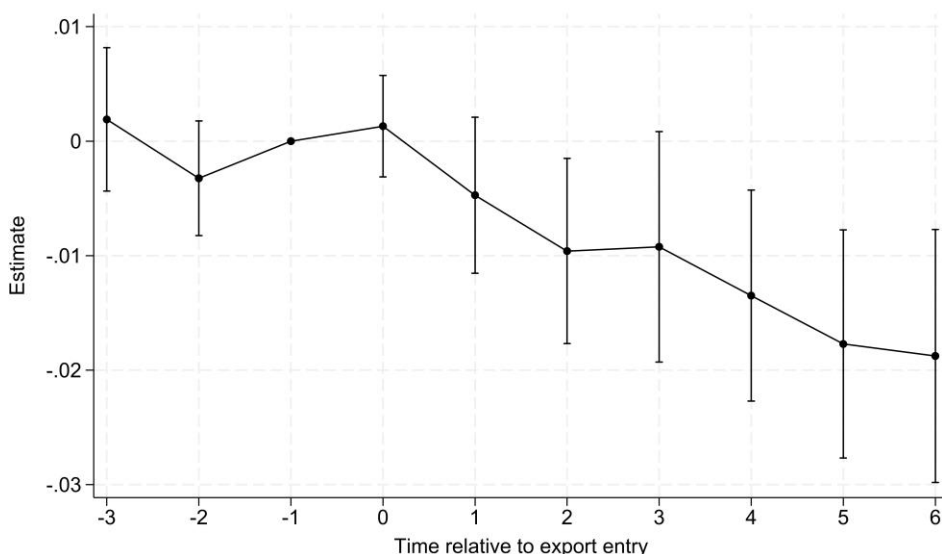
the same firm yield results similar to those from the baseline specification. These findings suggest that the estimated patterns are robust to alternative definitions of comparison groups and are not driven solely by worker sorting.



Note: Vertical bars indicate 95% confidence intervals for the point estimates.

Figure 1 - Estimated effects of export entry on between-firm wage inequality

Figure 2 presents the estimated effects of export entry on within-firm wage inequality, measured by the Gini coefficient. In the short run, the estimates become negative but remain mostly statistically insignificant, suggesting little change in within-firm wage inequality shortly after export entry. In the long run, however, the estimates become more negative and statistically significant, indicating a decline in within-firm wage inequality. By year 6, the within-firm Gini coefficient is estimated to be about 0.019 points lower among treated firms than among comparable control firms, corresponding to a decline of approximately 15% relative to the pre-treatment mean of 0.13 reported in Table 2. Small and statistically insignificant pre-treatment effects support the parallel-trends assumption. These findings are robust to alternative measures of within-firm wage inequality, as the 90th–10th percentile wage gap and the variance of log wages yield similar patterns.



Note: Vertical bars indicate 95% confidence intervals for the point estimates.

Figure 2 - Estimated effects of export entry on within-firm wage inequality

We conduct two additional robustness checks. First, we restrict the control group to firms that never export during the observation period. Second, we require treated firms to have not exported for at least five years before entry or to have been established within that window. Both checks yield similar results in the between-firm and within-firm analyses.

6. Discussion

This paper examines how export entry affects wage inequality in Slovenian firms. The results support a dynamic view of export entry, as its effects differ between the short and long run rather than appearing immediately as a one-off shift. This pattern is consistent with evidence of gradual firm adjustment after export entry and slow labour market responses due to costly worker reallocation (Dorn & Levell, 2024; Eaton et al., 2025).

The point estimates suggest that between-firm wage inequality increases in the long run after export entry. This would imply that wages grow faster for workers in newly exporting firms than for observationally similar workers in non-exporting firms. This pattern is consistent with the literature on exporter wage premia and firm heterogeneity, which shows that exporters tend to be more productive, generate higher revenues, and share part of these gains with workers through higher wages (Bernard & Jensen, 1995; Amiti & Davis, 2012; Helpman et al., 2017). However, all post-entry estimates are statistically insignificant. Consequently, the results do not provide sufficient evidence that export entry increases between-firm wage inequality and should therefore be interpreted with caution. The hypothesis that export entry increases between-firm wage inequality in the short run, with the effect

attenuating over time, is not supported, as the point estimates become larger rather than smaller over time.

