Preparing to Export*

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Abstract

Exporters differ from each other in size and export-market participation over time. This diversity, however, is not strongly reflected in their observed workforce composition regarding skills and occupations. Using Brazilian linked employer-employee data, we turn to a typically unknown worker characteristic: a worker's prior experience at other exporters. We show that expected export status, predicted with current destination-country trade instruments, leads firms to prepare their workforce by hiring workers from other exporters. Hiring away exporter workers is associated with both a wider subsequent reach of destinations and a deeper market penetration at the poaching firm, but only with reduced market penetration at the firm losing the worker. This evidence is consistent with the hypothesis that expected export-market access exerts a labor demand shock, for which exporters actively prepare with selective hiring, and with the idea that a few key workers affect a firm's competitive advantage.

Keywords: International trade; exporter behavior; trade and labor market interactions

JEL Classification: F12, F14, F16

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1 Introduction

A large body of empirical evidence and recent trade theory suggest that exporters substantively differ from non-exporters regarding size, productivity and workforce composition.[1] To learn more about export success, this paper compares Brazilian exporters among themselves regarding export dynamics and workforce characteristics. We document that firms actively prepare for expected exporting by hiring a few key workers from other exporters, and we provide evidence that hiring exporter workers is a strong predictor of various aspects of export-market success at the poaching firm.

There is considerable heterogeneity in performance and size among exporters. When we rank Brazilian exporters by their export-market participation over three consecutive years, this performance ranking is almost perfectly mirrored in a monotonic size ranking from about 80 workers at "marginal" in-out switching exporters to 550 workers at "successful" exporters with a sustained OECD-market presence. Surprisingly, the substantive heterogeneity in export participation and size is not reflected in observable worker characteristics. The workforce composition regarding skills and occupations is similar among otherwise diverse exporters and in some cases statistically indistinguishable. Comparable to our evidence for Brazil, Bernard and Jensen (1997, 1999), Trefler (2004) and Harrigan and Reshef (2011) also find negligible differences in educational composition among U.S., Canadian and Chilean exporters in the cross section.[2] This leads us to hypothesize that typically unobserved worker characteristics can be important determinants of export-market performance.

We use comprehensive linked employer-employee data for the universe of formal Brazilian manufacturing firms and their export behavior between 1990-2001 to extract an otherwise unobserved worker characteristic: a worker's prior experience at other exporting firms. We define *hires from exporters* as the head count of hired workers whose immediately preceding formal employment was at

[1]The literature following Bernard and Jensen (1995) documents exporter premia for many countries (see for example Bernard and Wagner 1997, Isgut 2001, Álvarez and López 2005). Exporter wage premia persist after controlling for unobserved worker and spell effects in linked employer-employee data (for example Schank, Schnabel and Wagner 2007, Krishna, Poole and Senses 2011).

[2]Results for exporter responses to large-scale trade shocks are more mixed. Trefler (2004) detects no response of the educational workforce composition at Canadian exporters under the Canada-U.S. Free Trade Agreement, whereas Bustos (2011) finds that Argentine firms employ more educated workers when MERCOSUR reduces import duties in Argentina's neighboring export markets. Results are also mixed for major exchange rate shocks. Verhoogen (2008) argues that Mexican exporters upgraded workforce skills as reflected in wages around the Peso devaluation in 1995, whereas Frías, Kaplan and Verhoogen (2009) favor the interpretation that increases in wage premia at Mexican exporters after the Peso devaluation are largely shared rents not associated with skill upgrading. Brambilla, Lederman and Porto (2012) find that the workforce skill composition at Argentine exporters responded to the revaluation of the Peso against the Brazilian Real in 1999 only among the exporters that ship to high-income countries. Those studies rely on large-scale macroeconomic shocks for identification, whereas our instrumentation method isolates exporter responses also during tranquil times.

an exporter. We propose that expected favorable export conditions in the future, predicted by current product market conditions abroad, exert a labor demand shock that leads firms to prepare workforces. To provide evidence on the hypothesis, we implement a new identification strategy for export preparations in economically stable times: we use current sector-level imports into destinations outside Latin America from source countries other than Brazil as instruments to predict a Brazilian firm's future export status. Our panel data allow us to simultaneously condition on a rich set of worker and firm characteristics, including a firm's overall employment change, as well as firm, sector and year effects, domestic sector-level absorption and sector-year trends. A firm's instrumented future export status in turn predicts significantly more hires of former exporter workers in the current year.

Firms in Brazilian regions with many exporters, large firms, and firms with lasting export-market participation react most responsively in hiring away other exporters' workers. The poached workers share in the current employer's wage premium. A corollary of our hypothesis is that firms for which foreign product market conditions predicted a high probability of export-market participation but which subsequently fail to become exporters should let go again the recently poached hires from exporters. Our results show that unexpectedly unsuccessful exporters indeed separate again from most of their recently hired former exporter workers.

Former-exporter hires predict both a wider reach of destinations at the extensive margin and a deeper export-market penetration at the intensive margin. These effects are the strongest when there is an overlap of export destinations between the former and the current employer. Poaching exporter workers in marketing-related occupations predicts a wider destination reach, whereas poaching skilled production workers predicts a deeper market penetration. These findings are consistent with the idea that exporters actively build up workforce expertise for expected export-market access. Results also suggest that worker mobility may be a crucial mechanism by which knowledge spreads through an economy: we find that firms losing workers to other exporters do not suffer a significant decline in the number of export destinations, only a decline in market penetration, whereas hiring firms experience improvement at both margins.

Our paper is related to several strands of the existing literature. Recent trade theory for heterogeneous firms explains how the sorting of workers to employers interacts with exporting. One line of research considers competitive labor markets and generates assortative matching of more able workers to more capable firms, but workers with the same characteristics are paid the same wage (see for example Manasse and Turrini 2001, Yeaple 2005, Verhoogen 2008, Bustos 2011, Monte 2011,

Burstein and Vogel 2012). Another line of research introduces labor market frictions so that workers with the same ability can be paid different wages by different firms, and higher wages by exporters. Search and matching frictions and the resulting bargaining over surplus from production can induce wages to vary across firms (see for example Helpman, Itskhoki and Redding 2010, Davidson, Matusz and Shevchenko 2008, Coşar, Guner and Tybout 2011). Alternatively, efficiency wages that induce effort or fair wages can vary with revenue between firms (see for example Egger and Kreickemeier 2009, Amiti and Davis 2011, Davis and Harrigan 2011). In a dynamic setting, Fajgelbaum (2013) studies employment growth under search frictions with job-to-job mobility and shows that job-to-job transitions generate diverse outcomes across workers. Our data show that similarly able workers receive different wages depending on their employer (see also Helpman et al. 2012). While broadly consistent with our empirical work and gradual employment responses to anticipated export-market opportunities, the theoretical models do not discern potentially export-specific skills.

Worker skills relevant for exporting have been shown to be portable from firm to firm in case studies and firm surveys (Rhee 1990, Gershenberg 1987, Görg and Strobl 2005). Using linked employer-employee data, Balsvik (2011) and Poole (2013) provide systematic evidence that domestic employers exhibit higher productivity and pay higher wages after they hire workers from foreign-owned firms. Parrotta and Pozzoli (2012) document that poached recruits with specific knowledge from a prior employer significantly raise value added at the hiring firm. Poole (2013) uses linked employer-employee data from the same Brazilian source as we do and documents a statistically significant pay increase of incumbent workers at domestic firms after workers from foreign-owned firms join, but the pay raise is small. For export-market participation, in contrast, we find the hiring of a few former exporter workers to be an economically important variable, predicting a probability increase in export-market participation of about 3 percentage points. This is a considerable probability shift, given an overall exporting frequency of only 5 percent in manufacturing, and is similar in magnitude to what only substantive changes in observed workforce characteristics would predict.

In recent research closely related to ours, Minondo (2011), Sala and Yalcin (2012) and Mion and Opromolla (2014) investigate how the presence of managers with prior exporter experience changes a firm's outcomes. Minondo (2011) and Sala and Yalcin (2012) use linear and probit probability models for a firm's export status and show for Spanish and Danish firms that the presence of a manager with a previous job spell at an exporter predicts a higher probability of export participation at the current employer. Mion and Opromolla (2014) estimate Mincer wage regressions for Portuguese linked

employer-employe data and document that managers with prior exporter experience receive sizeable wage premia, especially if the preceding and the current employer export to common destinations. Those empirical strategies lend themselves to the interpretation that a favorable labor supply condition (the treatment with managers assigned to firms) facilitates export performance at the manager's current employer. Our paper broadens the perspective to workers in any occupation and with any skill, and poses the complementary question: How do favorable product market conditions translate into a firm's labor demand for skills pertinent to exporting? Related to the specific literature on demand for observed skill and product-market conditions (see for example Guadalupe 2007 and the survey by Fortin and Lemieux 1997), we provide evidence that typically unobserved ability, inferrable from a worker's career history, influences employment and pay. Reminiscent of findings in the literature on knowledge spillovers and agglomeration (for example Jaffe, Trajtenberg and Henderson 1993, Moretti 2004), the targeted hiring of exporter workers is statistically most significant in locations with a concentration in manufacturing.

Much empirical research has established evidence that firms with a competitive advantage self-select into exporting (see for example Clerides, Lach and Tybout 1998, Bernard and Jensen 1999).[3] A more recent branch of the literature explores preparations for export-market entry.[4] López (2009) documents for a Chilean plant sample that productivity and investment increase prior to export-market entry. Identification rests on the notion of Granger causality that subsequent realizations of firm-level variables should not cause current realizations. Aw, Roberts and Xu (2011) structurally estimate a model of innovation and exporting choices, and find that allowing for both endogenous exporting and innovation contributes to large estimated productivity gains at Taiwanese electronics plants. Iacovone and Javorcik (2012) study unit prices of products at Mexican plants. They use anticipated cuts in U.S. tariffs, which offer large-scale exogenous variation, and show that a product variety receives a domestic price premium one year before its first export, consistent with advance quality upgrading. Our paper explores preparations in workforce choice and uses current foreign product market conditions as instruments for identification, so our findings equally apply to exporter behavior under ordinary economic conditions.

The remainder of the paper is structured as follows. We describe our data in Section 2, and we

[3] Most evidence suggests that a firm-level competitive advantage leads to exporting, and typically not the reverse, with some exceptions (for example Van Biesebroeck 2005, Crespi, Criscuolo and Haskel 2008).

[4] This economic literature adds systematic evidence to case study and survey findings from related research in strategic management (see for example Gomez-Mejia 1988 and the survey by Leonidou, Katsikeas and Coudounaris 2010) as well as organizational change (for a survey see Helfat and Lieberman 2002).

document substantial differences among exporters in Section 3. In Section 4 we turn to our main analysis of workforce choice in response to foreign product market conditions, present the identification strategy, and empirically document active workforce preparations for subsequent exporting. Section 5 highlights worker and job characteristics that are closely associated with subsequent exporter success. Section 6 concludes.

2 Data

We combine data from three main sources. Our first data source is the universe of Brazilian exporters: a three-dimensional panel data set by firm, destination country and year between 1990 and 2001. Second, we match those exporter data to the universe of formal firms and all their formally employed workers. This second data source is a three-dimensional linked employer-employee panel data set by firm, worker and year between 1990 and 2001. The matched employer-employee-exports data provide us with information on the workforce at exporters as well as on transitions of workers from firm to firm, and complement the exporter data with the universe of formal non-exporting firms. Third, we combine the former two data sources with worldwide trade flow data by sector at distant destinations for Brazilian exporters to construct instrumental variables (IVs) for export status.

Exporter data. Exporter data derive from the universe of Brazilian customs declarations for merchandise exports by any firm collected at SECEX (*Secretaria de Comércio Exterior*). For comparability to other studies, we remove agricultural and mining firms as well as commercial intermediaries from the exporter data and only keep manufacturing firms that report their direct export shipments. See Appendix A.1 for more detail on the SECEX data and their deflation.

Linked employer-employee data. Our source for linked employer-employee data is RAIS (*Relação Anual de Informações Sociais*), a comprehensive administrative register of workers formally employed in any sector of Brazil's economy. This register contains the universe of formal Brazilian firms, including non-exporters. RAIS offers information on worker characteristics such as education, a detailed occupational classification of the job, the firm's industry, and the legal form of the company including its foreign ownership, as well as the worker's earnings. We keep observations for the years 1990 through 2001, again drop all firms outside manufacturing, and then construct workforce and firm characteristics from employment on December 31st, and we track recent hires back to their

last preceding employer's export status. These RAIS records consist of 49 million formal workers employed at 449,390 manufacturing firms (1,767,491 firm-year observations). See Appendix A.2 for more detail on RAIS.

