Wage and Employment Gains From Exports Evidence from Developing Countries

Guido G. Porto

Universidad Nacional de La Plata

&

ACET

Presentation: 3 in 1

- "Wage and Employment Gains From Exports. Evidence from Developing Countries" (in progress)

- "High-Income Export Destinations, Quality and Wages" (under review)

- "Exporting Firms and the Demand for Skilled Tasks" (in progress)

General Motivation

- Are there wage and employment gains from exports in developing (including low income) countries?
- What features of the labor markets matter?
- What features of the export markets matter?
- What are the mechanisms?

- Analysis to support *evidence-based* policies to boost gains from trade

Wage and Employment Gains from Exports

- Are exports good? If so, why?
- Begin with stylized facts: export premia
  - very large literature on exporter premium after Bernard and Jensen (1995): exporting firms pay higher wages and hire more workers than non-exporters
- Evidence for developing & low-income countries based on comparable data from the Enterprise Surveys
  - collected by WB but collaborative effort (European Bank for Reconstruction and Development, the IADB, DFID, COMPETE Caribbean)
  - representative of the private sector
  - some noise, but very wide coverage & wide array of information

ES Coverage

Enterprise Surveys. Manufacturing Plants

Country	Survey Year	All Industries			Selected Industries		
		Number of Plants (1)	Share Exporters (2)	Average Exports (3)	Number of Plants (4)	Share Exporters (5)	Average Exports (6)
All countries		**43164**	**0.34**	**0.53**	**25473**	**0.35**	**0.59**
Europe		**3111**	**0.32**	**0.46**	**1957**	**0.34**	**0.53**
Hungary	2005	271	0.52	0.43	247	0.52	0.44
Romania	2005	316	0.3	0.65	282	0.28	0.69
Bulgaria	2007	497	0.45	0.57	291	0.44	0.66
Macedonia	2009	103	0.71	0.64	71	0.66	0.73
Moldova	2009	107	0.4	0.67	84	0.4	0.7
Romania	2009	107	0.33	0.73	68	0.34	0.76
Russia	2009	484	0.27	0.23	326	0.24	0.23
Russia	2012	858	0.17	0.19	288	0.17	0.2
Ukraine	2008	368	0.29	0.5	300	0.31	0.52

ES Coverage

Country	Survey Year	All Industries			Selected Industries		
		Number of Plants (1)	Share Exporters (2)	Average Exports (3)	Number of Plants (4)	Share Exporters (5)	Average Exports (6)
Latin America		**13907**	**0.36**	**0.34**	**8356**	**0.36**	**0.38**
Brazil	2003	1575	0.31	0.25	825	0.28	0.21
Chile	2004	688	0.43	0.38	393	0.39	0.44
Costa Rica	2005	296	0.31	0.39	128	0.32	0.5
Ecuador	2003	329	0.29	0.31	190	0.28	0.33
El Salvador	2003	465	0.45	0.47	308	0.47	0.52
Guatemala	2003	435	0.37	0.44	268	0.38	0.54
Honduras	2003	428	0.35	0.6	224	0.42	0.66
Nicaragua	2003	452	0.26	0.52	198	0.24	0.49
Argentina	2006	494	0.5	0.26	482	0.5	0.26
Argentina	2010	671	0.55	0.25	437	0.5	0.25
Brazil	2009	1150	0.25	0.18	601	0.24	0.17
Chile	2006	316	0.31	0.36	202	0.27	0.49
Chile	2010	654	0.36	0.29	405	0.33	0.32
Colombia	2006	574	0.3	0.3	428	0.33	0.32
Colombia	2010	633	0.46	0.23	421	0.43	0.25
Costa Rica	2010	235	0.42	0.42	137	0.38	0.47
Dominican Rep.	2010	113	0.36	0.53	54	0.41	0.53
Ecuador	2006	185	0.3	0.36	114	0.32	0.46
Ecuador	2010	102	0.33	0.3	56	0.32	0.26
El Salvador	2006	297	0.38	0.43	194	0.43	0.47
Guatemala	2006	196	0.42	0.44	160	0.37	0.49
Guatemala	2010	234	0.44	0.36	159	0.42	0.38
Honduras	2006	139	0.24	0.56	95	0.23	0.7
Honduras	2010	110	0.26	0.6	51	0.25	0.67
Jamaica	2010	109	0.28	0.34	46	0.35	0.37
Mexico	2010	1062	0.34	0.28	575	0.32	0.29
Nicaragua	2006	183	0.17	0.43	92	0.24	0.44
Nicaragua	2010	100	0.23	0.52	29	0.21	0.64
Panama	2006	124	0.29	0.38	68	0.28	0.47
Paraguay	2006	199	0.27	0.44	183	0.25	0.55
Peru	2006	307	0.46	0.47	227	0.45	0.57
Peru	2010	619	0.47	0.4	402	0.5	0.47
Uruguay	2006	199	0.4	0.37	130	0.32	0.45
Uruguay	2010	234	0.44	0.47	154	0.36	0.52

