Wage and Employment Gains From Exports Evidence from Developing Countries*

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Abstract

We systematically explore the relationship between exports, employment, and wages in developing countries. Using a combination of firm level data for most developing countries and cross-country, industrial-level data, we quantitatively document the potential gains from export opportunities. On the export market side, we investigate the role of product quality demanded by foreign markets and the mechanisms by which quality is produced, specifically the demand for high quality, skilled labor, and the demand for high-quality, imported inputs. On the firm/industry side, we explore hypothesis related to productivity and technological efficiency.

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1 Introduction

In this paper, we systematically explore the relationship between exports, employment, and wages in developing countries (including low income countries). The analysis builds on the notion that export markets bring gains to the domestic economy. Support for this argument comes from two empirical observations. One establishes that exporting firms pay higher wages and hire more workers than non-exporters. The other establishes a positive link between exports, wages and skill utilization at the industry and firm levels. These associations are the consequence of the combination of the act of exporting and of some inherent attributes of firms or industries, such as productivity, production technology, efficiency, or various types of constraints. Exporting brings up enhanced opportunities for firms and industries in world markets, and these opportunities can be successfully exploited if firms, or industries, have, or develop, the needed attributes and thus become efficient world producers. In turn, this process has implications for employment and wages and, in consequence, the whole mechanism allows those world export opportunities to be transmitted to the local economy. In the end, the benefits from globalization can be realized at a micro-level. In contrast, those economies and firms that are not endowed with the needed attributes suffer from the globalization process and may have to adapt and adjust to the new environment.

The analysis builds on various different pieces of evidence. Using a combination of micro-data for most developing countries and cross-country, industry-level data, we quantitatively document the potential gains from export opportunities. We establish the links between exports, wages, and employment, and we explore the mechanisms in play, both quantitatively and qualitatively. This is done by establishing links between export markets and firm/industry attributes. On the export market side, we investigate the role of product quality demanded by foreign markets and the mechanisms by which quality is produced, namely the demand for high-quality, skilled labor, and the demand for high-quality, imported inputs. On the firm/industry attributes side, we explore hypothesis related to productivity and technological efficiency.

The facts gathered in this research, both on the basic links between exports, wages and employment, on the one hand, and on the mechanisms, on the other, will allow us to derive policies both to boost the beneficial impacts of exports and to ameliorate the risks of global competition.

The paper is organized as follows. In section 2, we use the firm-level micro data to estimate the wage and employment exporter premia in developing countries. In section 3, we provide evidence of some of the mechanisms at play behind those premia. Along the way, we complement these estimates with a comprehensive literature review of over 100 papers from the related literature. In sections 4 and 5, we turn to detailed case studies and we emphasize causality issues. In particular, section 4 studies how exporting firms in Chile demand high-skill tasks, relative to non-exporting firms. Section 5 explores similar causal effects using industry-level cross-country data.[1] Finally, section 6 discusses some policy implications and section 7 concludes.

2 The Gains from Exporting: Wages and Employment

The aim of this section is to establish empirically the main premise of this study, namely that exporting leads to gains in employment and wages. We are particularly interested in determining whether these observations hold for developing countries and also for low-income countries.

The basic set of stylized facts concerning exporting firms and labor market variables such as employment and wages is derived here using comparable data from the Enterprise Surveys. An Enterprise Survey is a firm-level survey of a representative sample of an economy's private sector. The surveys cover a broad range of business environment topics including access to finance, corruption, infrastructure, crime, competition, and performance measures. The Enterprise Surveys provide the world's most comprehensive firm-level data for low income countries. The Enterprise Surveys project is jointly led by the World Bank and various partners, such as the European Bank for Reconstruction and Development, the Inter-American Development Bank (IDB), COMPETE Caribbean, and the UK's Department

[1]The analysis in section 4 is based on Brambilla, Lederman, and Porto (2014), while the analysis in section 5, in Brambilla and Porto (2014).

for International Development (DFID).

Table 1 lists the countries covered in the analysis as well as some basic information on export exposure. The data covers most developing countries, and many low-income countries, especially in Africa. LIC African countries in the sample are Burundi, Congo Democratic Republic, Ethiopia, Guinea, Kenya, Madagascar, Mali, Mozambique, Tanzania, Uganda, and Zimbabwe. Non-African LICs include only Bangladesh and Nepal.

The Enterprise Survey data uncover a significant exposure to exports. On average, worldwide, 34 percent of firms participate in exports (column 2). The fraction of exporting firms is 36 percent in Latin America and Asia, 32 percent in Europe and only 28 percent in Africa. There is a lot of dispersion, even within continents. For instance, the fraction of exporters is 71 percent in Macedonia, and 17 percent in Russia; 50-55 percent in Argentina, and 17 percent in Nicaragua; 62 percent in Thailand, and 11-14 percent in Kazakhstan. In Africa, the fraction of exporters ranges from as high as 61 percent in South Africa and 52 percent in Morocco, to 3 percent in Nigeria, 5 percent in Burundi, or 7 percent in Ethiopia.

To some extent, these cross-country differences are due to differences in industry coverage. In fact, the surveys may target different industries in different countries and in different time periods. To assess this, we identify a group of "selected" industries that are covered in all Enterprise Surveys. These are Textiles, Garment, Food, Beverages, and Metals and Machinery. The average fraction of exporters in these industries are reported in columns 4-6 of Table 1. The first observation to make is that the shares across selected industries are close to the average across all industries so that the regularities in the data are robust, on aggregate. However, there can be important differences for specific countries/time periods. We interpret this as indicating that our analysis may miss the experience of a particular country but can indeed portray a sufficient accurate experience on average.

It is noteworthy that the intensity of exports also varies a lot across countries, and not necessarily as export participation does (column 3). We define export intensity as the share of exports in total sales for exporting firms. Worldwide, the average exporter ships 53 percent of its sales abroad. The highest export intensity is computed in Asia, 69 percent. In Africa, the average exporting firm exports 53 percent of its sales, the worldwide average, but the

Table 1
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
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	103	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

Table 1
Enterprise Surveys. Manufacturing Plants

Country	Survey Year	All Industries Number of Plants (1)	Share Exporters (2)	Average Exports (3)	Selected Industries 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
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

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.

share of exporting firms is the lowest. Latin American exporters ship on average 34 percent of their sales abroad, and the corresponding figure for Europe is 46 percent. The fraction of exporters and the intensity of exports is higher in selected industries such as Textiles, Garment, Food, Beverages and Metals and Machinery (columns 4-6).

The starting point of our quantitative analysis is the exploration of the correlation between exports, exporting firms, wages and employment. To investigate these premia with the firm-level Enterprise Survey, note that the micro-data is a cross-section of firms. The proposed empirical model is

$$(1) \quad y_{ij} = \delta E_{ij} + \phi_j + u_{ij},$$

where y_{ij} is the outcomes of interest (log average wages, log employment) for firm i in industry j, E_{ij} is a measure of exporting status, ϕ_j is an industry fixed effect and u_{ij} is an error term. In (1), the exporting status of firm i can be measured with a dummy (if the firm exports anything) or with the share of sales going to exports (a measure of export intensity). The coefficient of interest is δ, which is interpreted as the wage or employment exporter-premium. It should be noted that the regression model in equation (1) can only uncover (unconditional or conditional) correlations. No causality can be inferred.[2]

We begin with the wage premium (column 1 of Table 2). This can be interpreted as a measure of how higher wages are, on average, when comparing exporting and non-exporting firms. On average, exporters pay 31 percent higher wages than non-exporters. These premia are: 20 percent in Europe, 38 percent in Latin America, 30 percent in Asia and 22 percent in Africa. As always, these averages mask lots of cross-country variation. For instance, the highest wage premia are estimated in Moldova (67 percent), Brazil (70 percent), Guatemala (68 percent), Indonesia (71 percent) and Côte d'Ivoire (77 percent). The lowest premia (which often are not statistically significant) are estimated in Russia (4 percent), Hungary (9 percent), Paraguay (6 percent), Chile (5 percent), Vietnam (8), Zimbabwe (7 percent) and Morocco and Bostwana (10 percent). These are huge differences, with potentially important implications for the well-being of the workers and for inequality across skill categories and

[2]We tackle causality in sections 4 and 5 below.

educational attainments.

We now turn to the employment premium. This can be interpreted as a measure of how larger, on average, exporting firms are (relative to non-exporting firms). Exporters are indeed much larger firms. On average, an exporter is 130 percent larger than a non-exporter. There are differences across continents and countries, as expected, but these differences are not as pronounced as with the wage premia. For instance, the employment premium is 1.22 in Europe, 1.38 in Latin America, 1.29 in Asia and 1.17 in Africa.

It is a very well-documented fact that exporting firms are very different from non-exporting firms in various characteristics. Since the seminal work by Bernard and Jensen (1995), Bernard and Jensen (1999) and Bernard and Wagner (1997), several papers have found a positive correlation between exports and firm outcomes, both in developed and developing countries. A recent comprehensive study that summarizes much of the typically observed correlations can be found in Bernard, Jensen, Redding and Schott (2007). They calculate the export premia in U.S. manufacturing in 2002 for different firm characteristics. Focusing on unconditional differences, exporting firms have 119 percent more employment, 148 percent higher shipments, 26 percent higher value-added per worker, 2 percent higher productivity, 17 percent higher wages, 32 percent higher capital-labor ratios, and 19 percent higher skill per worker. Similar findings emerge from regression models with industry fixed-effects to control for basic inherent firm heterogeneity across industries (though the differences are slightly lower). Within industries, exporters are larger than non-exporters: employment is 97 percent higher while shipments are 108 percent higher at exporters. They are also more productive by 11 percent in value-added per worker and by 3 percent in TFP. Exporters also pay higher wages, by around 6 percent, and are more capital-intensive (12 percent) and skill-intensive (11 percent). A large literature follows Bernard and Jensen's methodology (to different degrees) and establishes the existence of export premium in wage regressions. Examples include Bernard (1995), Meller (1995), Aw and Batra (1999), Liu et al. (1999), Isgut (2001), Tsou et al. (2002), Farinas and Martin-Marcos (2007), Zhou (2003), Bernard and Jensen (2004), Greenway and Yu (2004), Hahn (2004), Hansson and Lundin (2004), Alvarez and Lopez (2005), Arnold and Hussinger (2005), Van Biesebroeck (2005),

Table 2
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)
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
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***	1.58***	1062	0.52***	1.57***	575
Nicaragua 2003	0.1	1.02***	452	0.03	1.35***	198
Nicaragua 2006	0.48**	1.32***	183	0.66***	1.59***	92
Nicaragua 2010	0.57**	2.06***	100	0.09	1.54**	29
Panama 2006	0.24	1.53***	124	-0.02	1.91***	68
Paraguay 2006	0.06	1.10***	199	0.56	1.22**	103
Peru 2006	0.2	1.35***	307	0.08	1.60***	227
Peru 2010	0.52***	1.34***	619	0.61***	1.49***	402
Uruguay 2006	0.26	1.24***	199	0.06	1.48***	130
Uruguay 2010	0.51***	0.97***	234	0.38***	1.04***	154

Table 2
Wage and Employment Export Premium

Country	All Industries Wage Premium (1)	All Industries Employment Premium (2)	N (3)	Selected Industries Wage Premium (4)	Selected Industries Employment Premium (5)	N (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
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
Zambia 2007	0.47***	1.10***	237	0.47***	1.10***	196
Zimbabwe 2011	0.07	1.74***	317	-0.05	1.81***	247

Columns (1) and (4): Percentage difference in wages of exporters and non-exporters controlling for country-industry-year interaction effects.
Columns (2) and (5): Percentage difference in number of workers, with the same controls as before.
Columns (3) and (6): Number of observations.
Columns (4)-(6): Plants in Textiles, Garments, Food, Beverages, and Metals and Machinery.

De Loecker (2007), and Sinani and Hobdari (2010).

The correlations uncovered by this literature, as well as the correlations estimated above from the Enterprise Survey, do not imply causality. This means that exporting is not necessarily conducive to higher wages. One reason might be self-selection of workers with different characteristics (age, education). The literature has addressed this issue by combining employer-employee matched data, which allows for controls of observed heterogeneity (in the employee data, but unobserved in the employer data) at the individual level. Examples of this type of work are Schank, Schnabel, and Wagner (2007) and Baumgarten (2013), who use German linked employer-employee data. They find that, even with firm and worker controls, the export premium for wages persists. In Schank, Schnabel and Wagner (2007), for instance, the premium for blue-collar is around 1.8 percent, while the premium for white-collar employees is 0.9 percent.[3] Baumgarten (2013) shows that the wage differential between exporters and domestic establishments increased by around 8 percent from 1996 to 2007.

The literature has postulated several hypotheses to explain the link between exporting and the wage (and employment) premium. Originally, two theories stood out (Roberts and Tybout, 1997; Clerides, Lach, and Tybout, 1998). One theory argues that firms self-select into exporting. Consequently, "better" firms becomes exporters and, jointly, perform better. This better performance implies the payment of a wage premium, the hiring of more workers, among other features (such as productivity, input use, technology adoption; more on this below). An elaboration of this idea is the conscious self-selection theory, whereby self-selection is a conscious decision of firms that become "better" (e.g., become more productive) with the intended purpose of becoming exporters. The other theory postulates a learning-by-exporting process. Firms become exporters and later become "better," paying higher wages, employing more workers, and so on.

Both theories imply a correlation between exports and firm productivity. As in the case of wages and employment, this correlation has been extensively documented in the literature.

[3] In this paper, export exposure is measured with the ratio of exports to sales. The premia reported are based on the comparison of a firm with 60 percent export intensity and another otherwise identical non-exporting plant.

All the papers mentioned above, Bernard and Jensen (1995), Bernard and Jensen (1999), Bernard and Wagner (1997), Meller (1995), Aw and Batra (1999), Liu et al. (1999), Isgut (2001), Tsou et al. (2002), Farinas and Martin-Marcos (2007), Zhou (2003), Bernard and Jensen (2004), Greenway and Yu (2004), Hahn (2004), Hansson and Lundin (2004), Alvarez and Lopez (2005), Arnold and Hussinger (2005), Van Biesebroeck (2005), De Loecker (2007), and Sinani and Hobdari (2010), document a positive correlation between exporting and productivity at the firm level.

The evidence, however, tends to support a theory of self-selection more than a theory of learning-by-exporting. A widespread (but not universal) interesting finding of this literature is that, while it is clear that good firms become exporters, it is less clear that exporters remain significantly better than non-exporters. For the U.S., Bernard and Jensen (1995) and Bernard and Jensen (1999) argue that while, at a point in time, exporters outperform non-exporters, the evidence on the benefits of export experience to the plant is mixed. Exporters perform significantly better in the short run than non-exporters in terms of employment growth. However, short-run wage growth and long-run performance in all areas are negatively correlated with export status in the initial year. Similarly, for Germany, Bernard and Wagner (1997) show that exporters are better than non-exporters *before* becoming exporters. In fact, they find no positive effects on employment, wage or productivity growth after entry into exports. Using linked employer-employee data and focusing on wages, Schank, Schnabel and Wagner (2010) show that the exporter wage premium already exists a few years before firms start to export, and that it does not increase in the following years. Higher wages in exporting firms are thus due to self-selection of more productive, better paying firms into export markets; they are not caused by export activities.

To better document this evidence, we now review some of this literature in more detail.[4] Alvarez and Lopez (2005) test the hypotheses using plant-level data from Chile. They find that plants that enter international markets show superior initial performance compared with non-exporters, consistent with self-selection; they also observe increases in productivity after plants begin to export, which is consistent with learning-by-exporting. In Sweden, support

[4] See also the review in Wagner (2007).

for both theories is reported by Hansson and Lundin (2004). In the U.K. chemical industry, Greenaway and Yu (2004) find that exporters are more productive than non-exporters, both because of self-selection and learning-by-exporting effects. Similar results are reported for Italy in Serti and Tomassi (2008).

Mixed evidence is reported by Isgut (2001) in Colombia. Exporters are clearly better than non-exporters, as the self-selection theory predicts. After entry, sales and employment keep growing significantly faster for exporters, but the growth of labor productivity and capital intensity is indistinguishable for exporters and non-exporters. This is partly consistent with the learning-by-exporting hypothesis. For Spanish firms, Delgado, Farinas and Ruano (2002) use non-parametric techniques to provide strong evidence supporting the self-selection of more productive firms in the export market. The evidence in favor of learning-by-exporting is rather weak, and limited to younger exporters only. Similarly, Fryges and Wagner (2008) find a causal effect of firms' export activities on labor productivity growth. However, exporting improves labor productivity growth only within a sub-interval of the range of firms' export-sales ratios.

A leading paper that presents evidence against the learning hypothesis (and thus in full support of the self-selection theory) is Clerides, Lach and Tybout (1998). In Colombia, Mexico, and Morocco, they find that relatively efficient firms become exporters but that the costs of a given firms are not affected by previous exporting activities. In Germany, Arnold and Hussinger (2005) also find that higher firm productivity leads to exporting, but exporting per se does not enable firms to achieve further productivity improvements.

It is important to note at this point that the evidence supports the idea that self-selection is a conscious process by which plants increase productivity with the purpose of becoming exporters. Alvarez and Lopez (2005) and Lopez (2009) find early support for this contention in Chile. They find that productivity and investment increase before plants begin to export. Moreover, productivity of entrants to exporting, but not that of non-exporters and exporters, increases in response to increases in foreign income, before entry but not after that. These results suggest that the productivity advantage of future exporters may be the result of firms increasing their productivity in order to export. Using plant data for Mexico, Iacovone and

Javorcik (2012) report that quality upgrades take place in preparation for entry into export markets, but they find no evidence of upgrading after entering export markets.

All the evidence reviewed so far refers to developing or developed countries, but there is only scant evidence on these links for low-income countries. Brambilla, Dix-Carneiro, Lederman and Porto (2012) establish a positive link between the skill premium at the industry level and sectoral exports in a set of Latin American countries. For Sub-Saharan Africa, Milner and Tandrayen (2004) use employer-employee matched data for manufacturing firms in six countries and find a positive association between individual earnings and the export status of the firm. As in Brambilla et al. (2012), the skill wage premium in exporting firms is significantly higher. In terms of productivity in Africa, Mengistae and Pattillo (2004) show that export manufacturers have an average total factor productivity premium of 17 percent. African exporters also enjoy productivity growth that is 10 percent faster than among non-exporters. Using firm-level data for the manufacturing sector in Cameroon, Ghana, Kenya and Zimbabwe, Bigsten, Collier, Dercon, Fafchamps, Gauthier, Gunning, Oduro, Pattillo, Oostendorp, Söderbom, Teal and Zeufack (2004) estimate significant efficiency gains from exporting, which can be interpreted as learning by exporting. Van Biesebroeck (2005) reports similar results for a panel of manufacturing firms in nine African countries. The results indicate that exporters in these countries are more productive and, more importantly, that exporters increase their productivity advantage after entry into the export market (which is consistent with both self-selection and with learning-by-exporting).

A technical issue that deserves attention is causality. In many of the studies reviewed above, the analysis is based on correlations. Firm-productivity is found to be positively correlated with wages and exporting, initial export status is sometimes positively correlated with future productivity, and so on. Establishing causality requires exogenous variation in exporting or in productivity. For our literature review, a nice starting point is the paper by Frias, Kaplan and Verhoogen (2009) on exports and wages in Mexico. They use employer-employee data, so that they can account for worker heterogeneity, and an instrumental variable approach, where the instrument is varying firm-level exposure to the Mexican devaluation of 1994. The paper uses information on individual worker' wage histories to decompose plant-level average wages into a component reflecting skill composition and a component reflecting wage premia. Approximately two-thirds of the higher level of wages in larger, more productive plants is explained by higher levels of wage premia. These findings argue against the hypothesis that sorting on individual ability is solely responsible for the correlation between exporting and wages. Kandilov (2009) assesses the impact of increased export activity on plant wages exploiting the exogenous variation in exports induced by the export subsidy system implemented in Chile in 1986. While the export subsidy had only a modest positive impact on the industry-wide relative high-skilled wage, it signicantly increased the plant-level relative high-skilled wage in medium-size establishments, which are most likely to take advantage of the subsidy and enter the export market.

Looking at exports and productivity, De Loecker (2007) uses matched sampling techniques to analyze whether firms that start exporting become more productive, controlling for the self-selection into export markets. He finds that export entrants become more productive once they start exporting. The productivity gap between exporters and their domestic counterparts increases further over time. This provides causal evidence in support of learning-by-exporting. Using a large plant level panel data set from Germany and a matching approach as well, Wagner (2002) finds positive effects of starting to export on growth of employment, labor productivity, and wages. Park, Yang, Shi, and Jiang (2010) construct firm-specific exchange rate shocks based on the pre-crisis destinations of firms' exports. Because the shocks were unanticipated and large, they are a plausible instrument for identifying the impact of exporting on firm productivity and other outcomes. They find that firms whose export destinations experience greater currency depreciation have slower export growth, and that export growth leads to increases in firm productivity and other firm performance measures. Consistent with "learning-by-exporting," the productivity impact of export growth is greater when firms export to more developed countries. Using a very different approach, Marin (1992) tries to establish whether a causal link between exports and productivity exists for four developed market economies based on co-integration and Granger causality techniques. The findings suggest that an "outward-looking" regime favors the productivity performance of developed market economies as well as that of developing countries.

3 Mechanisms

For both analytical purposes and for policy purposes, it is important to understand the mechanisms via which the link between exports, wages and employment operates. This will allows us to derive concrete recommendations to guide policy in developing countries. To explore this issue, we proceed as follows. First, we do a comprehensive literature review to identify, both theoretically and empirically, the main mechanisms. From this review, we conclude that the main mechanisms to focus our attention are skilled labor utilization, technology sophistication, imported input use, and productivity. Second, summarize the literature by introducing a simple model that captures, in a cohesive way, those four mechanisms. Finally, we turn to the Enterprise Survey for evidence for developing countries.

3.1 Identifying Some of the Main Mechanisms

There are many reasons why exporters hire more workers and, especially, why they pay higher wages. A key reason is that the production of goods for export requires skilled labor. Skilled labor is needed because exporting requires quality upgrades, as in Verhoogen (2008) or because the act of exporting involves operational services, as in Matsuyama (2007).[5] Both the provision of quality and the production of exporting services are skilled-intensive activities. As a result, firms that choose to export need to hire proportionately more skilled labor and pay their high-skilled workers a wage premium. Exporters can afford to do that because exports markets pay, in turn, a premium for their products. Another reason why exporters pay higher wages is a complementarity between the choice of technology of production used in

[5] Using aggregate product-level bilateral trade data, Hallak (2006) is one of the first authors to document the positive correlation between export unit values and the level of income of the country of destination. More recent studies, such as Baldwin and Harrigan (2011) and Johnson (2012), also find positive correlations between export unit values and the income of the destination country. Using firm-level data, Manova and Zhang (2012) show that Chinese exporting firms do indeed charge higher prices in richer markets. Similar evidence is reported by Bastos and Silva (2010), for the case of Portuguese exporters, and Görg, Halpern and Muraközy (2010), for the case of Hungarian exporters.

exporting and the skilled level needed to use those technologies. Yeaple (2005) and Acemoglu and Zilibotti (2001) are examples.[6]

There is a large empirical literature linking skill utilization and exports. Bernard and Jensen (1997) document that increases in employment at exporting plants contribute to the observed increase in relative demand for skilled labor in manufacturing in the U.S. Moreover, exporters account for almost all of the increase in the wage gap between high– and low–skilled workers. Munch and Skaksen (2008) study the link between a firm education level, its export performance and the wages of its workers. Using matched worker–firm panel data, these authors find that firms with high export intensities do indeed pay higher wages and use more skilled labor. However, an interaction term between export intensity and skill intensity has a positive impact on wages and it absorbs the direct effect of the export intensity. This means that the export wage premium found in the data accrues to workers in firms with high skill intensities. Verhoogen (2008) uses the Mexican devaluation of 1994 as an exogenous change in exports. He finds that firms that were more intensively affected by this "export" shock paid higher wages and that this was in part due to an increase in the composition of skilled employment needed to upgrade product quality in Mexican exports to the U.S. Bustos (2014) studies the experience of Argentine firms in the face of enhanced export opportunities to Brazil and confirms that the reduction in Brazil's tariffs induces the most productive Argentine firms to upgrade skills. In fact, she documents that one third of the increase in the relative demand for skills can be attributed to the reduction in Brazil's tariffs. There are many other papers linking exports to skill utilization. Serti, Tomasi and Zanfei (2010) investigate the Italian manufacturing industry. Söderbom and Teal (2000), for Ghana.

A different strand of literature provides evidence in support for a quality provision mechanism in exports. Schott (2004) explores U.S. import unit values and reports higher unit values for varieties originating in capital- and skill-abundant countries. Moreover, exporting countries that become more skill- and capital-abundant with time experience increases in unit

[6] Yet another reason is profit-sharing. Exporters make higher profits and, because of efficiency wages, firms share part of those higher profits with workers. See Egger and Kreickemeier (2009), Egger and Kreickemeier (2010) and Egger and Kreickemeier (2012) for a theoretical approach and Amiti and Davis (2011) for empirical evidence for Indonesia.

values relative to other exporters. He also finds that richer countries tend to export higher quality products. Hummels and Klenow (2005) show that quality differentiation is needed to explain differences in unit values and show that these unit values positively correlate with per capita income of the exporting country. Hallak (2010) documents that trade is more intense among countries with similar income per capita—the Linder hypothesis. Caron, Fally, and Markusen (2014) establish a positive correlation between the income elasticity of a good and its skilled-labor intensity. This implies that richer countries demand and produce higher quality goods and, as a consequence, trade between rich countries is more intense than trade between rich and poor countries (especially in higher quality goods).