Combined with the SECEX exporter data 1990-2001, we find that 23,518 manufacturing firms are exporters in at least one sample year (87,050 exporter-year observations). These manufacturing exporters account for only around 5 percent of formal manufacturing firms, similar to the around 5 percent exporter share in the U.S. universe of manufacturing firms (Bernard, Jensen and Schott 2009). Single-employee firms enter the RAIS records, explaining the apparently low share of exporter firms compared to data from many other developing countries, which censor their samples at a minimum employment level. In terms of employment, manufacturing exporters account for 24 million jobs or roughly half of Brazilian formal employment during the sample period.

Including both non-exporters and exporters, there is a total of 1,767,491 firm-year observations in our manufacturing data (after restricting the sample period to the years 1992-2001 in order to measure export status with two lags). In regression analysis, we use one lead year and our basic regression sample shrinks to 1,557,474 firm-year observations for 1992-2000. When we include employment change at the firm level as a covariate in regressions, only firms with observations for two consecutive years remain in the sample, and sample size drops to 1,199,490 firm-year observations for 1992-2000.

Given those large sample sizes, we report statistical significance only at the 1-percent significance level throughout this paper.

Tracing workers to prior and future employers. We track a firm's hires back to their prior employer. We define a relevant hire at a manufacturing firm as a worker accession that is not classified as a transfer between the firm's plants and that lasts at least until December 31st of the calendar year. We then trace the worker back to the last preceding formal-sector employment for up to three prior years and obtain the former employer's export status.[5] This allows us to identify *hires from exporters* as acceding workers whose immediately preceding formal-sector employment during up to three past years was at an exporter. For predictions of exporter performance, we obtain in addition the share of common export destination markets (overlap) between the prior and the current employer, an indicator whether the former employer was a continuous exporter for three years, an occupational indicator whether the worker's prior employment was in sales (CBO 3-digit classification codes 400 to 499), and another occupational indicator whether the worker's prior employment was in an ISCO-88 skilled

[5]For hires from exporters in 1990 or 1991 we use the exporter category in 1992 (see Table 1).

blue-collar occupation.[6]

We also track workers into the future. First, we follow recent hires from exporters into the next calendar year and identify subsequent separations. We define *separations of recent exporter hires* as hires from exporters whose new employment terminates before December 31st of the following year. Second, we track any worker who separates from a firm to the immediately following formal-sector employment for up to three subsequent years and obtain the future employer's export status (mirroring the definition for hires from exporters). This allows us to define *departures to exporters* as separating workers whose immediately following formal-sector employment during up to three future years will be at an exporter.

Worldwide trade flows by sector. Our IVs for expected export status are imports into destinations outside Latin America from source countries other than Brazil, by subsector IBGE. We use WTF data on bilateral trade (Feenstra et al. 2005) from 1991 to 2000 to construct the IVs by subsector IBGE, year and six world destinations. The six world destinations are Asia-Pacific Developing countries (APD), Central and Eastern European countries (CEE), North American countries (NAM excluding Mexico), Other Developing countries (ODV), Other Industrialized countries (OIN), and Western European countries (WEU). We remove Latin American and Caribbean countries (LAC) from our set of IVs. We concord the SITC (Rev. 2) sectors at the four-digit level in WTF to subsector IBGE.[7] We then calculate aggregate imports into each foreign destination region, excepting imports from Brazil, by subsector IBGE. The IVs are plausibly unrelated to labor-market outcomes in Brazil other than through export-market shocks.

3 Exporter Types and Workforce Characteristics

Exporter categories. To document export success over time, we adopt a lexicographic ranking of export-market participation. We consider the current year and two preceding years and record in which of the three years a firm was an exporter with at least one reported shipment (8 possible combinations). We first order firms by current-year export status (t), within current-year status by past-year

[6] We also constructed a common-sector indicator whether the prior and the current employer are in the same subsector IBGE industry, an indicator whether the worker is employed in the same occupation at the current employer as at the prior employer, and the worker's tenure at the prior employer. We found none of those variables to be statistically significant predictors of exporter performance (Table 12), conditional on our common covariate set, and omit them.

[7] Our concordance is available at URL *econ.ucsd.edu/muendler/brazil*.

Table 1: EXPORT STATUS ORDERING

Export status	Export period $t-2$	Export period $t-1$	Export period t	Firm-year observations (1)	Workers per firm (2)	Annual exports (3)
Non-Exporter						
Permanent non-exporter[a]	0	0	0	1,596,947	12	
Current non-exporter[a]	0	0	0	60,198	66	
Export Quitters						
Past quitter	1	0	0	9,101	79	
In-out switcher	0	1	0	7,626	76	
Recent quitter	1	1	0	6,569	102	
Export Starters						
Recent starter	0	0	1	18,420	104	310.7
Re-entrant	1	0	1	3,181	137	231.0
Past starter	0	1	1	12,252	149	923.1
Continuous Exporters						
Non-sustained continuous exporter[b]	1	1	1	6,047	178	561.1
Sustained non-OECD exporter[b]	1	1	1	21,916	232	889.2
Sustained OECD exporter[b]	1	1	1	25,234	552	10,803.7

[a]Permanent non-exporters do not export in any sample year; current non-exporters export in at least one sample year.
[b]Non-sustained continuous exporters export in three consecutive years but serve no single destination in all three years; sustained non-OECD exporters serve at least one destination (but no 1990-OECD member country) in three consecutive years; sustained OECD exporters serve at least one 1990-OECD member country in all three years.

Source: SECEX 1990 through 2001 (t: 1992-2001), manufacturing firms (subsectors IBGE 2-13).
Notes: Universe of 1,767,491 manufacturing firm-year observations. Exports (fob) in thousands of August-1994 USD.

status ($t-1$), and within those by two-years past status ($t-2$). Beyond this basic time-pattern ranking, we separate non-exporting firms into those that are permanent non-exporters (non-exporters in every sample year) and current non-exporters (with foreign sales in at least one sample year). We also separate continuous-exporting firms into non-sustained exporters that do not serve one common destination in all three years, into sustained non-OECD exporters that serve at least one non-OECD country for three years, and into sustained OECD exporters that serve at least one OECD country for three years (resulting in a total of 11 possible combinations). Table 1 shows our resulting ranking of export success, with the category in the upper-most row showing the least successful exporters (permanent non-exporters) and the lower-most row containing the most successful exporters (sustained OECD exporters).[8]

We choose these export-status categories to clarify beyond a two-period categorization that there

[8]In an alternative ordering, Álvarez and López (2008) classify firms as permanent exporters if they export in all sample years, as sporadic exporters if they export in at least one sample year, and as non-exporters if they do not export during the sample period. Except for permanent non-exporting, our lexicographic ordering does not depend on the number of sample periods. When we adopt the Álvarez and López classification, we obtain similar results.

is considerable heterogeneity among exporters, both in terms of workforce sizes and export values. As displayed in Table 1, our time-pattern and destination-market ranking of export-market success is a refinement of a simpler two-period grouping of exporters into *non-exporters* for three consecutive years, exporters that *quit exporting* (including past quitters), firms that *start exporting* (including past starters), and exporters with *continuous exporting*.[9] Curiously, our refined export-status ranking is almost perfectly mirrored in the firms' ranking by workforce size (column 2). For example, permanent non-exporters have an average size of twelve workers, in-out switchers who recently quit exporting employ 76 workers, recent export starters employ 104 workers, while sustained OECD exporters employ 552 workers on average. This surprising employment size monotonicity is preserved for all but one pair of neighboring rows.[10] Our refined export-status ranking is also positively related to annual sales (column 3, correlation coefficient of .11 at the firm level).

The vast majority of formal-sector manufacturing firms (over 90 percent) never exports in any year between 1990 and 2001. The 57,149 firms that quit or start exporting make up more than half of all firms that export in at least one year between 1990 and 2001 but account for only 6 percent of all export sales. Even among the continuous exporters, it is the select group of sustained OECD exporters that dominates. The 25,234 sustained OECD exporters are fewer than one-third of all current exporters, but they ship close to 90 percent of Brazilian exports and employ more than half of all exporters workers (and one-third of all Brazilian manufacturing workers). For a breakdown of export-market participation and employment by sector, see Table A.1 in the Appendix.

Workforce composition. Table 2 reports summary statistics for the universe of manufacturing firms, restricting the sample to 1992-2000 to account for one lead in addition to two lags in export status. There are substantive differences in export-market participation among exporters. Compared to firms that start exporting, continuous exporters serve 2.7 times (one log unit) more destinations and have 4.6 times (one-and-a-half log units) larger sales per destination. Continuous exporters exhibit less than a one-in-twelve frequency of quitting exports, while firms that recently started exporting (within the past two years) quit exporting with almost a one-in-three frequency.

Surprisingly, workforce characteristics do not reflect exporters' performance and size differences.

[9] About 39 percent of manufacturing exporters are starters; they account for employment of four million workers out of a total of 49 million in manufacturing and command 6 percent of export sales.

[10] A two-period classification would have lumped past quitters with non-exporters, but their workforce size turns out to be more similar to other quit-exporting firms under the refinement. Similarly, a two-period classification would have lumped past starters with continuous-exporting firms, but their workforce is more similar to other start-exporting firms under the refinement.

Table 2: SUMMARY STATISTICS

	All firms	Ex-porters	Export Status (t)		
			Continuous	Start	Quit
Variable	(1)	(2)	(3)	(4)	(5)
Foreign-market participation					
Indic.: Exporter (t)	.049	1.000	1.000	1.000	
Indic.: Affiliate of foreign MNE (t)	.0001	.0005	.0007	.0002	.0002
Log # Destinations (t)	.986	.986	1.375	.376	
Log Exports/Destination (t)	3.832	3.832	4.423	2.906	
Anticip. Continuous Exporting ($t+1$)	.031	.619	.854	.252	
Anticip. Start Exporting ($t+1$)	.017	.136		.350	.192
Anticip. Quit Exporting ($t+1$)	.013	.163	.076	.298	.398
Anticip. Non-exporter for three years ($t+1$)	.741				.287
Size					
Employment (t)	28.2	285.4	386.1	127.9	87.2
Log Employment (t)	1.756	4.329	4.758	3.658	3.311
Net Employment Change ($t-1$ to t)	-0.2	-5.5	-13.0	7.2	-6.1
Workforce characteristics					
Share: Unskilled blue-collar occupation (t)	.130	.127	.120	.137	.132
Share: Skilled blue-collar occupation (t)	.631	.576	.573	.580	.560
Share: White-collar occupation (t)	.239	.297	.306	.283	.309
Share: Primary school education (t)	.756	.673	.662	.690	.690
Share: High school education (t)	.207	.232	.234	.229	.228
Share: Tertiary education (t)	.037	.095	.104	.081	.081
Workforce background					
Indic.: Hires from Exporters (in t)	.205	.741	.786	.671	.529
Gross Hires from Exporters (in t)	1.1	12.1	15.2	7.3	3.5

Sources: SECEX and RAIS 1990-2001 (t: 1992-2000), manufacturing firms (subsectors IBGE 2-13).
Notes: 1,557,474 regression sample observations (employment change based on 1,277,201 observations of firms with consecutive-year presence). Export status as defined in Table 1. Current exporters (column 2) include firms with continuous exporting (column 3) or that start exporting (column 4) but not firms that recently quit exporting (column 5). Workforces on December 31st. Exports (fob) and annualized December wages in thousands of August-1994 USD.

