Online Appendix for Improving Preferential Market Access Through Rules of Origin: Firm-level Evidence from Bangladesh

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A1 Additional Tables

Table A1: Specification tests

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$WOVEN_k$	0.234	0.040	0.092						
	(0.191)	(0.129)	(0.124)						
EU_j	1.056***	1.142***	1.200***						
	(0.252)	(0.172)	(0.185)						
$WOVEN_k * EU_j$	-0.358*	-0.321**	-0.343**						
	(0.191)	(0.143)	(0.138)						
$POST_t$	0.078	0.192**							
	(0.105)	(0.082)							
$WOVEN_k * POST_t$	-0.023	-0.012	-0.122***						
	(0.062)	(0.056)	(0.042)						
$EU_j * POST_t$	0.305***	0.193**	0.173**						
	(0.105)	(0.080)	(0.073)						
$WOVEN_k * EU_j * POST_t$	0.165***	0.154***	0.195***	0.326***	0.265***	0.219***	0.224***	0.258***	0.258**
	(0.062)	(0.050)	(0.037)	(0.044)	(0.049)	(0.053)	(0.068)	(0.059)	(0.105)
Observations	275,577	273,615	269,409	104,803	61,730	151,847	104,863	151,847	151,847
R-squared	0.064	0.202	0.246	0.903	0.954		0.742	0.720	0.720
firm fe		y							
firm-prod-year fe				y	y	y	y	y	y
firm-prod-dest fe				y		y	y	y	y
market-year fe						y	y	y	y
firm-market-year fe				y	y				
firm-prod-market fe					y				
firm-year fe			y						
GSP Only							y		
PPML						y			
cluster	market	market	market	market	market	market	market	market-HS2	market-HS2-year

Notes: This table presents the results from estimating equation (3) using alternative sets of fixed effects, estimation procedures, samples, and error cluster specifications. Column 7 is estimated using pseudo-Poisson maximum likelihood. Column 8 is estimated using only destinations with GSP programs.

Table A2: Event Study

	(1) Woven products DD	(2) Knit products DD	(3) DDD
$EU_j * 1(Year_t = 2008)$	0.0374	0.0978	
	(0.0718)	(0.0863)	
$EU_j * 1(Year_t = 2009)$	0.0760	0.0811*	
	(0.0636)	(0.0468)	
$EU_j * 1(Year_t = 2010)$	0.205**	0.0818**	
	(0.0927)	(0.0354)	
$EU_j * 1(Year_t = 2012)$	0.374***	0.0947	
	(0.121)	(0.0728)	
$EU_j * 1(Year_t = 2013)$	0.378***	-0.0350	
	(0.127)	(0.0763)	
$EU_j * WOVEN_k * 1(Year_t = 2008)$			-0.0822
			(0.0584)
$EU_j * WOVEN_k * 1(Year_t = 2009)$			-0.0448
			(0.0785)
$EU_j * WOVEN_k * 1(Year_t = 2011)$			0.0934
			(0.0743)
$EU_j * WOVEN_k * 1(Year_t = 2012)$			0.247***
			(0.0778)
$EU_j * WOVEN_k * 1(Year_t = 2013)$			0.407***
			(0.0986)
Observations	73,009	79,032	151,847
R-squared	0.550	0.644	0.720
firm-prod-year fe	y	y	y
firm-prod-dest fe	y	y	y
market-year fe			y

Notes: This table presents the results from estimating the event study versions of equations (1), (2), and (3), respectively. Errors allow for clustering at the market level. The year 2010 is used as a reference category.