Exporters may pay higher wages (on top of the skilled labor utilization mechanism) because of complementarities with technology upgrades. Bustos (2011) provides evidence on the link between exports and technology upgrading in Argentina after MERCOSUR. Her empirical analysis reveals that firms in industries facing higher reductions in Brazil's tariffs (main MERCOSUR partner for Argentine firms) increase investment in technology faster, especially for middle-upper and high-productivity firms. Lileeva and Trefler (2010) study the experience of Canadian firms and their exports to the U.S. They find that those lower-productivity Canadian plants that were induced by the tariff cuts to start exporting engaged in more product innovation and had high adoption rates of advanced manufacturing technologies. In contrast, they find no effects for higher-productivity plants. An important related paper is Aw, Roberts and Xu (2011). This paper estimates a dynamic structural model of a producer's decision to invest in R&D and export, allowing both choices to endogenously affect the future path of productivity. Using plant-level data for the Taiwanese electronics industry, both activities are found to have a positive effect on the plant's future productivity. This in turn drives more plants to self-select into both activities, contributing to further productivity gains. Simulations of an expansion of the export market are shown to increase both exporting and R&D investment and generate a gradual within-plant productivity improvement.

The literature has pointed out that the production of export goods (e.g., products of higher quality) often requires high quality inputs (besides high quality labor, as above). In general, in developing countries, higher quality inputs are imported. If there is, as suggested in the literature, a complementarity between the use of higher-quality inputs and the use of higher-quality labor, then this is another mechanism underlying the wage export premium. This mechanism can be interpreted as an extension of the idea advanced by Verhoogen (2008). Kugler and Verhoogen (2012) elaborate on this "quality-complementarity" hypothesis and show that input quality and plant productivity are complementary in generating output quality. The empirical results for Colombia indicate that higher productivity firms (which are more likely to be exporters) charge more for their outputs and pay more for their material inputs.

The empirical evidence on the link between imported inputs and wages is indirect. Bas (2012) looks at the relationship between changes in input tariffs and within-firm changes in export status. Using detailed firm-level data from Argentina, she finds that the probability of entering the export market is higher for firms producing in industries that have experienced greater input tariff reductions. Bas and Strauss-Kahn (2011) use firm import data at the product (HS6) level in France to confirm that access to new varieties of inputs increase productivity, and thereby exports, through better complementarity of inputs and transfer of technology. Feng, Li and Swenson (2012) look at Chinese manufacturing firms following the country accession to the WTO. Their results show that firms that expanded their intermediate input imports expanded the volume of their exports and increased their export scope.

3.2 Theoretical Model

To better organize our discussion, we develop here a simple model that captures the mechanisms outlined in the review. The goal is to lay out a theoretical framework to formalize the intuitions provided by the empirical results. The model is a simple partial equilibrium model. We introduce the demand and production structure and we study optimal firm decisions. In the process, we describe how the four mechanisms operate.

Consider a differentiated good j with quality θ_j and price p_j. The demand function for this good is $x(p_j, \theta_j)$, conditional on income and on the prices of all the other goods. Consider a firm in a monopolistic competition framework that faces this demand function. The firm has to choose the quality θ_j of the good and its selling price. In line with the literature, the total cost of producing the physical units depends on quantities as well as on the quality of the good. The cost function is $C_j(x_j, \theta_j)$. There may also be a separate cost of producing quality (that is independent of quantities), $\widetilde{F}_j(\theta_j)$. Firm j maximizes profits

$$(2) \quad \pi_j = p_j x(p_j, \theta_j) - C(x_j, \theta_j) - \widetilde{F}_j(\theta) - F_j,$$

where F_j is a fixed cost of production or of entering a market.

The literature imposes some restrictions on this general framework. First, the demand function takes a logit (Verhoogen, 2008; Fajgelbaum, Grossman, and Helpman, 2011; Brambilla, Lederman, and Porto, 2012) or a quality-adjusted CES specification (Bastos, Silva, and Verhoogen, 2014; Feenstra and Romalis, 2012; Hallak, 2006; Hallak, 2010; Johnson, 2012; Kugler and Verhoogen, 2012).[7] For our purposes, both demand systems deliver the same results and, in what follows, we adopt the logit model.

For the sake of generality, we will assume that a firm can serve many different market destinations (countries). The utility that individual h in destination d derives from the consumption of variety j is given by

$$(3) \quad U_{hj}^d = \alpha(y^d)\theta_j^d - p_j^d + \epsilon_{hj}^d,$$

where y^d is income in destination d and ϵ_{hj} is a random deviation that follows a type-I extreme value distribution. As in Verhoogen (2008), the parameter $\alpha(y^d)$ captures quality valuation. Throughout the analysis, we assume that $\alpha'(y^d) > 0$ because 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. This assumption establishes a quality valuation mechanism, i.e., consumers value quality and firms can then exploit this valuation when choosing the optimal quality of their products.[8]

[7] Melitz and Ottaviano (2008) work instead with linear demands.

[8] Alternatively, the CES demand is $x = (\theta^{\iota(y^d)(\rho-1)} p_j^{(-\rho)} I)/P$, where I is income, P is the CES price index, and ρ is the elasticity of substitution. Here, $\iota(y^d)$ plays the role of $\alpha(y^d)$: a higher ι implies a higher

The multinomial–logit aggregate demand function is

$$(4) \quad x_j^d(p_j^d, \theta_j^d) = \frac{M^d}{W^d} \exp\left(\alpha(y^d)\theta_j^d - p_j^d\right),$$

where M^d is the number of consumers in country d, or market size, and W^d is an index that summarizes the characteristics of all available products in that market (i.e. $W^d = \sum_{d \in Z^d} \exp(\alpha^d \theta_z^d - p_z^d)$, where Z^d is the set of available products).

The second restriction usually imposed by the literature is that the production technology is such that physical output is produced under constant returns to scale and thus constant marginal costs. We can thus work with a marginal cost function $c_j(\theta_j)$ that depends on quality, with $c_j'(\theta_j) > 0$ and $c_j''(\theta_j) > 0$. The mechanisms described above will operate through this cost function, as we shortly show.

In the source country, there are J firms producing differentiated products under monopolistic competition. Each firm can ship its product to multiple destinations. At this point, to simplify the analysis, we assume that there are no fixed costs of producing quality, that is $\widetilde{F}_j(\theta) = 0$, though there are fixed cost to reach markets which are common to all firms and all destinations, $F \geq 0$. We further assume that firms can choose prices p_j^d and quality θ_j^d at each destination market separately. The first order conditions for profit maximization are:

$$(5) \quad p_j^d = 1 + c_j(\theta_j^d),$$

$$(6) \quad \alpha(y^d) = \frac{c_j'(\theta_j^d)}{p_j^d - c_j(\theta_j^d)}.$$

The intuition is straightforward. First, firms charge a constant markup over marginal costs. Second, given the optimal markup, optimal quality in a given market requires equating the marginal costs of quality provision with the quality valuation α.

quality valuation and $\iota'(y^d) > 0$ so that richer countries value quality more.

Consider now the function $\alpha(y^d)$, with $\alpha'(y^d) > 0$. It is easy to show that

$$(7) \quad \frac{d\theta_j^d}{dy^d} = \frac{\alpha'(y^d)}{c_j''(\theta_j^d)} > 0,$$

$$(8) \quad \frac{dp_j^d}{dy^d} = \frac{\alpha'(y^d)c_j'(\theta_j)}{c_j''(\theta_j)} > 0.$$

These results establish that higher income countries, which value quality more ($\alpha'(y^d) > 0$), induce firms to optimally deliver higher quality products, $d\theta_j^d/dy^d > 0$. In turn, these products can be sold at a higher price, $dp_j^d/dy^d > 0$.

To better characterize the solution, we need to describe the function $c_j(\theta_j)$. We adopt a unifying framework to study the mechanisms. We build on Johnson (2012), Crino and Epifani (2012), Hallak and Sivadasan (2013), Flam and Helpman (1987), Hummels and Klenow (2005), Verhoogen (2008), Bastos, Silva and Verhoogen (2014), Brambilla, Lederman, and Porto (2012), Feenstra and Romalis (2012), and Kugler and Verhoogen (2012).

To produce quantity and quality, a firm utilizes three production factors: labor, (imported) material inputs, and capital or technology, combined with productivity λ. The production of one unit of physical output requires $1/\ell$ units of labor and 1 unit of imported material inputs and 1 unit of capital/technology. All these three production factors are heterogeneous in quality. Workers are heterogenous in skills or ability, S. Imported material differ is quality M, and capital or technology differ in their "sophistication" K. Note that the production of physical output takes place with a fixed-coefficient production function. The quality of the inputs is instead relevant in the production of the quality of the output (the "quality-complementarity" hypothesis of Kugler and Verhoogen, 2012). Thus, for example, a higher ability worker can produce, ceteris paribus, ℓ units of physical output, but of a higher quality θ. To model quality production, firms combine factors with "capability" or "caliber" λ (Kugler and Verhoogen, 2012; Hallak and Sivadasan, 2013) as follows:

$$(9) \quad \theta_j = \lambda_j(K_j)^{\sigma^K}(M_j)^{\sigma^M}(S_j)^{\sigma^S},$$

where $\sigma^K > 0$, $\sigma^M > 0$, $\sigma^S > 0$. This is a standard Cobb-Douglas production function and it implies some degree of complementarity among capability, the quality or sophistication of capital, the quality of (imported) material inputs and skills. Since we are interested in wages, what matters is that this production function implies that a higher λ, a higher K, and a higher M is associated with a more efficient use of a given level of skilled labor in the generation of quality. More generally, equation (9) delivers a positive relationship between the production of quality θ_j and the quality of inputs S_j, M_j and K_j.

To attract higher skilled workers (to produce higher quality), firms face an upward sloping wage scheduled as in Verhoogen (2008). We work with a simple functional form

$$(10) \quad S_j = (w_j^S)^{\xi^S},$$

where w_j^S is the wage rate offered to skills S_j and $\xi^S > 0$ governs the responsiveness of the skill to the offered wage. Equation (10) can be interpreted as a reduced-form representation of an efficiency-wage model or a profit sharing model. Equations (9) and (10) establish the quality provision mechanism because the production of quality requires skills and skilled workers are paid higher wages. We adopt similar factor-price schedules for technology

$$(11) \quad K_j = (w_j^K)^{\xi^K},$$

and material inputs

$$(12) \quad M_j = (w_j^M)^{\xi^M},$$

where w_j^K and w_j^M are the prices for technology and material inputs and $\xi^K, \xi^M > 0$.

For a firm, the cost of producing one unit of output of quality θ_j is the cost of hiring one worker of skill S_j at the wage w_j^S, one unit of capital with sophistication K_j at price w_j^K and one unit of material inputs with quality M_j at price w_j^M. As in Verhoogen (2008), we assume that firms run separate production lines for different qualities. Separability in production allows firms to make independent decisions of entry, quality choice, and price to each market. Firms can in principle differ in physical output productivity ℓ, and in capability/productivity

λ. To simplify the analysis we assume firms are heterogeneous only in capability λ, although adding firm heterogeneity in a second dimension is straightforward.

To illustrate how the mechanisms operate in the model, it is useful to consider a firm with productivity λ_j, capital K_j and material inputs M_j.[9] Assuming capital or the sophistication of technology K is given at a moment in time can be the result of a time-to-build assumption so that capital/technology investment decisions are adopted with lags, and K is consequently predetermined. Material inputs are likely to be adjusted "instantaneously," as labor is, but for the moment we assume M is also predetermined. Using (9) and (10), the marginal cost of producing a physical unit of good j is

$$(13) \quad c_j(\theta_j) = \frac{1}{\ell \left(\lambda_j K_j^{\sigma^K} M_j^{\sigma^M}\right)^{1/\xi^S\sigma^S}} (\theta_j)^{\frac{1}{\xi^S\sigma^S}},$$

with $c' > 0$ and $c'' > 0$ if $\xi^S\sigma^S < 1$. From (13) and (6), we can solve for optimal quality

$$(14) \quad \theta_j^* = \left(\ell\alpha\xi^S\sigma^S\right)^{\frac{\xi^S\sigma^S}{1-\xi^S\sigma^S}} \left(\lambda_j (K_j)^{\sigma^K} (M_j)^{\sigma^M}\right)^{\frac{1}{1-\xi^S\sigma^S}},$$

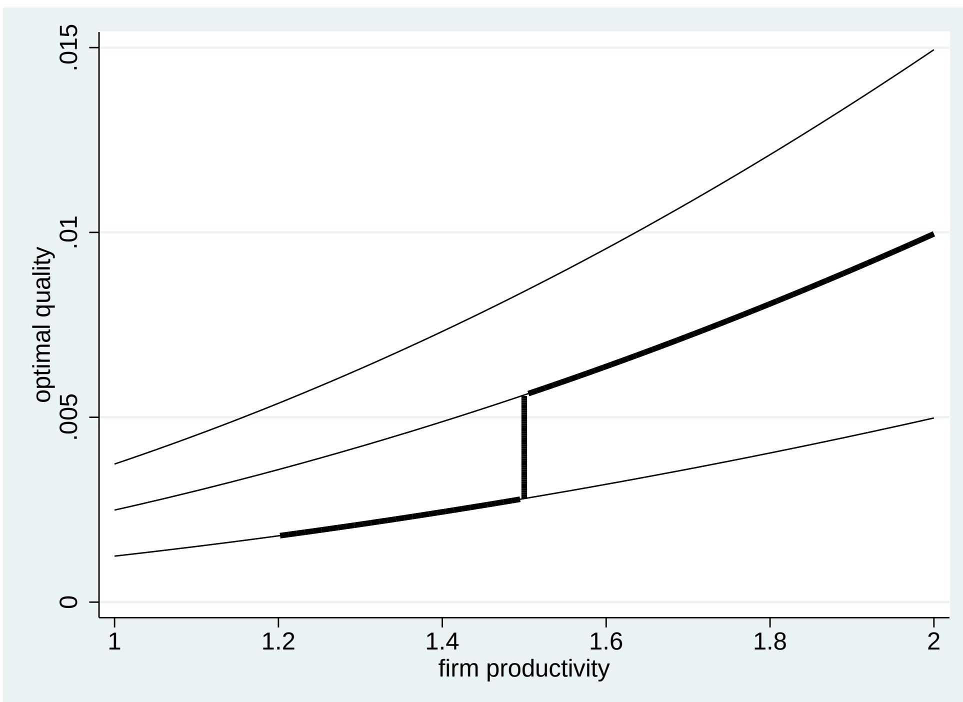
which is increasing in the quality of material inputs M_j, in the sophistication of technology K_j and in productivity λ_j.

The next step needed to establish the mechanisms is to incorporate explicitly the export market. To do this in the most straightforward manner, consider two destinations d, the domestic market and a foreign market with a higher quality valuation α. The equilibrium is described in Figure 1. We plot the optimal choice of quality (equation (14)) as a function of firm productivity λ_j for the domestic and the foreign markets. Clearly, optimal quality is increasing in λ. Moreover, since the foreign market has a higher valuation for quality, the level of optimal quality is higher, at each productivity level. As a consequence, the quality schedule of the export market goods lies above the quality schedule of the domestic market good.

As in all the literature, we assume firms face a fixed costs of entering the domestic market and an additional, higher fixed cost of entering the foreign market. This defines two

[9] We work out the full solution to the firm optimization problem below.

Figure 1
Optimal Quality and Productivity
(Given Capital K and Material Inputs M)



Note: Optimal quality example from model.

productivity cutoff λ_{min} and λ_{exp} so that firms with productivity $\lambda < \lambda_{min}$ cannot afford to enter any market, firms with productivity $\lambda_{min} < \lambda < \lambda_{exp}$ produce for the domestic market, and firms with productivity $\lambda > \lambda_{exp}$ produce for the both the domestic and the export markets. In Figure 1, we highlight the average quality produced by firms with different productivities. As it can be seen, firms that enter the export market produce higher average quality. At low productivity levels, average quality tracks the quality demanded at the domestic market. There is a discrete jump at the cutoff λ_{exp}, and then average quality is just the average of the quality demanded domestically and abroad.

Now consider a firm with higher capital sophistication or higher material input quality. (These are endogenous choices, but it is useful to explore this setting to think about the mechanisms at play). Higher K or higher M allows firms to produce higher optimal quality, both for the domestic market and for the foreign market. This means that the quality schedules in Figure 1 shift up; see Figure 2. The cutoff also change, and both λ_{min} and λ_{exp} are lower. This is because higher K or higher M allows firm to produce more and then become profitable at lower levels of productivity or capability. The effect on the quality premium of exporters is consequently ambiguous. However, overall, firms with more sophisticated machines or firms that buy higher quality inputs produce higher quality outputs.

These mechanisms translate to skill utilization and wages. The solution for optimal skill utilization, conditional on all other variables, is

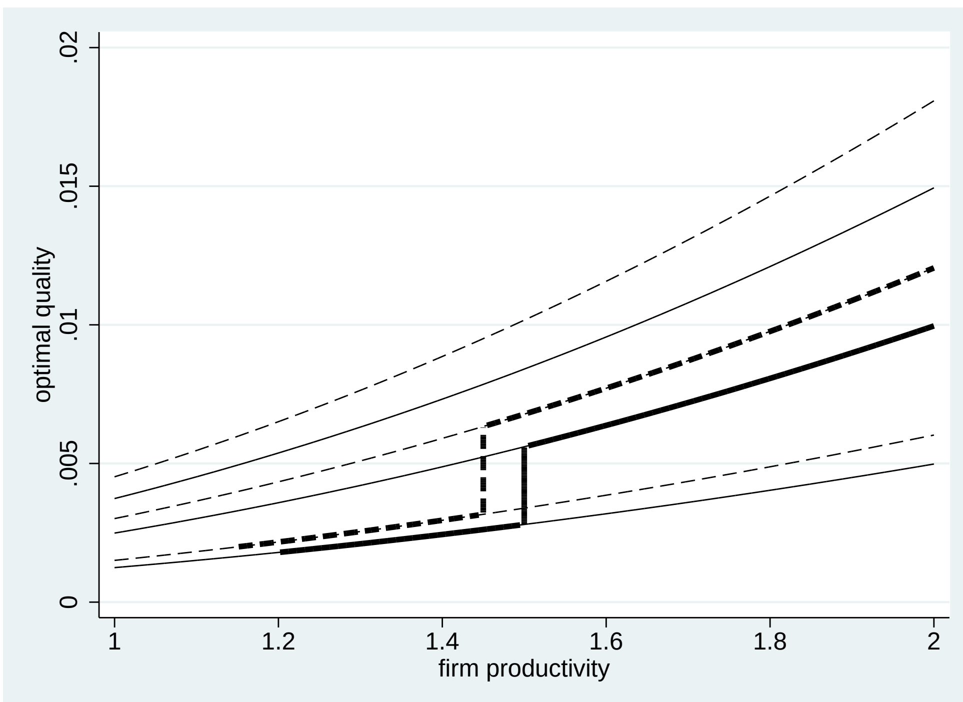
$$(15) \quad S_j^* = \left(\ell\alpha\xi^S\sigma^S\right)^{\frac{\xi^S}{1-\xi^S\sigma^S}} \left(\lambda_j(K_j)^{\sigma^K}(M_j)^{\sigma^M}\right)^{\frac{\xi^S}{1-\xi^S\sigma^S}} .$$

Wages are

$$(16) \quad w_j^* = \left(\ell\alpha\xi^S\sigma^S\right)^{\frac{1}{1-\xi^S\sigma^S}} \left(\lambda_j(K_j)^{\sigma^K}(M_j)^{\sigma^M}\right)^{\frac{1}{1-\xi^S\sigma^S}} .$$

Figure 3 illustrate this solution. First, exporters utilize more skills and pay higher wages than non-exporters. Second, firms with higher K and higher M utilize even higher skills. As a result, they also pay higher wages. This shows the intuition behind this theoretical apparatus. There is a complementarity between input quality and output quality. More productive firms

Figure 2
Optimal Quality and Productivity with Higher Capital
(Given Material Inputs M)



Note: Optimal quality example from model and the impact of higher capital sophistication.

can afford to produce higher quality products and enter world markets. To do this, ceteris paribus, they need to hire skilled labor. Since it is expensive to do so, because to attract skilled labor firms need to pay higher wages, wages at exporting firms are on average higher than wages at non-exporting firms. There is, indeed, a wage export-premium. Moreover, given higher technology sophistication or material input quality, firms produce even higher quality, hire even higher skilled labor, and pay even higher wages.

For completeness, we work out the full solution of the model. The first order conditions for price and quality are (5) and (6), as before. Firms now jointly choose the quality of capital, labor and material inputs. To simplify the algebra, we assume the input use efficiency ℓ applies to all three factors.[10] Firms minimize costs $c = (1/\ell)(w^S + w^K + w^M)$, subject to the quality production function (9) and the wage schedules (10), (11) and (12). The optimal choice of quality is

$$(17) \quad \theta_j^* = (\ell\alpha)^{\frac{a}{1-a}} \lambda_j^{\frac{1}{1-a}} J,$$

where $a = \xi^S\sigma^S + \xi^K\sigma^K + \xi^M\sigma^M$ and we assume that $a < 1$ (to get an interior solution for θ) and $J = [(\xi^S\sigma^S)^{\xi^S\sigma^S}(\xi^K\sigma^K)^{\xi^K\sigma^K}(\xi^M\sigma^M)^{\xi^M\sigma^M}]^{1/(1-a)}$. The solutions for optimal labor quality S, material inputs quality M and capital sophistication K are

$$(18) \quad S_j^* = (\xi^S\sigma^S)^{\xi^S} (\alpha\ell)^{\frac{\xi^S}{1-a}} (\lambda_j)^{\frac{1}{1-a}} J^{\xi^S},$$

$$(19) \quad M_j^* = (\xi^M\sigma^M)^{\xi^M} (\alpha\ell)^{\frac{\xi^M}{1-a}} (\lambda_j)^{\frac{1}{1-a}} J^{\xi^M},$$

and

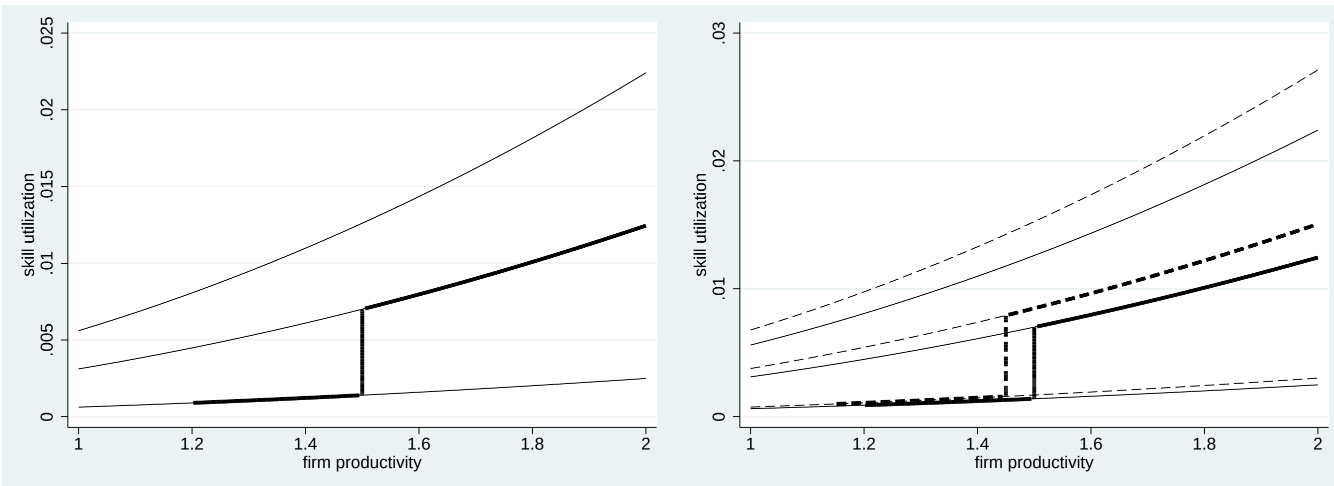
$$(20) \quad K_j^* = (\xi^K\sigma^K)^{\xi^K} (\alpha\ell)^{\frac{\xi^K}{1-a}} (\lambda_j)^{\frac{1}{1-a}} J^{\xi^K},$$

Ultimately, the choices of input quality are a function of firm features such as productivity or caliber λ (and ℓ). We can see that exporters hire more skilled labor, more and better

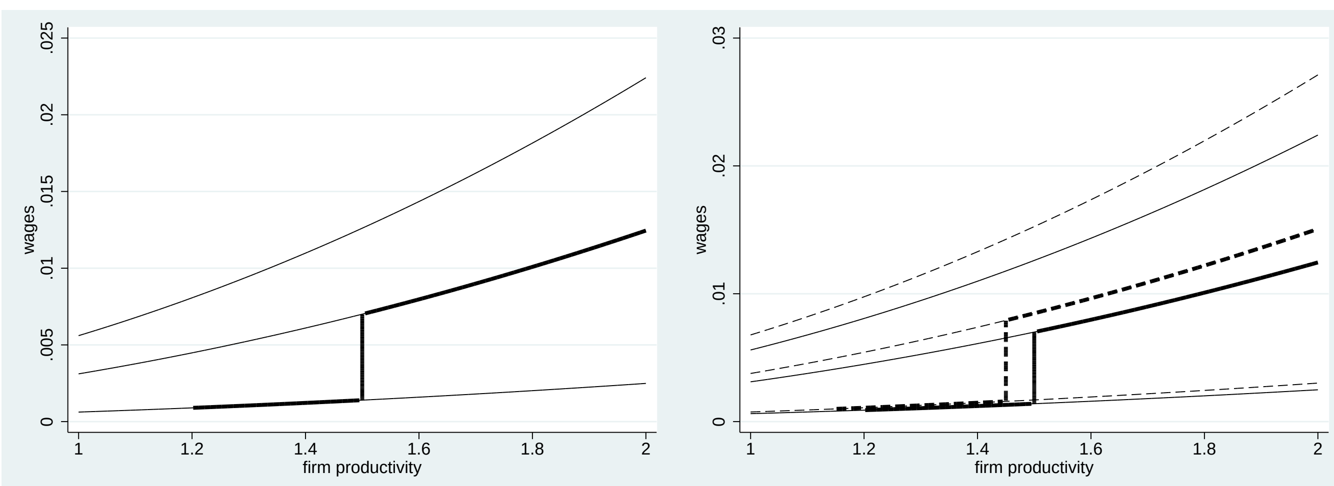
[10] It is easy but cumbersome to consider potential differences in the efficiency in the use of capital, labor and materials.