The most prevalent occupation in manufacturing, skilled blue-collar work, is performed by 63 percent of workers at the average manufacturing firm and by around 57 percent of workers at exporters, almost independent of the exporters' export status. Similarly, white-collar occupations are preformed to a similar degree across exporters, varying only between 28 and 31 percent. The most prevalent schooling level in manufacturing is primary education. There are more primary schooled workers at the average manufacturing firm with a share of 76 percent than at exporters with a share of 67 percent, but there is only minor variation among exporters for primary school educated workers (between 66 and 69 percent) or highly educated workers (between 8 and 10 percent).[11]

[11] Exporters, and especially continuous exporters, exhibit net employment reductions, a phenomenon beyond the scope

Table 3: EXPORTER PREMIA CONDITIONAL ON LOG FIRM SIZE

	Export Status			t-tests of null-hypothesis	
	Continuous	Start	Quit		
Firm characteristic	(1)	(2)	(3)	(1)==(2)	(2)==(3)
Earnings					
Log Annual Wage	.440 (.006)*	.307 (.004)*	.316 (.005)*	$\neq$	
Residual Log Annual Wage	.351 (.005)*	.248 (.004)*	.256 (.005)*	$\neq$	
Observed workforce composition					
Share: Unsk. blue-collar occ.	-.021 (.002)*	-.003 (.002)	-.001 (.002)	$\neq$	
Share: Skilled Blue-Collar Occ.	-.081 (.003)*	-.070 (.002)*	-.085 (.003)*	$\neq$	$\neq$
Share: White-collar occ.	.102 (.002)*	.073 (.002)*	.086 (.002)*	$\neq$	$\neq$
Share: High School Education	.047 (.002)*	.034 (.002)*	.021 (.002)*	$\neq$	$\neq$
Share: Tertiary Education	.064 (.001)*	.042 (.001)*	.040 (.001)*	$\neq$	
Typically unobserved background					
Log Gross Hires from Exporters	.834 (.011)*	.475 (.007)*	.185 (.007)*	$\neq$	$\neq$

Sources: SECEX and RAIS 1992-2001, manufacturing firms (subsectors IBGE 2-13).
Notes: Premia are coefficients from linear regressions of the firm characteristic on export status dummies, controlling for the firms' log employment, sector and year effects in the universe of 1,767,491 manufacturing firm-year observations. Export status as defined in Table 1. The omitted baseline category is non-exporters for three years. Workforces on December 31st. Annualized December wages in thousands of August-1994 USD. The residual log annual wage is from a linear regression on educational and occupational workforce composition variables. The log number of gross hires from exporters is set to missing if zero. Robust standard errors in parentheses, clustering at the firm level, in parentheses. In columns 4 and 5, rejections of the null hypothesis of equality are reported for t tests at 1-percent significance.

Firm heterogeneity is often described with log premia regressions, which show that non-exporters significantly differ from exporters along several dimensions including workforce characteristics. Arguably less attention has been paid to differences among exporters. In our exporter-premia regressions, we condition on sector and year effects, as well as on the firm's log employment to control for the part of the exporter premium that is predictable with size differences. The omitted firm category is non-exporters for at least three years.

Table 3 shows that workers at continuous exporters earn a wage premium of 55 percent (.44 log units) over workers at non-exporters, and even workers at recent export-market quitters earn 38 percent (.32 log units) more than workers at firms with no exports for three years. Only a small part

of this paper. For related evidence and explanations see Helpman et al. (2012) and Bazzi, Menezes-Filho and Muendler (2014).

of this wage premium is due to different workforce compositions, as the log wage residual (from a regression on educational and occupational workforce variables) shows. The residual log wage still exhibits a premium between 28 and 42 percent (.25 and .35 log units) over non-exporters, suggesting that much wage variation remains to be explained by other firm or workforce characteristics. These findings are consistent with the hypothesis that mostly unobserved worker characteristics are associated with a firm's export status and that there is sharing of an exporter's profits with the exporter employees.[12]

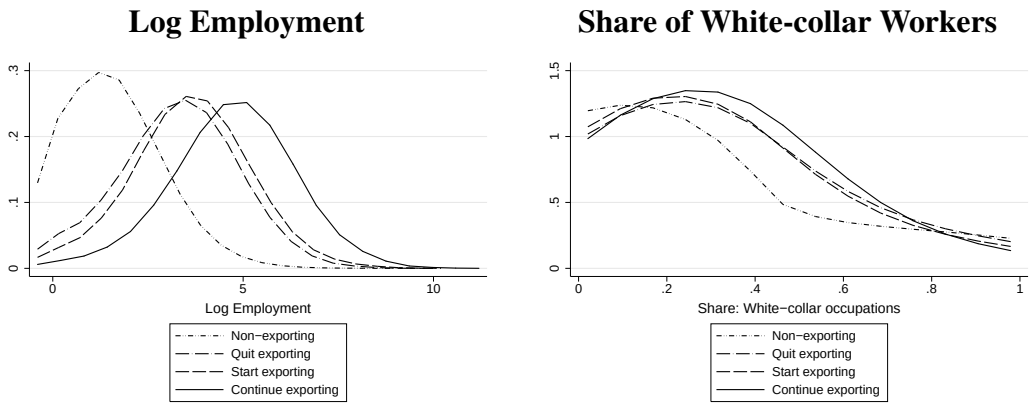
Workforce composition differences in Table 3 are economically small and not generally statistically significant (at the one-percent significance level in the universe of firms). Employment premia for white-collar occupations, for instance, are statistically significantly different between exporters but economically roughly similar at a 7 to 10 percent premium for exporters of any status over non-exporters. For college (tertiary) educated educated workers there are statistically significant differences among continuous and other exporters but these differences are economically small (just as the raw mean differences in Table 2 show no marked variation among exporters of different status).

One typically unobserved worker characteristic is the worker's prior work experience at an exporter. Continuous exporters hire 43 percent (.36 log units) more workers from other exporters than export starters, conditional on firm size, and export starters hire 33 percent (.29 log points) more workers with prior exporter experience than export quitters. Compared to these substantive differences in gross hires of workers with typically unobserved prior exporter experience, the observed workforce composition differences in Table 3 appear small.[13]

In Figure 1, we look beyond mean comparisons and plot nonparametric estimates of densities for firm characteristics. In the left graph of the Figure, the kernel estimates for log employment reflect the marked size rankings from Table 1 before, with continuous exporters' sizes exhibiting a clearly right-shifted probability mass over firms that start exporting, firms that quit exporting, and non-exporters in this order. The ranking becomes less clear-cut for shares of white-collar occupations in the right graph of Figure 1. While there is still a pronounced difference between non-exporters and exporters, the density functions for exporters with different status exhibit multiple crossings and do not suggest as clear a ranking as there appears to be for sizes. The minor economic differences

[12]For structural evidence on rent sharing in the cross section of firms see for example Helpman et al. (2012).

[13]The differences in pay and gross hires of former exporter workers are even more pronounced in premia regressions that do not condition on size, and workforce characteristics premia are economically more similar among exporters (see Online Supplement).



Sources: SECEX and RAIS 1992-2001, manufacturing firms (subsectors IBGE 2-13).
Note: Export status as defined in Table 1. Workforces on December 31st. Epanechnikov kernels with bandwidths .4 (employment) and .2 (white-collar occupations).

Figure 1: **Density Estimates of Sizes and White-collar Shares**

of workforce characteristics among exporters in Table 1 and the right graph of Figure 1 suggest that more successful and larger exporters employ scaled-up workforces with similar compositions as their less successful and smaller competitors.

To summarize, existing research documents that workforce characteristics differ between non-exporters and exporters. Our descriptive evidence shows in addition that export-market performance and sizes also differ markedly among exporters of different status. Commonly observed workforce characteristics such as educational attainment and occupations, however, are quite similar among exporters despite substantive diversity in export performance and size. However, the typically unobserved worker characteristic of a worker's prior experience at another exporting firm is markedly different between different types of exporters. We now query to what extent the hiring of former exporter workers occurs in preparation for export-market participation.

4 Preparing to Export

In trade models with endogenous technology adoption such as Yeaple (2005) and Costantini and Melitz (2008), falling variable trade costs induce more firms in differentiated-goods industries to adopt innovative technology and raise their employment, hiring away from differentiated-goods producers with lower productivity (in Costantini and Melitz 2008) or hiring away the top-skilled workers from firms with inferior technology (in Yeaple 2005). The timing of hiring and technology-adoption

decisions is explicitly modelled by Costantini and Melitz who show in simulations that anticipated future drops in variable trade costs lead firms to adopt innovation before the anticipated favorable trade shock manifests itself.

Estimation model. Motivated by these theories, we adopt a straightforward empirical model of the firm's employment and export decision in two parts. First, a firm i observes export-market conditions $\mathbf{z}_{it}$ abroad at time t and uses them to linearly estimate the probability of its own future export-market participation next year $x_{i,t+1}$, conditional on its current firm characteristics and domestic market conditions $\mathbf{y}_{it}$:

$$x_{i,t+1} = \mathbf{y}'_{it}\boldsymbol{\gamma}_y + \mathbf{z}'_{it}\boldsymbol{\gamma}_z + \eta_{it}, \tag{1}$$

where η_{it} is a mean independent error term and $\boldsymbol{\gamma}_y$ and $\boldsymbol{\gamma}_z$ are vectors of regression coefficients. The measures of export-market conditions $\mathbf{z}_{it}$ are sector-level imports into foreign destinations (outside Latin America) from source countries other than Brazil. The idea for these foreign-demand IVs is that, prior to exporting, firms use the foreign market information available in the media, through trade fairs, or from specialized trade journals on their product markets to infer the future market conditions of their own expected residual demand.

Second, firm i uses the prediction of its future export status $\hat{x}_{i,t+1} = \mathbf{y}'_{it}\hat{\boldsymbol{\gamma}}_y + \mathbf{z}'_{it}\hat{\boldsymbol{\gamma}}_z$ to choose the number of its hires from exporters h_{it}:

$$\ln(1 + h_{it}) = \mathbf{y}'_{it}\boldsymbol{\beta}_y + \hat{x}_{i,t+1}\beta_x + \epsilon_{it}, \tag{2}$$

where ϵ_{it} is a mean independent error term that is uncorrelated with $\mathbf{z}_{it}$, conditional on the set of covariates $\mathbf{y}_{it}$. The measure $\ln(1 + h_{it})$ of log gross hiring from exporters is zero for zero hires and increases monotonically at a decreasing rate in the number of hires so that regression coefficient reflect semi-elasticities.[14] In robustness analysis, we also use exports two and three periods in advance, $x_{i,t+2}$ and $x_{i,t+3}$, for otherwise the same right-hand side variables in equations (1) and (2).

The control variables $\mathbf{y}_{it}$ include firm fixed effects, sector fixed effects, year fixed effects and domestic sector-level absorption (to control for a potentially co-integrated sector-level business cycle abroad and in Brazil), three indicators for the firm's current export status (to capture different degrees of persistence in export market participation), the firm's employment change between $t-1$ and t

[14] We experimented with three more specifications of the left-hand side outcome in equation (2): $\ln h_{it}$ (which is only defined for non-zero hires), h_{it}, and an indicator $\mathbf{1}(h_{it} > 0)$. Those specifications result in the same significance and sign patterns as the specifications reported below (see Online Supplement).

relative to employment at t (to control for total net hiring that coincides with the hiring of exporter workers), employment (as a basic size measure), and an indicator whether the firm is directly foreign owned. This is our baseline specification. In a variant under firm-level IVs, we also include sector-year trends.

A concern with the baseline specification is that omitted workforce characteristics and concomitant workforce changes, in addition to hiring-away exporter workers, may bias the estimates. However, the changing workforce composition is itself a potentially endogenous outcome of anticipated future export participation. To facilitate interpretation of our estimates we therefore adhere to the baseline regression and adopt longer regressions in robustness checks, including the workforce composition shares of worker education and occupation categories, an indicator whether the firm is high-skill intensive (its current share of technical/supervisory and professional/managerial occupations falling into the top quartile of firm-year observations), and observed changes in the workforce composition. We will find the main coefficient estimates to be similar in sign and magnitude to those from the shorter baseline regression.

While a large swing in the real exchange rate or dismantling trade barriers offers substantive variation beyond a firm's control, findings from such large-scale experiments, which might have considerable concomitant macroeconomic consequences, are arguably less instructive about exporter behavior in ordinary times. We therefore adopt an instrumentation strategy that relates a firm's export-market participation next year to current destination-market shocks. Our main identifying assumption is that a sector's current foreign market conditions $\mathbf{z}_{it}$ in destinations outside Latin America affect the hiring of exporter workers h_{it} only through expected export-market participation—conditional on the firm's sectoral affiliation, its current export status, its other observed characteristics and domestic market conditions at the sector level. The sectoral variation in the instruments allows us to remove concomitant economy-wide shocks, responses to country-level trade flows, and macroeconomic shocks through year effects and common sectoral responses through sector effects.

Our main hypothesis is that β_x is strictly positive. When firms observe a favorable foreign import-demand shock so that they can expect a higher chance of exporting $\hat{x}_{i,t+1}$ next year, they prepare their workforces similar to technology upgrading in Costantini and Melitz (2008) and top-skill hiring in Yeaple (2005). Our empirical design allows us to interpret a positive β_x coefficient as evidence of preparing to export because market conditions $\mathbf{z}_{it}$ at distant destinations abroad plausibly isolate how favorable product demand translates into a firm's labor demand $(1 + h_{it})$ for exporting skills.