ES Coverage

Enterprise Surveys. Manufacturing Plants

Country	Survey Year	All Industries			Selected Industries		
		Number of Plants (1)	Share Exporters (2)	Average Exports (3)	Number of Plants (4)	Share Exporters (5)	Average Exports (6)
Asia		**16841**	**0.36**	**0.69**	**9367**	**0.38**	**0.76**
Bangladesh	2002	980	0.43	0.9	701	0.48	0.94
China	2002	965	0.52	0.5	310	0.53	0.59
China	2003	1309	0.25	0.5	471	0.28	0.71
India	2000	855	0.29	0.87	558	0.35	0.91
India	2002	1775	0.22	0.55	809	0.27	0.67
Indonesia	2003	667	0.43	0.7	445	0.39	0.73
Kazakhstan	2005	244	0.14	0.28	229	0.14	0.28
Nepal	2000	195	0.39	0.68	131	0.47	0.69
Pakistan	2002	910	0.18	0.85	594	0.13	0.77
Philippines	2003	665	0.39	0.78	552	0.32	0.74
Sri Lanka	2004	404	0.7	0.88	369	0.69	0.89
Thailand	2004	1385	0.62	0.62	710	0.66	0.67
Vietnam	2005	1145	0.48	0.66	538	0.55	0.69
Azerbaijan	2009	109	0.18	0.35	66	0.27	0.33
Bangladesh	2007	1270	0.38	0.9	761	0.48	0.94
Indonesia	2009	892	0.19	0.57	440	0.2	0.61
Kazakhstan	2009	146	0.11	0.31	80	0.14	0.31
Mongolia	2009	130	0.25	0.55	80	0.3	0.54
Nepal	2009	125	0.23	0.46	69	0.3	0.5
Pakistan	2007	743	0.2	0.59	469	0.17	0.66
Philippines	2009	788	0.38	0.74	235	0.31	0.77
Sri Lanka	2011	295	0.24	0.83	229	0.24	0.87
Uzbekistan	2008	120	0.28	0.37	70	0.34	0.36
Vietnam	2009	724	0.47	0.65	451	0.49	0.71

Column (1): number of plants in the survey. Column (2): share of exporting firms.
Column (3): average export participation in total sales, conditional on exporting.
Columns (4) to (6): Plants in Textiles, Garments, Food, Beverages, and Metals and Machinery.

Swiss Programme for Research
on Global Issues for Development

ES Coverage

Enterprise Surveys. Manufacturing Plants

Country	Survey Year	All Industries			Selected Industries		
		Number of Plants (1)	Share Exporters (2)	Average Exports (3)	Number of Plants (4)	Share Exporters (5)	Average Exports (6)
Africa		**9305**	**0.28**	**0.53**	**5793**	**0.3**	**0.62**
Egypt	2004	954	0.24	0.37	572	0.24	0.41
Ethiopia	2002	417	0.07	0.53	155	0.06	0.35
Madagascar	2005	210	0.34	0.83	108	0.5	0.92
Morocco	2000	856	0.52	0.83	635	0.58	0.86
Morocco	2004	838	0.6	0.82	585	0.69	0.89
South Africa	2003	554	0.61	0.23	231	0.63	0.26
Angola	2010	122	0.08	0.15	67	0.06	0.17
Botswana	2006	112	0.21	0.37	42	0.21	0.62
Burundi	2006	102	0.05	0.31	43	0.05	0.51
Congo D.Rep.	2006	149	0.08	0.38	75	0.03	0.5
Ethiopia	2011	213	0.17	0.68	198	0.18	0.68
Ghana	2007	292	0.22	0.31	217	0.22	0.27
Guinea	2006	135	0.2	0.24	68	0.22	0.24
Ivory Coast	2009	175	0.16	0.46	92	0.14	0.38
Kenya	2007	396	0.43	0.32	260	0.35	0.37
Madagascar	2009	165	0.38	0.78	96	0.47	0.82
Mali	2007	234	0.12	0.38	234	0.12	0.38
Mauritius	2009	161	0.42	0.57	119	0.42	0.62
Mozambique	2007	207	0.04	0.53	136	0.04	0.64
Namibia	2006	104	0.33	0.39	25	0.56	0.63
Nigeria	2007	948	0.03	0.28	643	0.03	0.29
Senegal	2007	156	0.14	0.4	145	0.11	0.4
South Africa	2007	672	0.3	0.22	372	0.3	0.24
Tanzania	2006	272	0.15	0.25	127	0.16	0.24
Uganda	2006	307	0.17	0.37	105	0.26	0.46
Zambia	2007	237	0.1	0.15	196	0.12	0.15
Zimbabwe	2011	317	0.16	0.27	247	0.14	0.27