Table A3: Event Study Robustness

	(1) Woven DD	(2) Knit DD	(3) DDD	(4) Woven DD	(5) Knit DD	(6) DDD	(7) Woven DD	(8) Knit DD	(9) DDD	(10) Woven DD	(11) Knit DD	(12) DDD	(13) Woven DD	(14) Knit DD	(15) DDD	(16) Woven DD	(17) Knit DD	(18) DDD
$EU_j * (Year_t = 2008)$	-0.00819	0.00244		-0.000189	0.0464		0.0298	0.0456		0.0855	0.0298		0.233***	0.150**		0.0714	0.0747	
	(0.108)	(0.0870)		(0.103)	(0.0862)		(0.0834)	(0.0903)		(0.0872)	(0.0856)		(0.0590)	(0.0584)		(0.0474)	(0.0640)	
$EU_j * (Year_t = 2009)$	0.0659	0.0998**		0.0178	0.127***		0.0390	0.126***		0.0835	0.121***		0.101*	0.153***		0.0760	0.0656*	
	(0.0455)	(0.0414)		(0.0433)	(0.0401)		(0.0494)	(0.0410)		(0.0579)	(0.0428)		(0.0542)	(0.0378)		(0.0607)	(0.0367)	
$EU_j * (Year_t = 2011)$	0.209***	0.156***		0.140**	0.136***		0.153***	0.0999**		0.220***	0.0798		0.0747	-0.0231		0.110	0.0292	
	(0.0697)	(0.0535)		(0.0627)	(0.0488)		(0.0496)	(0.0458)		(0.0831)	(0.0568)		(0.0577)	(0.0374)		(0.0697)	(0.0421)	
$EU_j * (Year_t = 2012)$	0.469***	0.275***		0.313***	0.213**		0.368***	0.183**		0.434***	0.0950		0.133*	-0.0969		0.0852	-0.0852	
	(0.114)	(0.0980)		(0.0947)	(0.0851)		(0.0724)	(0.0746)		(0.114)	(0.0867)		(0.0696)	(0.0722)		(0.0968)	(0.0737)	
$EU_j * (Year_t = 2013)$	0.686***	0.510***		0.482***	0.381***		0.518***	0.350***		0.501***	0.198**		0.0782	-0.0647		-0.0428	-0.234***	
	(0.135)	(0.114)		(0.106)	(0.103)		(0.0951)	(0.0936)		(0.142)	(0.0996)		(0.0826)	(0.0775)		(0.137)	(0.0834)	
$EU_j * WOVEN_K * (Year_t = 2008)$			-0.0106			-0.0285			-0.00207			0.0557			0.0138			-0.00807
			(0.0639)			(0.0629)			(0.0592)			(0.0487)			(0.0342)			(0.0622)
$EU_j * WOVEN_K * (Year_t = 2009)$			-0.0339			-0.0547*			-0.0522			-0.0378			-0.0627			-0.0112
			(0.0294)			(0.0302)			(0.0371)			(0.0492)			(0.0407)			(0.0784)
$EU_j * WOVEN_K * (Year_t = 2011)$			0.0536			0.0376			0.0438			0.140***			0.131***			0.0526
			(0.0355)			(0.0363)			(0.0301)			(0.0369)			(0.0449)			(0.0428)
$EU_j * WOVEN_K * (Year_t = 2012)$			0.194***			0.169***			0.248***			0.339***			0.305***			0.141***
			(0.0677)			(0.0608)			(0.0450)			(0.0730)			(0.0572)			(0.0519)
$EU_j * WOVEN_K * (Year_t = 2013)$			0.176**			0.158**			0.211***			0.304***			0.254***			0.164***
			(0.0786)			(0.0665)			(0.0587)			(0.0950)			(0.0880)			(0.0616)
Observations	127,378	148,199	275,577	125,598	146,365	273,615	121,627	142,025	269,409	80,784	89,659	170,443	80,756	89,629	170,419	46,912	48,992	95,752
R-squared	0.046	0.084	0.066	0.218	0.241	0.203	0.265	0.293	0.246	0.478	0.554	0.517	0.649	0.645	0.642	0.893	0.898	0.899
firm-prod-year fe										y	y	y	y	y	y	y	y	y
firm-prod-market fe																y	y	y
market-year fe																		y
market fe													y	y	y			
firm-year fe							y	y	y									
firm fe				y	y	y												

This table displays the results from estimating the event-study difference-in-differences and triple-difference specifications with alternate sets of fixed effects. The year 2010 is used as a reference category. Errors allow for clustering at the market level.