In contrast, within-firm wage inequality decreases after export entry, with statistically significant effects emerging primarily in the longer run. The hypothesis that export entry increases within-firm wage inequality in the short run, with the effect attenuating over time, is therefore not supported. This finding is surprising, as the trade-and-organization literature predicts that exporting may increase within-firm wage dispersion through hierarchical expansion or greater task specialization (Caliendo & Rossi-Hansberg, 2012; Caliendo et al., 2015; Becker et al., 2025). Becker et al. (2025) argue that access to export markets deepens the internal division of labour, leading firms to introduce more occupations with narrower task ranges. Such organizational changes may increase wage differentiation within occupations. The observed decline in within-firm wage inequality may therefore reflect a reduction in between-occupation wage inequality, which would occur if newly added occupations are concentrated near the centre of the wage distribution, while removed occupations are more dispersed across the wage structure. However, how export entry affects occupational wage inequality remains an important question for future research.

The findings show that even in a small, open economy with a relatively equal wage and income distribution, export entry can have important distributional consequences. The results underscore the importance of policies that promote export entry as a source of wage growth and reduced wage inequality. Although this paper focuses on Slovenia, the findings are relevant to other small open economies.

Several limitations should be noted. First, the dataset includes only full-time employees who are continuously employed throughout the year. This restriction may understate within-firm wage inequality by excluding part-time, temporary, or marginal workers, who often earn lower wages. Second, export entry may still be endogenous. Although SCM and the dynamic DID framework improve pre-treatment comparability, exporting firms may still differ from non-exporters in unobserved ways, such as management quality, innovation capacity, or demand shocks. Third, firms vary in the intensity, composition, and persistence of export activity, which may affect wage inequality beyond the switch into exporting.

7. Conclusion

This paper examines how export entry affects between-firm and within-firm wage inequality in Slovenian manufacturing firms using linked employer–employee panel data from 2008 to 2022. It contributes to the literature by providing a dynamic and multidimensional assessment of export-related wage inequality in a small open economy. The results suggest that wage differences between firms increase in the long run following export entry, whereas wage dispersion within firms gradually declines relative to the synthetic counterfactuals. These findings do not support the initial hypothesis and suggest that export entry reshapes wage inequality mainly by reducing wage dispersion within firms.

These results suggest that policies supporting export entry and productivity growth should be accompanied by measures that broaden the benefits of internationalization across workers and firms. Policies that promote skill development and retraining, facilitate worker mobility, and encourage the

diffusion of knowledge and productivity gains from exporting to non-exporting firms may help limit widening wage disparities across firms. At the same time, the decline in within-firm wage inequality suggests that integration into international markets need not be associated with greater wage dispersion within exporting firms.

Several avenues for future research follow from these findings. First, further work should investigate the mechanisms underlying the decline in within-firm wage inequality, including the role of occupational restructuring. Second, future studies could examine heterogeneity across skill and education groups, by gender, and across different parts of the wage distribution. Such analyses could help distinguish changes in workforce composition from changes in wages within comparable groups. Third, future research could consider differences in export intensity and export destinations, rather than focusing only on entry into export markets.

Conflict of interest

The authors declare no conflict of interest.

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Appendix

Table A1 - Comparison of treated and synthetic controls after SCM

Outcome	Average	t_0-3	t_0-2	t_0-1	t_0	t_0+1	t_0+2	t_0+3	t_0+4	t_0+5	t_0+6
Within-firm											
Synthetic controls	0.14	0.13	0.13	0.12	0.12	0.13	0.13	0.14	0.15	0.15	0.16
Treated	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
t -test	6.10	-0.46	0.03	-0.65	-0.77	0.45	0.87	1.24	2.00	2.57	3.78
$P > t $	0	0.64	0.98	0.51	0.44	0.65	0.39	0.22	0.05	0.01	0
N	6,016	338	448	640	640	535	485	450	425	402	369

Note: N denotes the number of observations. The reported t -values are test statistics from two-sample t -tests with unequal variances, and P denotes the corresponding p -values. t_0 denotes the year of export entry. Average values are reported as means over the full sample period, 2008–2022. Within-firm wage inequality is measured using the Gini coefficient.