Table 4: FOREIGN DEMAND AND FUTURE EXPORT-MARKET PARTICIPATION

	Exporter	Export Status ($t+1$)		
	($t+1$)	Continuous	Start	Quit
Instrument (t)	(1)	(2)	(3)	(4)
A: Sectoral Foreign Imports by Region, no trend (IV)				
Non-Brazil Imports in NAM (t)	-.037	.013	-.050	-.002
	(.017)	(.011)	(.015)*	(.013)
Non-Brazil Imports in OIN (t)	-.193	-.123	-.070	.070
	(.059)*	(.039)*	(.052)	(.044)
Non-Brazil Imports in WEU (t)	.031	.005	.026	-.026
	(.013)	(.009)	(.012)	(.010)*
Observations	1,199,490	1,199,490	1,199,490	1,199,490
F statistic	7.76	3.50	6.23	4.03
B: Sectoral Foreign Imports × Exporter Status, no trend (IV × Exp.)				
Non-Brazil Imports WW (t) × Cont. Exp. (t)	-.087	-.039	-.049	.039
	(.006)*	(.006)*	(.004)*	(.005)*
Non-Brazil Imports WW (t) × Start. Exp. (t)	-.069	-.011	-.058	.035
	(.008)*	(.005)	(.006)*	(.007)*
Non-Brazil Imports WW (t) × Quit. Exp. (t)	-.020	-.007	-.013	-.019
	(.007)*	(.003)*	(.006)	(.006)*
Observations	1,199,490	1,199,490	1,199,490	1,199,490
F statistic	64.24	14.47	55.36	33.01
C: Sectoral Foreign Imports × Exporter Status, with sector trend (IV × Exp.)				
Non-Brazil Imports WW (t) × Cont. Exp. (t)	-.089	-.040	-.049	.042
	(.006)*	(.006)*	(.004)*	(.005)*
Non-Brazil Imports WW (t) × Start. Exp. (t)	-.070	-.012	-.058	.037
	(.008)*	(.005)	(.006)*	(.007)*
Non-Brazil Imports WW (t) × Quit. Exp. (t)	-.022	-.008	-.014	-.017
	(.007)*	(.003)*	(.006)	(.006)*
Observations	1,199,490	1,199,490	1,199,490	1,199,490
F statistic	67.62	16.10	55.65	35.31

Sources: SECEX and RAIS 1990-2001 (t: 1992-2000), manufacturing firms (subsectors IBGE 2-13).
Notes: Linear regressions, controlling for firm fixed effects, sector and year effects, and sectoral absorption, panel C also controlling for linear sector trends. Binary future exporter indicator represents firms that start exporting at $t+1$ or that continue exporting at $t+1$; future and current export status as defined in Table 1. Non-Brazilian imports in Other Industrialized countries (OIN), Western European countries (WEU), North American countries (NAM excluding Mexico), and worldwide (WW excluding Latin America and Caribbean). Additional regressors: current export status, workforce characteristics, MNE indicator and absorption as in Table 5. F statistics for the joint zero effect of the IVs. Robust standard errors, clustered at the firm level, in parentheses; asterisk marks significance at 1-percent level.

Export-market shocks. There is limited econometric guidance to date for the selection among multiple valid IVs when some IVs are potentially weak but others strong. If the F statistic for the hypothesis that the instrumental-variable coefficient is non-zero on the first stage surpasses a value of 10, an instrument is commonly considered a strong one (Stock, Wright and Yogo 2002). We have six potential IVs but our export status classification requires three IVs for our regressions to be just

identified. To select the strongest possible set of IVs, we use the F statistic like an information criterion. We first regress the binary future exporting indicator on all six IVs and other exogenous variables, conditioning on firm, sector and year effects. From this initial regression we select the three IVs with the highest t statistics. We then set out to add IVs in the order of their t statistics, from next highest to lowest, and observe the evolution of the F statistic as we include IVs, with the intent to stop including IVs as soon as the F statistic starts falling. We find the import-demand IVs of OIN, WEU and NAM to have similarly high t statistics (between 3.9 and 3.4 in absolute value) and then add CEE to the regression, which has the next highest t statistic (1.7 in absolute value). With this addition, the F statistic for joint significance of the IVs drops, however. We therefore use no IVs other than import demand in OIN, WEU and NAM.

The upper panel (specification A) in Table 4 shows the results from linear regressions of future exporting on these pure demand IVs, conditional on our set of control variables.[15] There is no a priori expected sign for coefficients on our foreign import-demand measures. A positive sign is consistent with favorable consumer demand conditions at the foreign destination both for Brazilian and non-Brazilian exporters. A negative sign is consistent with unfavorable residual demand at the foreign destination for Brazilian exporters in the wake of large competing shipments by non-Brazilian export countries. By this interpretation of coefficients in Table 4, shipments from non-Brazilian export countries to North America and other industrialized countries tend to substitute Brazilian exports whereas others' shipments to Western Europe tend to complement Brazilian exports (columns 1 through 3). Expectedly, signs of significant coefficients are reversed for Brazilian firms that quit exporting (column 4).

Foreign market conditions $\mathbf{z}_{it}$ vary by sector and year and capture pure demand effects, which are common to all firms within a sector. While instrument validity is unaffected by this limited variation, predictive power of the IVs can be a concern. The F statistic clearly exceeds 10 for the binary future exporter indicator and for export starters, but the F statistic falls below the threshold of 10 for continuous exporting status and for firms that quit exporting. We will therefore interpret second-stage results for continuous exporters and export quitters with caution. For export status two or three periods in advance, in contrast, the same IVs clearly exceed the F statistic threshold of 10 for all exporter categories in our robustness regressions (see Tables C.3 and C.3 in the Appendix).

In the presence of sunk entry costs the firms' responses to changing foreign market conditions

[15] Firms are not nested within sectors in our data so sector fixed effects are separately identified but common clustering of standard errors in the two-stage least squares regression becomes inviable.

depend on the firm's current export status (Dixit 1989). Among the control variables $\mathbf{y}_{it}$ we include the firm's current export status, thus capturing the direct effect of current exporting on hiring exporter workers on the second stage (2). As a result, the interaction of worldwide market conditions and the vector of current export status indicators $z_{it}^{ww} \cdot \mathbf{x}_{it}$ is a valid instrument as long as persistent firm-level export-supply shocks are summarized by the current export status and hence do not confound second-stage estimation, conditional on a large set of firm-level controls. We exclude imports into any Latin American economy from the measure of worldwide imports z_{it}^{ww} and interact worldwide import demand with indicators for the three export status categories other than non-exporters (Table 1).

The middle panel (B) in Table 4 shows the results for the first-stage of the according interacted instrumental variable regression. Expectedly, the F statistics now far exceed the threshold of 10. In the lower panel (C) in Table 4, we introduce sector-year trends in addition and the F statistics remain above the threshold of 10. The identifying assumption for the new set of instruments (B and C) is more restrictive. So we will check second-stage estimates from the alternative sets of instruments (A-C) against each other to assess robustness and query their implied validity.

Hiring away exporter workers. We now consider the hiring of former exporter workers at time t as a preparation for anticipated export-market participation in the next year. For this purpose, we use expected export-market participation at $t+1$, predicted by the above-mentioned observed foreign import-demand shocks at t.

Results in Table 5 show that expected future exporting is significantly positively associated with advance hiring of former exporter workers across all four specifications, irrespective of instrumentation. In magnitude, coefficient estimates are strictly larger when future exporting is instrumented (columns 2 through 4) than in ordinary regression (column 1). Note that our IV regressions measure the effect of expected future export-market participation (the treatment) on responding firms that are susceptible to favorable foreign demand conditions (treatment responders). In contrast, the ordinary regression (column 1) measures the covariation of observed future export-market participation on the universe of firms, including the bulk of never-exporting firms that are not susceptible to favorable foreign demand (never responders). Coefficients in IV regressions therefore expectedly exceed those from ordinary regression. We provide evidence on the most responsive firms by region and size below, consistent with this interpretation (Table 7).

Using pure foreign-demand IVs (specification A in column 2) predicts that firms prepare for an expected 10 percentage-point increase in the probability of export-market participation next year with

Table 5: HIRES FROM EXPORTERS

	Log[1 + Hires from Exporters] (t)			
		IV	IV × Exp.	
	FE	FE (A)	FE (B)	FE, trend (C)
Predictor (t unless noted otherwise)	(1)	(2)	(3)	(4)
Indic.: Anticip. Exporter $(t+1)$	.121	4.679	2.034	1.766
instr. in (2)-(4)	(.005)*	(1.076)*	(.194)*	(.175)*
Indic.: Continue Exporting	.014	-.564	-.229	-.188
	(.009)	(.140)*	(.028)*	(.025)*
Indic.: Start Exporting	.051	-.704	-.266	-.219
	(.006)*	(.180)*	(.034)*	(.031)*
Indic.: Quit Exporting	-.030	.285	.103	.088
	(.006)*	(.076)*	(.017)*	(.015)*
Rel. Employment Chg. ($t-1$ to t per t)	.002	-.0001	.001	.001
	(.0005)*	(.0005)	(.0004)*	(.0004)*
Log Employment	.231	.139	.192	.197
	(.002)*	(.022)*	(.004)*	(.004)*
Indic.: Affiliate of foreign MNE	.037	.102	.064	.061
	(.066)	(.115)	(.068)	(.065)
Observations	1,199,490	1,199,490	1,199,490	1,199,490
F statistic (excluded IVs first stage)		7.76	64.24	67.61

Sources: SECEX and RAIS 1990-2001 (t: 1992-2000), manufacturing firms (subsectors IBGE 2-13).
Notes: Linear regressions, controlling for firm fixed effects, sector and year effects, and sectoral absorption; for linear sector trends in specification 4. Specifications 2, 3 and 4 use instrumented binary future exporter indicator (column 1 of Table 4). Binary future exporter indicator represents firms that start exporting at $t+1$ or that continue exporting at $t+1$; current export status as defined in Table 1. Workforces on December 31st. F statistics for the joint zero effect of IVs on the first stage from Table 4. Robust standard errors, clustered at the firm level, in parentheses; asterisk marks significance at 1-percent level.

one gross hire of a former exporter worker at the sample mean.[16] This is a plausible number. The average firm in the sample exports with a probability of 4.9 percent (Table 2). The average exporter contracts twelve former exporter workers per year during the sample period, while recent export quitters just hire three former exporter workers on average and the mean manufacturing firm just hires one (Table 2). Using foreign-demand IVs interacted with the firm's present export status (columns 3 and 4) leads to a smaller magnitude: by this measure, an expected 10 percentage-point increase in the exporting probability next year results in advance gross hiring of only .4 former exporter workers.

We condition on a firm's relative employment change, so employment expansions at hiring firms cannot confound our finding. We control for affiliates of foreign multinational enterprises, so our specification separates the effect of exports from foreign ownership. Our finding is also unaffected by

[16] By the coefficient estimate in column 2, implied gross hiring of former exporter workers is $.1 \cdot 4.679 \cdot (1+\bar{h}) = .98$ workers for a 10 percentage-point increase in the exporting probability and mean former exporter hires $\bar{h} = 1.1$ (Table 2). It is $.1 \cdot 2.034 \cdot (1+\bar{h}) = .43$ by column 3 and $.1 \cdot 1.766 \cdot (1+\bar{h}) = .37$ by column 4.

common sectoral business cycles between Brazil and foreign markets because we control for domestic absorption at the sector level.

Numerous coefficients on current firm characteristics are consistent with the interpretation that strong firm-side performance up to the current year is not typically associated with hiring former exporter workers. Continuous exporting firms up to the current period, and export starters in the current period, hire strictly fewer former exporter workers than non-exporters, whereas firms that just quit exporting in the current period contract more former exporter workers, arguably in anticipation of a reversion in their export participation. Similarly, firms with more tertiary educated workers and a higher skill intensity hire strictly fewer former exporter workers (with a minor coefficient alteration for the fraction of exporters among high skill intensive firms). The overall pattern broadly supports the interpretation that currently less successful exporters and less well staffed firms pursue the strongest advance hiring of former exporter workers.