Figure 3
Skill Utilization, Wages and Productivity

A) Skill Utilization



B) Wages



Note: Optimal skill utilization and equilibrium wages; example from model.

material inputs and adopt a higher sophistication of technology in Figure 4. In each panel, we plot the optimal choice of S (upper-left panel), M (upper-right panel) and K (lower-left panel) as a function of λ for the domestic market and for the foreign market. As with optimal quality, the average skill increases in λ as exporters hire, on average, more skilled workers. Similar statements can be made for the cases of material inputs and capital sophistication.

Next, we turn to the evidence provided by our regression analysis of the Enterprise Surveys.

3.3 Skill Utilization

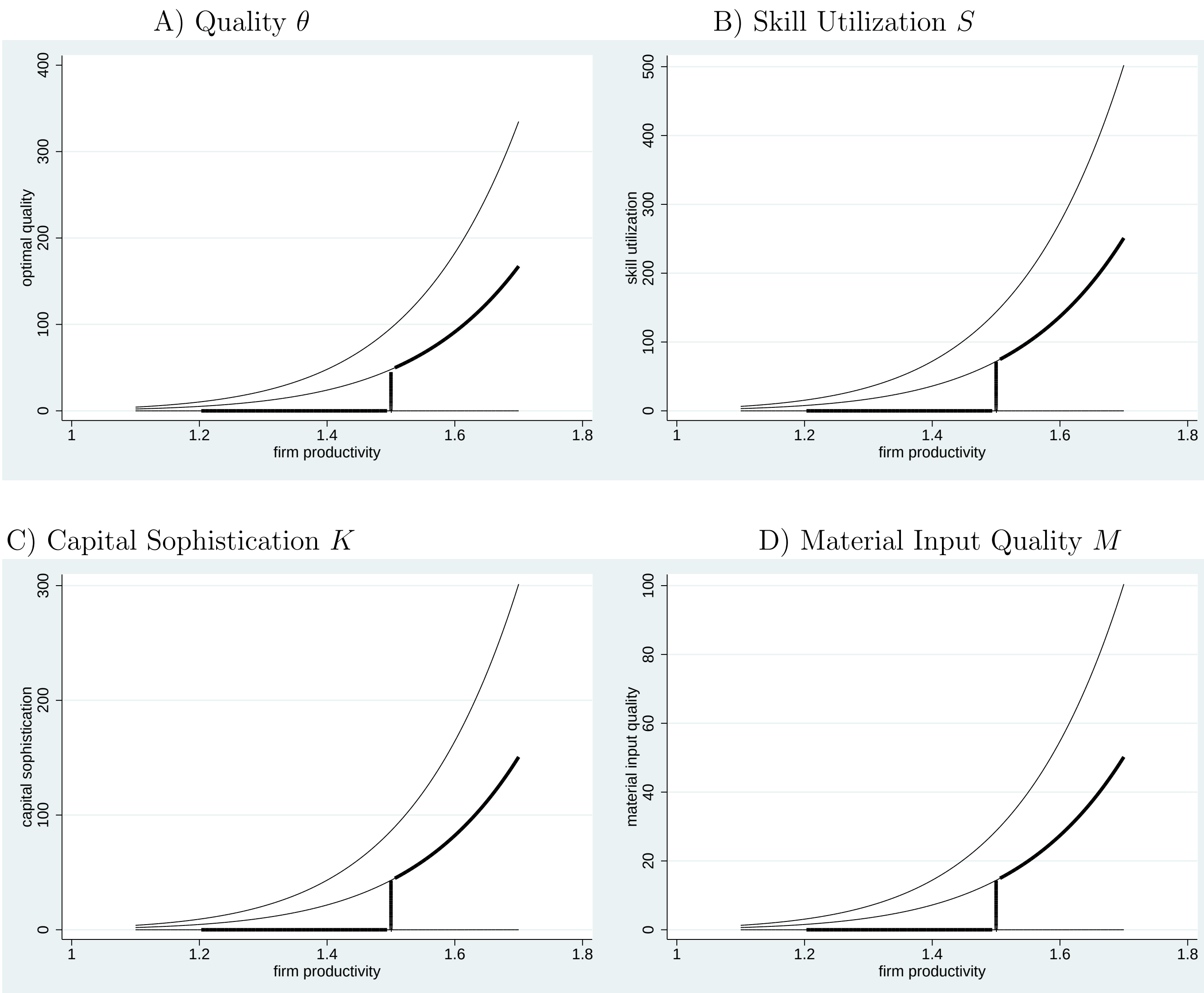
To study whether exporters demand more skilled workers over unskilled workers than non-exporters in low income countries, we adopt the following variant of regression model (1)

(21) $s_{ij} = \delta E_{ij} + \phi_j + u_{ij},$

where now the dependent variable s_{ij} is some measure of the utilization of skilled labor relative to unskilled labor. All other variables are defined as above.

Our main results are reported in Table 3. In column 1, we measure the correlation between exporting and the ratio of skilled labor employment. This correlation is always positive and statistically significant across developing countries. In column 2, the dependent variable is the share of the work-force with completed high-school. This information is not available for all survey, and consequently our analysis is less detailed than before. Nevertheless, we confirm that exporting is positively correlated with this measure of skill utilization. Worldwide, on average, the proportion of the workforce of an exporting firm that has completed high-school is 4 percent higher than for non-exporters. In Latin America and Asia, the share is 5 percent higher, while in Europe and Africa, the correlation is not statistically significant. In Europe, there appears to be some issues with the sample, because there are only two countries with this information, and the correlation is positive and significant in one country and negative and significant in the other (so that, on average, the correlation is lost). In Africa, the

Figure 4
Optimal Firm Choices
Quality, Skills, Capital Sophistication, Material Input Quality



Note: Optimal quality example from model.

absence of a link between exporting and skills may have more economic content.

In columns 3 and 4, we investigate whether exporters demand specific skills from high-rank employees. Concretely, we look first at the quality (i.e., education) of managers. In column 3, we find that, on the average (worldwide) exporting firm, managers are 17 percent more likely to have College Education that at a non-exporter. This correlation is strong statistically and very robust across continents. In Latin America, for instance, the coefficient is 0.25, in Asia, 0.13, and in Africa 0.19. In column 4, we explore the probability that a manager has Post-Graduate Education. We find that, on average, the probability that the manager of an exporting firm has a Post-Graduate degree is 12 percent higher compared to non-exporters. This correlation also holds in Latin America (18 percent), Asia (8 percent), and Africa (13 percent).

3.4 Sophistication of Technology

We investigate this in Table 4 (the regressions are the same as before, except that we change the dependent variables). In column 1, we correlate export status with the firm' capital labor ratio. We find that this correlation is positive and statistically strong everywhere (on average, in Europe, in Latin America, in Asia, and in Africa.). In column 2, we look at the correlation with the probability of having ISO-certified product, and we find that it is much higher at exporting firms than at non-exporting firms. Worldwide, on average, exporters are 24 percent more likely to have ISO certification than non-exporters. The link appears stronger in Asia (27 percent) and Latin America (26 percent) than in Africa (20 percent) or Europe (21 percent). But the association is always statistically very significant.

For a subset of countries, we also have information of the adoption of new technologies (column 3) and R&D spending (column 4). Exporters are 11 percent more likely to incorporate new technologies than non-exporters. This is observed worldwide; In Europe exporters are 13 percent likely to use new technologies, in Latin America, 9 percent, in Asia 11 percent and in Africa 15 percent. Similarly, R&D spending is 5 percent higher at exporting firms, on average.

Table 3
Export Premium. Composition of the Labor Force

Country	Share of Skilled Workers Premium (1)	N (2)	Completed High School Premium (3)	N (4)	Manager with College Education Premium (5)	N (6)	Manager with Post-grad. Education 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**				
Bulgaria 2007	0.95	497						
Hungary 2005	1.08	271	0.05***	267				
Macedonia 2009	1.72***	103						
Moldova 2009	1.29*	107						
Romania 2005	4.54	316	-0.06***	314				
Romania 2009	4.37*	107						
Russia 2009	0.22	484						
Russia 2012	2.71***	858						
Ukraine 2008	3.20***	368						
Latin America	**0.65*****	**13907**	**0.05*****	**7593**	**0.25*****	**4660**	**0.18*****	**4660**
Argentina 2006	1	494						
Argentina 2010	0.63***	671	0.10***	624				
Brazil 2003	0.72***	1575	0.04***	1571	0.22***	1574	0.19***	1574
Brazil 2009	1.34***	1150						
Chile 2004	0.60*	688	0.04	672	0.20***	684	0.17***	684
Chile 2006	0.4	316						
Chile 2010	0.63***	654	0.11***	633				
Colombia 2006	0.52***	574						
Colombia 2010	0.43***	633	0.04***	618				
Costa Rica 2005	0.89*	296	0.08***	296	0.43***	296	0.30***	296
Costa Rica 2010	0.43	235	0.12***	226				
Dominican Rep. 2010	0.52	113	-0.20***	104				
Ecuador 2003	2.41*	329	-0.05***	311	0.08*	327	0.15***	327
Ecuador 2006	0.39	185						
Ecuador 2010	0.6	102	0.05	101				
El Salvador 2003	0.51***	465	0.21***	28	0.35***	464	0.20***	464
El Salvador 2006	1.35**	297						
Guatemala 2003	0.11	435	-0.10***	10	0.29***	435	0.16***	435
Guatemala 2006	0.84	196						
Guatemala 2010	1.37***	234	0.03	225				
Honduras 2003	-0.04	428	0.15*	16	0.37***	428	0.15***	428
Honduras 2006	0.5	139						
Honduras 2010	0.5	110	0.11**	107				
Jamaica 2010	-0.11	109	0.03	99				
Mexico 2010	0.39***	1062	0.09***	1045				
Nicaragua 2003	0.02	452	0.08	9	0.19***	452	0.14***	452
Nicaragua 2006	0.35	183						
Nicaragua 2010	2.30*	100	0.17***	92				
Panama 2006	0.93	124						
Paraguay 2006	0.02	199						
Peru 2006	0.64	307						
Peru 2010	0.22	619	0.02*	613				
Uruguay 2006	0.47	199						
Uruguay 2010	0.52	234	0.08	193				

Table 3
Export Premium. Composition of the Labor Force

Country	Share of Skilled Workers Premium (1)	N (2)	Completed High School Premium (3)	N (4)	Manager with College Education Premium (5)	N (6)	Manager with Post-grad. Education Premium (7)	N (8)
Asia	**1.04*** **	**16836**	**0.05*** **	**6725**	**0.13*** **	**10683**	**0.08*** **	**6730**
Azerbaijan 2009	1.98	109						
Bangladesh 2002	2.62	980			0.06	813	0.01	813
Bangladesh 2007								
China 2002					0.10***	962	0.06*	962
China 2003	0.02*	1309			0.11***	1299	0.09***	1299
India 2000	1.38**	855			0.08*	810		
India 2002			0.07***	1714	0.03	1762		
Indonesia 2003	1.11	667	0.09**	667	0.28***	666	0.09***	666
Indonesia 2009	1.82***	891						
Kazakhstan 2005	3.47***	244	0.06	243				
Kazakhstan 2009	3.28	146						
Mongolia 2009	0.74	130						
Nepal 2000	0.01	195						
Nepal 2009	0.6	125						
Pakistan 2002	1.72**	910	0.05*	908	0.27***	907	0.25***	907
Pakistan 2007	1.79***	743						
Philippines 2003	2.25**	665			0.16***	637	0.12***	637
Philippines 2009	2.09**	784						
Sri Lanka 2004	2.57	404	0.04*	397	0.06	308	0.01	308
Sri Lanka 2011	3.17	295	0.08**	278				
Thailand 2004	-0.07	1385	0.04**	1385	0.16***	1381		
Uzbekistan 2008	1.3	120						
Vietnam 2005	2.08***	1145	0.0027	1133	0.14***	1138	0.02	1138
Vietnam 2009	0.41	724						
Africa	**0.74*** **	**9305**	**0.01**	**3031**	**0.19*** **	**3665**	**0.13*** **	**2393**
Angola 2010	1.76	122	-0.01	93				
Botswana 2006	1.63***	112						
Burundi 2006	1.56	102						
Congo D.Rep. 2006	-0.01	149						
Egypt 2004	0.67	954	0.04***	951	0.08***	953	0.03***	953
Ethiopia 2002	-0.05	417			0.22***	416		
Ethiopia 2011	-0.24***	213	-0.04***	206				
Ghana 2007	2.46***	292						
Guinea 2006	-0.17	135						
Ivory Coast 2009	0.75	175						
Kenya 2007	-0.06	396						
Madagascar 2005	-0.05	210	-0.06	159	0.37	56	0.14	56
Madagascar 2009	1.1	165						
Mali 2007	-0.77***	234						
Mauritius 2009	0.25	161						
Morocco 2000	1.01**	856			0.19***	856		
Morocco 2004	1.25**	838	0.01	838	0.24***	831	0.17***	831
Mozambique 2007	-0.59***	207						
Namibia 2006	0.61	104						
Nigeria 2007	1.01*	948						
Senegal 2007	-0.15	156						
South Africa 2003	1.28**	554	0.02	469	0.24***	553	0.19***	553
South Africa 2007	0.60*	672						
Tanzania 2006	0.53	272						
Uganda 2006	0.21	307						
Zambia 2007	1.61***	237						
Zimbabwe 2011	-0.08	317	-0.03	315				

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).

Table 4
Export Premium. Sophistication of Technology

Country	Capital-Labor Ratio		ISO-certified Products		New Technology		R&D Spending	
	Premium	N	Premium	N	Premium	N	Premium	N
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(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**
Bulgaria 2007	0.26	298	0.17***	471				
Hungary 2005			0.13***	271	0.04	271	0.16***	271
Macedonia 2009	1.21***	87	0.37**	95				
Moldova 2009	0.95***	102	0.37***	104				
Romania 2005			0.11	316	0.24***	315	-0.03***	316
Romania 2009	0.54	74	0.09	101				
Russia 2009	0.03	296	0.27***	478				
Russia 2012	0.39***	455	0.22***	843				
Ukraine 2008	0.94***	196	0.26***	364				
Latin America	**0.52*****	**12009**	**0.26*****	**13405**	**0.09*****	**4667**	**0.05*****	**13907**
Argentina 2006	0.38**	329	0.29***	492				
Argentina 2010	0.66***	581	0.36***	646				
Brazil 2003	0.61***	1523	0.22***	1500	0.04	1575	0.21***	1575
Brazil 2009	0.67***	864	0.24***	1117				
Chile 2004	0.73***	688	0.35***	604	0.14***	688	0.13***	688
Chile 2006	0.68***	200	0.35***	301				
Chile 2010	0.73***	606	0.40***	619				
Colombia 2006	0.29	511	0.22***	573				
Colombia 2010	0.42***	574	0.41***	599				
Costa Rica 2005	0.53***	281	0.26***	290	0.14**	296	0.10**	296
Costa Rica 2010	0.38***	204	0.39***	214				
Dominican Rep. 2010	0.14	88	0.22**	108				
Ecuador 2003	0.77***	279	0.24***	329	0.11*	328	0.12***	329
Ecuador 2006	0.45***	140	0.32***	168				
Ecuador 2010	0.74**	89	0.39***	101				
El Salvador 2003	0.62***	465	0.09***	465	0.17**	465	0.12***	465
El Salvador 2006	0.25	224	0.24***	280				
Guatemala 2003	0.08	431	0.01	435	0.18***	435	0.15*	435
Guatemala 2006	0.41	178	0.16	186				
Guatemala 2010	0.71***	199	0.19***	223				
Honduras 2003	0.30**	425	0.06***	428	0.03	428	0.14***	428
Honduras 2006	0.39	120	0.1	126				
Honduras 2010	-0.55	70	0.31***	108				
Jamaica 2010	0.59*	90	0.13**	105				
Mexico 2010	0.36***	1008	0.34***	1019				
Nicaragua 2003	0.11	451	0.02	452	-0.04	452	0.08*	452
Nicaragua 2006	0.31	137	0.25***	181				
Nicaragua 2010	0.28	55	0.39***	99				
Panama 2006	0.07	68	-0.01	119				
Paraguay 2006	0.74***	101	0.14**	199				
Peru 2006	0.61**	227	0.25***	306				
Peru 2010	0.60***	494	0.31***	586				
Uruguay 2006	0.72**	138	0.28***	198				
Uruguay 2010	1.11***	171	0.27***	229				

Table 4
Export Premium. Sophistication of Technology

Country	Capital-Labor Ratio		ISO-certified Products		New Technology		R&D Spending	
	Premium	N	Premium	N	Premium	N	Premium	N
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Asia	**0.50*** **	**14542**	**0.27*** **	**11955**	**0.11*** **	**6317**	**0.07*** **	**16836**
Azerbaijan 2009	-1.03**	95	0.28***	103				
Bangladesh 2002	0.08	977					0.04	980
Bangladesh 2007	1.28	1262	0.28***	1247				
China 2002	0.68***	962	0.17***	903	0.10***	964	0.06	965
China 2003	0.61***	1303	0.18**	1309	0.08	1301	0.18**	1309
India 2000	0.11	775						
India 2002	0.25	1773					0.21***	1775
Indonesia 2003	0.76***	460	0.19***	651	0.08**	641		
Indonesia 2009	1.28***	589	0.38***	876				
Kazakhstan 2005			0.07***	244	0.02	244	0.04*	244
Kazakhstan 2009	-0.44	119	0.53***	142				
Mongolia 2009	0.95**	127	0.45***	123				
Nepal 2000								
Nepal 2009	0.88**	91	0.08	125				
Pakistan 2002	-0.14	906	0.45***	907			-0.0018	910
Pakistan 2007	1.43***	128	0.47***	736				
Philippines 2003	0.66***	656	0.21*	598	0.16***	638	0.15***	665
Philippines 2009	0.02	447	0.25***	762				
Sri Lanka 2004	0.05	398					0.02	404
Sri Lanka 2011	-0.55**	213	0.30***	295				
Thailand 2004	1.22***	1366	0.28***	1183	0.14***	1385	0.14***	1385
Uzbekistan 2008	-0.31	116	0.44***	120				
Vietnam 2005	0.04	1141	0.25***	920	0.11**	1144	0.07***	1145
Vietnam 2009	0.14	638	0.26***	711				
Africa	**0.17*** **	**8263**	**0.20*** **	**9075**	**0.15*** **	**2554**	**0.04*** **	**9305**
Angola 2010	0.25	108	0.50***	117				
Botswana 2006	0.34	109	0.1	112				
Burundi 2006	0.68	89	0.41	102				
Congo D.Rep. 2006	0.05	149	0.20**	149				
Egypt 2004	0.28	740	0.26***	933	0.17***	954	0.12***	954
Ethiopia 2002	0.88**	413	-0.03*	417			0.14*	417
Ethiopia 2011	0.32***	109	0.24***	210				
Ghana 2007	0.09	271	0.11	292				
Guinea 2006	0.21	103	0.16**	128				
Ivory Coast 2009			0.16	172				
Kenya 2007	0.26***	393	0.24***	395				
Madagascar 2005	-0.86	138	0.16*	194	0.27**	210	0	210
Madagascar 2009	-0.70**	141	0.21**	163				
Mali 2007	0.59***	199	0.31***	232				
Mauritius 2009	-0.56	111	0.18**	157				
Morocco 2000	-0.01	844	0.05**	781			0.02**	856
Morocco 2004	0.07	823	0.11**	831	0.19***	838	0.04***	838
Mozambique 2007	0.08	164	0.76***	199				
Namibia 2006	0.23*	98	0.3	104				
Nigeria 2007	0.80***	913	0.31**	904				
Senegal 2007	-0.23**	132	0.19	152				
South Africa 2003	0.29	529	0.22***	550	0.04	552	0.16***	554
South Africa 2007	0.2	644	0.32***	672				
Tanzania 2006	1.01***	243	0.04	272				
Uganda 2006	0.70***	268	0.26***	305				
Zambia 2007	0.27	224	0.35***	217				
Zimbabwe 2011	-0.39*	308	0.27***	315				

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).

3.5 Imports and Imports of Intermediate Inputs

The Enterprise Survey allows us to explore this hypothesis because firms are asked whether they purchase inputs from aboard. We can thus study whether exporters tend to purchase imported inputs, and whether they tend to spend a higher fraction of resources on imported inputs. The regression model is the same as before, with changed dependent variables.

Results are in Table 5. We first investigate whether exporters are more likely to be importers too (Bernard, Jensen, Redding, and Schott, 2007). They indeed are. In column 1, we find that an exporter is 27 percent more likely to be an importer as well. This is a very strong and robust correlation. It is observed in Europe (20 percent premium), Latin America (22 percent premium), Asia and Africa (31 percent premium). In column 2, we examine if this correlation operates for imports of intermediate inputs. It does, also very strongly. We look at the correlation between exporting and the share of inputs used by the firm that are imported. On average, exporters have 14 percent higher imported inputs than non-exporters. This correlation is very robust. A European exporter has 14 percent higher imported inputs, Latin American exporters, 10 percent higher imported inputs, Asian exporters, 16 percent higher imported inputs, and African exporters, 19 percent higher imported inputs. The influence of foreign factors in this mechanism is also reflected in the correlation between exporting and foreign firm ownership. In columns 3 and 4, we see that exporting firms have a much higher foreign firm participation. These links hold on average worldwide, and on average within each continent.

