Winners and Losers: The Asymmetric Impact of Tariff Protection on Swedish Firms in the Late Nineteenth Century

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Introduction

With the Cobden-Chevalier treaty and its successors, a wave of tariff reductions were implemented on the European continent in the middle of the nineteenth-century (Lampe, 2009). However, this period of liberalization would remain brief: Fuelled by the import of cheap American grain and infant-industry arguments, many countries returned to protectionist policies towards the end of the century (O'Rourke, 1997, 2000). Was this protectionist shift beneficial for economic growth?

While standard growth theory and studies on contemporary periods generally suggest a negative economic impact of tariffs (e.g. Frankel & Romer, 1999), others argue that this shift back into protectionism increased growth (Bairoch, 1972; O'Rourke, 2000). This contradictory result is known as the *tariff-growth paradox* sparking further studies, which either supported (e.g. Lehmann & O'Rourke, 2011) or rejected it (e.g. Schularick & Solomou, 2011).

While these studies generally employ cross-country regressions, disaggregate Lampe and Sharp (2013) the analysis by looking at the trajectories of individual countries. They show that tariffs had a heterogeneous impact: While tariffs increased growth in some countries, they decreased it or had no impact in others. What can explain such heterogeneity?

One potential but disregarded channel in this literature is the focus on firms. This is understandable given the scarcity of historic firm-level data. Yet, there might be large gains in leveraging historic firm-level data as modern trade models suggest that tariffs have a differential impact on firms conditional on their initial characteristics: Protection is expected to benefit only low-productivity firms whereas high-productivity firms are adversely affected (Chen & Steinwender, 2019; Iacovone, 2012; Melitz, 2003). The inconclusiveness of studies on the tariff-growth paradox might thus at least partially be driven by heterogeneous firm-level responses to tariff changes.

I contribute to the tariff-growth literature by using a newly constructed firm-level panel covering the universe of Swedish manufacturing firms during the late nineteenth-century. This allows me to estimate the impact of the shift back into protectionism directly at the firm-level. Nineteenth-century Sweden is an appropriate choice: This period saw the breakthrough of the Swedish manufacturing industry while the country simultaneously returned to protectionism (Schön, 2010). If tariffs indeed promoted growth, it should be especially evident here.

By regressing a set of firm-level outcomes on industry-level tariffs while conditioning on the initial productivity of a firm, I show that only initially low-productivity firms profit from tariff increases whereas initially high-productivity firms are hurt. An increase in tariffs of one percentage point leads to the increase of firm-level productivity by three percent for initially low-productivity firms whereas high-productivity firms see a decline of three percent. The impact for other firms lies between these extremes.

In contrast, the results are much smaller and sometimes even statistically insignificant when I analyse the industry-level or do not condition on initial firm-level differences. The key insight is thus that firm-level heterogeneity matters when estimating the impact of tariffs. Countries with a different set of firms are likely to be differentially impacted by tariff changes. This can result at the aggregate level in either a positive, negative or absent relationship between tariffs and growth as documented by Lampe & Sharp (2013) across different countries.

Lastly, I document that the firm-level responses to tariff protection are similar to current times. To explain the results, I argue in conjunction with modern studies (Chen & Steinwender, 2019; Iacovone, 2012) that tariffs differentially shape the incentives of managers of initially high-/low-productivity firms to efficiently organize their management structures: Tariffs encourage initially low-productivity firms to improve their internal organizational structures, whereas they decrease the

incentive of more productive firms to do the same. As a result, initially low-productivity firms improve whereas initially high-productivity firms regress. More broadly, this suggests that the historic impact of tariffs is not exceptional but similar to modern trade dynamics.