A comparison of results from the three different sets of instruments (A-C) shows that signs and significance patterns are highly robust across specifications (columns 2 through 4), with signs identical when significant for thirteen out of fifteen covariates.

Hiring away exporter workers by expected export status. Theory implies that firms with the largest anticipated gains from exporting have the strongest incentive to engage in preparatory hiring (Yeaple 2005, Costantini and Melitz 2008). One proxy to returns from export-market participation is the expected exporter category, with expected continuous exporters arguably commanding larger gains than expected export starters. We accordingly estimate equation (1) for a vector of anticipated exporter status over three categories and look up to three years into the future.

Table 6 reports the results for one year in advance (t+1, with first stage results in Table 4, columns 2 through 4) and for two and three years in advance ($t+2$ and $t+3$, with first-stage results in Tables C.3 and C.4 in the Appendix). We disregard results from specification A in column 2, which produce a poor fit on the second stage under relatively weak instruments.[17]

As theory suggests, expected continuous exporters generally exhibit the strongest response. Results for t+1 show directly that expected continuous exporters hire more former exporter workers than

[17]We consider the coefficient on expected export quitters at $t+1$ in specification A spuriously significant, given weak instruments with an F statistic of only 4.03 (Table 4 column 4). When instruments are sufficiently strong with F statistics of 66.32 for $t+$ 2and 81.95 for $t+3$ (Tables C.3 and C.4 column 4), then expected export quitters exhibit no significant hiring.

Table 6: HIRES FROM EXPORTERS AND ANTICIPATED FUTURE EXPORT STATUS

	Log[1 + Hires from Exporters] (t)			
		IV	IV × Exp.	
	FE	FE (A)	FE (B)	FE, trend (C)
Predictor	(1)	(2)	(3)	(4)
	Export Status $t+1$			
Anticip. Continue Exporting ($t+1$)	.179	5.276	3.861	3.313
	(.009)*	(5.804)	(.750)*	(.675)*
Anticip. Start Exporting ($t+1$)	.113	3.141	2.311	1.956
	(.006)*	(3.036)	(.557)*	(.528)*
Anticip. Quit Exporting ($t+1$)	.034	16.822	1.603	1.236
	(.007)*	(4.606)*	(.583)*	(.554)
Observations	1,199,490	1,199,490	1,199,490	1,199,490
F statistics (IVs first stage)		3.50, 6.23, 4.03	14.47, 55.36, 33.01	16.10, 55.65, 35.10
	Export Status $t+2$			
Anticip. Continue Exporting ($t+2$)	.235	3.006	.774	.747
	(.008)*	(7.986)	(.093)*	(.098)*
Anticip. Start Exporting ($t+2$)	.119	-5.293	.481	.358
	(.007)*	(11.685)	(.464)	(.442)
Anticip. Quit Exporting ($t+2$)	.095	1.666	.693	.739
	(.007)*	(8.855)	(.511)	(.503)
Observations	1,035,386	1,035,386	1,035,386	1,035,386
F statistics (IVs first stage)		191.27, 41.43, 66.32	402.51, 39.04, 22.08	373.90, 31.37, 20.28
	Export Status $t+3$			
Anticip. Continue Exporting ($t+3$)	.250	-16.713	.303	.253
	(.008)*	(40.050)	(.209)	(.242)
Anticip. Start Exporting ($t+3$)	.127	22.319	3.119	3.488
	(.007)*	(44.734)	(4.570)	(5.207)
Anticip. Quit Exporting ($t+3$)	.140	20.821	-1.605	-1.913
	(.007)*	(52.140)	(3.168)	(3.636)
Observations	872,537	872,537	872,537	872,537
F statistics (IVs first stage)		209.71, 87.31, 81.95	512.73, 49.53, 67.15	478.46, 43.81, 59.24

Sources: SECEX and RAIS 1990-2001 (t: 1992-2000), manufacturing firms (subsectors IBGE 2-13).
Notes: Linear regressions, controlling for firm fixed effects, sector and year effects, and sectoral absorption; for linear sector trends in specification 4. For the first panel of export status at $t+1$, specifications 2, 3 and 4 use instrumented future export status indicator (columns 2 through 4 of Table 4; instrumented future export status indicators for the second and third panel of export status at $t+2$ and $t+3$ reported in columns 1 through 3 of Tables C.3 and C.4 in the Appendix). Future and current export status as defined in Table 1. Workforces on December 31st. Additional workforce and MNE control variables as in Table 5. F statistics for the joint zero effect of IVs on the first stage are reported (from Tables 4, C.3 and C.4) in the order shown for the three predicted effects (Continue Exporting first, Start Exporting next, Quit Exporting last). Robust standard errors, clustered at the firm level, in parentheses; asterisk marks significance at 1-percent level.

any other firm. The coefficient on continuous exporting monotonically drops for later years $t+2$ and $t+3$, consistent with a declining incremental response of continuous exporters. To interpret results for $t+2$ in levels, note that expected continuous exporters at $t+2$ must be at least export starters at $t+1$, so the coefficients in the lower panels of Table 6 cumulate with those in the panel above (for export status definitions see Table 1). When it comes to coefficient magnitudes, expected continuous exporters at t+2 also hire more former exporter workers than any other firm. However, at t+2, only the response of continuous exporters is statistically significant at the 1-percent significance level. At t+3, no response is statistically significant at the 1-percent level, and the response of continuous exporters would be the only statistically significant one at the 5-percent significance level.

Export starters show a statistically significant coefficient for exporter-worker poaching at the $t+1$ horizon, but smaller in magnitude than at continuous exporters. Export quitting at $t+1$, $t+2$ or $t+3$ is generally not associated with hiring of former exporter workers, except for specification B in column 3 at the $t+1$ horizon. One consistent explanation of that single finding might be that current exporters threatened by immediate export-market exit have a stronger incentive to poach former exporter workers than non-exporters, perhaps because a current exporter's expected returns from catching up to well staffed exporters are larger than for never-exporters, similar to a gamble for resurrection. In summary, continuous exporters with arguably the largest gains from exporting also exhibit the strongest response in hiring away exporter worker.

We now return to the difference in coefficient magnitudes between the instrumented and non-instrumented specifications. To assess our explanation that non-exporting firms (never responders) bias ordinary regression coefficients downwards, we query which firms most responsively hire former exporter workers.

Hiring away exporter workers by region and firm size. We interact the indicator of exporting one year in advance with the firm's location in one of three broad regions in Brazil, having three instruments at hand. São Paulo state is Brazil's manufacturing center, hosting about half of Brazil's manufacturing value added during the 1990s. The South and South East of Brazil (excluding São Paulo state) exhibit higher per-capita incomes than the North, North East and Center West, but neither the South nor the remaining South East (Rio de Janeiro, Minas Gerais and Espírito Santo) can match São Paulo state's concentration of manufacturing industries.

Results in the upper panel of Table 7 corroborate our interpretation that instrumented regressions reflect the responses of firms that are susceptible to favorable foreign demand conditions (treatment

Table 7: HIRES FROM EXPORTERS AND REGION AND SIZE INTERACTIONS

	Log[1 + Hires from Exporters] (t)			
		IV	IV × Exp.	
	FE	FE (A)	FE (B)	FE, trend (C)
Predictor (t unless noted otherwise)	(1)	(2)	(3)	(4)
Regional Interactions				
Indic.: Antic. Exp. $(t+1)$	.105	-27.187	2.936	2.544
in São Paulo state	(.007)*	(236.744)	(.539)*	(.457)*
Indic.: Antic. Exp. $(t+1)$	.130	-141.581	2.064	1.552
in South/SouthEast	(.008)*	(1412.930)	(2.117)	(1.983)
Indic.: Antic. Exp. $(t+1)$	.165	-787.961	.830	1.691
in North/NorthEast/CenterWest	(.020)*	(6646.776)	(7.195)	(6.651)
Observations	1,199,227	1,199,227	1,199,227	1,199,227
F statistics (IVs first stage)		9.83, 1.55, 0.58	61.60, 59.63, 26.69	44.40, 60.10, 26.98
Log Size Interaction				
Indic.: Anticip. Exporter $(t+1)$	-.612	-12.046	.060	.179
	(.015)*	(2.316)*	(1.083)	(1.034)
Log Employment	.221	.095	.185	.191
	(.002)*	(.026)*	(.005)*	(.005)*
Indic.: Antic. Exp. $(t+1)$	.191	2.972	.368	.300
× Log Employment	(.004)*	(.394)*	(.201)	(.195)
Observations	1,199,490	1,199,490	1,199,490	1,199,490
F statistics (IVs first stage)		7.76, 14.62	64.24, 102.57	67.61, 105.54

Sources: SECEX and RAIS 1990-2001 (t: 1992-2000), manufacturing firms (subsectors IBGE 2-13).
Notes: Linear regressions, controlling for firm fixed effects, sector and year effects, and sectoral absorption; for linear sector trends in specification 4. Specifications 2, 3 and 4 use instrumented binary future exporter indicator (column 1 of Table 4). Future and current export status as defined in Table 1. Additional variables as in Table 5. F statistics for the joint zero effect of IVs on the first stage (from Tables C.1 and C.2) are reported in the order shown for the three predicted regional effects (São Paulo state first, South/SouthEast next, North/NorthEast/CenterWest last) in the upper panel and the two predictions in the lower panel (Exporter indicator first, interaction of indicator with Log Employment second). Robust standard errors, clustered at the firm level, in parentheses; asterisk marks significance at 1-percent level.

responders). We ignore results from weak instruments (specification A in column 2). Only firms in São Paulo state significantly respond to favorable foreign demand by hiring away exporter workers (columns 3 and 4). Arguably only the industry agglomeration in São Paulo state offers a sufficiently thick labor market to permit effective worker poaching.

We also interact the indicator of exporting one year in advance with the firm's current log size. Results in the lower panel of Table 7 for this interaction provide further evidence in favor of our interpretation of firm responsiveness (columns 3 and 4).[18] Only relatively large firms with an arguably strong competitive advantage respond to favorable foreign demand conditions by hiring former ex-

[18]Note that current mean log employment at exporters is 4.329 (Table 2), so an estimate of the net effect of future export status in specification A (column 2) is $.820 = -12.046 + 2.972 \cdot 4.329$. The net effect is therefore positive as expected but hard to interpret.

Table 8: HIRES FROM EXPORTERS, CONDITIONAL ON WORKFORCE VARIABLES

	Log[1 + Hires from Exporters] (t)			
		IV	IV × Exp.	
	FE	FE (A)	FE (B)	FE, trend (C)
Predictor	(1)	(2)	(3)	(4)
Baseline Specification (Table 5)				
Indic.: Anticip. Exporter $(t+1)$	.121	4.679	2.034	1.766
instr. in (2)-(4)	(.005)*	(1.076)*	(.194)*	(.175)*
Observations	1,199,490	1,199,490	1,199,490	1,199,490
F statistic (excluded IVs first stage)		7.76	64.24	67.61
Controlling for Workforce Characteristics				
Indic.: Anticip. Exporter $(t+1)$	.119	4.772	2.048	1.748
instr. in (2)-(4)	(.005)*	(1.094)*	(.208)*	(.186)*
Observations	1,199,490	1,199,490	1,199,490	1,199,490
F statistic (excluded IVs first stage)		7.75	57.78	60.80
Controlling for Workforce Characteristics and Skill Changes				
Indic.: Anticip. Exporter $(t+1)$	.112	4.701	1.982	1.687
instr. in (2)-(4)	(.005)*	(1.137)*	(.207)*	(.186)*
Observations	1,199,490	1,199,490	1,199,490	1,199,490
F statistic (excluded IVs first stage)		7.00	56.12	59.27

Sources: SECEX and RAIS 1990-2001 (t: 1992-2000), manufacturing firms (subsectors IBGE 2-13).
Notes: Linear regressions, controlling for firm fixed effects, sector and year effects, and sectoral absorption; for linear sector trends in specification 4. Specifications 2, 3 and 4 use instrumented binary future exporter indicator. Workforces on December 31st. Additional regressors: current export status, workforce characteristics, MNE indicator and absorption as in Table 5. Additional regressors in middle panel: those in upper-most panel and workforce characteristics as in Table B.1. Additional regressors in lower-most panel: those in middle panel and workforce skill changes as in Table B.2. F statistics for the joint zero effect of IVs on the respective first stage. Robust standard errors, clustered at the firm level, in parentheses; asterisk marks significance at 1-percent level.

porter workers. Overall, these findings on regional and size-specific responses are consistent with our hypothesis that non-exporting firms (never responders) bias ordinary regression coefficients downwards.