3.6 Productivity

We now turn to the correlation between productivity and exporting in the Enterprise Surveys. As we discussed in the literature review, firm productivity is one of the key better performance variables associated with exporting. The evidence in favor of this link is overwhelming, and it is not surprising that we find strong correlations in our data. We build three direct and indirect measures of firm productivity. First, we calculate labor productivity, which is value added per worker. Second, we measure TFP from OLS regressions of output on factor usage. Third, we use (log) sales as an indicator of productivity, as in Verhoogen

Table 5
Export Premium. Imports of Intermediate Inputs

Country	Importer		Percentage of Imported Inputs		Foreign		Majority Foreign	
	Premium	N	Premium	N	Premium	N	Premium	N
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(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
Bulgaria 2007	0.18***	497	0.17**	404	0.15***	497	0.11***	497
Hungary 2005	0.35***	271	0.23***	270	0.25***	271	0.22***	271
Macedonia 2009	0.31***	103	0.15	98	0.20**	103	0.16**	103
Moldova 2009	-0.01	107	0.03	106	0.32***	107	0.28***	107
Romania 2005	0.24***	316	0.18	314	0.16***	316	0.15***	316
Romania 2009	0.31***	107	0.35***	106	0.35**	107	0.27*	107
Russia 2009	0.08	484	-0.0036	417	0.08**	484	0.02	484
Russia 2012	0.17***	858	0.05	819	0.06***	858	0.03*	858
Ukraine 2008	0.33***	368	0.24***	305	0.14***	368	0.14***	368
Latin America	**0.22*** **	**13907**	**0.10*** **	**13695**	**0.16*** **	**13907**	**0.12*** **	**13907**
Argentina 2006	0.20**	494	0.03	479	0.16***	494	0.11***	494
Argentina 2010	0.18***	671	0.06***	668	0.20***	671	0.17***	671
Brazil 2003	0.23***	1575	0.03**	1575	0.09***	1575	0.07**	1575
Brazil 2009	0.26***	1150	0.04	1023	0.13***	1150	0.11***	1150
Chile 2004	0.41***	688	0.14***	686	0.15***	688	0.11***	688
Chile 2006	0.17**	316	0.08*	289	0.12**	316	0.11**	316
Chile 2010	0.22***	654	0.08***	654	0.23***	654	0.18***	654
Colombia 2006	0.17***	574	0.04	570	0.05	574	0.04	574
Colombia 2010	0.17***	633	0.06***	632	0.21***	633	0.13**	633
Costa Rica 2005	0.40***	296	0.25***	293	0.20***	296	0.17***	296
Costa Rica 2010	0.02	235	0.07	235	0.25***	235	0.24***	235
Dominican Rep. 2010	0.28***	113	0.15**	113	0.18**	113	0.18**	113
Ecuador 2003	0.11**	329	0.13***	327	0.15***	329	0.10**	329
Ecuador 2006	0.09*	185	0.08	180	0.15***	185	0.13***	185
Ecuador 2010	0.23***	102	0.13***	102	0.17	102	0.09	102
El Salvador 2003	0.35***	465	0.27***	460	0.12***	465	0.09***	465
El Salvador 2006	0.21***	297	0.25***	297	0.17***	297	0.13**	297
Guatemala 2003	0.41***	435	0.31***	432	0.16***	435	0.14***	435
Guatemala 2006	0.33***	196	0.22***	196	0.19***	196	0.14***	196
Guatemala 2010	0.34***	234	0.22***	234	0.08***	234	0.05**	234
Honduras 2003	0.27***	428	0.22***	426	0.20***	428	0.12	428
Honduras 2006	0.26***	139	0.19***	139	0.32***	139	0.18	139
Honduras 2010	0.25***	110	0.17	110	0.21*	110	0.11	110
Jamaica 2010	-0.08	109	-0.02	109	0.22***	109	0.02	109
Mexico 2010	0.31***	1062	0.14***	1054	0.18***	1062	0.16***	1062
Nicaragua 2003	0.10*	452	0.05	451	0.14***	452	0.12***	452
Nicaragua 2006	0.05	183	0.05	183	0.19**	183	0.16**	183
Nicaragua 2010	0.28***	100	0.09*	100	0.22***	100	0.22***	100
Panama 2006	0.23***	124	0.16***	123	0.13***	124	0.05	124
Paraguay 2006	0.05*	199	-0.06	199	0.14**	199	0.09**	199
Peru 2006	0.08*	307	0.0039	306	0.20*	307	0.17*	307
Peru 2010	0.10***	619	0.03	619	0.19***	619	0.14***	619
Uruguay 2006	0.06	199	0.06	197	0.09	199	0.08*	199
Uruguay 2010	0.03	234	0.07	234	0.14**	234	0.09**	234

Table 5
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)
Asia	**0.31*** **	**16169**	**0.16*** **	**16009**	**0.19*** **	**16836**	**0.14*** **	**16836**
Azerbaijan 2009	0.32***	109	0.20*	109	0.03	109	-0.0023	109
Bangladesh 2002	0.15***	980	0.1	978	0.03	980	0.03	980
Bangladesh 2007	0.34***	1270	0.12**	1270	0.08***	1270	0.06***	1270
China 2002	0.38***	965	0.18***	957	0.34***	965	0.28***	965
China 2003	0.38***	1309	0.13***	1298	0.29***	1309	0.20***	1309
India 2000	0.13***	855	0.06***	792	0.03***	855	0.0017	855
India 2002	0.26***	1775	0.09***	1766	0.08***	1775	0.02***	1775
Indonesia 2003					0.18***	667	0.15***	667
Indonesia 2009	0.53***	891	0.27***	877	0.27***	891	0.26***	891
Kazakhstan 2005	0.51***	244	0.30***	242	0.16***	244	0.04	244
Kazakhstan 2009	0.34***	146	0.31***	142	0.30***	146	0.13	146
Mongolia 2009	0.04	130	-0.14*	130	0.27***	130	0.19**	130
Nepal 2000	0.15**	195	0.16**	193	0.10*	195	0.04	195
Nepal 2009	0.29*	125	0.27***	124	0.06	125	0.03	125
Pakistan 2002	0.15***	910	0.04*	909	0.02	910	0.02	910
Pakistan 2007	0.37***	743	0.14***	741	0.07**	743	0.06**	743
Philippines 2003	0.48***	665	0.40***	648	0.38***	665	0.30***	665
Philippines 2009	0.36***	784	0.27***	784	0.39***	784	0.34***	784
Sri Lanka 2004	0.15	404	0.12	400	0.16**	404	0.12**	404
Sri Lanka 2011	0.39**	295	0.23	295	0.10**	295	0.02	295
Thailand 2004	0.32***	1385	0.16***	1385	0.28***	1385	0.15**	1385
Uzbekistan 2008	0.23	120	0.05	120	0.34***	120	-0.04	120
Vietnam 2005	0.25***	1145	0.14***	1137	0.15***	1145	0.12***	1145
Vietnam 2009	0.30***	724	0.16***	712	0.25***	724	0.19***	724
Africa	**0.31*** **	**9305**	**0.19*** **	**9170**	**0.16*** **	**9305**	**0.12*** **	**9305**
Angola 2010	0.43***	122	0.23***	122	0.30*	122	0.11	122
Botswana 2006	0.20***	112	0.35***	112	0.19*	112	0.20**	112
Burundi 2006	0.25***	102	0.36**	102	0.14	102	0.18	102
Congo D.Rep. 2006	0.13	149	0.03	149	0.30*	149	0.31*	149
Egypt 2004	0.44***	954	0.22***	953	0.07***	954	0.04***	954
Ethiopia 2002	-0.02	417	-0.15***	412	0.10**	417	0.10*	417
Ethiopia 2011	0.10***	213	0.02***	182	0.05***	213	0.06***	213
Ghana 2007	0.30***	292	0.23***	292	0.09	292	0.05	292
Guinea 2006	0.33***	135	0.13	135	0.10**	135	0.10**	135
Ivory Coast 2009	0.19**	175	0.09	149	0.27***	175	0.22***	175
Kenya 2007	0.29***	396	0.22***	396	0.11***	396	0.07***	396
Madagascar 2005	0.19*	210	0.14	206	0.28***	210	0.27**	210
Madagascar 2009	0.21**	165	-0.01	164	0.29***	165	0.24**	165
Mali 2007	0.20**	234	0.1	234	0.06*	234	0.06*	234
Mauritius 2009	0.25***	161	0.15	136	0.25***	161	0.21***	161
Morocco 2000	0.30***	856	0.31***	833	0.20***	856	0.15***	856
Morocco 2004	0.32***	838	0.30**	838	0.19***	838	0.14***	838
Mozambique 2007	0.73***	207	0.54***	207	0.34	207	0.14	207
Namibia 2006	0.17**	104	0.27***	104	0.34***	104	0.25***	104
Nigeria 2007	0.45***	948	0.17***	948	0.03	948	0.03	948
Senegal 2007	0.33***	156	0.18***	156	0.29***	156	0.18	156
South Africa 2003	0.31***	554	0.06*	539	0.12***	554	0.10**	554
South Africa 2007	0.36***	672	0.17***	672	0.14***	672	0.10***	672
Tanzania 2006	0.33***	272	0.17*	272	0.22**	272	0.14**	272
Uganda 2006	0.31***	307	0.13***	307	0.33***	307	0.30***	307
Zambia 2007	0.45***	237	0.18	237	0.06	237	0.09	237
Zimbabwe 2011	0.27***	317	0.15***	313	0.21***	317	0.03	317

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).

(2008), Bustos (2011) and many others. We then regress these variables on the firm export status, as before. Results are in Table 6.

Labor productivity is much higher at exporters (column 1). On average, exporting firms worldwide are 53 percent more productive than non-exporting firms. In Europe, the labor productivity premium is 30 percent, in Latin America, 67 percent; in Asia, 54 percent, and in Africa, 32 percent. Productivity as measured by total factor productivity is also higher at exporters, but not as much as labor productivity (column 2). The TFP premium is, on average, 10 percent. This premium is 8 percent in Europe, 13 percent in Latin America, 10 percent in Asia, and 7 percent in Africa. Sales are also much larger for exporting firm (column 3). On average, the sales premium is 1.86, but it can be as large as 2.06 in Latin America or 1.89 in Asia, to as low as 1.54 in Europe or 1.49 in Africa.

For our purposes, this correlation between exporting and productivity is useful for several reasons. Productivity is a clear indicator of firm performance, and consequently these correlations confirm the notion that exporters perform better, in general, than non-exporters. Also, much of the modern literature on trade with firm heterogeneity relies on productivity differences to explain firm decisions and the observation that exporters are more productive is consistent with this view. Finally, higher factor productivity and sales at exporting firms are consistent with the observation that exporters earn more profits than non-exporters. As such, they can afford to pay higher wages. This could happen because of an inherent complementarity with the other mechanisms explored above (skill use, imported inputs, technology, R&D, investment, ownership) or because of additional mechanisms. That is, more productive firms can pay higher wages, ceteris paribus (that is, even conditional on skill utilization, imported inputs use, technology adoption and so on). This could occur under fair wages hypothesis, bargaining of profit sharing between firms and workers (Blanchflower, Oswald and Sanfey 1996; Egger and Kreickemeier, 2009; Egger and Kreickemeier, 2010; Egger and Kreickemeier, 2012; Amiti and Davis, 2011).

Table 6
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**
Bulgaria 2007	0.31***	486	0.10***	497	1.18***	497
Hungary 2005	0.18***	259			1.58***	271
Macedonia 2009	0.53**	97	0.15	103	2.09***	103
Moldova 2009	0.17	104	0.01	107	1.98***	107
Romania 2005	0.1	293			1.56***	316
Romania 2009	0.11	97	0.04	107	1.54***	107
Russia 2009	0.2	407	0.10**	484	1.30***	484
Russia 2012	0.48***	801	0.11	858	1.52***	858
Ukraine 2008	0.46**	301	0.15*	368	2.16***	368
Latin America	**0.67*** **	**13174**	**0.13*** **	**13907**	**2.06*** **	**13907**
Argentina 2006	0.50**	482	0.07	494	1.81***	494
Argentina 2010	0.39***	652	0.05	671	1.74***	671
Brazil 2003	0.92***	1558	0.16***	1575	2.05***	1575
Brazil 2009	0.93***	998	0.22***	1150	2.31***	1150
Chile 2004	0.52	678	0.15	688	2.05***	688
Chile 2006	0.84***	313	0.16**	316	2.34***	316
Chile 2010	0.63***	651	0.11**	654	2.09***	654
Colombia 2006	0.47***	570	0.06**	574	1.63***	574
Colombia 2010	0.71***	629	0.11	633	2.17***	633
Costa Rica 2005	0.85***	278	0.2	296	2.52***	296
Costa Rica 2010	0.76***	224	0.15***	235	2.04***	235
Dominican Rep. 2010	0.07	113	0.02	113	1.30***	113
Ecuador 2003	0.68	18	0.20**	329	1.83***	329
Ecuador 2006	0.38	180	0.03	185	1.65***	185
Ecuador 2010	0.66**	102	-0.03	102	2.07***	102
El Salvador 2003	0.68***	461	0.12	465	1.98***	465
El Salvador 2006	0.55***	287	0.19	297	2.10***	297
Guatemala 2003	0.42**	412	0.18***	435	1.94***	435
Guatemala 2006	0.54**	191	0.17*	196	2.05***	196
Guatemala 2010	0.96***	223	0.13	234	2.60***	234
Honduras 2003	0.68***	414	0.18***	428	2.36***	428
Honduras 2006	1.16***	133	0.26***	139	2.60***	139
Honduras 2010	0.98***	101	0.15	110	2.69***	110
Jamaica 2010	0.68**	109	0.01	109	1.93***	109
Mexico 2010	0.66***	1040	0.08	1062	2.33***	1062
Nicaragua 2003	0.28**	447	0.1	452	1.31***	452
Nicaragua 2006	1.07***	171	0.22	183	2.31***	183
Nicaragua 2010	0.96***	94	0.07*	100	3.07***	100
Panama 2006	0.19	123	0.09	124	2.00***	124
Paraguay 2006	0.96***	186	0.14	199	2.13***	199
Peru 2006	0.86***	300	0.23***	307	2.09***	307
Peru 2010	0.63***	615	0.05	619	1.98***	619
Uruguay 2006	0.67**	193	0.14**	199	1.99***	199
Uruguay 2010	0.59**	228	0.03	234	1.62***	234

Table 6
Export Premium. Productivity and Size

Country	Labor Productivity		TFP		Log Sales	
	Premium	N	Premium	N	Premium	N
	(1)	(2)	(3)	(4)	(5)	(6)
Asia	**0.54*****	**14532**	**0.10*****	**16836**	**1.89*****	**16836**
Azerbaijan 2009	-0.2	105	-0.13	109	1.40***	109
Bangladesh 2002	0.06	966	0.01	980	0.47	980
Bangladesh 2007	0.70***	1262	0.01	1270	2.68***	1270
China 2002	0.69***	507	0.13***	965	1.56***	965
China 2003					2.03***	1309
India 2000	0.15	837	0.18***	855	0.88***	855
India 2002	0.29	1726	0.12*	1775	1.80***	1775
Indonesia 2003	0.77***	598	0.13	667	2.88***	667
Indonesia 2009	1.35***	842	0.17***	891	4.02***	891
Kazakhstan 2005	0.47	234			1.83***	244
Kazakhstan 2009	0.60***	141	0.06	146	2.50***	146
Mongolia 2009	1.03***	129	0.2	130	1.54***	130
Nepal 2000	1.78***	152			1.80***	195
Nepal 2009	0.09	106	0.06	125	1.93***	125
Pakistan 2002	0.66***	883	0.40***	910	1.55***	910
Pakistan 2007	1.07***	700	0.05	743	2.80***	743
Philippines 2003	0.89***	650	0.07	665	2.60***	665
Philippines 2009	0.30**	724	0.03	784	1.41***	784
Sri Lanka 2004	0.6	371	0.13*	404	1.28*	404
Sri Lanka 2011	-0.06	295	0.07	295	2.16***	295
Thailand 2004	0.68***	1362	0.07**	1385	1.77***	1385
Uzbekistan 2008	0.36	109	0.07	120	2.23***	120
Vietnam 2005	0.26***	1144	0.11	1145	1.36***	1145
Vietnam 2009	0.31***	689	0.12**	724	1.68***	724
Africa	**0.32*****	**8909**	**0.07*****	**9305**	**1.49*****	**9130**
Angola 2010	-1.55**	122	-0.96	122	-0.49	122
Botswana 2006	0.39*	108	0.15	112	1.57**	112
Burundi 2006	0.99***	101	-0.08	102	2.74***	102
Congo D.Rep. 2006	0.26	147	0.04	149	1.1	149
Egypt 2004	0.63***	872	0.20***	954	1.91***	954
Ethiopia 2002	0.66**	410	0.12	417	1.76***	417
Ethiopia 2011	0.35***	191	-0.05***	213	1.13***	213
Ghana 2007	0.08	292	0.07	292	0.89	292
Guinea 2006	0.2	135	0.03	135	0.75	135
Ivory Coast 2009						
Kenya 2007	0.26	395	0.04	396	1.93***	396
Madagascar 2005	0.21	201	0.17**	210	1.45***	210
Madagascar 2009	0.49*	159	0.17	165	1.31**	165
Mali 2007	0.34**	234	-0.05***	234	0.42	234
Mauritius 2009	0.52**	153	0.40***	161	1.85***	161
Morocco 2000	0.06	824	0.07*	856	1.13***	856
Morocco 2004	0.06	809	-0.0008	838	1.13***	838
Mozambique 2007	1.14***	207	0.06***	207	2.91***	207
Namibia 2006	0.52***	103	0.02	104	1.54***	104
Nigeria 2007	0.75***	948	0.11***	948	1.49***	948
Senegal 2007	0.48***	156	0.06	156	2.39**	156
South Africa 2003	0.36***	539	0.06	554	1.45***	554
South Africa 2007	0.41***	672	0.01	672	1.61***	672
Tanzania 2006	0.83***	272	0.31***	272	2.06***	272
Uganda 2006	0.76***	306	0.02	307	2.26***	307
Zambia 2007	0.27***	236	0.01	237	1.48***	237
Zimbabwe 2011	-0.12	317	0.10**	317	1.64***	317

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).

3.7 Explaining the Export Premium

We end this section with a hybrid model where we estimate the export premium for wages and employment conditional on the variables that capture the mechanisms. Our goals are to test whether the mechanisms make sense and, in addition, to explore how much of the export premium can be accounted for by them. Concretely, our expanded regression model is

$$(22) \quad y_{ij} = \delta E_{ij} + \mathbf{m}'_{ij}\gamma + \phi_j + u_{ij},$$

where all variables are defined as above and $\mathbf{m}_{ij}$ are measures of the mechanism, as in our previous discussion in this section. We include measures of skill utilization, technology, imported inputs, and productivity. We explore two specifications, "some controls" and "full controls." In the "some controls" specification, we include in $\mathbf{m}$ the ratio of skilled workers, the capital to labor ratio, the percentage of imports of intermediate inputs, and labor productivity. In the "full set of controls" specification, we keep the ratio of skilled workers, the capital to labor ratio, the percentage of imports of intermediate inputs, and labor productivity and we add iso certification, foreign ownership, and log sales. We add controls sequentially.

Results for the wage export premium are in Table 7. In both specifications, we observe that, as we add mechanisms $\mathbf{m}$, the wage premium *declines*. Controlling for skill composition alone (columns 2 and 6) does not affect the wage premium by much. Adding skill composition and technology together has sizeable effects on the wage premium. For instance, on average, the wage premium drops from 31 percent to between 21 and 18 percent in the "some control" and "full controls" specifications, respectively. If we further add imported inputs, the wage premium drops to between 17 and 11 percent, respectively. Finally, and most importantly, when we add measures of firm productivity, the wage premium disappears entirely. In this case, exporters and non-exporters would pay more or less the same wage, conditional on all the mechanisms.

In Table 8, we redo the analysis for the employment premium. Similar conclusions emerge. The employment premium drops very significantly as we add mechanisms. Overall, on average and in the full controls specification, the employment premium drops from 1.30 to 0.11. While this decline is sizeable, the employment premium in column 9 is still statistically significant. This implies the existence of some hidden mechanisms that make exporting firm larger, even after accounting for all the observable mechanisms in the data.

Table 7
Wage Export Premium Controlling for Plant Characteristics

	No controls	Some Controls				Full Set of Controls			
		Labor	Tech.	Imports	Produc.	Labor	Tech.	Imports	Produc.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
All countries	**0.31*** **	**0.31*** **	**0.21*** **	**0.17*** **	**0.04*** **	**0.31*** **	**0.18*** **	**0.11*** **	**-0.02***
Europe	**0.20*** **	**0.20*** **	**0.11** **	**0.07**	**0.01**	**0.20*** **	**0.05**	**-0.01**	**-0.09***
Bulgaria 2007	0.23***	0.22***	0.18**	0.17**	0.08	0.22***	0.16**	0.1	0.01
Macedonia 2009	0.46**	0.48**	0.28*	0.06	0.06	0.48**	0.18	-0.02	-0.19
Moldova 2009	0.67***	0.65***	0.43	0.45*	0.46*	0.65***	0.37	0.45	0.39
Romania 2009	0.12	0.11	0.16	0.21	0.03	0.11	0.15	0.36	0.25
Russia 2009	0.04	0.04	-0.18*	-0.20*	-0.21***	0.04	-0.22*	-0.27*	-0.28***
Russia 2012	0.26**	0.24**	0.16**	0.14*	0.02	0.24**	0.14*	0.11	-0.06
Ukraine 2008	0.21**	0.27**	-0.04	-0.17	-0.13	0.27**	-0.28	-0.42	-0.35
Latin America	**0.38*** **	**0.38*** **	**0.26*** **	**0.22*** **	**0.03**	**0.38*** **	**0.22*** **	**0.17*** **	**-0.03**
Argentina 2006	0.20*	0.19*	0.11	0.08	-0.09	0.19*	0.06	0.01	-0.18
Argentina 2010	0.31***	0.30***	0.23***	0.22***	0.16***	0.30***	0.13**	0.09	-0.03
Brazil 2003	0.51***	0.51***	0.38***	0.34***	0.07*	0.51***	0.28***	0.24***	-0.05*
Brazil 2009	0.70***	0.71***	0.38***	0.32***	-0.02	0.71***	0.41***	0.31***	-0.11
Chile 2004	0.26	0.26	-0.13	-0.16	-0.11***	0.26	-0.06	-0.12	-0.06
Chile 2006	0.05	0.07	-0.15	-0.11	-0.21	0.07	-0.05	0.0017	0.3
Chile 2010	0.37***	0.36***	0.26***	0.25***	0.14**	0.36***	0.17**	0.14***	0.01
Colombia 2006	0.38***	0.37***	0.31***	0.30***	0.13**	0.37***	0.27***	0.24**	0.13**
Colombia 2010	0.42***	0.42***	0.35***	0.32***	0.11*	0.42***	0.23*	0.15	0.02
Costa Rica 2005	0.45***	0.43***	0.37**	0.30**	0.02	0.43***	0.27	0.23	0.11
Costa Rica 2010	0.49***	0.49***	0.33***	0.33***	0.06	0.49***	0.34***	0.32***	0.09
Dominican Rep. 2010	0.17	0.20*	0.32**	0.22	0.21	0.20*	0.37**	0.25**	0.09
Ecuador 2003	0.21	0.21	0.1	0.07	1.24***	0.21	0.06	0.04	1.18
Ecuador 2006	0.2	0.2	0.12	0.11	0.11	0.2	0.42***	0.37**	0.45***
Ecuador 2010	0.63***	0.62***	0.36	0.3	0.12	0.62***	0.29	0.25	0.19
El Salvador 2003	0.39***	0.38***	0.29***	0.23**	0.09	0.38***	0.29***	0.20**	0.07
El Salvador 2006	0.05	0.08	0.21***	0.20***	0.05	0.08	0.14*	0.13	-0.02
Guatemala 2003	0.19	0.19	0.18*	0.11	0.02	0.19	0.18	0.12	0.01
Guatemala 2006	0.35***	0.36***	0.32***	0.23**	0.18*	0.36***	0.33***	0.28**	0.27
Guatemala 2010	0.68***	0.67***	0.61***	0.40***	0.08	0.67***	0.47**	0.28	-0.11
Honduras 2003	0.41***	0.41***	0.35***	0.29***	0.11	0.41***	0.37***	0.25***	0.07
Honduras 2006	0.27***	0.27***	0.09	0.04	-0.22**	0.27***	0.11	0.14	-0.18
Honduras 2010	0.66*	0.66*	1.03	1.01	0.28	0.66*	1.16*	1.12	0.04
Jamaica 2010	0.32***	0.32***	0.17*	0.17*	0.07	0.32***	0.20**	0.14	0.01
Mexico 2010	0.44***	0.43***	0.35***	0.28***	0.06	0.43***	0.27***	0.20***	0.01
Nicaragua 2003	0.1	0.1	0.08	0.06	-0.03	0.1	0.08	0.0009	-0.09
Nicaragua 2006	0.48**	0.51***	0.64	0.64	0.4	0.51***	0.53	0.39	0.17
Nicaragua 2010	0.57**	0.52*	1.08***	1.02***	0.38	0.52*	0.79***	0.77***	0.29
Panama 2006	0.24	0.34	0.04	0.03	-0.005	0.34	0.04	0.04	-0.21
Paraguay 2006	0.06	0.06	0.12	0.12	0.11	0.06	0.05	0.06	0.01
Peru 2006	0.2	0.18	0.2	0.2	0.04	0.18	0.19	0.23	0.04
Peru 2010	0.52***	0.52***	0.36***	0.32***	0.15**	0.52***	0.30***	0.25***	0.06
Uruguay 2006	0.26	0.24	0.15	0.13	-0.02	0.24	0.27	0.26	0.30***
Uruguay 2010	0.51***	0.50***	0.20*	0.21	0.12*	0.50***	0.09	0.08	0.04