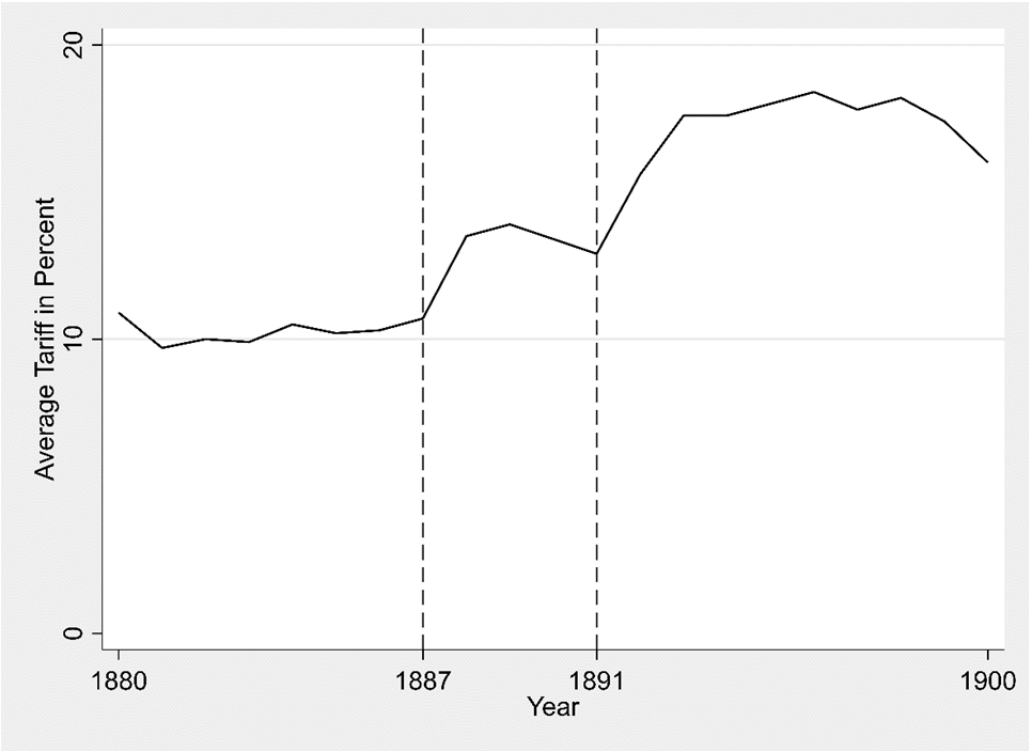


Figure 1: Average Swedish tariffs (Data: Persarvet, 2019; own representation)

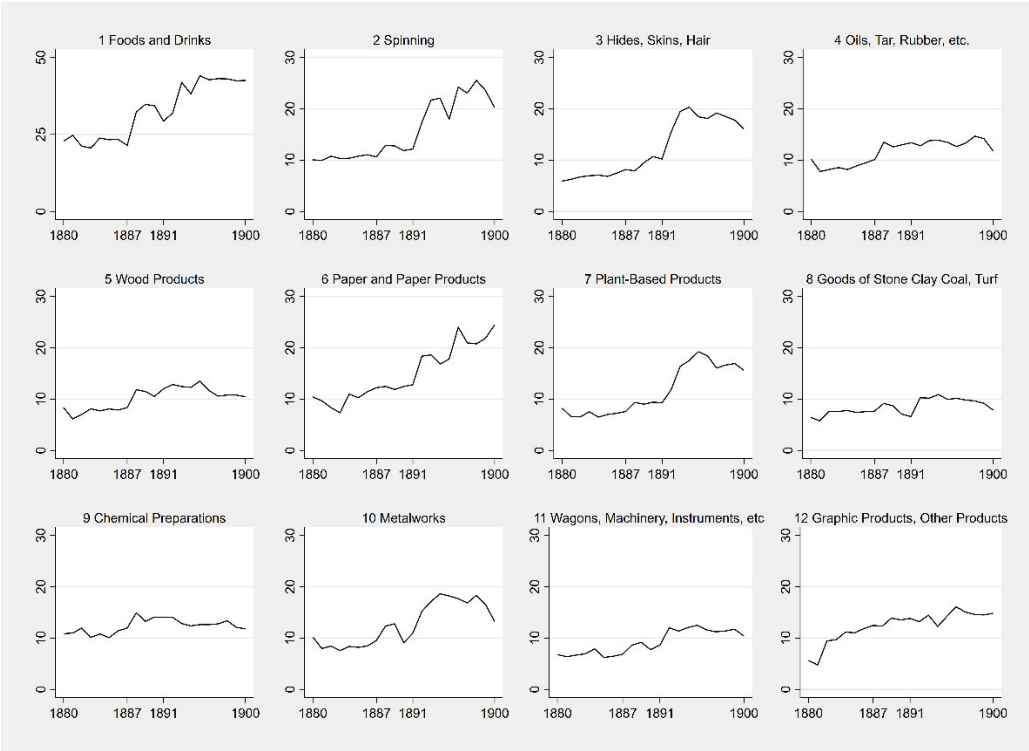


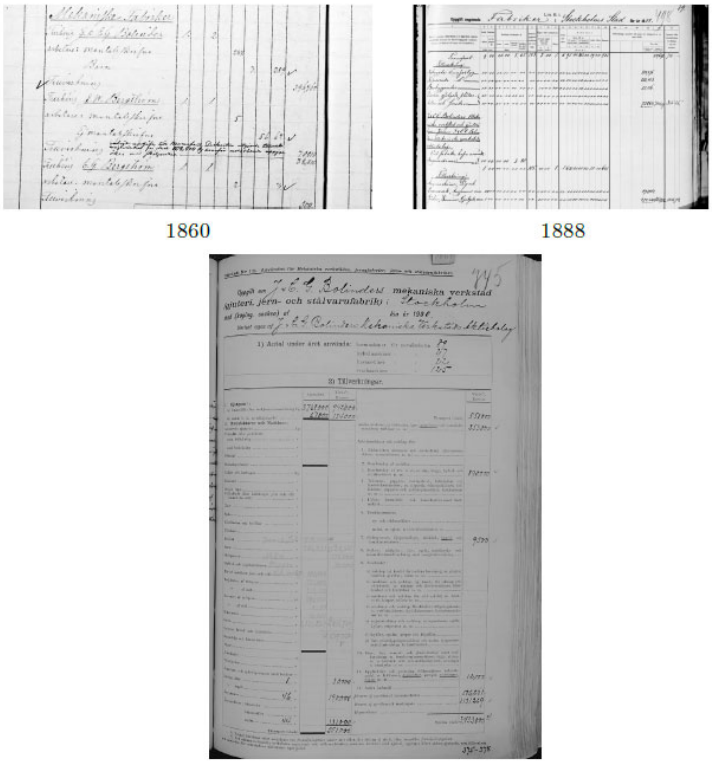
Figure 2: Industry-level Swedish tariffs in percent (Data: Persarvet, 2019; own representation)

Data

I leverage the Industrial Statistics of Sweden (*Fabriksberättelser*), a newly digitized dataset providing detailed information on the performance of all manufacturing firms. It states the location, name, and industry of firms together with their sales, profits, and number of workers. Figure 3 shows examples of the questionnaires used by the state to collect the data. I use the years 1891 to 1900 since this is when the tariff issue was most prominent in Sweden (Persarvet, 2019) and calculate my main outcome variable measuring firm-level productivity as *ln(Sales/Workers)*.