Table A4: Robustness of prices, quality, and quality-adjusted price response

	(1) price	(2) qual	(3) adj price	(4) price	(5) qual	(6) adj price	(7) price	(8) qual	(9) adj price	(10) price	(11) qual	(12) adj price	(13) price	(14) qual	(15) adj price
$EU_j * WOVEN_k * POST_t$	0.016	0.063**	-0.047***	0.003	0.112***	-0.109***	0.016	0.096***	-0.080***	0.014	0.102***	-0.088***	0.007	0.096***	-0.089***
	(0.010)	(0.024)	(0.017)	(0.013)	(0.023)	(0.015)	(0.016)	(0.026)	(0.017)	(0.017)	(0.026)	(0.016)	(0.017)	(0.026)	(0.016)
Observations	60,919	60,919	60,919	104,803	104,803	104,803	38,065	38,065	38,065	61,730	61,730	61,730	37,662	37,662	37,662
R-squared	0.797	0.663	0.699	0.896	0.856	0.884	0.909	0.879	0.898	0.940	0.926	0.944	0.937	0.922	0.940
firm-prod-year fe	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y
firm-prod-dest fe	y	y	y	y	y	y	y	y	y						
dest-year fe	y	y	y												
firm-dest-year fe				y	y	y	y	y	y	y	y	y	y	y	y
firm-prod-market fe										y	y	y	y	y	y
incumbents only	y	y	y				y	y	y				y	y	y

Notes: This table presents the results from estimating the response of prices, product quality, and quality-adjusted prices. Incumbent firms are defined as firms that exported a HS8 product to an export market at some point before and after the rules of origin revision in 2011. Errors allow for clustering at the export market level.

Table A5: Reallocation of market share across firm types

	(1) Incumbent	(2) Net entry	(3) Exit	(4) Prod Droppers	(5) Dest Droppers	(6) Complete Exit	(7) Entry	(8) Prod Adders	(9) Dest Adders	(10) Brand New
EU_j	0.549***	-0.549***	0.549***	0.014***	0.469***	0.067***	-0.502***	-0.010**	-0.422***	-0.070***
	(0.029)	(0.029)	(0.029)	(0.004)	(0.028)	(0.016)	(0.024)	(0.004)	(0.025)	(0.018)
$WOVEN_k$	0.070**	-0.070**	0.070**	-0.006	0.048*	0.028	-0.044	-0.002	0.023	-0.065***
	(0.029)	(0.029)	(0.029)	(0.009)	(0.027)	(0.020)	(0.027)	(0.005)	(0.030)	(0.023)
$EU_j * WOVEN_k$	-0.096***	0.096***	-0.096***	-0.007	-0.057**	-0.032	0.050*	0.006	-0.021	0.065***
	(0.029)	(0.029)	(0.029)	(0.009)	(0.027)	(0.020)	(0.027)	(0.005)	(0.030)	(0.023)
$POST_t$	-0.104***	0.104***								
	(0.019)	(0.019)								
$EU_j * POST_t$	-0.047**	0.047**								
	(0.019)	(0.019)								
$WOVEN_k * POST_t$	-0.026	0.026								
	(0.026)	(0.026)								
$EU_j * WOVEN_k * POST_t$	0.045*	-0.045*								
	(0.026)	(0.026)								
Observations	1,626	1,626	792	792	792	792	834	834	834	834
R-squared	0.285	0.285	0.269	0.006	0.212	0.011	0.263	0.003	0.219	0.011

Notes: This table presents the results from estimating equation (12). The dependent variable is the market share of a given type of firm, as described in the text and by equation (11). Errors allow for clustering at the export market level.

A2 Additional Figures

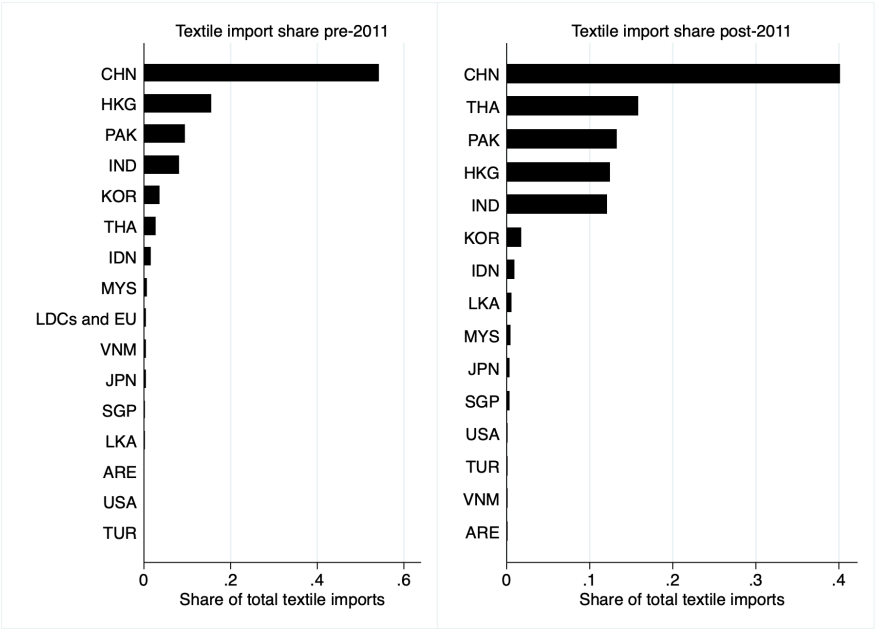

Figure A1: Textiles sourcing before and after the rules of origin revision in 2011