Table 7
Wage Export Premium Controlling for Plant Characteristics

	No controls	Some Controls				Full Set of Controls			
		Labor	Tech.	Imports	Produc.	Labor	Tech.	Imports	Produc.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Asia	**0.30*** **	**0.30*** **	**0.18*** **	**0.12*** **	**0.03**	**0.30*** **	**0.16*** **	**0.05**	**-0.04**
Azerbaijan 2009	0.09	0.08	0.12	0.05	0.08	0.08	-0.01	-0.01	-0.06
Bangladesh 2002	0.1	0.12	0.11	0.1	0.1				
Bangladesh 2007	0.29***	0.29***	0.14**	0.10*	-0.03	0.29***	0.06	0.03	-0.05
China 2002	0.35***	0.35***	0.10*	-0.02	-0.03	0.35***	0.1	-0.09**	0.07
India 2000	0.05	0.06	0.01	-0.0037	-0.05				
India 2002	0.29**	0.29**	0.21***	0.10*	0.06				
Indonesia 2009	0.71***	0.71***	0.21	0.1	0.01	0.71***	0.1	-0.06	-0.22**
Kazakhstan 2009	0.34*	0.27	0.41*	0.36*	0.17***	0.27	0.47	0.46	0.12
Mongolia 2009	0.44*	0.42	0.2	0.2	-0.01	0.42	0.22	0.18	0.03
Nepal 2009	0.09	0.06	-0.19	-0.27	-0.15	0.06	-0.19	-0.3	-0.27
Pakistan 2002	0.28*	0.26*	0.30**	0.30**	0.16	0.26*	0.30**	0.30**	0.16
Pakistan 2007	0.40***	0.37***	0.12	0.04	-0.40*	0.37***	-0.09	-0.19	-0.52***
Philippines 2003	0.62***	0.62***	0.42**	0.30**	0.14**	0.62***	0.42**	0.18*	0.04
Philippines 2009	0.18**	0.18**	0.49***	0.38***	0.22**	0.18**	0.43***	0.28**	0.14*
Sri Lanka 2004	0.36**	0.34**	0.30***	0.24***	0.15***				
Sri Lanka 2011	-0.20**	-0.15**	-0.21	-0.14	-0.15	-0.15**	-0.27*	-0.19	-0.29**
Thailand 2004	0.29***	0.29***	0.14***	0.09*	-0.06	0.29***	0.12**	0.03	-0.10**
Uzbekistan 2008	0.19	0.14	0.15	0.07	0.23**	0.14	0.32	0.23	0.46
Vietnam 2005	0.16**	0.15*	0.15**	0.11**	0.06	0.15*	0.13**	0.07	-0.02
Vietnam 2009	0.08	0.07	0.04	0.02	-0.02	0.07	-0.05	-0.09*	-0.12
Africa	**0.22*** **	**0.22*** **	**0.17*** **	**0.14*** **	**0.05* **	**0.22*** **	**0.11*** **	**0.07** **	**-0.01**
Angola 2010	0.16	0.34*	0.93**	0.64*	0.80***	0.34*	1.10***	0.91***	1.21***
Botswana 2006	0.1	0.14	0.09	0.05	-0.07	0.14	0.06	0.0017	-0.07
Burundi 2006	0.41*	0.3	-0.16	-0.23	-0.68*	0.3	-0.59***	-0.62***	-0.82**
Congo D.Rep. 2006	0.21	0.21	0.21	0.19	0.09	0.21	0.14	0.1	0.05
Egypt 2004	0.19**	0.19**	0.12	0.03	-0.13	0.19**	0.02	-0.06	-0.20**
Ethiopia 2002	0.63*	0.63*	0.55	0.55	0.33	0.63*	0.56	0.55	0.31
Ethiopia 2011	0.45***	0.44***	0.65***	0.65***	0.47***	0.44***	0.71***	0.75***	0.64***
Ghana 2007	0.06	0.04	0.01	0.08	0.0035	0.04	-0.03	0.05	-0.03
Guinea 2006	0.14	0.16	0.12	0.03	0.06	0.16	0.17	0.06	0.19
Kenya 2007	0.07	0.07	-0.02	-0.07	-0.13	0.07	-0.11	-0.16	-0.15***
Madagascar 2005	0.2	0.2	0.31	0.31	0.25	0.2	0.14	0.03	0.05
Madagascar 2009	0.13	0.13	0.15	0.13	0.07	0.13	0.14	0.07	0.03
Mali 2007	0.57***	0.56***	0.52***	0.47***	0.37***	0.56***	0.50***	0.45***	0.30**
Mauritius 2009	0.37	0.35	0.32	0.4	0.21	0.35	0.48*	0.44**	0.31
Morocco 2000	0.13*	0.13	0.13**	0.06	0.08	0.13	0.1	-0.0022	-0.01
Morocco 2004	0.1	0.1	0.09	0.03	0.03	0.1	0.04	-0.07	-0.13***
Mozambique 2007	0.55***	0.56***	0.41***	0.32***	-0.04	0.56***	0.45**	0.35	-0.06
Namibia 2006	0.35*	0.33	0.2	0.11	0.03	0.33	-0.03	-0.03	-0.1
Nigeria 2007	0.40***	0.40***	0.25***	0.34***	0.06	0.40***	0.22***	0.30***	0.05
Senegal 2007	0.42	0.42	0.54	0.49	0.11	0.42	0.47	0.41	-0.16
South Africa 2003	0.27***	0.27***	0.13***	0.09**	0.05	0.27***	0.08*	0.05	-0.01
South Africa 2007	0.32***	0.32***	0.28***	0.22***	-0.02	0.32***	0.17***	0.12***	-0.05
Tanzania 2006	-0.08	-0.1	-0.19	-0.25	-0.44***	-0.1	-0.2	-0.26*	-0.45***
Uganda 2006	0.35***	0.35***	0.21***	0.16**	-0.04	0.35***	0.17**	0.08	0.0046
Zambia 2007	0.47***	0.50***	0.35***	0.29	0.21*	0.50***	0.29	0.26	0.17
Zimbabwe 2011	0.07	0.07	0.18	0.14	0.17*	0.07	0.15	0.1	0.15

Wage export premium controlling for plant characteristics.
Some controls: ratio of skilled workers, capital to labor ratio,
imports of intermediate inputs, labor productivity.
Full set of controls: ratio of skilled workers, capital to labor ratio,
iso certification, imports of intermediate inputs,
foreign ownership, labor productivity, log sales.

Table 8
Employment Export Premium Controlling for Plant Characteristics

	No controls	Some Controls				Full Set of Controls			
		Labor	Tech.	Imports	Produc.	Labor	Tech.	Imports	Produc.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
All countries	**1.30*** **	**1.28*** **	**1.24*** **	**1.07*** **	**1.06*** **	**1.28*** **	**1.06*** **	**0.87*** **	**0.11*** **
Europe	**1.22*** **	**1.15*** **	**1.03*** **	**0.99*** **	**0.99*** **	**1.15*** **	**0.90*** **	**0.82*** **	**0.12*** **
Bulgaria 2007	0.91***	0.84***	0.67***	0.61***	0.57***	0.84***	0.61***	0.47***	0.06
Macedonia 2009	1.65***	1.63***	1.67***	1.62***	1.80***	1.63***	1.38***	1.20**	0.39**
Moldova 2009	1.70***	1.66***	1.63***	1.65***	1.65***	1.66***	1.25***	1.14***	0.26***
Romania 2009	1.64***	1.55***	1.54***	1.42***	1.45**	1.55***	1.40***	1.16***	0.44***
Russia 2009	1.00***	0.99***	0.90***	0.88***	0.88***	0.99***	0.82***	0.81***	0.06
Russia 2012	0.97***	0.85***	0.73***	0.74***	0.71***	0.85***	0.64***	0.65***	0.02
Ukraine 2008	1.73***	1.56***	1.66***	1.46***	1.50***	1.56***	1.41***	1.24***	0.37***
Latin America	**1.38*** **	**1.36*** **	**1.33*** **	**1.22*** **	**1.17*** **	**1.36*** **	**1.11*** **	**0.94*** **	**0.11*** **
Argentina 2006	1.36***	1.34***	1.38***	1.26***	1.26***	1.34***	1.03***	0.89***	0.16***
Argentina 2010	1.25***	1.22***	1.06***	0.98***	0.94***	1.22***	0.67***	0.53***	0.06**
Brazil 2003	1.14***	1.14***	1.08***	1.03***	0.97***	1.14***	0.96***	0.91***	0.10***
Brazil 2009	1.41***	1.34***	1.44***	1.30***	1.27***	1.34***	1.17***	0.99***	0.10***
Chile 2004	1.57***	1.55***	1.53***	1.28***	1.28***	1.55***	1.33***	1.05***	0.03*
Chile 2006	1.54***	1.50***	1.46***	1.39***	1.39***	1.50***	1.13***	1.03***	0.09
Chile 2010	1.43***	1.39***	1.34***	1.25***	1.19***	1.39***	0.94***	0.82***	0.07*
Colombia 2006	1.20***	1.16***	1.22***	1.17***	1.13***	1.16***	1.00***	0.94***	0.19**
Colombia 2010	1.51***	1.47***	1.49***	1.43***	1.25***	1.47***	1.03***	0.85***	0.18***
Costa Rica 2005	1.71***	1.61***	1.61***	1.28***	1.09***	1.61***	1.28***	0.93***	0.0048
Costa Rica 2010	1.26***	1.24***	1.25***	1.26***	1.17***	1.24***	0.99***	0.82***	0.07
Dominican Rep. 2010	1.24***	1.27***	1.20***	1.11***	1.11***	1.27***	1.03***	0.91***	0.24**
Ecuador 2003	1.32***	1.27***	1.09***	1.03***	1.38	1.27***	0.94***	0.82***	-0.42
Ecuador 2006	1.15***	1.11***	0.88***	0.83***	0.77***	1.11***	0.76**	0.69**	-0.12
Ecuador 2010	1.40***	1.31***	1.39***	1.23***	1.01***	1.31***	1.21***	0.99***	0.20***
El Salvador 2003	1.42***	1.40***	1.35***	1.09***	1.05***	1.40***	1.29***	0.92***	0.20***
El Salvador 2006	1.50***	1.46***	1.44***	1.37***	1.35***	1.46***	1.28***	0.98***	0.04
Guatemala 2003	1.53***	1.52***	1.53***	1.19***	1.08***	1.52***	1.52***	1.05***	0.11*
Guatemala 2006	1.35***	1.31***	1.32***	1.05***	1.03***	1.31***	1.24***	0.84***	-0.08
Guatemala 2010	1.64***	1.54***	1.48***	1.23***	1.14***	1.54***	1.21***	0.99***	0.23***
Honduras 2003	1.57***	1.57***	1.56***	1.36***	1.31***	1.57***	1.54***	1.22***	0.08
Honduras 2006	1.65***	1.65***	1.59***	1.41***	1.26***	1.65***	1.51***	1.12***	0.12*
Honduras 2010	1.79***	1.73***	1.61***	1.58***	1.48***	1.73***	1.40***	1.27***	0.20**
Jamaica 2010	1.21***	1.21***	0.78***	0.79***	0.72**	1.21***	0.76***	0.69***	0.05
Mexico 2010	1.58***	1.54***	1.53***	1.30***	1.19***	1.54***	1.25***	1.02***	0.04
Nicaragua 2003	1.02***	1.02***	1.02***	0.98***	0.91***	1.02***	1.01***	0.83***	0.20***
Nicaragua 2006	1.32***	1.27***	1.30*	1.29*	1.23**	1.27***	1.12*	0.8	0.11*
Nicaragua 2010	2.06***	1.93***	1.63***	1.53***	1.16***	1.93***	1.51***	1.28***	-0.08
Panama 2006	1.53***	1.51***	1.63***	1.58***	1.62***	1.51***	1.58***	1.54***	0.14***
Paraguay 2006	1.10***	1.10***	1.03***	0.98***	0.87***	1.10***	0.92***	0.91***	0.1
Peru 2006	1.35***	1.27***	1.08***	1.08***	1.07***	1.27***	0.77***	0.72***	0.06
Peru 2010	1.34***	1.32***	1.17***	1.13***	1.06***	1.32***	0.88***	0.76***	0.01
Uruguay 2006	1.24***	1.20***	1.30***	1.30***	1.28***	1.20***	1.18***	1.18***	0.19*
Uruguay 2010	0.97***	0.94***	0.72***	0.72***	0.68***	0.94***	0.55***	0.50***	0.03

Table 8
Employment Export Premium Controlling for Plant Characteristics

	No controls	Some Controls				Full Set of Controls			
		Labor	Tech.	Imports	Produc.	Labor	Tech.	Imports	Produc.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Asia	**1.29*** **	**1.27*** **	**1.20*** **	**0.95*** **	**0.96*** **	**1.27*** **	**1.05*** **	**0.82*** **	**0.13*** **
Azerbaijan 2009	1.31***	1.18***	1.11***	0.94***	0.81***	1.18***	0.77***	0.72***	0.01
Bangladesh 2002	0.48**	0.44**	0.43**	0.31	0.32				
Bangladesh 2007	1.66***	1.66***	1.65***	1.43***	1.44***	1.66***	1.47***	1.27***	0.13*
China 2002	0.93***	0.93***	0.85***	0.68***	0.59***	0.93***	0.74***	0.68***	0.0047
India 2000	0.79***	0.76***	0.64***	0.53**	0.53**				
India 2002	1.35***	1.35***	1.35***	1.06***	1.05***				
Indonesia 2009	2.59***	2.50***	2.02***	1.46***	1.43***	2.50***	1.73***	1.28***	0.36***
Kazakhstan 2009	1.63***	1.53***	1.67***	1.49***	1.45***	1.53***	1.05***	0.75*	0.01
Mongolia 2009	0.59***	0.50***	0.39***	0.39***	0.27	0.50***	0.37**	0.29	-0.1
Nepal 2009	1.17***	1.10***	1.09***	1.05***	1.02***	1.10***	0.99***	0.97***	0.15
Pakistan 2002	0.95***	0.84***	0.83***	0.72***	0.69***	0.84***	0.48**	0.39*	0.01
Pakistan 2007	1.81***	1.74***	1.72***	1.43***	1.33***	1.74***	0.96***	0.79***	0.15
Philippines 2003	1.82***	1.81***	1.71***	1.29***	1.23***	1.81***	1.45***	0.72***	0.22***
Philippines 2009	1.16***	1.14***	0.98***	0.75***	0.75***	1.14***	0.70***	0.40***	0.17***
Sri Lanka 2004	0.99***	0.95***	1.04***	0.96***	0.83***				
Sri Lanka 2011	2.26***	2.11***	2.01***	1.61***	1.61***	2.11***	1.70***	1.38***	0.22***
Thailand 2004	1.11***	1.11***	0.98***	0.82***	0.82***	1.11***	0.77***	0.58***	0.11***
Uzbekistan 2008	1.72***	1.56***	1.53***	1.46***	1.39***	1.56***	1.20***	1.11***	0.25
Vietnam 2005	1.12***	1.08***	1.09***	0.89***	0.88***	1.08***	0.80***	0.67***	0.03*
Vietnam 2009	1.29***	1.28***	1.31***	1.12***	1.09***	1.28***	1.03***	0.84***	0.24***
Africa	**1.17*** **	**1.16*** **	**1.14*** **	**0.99*** **	**0.98*** **	**1.16*** **	**0.96*** **	**0.78*** **	**0.08*** **
Angola 2010	0.87**	0.68**	0.62**	0.66**	0.6	0.68**	0.46**	0.47	-0.18
Botswana 2006	1.26**	1.19**	1.16*	1.11*	1.09	1.19**	1.10**	1.02**	0.25***
Burundi 2006	2.01**	1.82**	2.53***	2.43***	2.41***	1.82**	2.35***	2.32***	0.73***
Congo D.Rep. 2006	0.73	0.73	0.73	0.66	0.63	0.73	0.5	0.25	0.03
Egypt 2004	1.38***	1.36***	1.32***	0.86***	0.90***	1.36***	0.97***	0.60***	0.06***
Ethiopia 2002	1.06**	1.06**	1.05**	1.06**	0.99**	1.06**	1.10***	1.04**	-0.01
Ethiopia 2011	0.72***	0.73***	0.47***	0.46***	0.22***	0.73***	0.29***	0.21***	0.02***
Ghana 2007	0.77*	0.69*	0.68*	0.6	0.58	0.69*	0.55**	0.48**	0.11*
Guinea 2006	0.57	0.58	0.72*	0.64	0.64	0.58	0.54	0.50*	-0.01
Kenya 2007	1.56***	1.56***	1.57***	1.38***	1.38***	1.56***	1.47***	1.27***	0.10***
Madagascar 2005	1.27***	1.27***	1.32***	1.20***	1.17***	1.27***	1.18***	0.94***	0.08
Madagascar 2009	1.17***	1.16***	1.21***	1.10***	0.98**	1.16***	1.20***	0.97***	0.39***
Mali 2007	0.13	0.13	0.24***	0.18***	0.18***	0.13	-0.02	-0.11	-0.01
Mauritius 2009	1.32***	1.32***	1.13***	1.01***	0.80***	1.32***	1.00***	0.80***	0.09
Morocco 2000	1.09***	1.06***	1.04***	0.92***	0.90***	1.06***	0.98***	0.80***	0.02
Morocco 2004	1.11***	1.10***	1.07***	0.89***	0.86***	1.10***	0.96***	0.76***	0.04
Mozambique 2007	1.66***	1.69***	1.70***	1.47**	1.34*	1.69***	1.43**	1.22*	0.21***
Namibia 2006	0.86**	0.85**	0.89**	0.88*	0.83*	0.85**	0.70***	0.61***	-0.09***
Nigeria 2007	0.77***	0.73***	0.67***	0.73***	0.61***	0.73***	0.27*	0.33**	0.09**
Senegal 2007	1.87**	1.88**	1.78**	1.64**	1.56**	1.88**	1.62**	1.34*	0.25
South Africa 2003	1.04***	1.03***	1.02***	0.88***	0.89***	1.03***	0.86***	0.72***	0.07
South Africa 2007	1.14***	1.11***	1.12***	0.97***	0.87***	1.11***	0.79***	0.65***	0.02
Tanzania 2006	1.19***	1.15***	1.00***	0.86***	0.84***	1.15***	1.00***	0.68***	0.13***
Uganda 2006	1.35***	1.34***	1.27***	1.08***	1.07***	1.34***	1.04***	0.77***	0.04
Zambia 2007	1.10***	0.97**	0.96***	0.68**	0.70**	0.97**	0.68	0.5	0.07
Zimbabwe 2011	1.74***	1.74***	1.78***	1.54***	1.54***	1.74***	1.56***	1.29***	0.05

Wage export premium controlling for plant characteristics.
Some controls: ratio of skilled workers, capital to labor ratio, imports of intermediate inputs, labor productivity.
Full set of controls: ratio of skilled workers, capital to labor ratio, iso certification, imports of intermediate inputs, foreign ownership, labor productivity, log sales.

4 Firm-Level Panel Data Evidence: The Case of Chile

The evidence presented above indicates that the act of exporting requires skills and, in particular, requires certain tasks performed by skilled labor.[11] In this section of the report, we document these mechanisms using firm-level panel data from Chile. Moreover, the evidence from the Enterprise Survey points to correlations between exporting and firm attributes. Here, we use an instrumental variable approach to establish causal effects.

We use two sources of data, firm-level data and customs records. The firm-level data come from the Encuesta Nacional Industrial Anual (ENIA), an annual industrial census run by Chile's Instituto Nacional de Estadística that interviews all manufacturing plants with 10 workers or more. It is a panel. The customs data provide administrative records on firms exports by destination. We manually matched both databases for the period 2001-2005. As a result, we built a 5-year panel database of Chilean manufacturing firms. The data have several modules. The main module contains information on industry affiliation, ownership type, sales, exports, input use, imports of materials, workers and wages. Industry affiliation is defined at the 4-digit ISIC Revision 3 level, which makes up for a total of 113 industries.

We are mostly interested in the employment information. The data on workers are presented at detailed categories, which allows us to explore the demand for different skills and tasks. From the detailed employment records, we define the following tasks: management (directors), administrative services (accountants, lawyers), engineers (specialized skilled production workers), blue-collar activities (non-specialized unskilled production workers), and general maintenance services (unskilled non-production workers). The first three

[11] A recent strand of recent trade theories advocates models of trade and tasks. Pioneering studies of intermediate inputs as tasks can be found in Feenstra and Hanson (1996) and Feenstra and Hanson (1997). Modern models can also be found in Antras, Garicano, and Rossi-Hansberg (2006), Grossman and Rossi-Hansberg (2008) and Grossman and Rossi-Hansberg (2012). In these papers, tasks are tradable and tasks offshoring affects wage inequality and the wages of unskilled workers. Empirically, Autor, Levy and Murnane (2003) and Ebenstein, Harrison, McMillan and Phillips (2014) find that firms in the U.S. do indeed offshore unskilled-intensive tasks or routine tasks and document that occupational exposure to globalization is associated with large wage losses, especially for unskilled and routine-task workers. Artuc and McLaren (2012) study these same issues with a structural model of workers mobility across industries and occupation and find that occupations (tasks) matter, but not so much as industry affiliation. A different line of research formulates a general model of international trade where goods are produced by combining various tasks using assignment models. Notable examples include Acemoglu and Zilibotti (2001), Acemoglu and Autor (2011) and Costinot and Vogel (2010).

categories, managers, administrative workers, and engineers, comprise skilled labor. To enrich the analysis, we also define a highly-skilled group, which includes managers and engineers. Unskilled workers are blue-collar, non-specialized and general maintenance workers. In turn, production workers include engineers and blue-collar operatives, while non-production workers include managers, administrative workers and maintenance workers.

Table 9 briefly presents some key summary statistics for the key variables in our model. We present the unconditional averages as well as averages for exporting firms and non-exporting firms. On average, Chilean firms hire 39 percent of skilled workers and 61 percent of unskilled workers. As expected, exporters utilize a higher share of skilled workers (41 percent) than non-exporters (39 percent). Exporters are also larger and they hire, on average, more workers in all skilled categories than non-exporters. Employment of unskilled workers in also higher among exporters, but only marginally. Production workers account for 73 percent of employment of all Chilean firms, and of 70 percent of the employment of exporters. In addition, exporters employ more managers, engineers and administrative services workers than non-exporters. Employment of unskilled blue-collar workers is very similar while maintenance employees are slightly more among exporters. Finally, the average exporter ships around 32 percent of its sales abroad. Among all firms, exports accounts for only 5 percent of total firm sales.

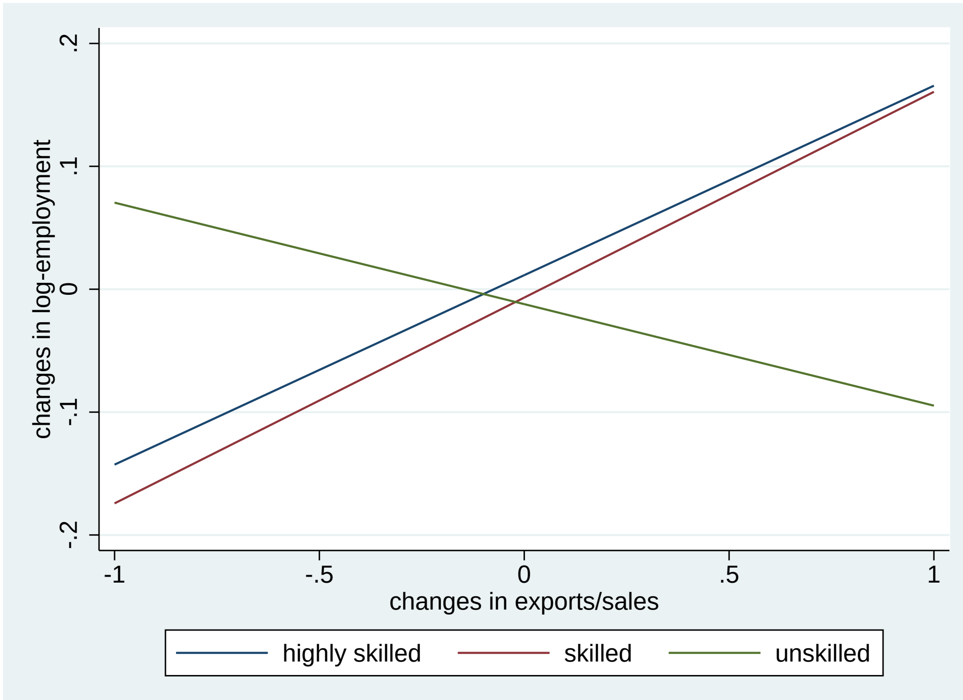
To motivate and to summarize our findings, we begin with the presentation of simple panel-data correlations between the outcomes of interest and exporting. The outcomes of interest are the employment of workers and tasks of varying skills. We show these correlations with the panel linear fit of an outcome and our measure of export intensity (the ratio of exports to sales at the firm level). These linear fits are estimated with the following regression

$$y_{it} = \gamma E_{it} + \phi_i + u_{it}, \tag{23}$$

where i is a firm, t is year, y be the outcome of interest, E is export intensity and ϕ_i is the firm fixed-effect. We plot Δy_t against $\widehat{\gamma}\Delta E_t$, where $\widehat{\gamma}$ is estimated with OLS-FE. Results are in Figures 5-10.

Figure 5 shows that exports are positively associated with skilled employment and

Figure 5
Exports and the Demand of Skilled Workers



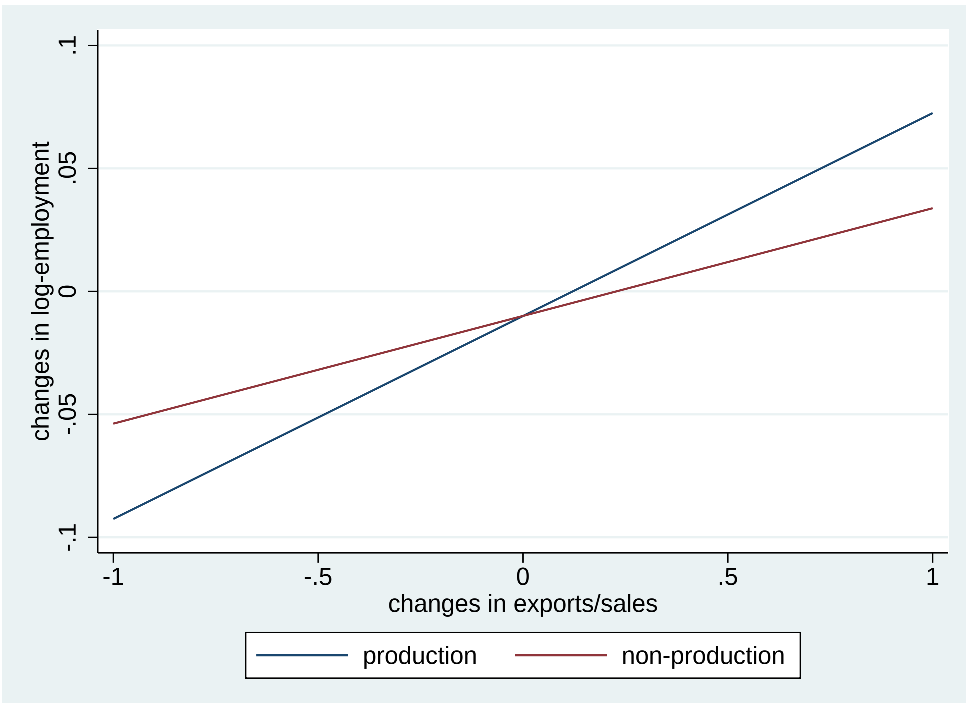
Note: Correlation between changes in changes in log employment and in export intensity (exports/sales) for highly-skilled (managers and engineers), skilled (managers, engineers, and administrative services workers), and unskilled workers (blue-collar and general maintenance workers) in Chile. The graph shows the slope of a OLS-FE regression between the reported variables.

negatively correlated with unskilled employment. Moreover, we find separate positive correlations with highly skilled employment as well as with skilled employment more generally. In turn, Figure 6 shows that higher export intensity is associated with higher employment of both production and non-production workers.