Exporter Premia

- $y_{ij} = \delta E_{ij} + \phi_j + u_{ij}$
  - exporters pay 31 percent higher wages than non-exporters
  - Europe: 20 percent
  - Latin America: 38 percent
  - Asia: 30 percent
  - Africa: 22 percent
    - Moldova: 67; Brazil: 70; Guatemala: 68; Indonesia: 71; CIV: 77
    - Russia: 4; Hungary: 9; Paraguay: 6; Chile: 5; Vietnam: 8; Zimbabwe: 7; Morocco and Botswana: 10
  - on average, exporters are 130 percent larger than non-exporters
  - Europe: 122 percent
  - Latin America: 138 percent
  - Asia: 129 percent
  - Africa: 117 percent

Wage and Employment Export Premia

Country	All Industries			Selected Industries		
	Wage Premium (1)	Employment Premium (2)	N (3)	Wage Premium (4)	Employment Premium (5)	N (6)
All countries	**0.31*****	**1.30*****	**43159**	**0.28*****	**1.38*****	**25473**
Europe	**0.20*****	**1.22*****	**3111**	**0.21*****	**1.39*****	**1957**
Bulgaria 2007	0.23***	0.91***	497	0.18***	1.08***	291
Hungary 2005	0.09**	1.42***	271	0.10***	1.48***	247
Macedonia 2009	0.46**	1.65***	103	0.61*	1.83***	71
Moldova 2009	0.67***	1.70***	107	0.85***	1.61***	84
Romania 2005	0.15*	1.48***	316	0.07**	1.62***	282
Romania 2009	0.12	1.64***	107	0.1	1.28***	68
Russia 2009	0.04	1.00***	484	0.1	1.06***	326
Russia 2012	0.26**	0.97***	858	0.40***	1.07***	288
Ukraine 2008	0.21**	1.73***	368	0.20*	1.91***	300

Wage and Employment Export Premium

Wage and Employment Export Premia

	Wage and Employment Export Premium					
Country	All Industries			Selected Industries		
	Wage Premium (1)	Employment Premium (2)	N (3)	Wage Premium (4)	Employment Premium (5)	N (6)
Latin America	**0.38*****	**1.38*****	**13907**	**0.34*****	**1.45*****	**8356**
Argentina 2006	0.20*	1.36***	494	0.20*	1.37***	482
Argentina 2010	0.31***	1.25***	671	0.35***	1.32***	437
Brazil 2003	0.51***	1.14***	1575	0.50***	1.17***	825
Brazil 2009	0.70***	1.41***	1150	0.69***	1.35***	601
Chile 2004	0.26	1.57***	688	-0.07	1.48***	393
Chile 2006	0.05	1.54***	316	-0.26*	1.80***	202
Chile 2010	0.37***	1.43***	654	0.40***	1.49***	405
Colombia 2006	0.38***	1.20***	574	0.39***	1.16***	428
Colombia 2010	0.42***	1.51***	633	0.36***	1.35***	421
Costa Rica 2005	0.45***	1.71***	296	0.51	1.93***	128
Costa Rica 2010	0.49***	1.26***	235	0.46***	1.48***	137
Dominican Rep. 2010	0.17	1.24***	113	0.21	1.00***	54
Ecuador 2003	0.21	1.32***	329	0.14	1.59***	190
Ecuador 2006	0.2	1.15***	185	-0.15	1.30***	114
Ecuador 2010	0.63***	1.40***	102	0.42*	1.11	56
El Salvador 2003	0.39***	1.42***	465	0.39***	1.56***	308
El Salvador 2006	0.05	1.50***	297	0.02	1.84***	194
Guatemala 2003	0.19	1.53***	435	0.11	1.76***	268
Guatemala 2006	0.35***	1.35***	196	0.43***	1.34***	160
Guatemala 2010	0.68***	1.64***	234	0.52***	1.79***	159
Honduras 2003	0.41***	1.57***	428	0.47***	1.77***	224
Honduras 2006	0.27***	1.65***	139	0.21***	2.05***	95
Honduras 2010	0.66*	1.79***	110	0.31	1.86***	51
Jamaica 2010	0.32***	1.21***	109	0.26	1.16***	46
Mexico 2010	0.44***	1.50***	1062	0.52***	1.57***	575