Notes: This figure displays the share of Bangladesh textile imports (based on import value) from different source countries. The EU and all LDCs are grouped together. The panel on the left displays the pre-2011 average annual shares, and the right panel displays the post-2011 average shares. Textiles fall under the HS2 heading HS60 (knit), and HS4 headings (woven): 5007, 5111, 5112, 5113, 5208, 5209, 5210, 5211, 5212, 5309, 5310, 5311, 5407, 5408, 5512, 5513, 5514, 5515, 5516, 5602, 5603, 5801, 5802, 5809, 5903, 5906, and 5907.

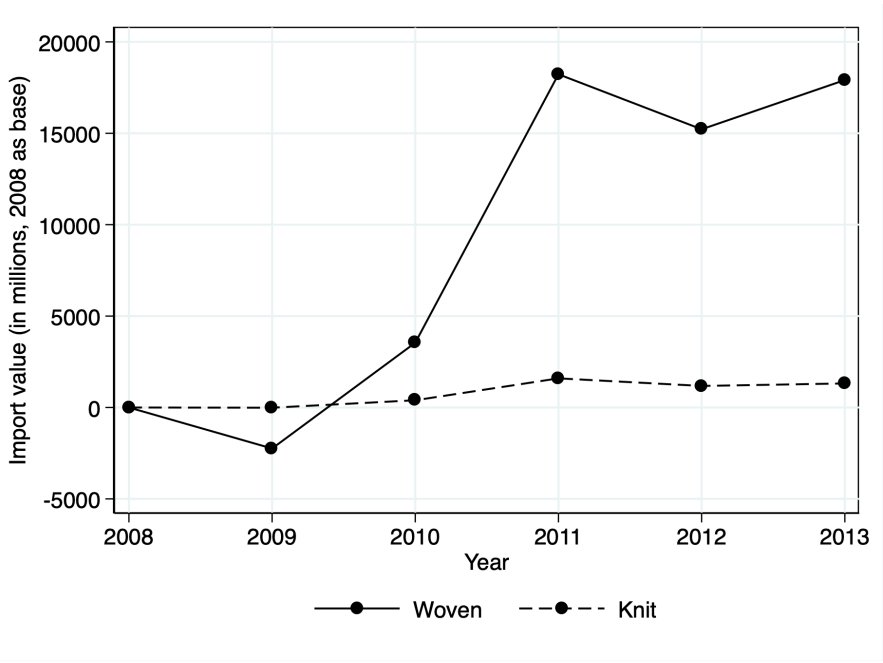

Figure A2: Textile imports

Notes: This figure displays the change in total woven and knit textile imports over time. 2008 is used as a base year. The data come from the UN's Comtrade database. Knit textiles fall under the HS2 heading HS60, and woven textiles have HS4 headings: 5007, 5111, 5112, 5113, 5208, 5209, 5210, 5211, 5212, 5309, 5310, 5311, 5407, 5408, 5512, 5513, 5514, 5515, 5516, 5602, 5603, 5801, 5802, 5809, 5903, 5906, and 5907.

A3 Additional tests and information

A3.1 Permutation tests

As an additional test, I use randomization inference to calculate the probability of observing the effect magnitudes I estimate in the previous section, conditional on fixed effects, under the null of no effect. This application of exact inference in the context of a difference-in-differences framework is similar to exercises in Conley and Taber (2011), and Bertrand, Duflo and Mullainathan (2004). For each margin (export revenue, product-level extensive, and firm-level extensive), I conduct three tests. First, I randomly shuffle which products are classified as woven and which are classified as knit while ensuring that the number of woven and knit products in the randomized sample is the same as the actual sample. I then re-estimate equation (3) using this created data set. I repeat this process 5,000 times, each time storing