Workforce composition and concomitant changes in observed skill demand. To assess the robustness of our baseline specification to omitted workforce characteristics, we adopt a long regression specification that includes the workforce composition shares of worker education and occupation categories as well as an indicator whether the firm is high-skill intensive (its current share of technical/supervisory and professional/managerial occupations falling into the top quartile of firm-year observations). For our main predictor of interest, Table 8 restates the earlier results from the short baseline specification (Table 5) in the upper-most panel and shows the results from the long specification with workforce controls in the middle panel. (For the full robustness regression results

see Appendix B.) The main coefficient estimates on the anticipated export status predictors remain closely similar, compared to our baseline specification in Table 5, and are not statistically significantly different.

A remaining concern with our findings could be that a firm may hire former exporter workers away not because of their prior exporter experience but because of their other skills. Those other skills could correlate with employment at an exporter. To isolate a hiring firm's changes to observed skill demand, we therefore augment the specifications of Table 5 not only with workforce characteristics in the current year but also with a set of concomitant relative employment changes by education and occupation group at the firm. Table 8 reports the results in the lower-most panel. A comparison to coefficient estimates in Table 5 shows that the inclusion of controls for observed workforce skill changes hardly affects our main estimates. None of the slight coefficient changes are statistically significant. In summary, our evidence suggests that a firm with expected export-market participation prepares its workforce by hiring away workers from other exporters because of those workers' exporter experience.

Alternative clustering assumptions. We assess the statistical significance of our results under alternative clustering assumptions, testing the hypothesis that a coefficient estimate is zero in three different ways. In the IV regressions reported in Table 5, we cluster the standard errors at the firm level. In doing so, we account for the existence of serial correlation at the firm level in unobserved factors that may affect hiring away from exporters. Panel I in Table 9 restates the IV regression results from Table 5, now reporting the p-value for each coefficient estimate instead of the standard error, for comparison to alternative tests. Reported p-values less than $1\,e-06$ indicate that estimates are zeroes at machine-size precision.

Panel II of Table 9 shows the results when clustering the standard errors at the sector level. Sector-level clustering allows for both serial correlation at the firm level and correlation across firms or over time within the same sector. We classify firms into twelve manufacturing sectors using the RAIS industry classification subsector IBGE. We need to assign firms to a single sector (cluster) over time and choose the mode sector for this assignment. We therefore lose observations of firms whose mode sector is indeterminate because of ties, resulting in a small reduction of our sample. Coefficient estimates, however, remain closely similar to those in Panel I. Under sector-level clustering the p-value increases compared to firm-level clustering, but we continue to reject the null of a zero coefficient at the 1-percent significance level. However, the small number of sectors raises the concern of lacking

Table 9: ALTERNATIVE CLUSTERING ASSUMPTIONS

	Log[1 + Hires from Exporters] (t)		
	IV	IV × Exp.	
	FE (A)	FE (B)	FE, trend (C)
Predictor	(1)	(2)	(3)
I: Baseline Firm-level Clustering (Table 5)			
Indic.: Anticip. Exporter $(t+1)$	4.679	2.034	1.766
p-value	$1.00\,e{-}05^{*}$	$<1\,e{-}06^{*}$	$<1\,e{-}06^{*}$
Observations	1,199,490	1,199,490	1,199,490
II: Sector-level Clustering			
Indic.: Anticip. Exporter $(t+1)$	4.936	2.074	1.769
p-value	$.008^{*}$	$<1\,e{-}06^{*}$	$<1\,e{-}06^{*}$
Observations	1,190,402	1,190,402	1,190,402
III: Sector-level Clustering, Wild Bootstrap			
Indic.: Anticip. Exporter $(t+1)$	4.936	2.074	1.769
p-value	.038	$<1\,e{-}06^{*}$	$<1\,e{-}06^{*}$
Observations	1,190,402	1,190,402	1,190,402

Sources: SECEX and RAIS 1990-2001 (t: 1992-2000), manufacturing firms (subsectors IBGE 2-13).
Notes: Linear regressions, controlling for firm fixed effects, sector and year effects, and sectoral absorption; for linear sector trends in specification 4. Specifications 2, 3 and 4 use instrumented binary future exporter indicator (column 1 of Table 4). Binary future exporter indicator represents firms that start exporting at $t+1$ or that continue exporting at $t+1$; current export status as defined in Table 1. Controls as in Table 5. p-values reported below coefficient estimates. Wild bootstrap based on 999 repetitions (Davidson and MacKinnon 2010); asterisk marks significance at 1-percent level. Reports of p-values less than $1\,e{-}06$ indicate that estimates are zeroes at machine-size precision.

consistency.

A finer industry classification is not available for the full sample period. In Panel III we therefore show p-values from a wild bootstrap. Simulations have shown the wild bootstrap to produce a better test size than the standard Wald test under clustering when the number of clusters is small (Cameron, Gelbach and Miller 2008). We follow Davidson and MacKinnon (2010) in applying the wild bootstrap procedure to our IV model. Expectedly, the p-values from the wild bootstrap are higher than those under clustering at the sector level (Panel II). The IV result without export status interactions (column 1) is now only statistically significant at the 5-percent level. However, we continue to reject the null of a zero coefficient at the 1-percent significance level for the interacted IVs (columns 2 and 3). In summary, we find no evidence that our baseline firm-level clustering assumption would lead to erroneous statistical significance judgments.

Wage changes and their components for hires from exporters. The value of a former exporter worker to the current employer should be reflected in the wage payment. For every hired worker j from an exporter, we compute the difference in the log wage between the current job and the immedi-

Table 10: LOG WAGE CHANGES FOR HIRES FROM EXPORTERS

	Change in mean Log Wage Component ($t-1$ to t)			
		IV	IV × Exp.	
	FE	FE (A)	FE (B)	FE, trend (C)
Predictor	(1)	(2)	(3)	(4)
	Change in mean **Log Wage**			
Indic.: Anticip. Exporter ($t+1$)	-.001	1.670	.795	.296
	(.004)	(.672)	(.127)*	(.120)
R^2 (overall)	.106	.030	.062	.100
	Change in mean **Worker Observable Log Wage Component**			
Indic.: Anticip. Exporter ($t+1$)	-.002	.309	-.065	-.085
	(.001)	(.203)	(.041)	(.041)
R^2 (overall)	.165	.090	.166	.165
	Change in mean **Plant-fixed Log Wage Component**			
Indic.: Anticip. Exporter ($t+1$)	.0006	1.564	.947	.576
	(.003)	(.516)*	(.095)*	(.086)*
R^2 (overall)	.155	.070	.106	.141
	Change in mean **Individual Worker Log Wage Residual Component**			
Indic.: Anticip. Exporter ($t+1$)	.0001	-.203	-.087	-.194
	(.003)	(.443)	(.095)	(.093)
R^2 (overall)	.002	.004	.004	.004

Sources: SECEX and RAIS 1990-2001 (t: 1992-2000), manufacturing firms (subsectors IBGE 2-13). 658,077 observations. *Notes*: Log wage change is difference between the current log wage (component) and the log wage (component) at the preceding exporter. Log wage components from Mincer (1974) regressions by year for the cross section of plants, decomposing the log wage into a worker observable component, a plant-fixed component, and an individual worker residual, and then summing up over current employer's hires from exporters. Linear regressions, controlling for firm fixed effects, sector and year effects, and sectoral absorption; for linear sector trends in specification 4. Specifications 2, 3 and 4 use instrumented binary future exporter indicator (similar to Table 4 for subsample with wage information). Future and current export status as defined in Table 1. Additional workforce and MNE control variables as in Table B.1. Standard errors in parentheses (no correction for generated regressors); asterisk marks significance at 1-percent level.

ately preceding job ($\ln w_{jt} - \ln w_{j,t-\tau}$). We then use the mean log difference in wages of hired former exporter workers at a given firm i as the left-hand side variable ($\Delta_i \ln w_{it} \equiv (1/J_i) \sum_j \ln w_{jt}/w_{j,t-\tau}$), and run our main regression equation (2) with the mean former exporter workers' log wage difference between jobs as dependent variable ($\Delta_i \ln w_{it} = \mathbf{y}'_{it}\boldsymbol{\delta}_y + \hat{x}_{i,t+1}\delta_x + \epsilon_{it}$). Table 10 reports the important coefficient estimate for expected future exporter status in the upper panel. Former exporter workers receive a sizeable log wage premium upon being hired away in response to the new employer's favorable export market demand shock. The pay increase is statistically significant at the one-percent level only in specification B (column 3) but would be significant at the five-percent level in all IV specifications.

To determine the source of the wage increase, we resort to a Mincer log wage regression $\ln w_{jt} = \boldsymbol{z_{jt}}'\boldsymbol{\vartheta}_t + \psi_{i(j)t} + \nu_{jt}$ in the cross section of workers j year by year to isolate three log wage components

for every worker (as in Menezes-Filho, Muendler and Ramey 2008):[19] first the log wage component $\boldsymbol{z_{jt}}'\hat{\boldsymbol{\vartheta}}_t$ that is predicted by observed worker characteristics (education, occupation, labor force experience, gender, age); second the plant-specific component $\psi_{i(j)t}$ predicted by a plant fixed effect in the annual cross section of employers (reflecting both a pure plant component and unobserved differences in workforce composition such as the plant average match effects); and third an individual worker residual component (ν_{jt}). We then use the mean difference in those wage components for hired former exporter workers at a given firm i as the left-hand side variable in our main regression equation (2). Table 10 reports the coefficient estimates for expected future exporter status in the lower three panels.

Only the firm-average plant fixed effect is statistically significantly associated with the new employer's favorable export demand shock, whereas neither a hired former exporter worker's individual residual wage component nor the worker's observable characteristics are associated with the wage premium at the new employer. The decomposition exercise therefore shows that the pay increase for former exporter workers between jobs stems from the new employer's firm-wide pay, in which all employees share.

Firing recent exporter hires upon unexpected export failure. Regression specifications so far offer evidence for our main hypothesis that a firm hires away exporter workers when it can expect to realize export-market gains. A corollary of our hypothesis is that a firm with favorable foreign-demand conditions, which currently predict a high probability of export-market participation next year, should lay off again its currently poached hires from exporters if it fails to become an exporter by next year.[20] To pursue this placebo-like treatment, we follow recent hires from exporters in the current year into the next calendar year and identify separations that occur before the end of the next calendar year. We define *separations of recent exporter hires* as hires from exporters in the current year whose new employment terminates before December 31st of the next year. We then restrict the firm sample in two ways. First, we keep only those firm observations whose predicted export indicator for next year from Table 5 is above the sample median, consistent with a favorable expectation of export-market participation. Of those firm observations, we only keep the ones that turn out to be non-exporters next year. Second, we keep only firm observations with predicted exporting next year

[19] To narrow the data to a single job per worker and year, we retain the last recorded and highest-paid job spell (randomly dropping ties) in a given year.

[20] We thank Don Davis for this suggestion.

Table 11: SEPARATIONS OF RECENT EXPORTER HIRES AT UNEXPECTEDLY UNSUCCESSFUL EXPORTERS

	Log[1 + Separations of Recent Exp. Hires] $(t+1)$		
	IV	IV × Exp.	
	FE (A)	FE (B)	FE, trend (C)
Predictor (predictors at t not reported)	(1)	(2)	(3)
Unsuccessful Exporters with Pred. Export Indic. above Median			
Pred. Indic. Anticip. Exporter $(t+1)$	4.248	.754	.630
	(1.152)*	(.234)*	(.195)*
Observations	576,340	576,226	576,186
R^2 overall (subsample)	.257	.256	.257
Unsuccessful Exporters with Pred. Export Indic. above 75th Percentile			
Pred. Indic. Anticip. Exporter $(t+1)$	4.314	.565	.492
	(2.131)	(.307)	(.303)
Observations	257,766	257,623	257,592
R^2 overall (subsample)	.260	.262	.261

Sources: SECEX and RAIS 1990-2001 (t: 1992-2000), manufacturing firms (subsectors IBGE 2-13).
Notes: Linear regressions, controlling for firm fixed effects, sector and year effects, and sectoral absorption; for linear sector trends in specification 3. Additional workforce and MNE control variables as in Table B.1. Standard errors from 50 bootstraps over both stages in parentheses; asterisk marks significance at 1-percent level.

above the 75th percentile, and of those only the non-exporters next year.