Wage and Employment Export Premia

	Wage and Employment Export Premium					
Country	All Industries			Selected Industries		
	Wage Premium	Employment Premium	N	Wage Premium	Employment Premium	N
	(1)	(2)	(3)	(4)	(5)	(6)
Asia	**0.30*****	**1.29*****	**16836**	**0.29*****	**1.38*****	**9367**
Azerbaijan 2009	0.09	1.31***	109	0.12	1.37***	66
Bangladesh 2002	0.1	0.48**	980	0.05	0.37	701
Bangladesh 2007	0.29***	1.66***	1270	0.24***	1.70***	761
China 2002	0.35***	0.93***	965	0.46***	0.76***	310
China 2003	0.42***	1.08***	1309	0.43***	0.90***	471
India 2000	0.05	0.79***	855	-0.02	0.92***	558
India 2002	0.29**	1.35***	1775	0.11	1.22***	809
Indonesia 2003	0.33**	2.12***	667	0.49***	2.33***	445
Indonesia 2009	0.71***	2.59***	891	0.71***	2.78***	440
Kazakhstan 2005	0.19**	1.20***	244	0.17**	1.19***	229
Kazakhstan 2009	0.34*	1.63***	146	0.49***	1.44***	80
Mongolia 2009	0.44*	0.59***	130	0.75***	0.74***	80
Nepal 2000	1.85***	-0.26	195	1.89***	-0.25	131
Nepal 2009	0.09	1.17***	125	0.02	1.19***	69
Pakistan 2002	0.28*	0.95***	910	0.08	1.23***	594
Pakistan 2007	0.40***	1.81***	743	0.35***	2.03***	469
Philippines 2003	0.62***	1.82***	665	0.69***	1.73***	552
Philippines 2009	0.18**	1.16***	784	0.51***	1.65***	235
Sri Lanka 2004	0.36***	0.99***	404	0.34*	1.02***	369
Sri Lanka 2011	-0.20**	2.26***	295	-0.30***	2.43***	229
Thailand 2004	0.29***	1.11***	1385	0.26***	1.19***	710
Uzbekistan 2008	0.19	1.72***	120	0.2	1.82***	70
Vietnam 2005	0.16**	1.12***	1145	0.27*	1.24***	538
Vietnam 2009	0.08	1.29***	724	0.06	1.59***	451

Wage and Employment Export Premia

	Wage and Employment Export Premium					
Country	All Industries			Selected Industries		
	Wage Premium (1)	Employment Premium (2)	N (3)	Wage Premium (4)	Employment Premium (5)	N (6)
Africa	**0.22*****	**1.17*****	**9305**	**0.19*****	**1.24*****	**5793**
Angola 2010	0.16	0.87**	122	0.26	0.22	67
Botswana 2006	0.1	1.26**	112	-0.06	2.59***	42
Burundi 2006	0.41*	2.01**	102	0.83***	2.53***	43
Congo D.Rep. 2006	0.21	0.73	149	0.70***	0.7	75
Egypt 2004	0.19**	1.38***	954	0.1	1.52***	572
Ethiopia 2002	0.63*	1.06**	417	1.10**	1.44*	155
Ethiopia 2011	0.45***	0.72***	213	0.52***	0.76***	198
Ghana 2007	0.06	0.77*	292	-0.03	0.35**	217
Guinea 2006	0.14	0.57	135	-0.05	0.52	68
Ivory Coast 2009	0.77**	1.75***	175	1.03***	1.70**	92
Kenya 2007	0.07	1.56***	396	0.04	1.74***	260
Madagascar 2005	0.2	1.27***	210	0.21	1.89***	108
Madagascar 2009	0.13	1.17***	165	0.09	1.67***	96
Mali 2007	0.57***	0.13	234	0.57***	0.13	234
Mauritius 2009	0.37	1.32***	161	0.1	1.43***	119
Morocco 2000	0.13*	1.09***	856	0.1	1.11***	635
Morocco 2004	0.1	1.11***	838	-0.01	1.02***	585
Mozambique 2007	0.55***	1.66***	207	0.35	2.23***	136
Namibia 2006	0.35*	0.86**	104	-0.26***	2.01***	25
Nigeria 2007	0.40***	0.77***	948	0.34***	0.72***	643
Senegal 2007	0.42	1.87**	156	0.49	1.89*	145
South Africa 2003	0.27***	1.04***	554	0.40***	1.22***	231
South Africa 2007	0.32***	1.14***	672	0.29***	1.37***	372
Tanzania 2006	-0.08	1.19***	272	0.21	1.11***	127
Uganda 2006	0.35***	1.35***	307	0.39***	1.45***	105

The Mechanisms in the Literature

- Skilled labor utilization
- Technology sophistication
- Imported input use
- Productivity

- The production of goods for export requires skilled labor, sophisticated machines, high-quality inputs, productivity:
  - because exporting requires quality upgrades: Verhoogen (2008)
  - because exporting involves operational services: Matsuyama (2007)
  - these activities are intensive in skilled labor, sophisticated machines, high-quality inputs, productivity
- The "quality-complementarity" hypothesis

- profit sharing?

The Mechanisms in the Literature

- Skilled Utilization: Verhoogen (2008); Matsuyama (2007); Brambilla, Lederman, Porto (2012); Brambilla, Dix-Carneiro, Lederman, Porto (2012); Bernard, Jensen (1997); Munch, Skaksen (2008); Bustos (2014); Serti, Tomasi and Zanfei (2010); Söderbom and Teal (2000)

- Machine Sophistication: Yeaple (2005); Acemoglu, Zilibotti (2001); Bustos (2011); Lileeva, Trefler (2010); Aw, Roberts, Xu (2011)

- (Imported) Input Quality: Kugler, Verhoogen (2012); Bas (2012); Feng, Li, Swenson (2012)