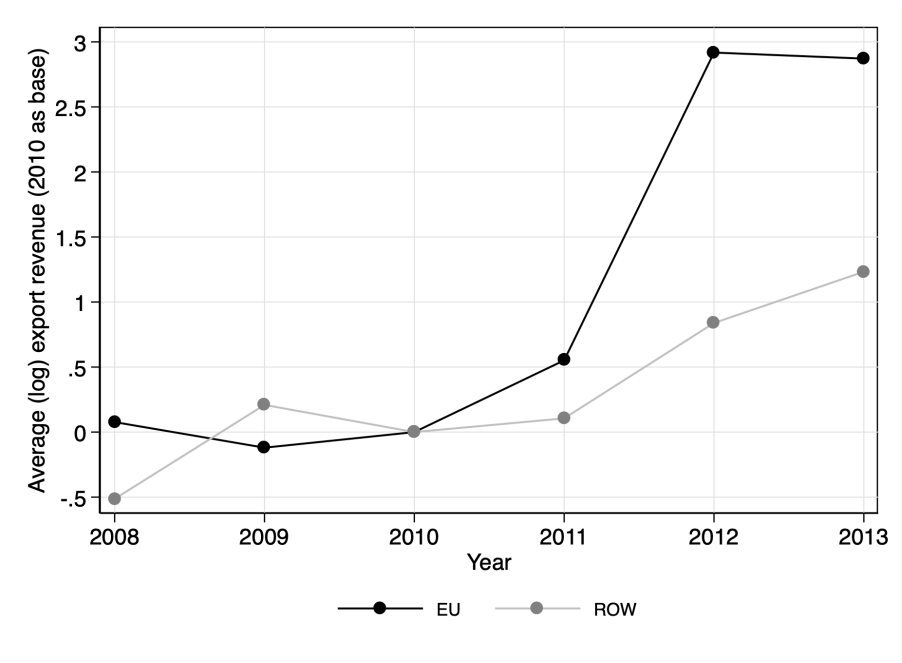

Figure A3: Coated Sales

Notes: This figure displays the trends in export revenue for woven apparel made from coated woven textiles (HS 6210), relative to sales in 2010. Sales are broken up by EU/ROW destinations.

the estimate of β_1, the coefficient on $EU_j * WOVEN_k * POST_t$. Then, I shuffle which years are classified as pre and post the rules of origin revision, and which destinations are EU using a similar process.

P-values are calculated under the sharp null of no effect ($\beta_1 = 0$) non-parametrically from the empirical null distribution as the ratio of the number of times the estimate under randomization was at least as large as the actual estimate relative to the total number of randomized evaluations of the triple-difference. Column (1) of Table A6 presents the results. I show the results when products are randomized, when destinations are randomized, and when years are randomized. In all cases, these p-values are less than 1%.

MacKinnon and Webb (2019) note that when treated groups have a different number of observations as control groups randomization inference based on beta coefficients can over-reject. This may be relevant in the context of this study. For example, 53% of HS8 level products are woven products and there are more non-EU

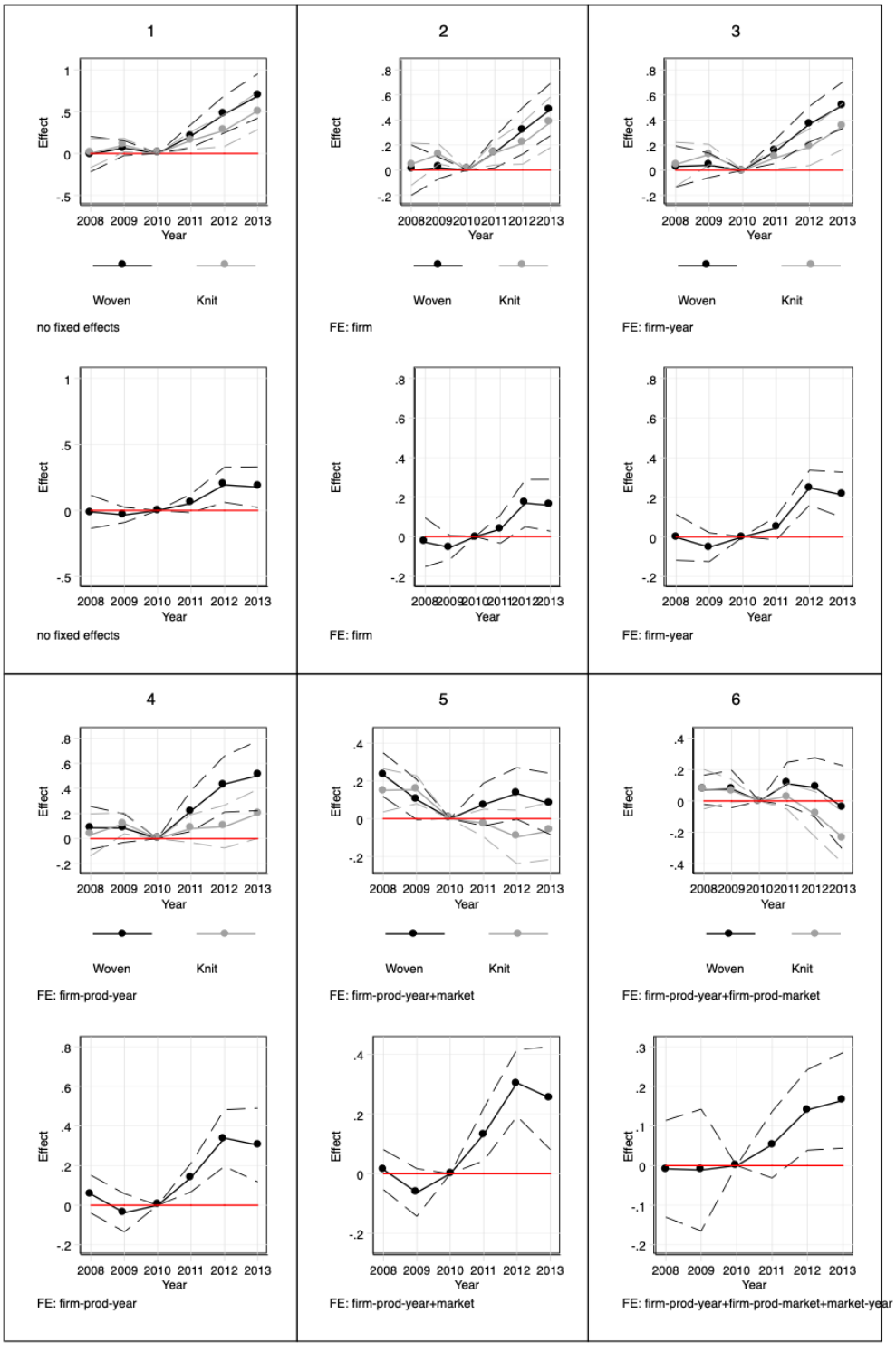

Figure A4: Event Study Robustness

This figure displays the DD and DDD event studies with different sets of fixed effects. The fixed effects included are shown in each panel. Estimates and 95% confidence intervals are show. Errors allow for clustering at the market level.