In Figure 7, we learn that, within skilled labor, exports demand more engineers (specialized workers) and services (accounting, IT), but not necessarily managers. In Figure 8, we learn that, within unskilled labor, exports demand less blue-collar workers and maintenance services (janitors, repair workers) in general. In addition, for production, exports demand engineers over blue-collars (Figure 9), while, for non-production, exports demand services more than maintenance workers (Figure 10).

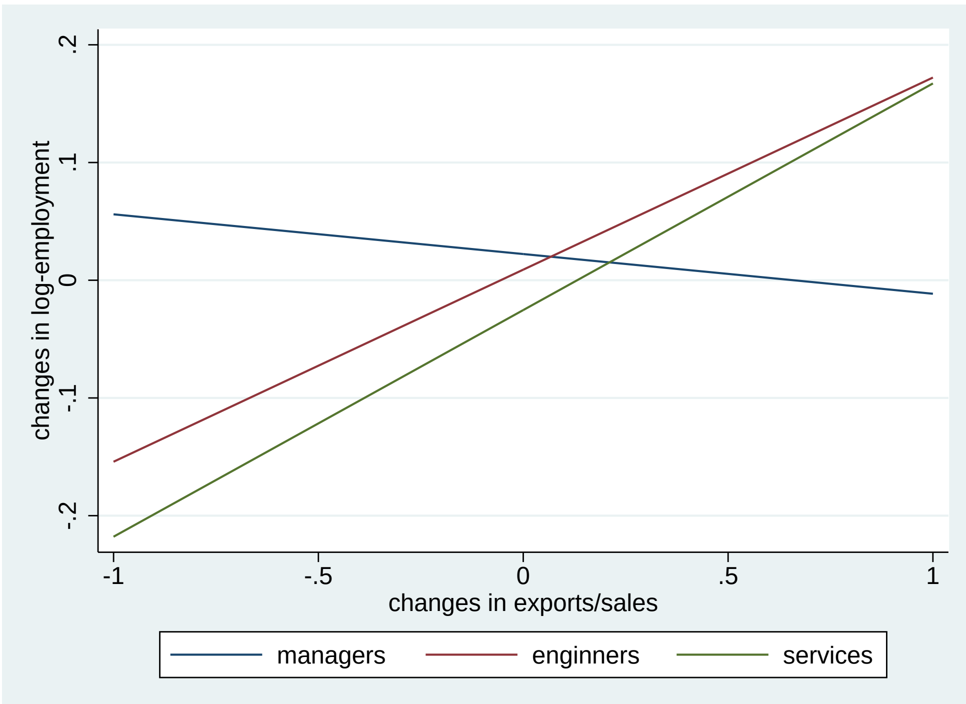
We now set out to study the correlations outline above with formal regression models. We first want to explore if the correlations are robust to other correlates and, second, to test

Figure 6
Exports and the Demand of Production Workers



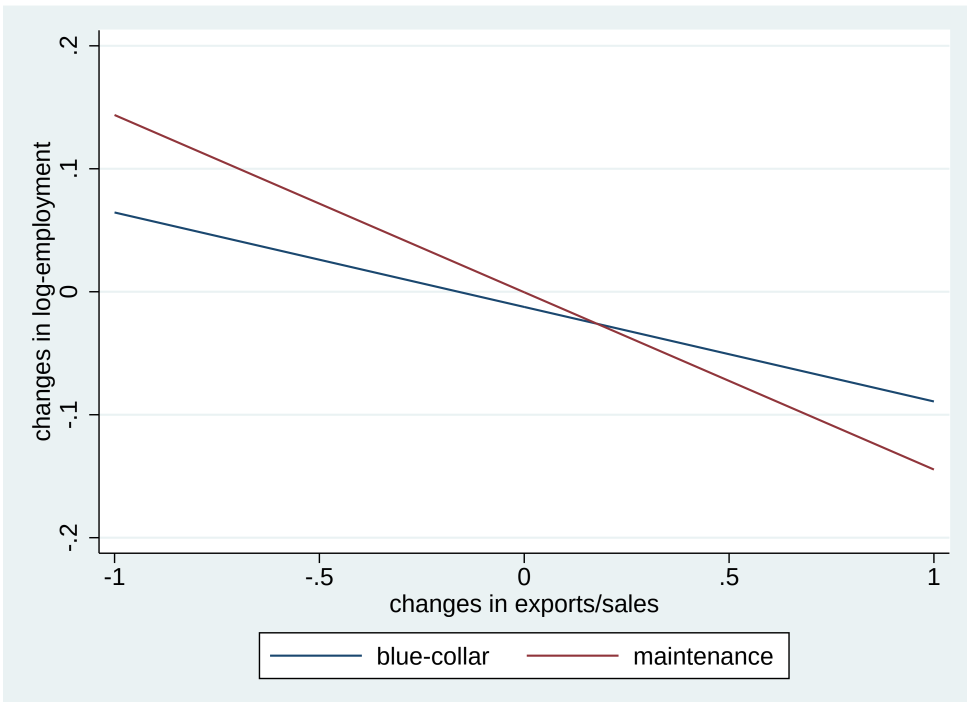
Note: Correlation between changes in changes in log employment and in export intensity (exports/sales) for production (engineers and blue-collar workers) and non-production (managers, administrative services and general maintenance workers) in Chile. The graph shows the slope of a OLS-FE regression between the reported variables.

Figure 7
Exports and the Demand of Skilled Tasks



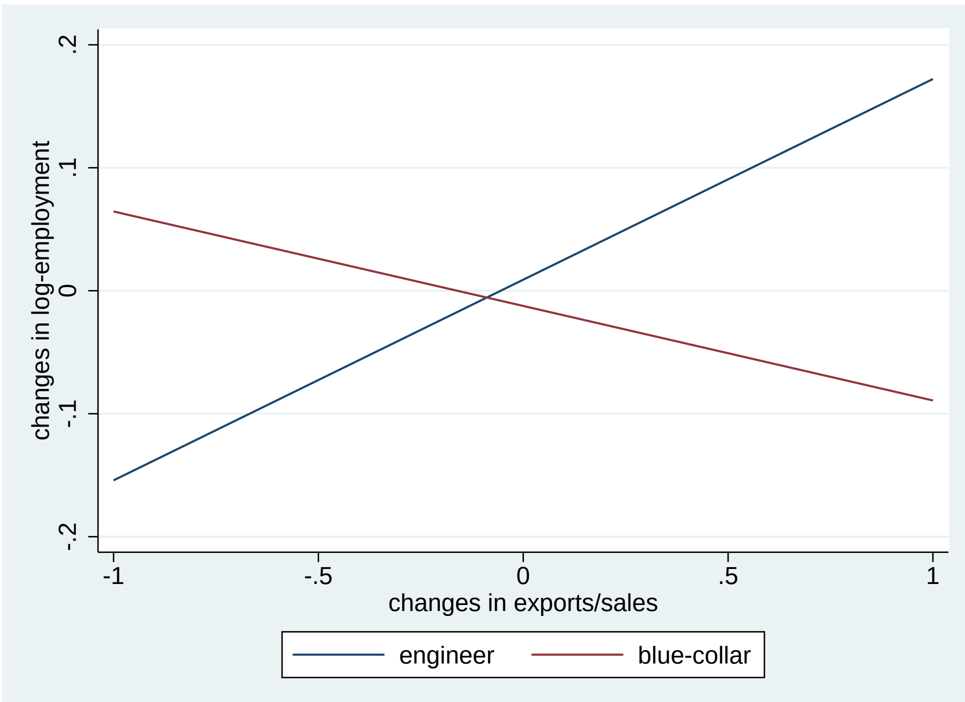
Note: Correlation between changes in changes in log employment and in export intensity (exports/sales) for skilled tasks, managers, engineers, and administrative services workers. The graph shows the slope of a OLS-FE regression between the reported variables.

Figure 8
Exports and the Demand of Unskilled Tasks



Note: Correlation between changes in changes in log employment and in export intensity (exports/sales) for unskilled tasks, blue-collar and general maintenance workers. The graph shows the slope of a OLS-FE regression between the reported variables.

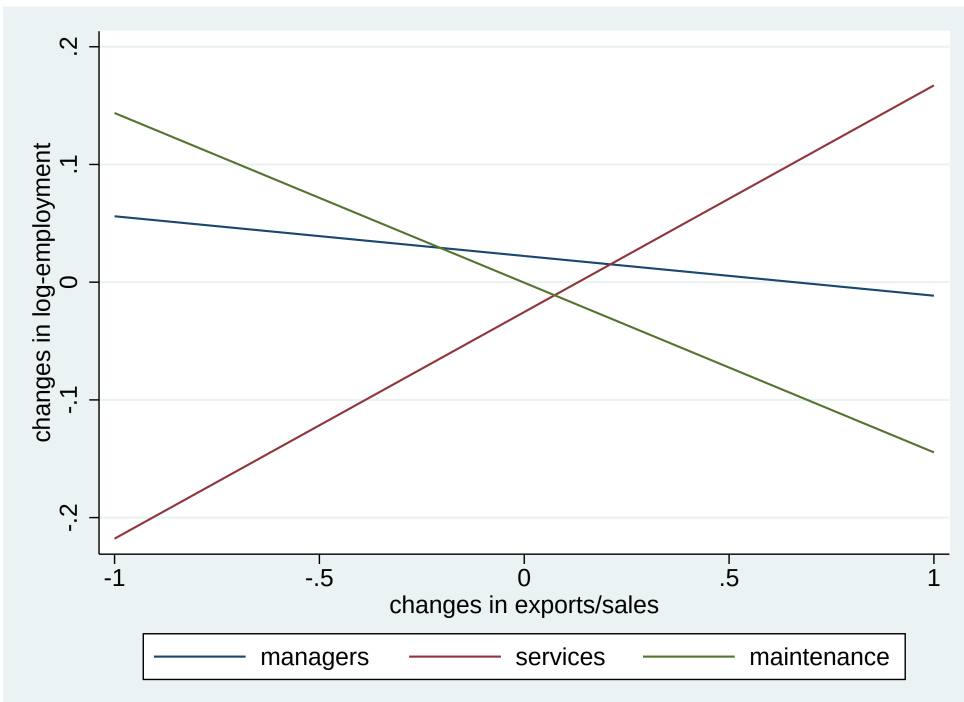
Figure 9
Exports and the Demand of Production Tasks



Note: Correlation between changes in changes in log employment and in export intensity (exports/sales) for production tasks, engineers and blue-collar workers. The graph shows the slope of a OLS-FE regression between the reported variables.

Figure 10

Exports and the Demand of Non-Production Tasks



Note: Correlation between changes in changes in log employment and in export intensity (exports/sales) for non-production tasks, managers, administrative services workers, and general maintenance workers. The graph shows the slope of a OLS-FE regression between the reported variables.

for causality. To do this, we expand our model as follows

$$(24) \quad y_{ijt} = \mathbf{x}'_{ijt}\beta + \gamma E_{ijt} + \phi_i + \phi_{jt} + \epsilon_{ijt},$$

where indices i and t are as above and j is an industry. We add the vector $\mathbf{x}$, which includes firm level variables such as log total employment, log sales, and initial conditions (sales and exporting status) interacted with year dummies to account for firm-specific trends. The regression includes firm fixed effects, ϕ_i, and industry-year fixed effects, ϕ_{jt}.

Before turning to causality, we explore the correlations with these extended OLS-FE estimation. Results are in Table 10. In column 1, we show the basic correlation corresponding to the graphs above. These regressions only include export intensity, firm fixed-effects and year-effects and we report them for consistency with the graphical analysis. For the first robustness experiment, in column 2, we add log employment to control for size. This means we compare firms of equal size, with different export intensity. As it can be seen, the correlation between exports and highly-skilled and skilled employment is positive and statistically significant. The results show that a firm with 10 percentage points higher export intensity hire 1.9 percent more highly-skilled workers and 1.6 percent higher skilled workers than a similar-sized firm. Exporters tend to hire less unskilled labor, but this coefficient is weak statistically. In terms of specific tasks, we find that exports hire more engineers and administrative service workers and hire less maintenance service workers. There are no statistically discernible difference in managerial and unskilled blue-collar employment.

These correlations may be driven by industry trends, such as industry-specific growth processes. To account for those trends, we add in column 3 interactions between year dummies and industry dummies. The results are robust. In column 4, we also add initial conditions to account for firm-specific trends (Brambilla, Lederman, and Porto, 2012). The results are also very robust. The magnitudes of the coefficients are also stable across specifications.

While these correlations are very robust, they are still correlations, not necessarily causal effects. To get to these causal effects, we need to instrument the variable E_{ijt}. This is because, for instance, there might be omitted variables creating biases. More productive firms are, for example, more likely to export and, at the same time, be more efficient in the use of skilled labor. To build instruments, we follow a strategy similar to Revenga (1992), Revenga (1997), Bastos, Silva and Verhoogen (2014), Brambilla, Lederman and Porto (2012), Brambilla and Porto (2014), and Park et al. (2010), among others. Intuitively, the argument runs as follows. Exogenous export opportunities for a firm are likely to arise when its foreign export markets expand. In turn, this will happen when the income of the destination country grows and when exchange rate changes make Chilean exports relatively cheaper. Given any of these exogenous changes, a firm will be more likely to take advantage of these export opportunities if it is exposed to those markets. A natural measure of destination exposure in this case is the share of a firm's exports to that destination in total firm sales. Formally, we define two instruments

$$(25)\quad z_{jt}^{0} = \sum_{d} s_{dj} \ln g_{dt},$$

and

$$(26)\quad z_{jt}^{1} = \sum_{d} s_{dj} \ln r_{dt},$$

where z^0 and z^1 are the instruments, s_{dj} is the share of exports of firm j to export destination d at the initial time period (year 2001), g_{dt} is the real GPD of destination d at time t, and r_{dt} is the bilateral exchange rate between Chile and country d at t. Hence, z_{jt}^0 and z_{jt}^1 are weighted averages of the real gdp and the real exchange rate face by Chilean exporters, where the firm-specific weights are the initial shares of exports in sales. As in Brambilla, Lederman and Porto (2012), we also interact z^0 and z^1 with initial firm sales (i.e., log sales in 2001) to include any firm advantages in profiting from export opportunities based on firm size. To assess the power of these instruments, we can look at the first stage results for the same four specifications used in the OLS-FE model. The results are in Table 11. As it can be seen, the instruments have a lot of explanatory power in this first stage. They also easily satisfy the test of joint significance. The real GDP of the export destination market appears to be a stronger determinant of export intensity than the real exchange rate. However, it is the combination of all these instruments together that performs very well and we consequently use this specification in what follows.

The causal impacts of export intensity of employment are reported in Table 12. Conditional on size, firms that export a higher share of their total sales utilize more skilled (and also highly-skilled) workers, and less unskilled workers. This implies that exporters need to perform skill intensive activities and tasks. By contrast, there are no discernible causal impacts of exports on production or non-production employment. This means that, ceteris paribus, a firm utilizes roughly the same type of production and non-production workers to produce goods for exports or for the local domestic market.

Among skilled workers, exporters utilize significantly more engineers (specialized workers), conditional on size. However, employment of specialized service workers tends to be higher but this is not statistically significant. Similarly, managerial employment is relative smaller as exports grow, but not significantly so (statistically). Among unskilled workers, the bulk of the difference takes place among non-specialized blue-collar workers.

Table 13 reports results using shares of employment, instead of log employment. We confirm that the share of skilled labor is statistically higher among exporters. The share of highly-skilled workers is also higher. Instead, the shares of production and non-production workers are not statistically different. The share of engineering employment is much higher among exports. This is compensated with lower shares of blue-collar employment, while the shares of all other types of employments are not statistically different.

Table 9
Summary Statistics
National Annual Industrial Survey
Chile 2001 - 2005

	All Firms	Exporters	Non-Exporters
A) Skilled and Unskilled Labor			
log skilled employment	2.37	2.47	2.36
log highly-skilled employment	1.78	1.91	1.77
log unskilled employment	2.88	2.88	2.87
share skilled employment	38.69	40.62	38.53
share highly-skilled employment	25.95	26.79	25.88
share unskilled employment	61.31	59.38	61.47
B) Production and Non-Production Labor			
log production employment	3.17	3.12	3.17
log non-production employment	2.03	2.16	2.02
share production employment	73.21	70.15	73.47
share non-production employment	26.79	29.85	26.53
C) Tasks			
log managerial employment	0.60	0.79	0.58
log engineering employment	1.22	1.36	1.21
log services employment	1.22	1.34	1.21
log blue-collar employment	2.71	2.72	2.71
log maintenance employment	0.46	0.48	0.46
share managerial employment	7.17	8.68	7.04
share engineering employment	18.78	18.11	18.84
share services employment	12.74	13.84	12.65
share blue-collar employment	54.42	52.04	54.63
share maintenance employment	6.88	7.33	6.85
D) Exports			
exports/sales	0.05	0.32	0.00

Source: averages calculated from the Encuesta Nacional Industrial Anual (National Annual Industrial Survey), Chile 2001-2005.

Table 10
The Demand for Tasks and Exports
(log employment)
OLS-FE

	(1)	(2)	(3)	(4)
A) Skilled and Unskilled Labor				
log highly-skilled	0.33***	0.19***	0.19**	0.19***
	(0.087)	(0.073)	(0.073)	(0.073)
log skilled	0.31***	0.16***	0.16***	0.16***
	(0.074)	(0.058)	(0.058)	(0.058)
log unskilled	0.11	-0.13	-0.13	-0.13
	(0.101)	(0.082)	(0.082)	(0.082)
B) Production and Non-Production Labor				
log production	0.27***	0.00	0.00	0.00
	(0.073)	(0.015)	(0.015)	(0.015)
log non-production	0.14**	0.03	0.03	0.03
	(0.056)	(0.041)	(0.041)	(0.041)
C) Tasks				
log managers	0.09	0.02	0.01	0.01
	(0.073)	(0.067)	(0.067)	(0.067)
log engineers	0.37***	0.22**	0.22**	0.22**
	(0.103)	(0.089)	(0.090)	(0.090)
log services	0.29***	0.16**	0.15**	0.15**
	(0.083)	(0.070)	(0.070)	(0.069)
log blue-collar	0.14	-0.11	-0.11	-0.11
	(0.111)	(0.093)	(0.093)	(0.093)
log maintenance	-0.15*	-0.20***	-0.20***	-0.20***
	(0.080)	(0.078)	(0.077)	(0.077)

Notes: OLS-FE regressions of (log) employment on export intensity (exports/sales). Column (1): firm fixed-effects and year fixed-effects; column (2): adds log total employment (firm size); column (3): adds controls for industry-specific trends (i.e., interactions between year dummies and industry dummies); column (4): adds initial conditions to control for firm-specific trends. Data are from the Encuesta Nacional Industrial Anual (National Annual Industrial Survey), Chile 2001-2005.

Table 11
First Stage Results
(exports /sales on z^0 and z^1)

	(1)	(2)	(3)	(4)
average real gdp	0.0877***	0.0880***	0.0885***	0.0879***
(z^0_{jt})	(0.0099)	(0.0098)	(0.0090)	(0.0088)
average real gdp * initial sales	0.0012*	0.0011*	0.0010*	0.0011*
($z^0_{jt} * s_{j0}$)	(0.0006)	(0.0006)	(0.0006)	(0.00068)
average real exchange rate	-0.0271	-0.0268	-0.0263	-0.0277
(z^1_{jt})	(0.0202)	(0.0201)	(0.0190)	(0.0189)
average real exchange rate * initial sales	0.0018	0.0018	0.0017	0.0018
($z^1_{jt} * s_{j0}$)	(0.0014)	(0.0014)	(0.0013)	(0.0013)
R^2	0.4682	0.4688	0.4682	0.4683
F-statistic	4703.13	4776.59	4954.79	5007.10
Prob > F	0.0000	0.0000	0.0000	0.0000

Notes: First-stage results of IV-FE regressions of (log) employment on export intensity (exports/sales). Column (1): firm fixed-effects and year fixed-effects; column (2): adds log total employment (firm size); column (3): adds controls for industry-specific trends (i.e., interactions between year dummies and industry dummies); column (4): adds initial conditions to control for firm-specific trends. Data are from the Encuesta Nacional Industrial Anual (National Annual Industrial Survey), Chile 2001-2005.

Table 12
The Demand for Tasks and Exports
(log employment)
IV-FE

	(1)	(2)	(3)	(4)
A) Skilled and Unskilled Labor				
log highly-skilled	0.45***	0.31***	0.31***	0.31***
	(0.127)	(0.101)	(0.102)	(0.102)
log skilled	0.41***	0.26***	0.26***	0.26***
	(0.108)	(0.079)	(0.079)	(0.079)
log unskilled	-0.07	-0.32***	-0.32***	-0.32***
	(0.120)	(0.123)	(0.123)	(0.123)
B) Production and Non-Production Labor				
log production	0.29***	0.02	0.02	0.02
	(0.091)	(0.017)	(0.018)	(0.018)
log non-production	0.10	-0.02	-0.03	-0.03
	(0.060)	(0.048)	(0.047)	(0.047)
C) Tasks				
log managers	-0.05	-0.12	-0.13	-0.13
	(0.107)	(0.099)	(0.099)	(0.099)
log engineers	0.55***	0.40***	0.40***	0.40***
	(0.152)	(0.126)	(0.127)	(0.127)
log services	0.25**	0.11	0.10	0.10
	(0.105)	(0.099)	(0.098)	(0.098)
log blue-collar	-0.07	-0.33**	-0.34**	-0.34**
	(0.132)	(0.137)	(0.137)	(0.137)
log maintenance	-0.03	-0.09	-0.09	-0.09
	(0.100)	(0.102)	(0.102)	(0.101)

Notes: IV-FE regressions of (log) employment on export intensity (exports/sales). The instruments are the weighted average the real exchange rate of a firm export partners and the weighted average of the real gdp of a firm export destinations. Column (1): firm fixed-effects and year fixed-effects; column (2): adds log total employment (firm size); column (3): adds controls for industry-specific trends (i.e., interactions between year dummies and industry dummies); column (4): adds initial conditions to control for firm-specific trends. Data are from the Encuesta Nacional Industrial Anual (National Annual Industrial Survey), Chile 2001-2005.

Table 13
The Demand for Tasks and Exports
(shares of employment)
IV-FE

	(1)	(2)	(3)	(4)
A) Skilled and Unskilled Labor				
share highly-skilled	0.08***	0.09***	0.09***	0.09***
	(0.029)	(0.030)	(0.030)	(0.030)
share skilled	0.07**	0.09***	0.09***	0.09***
	(0.029)	(0.031)	(0.031)	(0.031)
B) Production and Non-Production Labor				
share production	0.04***	0.01	0.01	0.01
	(0.012)	(0.009)	(0.009)	(0.009)
C) Tasks				
share managers	-0.01***	-0.00	-0.00	-0.00
	(0.005)	(0.005)	(0.005)	(0.005)
share engineers	0.09***	0.09***	0.09***	0.09***
	(0.030)	(0.030)	(0.030)	(0.030)
share services	-0.01	-0.00	-0.00	-0.00
	(0.007)	(0.007)	(0.007)	(0.007)
share blue-collar	-0.05*	-0.08***	-0.08**	-0.08***
	(0.029)	(0.031)	(0.031)	(0.031)
share maintenance	-0.01***	-0.01	-0.01	-0.01
	(0.005)	(0.004)	(0.004)	(0.004)

Notes: IV-FE regressions of employment shares on export intensity (exports/sales). The instruments are the weighted average the real exchange rate of a firm export partners and the weighted average of the real gdp of a firm export destinations. Column (1): firm fixed-effects and year fixed-effects; column (2): adds log total employment (firm size); column (3): adds controls for industry-specific trends (i.e., interactions between year dummies and industry dummies); column (4): adds initial conditions to control for firm-specific trends. Data are from the Encuesta Nacional Industrial Anual (National Annual Industrial Survey), Chile 2001-2005.

5 Exports and the Destination of Exports

As we have shown, the available data and the recent literature have shown that exporting requires skills. Brambilla, Lederman and Porto (2012) argue that exporting per se may not necessarily lead to higher skill utilization. What matters is the destination of a firms' exports. In particular, for developing countries, exporting to high-income countries requires skills but exporting per se does not necessarily. This is because firms need to increase product quality, as in Verhoogen (2008), and because firms need to use skilled labor during the export process, as in Matsuyama (2007). In this section, we explore this relationship in a panel of industries and countries for the period 1990-2004. The overall motivation for the analysis is to establish whether the destination of a country's exports is relevant for skill utilization and to take this as evidence of a demand for high quality products in export markets. As argued by Hausman, Hwang and Rodrik (2007), these results are of great policy relevance because the set of goods produced, and exported, by a developing country may be critical for its sustained economic development.

In this section, our main objective is to establish a link between the income level of the destination countries and the level of average wages in the exporting country across the world economy. As our literature review shows, the evidence supporting a link between high-income export destinations and quality appears much more widespread than the evidence in support of the link between high-income export destinations and wages (and skills). Our goal is to generalize the results for Mexico, in which Verhoogen (2008) is based, and Argentina, in which Brambilla, Lederman and Porto (2012) is based. To do this, we use cross-country panel data to set up an instrumental variable model of high-income export destinations and wages. We utilize the trade and production database compiled by Nicita and Olarreaga (2007) to measure exports and wages across industries and countries. We merge these data with country characteristics such as per capita GDP to build a measure of the average GDP of the destination of an industry's exports. For each industry-country pair, we calculate the export-share weighted average of the destination per capita GDP. We then study whether the share of exports to high-income countries at the industry level is significantly correlated with the average wage paid by firms in an industry.

As in the case of Chile, we establish causality from exports and export destinations to wages. To deal with endogeneity issues in the export-share weights, we estimate bilateral trade regressions at the industry level using country characteristics and bilateral exchange rates as regressors (Brambilla, Lederman, and Porto 2012; Park, Yang, Shi, and Jiang, 2010). These regressions allow us to estimate predicted export-share weights that we use as an instrument for the observed export-share weighted destination GDP, as Frankel and Romer (1999), Feyrer (2013), and Irwin and Terviö (2002), among others.

We find robust evidence that, worldwide, industries that ship products to high-income destinations do pay higher average wages. Our IV results indicate this is a causal relationship. We also explore the operating mechanisms, and find robust evidence in support of the dual link advanced above. First, industries that ship products to high-income destination export higher quality goods (as measured by the average unit value of exports within industries). This is because high-income countries demand high-quality products. Second, the provision of quality is costly and requires more intensive use of higher-wage skilled labor. As a result, the production of higher quality products at the industry level creates a wage premium and conduces to higher average industry wages. Finally, we find that these relationships are stronger in rich-income countries and in less-developed countries because poor countries may lack the firm capabilities and workers skills needed to produce higher quality products.

5.1 Basic Correlations

We now show that these mechanisms operate in a cross-section of countries across the world. Our main source of data is the "Trade, Production and Protection" database put together by Nicita and Olarreaga (2007). The cross-country data include information on export values and export quantities, production, value added, employment, wages, and number of establishments for 28 manufacturing industries corresponding to the 3-digit level of the International Standard Industrial Classification (ISIC), Revision 2. The database is available at the World Bank trade website (`www.worldbank.org/trade`).

We combine the Nicita and Olarreaga data with supplementary data on country characteristics from the World Development Indicators. These characteristics include population, GDP, per capita GDP, bilateral exchange rates, and inequality measures such as the Gini coefficient or the share of income held by different quintiles of the population. Our database covers a total of 82 countries from 1990 to 2000.

The starting point of our analysis is the correlation between the average income level of an industry exports and the level of wages. Using the Nicita and Olarreaga (2007) data, we calculate the average industry wage as the ratio of total industry wage bill and total employment. Let w_{ic} be the average wage in industry i in country c. To construct a measure of the level of income in destination markets, let $GDPpc_d$ be the per capita GDP of destination country d in 1990 (the first year of data) and let s_{icdt} be the share of exports of industry i in country c shipped to destination d (at time t). We define the average income of an industry's exports as:

$$(27) \quad g_{ict} = \ln\left(\sum_d s_{icdt} * GDPpc_d\right).$$

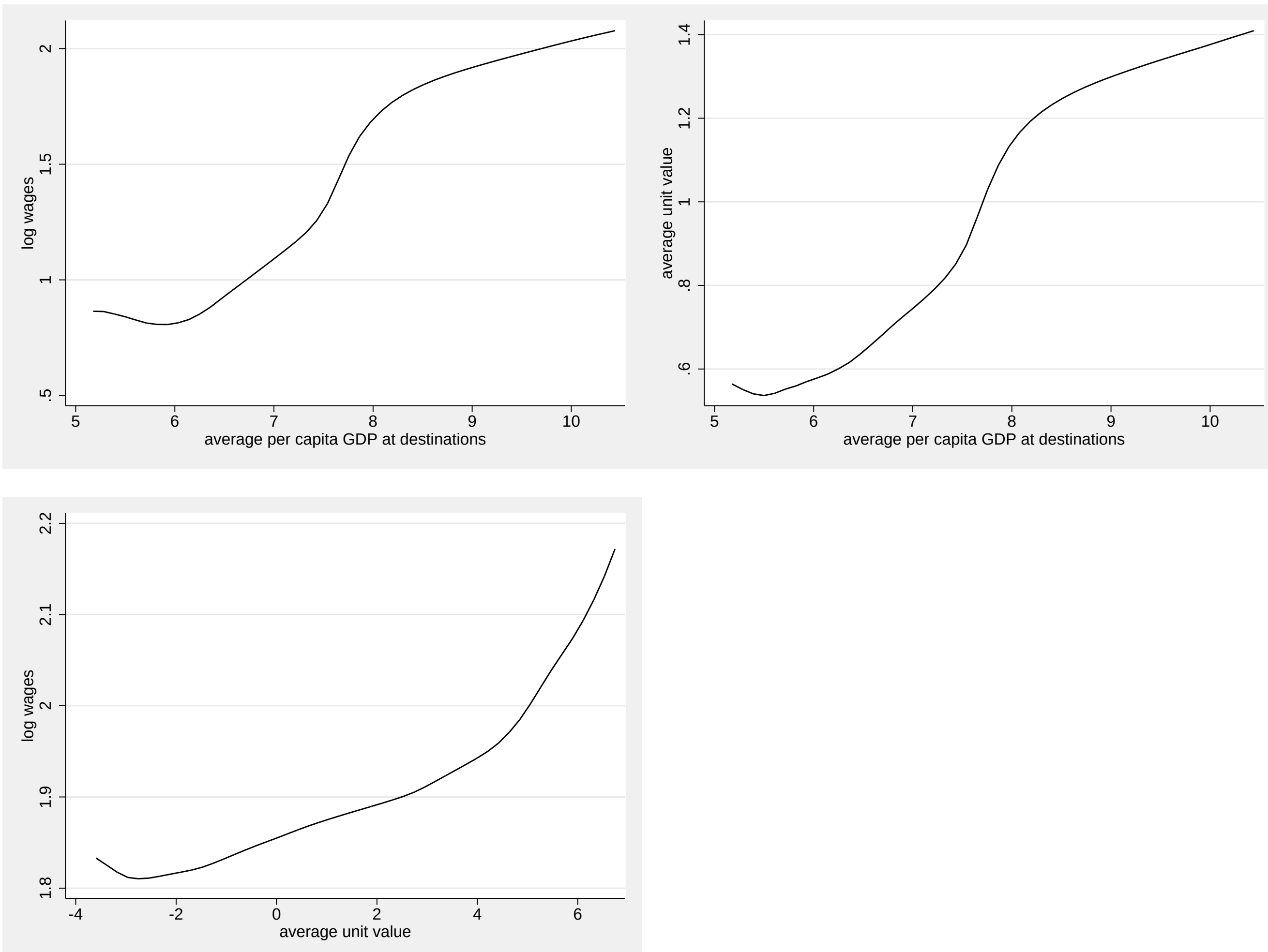
The top-left panel in Figure 11 uncovers our basic finding, the positive correlation between the log of the average wage paid in industry i in country c and the average income of the countries to which the exports of that industry are destined to. The correlation is estimated non-parametrically using a local weighted regression with a Gaussian Kernel. The graph suggests that, on average, the higher the income of a industry export destinations is, the higher the average wage becomes. Note that, in (27), we kept the per capita GDP of destination country d fixed at the 1990 level, thus treating GDP_d as a predetermined feature of the trade partners. We do this explicitly to capture differences in wages for industries with varying exposure to the income at export destinations. Below, we also explore models where the level of income of the destination country varies across time (so that $g_{ict} = \ln(\sum_d s_{icdt} * GDPpc_{dt})$. None of our results are affected by this alternative definition of g.

Based on the literature, this link operates via a two-way mechanism. The quality valuation mechanism links export destinations income with quality demand. The quality provision mechanism links quality production with skill utilization and wages. Both mechanisms are supported in our data. To document the quality valuation mechanism, note that the trade data in Nicita and Olarreaga's database allows us to build measures of export quality with export unit values, the ratio of export values and export quantities. This is a widespread, albeit imperfect, measure of average quality.[12] Prima-facie evidence that exports to high-income countries are of higher quality is in the top-right panel of Figure 11, which shows a positive correlation between the unit value of a industry exports and the income level of the export destinations. This link originates from a higher demand for quality in higher-income countries.

Finally, to document the basic correlation behind the quality provision mechanism, we estimate a non-parametric regression between average industry wages and export unit values. In bottom panel of Figure 11, we show that this correlation is positive. The provision of higher quality is more costly, in part because quality upgrades are intensive in skilled labor, which is more expensive. We thus interpret the correlation between quality and wages as indicative of a positive correlation between quality and skills.

[12] See for example Schott (2004), Hummels and Klenow (2005) or Hallak (2006). Khandelwal (2010) and Hallak and Schott (2011) discuss and estimate better measures of quality.

Figure 11
Basic Correlations
Average Wages, Average per capita GDP at Export Destinations
and Average Unit Values



Notes: univariate (non-parametric) correlations. Top-left: log of the average wage paid in a sector and the average per capita GDP of the export destinations; Top-right: average sectoral unit value of exports and the average per capita GDP of the export destinations; Bottom: log of the average wage paid in a sector and the average sectoral unit value. Data from the "Trade, Production and Protection" database of Nicita and Olarreaga (2007) and World Development Indicators.

5.2 Econometric Model and Results

In this section, we econometrically explore these mechanisms more carefully. We begin with the basic finding with the following regression specification for wages:

$$(28)\quad \log w_{ict} = \gamma^1 g_{ict} + \mathbf{x}'_{ict}\beta^1 + \phi^1_t + \phi^1_{ic} + u^1_{ict},$$

where $\log w_{ict}$ is the log of the average wage paid in industry i in country of origin c at time t, g_{ict} is the export-shares weighted average GDP across destination markets (as defined above in (27)), $\mathbf{x}_{ict}$ is a vector of controls (to be discussed shortly), ϕ^1_t are year fixed-effects, ϕ^1_{ic} are country of origin-industry fixed effects, and u^1_{ict} is the error term. For our purposes, the main regressor in (28) is g_{ict}, and we are mostly interested in γ^1.

The baseline OLS-FE results are in Table 14.[13] In column 1, we report the basic correlation between wages and high-income export destinations conditional only on the fixed effects ϕ^1_t and ϕ^1_{ic}. The coefficient is positive and significant. An industry that enjoys a 10 percent richer set of destination markets pays on average 0.412 percent higher wages. Note that this simple model includes year effects, so that any aggregate shock is accounted for, as well as origin-industry effects, so that any time-invariant features of an industry in a given country (such as certain technological characteristics or policies that remain constant) are also accounted for. This result is robust to the inclusion of various important controls. In column 2, we add the log of the per capita GDP of the origin country. Higher income implies a higher domestic demand and thus higher wages. The level of per capita GDP also accounts for differential country effects across time, such as periods of booms or crises. In column 3, we exclude per capita GDP but include the log of industry exports. In this regression, both average destination GDP and industry exports appear positive and statistically significant. As in Brambilla, Lederman, and Porto (2012), adding the level of exports, on top of the average GDP of export destinations, is conceptually important. The positive coefficient on g implies that, conditional on a level of exports, those industries with a higher composition of high-income exports pay higher average wages. This finding is robust to the inclusion of per

[13] These results are thus the linear version of the plot in Figure 11, conditional on covariates.

Table 14
Average Wages and Average per capita GDP at Export Destinations
OLS-FE Estimation

	(1)	(2)	(3)	(4)	(5)
Average p/c GDP	0.0412***	0.0479***	0.0404***	0.0450***	0.0372***
	(0.0142)	(0.0139)	(0.0142)	(0.0143)	(0.0126)
Log Origin p/c GDP		1.167***		1.056***	1.170***
		(0.0753)		(0.0788)	(0.0714)
Log Industry Exports			0.000178**	-8.67e-05	-1.55e-05
			(7.27e-05)	(6.95e-05)	(6.12e-05)
Log Industry Output				0.134***	0.0221
				(0.0197)	(0.0177)
Productivity					0.204***
					(0.0230)
Observations	12,850	12,850	12,850	12,331	11,382
R^2	0.016	0.079	0.017	0.116	0.217
Origin-Industry Groups	1,757	1,757	1,757	1,719	1,575

Note: Data from the "Trade, Production and Protection" database of Nicita and Olarreaga (2007) and World Development Indicators. The dependent variable is Average Log Wage.
Controls in all columns: origin-industry effects, year effects.
Standard errors clustered at origin-industry level.
Significance at 1%, 5% and 10% levels indicated by ***, ** and *.

capita GDP, log industry exports and log industry output (column 4), where $\widehat{\gamma}_1 = 0.0450$.

The results so far can be confounded by productivity shocks. The argument is that more productive firms may be able to both explore high-income destinations markets and pay higher wages (perhaps sharing a fraction of the additional profits created by the productivity shocks). To control for this, we add output per worker which is a direct measure of labor productivity in column 5. The results are not affected: $\gamma^1 = 0.0372$ remains positive and statistically significant.

As pointed out by Brambilla, Lederman, and Porto (2012), even after controlling for all these effects, there might still be unobserved confounding factors. In particular, our main regressor g_{ict} is built using the share of an industry's exports destined to different destinations, and these shares can be endogenous. Within industries, firm attributes such as unobserved productivity or cost shocks that are not captured by labor productivity directly can create upward biases. By contrast, industries with stronger labor regulations (for instance those where unions have wider presence) can pay higher wages but be less likely to export, especially to high-income countries (Galiani and Porto, 2010). This would create a downward bias in the OLS-FE specification. In addition, exports are also associated with imports, within firms and within industries (Bernard, Jensen, Redding and Schott, 2007). If imports of inputs affect wages, for example because high quality inputs are complements of skilled labor or, by contrast, because imported machines may replace labor, our results may also be biased. Further, exports and imports may be more likely to occur in industries with a heavier presence of multinational corporations that may split skill tasks across subsidiaries and be more likely to imports goods to be sold domestically, thus hiring less workers and paying lower wages, on average.

We deal with the endogeneity issue by estimating the model with instrumental variables. To do this, we need to find instruments that are able to (partly) explain the shares of industry i's exports to country c for all industries i and all countries c. This means the instruments need to (partly) explain the patterns of global trade. We do this by combining ideas from the literature. Frankel and Romer (1999) and Feyrer (2013), among others, instrument trade in growth regressions with predictions of the volume of trade of country c based on exogenous factors such as geography, distance, or time-varying air transportation costs.[14] Brambilla, Lederman, and Porto (2012), Park et al. (2010), and Revenga (1992), among others, use partners' exchange rates as instruments. Here, since we need predictions for trade shares to each each country's export destinations, we propose to use bilateral exchange rates to explain trade export shares in the following model:

$$s_{icdt} = \delta_i e_{cdt} + \nu_{it} + \nu_{icd} + \epsilon_{icdt}, \quad (29)$$

[14]This approach has been adopted and improved by numerous authors. The geography-based instrument can fail is there are time-invariant country characteristics that are correlated with trade and growth simultaneously. To deal with this, Feyrer (2013) uses a time-variant measure of geography given by changing costs in transportation. Felbermayr and Gröschl (2013) work with the interaction of the occurrence of natural disasters (volcano eruptions, earthquakes, floods) and geographical variables. See also Hall and Jones (1999), Irwin and Terviö (2002), Alcalá and Ciccone (2004), Noguer and Siscart (2005), Frankel and Rose (2005), Rodriguez and Rodrik (2001).

where, as before, s_{icdt} is the share of exports of good i from country c to destination d at time t. The regressor e_{cdt} is the real bilateral exchange rate between country c and country d, ν_t are year effects, and ν_{cd} are origin-destination fixed effects. This regression is run separately for each industry i, which allows us to incorporate a lot of flexibility into the model. Bastos, Silva and Verhoogen (2014) use an instrument which is very similar to ours, in the sense that they predict export shares of Portuguese firms using exogenous exchange rates movements. It is important to note that we are not interested in estimating a fully specified structural model of trade. We just need a good prediction for the trade export shares, i.e., we need instruments that are correlated with our endogenous regressor g. This can be tested in the first stage regression below. To give a sense of the results from (29), we report in Table 15, for each of the 28 manufacturing industries in our sample, the F test of joint significant associated with the estimation of equation (29) by OLS-FE. As it can be seen, for all ISIC sectors, the shares are predicted with sufficient precision, which helps with the statistical properties of our IV strategy.

After estimating (29) separately for each industry, we predict the flow of trade $\widehat{s}_{icdt}$ and then, for each i and c, we build our instrument for g as

$$(30) \quad \widehat{g}_{ict} = \sum_{d} \widehat{s}_{icdt} * GDP_d.$$

Finally, we estimate the wage model (28) with IV using $\widehat{g}_{ict}$ as defined in (30) as the instrument for g.

Our findings are reported in Table 16. In Panel A, we show the first stage results. The columns in these regressions correspond to the same specifications of the baseline OLS-FE model in Table 14. In all of them, we find a strong positive correlation between the instrument and the endogenous regressor and this correlation is always statistically very significant. In Panel B, we show the IV results from the second stage. Again, in all specifications, g has a statistically strong positive causal effect on wages.[15] These results confirm the finding that industries where exports are destined to high income destination pay higher average

[15]Note that asymptotically it is not necessary to correct the standard errors on the second stage regression for the fact that the instrument is estimated (although there might be biases in small sample, of course).

wages. In the preferred specification in column 5, on average, an increase in 10 percent in the average GDP of the destinations of an industry causes average wages in the industry to increase by 0.902 percent. The findings in Brambilla, Lederman, and Porto (2012) and Verhoogen (2008), which apply to Argentine and Mexican firms, hold, on average, for a wider cross-section of countries.

At the bottom of Table 16, we report the second-stage results using a variant of g in which the GDP of destination countries is allowed to change in time. This has no substantial effect on the results, which remain virtually unchanged. Our preferred model is, however, the one that keeps destination GDP constant (at their pre-sample level) because it provides a better test of our theory. Changes in GDP due to booms or slowdowns in trade partners can affect wages in source countries due to market size effects, for instance, as well as through quality. The model that exploits exogenous changes in exposure to high-income destinations is arguably a cleaner test of the quality mechanism. Nevertheless, as shown, our results are quite robust.

Table 15
Predicting Export Shares
$F-$Test

ISIC	Observations	F-Test	p value
311	54514	6.44	0
313	27750	8.25	0
314	14628	12.03	0
321	53653	7.07	0
322	36726	5.09	0
323	32091	6.43	0
324	20299	583.1	0
331	35961	93.2	0
332	30876	6.33	0
341	41557	1918	0
342	37130	8.91	0
351	51957	9.97	0
352	50481	12.06	0
353	27871	395.97	0
354	12411	857.05	0
355	38506	5685.17	0
356	39930	359.15	0
361	27154	1228.04	0
362	34413	12.18	0
369	36178	10.29	0
371	40137	10.79	0
372	34232	613.94	0
381	51331	409.98	0
382	50489	7.37	0
383	46758	7.8	0
384	42195	1804.87	0
385	39005	16.56	0
390	37719	140.37	0

Note: Data from the "Trade, Production and Protection" database of Nicita and Olarreaga (2007) and World Development Indicators. F-statistic of the export share regressions on bilateral exchange rates, year effects, and origin-destination fixed effects (and associated p-values). Regressions run at the ISIC 3-digit industry level.

Table 16
Average Wages and Average per capita GDP at Export Destinations
IV Estimation

	(1)	(2)	(3)	(4)	(5)
A) First Stage Results					
Predicted Average p/c GDP	0.309***	0.309***	0.310***	0.311***	0.310***
	(0.0213)	(0.0214)	(0.0214)	(0.0217)	(0.0241)
Observations	12,167	12,167	12,167	11,665	10,733
R^2	0.202	0.202	0.202	0.202	0.194
Origin-Industry Groups	1,724	1,724	1,724	1,686	1,530
B) Second Stage Results					
Average p/c GDP	0.0986**	0.131***	0.0935**	0.136***	0.0902**
	(0.0437)	(0.0434)	(0.0440)	(0.0434)	(0.0384)
Observations	12,167	12,167	12,167	11,665	10,733
R^2	0.011	0.068	0.013	0.106	0.210
Origin-Industry Groups	1,724	1,724	1,724	1,686	1,530
C) Second Stage Results: Robustness					
Average p/c GDP	0.0989**	0.127***	0.0938**	0.130***	0.0868**
	(0.0427)	(0.0425)	(0.0429)	(0.0422)	(0.0376)

Note: Data from the "Trade, Production and Protection" database of Nicita and Olarreaga (2007) and World Development Indicators. The dependent variable is Average Log Wage. The main regressor is the average per capita GDP at export destinations. The instrument is the average per capita GDP of destination countries using predicted export shares as weights. In Panel A and B, "Average p/c GDP" is the weighted average of the 1990 per capita GDP at destinations. Panel C uses weighted averages of time-varying per capita GDP.
Controls in all columns: origin-industry effects, year effects.
Standard errors clustered at origin-industry level.
Significance at 1%, 5% and 10% levels indicated by ***, ** and *.

5.3 The Operating Mechanisms

We now investigate the operating mechanisms, the statistical link between export quality and high-income exports, on the one hand, and the link between quality and wages, on the other. For the first of these mechanisms, we use exactly the same regression model in equation (28) for a measure of quality, the average unit value:

$$(31)\quad \log uv_{ict} = \gamma^2 g_{ict} + \mathbf{x}'_{ict}\beta^2 + \phi^2_t + \phi^2_{ic} + u^2_{ict},$$

where uv is the average unit value in industry i, country of origin c, and time level t. In this model, as in (28), the destination of a industry's exports can be endogenous. We thus estimate the models using both OLS-FE and IV, where $\widehat{g}$ is the instrument for g, as before. Results are in Table 17. Looking first at the OLS-FE results (Panel A, at the top), we find that, pooling all countries, the average per capita GDP of a industry' export destinations is positively associated with average unit values. The results are robust to the inclusion of all the other previous controls, namely, log per capita GDP at origin (columns 2), log industry exports (column 3), log industry output (column 4), and productivity (column 5). Our IV results, in Panel B, confirm the causal link.[16] In all five specifications, high-income export destinations lead to higher quality at the industry level. These impacts are always statistically significant. Using the preferred estimates in column 5, unit values are around 1.66 percent higher in industries with 10 higher income at destinations, on average. These results are thus consistent with the intuition that industries oriented to higher income destinations produce, on average, higher quality products.[17]

Turning to the link between quality, skills and wages, the model is

$$(32)\quad \log w_{ict} = \gamma^3 \log uv_{ict} + \mathbf{x}'_{ict}\beta^3 + \phi^3_t + \phi^3_{ic} + u^3_{ict}.$$

For completeness, we estimate this model with OLS-FE. The results are in Table 18. We uncover a positive correlation between the average quality in an industry on the average wage paid by the industry (Panel A). The estimates are always positive (column 1 to 5) and statistically significant.

However, to be consistent with our interpretation, we need to argue that this association

[16] The first stage results are the same as in Table 16 and are not reported here.

[17] These results are not affected when the GDP of destination countries in g changes in time.

is caused by the fact that the production of higher quality products (a higher unit value) requires skills, and skilled workers are paid higher wages than unskilled workers used more intensively in lower quality industries. While we do not have information on skill utilization in the data, we can establish this link more strongly by estimating (32) with instrumental variables (so as to rule out, for instance, any reverse causality stemming from the fact that higher quality products are overall more expensive to produce). In this case, the endogenous variable, the log of the unit value, can also be instrumented with the predict average GDP of an industry destinations. This is because of the statistical association found in (31), the first link in our proposed mechanism.[18]

Our IV results are reported in Table 18. The first stage results (Panel B) confirm a strong predicted power of the instrument, as expected. The second stage results (Panel C) uncover a causal link between quality and wages. In specification 5, for instance, in an industry with 10 percent higher average unit value, wages would be 0.459 percent higher. We argue that this result suggests a positive link between quality production and skill utilization, which implies a more intensive use of high-wage skilled workers at the industry level.

[18]Note that the instrument is actually the predictions of the log of the unit value from the first stage regression of $\log uv$ on $\widehat{g}$. In the linear model, this is the same as using $\widehat{g}$ directly in the IV estimation.