- Productivity: Melitz (2003) and long follow-up literature

The Mechanisms: Prima Facie Evidence

$$m_{ij} = \delta E_{ij} + \phi_j + u_{ij}$$

- Skill utilization ✓

Skilled Utilization in the ES

Export Premium. Composition of the Labor Force

Country	Share of Skilled Workers		Completed High School		Manager with College Education		Manager with Post-grad. Education	
	Premium (1)	N (2)	Premium (3)	N (4)	Premium (5)	N (6)	Premium (7)	N (8)
All countries	0.91***	43159	0.04***	17930	0.17***	19008	0.12***	13783
Sel.industries)	1.08***	25473	0.04***	10663	0.19***	10545	0.13***	7717
Europe	1.99***	3111	0.0001	581				
Latin America	0.65***	13907	0.05***	7593	0.25***	4660	0.18***	4660
Asia	1.04***	16836	0.05***	6725	0.13***	10683	0.08***	6730
Africa	0.74***	9305	0.01	3031	0.19***	3665	0.13***	2393

Export premium controlling for country-industry-year interaction effects.
Variables: Share of skilled workers (Column 1); Share of workers with high school education or more (Column 3);
Manager has a college degree (Column 5); Manager has post-graduate education (Column 7).

The Mechanisms: Prima Facie Evidence

$$m_{ij} = \delta E_{ij} + \phi_j + u_{ij}$$

- Skill utilization ✓
- Sophistication of technology ✓

Technology and Exporting in the ES

Export Premium. Sophistication of Technology

Country	Capital-Labor Ratio		ISO-certified Products		New Technology		R&D Spending	
	Premium (1)	N (2)	Premium (3)	N (4)	Premium (5)	N (6)	Premium (7)	N (8)
All countries	0.44***	36322	0.24***	37478	0.11***	14124	0.05***	43159
Sel.industries)	0.31***	21335	0.24***	22063	0.10***	7780	0.05***	25473
Europe	0.45***	1508	0.21***	3043	0.13*	586	0.02	3111
Latin America	0.52***	12009	0.26***	13405	0.09***	4667	0.05***	13907
Asia	0.50***	14542	0.27***	11955	0.11***	6317	0.07***	16836
Africa	0.17***	8263	0.20***	9075	0.15***	2554	0.04***	9305

Export premium controlling for country-industry-year interaction effects.
Variables: Log capital to labor ratio (Column 1); Indicator variable for ISO-certified products (Column 3);
Indicator variable for whether new production technology was introduced in the past 3 years (Column 5);
Indicator variable for positive R&D spending (Column 7).

The Mechanisms: Prima Facie Evidence

$$m_{ij} = \delta E_{ij} + \phi_j + u_{ij}$$

- Skill utilization ✓
- Sophistication of technology ✓
- Imported inputs ✓

Imported Inputs and Exporting in the ES

Export Premium. Imports of Intermediate Inputs

Country	Importer		Percentage of Imported Inputs		Foreign		Majority Foreign	
	Premium (1)	N (2)	Premium (3)	N (4)	Premium (5)	N (6)	Premium (7)	N (8)
All countries	0.27***	42492	0.14***	41713	0.17***	43159	0.13***	43159
Sel.industries	0.27***	25028	0.14***	24789	0.16***	25473	0.12***	25473
Europe	0.20***	3111	0.14***	2839	0.15***	3111	0.11***	3111
Latin America	0.22***	13907	0.10***	13695	0.16***	13907	0.12***	13907
Asia	0.31***	16169	0.16***	16009	0.19***	16836	0.14***	16836
Africa	0.31***	9305	0.19***	9170	0.16***	9305	0.12***	9305

Export premium controlling for country-industry-year interaction effects.
Variables: Indicator variable for imported inputs (Column 1);
Percentage of inputs that are imported (Column 3);
Indicator variable for some percentage of foreign ownership (Column 5);
Indicator variable for more than 50 percent of foreign ownership (Column 7).

The Mechanisms: Prima Facie Evidence

$$m_{ij} = \delta E_{ij} + \phi_j + u_{ij}$$

- Skill utilization ✓
- Sophistication of technology ✓
- Imported inputs ✓
- Productivity ✓

Productivity and Exporting in the ES

Export Premium. Productivity and Size

Country	Labor Productivity		TFP		Log Sales	
	Premium	N	Premium	N	Premium	N
	(1)	(2)	(3)	(4)	(5)	(6)
All countries	**0.53*****	**39460**	**0.10*****	**43159**	**1.86*****	**42984**
Sel.industries	**0.46*****	**23865**	**0.10*****	**25473**	**1.87*****	**25381**
Europe	**0.30*****	**2845**	**0.08*****	**3111**	**1.54*****	**3111**
Latin America	**0.67*****	**13174**	**0.13*****	**13907**	**2.06*****	**13907**
Asia	**0.54*****	**14532**	**0.10*****	**16836**	**1.89*****	**16836**
Africa	**0.32*****	**8909**	**0.07*****	**9305**	**1.49*****	**9130**

Export premium controlling for country-industry-year interaction effects.
Variables: Labor productivity defined as value added per worker (Column 1);
Total factor productivity estimated by OLS (Column 3); Log sales (Column 5).

Delving Deeper

- Exporter Premia: wages, employment, skill utilization, sophistication of machines, intermediate input quality, productivity
- We found strong and robust correlations among developing countries, including many low-income countries

- Still, these are correlations
- Can we fine tune some of these results?
- Focus on validating the mechanisms: skilled utilization & quality
- Inspecting the mechanisms within the mechanism

Mechanisms: Some Theory

- The arguments require two pillars

  - Quality valuation: export goods are higher quality goods
  - Quality provision: producing quality requires skilled labor, sophisticated machines, imported inputs, productivity

- How do these mechanisms work?

Quality Valuation

- Logit demands

$$x_j^d(p_j^d, \theta_j^d) = \frac{M^d}{W^d} e^{(\alpha(y^d)\theta_j^d - p_j^d)}$$

  - θ_j^d: quality of good j
  - $\alpha(y^d)$ captures quality valuation
  - $\alpha'(y^d) > 0$: consumers in high income countries have a lower marginal utility of income and thus are willing to pay a premium for a good of a given quality

Quality Provision

- The firm chooses quality θ_j and price p_j

$$\pi_j = [p_j - c_j(\theta_j)]x(p_j, \theta_j) - F$$

- Parameterization vs. Microfoundation: Verhoogen (2008); Kugler, Verhoogen (2012), Brambilla, Lederman, Porto (2012)
  - linear technology of physical output x: 1 unit of labor, at cost w
  - production of θ requires 1 worker of "quality" S

$$\theta = \lambda S^\sigma$$

  - to attract a worker of quality S, firm face a wage-schedule

$$S = w^\xi$$

  - marginal cost is

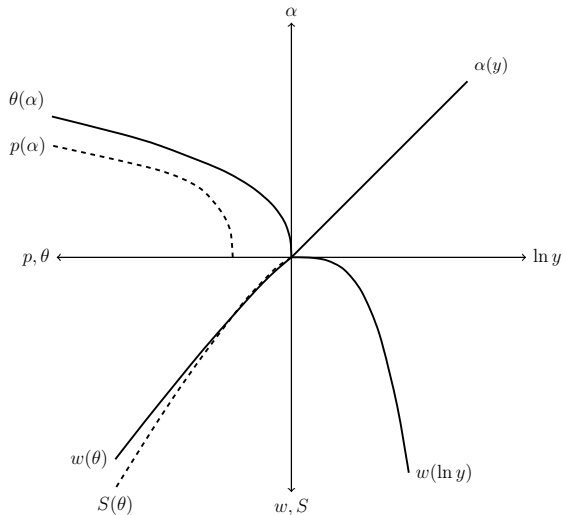$$c(\theta) = \left(\frac{\theta}{\lambda}\right)^{\frac{1}{\sigma\xi}}$$

Swiss Programme for Research
on Global Issues for Development

Joint Mechanisms

$$\theta_j^d(y_d) = h_\theta(y^d) = \lambda \left(\xi\sigma\lambda\alpha(y_d)\right)^{\frac{\xi\sigma}{1-\xi\sigma}}$$

$$p_j^d(y_d) = h_p(y^d) = 1 + \left(\xi\sigma\lambda\alpha(y_d)\right)^{\frac{1}{1-\xi\sigma}}$$

$$S_j^d(y_d) = h_S(y^d) = \left(\xi\sigma\lambda\alpha(y_d)\right)^{\frac{\xi}{1-\xi\sigma}}$$

$$w_j^d(y_d) = h_w(y^d) = \left(\xi\sigma\lambda\alpha(y_d)\right)^{\frac{1}{1-\xi\sigma}}$$

Joint Mechanisms

Generalizing to Various Inputs

- Production of quality

$$\theta_j = \lambda_j (K_j)^{\sigma^K} (M_j)^{\sigma^M} (S_j)^{\sigma^S}$$

- Factor price schedules

$$S_j = (w_j^S)^{\xi^S}$$

$$K_j = (w_j^K)^{\xi^K}$$

$$M_j = (w_j^M)^{\xi^M}$$

Testing the Predictions: Data

- Trade, Production and Protection database (Nicita and Olarreaga, WBER 2007)
- Cross-country data: export values and export quantities, production, value added, employment, wages, and number of establishments
- 28 manufacturing sectors, 3-digit ISIC, Revision 2
- 82 countries from 1990 to 2000

Econometric Model

$$\log w_{ict} = \gamma^1 g_{ict} + \mathbf{x}'_{ict}\beta^1 + \phi^1_t + \phi^1_{ic} + u^1_{ict}$$

- g_{ict}: export-shares (s_{icdt}) weighted average GDP across destinations

$$g_{ict} = \ln\left(\sum_d s_{icdt} * GDP_d\right)$$

- IV: Specify the following model:

$$s_{icdt} = \delta e_{cdt} + \nu_t + \nu_{cd} + \epsilon_{icdt}$$

  - e_{cdt}: bilateral exchange rate between country c and country d
- Run separately for each industry i
- Predict flows and, for each i and c, build instrument for g as

$$\widehat{g}_{ict} = \ln\left(\sum \widehat{s}_{icdt} * GDP_d\right)$$

Table 3: Wages and Export Destinations

	(1)	(2)	(3)	(4)	(5)
A) First Stage Results					
Predicted p/c Average GDP	0.326***	0.326***	0.328***	0.330***	0.327***
	(0.0207)	(0.0207)	(0.0208)	(0.0209)	(0.0232)
Observations	12,945	12,945	12,945	12,427	11,476
R^2	0.199	0.199	0.199	0.200	0.190
Origin-Industry Groups	1,797	1,797	1,797	1,760	1,601
B) Second Stage Results					
Average p/c GDP	0.111***	0.129***	0.104**	0.130***	0.0863**
	(0.0432)	(0.0430)	(0.0435)	(0.0430)	(0.0382)
Observations	12,945	12,945	12,945	12,427	11,476
R^2	0.006	0.061	0.009	0.099	0.201
Origin-Industry Groups	1,797	1,797	1,797	1,760	1,601
C) Second Stage Results: Robustness					
Average p/c GDP	0.111***	0.127***	0.104**	0.127***	0.0838**
	(0.0425)	(0.0425)	(0.0427)	(0.0422)	(0.0378)

Table 4: The Operating Mechanisms

Operating Mechanisms
Mean Unit Value and High-Income Exports

	(1)	(2)	(3)	(4)	(5)
]A) OLS-FE					
Average p/c GDP	0.142***	0.146***	0.141***	0.146***	0.121***
	(0.0288)	(0.0286)	(0.0288)	(0.0297)	(0.0314)
Observations	13,377	13,377	13,377	12,857	11,904
R^2	0.017	0.024	0.018	0.025	0.022
Origin-Industry Groups	1,810	1,810	1,810	1,772	1,627
B) IV Second Stage					
Average p/c GDP	0.237***	0.249***	0.226***	0.232***	0.163**
	(0.0751)	(0.0746)	(0.0744)	(0.0767)	(0.0799)
Observations	12,945	12,945	12,945	12,427	11,476
R^2	0.010	0.017	0.012	0.020	0.020
Origin-Industry Groups	1,797	1,797	1,797	1,760	1,601

Table 5: The Operating Mechanisms

Operating Mechanisms
Average Wage and Average Unit Value

	(1)	(2)	(3)	(4)	(5)
]A) OLS-FE					
Average UV	0.0390***	0.0271***	0.0382***	0.0262***	0.0163**
	(0.00803)	(0.00777)	(0.00797)	(0.00765)	(0.00656)
Observations	13,377	13,377	13,377	12,857	11,904
R^2	0.017	0.074	0.019	0.111	0.208
Origin-Industry Groups	1,810	1,810	1,810	1,772	1,627
B) IV First Stage					
Predicted Average p/c GDP	0.363***	0.360***	0.367***	0.368***	0.370***
	(0.0147)	(0.0147)	(0.0149)	(0.0153)	(0.0166)
Observations	12,945	12,945	12,945	12,427	11,476
R^2	0.226	0.230	0.228	0.233	0.220
Origin-Industry Groups	1,797	1,797	1,797	1,760	1,601
C) IV Second Stage					
Average UV	0.102***	0.0833***	0.0957***	0.0776***	0.0425**
	(0.0246)	(0.0262)	(0.0246)	(0.0255)	(0.0175)
Observations	12,945	12,945	12,945	12,427	11,476
R^2	0.006	0.063	0.009	0.104	0.204
Origin-Industry Groups	1,797	1,797	1,797	1,760	1,601

Swiss Programme for Research
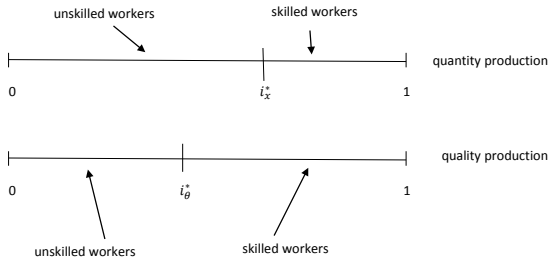on Global Issues for Development

Exports and the Demand for Skilled Tasks

- Explore the mechanisms within the mechanism
  - exports require skills
  - what type of skills? what skilled tasks? CEOs? Engineers?
- Explore the skilled tasks demanded by Chilean exporting firms
- Combine two strands of literature:
  - exporting, skills and quality (Verhoogen, 2008; Brambilla, Lederman and Porto, 2012; Bastos, Silva, Verhoogen, 2014)
  - trade and tasks (Feenstra and Hanson, 1996; Antras, Garicano, and Rossi-Hansberg, 2006; Grossman and Rossi-Hansberg, 2008; 2012; Acemoglu and Zilibotti, 2001; Acemoglu and Autor, 2011; Costinot and Vogel, 2010)
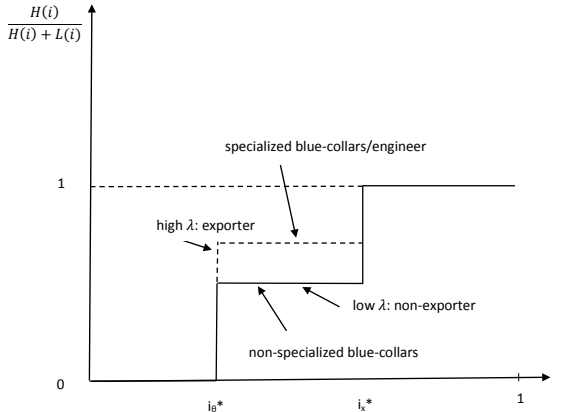
Model: Outline