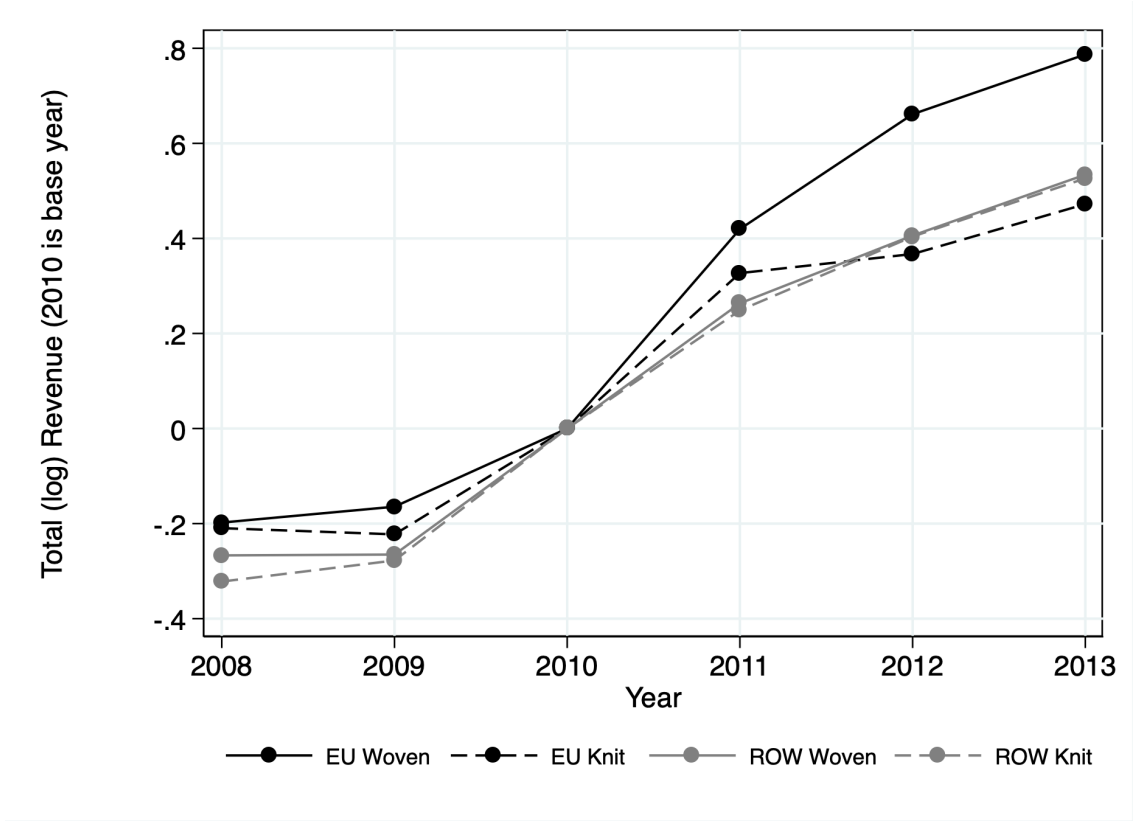

Figure A5: Trends in total export revenue

This figure displays the trends in total bilateral export revenue for woven and knit apparel between destinations, relative to the level in 2010.

countries than EU countries in the sample. As a secondary test, it is recommended to use t-statistics rather than coefficients. Randomization inference based on t-statistics tend to under-reject, making this a more conservative test (MacKinnon and Webb, 2019). I examine the probability of observing a t-statistic of at least 2 using the same permutation procedure described above. Column (2) of Table A6 presents the results of the permutation test based on t-statistics. Across all sources of randomization, the p-values are larger than the β_1 based p-values. In all cases, even these conservative p-values are less than 0.05.

Table A6: Permutation Tests

	p-value based on β_1	p-value based on t-statistic
Product randomization	< 0.001	0.007
Destination randomization	< 0.001	< 0.001
Year randomization	< 0.001	0.0132

Notes: This table presents the results from permutation tests. Non-parametric p-values are calculated based on random permutations of which products are classified as woven, or which destinations are classified as EU, or which years are classified as post-2011. The first column show the p-values based on estimates of the triple-difference effect (β_1 in equation 3). The second column presents p-values based on t-statistics. There were 5,000 replications used to produce results in both columns.

A3.2 Product quality

Following Khandelwal, Schott and Wei (2013), product quality enters consumer utility as an unobserved attribute of a variety that increases consumer willingness to purchase relatively large quantities of the variety despite the relatively high prices charged. The derivation begins with the assumption that there exists a representative consumer with CES utility given by: $U = (\int_{k\in\Omega}(q_k\lambda_k)^{\frac{\sigma-1}{\sigma}}dk)^{\sigma/(\sigma-1)}$, where q_k and λ_k represent the quantity and quality of product k, respectively. The elasticity of substitution across varieties is given by $\sigma > 1$, and Ω is the set of all products available.

From this set up, the demand for firm ϕ's specific variety of product k can be expressed as a function of the price, as well as its quality: $q_{jk}(\phi) = \lambda_{jk}(\phi)^{\sigma-1}p_{jk}(\phi)^{-\sigma}P_j^{\sigma-1}E_j$, where $p_{jk}(\phi)$ is the price of the variety, and P_j and E_j are the price index and expenditures. Taking logs, quality can be estimated at the firm-product-destination-year level as the residual of the OLS regression:

$$ln(q_{ijkt}) + \sigma ln(p_{ijkt}) = \alpha_k + \alpha_{jt} + \eta_{ijkt}$$

where α_{jt} controls for export market price indices and expenditures. Because prices and quantities are not necessarily comparable across apparel products, a product fixed effect (α_k) is included as well. Using $\sigma = 4$, the median elasticity for apparel products estimated in Broda and Weinstein (2006), and the elasticity used in Khandelwal, Schott and Wei (2013) to study Chinese apparel firms, product quality can

be recovered from the residual: $\hat{\lambda}_{ijkt} = \hat{\eta}_{ijkt}/(\sigma - 1)$. The quality-adjusted price is given by $ln(p_{ijkt}) - ln(\hat{\lambda}_{ijkt})$.

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