The data are separately recorded and digitized for each year. To build a yearly panel, I code an algorithm based on principles of automatic record linkage (Ruggles, 2006). Firms in the same region and industry are linked across years if they have similar firm or owner names according to Jaro-Winkler or Levenshtein distances, a statistic measuring the similarity of names. The panel is manually checked and corrected.

I combine this data with unweighted average industry-level tariffs by Persarvet (2019). Figures 2-3 show the development of the Swedish tariffs during the late nineteenth century, which is characteristic for this period. After a period of openness, Sweden returned to protectionist policies in 1888 and increased industrial tariffs in 1892 (Persarvet, 2019).



1860 1888

1890

Figure 3: The raw data

Methodology

Equation 1 states the baseline regression. Y_{ijt} is an outcome variable such as productivity for firm i in industry j in year t. Firm and region by year fixed effects control for time-invariant firm-level characteristics and common shocks in a year and region. C_{ijt} includes a vector of controls as denoted in the regression tables. $Tariff_{jt}$ measures the industry-level tariff.

$$Y_{ijt} = \beta_0 + \beta_1 Tariff_{jt} + \beta_2 Tariff_{jt} * DummyProductivity_{ijt_0} + FirmFE_i + Region_r * Year_t + \beta_n C_{ijt} + \varepsilon_{ijt} \quad [1]$$

As motivated above, it is necessary to condition on initial firm-level characteristics when estimating the impact of tariffs. I focus on firms active in 1891 as they experienced the tariff increase in 1892. $DummyProductivity_{ijt0}$ is a dummy indicating in which quartile of the industry-wide productivity distribution an individual firm fell in 1891. It ranges from 0, the lowest quartile and reference group, to 3 with the initially most productive firms. The interaction between $Tariff_{jt}$ and $DummyProductivity_{ijt0}$ allows me to test the hypothesis that initially less productive firms benefit more from tariff protection, i.e. I expect β_1 to be positive but β_2 to be increasingly negative. I use two-way cluster-robust standard errors at the firm- as well as industry-year-level to account for serial correlation and possible heteroscedasticity.

One concern is that tariffs are endogenous e.g. due to lobbying by firms (Amiti & Konings, 2007). The included industry and year fixed effects account for this issue if some industries are systematically protected over time or all industries receive in one year a common protective shock (Goldberg & Pavcnik, 2005). Additionally, I show that the lagged industry-level productivity does not predict current tariffs (Appendix 1).

Results

Table 1 shows summary statistics and Table 2 shows the main results. Figure 4 represents them graphically. I begin by regressing firm-level productivity on tariffs without conditioning on the initial firm-level characteristics (Specification 1). The effect is small and statistically insignificant.

Statistically and economically significant results only emerge when considering initial differences in firm-level productivity. Given a tariff increase of one percentage point, the initially least productive firms increase their productivity by about three percent while the initially most productive firms decrease their productivity by three percent (Specifications 2-3). Thus, firm-level heterogeneity matters when estimating the impact of tariffs (Chen & Steinwender, 2019; Iacovone, 2012). Firms between these extremes notice smaller changes. The results are similar in size to contemporary ones by e.g. Bombardini et al. (2018).

The importance of considering firm-level heterogeneity is reflected even more when collapsing all observations to the industry-level in spirit of previous studies on the tariff-growth paradox. Table 3 shows that the industry-level impact of tariffs is much smaller and often statistically insignificant compared to the firm-level results.

Thus, the key insight of this paper is that tariffs do not have a consistent impact on growth. There are mediating forces such as initial differences in firm-level characteristics, which matter for how tariffs impact firms. These differences can then contribute to the inconclusive findings at the aggregate level as documented by Lampe and Sharp (2013).

Robustness checks

The results are robust to multiple checks. First, I include different control variables and exclude firms that switch industry or exit the market (Table 2). Second, I use different empirical specifications. The results remain similar when using the distance to the productivity frontier instead of dummies to determine initial firm-level productivity[1] and when deflating sales by a price index developed in Ljungberg (1990) (Appendices 2-3).

A different concern is whether ln(Sales/Workers) is an appropriate measure of firm-level productivity. Similar results emerge when I use *ln(Profits/Worker), ln(Workers), ln(Sales)*, and *ln(Profits)* as proxies (Appendices 4-7).[2]

Lastly, the results remain similar when rerunning the whole analysis using 1887 as a base year (Appendix 8). This was the period when industrial tariffs were first increased but were still bound by international treaties and could not freely fluctuate (Persarvet, 2019).