For each restricted sample of unexpectedly failing exporters, we replicate equation (2) and regress separations from current exporter hires $\ln(1 + s_{i,t+1})$ on the prediction of the firm's future export status $\hat{x}_{i,t+1}$ and the control variables. Note that separations in this exercise are only for those workers recently hired from exporters. We know from estimates of equation (2) that a higher propensity of exporting next year leads to more hires of exporter workers in the current year. If those hires mainly serve for export-market entry, and little else, then we should expect in the restricted sample of unexpectedly failing exporters that a higher propensity of exporting next year leads to more firings of these recently hired former exporter workers over the next year. Results in Table 11 corroborate this implication.

The coefficient estimate on the exporting predictor for next year is strictly positive. Unexpectedly failing exporters fire more recent exporter hires if the exporting predictor induced them to poach more exporter workers in the current year. Given our endogenous sample restriction based on first-stage estimates, we bootstrap the standard errors over both estimation stages. The coefficients are statistically significant at the one-percent level in the larger sample with the median export indicator as the cutoff for a firm's predicted export indicator (and at the five-percent level in the smaller sample for specification B). Comparing estimates in the upper panel of Table 11 to the hiring estimates (Table 5)

suggests that unexpectedly failing exporters let go again of between one-third to 90 percent of the recently poached hires from exporters.[21]

In summary, firms hire former exporter workers in advance of expected favorable export conditions, and especially firms in regions with thick manufacturing labor markets contract exporter workers in response to expected export-market participation. Large firms and firms that anticipate to become continuous exporters pursue relatively more such advance hires. The hired former exporter workers share in the firm-wide wage premium upon their employment change. Conversely, unexpectedly failing exporters lay off a significant fraction of their recently hired former exporter workers. We now return to a descriptive investigation into the importance of advance hiring of exporter workers for a firm's performance in foreign markets.

5 Predictors of Exporter Performance

Performance after hiring away exporter workers. We now restrict the sample to exporters only and seek additional evidence on two aspects of exporter performance. We decompose the log of a firm's exports into the log number of its export destinations (market reach) and its log exports per destination (market penetration). We relate these two outcomes next year to the firm's present characteristics, including its hires of former exporter workers.

Table 12 shows two sets of three regressions for exporting firms, one set with the log number of destinations as dependent variable (columns 1 through 3) and one set with the log exports per destination as dependent variable (columns 4 through 6). Each regression conditions on the other outcome variable to isolate the covariation of predictors.

In a short regression, neither the indicator for hiring former exporter workers nor the log number of hired exporter workers are significant predictors of market reach at the one-percent significance level (column 1). The log number of hired exporter workers, however, is a significant predictor of export-market penetration in a short regression (column 4). We next bring to bear exporter categories in our data to discern between hires from continuous exporters and hires from recent export starters. For both outcomes at the hiring firm, market reach (column 2) and market penetration (column 5), now the log number of workers hired from continuous exporters is a significant predictor of better export performance, but not the number of hires from export starters. This finding is consistent with

[21] The coefficient ratios range from .37 and .36 under specifications (B) and (C) to .89 under specification (A).

Table 12: PREDICTIONS OF FUTURE EXPORTER PERFORMANCE

	Log # Destinations $(t+1)$			Log Exports/Dest. $(t+1)$		
Predictor (t unless noted)	(1)	(2)	(3)	(4)	(5)	(6)
Log # Destinations $(t+1)$				.114	.114	.104
				(.013)*	(.013)*	(.013)*
Log Exports/Destination $(t+1)$	.029	.029	.026			
	(.003)*	(.003)*	(.003)*			
Log Employment	.204	.198	.186	.275	.276	.261
	(.010)*	(.010)*	(.010)*	(.019)*	(.018)*	(.019)*
Rel. Employment Chg. ($t-1$ to t per t)	-.001	-.001	-.001	-.002	-.002	-.002
	(.0008)	(.0008)	(.0008)	(.001)	(.001)	(.001)
Indic.: Hires from Exporters	-.010			-.002		
	(.008)			(.016)		
Log Gross Hires from Exp.	.009			.039		
	(.004)			(.007)*		
Indic.: Hires from Start Exp.		-.009	.010		.023	.030
		(.005)	(.006)		(.011)	(.012)*
Log Gross Hires from Start Exp.		.006	.016		.014	.015
		(.005)	(.005)*		(.009)	(.010)
Indic.: Hires from Cont. Exp.		.007	-.0009		.010	.010
		(.007)	(.009)		(.014)	(.020)
Log Gross Hires from Cont. Exp.		.011	-.003		.029	.007
		(.004)*	(.005)		(.008)*	(.009)
Indic.: Skld. Bl. Hires fr. Exp.			.009			-.035
			(.009)			(.020)
Log Gr. Skld. Bl. Hires fr. Exp.			-.005			.029
			(.004)			(.009)*
Indic.: Mkt. Occ. Hires fr. Exp.			-.0007			.008
			(.006)			(.012)
Log Gr. Mkt. Occ. Hires fr. Exp.			.014			-.006
			(.005)*			(.010)
Mean # Overlapping Dest.			.048			.026
			(.002)*			(.003)*
Indic.: High-skill firm	.022	.023	.016	.004	.004	.004
	(.011)	(.011)	(.010)	(.022)	(.022)	(.022)
Indic.: High-sk. frm. $\times$ Ind.: Hires fr. Exp.			-.070			-.044
			(.010)*			(.022)
Observations	56,141	56,141	56,141	56,141	56,141	56,141
R^2 (overall)	.292	.293	.410	.279	.28	.288

Sources: SECEX and RAIS 1990-2001 (t: 1992-2000), current and future manufacturing exporters (subsectors IBGE 2-13). *Notes*: Linear regressions, controlling for firm fixed effects, sector and year effects, and sectoral absorption. Workforces on December 31st. Exports (fob) in thousands of August-1994 USD. Log number of gross hires from exporters set to zero if zero hires. High-skill firms are firms with share of technical/supervisory and professional/managerial occupations in top quartile of firm-year observations. Additional control variables as in Table 5. Robust standard errors, clustered at the firm level, in parentheses; asterisk marks significance at 1-percent level.

Table 13: PREDICTIONS OF FUTURE EXPORTER PERFORMANCE, CONTROLLING FOR DEPARTING WORKERS TO EXPORTERS

	Log # Destinations ($t+1$)			Log Exports/Dest. ($t+1$)		
Predictor (t)	(1)	(2)	(3)	(4)	(5)	(6)
Indic.: Departures to Exporters	.011	.011	.017	.0007	.002	-.004
	(.006)	(.006)	(.007)	(.013)	(.013)	(.014)
Log Gross Departures to Exp.	.001	-.0004	-.008	-.017	-.019	-.023
	(.004)	(.004)	(.004)	(.008)	(.008)	(.008)*
Observations	56,141	56,141	44,463	56,141	56,141	44,463
R^2 (overall)	.292	.293	.411	.278	.277	.268

Sources: SECEX and RAIS 1990-2001 (t: 1992-2000), current and future manufacturing exporters (subsectors IBGE 2-13). *Notes*: Linear regressions, controlling for firm fixed effects, sector and year effects, and sectoral absorption. Additional workforce and MNE control variables as in Table 12. Robust standard errors, clustered at the firm level, in parentheses; asterisk marks significance at 1-percent level.

the idea that workers with a background at continuous exporters have unobserved characteristics that are more important for reaching more destinations and deeper into a destination than workers just with experience at export starters.

Finally, we bring to bear both additional worker-level and exporter information in our data to gain more detailed insight from long regressions. Among the hires from exporters, mostly workers in marketing occupations at the prior employer predict a wider market reach at the hiring firm (column 3) but not a deeper export-market penetration (column 6). Mostly workers in skilled blue-collar occupations at the prior employer predict a deeper market penetration by the hiring firm (column 6) but not a wider export-market reach (column 3). A larger overlap of export destinations between the prior employer and the current employer predicts a higher success for both market reach and penetration at the hiring firm. These findings are consistent with the idea that workers bring with them destination-specific knowledge. The findings also invite speculation that salespersons may be more important to reach additional destinations (perhaps because they know market characteristics and clients), whereas production skills (perhaps for high quality and timely delivery) are more relevant for deeper penetration of a market with additional sales.

Performance after departures of workers to exporters. For a final investigation as to how knowledge may move with workers, we consider the effect of departing workers on an exporter's success. For this purpose, we track a worker who separates from a firm to the immediately following formal-sector employment for up to three subsequent years and obtain the future employer's export status (mirroring the definition for hires from exporters). This allows us to define *departures to exporters* as

separating workers whose following formal-sector employment is at an exporter.

We include an indicator for such worker departures to exporters and the log number of departures to exporters as additional regressors into the specifications of market reach and market penetration before. Table 13 reports the results for the two new variables. Remarkably, the log number of departures is a significant predictor only for market penetration (in the specification of column 6). A consistent interpretation is that current exporters might only suffer a significant loss in market penetration but not in market reach, once they know how to access a given set of foreign markets.

This result is interesting in at least two regards. First, the result offers a potential explanation why worker poaching can be successful. While the hiring firm may expect to improve export outcomes in two dimensions, both regarding market reach and market penetration, the losing firm may expect to suffer only in the dimension of market penetration. This difference in product-market outcomes potentially raises the marginal product of the poached worker for the hiring firm above the value for the losing firm. Second, the result suggests that worker mobility may be an efficient mechanism by which knowledge spreads through an economy. If the moving worker's marginal product increases with the move, the spread of knowledge is welfare improving.

6 Concluding Remarks

Using rich linked employer-employee data that track Brazilian manufacturing firms, their exports and individual workers over more than a decade, we document substantive size and performance differences among exporters, not just between exporters and non-exporters. Despite this diversity in export-market performance and employment, the workforce composition varies little among exporters. Looking into typically unobserved aspects of workers' job histories, we find that hiring a small number of former exporter workers is an important predictor of a firm's export-market success. To measure the extent of active workforce preparations for future exporting, we use import demands for non-Brazilian goods outside Latin America as instruments. We find that firms hire former exporter workers in response to favorable demand conditions abroad and in advance of expected export-market entry. Especially firms in regions with thick manufacturing labor markets, large firms, and firms that can anticipate to become continuous exporters contract exporter workers in response to expected export-market participation.

Hiring workers from marketing-related occupations at former exporters predicts a wider reach

of destinations, and hiring skilled blue-collar workers from exporters predicts a deeper penetration of destinations. Yet the exact origins of former exporter workers' skills remain a matter for future research. Former exporter workers may have special skills from passive learning or active training at former exporters, they may know individual clients or have broad insight into destination-market characteristics, or their prior exporter employment may simply signal a screened but unobserved ability.

Our results are consistent with the idea that firms, especially firms with long-term export potential, actively contract a competitive workforce to add to their initial advantage, and then select to export. So firms prepare for expected export-market participation through prior workforce upgrading. These workforce preparations are consistent with recent trade models where firms can both choose export-market participation and engage in innovation, while each activity raises the return to the other. A firm's competitive advantage is therefore partly under its own control, and firms share in an economy's knowledge pool through mobile workers.

Appendix

A Data Appendix

A.1 SECEX exports data

All export values in the SECEX exports data are reported in current U.S. dollars (USD), free on board (fob). We have observations on exporting plants, declared export values and export destinations for the years 1990 through 2001. We aggregate monthly plant-level export information to years and firms. We deflate export sales to their August-1994 equivalents using the monthly U.S. consumer price index (from Global Financial Data). The choice of August 1994 is motivated by the timing of Brazil's last major currency reform in July 1994, which put the Brazilian Real (BRL) value at an initial exchange rate of one with the U.S. dollar (USD).

Exporting is transitory for most Brazilian exporters. Similar to evidence in Brooks (2006) for Colombian plants between 1981 and 1991, only a fraction of any cohort of first-time exporters continues to export after a year. Of the 1993 cohort, for instance, less than a quarter of firms is still an exporter by 1998, five years later. Of the 1996 cohort, only slightly more than a quarter of firms is still an exporter by 2001.[22]

A.2 RAIS linked employer-employee data

Brazilian law requires every Brazilian plant to submit detailed annual reports with individual information on its employees to the ministry of labor (*Ministério de Trabalho*, MTE). The collection of the reports is called *Relação Anual de Informações Sociais*, or RAIS, and typically concluded at the parent firm by March for the preceding year of observation. By design, RAIS covers all formally employed workers in any sector (including the public sector) and tracks workers nationwide over time between formal jobs. Workers with no current formal employment, however, are not in RAIS. Our version of the data provides monthly spell information on individually identified workers at individually identified plants. Similar to our treatment of the SECEX data, we aggregate the monthly worker-plant information to years and firms for most of our analysis. (For Mincer log wage regressions at the worker level we retain the last recorded and highest-paid job spell, randomly dropping

[22] An empirical supplement with according tabulations is available at URL *econ.ucsd.edu/muendler*.

ties, in a given year and estimate cross-sectional employer fixed effects at the plant level.) Annual aggregation removes seasonal fluctuations in worker accession and separation rates from the data.