Table 17
Operating Mechanisms
Mean Unit Value and High-Income Exports

	(1)	(2)	(3)	(4)	(5)
A) OLS-FE					
Average p/c GDP	0.149***	0.153***	0.148***	0.154***	0.130***
	(0.0299)	(0.0297)	(0.0299)	(0.0309)	(0.0326)
Observations	12,850	12,850	12,850	12,331	11,382
R^2	0.018	0.026	0.019	0.026	0.023
Origin-Industry Groups	1,757	1,757	1,757	1,719	1,575
B) IV Second Stage					
Average p/c GDP	0.229***	0.250***	0.221***	0.234***	0.166**
	(0.0768)	(0.0765)	(0.0763)	(0.0794)	(0.0819)
Observations	12,167	12,167	12,167	11,665	10,733
R^2	0.014	0.021	0.016	0.023	0.023
Origin-Industry Groups	1,724	1,724	1,724	1,686	1,530

Note: Data from the "Trade, Production and Protection" database of Nicita and Olarreaga (2007) and World Development Indicators. The dependent variable is Average Log Unit Value of exports. The main regressor is the average per capita GDP at export destinations. The instrument in Panel B is the average per capita GDP of destination countries using predicted export shares as weights. The first stage is the same as in Table 16.
Controls in all columns: origin-industry effects, year effects.
Standard errors clustered at origin-industry level.
Significance at 1%, 5% and 10% levels indicated by ***, ** and *.

Table 18
Operating Mechanisms
Average Wage and Average Unit Value

	(1)	(2)	(3)	(4)	(5)
A) OLS-FE					
Average UV	0.0421***	0.0295***	0.0414***	0.0289***	0.0184***
	(0.00836)	(0.00809)	(0.00830)	(0.00800)	(0.00686)
Observations	12,850	12,850	12,850	12,331	11,382
R^2	0.018	0.078	0.019	0.115	0.215
Origin-Industry Groups	1,757	1,757	1,757	1,719	1,575
B) IV First Stage					
Predicted Average p/c GDP	0.339***	0.337***	0.339***	0.342***	0.342***
	(0.0151)	(0.0150)	(0.0151)	(0.0155)	(0.0169)
Observations	12,387	12,387	12,387	11,873	10,935
R^2	0.221	0.226	0.221	0.228	0.216
Origin-Industry Groups	1,743	1,743	1,743	1,707	1,549
C) IV Second Stage					
Average UV	0.0929***	0.0832***	0.0892***	0.0790***	0.0459**
	(0.0256)	(0.0268)	(0.0256)	(0.0262)	(0.0184)
Observations	12,387	12,387	12,387	11,873	10,935
R^2	0.011	0.069	0.013	0.109	0.211
Origin-Industry Groups	1,743	1,743	1,743	1,707	1,549

Note: Data from the "Trade, Production and Protection" database of Nicita and Olarreaga (2007) and World Development Indicators. The dependent variable is Average Log Wage. The main regressor is the Average Log Unit Value of exports. The instrument in Panels B and C is the average per capita GDP of destination countries using predicted export shares as weights.
Controls in all columns: origin-industry effects, year effects
Standard errors clustered at origin-industry level
Significance at 1%, 5% and 10% levels indicated by ***, ** and *.

6 Policy Analysis

Based on all facts generated in the analysis, the project will conclude with a summary of concrete policy guidelines to help identify areas where active economic policies can help reap the gains from exports in developing and low income countries.

7 Conclusions

In this paper we study the relationship between exports, employment, and wages in developing countries using both firm and industry level data.

The firm level data shows that on average exporters pay 31 percent higher wages than non-exporters. These premia are 20 percent in Europe, 38 percent in Latin America, 30 percent in Asia and 22 percent in Africa. However, there averages mask lots of cross country variation. The data also reveals that exporting firms are on average much larger. On average, an exporter employs 130 percent more people than a non exporting firm. The employment premium is 122 percent in Europe, 138 percent in Latin America, 129 percent in Asia, and 117 percent in Africa.

The wage and employment export premia observed in developing countries is also present in the many studies focusing in developed countries. Two theories explain these links. One postulates that firms self-select into exporting with better firms becoming exporters. The other theory argues that exporting firms are better because of a learning-by-exporting process. While the evidence is mixed, it tends to favor the first theory over the second.

We build a model that allows us to study the main mechanisms that explain the export premium. These are skilled labor utilization, technology sophistication, imported input use, and productivity. We present correlations between exporting and different measures of the four mechanisms. In all cases, the correlations between exporting and those measures are positive and statistically significant across countries and regions. Using a hybrid model we also estimate the export premium for wages and employment conditional on the variables that capture the mechanisms. We find that, conditional on all the mechanisms, the wage export premium disappears completely. In the case of the employment premium, it decreases from 130 percent to 11 percent when controlling by the different mechanisms. While this decline is sizeable, the difference in terms of employment between exporting and non exporting firm is statistically different from zero pointing out to the existence of some hidden mechanisms we are not considering here.

The correlations estimated using firm level data from the Enterprise Survey, do not imply causality. Establishing causality requires exogenous variation in exporting or in productivity. To do that, we use firm-level panel data from Chile and instrument variables capturing exogenous export opportunities for firms. The estimations show that conditional on size, firms that export a higher share of their total sales utilize more skilled (and also highly-skilled) workers, and less unskilled workers. This implies that exporters need to perform skill intensive activities and tasks.

We finally assess the argument that exporting per se may not necessarily lead to higher skill utilization and what matters is the destination of a firms' exports. We use a panel of industries and countries to establish whether the destination of a country's exports is relevant for skill utilization and to take this as evidence of a demand for high quality products in export markets. As in the case of Chile, we establish causality from exports and export destinations to wages. To deal with endogeneity issues in the export-share weights, we estimate bilateral trade regressions at the industry level using country characteristics and bilateral exchange rates as regressors. These regressions allow us to estimate predicted export-share weights that we use as an instrument for the observed export-share weighted destination GDP. We find robust evidence that, worldwide, industries that ship products to high-income destinations do pay higher average wages. Our IV results indicate this is a causal relationship. We also explore the operating mechanisms, and find that industries that ship products to high-income destination export higher quality goods and that the provision of quality is costly and require more intensive use of higher-wage skilled labor. As a result, the production of higher quality products at the industry level creates a wage premium and conduces to higher average industry wages. Finally, we find that these relationships are stronger in rich-income countries and in less-developed countries because poor countries may lack the firm capabilities and workers skills needed to produce higher quality products.

References

Acemoglu, D. and F. Zilibotti (2001) "Productivity Differences," Quarterly Journal of Economics 116(2), 563.606.

Acemoglu, D. and D. Autor (2011) "Skills, Tasks and Technologies: Implications for

Employment Earnings," in Ashenfelter, O., Card, D. (Eds.), The Handbook of Labor Economics, vol. 4b. Elsevier, Amsterdam, 1043-1171.

Alcalá, F. and A. Ciccone (2004). "Trade and Productivity," Quarterly Journal of Economics 119, 2, pp. 612–645.

Alvarez, R., and R. Lopez (2005). "Exporting and Performance: Evidence from Chilean Plants," Canadian Journal of Economics 38(4), pp. 1384–40.

Amiti, M. and D. D. R. Davis (2011). "Trade, Firms, and Wages: Theory and Evidence." Review of Economics Studies, vol 79, pp. 1–36.

Antras, P, L. Garicano and E. Rossi-Hansberg (2006). "Offshoring in a Knowledge Economy," Quarterly Journal of Economics, 121:1, pp. 31–77.

Arnold, J., and K. Hussinger (2005). "Export Behavior and Firm Productivity in German Manufacturing: A Firm-Level Analysis," Review of World Economics 141(2), pp. 219–243.

Artuc, E. and J. McLaren (2012). "Trade Policy and Wage Inequality: A Structural Analysis with Occupational and Sectoral Mobility," NBER Working Papers 18503, National Bureau of Economic Research.

Autor, D., F. Levy and R. Murnane (2003). "The Skill Content of Recent Technological Change: An Empirical Exploration," Quarterly Journal of Economics 118(4), pp. 1279–1334.

Aw, B.Y. and G. Batra (1999). "Wages, Firm Size, and Wage Inequality: How Much Do Exports Matter?," in: Audretsch, D.B. and Thurik, A.R. (Eds.), Innovation, Industry Evolution, and Employment. Cambridge University Press, Cambridge, UK, pp. 13–56.

Aw, B.Y., M. Roberts and D.Y. Xu (2011). "R&D Investment, Exporting, and Productivity Dynamics," American Economic Review, Vol. 101(4), pp. 1312–1344.

Baldwin, R. and J. Harrigan (2011). "Zeros, Quality and Space: Trade Theory and Trade Evidence," American Economic Journal: Microeconomics, 3, pp. 60–88.

Bas, M. and V. Strauss-Kahn (2011). "Does Importing More Inputs Raise Exports? Firm Level Evidence from France," Review of World Economics, 1–35.

Bas. M. (2012). "Input-Trade Liberalization and Firm Export Decisions: Evidence from Argentina," Journal of Development Economics, Volume 97, Issue 2, pp. 481–493.

Bastos, P. and J. Silva (2010). "The Quality of a Firm's Exports: Where you Export to Matters," Journal of International Economics, vol. 82(2), pp. 99–111.

Bastos, P., J. Silva, and E. Verhoogen (2014). "Export Destinations and Input Prices: Evidence from Portugal," mimeo.

Baumgarten, D. (2013). "Exporters and the Rise in Wage Inequality: Evidence from German Linked Employer-Employee Data," Journal of International Economics, 90(1), pp. 201–217.

Bernard, A., and B. Jensen (1995). "Exporters, Jobs, and Wages in U.S. Manufacturing: 1976–1987." In Brookings Papers on Economic Activity, Microeconomics: 1995, ed. G. L. Perry and W. C. Brainard, pp. 67–119. Washington, DC: Brookings Institution Press.

Bernard, A.B. and J.B. Jensen (1997). "Exporters, Skill Upgrading, and the Wage Gap," Journal of International Economics 42, pp. 3–31.

Bernard, A., and B. Jensen (1999). "Exceptional Exporter Performance: Cause, Effect, or Both?," Journal of International Economics 47 (1), pp. 1–25.

Bernard, A.B. and J.B. Jensen (2004). "Why Some Firms Export," Review of Economics and Statistics 86, pp. 561–569.

Bernard, A. and J. Wagner (1997). "Exports and Success in German Manufacturing," Weltwirtschaftliches Archiv, 133, pp. 134–157.

Bernard, A., B. Jensen, S. Redding, and P. Schott (2007). "Firms in International Trade," Journal of Economic Perspectives, Volume 21, Number 3, Summer 2007, pp. 105–130.

Blanchflower, D., A. Oswald and P. Sanfey (1996). "Wages, Profits, and Rent-Sharing," Quarterly Journal of Economics, Vol. 111, No. 1. pp. 227–251.

Bigsten, A., P. Collier, S. Dercon, M. Fafchamps, B. Gauthier, J.W. Gunning, A. Oduro, R., Pattillo, C. Oostendorp, M. Söderbom, F. Teal and A. Zeufack (2004). "Do African Manufacturing Firms Learn from Exporting?," Journal of Development Studies, 40(3), pp. 115–141.

Brambilla, I., R. Dix-Carneiro, D. Lederman, and G. Porto (2011). "Skills, Exports, and the Wages of Seven Million Latin American Workers," World Bank Economic Review, vol 26 (1), pp.34-60.

Brambilla, I. D. Lederman, and G. Porto (2012). "Exports, Export Destinations and Skills," American Economic Review, Vol. 102, No. 7, pp. 3406–3438.

Brambilla, I. and G. Porto (2014). "High-Income Export Destinations, Quality and Wages," mimeo University of La Plata.

Brambilla, I. D. Lederman, and G. Porto (2014). "Exporting Firms, Quality and the Demand for Skilled Tasks," mimeo.

Bustos, P. (2011). "Trade Liberalization, Exports and Technology Upgrading: Evidence on the impact of MERCOSUR on Argentinean Firms," American Economic Review, vol. 101(1), pp. 304–340.

Bustos, P. (2014). "The Impact of Trade Liberalization on Skill Upgrading. Evidence from Argentina," mimeo CREI.

Caron, J., T. Fally, and J. Markusen (2014). "International Trade Puzzles: A Solution Linking Production and Preferences," forthcoming in the Quarterly Journal of Economics.

Clerides, S. K., S. Lach, and J. R. Tybout (1998). "Is Learning By Exporting Important? Micro-Dynamic Evidence From Colombia, Mexico, And Morocco," The Quarterly Journal of Economics, 113(3), pp. 903–947.

Costinot, A. and J. Vogel (2010). "Matching and Inequality in the World Economy," Journal of Political Economy 118(4), 747.786.

Crino, R. and P. Epifani (2012). "Productivity, Quality and Export Behavior," Economic Journal, 122(565), pp. 1206–1243

Delgado, Miguel A., J.C. Farinas and S. Ruano (2002). "Firm Productivity and Export Markets: a Non-parametric Approach," Journal of International Economics 57 (2), pp. 397–422.

De Loecker, J. (2007). "Do Exports Generate Higher Productivity? Evidence from Slovenia," Journal of International Economics 73, pp. 69–98.

Ebenstein, A., A. Harrison, M. McMillan, and S. Phillips (2014). "Estimating the Impact of Trade and Offshoring on American Workers Using the Current Population Surveys," forthcoming Review of Economics and Statistics, 96(4), October.

Egger, H. and U. Kreickemeier (2009). "Firm Heterogeneity and the Labor Market Effects of Trade Liberalization," International Economic Review, vol. 50, No. 1, pp.

Egger, H. and U. Kreickemeier (2010). "Worker-specific Effects of Globalisation," The World Economy, Wiley Blackwell, vol. 33(8), pp. 987–1005.

Egger, H. and U. Kreickemeier (2012). "Fairness, Trade, and Inequality," Journal of International Economics 86, pp. 184–196.

Fajgelbaum, P., G. Grossman and E. Helpman (2011). "Income Distribution, Product Quality and International Trade," Journal of Political Economy, vol. 119(4), pp. 721–765.

Farinas, J.C. and A. Martin-Marcos (2007). "Exporting and Economic Performance: Firm-level Evidence of Spanish Manufacturing," The World Economy 30 (4), pp. 618–646.

Feng, L., Z. Li and D.L. Swenson (2012). "The Connection between Imported Intermediate Inputs and Exports: Evidence from Chinese Firms," NBER Working Papers 18260, National Bureau of Economic Research, Inc.

Feenstra, R. and G. Hanson (1996). "Foreign Investment, Outsourcing and Relative Wages," in Political Economy of Trade Policy: Essays in Honor of Jagdish Bhagwati, MIT Press, pp. 89–128.

Feenstra, R. and G. Hanson (1997). "Foreign Direct Investment And Relative Wages: Evidence From Mexico's Maquiladoras," Journal of International Economics, 1997, v42(3/4), pp. 371–393.

Feenstra, R. and J. Romalis (2012). "International Prices and Endogenous Quality," NBER Working Paper No. 18314.

Felbermayr, G. and J. Gröschl (2013). "Natural Disasters and the Effect of Trade on Income: A new panel IV approach," European Economic Review, vol. 58(C), pp. 18–30.

Feyrer, J. (2013). "Trade and Income—Exploiting Time Series in Geography," mimeo Dartmouth College.

Flam, H. and E. Helpman (1987). "Vertical Product Differentiation and North-South Trade," American Economic Review, 77 (5), pp. 810–822.

Frankel, J. and D. Romer (1999). "Does Trade Cause Growth?," American Economic Review 89 (3), 379–399.

Frankel, J. and A. Rose (2005). "Is Trade Good or Bad for the Environment? Sorting out the Causality," Review of Economics and Statistics 87, 1, pp. 85–91.

Frias, J.A, D.S. Kaplan, and E.A. Verhoogen (2009). "Exports and Wage Premia: Evidence from Mexican Employer-Employee Data," mimeo Columbia University.

Fryges, H. and J. Wagner (2008). "Exports and Productivity Growth: First Evidence from a Continuous Treatment Approach," Review of World Economics 144 (4), pp. 695–722.

Galiani, S. and G. Porto (2010). "Trends in Tariff Reforms and in the Structure of Wages," The Review of Economics and Statistics, vol. 92, No. 3, pp. 482–494.

Görg, H., L. Halpern and B. Muraközy (2010). "Why Do Within Firm-product Export Prices Differ Across Markets?," Kiel Working Paper No. 1596.

Greenaway, D. and Z. Yu (2004). "Firm-level Interactions Between Exporting and Productivity: Industry-specific Evidence," Review of World Economics / Weltwirtschaftliches Archiv 140, pp. 376–392.

Grossman, G. and E. Rossi-Hansberg (2008). "Trading Tasks: A Simple Theory of Offshoring," American Economic Review, vol. 98(5), pp.1978–1997

Grossman, G. and E. Rossi-Hansberg (2012). "Task Trade between Similar Countries," Econometrica, 80:2, pp. 593–629.

Hahn, C.H. (2004). "Exporting and Performance of Plants: Evidence from Korean Manufacturing," National Bureau of Economic Research, NBER Working Paper Series No. 10208.

Hall, R. and C. Jones (1999). "Why Do Some Countries Produce So Much More Output Per Worker Than Others?," Quarterly Journal of Economics 114, 1, pp. 83–116.

Hallak, J. C. (2006). "Product Quality and the Direction of Trade," Journal of International Economics, 62, pp. 238–265.

Hallak, J. C. (2010). "A Product-Quality View of the Linder Hypothesis," The Review of Economics and Statistics, vol. 92(3), pp. 453–466.

Hallak, J.C. and P. Schott (2011). "Estimating Cross-Country Differences in Product Quality," Quarterly Journal of Economics, vol. 126(1), pp. 417–474.

Hallak, J.C. and J. Sivadasan (2013). "Product and Process Productivity: Implications for Quality Choice and Conditional Exporter Premia," Journal of International Economics, 91(1), pp. 53–67.

Hansson, P. and N.N. Lundin (2004). "Exports As an Indicator On or Promoter of Successful Swedish Manufacturing Firms in the 1990s," Review of World Economics / Weltwirtschaftliches Archiv 140, pp. 415–445.

Hausmann, R., J. Hwang, and D. Rodrik (2007). "It Is Not How Much But What You Export That Matters," Journal of Economic Growth, 12, pp. 1–25.

Hummels, D. and P. Klenow (2005). "The Variety and Quality of a Nation's Exports," American Economic Review, 95 (3), pp. 704–723.

Iacovone, L. and B.S. Javorcik (2012). "Getting Ready: Preparation for Exporting," CEPR Discussion Papers 8926, C.E.P.R. Discussion Papers.

Irwin, D. and M. Terviö (2002). "Does Trade Raise Income? Evidence from the Twentieth Century," Journal of International Economics 58 (1), 1–18.

Isgut, A. (2001). "What's Different about Exporters? Evidence from Colombian Manufacturing," Journal of Development Studies 37 (5), pp. 57–82.

Johnson, R. (2012). "Trade and Prices with Heterogeneous Firms," Volume 86, Issue 1, pp. 43–56.

Kandilov, I.T. (2009). "Do Exporters Pay Higher Wages? Plant-level Evidence from an Export Refund Policy in Chile," The World Bank Economic Review, Vol.23, NO. 2, pp. 269–294.

Khandelwal, A. (2010). "The Long and Short (of) Quality Ladders," Review of Economic Studies, vol. 77(4). pp. 1450–1476.

Kugler, M. and E. Verhoogen (2012). "Prices, Plant Size, and Product Quality," Review of Economic Studies, vol. 79 no. 1, pp. 307–339.

Lileeva, A. and D. Trefler (2010). "Improved Access to Foreign Markets Raises Plant-level Productivity...for Some Plants," The Quarterly Journal of Economics, 125(3), pp. 1051–1099.

Liu, J.T., M.W., Tsou and J.K. Hammitt (1999). "Export Activity and Productivity: Evidence from the Taiwan Electronics Industry," Weltwirtschaftliches Archiv / Review of World Economics 135, pp. 675–691.

Lopez, R.A. (2009). "Do Firms Increase Productivity in Order to Become Exporters?," Oxford Bulletin of Economics and Statistics, 71, 5.

Manova, K. and Z. Zhang (2012). "Export Prices Across Firms and Destinations," Quaterly Journal of Economics, 127, pp. 379–436.

Marin.D. (1992). "Is the Export-led Growth Hypothesis Valid for Industrialized Countries?," Review of Economics and Statistics 74(4), pp. 678–88.

Matsuyama, K. (2007). "Beyond Icebergs: Towards A Theory of Biased Globalization," The Review of Economic Studies, 74 , pp. 237–253.

Melitz, M. J. and G. Ottaviano (2008). "Market Size, Trade, and Productivity," Review of Economic Studies 75, pp. 295–316.

Meller, P. (1995). "Chilean Export Growth, 19701990: An Assessment," in: Helleiner, G.K. (Ed.), Manufacturing for Export in the Developing World. Problems and Possibilities. Routledge, London, pp. 21–53.

Mengistae, T. and C. Pattillo (2004). "Export Orientation and Productivity in Sub-Saharan Africa," IMF Staff Papers, Vol. 51, pp. 327–353.

Milner, C. and V. Tandrayen (2004). "The Impact of Exporting and Export Destination on Manufacturing Wages: Evidence for Sub-Saharan Africa," Review of Development Economics, 11(1), pp. 13–30.

Munch, J.R. and J.R. Skaksen (2008). "Human Capital and Wages in Exporting Firms," Journal of International Economics 75 (2), pp. 363–372.

Nicita, A. and M. Olarreaga (2007). "Trade, Production, and Protection Database, 1976–2004," World Bank Economic Review, vol. 21(1), pp. 165–171.

Noguer, M. and M. Siscart (2005). "Trade Raises Income: A Precise and Robust Result," Journal of International Economics 65, 2, pp. 447–460.

Park, A., D. Yang, X. Shi, and Y. Jiang (2010). "Exporting and Firm Performance: Chinese Exporters and the Asian Financial Crisis," The Review of Economics and Statistics, vol. 92, No. 4, pp. 822-842.

Revenga, A. (1992). "Exporting Jobs? The Impact of Import Competition on Employment and Wages in U.S. Manufacturing," Quarterly Journal of Economics, 107, pp. 255–284.

Revenga, A. (1997). "Employment and Wage Effects of Trade Liberalization: The Case of Mexican Manufacturing," Journal of Labor Economics, 15, s20-s43.

Roberts, M.J. and J.R. Tybout (1997). "The Decision to Export in Colombia: An Empirical Model of Entry with Sunk Costs," American Economic Review, 87, pp. 545–564.

Rodriguez, F. and D. Rodrik (2001). "Trade Policy and Economic Growth: A Skeptic's Guide to Cross-national Evidence," NBER Macroeconomics Annual 15, pp. 261–325.

Schank, T., C. Schnabel, and J. Wagner (2007). "Do Exporters Really Pay Higher Wages? First Evidence from German Linked Employer-Employee Data," Journal of International Economics 72 (1), pp. 52–74.

Schank, T., C. Schnabel and J. Wagner (2010). "Higher Wages in Exporting Firms: Self-selection, Export Effect, or Both? First Evidence from Linked Employer-Employee Data," Review of World Economics 146.

Schott, P. (2004). "Across-Product versus Within-Product Specialization in International Trade." Quarterly Journal of Economics, 119 (2), pp. 647–678.

Serti, F. and C. Tomassi (2008). "Self-Selection and Post-Entry Effects of Exports: Evidence from Italian Manufacturing Firms," Review of World Economics 144 (4): pp. 660–694.

Serti, F., C. Tomasi and A. Zanfei (2010). "Who Trades with Whom? Exploring the Links between Firms' International Activities, Skills, and Wages," Review of International Economics, 18(5), pp. 951–971.

Sinani, E and B. Hobdari (2010). "Export Market Participation with Sunk Costs and Firm Heterogeneity," Applied Economics, Vol. 42, No. 25, pp. 3195–3207.

Söderbom, M. and F. Teal (2000). Skills, Investment, and Exports from Manufacturing Firms in Africa," Journal of Development Studies 37 (2), pp. 13–43.

Tsou, M.W., J.T. Liu and C.J. Huang (2006). "Export Activity, Firm Size and Wage Structure: Evidence from Taiwanese Manufacturing Firms," Asian Economic Journal, 20(4), pp. 333–354.

Van Biesebroeck, J. (2005). "Exporting Raises Productivity in Sub-Saharan African Manufacturing Plants," Journal of International Economics 67, pp. 373–391.

Verhoogen, E. (2008). "Trade, Quality Upgrading, and Wage Inequality in the Mexican Manufacturing Sector," Quarterly Journal of Economics, Vol 123, No. 2, pp. 489–530.

Wagner, J. (2002). "The Causal Effects of Exports on Firm Size and Labor Productivity: First Evidence from a Matching Approach," Economics Letters, 77(2), pp. 287–292.

Wagner, J. (2007). "Exports and Productivity: A survey of the Evidence from Firm-level Data," The World Economy, 30(1), pp. 60–82.

Yeaple, S. (2005). "A Simple Model of Firm Heterogeneity, International Trade and Wages," Journal of International Economics, 65, pp. 1–20.

Zhou, L. (2003). "Why Do Exporting Firms Pay Higher Wages?," Mimeo, Emory University, Atlanta.