[1] I calculate the distance to the productivity frontier by dividing the productivity of the leading firm in an industry by the productivity of a given firm. The mean distance is 1.4.

[2] The results are flipped when using ln(Workers). However, they are much smaller suggesting that tariffs did not have a large impact on the number of workers at a factory.

Table 1: Summary statistics

	N	Mean	SD	Min.	p50	Max.
ln Productivity (Sales / Workers)	24,006	7.316	1.136	0	7.365	13.02
ln Productivity (Profits / Workers)	19,612	5.370	1.128	-1.562	5.416	11.51
ln Workers	24,738	2.317	1.574	-0.693	2.197	9.905
ln Sales	25,252	9.521	2.199	0.916	9.459	16.06
ln Profits	20,306	7.761	1.784	-0.693	7.824	14.20
Tariff Rate	26,629	18.68	10.384	6.578	15.47	44.05
Year	26,629	1894.6	2.766	1891	1894	1900
Dummy Initial Productivity ln(Sales / Workers)	23,537	1.538	1.107	0	2	3
Dummy Initial Productivity ln(Profits / Workers)	19,055	1.514	1.118	0	2	3

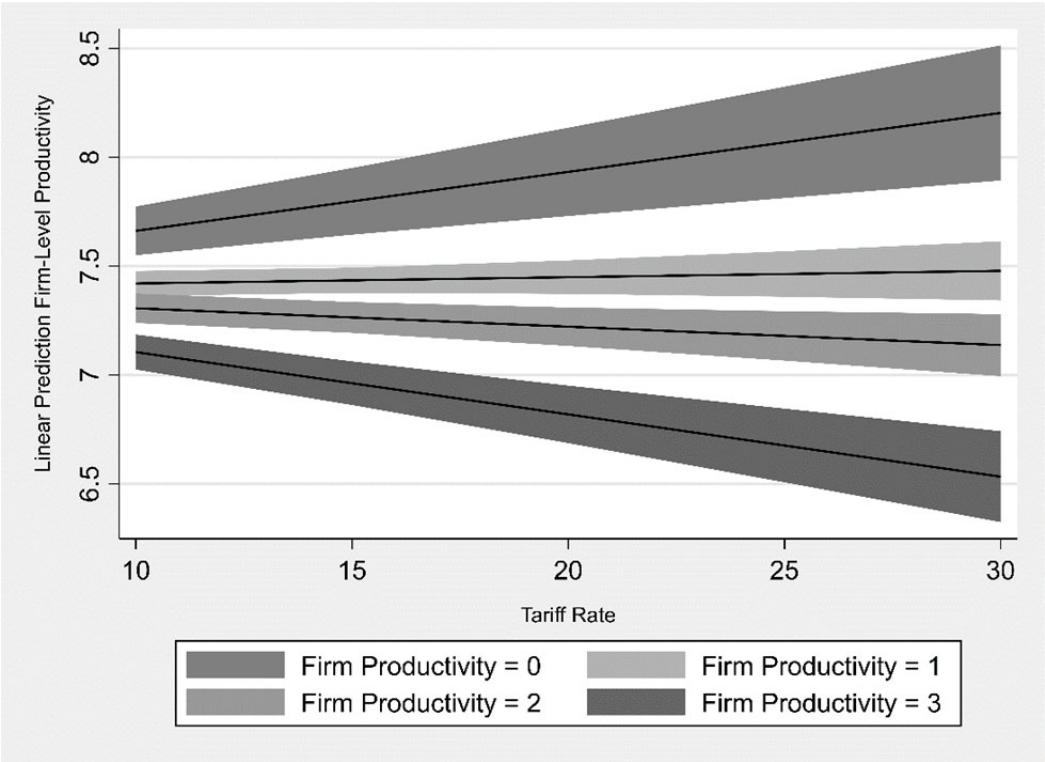


Figure 4: The results graphically

Table 2: Main results

	(1) All Firms	(2) All Firms	(3) All Firms	(4) One Industry	(5) All Firms	(6) Staying Firms
Tariff Rate	-0.004	0.027***	0.026***	0.027***	0.026***	0.036***
	(0.003)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)
	0.188	0.000	0.000	0.000	0.000	0.000
Tariff Rate * Dummy Productivity Firm = 1		-0.025***	-0.024***	-0.026***	-0.025***	-0.032***
		(0.006)	(0.006)	(0.006)	(0.006)	(0.007)
		0.000	0.000	0.000	0.000	0.000
Tariff Rate * Dummy Productivity Firm = 2		-0.035***	-0.035***	-0.039***	-0.037***	-0.044***
		(0.006)	(0.006)	(0.007)	(0.006)	(0.008)
		0.000	0.000	0.000	0.000	0.000
Tariff Rate * Dummy Productivity Firm = 3		-0.056***	-0.055***	-0.057***	-0.057***	-0.062***
		(0.008)	(0.008)	(0.008)	(0.008)	(0.010)
		0.000	0.000	0.000	0.000	0.000
Firm Exit = 1					-0.014	
					(0.020)	
					0.474	
Within R-Squared	0.002	0.016	0.017	0.017	0.019	0.022
Number of Observations	22,571	22,571	22,571	22,052	21,145	12,176
Number of Firms	3,319	3,319	3,319	3,239	3,316	1,513
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	No	Yes	N/A	Yes	Yes
Region by Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry Growth Workers	Yes	No	Yes	Yes	Yes	Yes
Herfindahl–Hirschman Index Workers	Yes	No	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes

Table 3: Industry -level

	(1) ln Productivity (Sales / Workers)	(2) ln Productivity (Profits / Workers)	(3) ln Workers	(4) ln Sales	(5) ln Profits	(6) ln Active Factories
Tariff Rate	-0.014**	-0.014	-0.004	-0.018	-0.018	0.004
	(0.005)	(0.011)	(0.010)	(0.012)	(0.019)	(0.027)
	0.020	0.236	0.685	0.156	0.352	0.894
Within R-Squared	0.041	0.026	0.002	0.045	0.021	0.001
Number of Observations	120	120	120	120	120	120
Number of Industries	12	12	12	12	12	12
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes

Potential channels

The key finding of this paper is the substantial heterogeneity in the response of Swedish firms to tariff increases. This section discusses potential explanations.

One potential channel is technology adoption. Behind tariffs, it could e.g. become especially for lagging firms profitable to improve their technological level resulting in higher productivity. I test this channel by using a similar regression with different outcome variables measuring the technological level of a firm (Table 4). However, the small and largely insignificant coefficients suggest that tariffs did not have a large impact on technology adoption.

A different channel emphasizes that firms using imported inputs could be negatively impacted by tariffs due the increased price of inputs. Unfortunately, the data do not state which firm used

imported inputs. However, it is possible to identify foreign firms.[3] Arguably, especially these firms used imported inputs due to their international ties. In Table 5, I use a three-way interaction to evaluate whether they were especially negatively affected by the tariffs.[4] Table 6 states the associated marginal effects. Given the statistically insignificant results in Specification (2) of Table 5, it is unlikely that foreign firm and the usage of inputs are driving the findings.

In contrast, the modern firm-level tariff literature suggests that tariffs affect firm-level productivity by differentially changing the incentives of managers of low- and high-productivity firms to organize and manage their firms efficiently. The focus on managerial efforts includes e.g. the ability to learn from failures, a better organization of the inventory, learning how to early diagnose failures, and repairing machinery (Bloom et al., 2013).

This literature proposes two effects, which assume that an increase in tariffs reduces competitive pressures in the economy. According to the Schumpeterian effect, this increases the postinnovation rents of especially low-productivity firms. They respond by increasing their innovative efforts and thus notice an increase in firm-level productivity. The escape-competition effect argues that a reduction in competition increases the preinnovation rents of especially high-productivity firms. This leads to a decline in innovative efforts and firm-level productivity (Chen & Steinwender, 2019).

Overall, findings in my paper are consistent with these two effects as I show that initially low-/high-productivity firms notice a rise/decline in productivity. But since the regression estimates an overall effect, it is difficult to determine which effect was more important.

To imperfectly distinguish between these two channels, I run in Table 5 similar triple interactions between initial productivity, tariffs, and a dummy for whether a firm was a corporation or company.[5] These regressions are motivated by current evidence suggesting that corporations are better managed than family-firms (Bloom et al., 2012). The overall statistically significant triple interactions in Specifications (3-4) suggest that especially initially high-productivity family-firms noticed reductions in their productivity after the tariff increases. In contrast, initially low-productivity family firms and companies noticed almost identical changes. This is suggestive evidence that the escape-competition effect mattered more.

[3] The raw data states the place of residence of individual firm owners. I identify foreign-owned firms as those where the owner does not reside in Sweden.

[4] For simplicity, I define the dummy measuring initial firm-level productivity in the following regressions as taking one if a firm is above the median industry-level productivity and zero otherwise.

[5] Companies are stated as such in the data. I apply a string-search algorithm to identify corporations. I supplement this algorithm with information from the Swedish register on corporations. I use the earliest potential year as the year when a firm incorporated.

Table 4: Technology adoption

	(1) Has Steam Engine = 1	(2) Has Water Power = 1	(3) Has Animal Power = 1	(4) Has Other Powersources = 1	(5) Has Machines = 1
Tariff Rate	0.000	-0.002	0.002*	-0.001	-0.000
	(0.001)	(0.001)	(0.001)	(0.002)	(0.004)
	0.821	0.135	0.050	0.440	0.924
Tariff Rate * Dummy Productivity Firm = 1	-0.000	0.002	-0.002	0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
	0.914	0.121	0.117	0.371	0.800
Tariff Rate * Dummy Productivity Firm = 2	-0.001	0.001	-0.001	0.003**	-0.000
	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)
	0.512	0.370	0.145	0.049	0.949
Tariff Rate * Dummy Productivity Firm = 3	0.001	0.002*	-0.002*	0.004**	0.005**
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
	0.714	0.100	0.064	0.024	0.018
Firm Exit = 1	-0.019***	-0.016***	-0.014**	-0.025***	-0.071***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.014)
	0.001	0.006	0.015	0.000	0.000
Within R-Squared	0.001	0.003	0.001	0.004	0.007
Number of Observations	22,013	22,013	22,013	22,013	22,013
Number of Firms	3,356	3,356	3,356	3,356	3,356
Firm FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Region by Year FE	Yes	Yes	Yes	Yes	Yes
Industry Growth Workers	Yes	Yes	Yes	Yes	Yes
Herfindahl–Hirschman Index Workers	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes

Table 5: Potential channels

	(1) All Firms	(2) Dummy Foreign = 1	(3) Dummy Corporation = 1	(4) Dummy Company = 1
Tariff Rate	0.013***	0.013***	0.011***	0.012***
	(0.004)	(0.004)	(0.004)	(0.004)
	0.001	0.002	0.004	0.003
Dummy More Productive = 1 * Tariff Rate	-0.033***	-0.033***	-0.037***	-0.042***
	(0.005)	(0.004)	(0.005)	(0.005)
	0.000	0.000	0.000	0.000
Firm Exit = 1	-0.016	-0.016	-0.018	-0.016
	(0.020)	(0.020)	(0.020)	(0.020)
	0.436	0.436	0.385	0.431
Tariff Rate * Dummy Foreign Business = 1		0.002		
		(0.016)		
		0.906		
Tariff Rate * Dummy More Productive = 1 * Dummy Foreign Business = 1		0.003		
		(0.016)		
		0.866		
Dummy Corporation = 1			0.131	
			(0.106)	
			0.219	
Tariff Rate * Dummy Corporation = 1			0.002	
			(0.006)	
			0.714	
Tariff Rate * Dummy More Productive = 1 * Dummy Corporation = 1			0.011	
			(0.007)	
			0.127	
Dummy Company = 1				0.097
				(0.101)
				0.342
Tariff Rate * Dummy Company = 1				-0.002
				(0.004)
				0.678
Tariff Rate * Dummy More Productive = 1 * Dummy Company = 1				0.017***
				(0.005)
				0.000
Within R-Squared	0.013	0.013	0.015	0.016
Number of Observations	21,145	21,145	21,145	21,145
Number of Firms	3,316	3,316	3,316	3,316
Firm FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Region by Year FE	Yes	Yes	Yes	Yes
Industry Growth Workers	Yes	Yes	Yes	Yes
Herfindahl–Hirschman Index Workers	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes

Table 6: Marginal effects

	(1) ... Dummy Foreign Business	(2) ... Dummy Corporation	(3) ... Dummy Company
Marginal Effect of Increasing Tariffs by One Percentage Point and ...			
Dummy More Productive = 0 and ... = 0	0.013***	0.011***	0.012***
	(0.004)	(0.004)	(0.004)
	0.001	0.003	0.002
Dummy More Productive = 0 and ... = 1	0.014	0.014**	0.010**
	(0.016)	(0.006)	(0.005)
	0.356	0.037	0.026
Dummy More Productive = 1 and ... = 0	-0.020***	-0.025***	-0.030***
	(0.003)	(0.004)	(0.004)
	0.000	0.000	0.000
Dummy More Productive = 1 and ... = 1	-0.016**	-0.012***	-0.015***
	(0.006)	(0.004)	(0.003)
	0.012	0.001	0.000

Conclusion

Studies on the tariff-growth paradox provide inconclusive results on the historical impact of tariffs, which is at least partially due to their usage of aggregate data. In contrast, micro-level data can potentially better determine through which channels tariffs impact economic development. Leveraging detailed Swedish firm-level data and using the Swedish shift back into protectionism in the late nineteenth-century as an example, I show that only initially low-productivity firms profit from tariff protection whereas initially high-productive firms are hurt. These dynamics are consistent with modern trade dynamics and can explain why there is no effect at the aggregate level. To explain the results, I provide suggestive evidence that tariffs differentially shape the incentives of the managers to organize their production efficiently. More broadly, my findings suggest that the inconclusive results of the tariff-growth paradox are at least partially driven by firm-level heterogeneity.

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Appendix

Appendix 1: Lagged productivity does not predict tariffs

	(1) 1880-1900	(2) 1880-1887	(3) 1887-1900	(4) 1887-1891	(5) 1891-1900
ln Industry-Level Productivity (Sales / Workers) One Lag	1.803	0.115	-0.037	-1.721	-0.591
	(2.083)	(0.524)	(2.673)	(1.979)	(1.583)
	0.405	0.831	0.989	0.403	0.716
Within R-Squared	0.013	0.001	0.000	0.005	0.001
Number of Observations	252	96	168	60	120
Number of Industries	12	12	12	12	12
Industry FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes

Appendix 2: Productivity as outcome with the distance to the productivity frontier

	(1) All Firms	(2) All Firms	(3) All Firms	(4) One Industry	(5) All Firms	(6) Staying Firms
Tariff Rate	-0.004	-0.130***	-0.134***	-0.136***	-0.137***	-0.148***
	(0.003)	(0.018)	(0.018)	(0.019)	(0.019)	(0.023)
	0.188	0.000	0.000	0.000	0.000	0.000
Tariff Rate * Distance to Productivity Frontier		0.084***	0.086***	0.088***	0.088***	0.099***
		(0.012)	(0.013)	(0.013)	(0.013)	(0.016)
		0.000	0.000	0.000	0.000	0.000
Firm Exit = 1					-0.015	
					(0.020)	
					0.479	
Within R-Squared	0.002	0.019	0.021	0.020	0.023	0.026
Number of Observations	22,571	22,571	22,571	22,052	21,145	12,176
Number of Firms	3,319	3,319	3,319	3,239	3,316	1,513
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	No	Yes	N/A	Yes	Yes
Region by Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry Growth Workers	Yes	No	Yes	Yes	Yes	Yes
Herfindahl–Hirschman Index Workers	Yes	No	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes

Appendix 3: Productivity as outcome with deflated sales

	(1) All Firms	(2) All Firms	(3) All Firms	(4) One Industry	(5) All Firms	(6) Staying Firms
Tariff Rate	0.008*	0.038***	0.038***	0.039***	0.038***	0.049***
	(0.004)	(0.006)	(0.006)	(0.007)	(0.006)	(0.008)
	0.057	0.000	0.000	0.000	0.000	0.000
Tariff Rate * Dummy Productivity Firm = 1		-0.026***	-0.025***	-0.026***	-0.025***	-0.032***
		(0.006)	(0.006)	(0.006)	(0.006)	(0.007)
		0.000	0.000	0.000	0.000	0.000
Tariff Rate * Dummy Productivity Firm = 2		-0.035***	-0.035***	-0.039***	-0.037***	-0.044***
		(0.007)	(0.006)	(0.007)	(0.006)	(0.008)
		0.000	0.000	0.000	0.000	0.000
Tariff Rate * Dummy Productivity Firm = 3		-0.055***	-0.055***	-0.057***	-0.057***	-0.063***
		(0.008)	(0.008)	(0.008)	(0.008)	(0.010)
		0.000	0.000	0.000	0.000	0.000
Firm Exit = 1					-0.018	
					(0.021)	
					0.407	
Within R-Squared	0.005	0.017	0.021	0.018	0.023	0.027
Number of Observations	22,571	22,571	22,571	22,052	21,145	12,176
Number of Firms	3,319	3,319	3,319	3,239	3,316	1,513
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	No	Yes	N/A	Yes	Yes
Region by Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry Growth Workers	Yes	No	Yes	Yes	Yes	Yes
Herfindahl–Hirschman Index Workers	Yes	No	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes

Appendix 4: ln(Profits/Worker) as outcome

	(1) All Firms	(2) All Firms	(3) All Firms	(4) One Industry	(5) All Firms	(6) Staying Firms
Tariff Rate	-0.007**	0.044***	0.043***	0.046***	0.044***	0.056***
	(0.004)	(0.008)	(0.009)	(0.009)	(0.008)	(0.010)
	0.038	0.000	0.000	0.000	0.000	0.000
Tariff Rate * Dummy Productivity Firm = 1		-0.045***	-0.045***	-0.048***	-0.045***	-0.057***
		(0.008)	(0.008)	(0.008)	(0.008)	(0.010)
		0.000	0.000	0.000	0.000	0.000
Tariff Rate * Dummy Productivity Firm = 2		-0.062***	-0.062***	-0.066***	-0.063***	-0.073***
		(0.010)	(0.010)	(0.010)	(0.010)	(0.011)
		0.000	0.000	0.000	0.000	0.000
Tariff Rate * Dummy Productivity Firm = 3		-0.087***	-0.087***	-0.091***	-0.090***	-0.100***
		(0.012)	(0.012)	(0.012)	(0.011)	(0.013)
		0.000	0.000	0.000	0.000	0.000
Firm Exit = 1					0.036	
					(0.024)	
					0.139	
Within R-Squared	0.003	0.030	0.032	0.034	0.037	0.039
Number of Observations	16,646	16,646	16,646	16,276	15,589	9,216
Number of Firms	2,614	2,614	2,614	2,553	2,612	1,235
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	No	Yes	N/A	Yes	Yes
Region by Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry Growth Workers	Yes	No	Yes	Yes	Yes	Yes
Herfindahl–Hirschman Index Workers	Yes	No	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes

Appendix 5: ln(Workers) as outcome

	(1) All Firms	(2) All Firms	(3) All Firms	(4) One Industry	(5) All Firms	(6) Staying Firms
Tariff Rate	0.000	-0.008**	-0.007*	-0.008*	-0.008**	-0.009*
	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
	0.787	0.043	0.076	0.063	0.039	0.054
Tariff Rate * Dummy Productivity Firm = 1		0.005	0.005	0.005	0.005	0.003
		(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
		0.152	0.188	0.160	0.160	0.494
Tariff Rate * Dummy Productivity Firm = 2		0.014***	0.014***	0.016***	0.015***	0.015***
		(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
		0.001	0.001	0.000	0.001	0.002
Tariff Rate * Dummy Productivity Firm = 3		0.011**	0.010**	0.011**	0.012**	0.013**
		(0.005)	(0.005)	(0.005)	(0.005)	(0.006)
		0.019	0.024	0.019	0.013	0.023
Firm Exit = 1					-0.045***	
					(0.012)	
					0.000	
Within R-Squared	0.003	0.003	0.005	0.003	0.007	0.009
Number of Observations	22,736	22,736	22,736	22,216	21,302	12,243
Number of Firms	3,330	3,330	3,330	3,250	3,327	1,513
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	No	Yes	N/A	Yes	Yes
Region by Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry Growth Workers	Yes	No	Yes	Yes	Yes	Yes
Herfindahl–Hirschman Index Workers	Yes	No	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes

Appendix 6: ln(Sales) as outcome

	(1) All Firms	(2) All Firms	(3) All Firms	(4) One Industry	(5) All Firms	(6) Staying Firms
Tariff Rate	-0.003	0.019***	0.019***	0.019***	0.017***	0.027***
	(0.004)	(0.005)	(0.005)	(0.006)	(0.005)	(0.007)
	0.394	0.001	0.001	0.001	0.001	0.000
Tariff Rate * Dummy Productivity Firm = 1		-0.019***	-0.019***	-0.020***	-0.019***	-0.028***
		(0.005)	(0.005)	(0.005)	(0.005)	(0.006)
		0.000	0.000	0.000	0.000	0.000
Tariff Rate * Dummy Productivity Firm = 2		-0.021***	-0.021***	-0.023***	-0.022***	-0.028***
		(0.005)	(0.005)	(0.005)	(0.005)	(0.006)
		0.000	0.000	0.000	0.000	0.000
Tariff Rate * Dummy Productivity Firm = 3		-0.044***	-0.044***	-0.045***	-0.044***	-0.048***
		(0.006)	(0.006)	(0.006)	(0.006)	(0.008)
		0.000	0.000	0.000	0.000	0.000
Firm Exit = 1					-0.068***	
					(0.022)	
					0.002	
Within R-Squared	0.002	0.009	0.011	0.010	0.013	0.012
Number of Observations	23,037	23,037	23,037	22,516	21,581	12,375
Number of Firms	3,336	3,336	3,336	3,256	3,333	1,514
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	No	Yes	N/A	Yes	Yes
Region by Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry Growth Workers	Yes	No	Yes	Yes	Yes	Yes
Herfindahl–Hirschman Index Workers	Yes	No	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes

Appendix 7: ln(Profits) as outcome

	(1) All Firms	(2) All Firms	(3) All Firms	(4) One Industry	(5) All Firms	(6) Staying Firms
Tariff Rate	-0.008**	0.036***	0.035***	0.039***	0.036***	0.045***
	(0.003)	(0.007)	(0.007)	(0.007)	(0.007)	(0.009)
	0.016	0.000	0.000	0.000	0.000	0.000
Tariff Rate * Dummy Productivity Firm = 1		-0.041***	-0.041***	-0.045***	-0.042***	-0.050***
		(0.007)	(0.007)	(0.007)	(0.007)	(0.009)
		0.000	0.000	0.000	0.000	0.000
Tariff Rate * Dummy Productivity Firm = 2		-0.053***	-0.053***	-0.058***	-0.055***	-0.062***
		(0.008)	(0.008)	(0.008)	(0.008)	(0.011)
		0.000	0.000	0.000	0.000	0.000
Tariff Rate * Dummy Productivity Firm = 3		-0.070***	-0.070***	-0.074***	-0.073***	-0.078***
		(0.010)	(0.010)	(0.010)	(0.009)	(0.012)
		0.000	0.000	0.000	0.000	0.000
Firm Exit = 1					0.006	
					(0.027)	
					0.815	
Within R-Squared	0.002	0.022	0.024	0.026	0.028	0.029
Number of Observations	16,839	16,839	16,839	16,467	15,773	9,308
Number of Firms	2,623	2,623	2,623	2,562	2,621	1,238
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	No	Yes	N/A	Yes	Yes
Region by Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry Growth Workers	Yes	No	Yes	Yes	Yes	Yes
Herfindahl–Hirschman Index Workers	Yes	No	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes

Appendix 8: Using 1887 as a base year

	(1) All Firms	(2) All Firms	(3) All Firms	(4) One Industry	(5) All Firms	(6) Staying Firms
Tariff Rate	0.002	0.028***	0.028***	0.029***	0.029***	0.029***
	(0.003)	(0.007)	(0.008)	(0.008)	(0.008)	(0.007)
	0.531	0.000	0.000	0.000	0.000	0.000
Tariff Rate * Dummy Productivity Firm = 1		-0.021***	-0.021***	-0.022***	-0.021***	-0.021***
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
		0.003	0.005	0.002	0.004	0.005
Tariff Rate * Dummy Productivity Firm = 2		-0.031***	-0.031***	-0.035***	-0.033***	-0.031***
		(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
		0.000	0.000	0.000	0.000	0.000
Tariff Rate * Dummy Productivity Firm = 3		-0.047***	-0.047***	-0.049***	-0.048***	-0.047***
		(0.007)	(0.008)	(0.008)	(0.008)	(0.008)
		0.000	0.000	0.000	0.000	0.000
Firm Exit = 1					-0.052**	
					(0.022)	
					0.019	
Within R-Squared	0.001	0.018	0.019	0.019	0.020	0.023
Number of Observations	23,203	23,203	23,203	22,361	22,256	11,827
Number of Firms	2,457	2,457	2,457	2,367	2,457	1,008
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	No	Yes	N/A	Yes	Yes
Region by Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry Growth Workers	Yes	No	Yes	Yes	Yes	Yes
Herfindahl–Hirschman Index Workers	Yes	No	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes