Unveiling Plant-Product Productivity via First-Order Conditions: Robust Replication of Orr (2022)*
Online Appendix: Additional Tables and Figures

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A Computational Reproducibility: Additional Results

Table A1: Demand Estimates

Estimates:	OLS	IV
p_{it}^{j}	0.007	-0.220
	(0.002)	(0.116)
$rs_{it}^{j\|g(j)}$	0.946	0.621
	(0.004)	(0.306)
Observations	64,917	64,917

First Stage:	p_{it}^{j}	$rs_{it}^{j\|g(j)}$
$Z_{t}^{g(j)}$	0.284	0.136
	(0.097)	(0.041)
Z_{it}^{-jg}	0.322	-0.186
	(0.198)	(0.108)
Observations	64,917	64,917

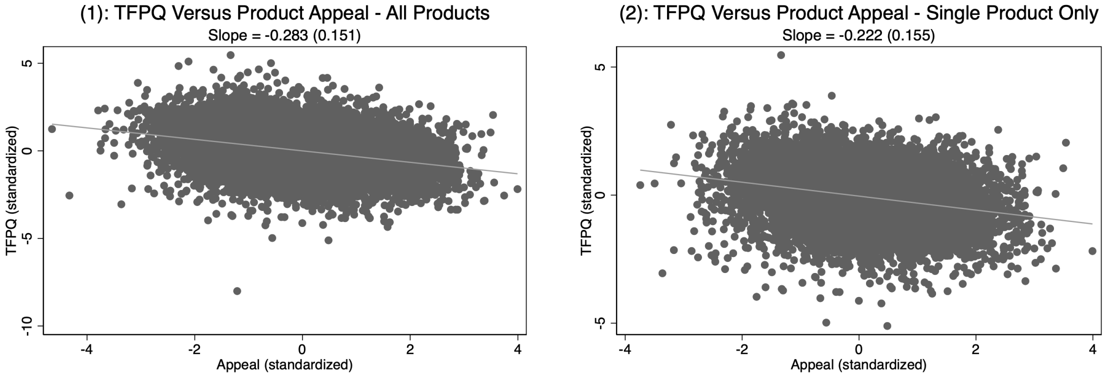
Notes: This table replicates Table 3 from Orr (2022). The calculations employ the 2000–2007 Indian Annual Survey of Industries (ASI) dataset from the Ministry of Statistics and Programme Implementation (MOSPI). All regressions control for firm age and include indicator variables for product code, year, state, census status, rural locations, organization type, ownership structure, and number of products. The Sanderson-Windmeijer F-statistics equal 16.36 for p_{it}^{j} and 10.07 for $rs_{it}^{j|g(j)}$. Standard errors cluster two-way by plant and product code.

Table A2: Computational Reproduction of Columns 2, 3, and 4 in Table 4 of Orr (2022): Cobb-Douglas Production Function Estimates

	GMM					
	(1)		(2)		(3)	
	Original Study	Rep.	Original Study	Rep.	Original Study	Rep.
β_L	0.331	0.325	0.321	0.315	0.626	0.617
	(0.192)	(0.192)	(0.191)	(0.191)	(0.261)	(0.261)
β_K	0.101	0.106	0.097	0.102	0.236	0.239
	(0.082)	(0.082)	(0.081)	(0.081)	(0.099)	(0.099)
β_M	0.790	0.789	0.806	0.806	0.217	0.223
	(0.191)	(0.191)	(0.186)	(0.186)	(0.352)	(0.352)
ρ^{74}	0.757	0.757	0.747	0.747	0.842	0.841
	(0.222)	(0.222)	(0.197)	(0.197)	(0.199)	(0.186)
ρ^{75}	0.657	0.658	0.661	0.661	0.670	0.670
	(0.082)	(0.082)	(0.078)	(0.078)	(0.068)	(0.068)
ρ^{76}	0.651	0.652	0.653	0.653	0.623	0.623
	(0.098)	(0.098)	(0.104)	(0.104)	(0.079)	(0.080)
ρ^{77}	0.420	0.420	0.422	0.422	0.541	0.540
	(0.062)	(0.062)	(0.060)	(0.060)	(0.087)	(0.088)
ρ^{78}	0.194	0.195	0.181	0.182	0.569	0.568
	(0.319)	(0.318)	(0.265)	(0.264)	(0.651)	(0.658)
RTS	1.222	1.220	1.224	1.223	1.078	1.078
	(0.084)	(0.084)	(0.080)	(0.080)	(0.113)	(0.112)
Ins.						
$(Z_t^{g(j)}, Z_{t-1}^{g(j)})$	✓	✓			✓	✓
m_{it-1}	✓	✓	✓	✓		
Observations	3,620	3,620	3,620	3,620	3,620	3,620

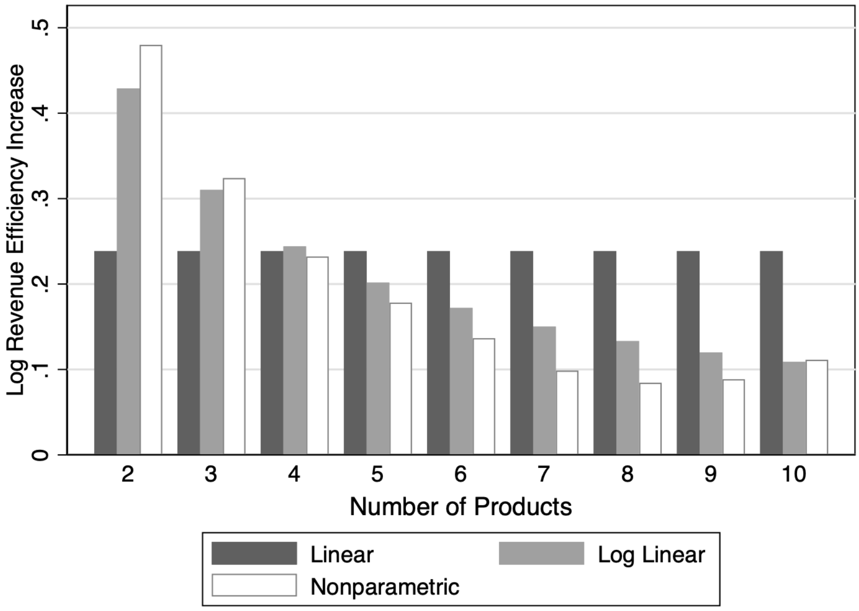
Notes: Columns 1, 2, and 3 present computational reproductions (Rep.) of Columns 2, 3, and 4, respectively, from Table 4 of Orr (2022) (Original Study). Calculations employ the 2000–2007 Indian ASI dataset provided by the Ministry of Statistics and Programme Implementation (MOSPI). Each observation represents a plant-product combination at the 5-digit ASICC variety level. The sample restricts analysis to producers within the machinery, equipment, and parts industry. The dependent variable captures the log quantity of product j produced by plant i. Parentheses report plant-level block bootstrapped standard errors with 1,000 replications.

Figure A1: Negative Correlation between TFPQ and Product Appeal



Notes: This figure replicates Figure 1 from Orr (2022). Appeal refers to η_{it}^{j}, while TFPQ refers to ω_{it}^{j}. The calculations employ the 2000–2007 Indian Annual Survey of Industries (ASI) dataset from the Ministry of Statistics and Programme Implementation (MOSPI). Both variables exhibit standardization to achieve zero mean and unit variance within each product code. Panel (1) encompasses all products while Panel (2) restricts analysis to single-product plants. Plant-level block bootstrapped standard errors appear in parentheses (1,000 replications).

Figure A2: Plant-Level Revenue Efficiency Growth After Removing Marginal Varieties



Notes: This figure replicates Figure 2 from Orr (2022). The figure displays the implied log revenue efficiency growth from removing a plant's lowest efficiency variety according to core-competence technology. The calculations employ the 2000–2007 Indian Annual Survey of Industries (ASI) dataset from the Ministry of Statistics and Programme Implementation (MOSPI). The y-axis denotes the change in plant-level log revenue efficiency after dropping a plant's worst product.

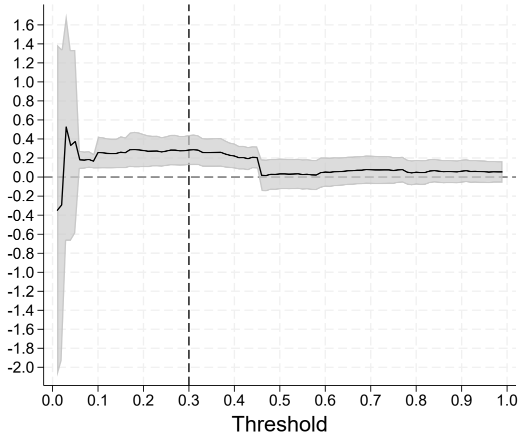
Table A3: Product-Dropping Probits (3,472 Observations)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
E_{it}^{j}	-0.0666							
	(0.0220)							
$\bar{P}_{t}^{g}$		-0.0318						-0.0253
		(0.0266)						(0.0271)
$\bar{A}_{it}^{j}$			-0.0403					-0.0390
			(0.0195)					(0.0199)
$\bar{C}_{it}^{j}$				0.0027				-0.0080
				(0.0173)				(0.0209)
$\hat{P}_{t}^{g}$					-0.0573			-0.0894
					(0.0218)			(0.0245)
$\hat{A}_{it}^{j}$						-0.0797		-0.1278
						(0.0194)		(0.0278)
$\hat{C}_{it}^{j}$							0.0087	-0.0700
							(0.0177)	(0.0370)

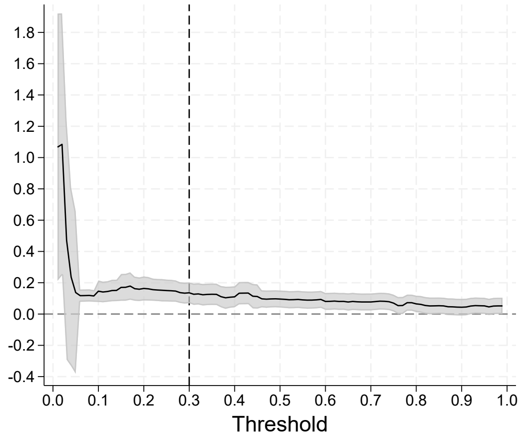
Notes: This table replicates Table 9 from Orr (2022), presenting marginal effects from a probit regression where the dependent variable indicates whether a plant discontinues production of a specific product in the subsequent period. The analysis uses plant–product observations from India's Annual Survey of Industries (ASI) dataset spanning 2000–2007, obtained from the Ministry of Statistics and Programme Implementation (MOSPI). The sample includes all producers within the machinery, equipment, and parts industry, with each observation representing a unique plant–product combination at the 5-digit ASICC classification level. Standard errors (in parentheses) are clustered at the plant level using block bootstrap with 1,001 replications.