- Quality Valuation
  - Logit demands
- Quality provision
  - quantity and quality are produced with a collection of tasks: managing, accounting, clerical activities, design, packaging, logistics, sales representation, operational production, input control, monitoring, supervision, services
  - a given task (in quantity or quality production) can be performed by either skilled or unskilled workers
  - Ricardian (fixed coefficient) technology: tasks differ in skill intensity
  - quality production is intensive in some skilled-intensive tasks

Cut-Offs

unskilled workers   skilled workers

quantity production

0   i_x^* 1

quality production

0   i_θ^* 1

unskilled workers   skilled workers

Relative Skill Utilization Across Tasks

Testable Implications

- Exporters hire more skilled workers
- Exporters hire more engineers but not necessarily more managers
- Exporters hire engineers over blue-collars

- Use panel of Chilean firms (Encuesta Nacional Industrial Anual (ENIA)) with information on "tasks"
- Combine firm-data with customs export data for 2001-2005
- Regression model:

$$y_{ijt} = \mathbf{x}'_{ijt}\beta + \gamma E_{ijt} + \phi_i + \phi_{jt} + \varepsilon_{ijt}$$

- Instruments (Verhoogen, 2008; Park et al., 2010; Brambilla, Lederman and Porto, 2012): export share weighted average of destination bilateral real exchange rate

IV-FE Results

	(1)	(2)	(3)	(4)
A) Skilled and Unskilled Labor				
log highly-skilled	0.41***	0.32***	0.32***	0.33***
	(0.136)	(0.110)	(0.111)	(0.111)
log skilled	0.38***	0.28***	0.28***	0.27***
	(0.115)	(0.084)	(0.085)	(0.085)
log unskilled	−0.20	−0.35***	−0.35***	−0.35***
	(0.134)	(0.134)	(0.135)	(0.135)
B) Production and Non-Production Labor				
log production	0.20**	0.02	0.02	0.02
	(0.097)	(0.018)	(0.020)	(0.020)
log non-production	0.07	−0.01	−0.01	−0.01
	(0.067)	(0.049)	(0.048)	(0.048)
C) Tasks				
log managers	−0.08	−0.13	−0.13	−0.13
	(0.114)	(0.105)	(0.105)	(0.104)
log engineers	0.52***	0.43***	0.42***	0.42***
	(0.165)	(0.137)	(0.138)	(0.139)
log services	0.25**	0.16	0.15	0.14
	(0.122)	(0.112)	(0.111)	(0.111)
log blue-collar	−0.20	−0.37**	−0.37**	−0.36**
	(0.147)	(0.150)	(0.151)	(0.151)
log maintenance	−0.06	−0.09	−0.09	−0.09
	(0.112)	(0.114)	(0.113)	(0.112)
firm and year FE	Yes	Yes	Yes	yes
log employment	No	Yes	Yes	Yes
industry-specific trends	No	No	Yes	Yes
firm-specific trends	No	No	No	Yes

IV-FE Results

	(1)	(2)	(3)	(4)
A) Skilled and Unskilled Labor				
share highly-skilled	0.08***	0.09***	0.09***	0.09***
	(0.031)	(0.032)	(0.032)	(0.032)
share skilled	0.08**	0.09***	0.09***	0.09***
	(0.032)	(0.033)	(0.034)	(0.034)
B) Production and Non-Production Labor				
share production	0.03**	0.01	0.01	0.01
	(0.012)	(0.009)	(0.009)	(0.009)
C) Tasks				
share managers	−0.01**	−0.01	−0.01	−0.009
	(0.006)	(0.005)	(0.005)	(0.005)
share engineers	0.09***	0.10***	0.10***	0.10***
	(0.031)	(0.031)	(0.032)	(0.032)
share services	−0.009	0.009	0.009	−0.009
	(0.008)	(0.007)	(0.007)	(0.007)
share blue-collar	−0.07**	−0.08**	−0.08**	−0.08**
	(0.031)	(0.033)	(0.034)	(0.034)
share maintenance	−0.01**	−0.01*	−0.01*	−0.01*
	(0.005)	(0.004)	(0.004)	(0.004)
firm and year FE	Yes	Yes	Yes	yes
log employment	No	Yes	Yes	Yes
industry-specific trends	No	No	Yes	Yes
firm-specific trends	No	No	No	Yes

Swiss Programme for Research
on Global Issues for Development