B Robustness of Threshold for Instrument Construction: Additional Results

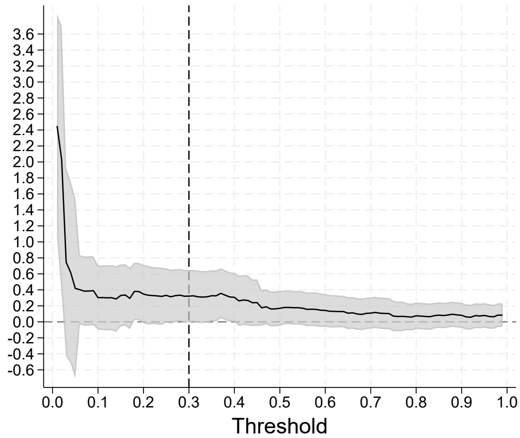
Figure A3: Sensitivity of First Stage Demand Estimates to Instrument Construction Threshold



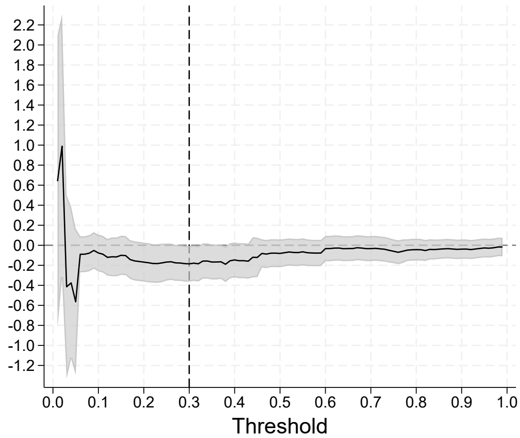
(a) First Stage Coefficient of p^j_{it} on $Z^{g(j)}_t$



(b) First Stage Coefficient of $rs^{j|g(j)}_{it}$ on $Z^{g(j)}_t$



(c) First Stage Coefficient of p^j_{it} on Z^{-jg}_{it}



(d) First Stage Coefficient of $rs^{j|g(j)}_{it}$ on Z^{-jg}_{it}

Notes: This figure displays changes in first-stage estimates reported in Table 3 of Orr (2022) as the instrument construction threshold varies in 0.01 increments. The y-axis presents distinct measures across panels: Panel (a) shows the estimated first-stage coefficient of p^j_{it} on $Z^{g(j)}_t$, Panel (b) displays the estimated first-stage coefficient of $rs^{j|g(j)}_{it}$ on $Z^{g(j)}_t$, Panel (c) reports the estimated first-stage coefficient of p^j_{it} on Z^{-jg}_{it}, and Panel (d) reports the estimated first-stage coefficient of $rs^{j|g(j)}_{it}$ on Z^{-jg}_{it}. All panels include 90% confidence intervals constructed using robust standard errors clustered by plant and product. A vertical dashed line marks the threshold employed in Orr (2022) (0.3). The calculations utilize the 2000–2007 Indian Annual Survey of Industries (ASI) dataset from the Ministry of Statistics and Programme Implementation (MOSPI).

C Robust Replication Using Different Sample Periods: Additional Results

Table A4: Plant-Year Summary Statistics: Machinery, Equipment, and Parts

Panel A: 2000–2007 Original Sample (20,701 Observations)

Variable	Mean	SD	Min	Max	Median
Log Labor	8.92	1.44	3.26	14.54	8.65
Log Capital Stock	15.15	2.25	-.09	23.48	14.94
Log Materials	6.91	3.29	-3.91	22.99	6.39
No. of varieties	1.55	1.31	1	28	1
Multiproduct	.26	.44	0	1	0

Panel B: 2010–2019 Sample (41,353 Observations)

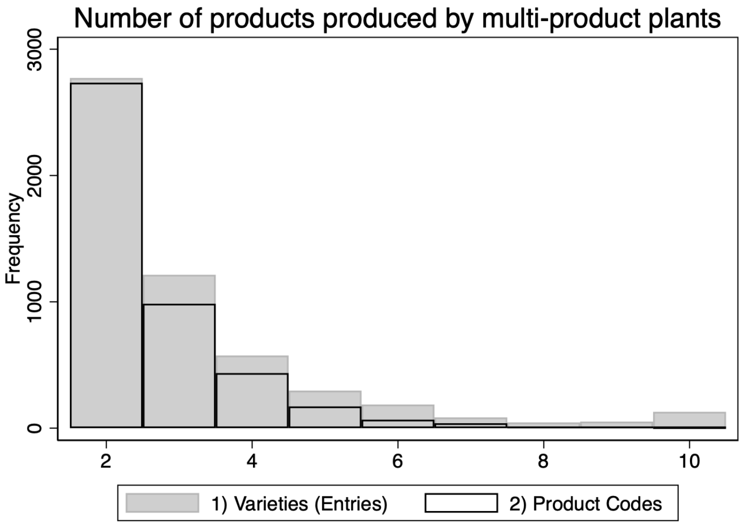
Variable	Mean	SD	Min	Max	Median
Log Labor	9.43	1.66	2.3	15.64	9.37
Log Capital Stock	16.06	2.43	-.7	24.63	16.07
Log Materials	7.71	3.33	-4.61	22.07	7.34
No. of varieties	1.21	.65	1	10	1
Multiproduct	.14	.34	0	1	0

Panel C: 2000–2019 Sample (71,079 Observations)

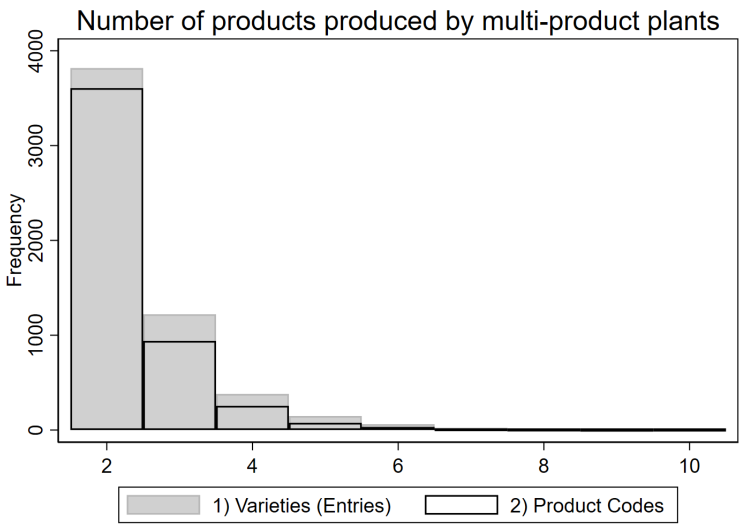
Variable	Mean	SD	Min	Max	Median
Log Labor	9.25	1.6	2.3	15.64	9.06
Log Capital Stock	15.75	2.4	-.7	24.32	15.65
Log Materials	7.44	3.35	-4.61	22.99	7.04
No. of varieties	1.36	1.01	1	28	1
Multiproduct	.19	.39	0	1	0

Notes: This table presents summary statistics across sample periods, replicating Table 2 from Orr (2022). The capital stock series is constructed using the perpetual inventory method. Consequently, maximum log capital stock values vary across sample periods due to differences in firm entry timing and subsequent accumulation paths. For instance, the firm with the largest capital stock in the 2010–2019 sample (24.63) enters the panel in 2010, whereas in the full 2000–2019 sample, this firm's earlier entry in 2008 generates a different accumulation trajectory.

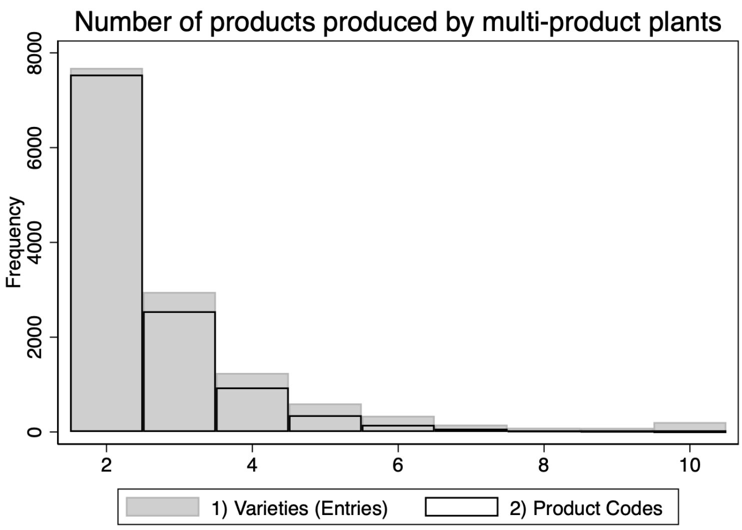
Figure A4: Product Counts: ASI Entries versus Number of Product Codes



(a) 2000–2007 Original Sample



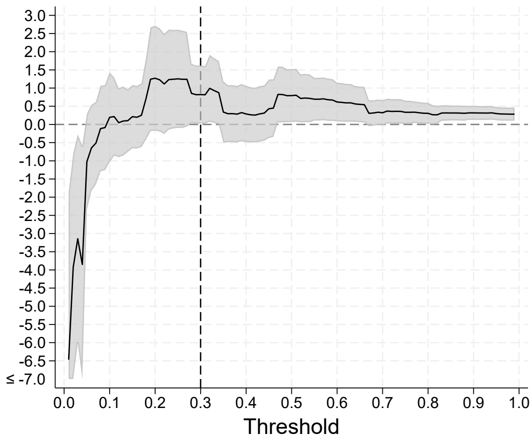
(b) 2010–2019 Sample



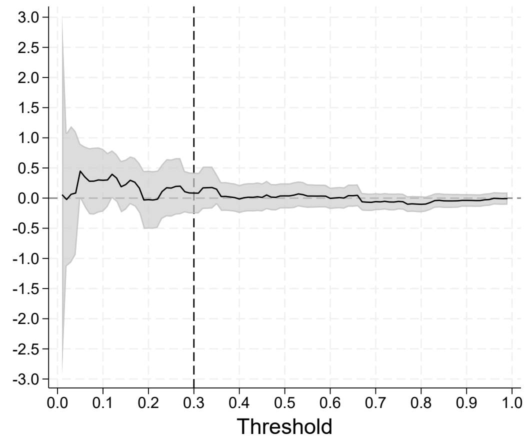
(c) 2000–2019 Sample

Notes: This figure reports plant-product counts by sample period, where product counts represent either (1) unique entries in the ASI database, permitting multiple entries per plant-product code, or (2) unique product codes within multi-product plants. The category ”10” includes plants reporting ten or more varieties.

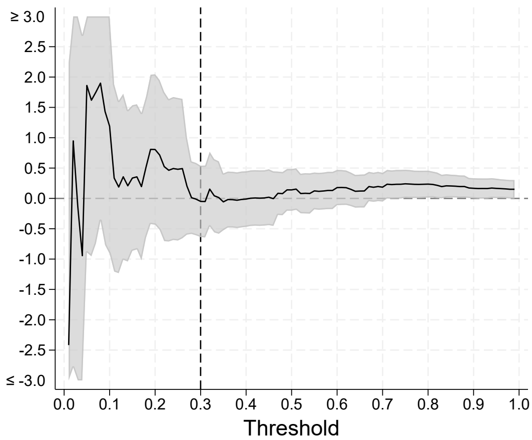
Figure A5: Sensitivity of First Stage Demand Estimates to Instrument Construction Threshold
Sample Period: 2010-2019



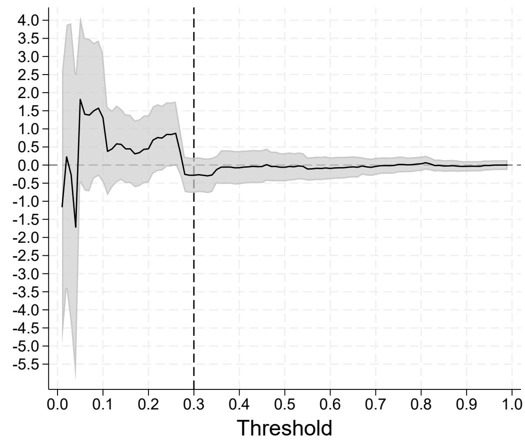
(a) First Stage Coefficient of p_{it}^{j} on $Z_t^{g(j)}$



(b) First Stage Coefficient of $rs_{it}^{j|g(j)}$ on $Z_t^{g(j)}$



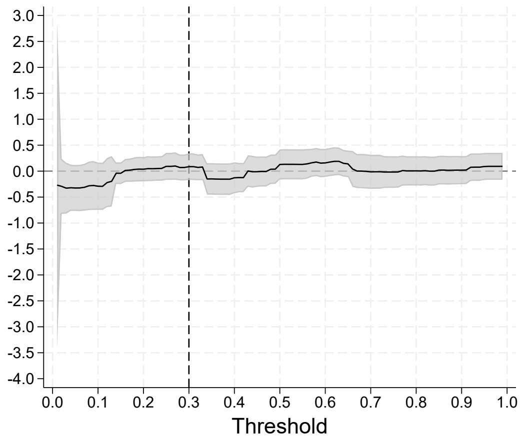
(c) First Stage Coefficient of p_{it}^{j} on Z_{it}^{-jg}



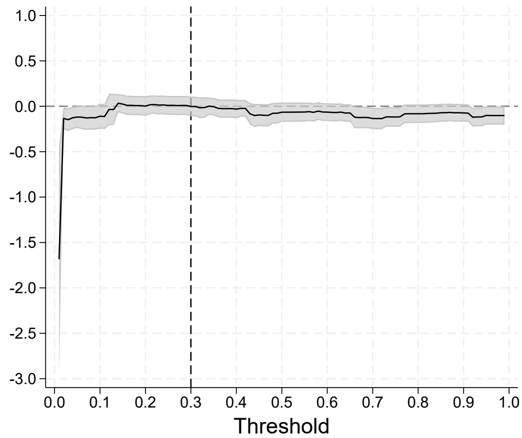
(d) First Stage Coefficient of $rs_{it}^{j|g(j)}$ on Z_{it}^{-jg}

Notes: This figure displays changes in first-stage estimates reported in Table 3 of Orr (2022) as the instrument construction threshold varies in 0.01 increments. The y-axis presents distinct measures across panels: Panel (a) shows the estimated first-stage coefficient of p_{it}^{j} on $Z_t^{g(j)}$, Panel (b) displays the estimated first-stage coefficient of $rs_{it}^{j|g(j)}$ on $Z_t^{g(j)}$, Panel (c) reports the estimated first-stage coefficient of p_{it}^{j} on Z_{it}^{-jg}, and Panel (d) reports the estimated first-stage coefficient of $rs_{it}^{j|g(j)}$ on Z_{it}^{-jg}. All panels include 90% confidence intervals constructed using robust standard errors clustered by plant and product. We bound the y-axis of panels (a) and (c) to [-7,3] and [-3,3], respectively, to enhance readability. A vertical dashed line marks the threshold employed in Orr (2022) (0.3). The calculations utilize the 2010–2019 Indian Annual Survey of Industries (ASI) dataset from the Ministry of Statistics and Programme Implementation (MOSPI).

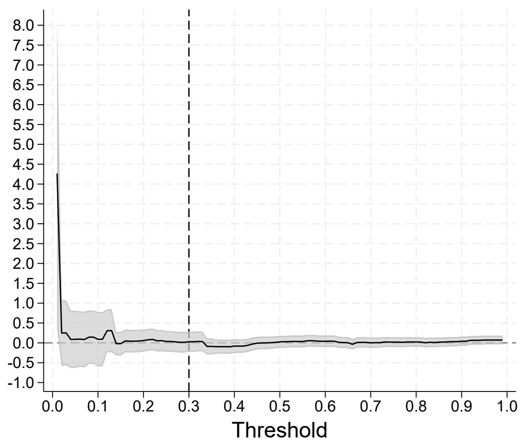
Figure A6: Sensitivity of First Stage Demand Estimates to Instrument Construction Threshold
Sample Period: 2000-2019



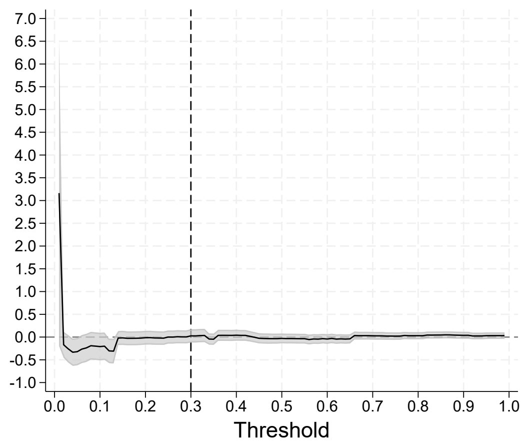
(a) First Stage Coefficient of p_{it}^{j} on $Z_t^{g(j)}$



(b) First Stage Coefficient of $rs_{it}^{j|g(j)}$ on $Z_t^{g(j)}$



(c) First Stage Coefficient of p_{it}^{j} on Z_{it}^{-jg}



(d) First Stage Coefficient of $rs_{it}^{j|g(j)}$ on Z_{it}^{-jg}

Notes: This figure displays changes in first-stage estimates reported in Table 3 of Orr (2022) as the instrument construction threshold varies in 0.01 increments. The y-axis presents distinct measures across panels: Panel (a) shows the estimated first-stage coefficient of p_{it}^{j} on $Z_t^{g(j)}$, Panel (b) displays the estimated first-stage coefficient of $rs_{it}^{j|g(j)}$ on $Z_t^{g(j)}$, Panel (c) reports the estimated first-stage coefficient of p_{it}^{j} on Z_{it}^{-jg}, and Panel (d) reports the estimated first-stage coefficient of $rs_{it}^{j|g(j)}$ on Z_{it}^{-jg}. All panels include 90% confidence intervals constructed using robust standard errors clustered by plant and product. A vertical dashed line marks the threshold employed in Orr (2022) (0.3). The calculations utilize the 2000–2019 Indian Annual Survey of Industries (ASI) dataset from the Ministry of Statistics and Programme Implementation (MOSPI).

Table A5: Robust Replication of Table 4 of Orr (2022): Cobb-Douglas Production Function Estimates from 2010–2019

	OLS	GMM		
		(1)	(2)	(3)
β_L	0.551	0.691	0.691	0.629
	(0.025)	(0.052)	(0.050)	(0.179)
β_K	0.198	0.080	0.079	0.069
	(0.016)	(0.021)	(0.022)	(0.034)
β_M	0.179	0.291	0.293	0.352
	(0.009)	(0.032)	(0.032)	(0.166)
ρ^{74}		0.634	0.634	0.629
		(0.025)	(0.027)	(0.029)
ρ^{75}		0.646	0.646	0.641
		(0.022)	(0.022)	(0.026)
ρ^{76}		0.559	0.559	0.556
		(0.036)	(0.036)	(0.041)
ρ^{77}		0.647	0.648	0.644
		(0.019)	(0.019)	(0.022)
ρ^{78}		0.709	0.707	0.698
		(0.053)	(0.049)	(0.066)
RTS	0.929	1.062	1.063	1.050
	(0.016)	(0.026)	(0.024)	(0.044)
Ins.				
$(Z_t^{g(j)}, Z_{t-1}^{g(j)})$		✓		✓
m_{it-1}		✓	✓	
Observations	16,714	16,714	16,714	16,714

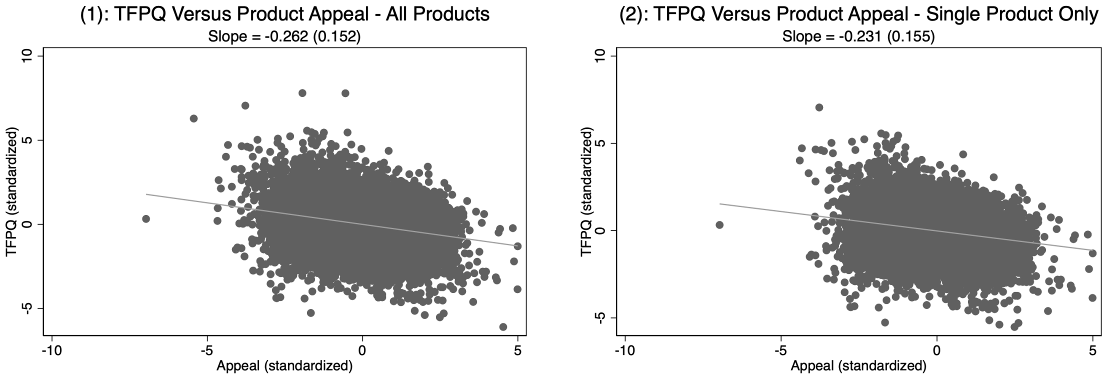
Notes: Calculations are based on the 2010–2019 Indian ASI dataset, provided by the Ministry of Statistics and Programme Implementation (MOSPI). Each observation represents a plant and a 5-digit ASICC variety. The sample is restricted to producers within the machinery, equipment, and parts industry. The dependent variable is the log quantity of product j produced by plant i. Plant-level block bootstrapped standard errors are presented in parentheses.

Table A6: Robust Replication of Table 4 of Orr (2022): Cobb-Douglas Production Function Estimates from 2000–2019

	OLS	GMM		
		(1)	(2)	(3)
β_L	0.528	0.506	0.508	0.598
	(0.026)	(0.000)	(0.001)	(0.004)
β_K	0.196	0.060	0.060	0.077
	(0.017)	(0.000)	(0.000)	(0.001)
β_M	0.205	0.466	0.465	0.368
	(0.009)	(0.001)	(0.001)	(0.005)
ρ^{74}		0.695	0.695	0.702
		(0.000)	(0.000)	(0.000)
ρ^{75}		0.659	0.659	0.665
		(0.000)	(0.000)	(0.001)
ρ^{76}		0.594	0.594	0.597
		(0.000)	(0.000)	(0.000)
ρ^{77}		0.617	0.617	0.624
		(0.000)	(0.000)	(0.000)
ρ^{78}		0.616	0.616	0.640
		(0.000)	(0.000)	(0.001)
RTS	0.930	1.033	1.033	1.043
	(0.016)	(0.000)	(0.000)	(0.000)
Ins.				
$(Z_t^{g(j)}, Z_{t-1}^{g(j)})$		✓		✓
m_{it-1}		✓	✓	
Observations	23,185	23,185	23,185	23,185

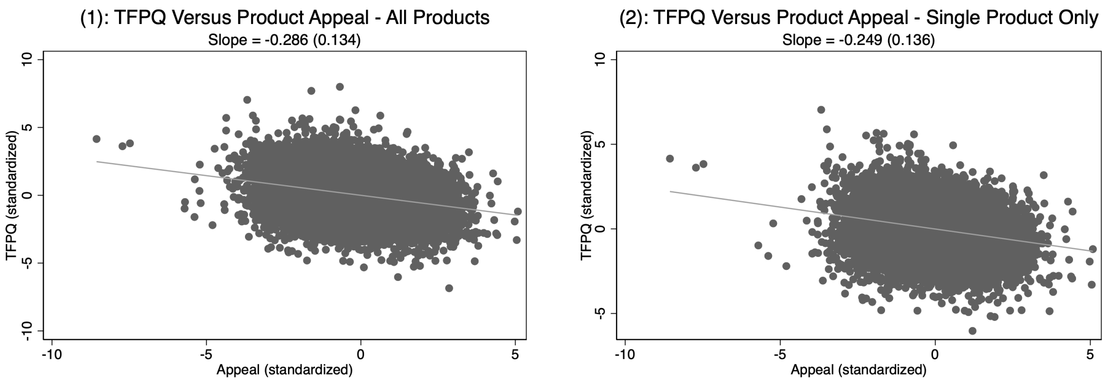
Notes: Calculations are based on the 2000–2019 Indian ASI dataset, provided by the Ministry of Statistics and Programme Implementation (MOSPI). Each observation represents a plant and a 5-digit ASICC variety. The sample is restricted to producers within the machinery, equipment, and parts industry. The dependent variable is the log quantity of product j produced by plant i. Plant-level block bootstrapped standard errors are presented in parentheses.

Figure A7: Negative Correlation between TFPQ and Product Appeal
Sample Period: 2010–2019



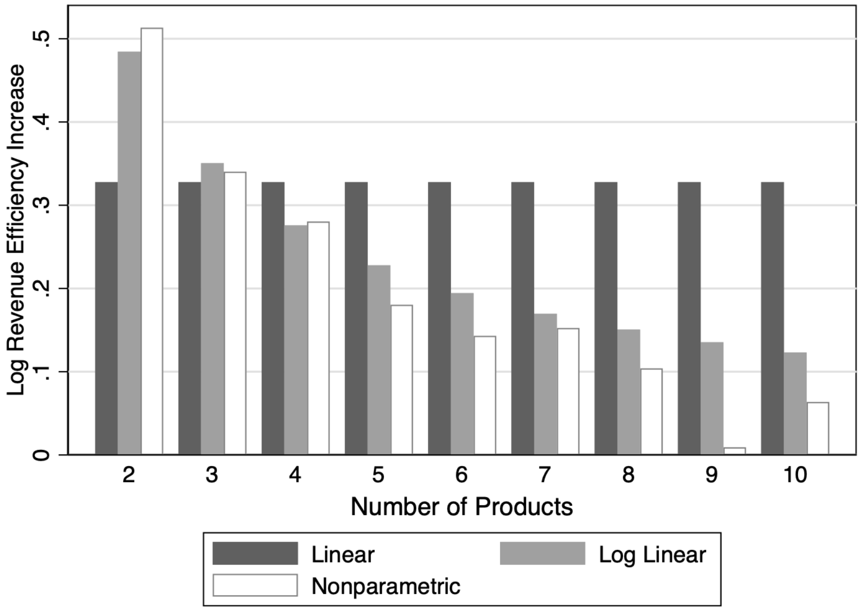
Notes: This figure replicates Figure 1 from Orr (2022). Appeal refers to η_{it}^{j}, while TFPQ refers to ω_{it}^{j}. The calculations employ the 2010–2019 Indian Annual Survey of Industries (ASI) dataset from the Ministry of Statistics and Programme Implementation (MOSPI). Both variables are standardized to have zero mean and unit variance within each product code. Panel (1) includes all products, while Panel (2) restricts to single-product plants. Plant-level block bootstrapped standard errors appear in parentheses (1,000 replications).

Figure A8: Negative Correlation between TFPQ and Product Appeal
Sample Period: 2000–2019



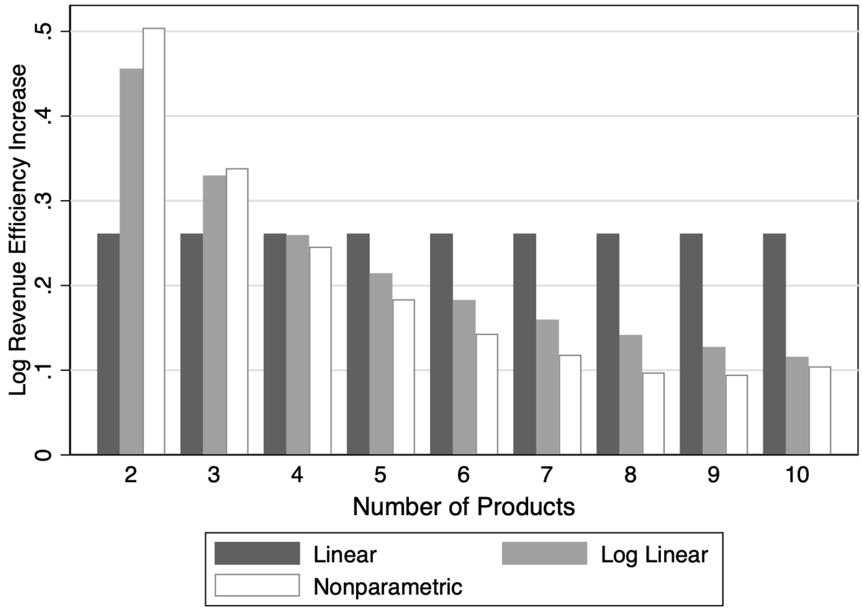
Notes: This figure replicates Figure 1 from Orr (2022). Appeal refers to η_{it}^{j}, while TFPQ refers to ω_{it}^{j}. The calculations employ the 2000–2019 Indian Annual Survey of Industries (ASI) dataset from the Ministry of Statistics and Programme Implementation (MOSPI). Both variables are standardized to have zero mean and unit variance within each product code. Panel (1) includes all products, while Panel (2) restricts to single-product plants. Plant-level block bootstrapped standard errors appear in parentheses (1,000 replications).

Figure A9: Plant-Level Revenue Efficiency Growth After Removing Marginal Varieties
Sample Period: 2010–2019



Notes: This figure replicates Figure 2 from Orr (2022). The figure displays the implied log revenue efficiency growth from removing a plant's lowest efficiency variety according to core-competence technology. The calculations employ the 2010–2019 Indian Annual Survey of Industries (ASI) dataset from the Ministry of Statistics and Programme Implementation (MOSPI). The y-axis denotes the change in plant-level log revenue efficiency after dropping a plant's worst product.

Figure A10: Plant-Level Revenue Efficiency Growth After Removing Marginal Varieties
Sample Period: 2000–2019



Notes: This figure replicates Figure 2 from Orr (2022). The figure displays the implied log revenue efficiency growth from removing a plant's lowest efficiency variety according to core-competence technology. The calculations employ the 2000–2019 Indian Annual Survey of Industries (ASI) dataset from the Ministry of Statistics and Programme Implementation (MOSPI). The y-axis denotes the change in plant-level log revenue efficiency after dropping a plant's worst product.

Table A7: Product-Dropping Probits (4,907 Observations)
Sample Period: 2010–2019

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
E_{it}^{j}	-0.0922							
	(0.0154)							
$\bar{P}_{t}^{g}$		-0.1052						-0.1028
		(0.0169)						(0.0142)
$\bar{A}_{it}^{j}$			-0.0379					-0.0312
			(0.0162)					(0.0159)
$\bar{C}_{it}^{j}$				-0.0228				-0.0289
				(0.0139)				(0.0132)
$\hat{P}_{t}^{g}$					-0.0595			-0.1072
					(0.0165)			(0.0271)
$\hat{A}_{it}^{j}$						-0.0754		-0.1379
						(0.0232)		(0.0317)
$\hat{C}_{it}^{j}$							0.0132	-0.0623
							(0.0106)	(0.0253)

Notes: This table replicates Table 9 from Orr (2022), presenting marginal effects from a probit regression where the dependent variable indicates whether a plant discontinues production of a specific product in the subsequent period. The analysis uses plant–product observations from India's Annual Survey of Industries (ASI) dataset spanning 2010–2019, obtained from the Ministry of Statistics and Programme Implementation (MOSPI). The sample includes all producers within the machinery, equipment, and parts industry, with each observation representing a unique plant–product combination at the 5-digit ASICC classification level. Standard errors (in parentheses) are clustered at the plant level using block bootstrap with 1,001 replications.

Table A8: Product-Dropping Probits (15,428 Observations)
Sample Period: 2000–2019

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
E_{it}^{j}	-0.0796							
	(0.0208)							
$\bar{P}_{t}^{g}$		-0.0707						-0.0637
		(0.0239)						(0.0232)
$\bar{A}_{it}^{j}$			-0.0468					-0.0394
			(0.0124)					(0.0098)
$\bar{C}_{it}^{j}$				-0.0001				-0.0043
				(0.0078)				(0.0100)
$\hat{P}_{t}^{g}$					-0.0644			-0.1094
					(0.0165)			(0.0181)
$\hat{A}_{it}^{j}$						-0.0798		-0.1269
						(0.0170)		(0.0159)
$\hat{C}_{it}^{j}$							0.0172	-0.0542
							(0.0069)	(0.0251)

Notes: This table replicates Table 9 from Orr (2022), presenting marginal effects from a probit regression where the dependent variable indicates whether a plant discontinues production of a specific product in the subsequent period. The analysis uses plant–product observations from India's Annual Survey of Industries (ASI) dataset spanning 2000-2019, obtained from the Ministry of Statistics and Programme Implementation (MOSPI). The sample includes all producers within the machinery, equipment, and parts industry, with each observation representing a unique plant–product combination at the 5-digit ASICC classification level. Standard errors (in parentheses) are clustered at the plant level using block bootstrap with 1,001 replications.

References

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