RAIS primarily provides information to a federal wage supplement program (*Abono Salarial*), by which every worker with formal employment during the calendar year receives the equivalent of a monthly minimum wage. A strong incentive for compliance is that workers' benefits depend on RAIS so that workers follow up on their records. The ministry of labor estimates that currently 97 percent of all formally employed workers in Brazil are covered in RAIS, and that coverage exceeded 90 percent throughout the 1990s.

We keep observations for the years 1990 through 2001, drop all firms outside manufacturing, and then use the data for the construction of several sets of variables. First, we use employment on December 31st to obtain information on the firm's workforce size and composition across all its plants. We pay attention mainly to the education and occupation categories and construct according shares and changes over time (see Appendix A.2 for definitions). Second, we use worker IDs to trace recent hires at potential exporting firms back to their preceding employer and count the number of gross hires who were employed at an exporter in their immediately preceding job. For the purpose of worker tracking, we restrict the worker sample to all proper worker IDs (11-digit *PIS*).

Third, we obtain industry information for every firm. RAIS reports industries at the subsector IBGE classification (roughly comparable to the *NAICS 2007* three-digit level) over the full sample period. Subsector IBGE industries are recorded by plant, however. There are multi-plant firms in our sample, and we assign the industry associated with most employees in a given year to multi-plant firms. At the subsector IBGE level, there are twelve manufacturing industries in RAIS. The main sector affiliation of firms varies over time. There are 36,599 observations of firms that change sector so that firm effects are not nested within sector effects in later empirical analysis. While RAIS offers comprehensive workforce information, data on domestic sales are neither available from SECEX nor RAIS.

Table A.1 reports firm counts, the share of exporters (from the link to SECEX exporter information) and select firm characteristics by subsector IBGE.[23] On average, only about 5 percent of Brazilian formal-sector manufacturing firms are exporters, a considerably smaller share than in Chile

[23]We consider as industrialized countries the 24 OECD member countries in 1990: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal (including Madeira Islands), Spain (including Alborán, Parsley Island, and Canary Islands), Switzerland, Turkey, United Kingdom (including Channel Islands), and the United States. We exclude the following types of exports and destinations: immediate reexports of imports, on-board aircraft consumption, and non-declared destinations.

Table A.1: FIRM CHARACTERISTICS BY INDUSTRY

Subsector IBGE	Firm-year observ.	Workers per firm	Share (%) exporters	Workers per exp.	Exports per exp.
Non-metallic mineral products	137,091	18.8	.026	212.5	1,574.7
Metallic products	201,093	24.8	.046	288.4	5,974.8
Machinery, equipment and instruments	73,976	39.4	.152	167.9	1,962.3
Electrical and telecomm. equipment	40,603	51.9	.123	285.8	2,618.3
Transport equipment	39,169	80.9	.103	622.4	13,010.7
Wood products and furniture	234,913	15.2	.042	120.1	1,064.9
Paper and paperboard, and publishing	132,108	23.0	.023	349.9	5,118.3
Rubber, tobacco, leather, and prod. nec.	96,152	25.3	.082	173.1	2,805.6
Chemical and pharmaceutical products	131,110	37.2	.099	206.4	2,100.9
Apparel and textiles	332,926	20.6	.025	314.1	1,290.1
Footwear	48,881	46.5	.099	335.2	2,630.4
Food, beverages, and ethyl alcohol	299,469	34.1	.024	637.2	9,372.6
Total	1,767,491	27.7	.049	278.9	3,598.7

Sources: SECEX and RAIS 1990-2001, manufacturing firms (subsectors IBGE 2-13).
Notes: Employment on December 31st. Exports (fob) in thousands of August-1994 USD.

(21 percent of manufacturing plants export in 1990-96, see Álvarez and López 2005), or Colombia (18 percent of plants in 1991, see Brooks 2006) and Mexico (36 percent of plants in 1996, see Iacovone and Javorcik 2012). Our data are more closely comparable to the U.S. universe of manufacturing firms (a 5 percent exporter share in the U.S. universe of manufacturing firms, see Bernard, Jensen and Schott 2009).

Exporting is most frequent in machinery and equipment manufacturing industries, where workforce sizes per firm also tend to be large. Except for transportation equipment, the industries with most frequent exporting are populated by firms with below-average sizes and below-average exports per firm. We account for sector differences with industry-fixed effects in all regressions.

A.3 Education and occupation categories in RAIS

We group education information from nine RAIS education categories into three categories as shown in Table A.2.

Occupation indicators derive from the 3-digit CBO classification codes in our nationwide RAIS data base, and are reclassified to conform to ISCO-88.[24] We map RAIS occupations into ISCO-88 occupations and regroup them into five categories as shown in Table A.3.

[24]See online documentation at URL *econ.ucsd.edu/muendler/brazil*.

Table A.2: EDUCATION CATEGORIES

	RAIS category	Education Level
1.	8.-9.	Some College or College Graduate
2.	6.-7.	Some High School or High School Graduate
3.	1.-5.	Illiterate, or Primary or Middle School Educated (*reference category*)

Earnings. We use the monthly December wage paid to workers with employment on December 31st of a given year. RAIS reports the December wage in multiples of the current minimum wage. We use the log of annualized December wages as our earnings measure, defined as the reported monthly wage times the December U.S. dollar equivalent of the current minimum wage times 12. Similar to export values, we deflate this earning measure to its August-1994 equivalent using the monthly U.S. consumer price index (from Global Financial Data).

Legal form. RAIS reports a firm's legal form, including its direct foreign ownership by a foreign company (the according legal form code is "branch or office of foreign company"). Indirect foreign ownership, minority foreign ownership, or portfolio holdings do not fall under this category. We use the annual mode of legal form across the firms' workers to deal with occasional coding errors of legal form. The self-reported foreign-ownership category in RAIS potentially differs from foreign ownership in Poole (2013), who uses independent information on direct and indirect foreign ownership from the Central Bank of Brazil for a shorter sample period.

Table A.3: OCCUPATION CATEGORIES

	ISCO-88 occupation category	Occupation Level
1.	Legislators, senior officials, and managers	Professional or Managerial
	Professionals	Professional or Managerial
2.	Technicians and associate professionals	Technical or Supervisory
3.	Clerks	Other White Collar
	Service workers and sales workers	Other White Collar
4.	Skilled agricultural and fishery workers	Skilled Blue Collar
	Craft and related workers	Skilled Blue Collar
	Plant and machine operators and assemblers	Skilled Blue Collar
5.	Elementary occupations	Unskilled Blue Collar (*reference category*)

B Robustness

To assess the robustness of our baseline specification to omitted workforce characteristics and concomitant workforce changes, we adopt long regression specifications. We include the workforce composition shares of worker education and occupation categories as well as an indicator whether the firm is high-skill intensive (its current share of technical/supervisory and professional/managerial occupations falling into the top quartile of firm-year observations), and report the results in Table B.1. In Table B.2 we show results when we also control for concomitant observed changes in the workforce composition. The main coefficient estimates on the anticipated export status predictors remain closely similar, compared to our baseline specification in Table 5.

C Additional First-stage IV Results

Tables C.1 through C.5 present the first-stage IV regressions that accompany Tables B.2, 7 and 6 in the text as well as Table B.1 in the Appendix.

Table B.1: HIRES FROM EXPORTERS, CONDITIONAL ON WORKFORCE COMPOSITION

	Log[1 + Hires from Exporters] (t)			
		IV	IV × Exp.	
	FE	FE (A)	FE (B)	FE, trend (C)
Predictor (t unless noted otherwise)	(1)	(2)	(3)	(4)
Indic.: Anticip. Exporter $(t+1)$	.119	4.772	2.048	1.748
instr. in (2)-(4)	(.005)*	(1.094)*	(.208)*	(.186)*
Indic.: Continue Exporting	.044	-.611	-.227	-.178
	(.010)*	(.157)*	(.033)*	(.029)*
Indic.: Start Exporting	.081	-.753	-.265	-.209
	(.007)*	(.198)*	(.039)*	(.035)*
Indic.: Quit Exporting	-.032	.294	.103	.086
	(.006)*	(.078)*	(.018)*	(.016)*
Rel. Employment Chg. ($t-1$ to t per t)	.002	-.0002	.0009	.001
	(.0005)*	(.0005)	(.0004)*	(.0004)*
Log Employment	.230	.137	.191	.197
	(.002)*	(.022)*	(.004)*	(.004)*
Share: High school education	.005	-.006	.0005	.002
	(.002)*	(.004)	(.002)	(.002)
Share: Tertiary education	-.025	-.027	-.026	-.025
	(.003)*	(.007)*	(.004)*	(.004)*
Share: Skilled blue-collar occ.	-.006	-.020	-.012	-.011
	(.002)*	(.006)*	(.003)*	(.003)*
Share: Other white-collar occ.	-.064	-.052	-.059	-.061
	(.004)*	(.008)*	(.005)*	(.005)*
Share: Techn. or supervis. occ.	.036	.041	.038	.038
	(.004)*	(.008)*	(.005)*	(.005)*
Share: Profess. or manag'l. occ.	.009	.049	.026	.023
	(.006)	(.016)*	(.008)*	(.007)*
Indic.: Affiliate of foreign MNE	.035	.104	.064	.060
	(.067)	(.117)	(.068)	(.064)
Indic.: High-skill firm	-.052	-.072	-.060	-.059
	(.002)*	(.006)*	(.003)*	(.002)*
Indic.: High-skill firm × Exporter	-.103	.116	-.012	-.027
	(.009)*	(.058)	(.017)	(.015)
Observations	1,199,490	1,199,490	1,199,490	1,199,490
F statistic (excluded IVs first stage)		7.75	57.78	60.80

Sources: SECEX and RAIS 1990-2001 (t: 1992-2000), manufacturing firms (subsectors IBGE 2-13).
Notes: Linear regressions, controlling for firm fixed effects, sector and year effects, and sectoral absorption; for linear sector trends in specification 4. Specifications 2, 3 and 4 use instrumented binary future exporter indicator (column 1 of Table C.5). Binary future exporter indicator represents firms that start exporting at $t+1$ or that continue exporting at $t+1$; current export status as defined in Table 1. Workforces on December 31st. F statistics for the joint zero effect of IVs on the first stage from Table C.5. Robust standard errors, clustered at the firm level, in parentheses; asterisk marks significance at 1-percent level.

Table B.2: HIRES FROM EXPORTERS, CONDITIONAL ON WORKFORCE SKILL CHANGES

	Log[1 + Hires from Exporters] (t)			
		IV	IV × Exp.	
	FE	FE (A)	FE (B)	FE, trend (C)
Predictor ($t-1$ to t per t unless noted)	(1)	(2)	(3)	(4)
Indic.: Anticip. Exporter $(t+1)$	.112	4.701	1.982	1.687
instr. in (2)-(4)	(.005)*	(1.137)*	(.207)*	(.186)*
Rel. empl. chg.: High school educ.	.002	-.001	.0006	.0008
	(.002)	(.001)	(.001)	(.001)
Rel. empl. chg.: Tertiary educ.	.004	-.0003	.003	.003
	(.001)*	(.002)	(.001)	(.001)
Rel. empl. chg.: Skilled blue-collar occ.	.005	.001	.003	.004
	(.0006)*	(.001)	(.0005)*	(.0005)*
Rel. empl. chg.: Other white-collar occ.	.007	.003	.005	.006
	(.003)	(.002)	(.003)	(.003)
Rel. empl. chg.: Techn. or supervis. occ.	.007	.004	.006	.006
	(.002)*	(.002)	(.002)*	(.002)*
Rel. empl. chg.: Prof. or manag'l. occ.	.020	.003	.013	.014
	(.002)*	(.005)	(.002)*	(.002)*
Observations	1,199,490	1,199,490	1,199,490	1,199,490
F statistic (excluded IVs first stage)		7.00	56.12	59.27

Sources: SECEX and RAIS 1990-2001 (t: 1992-2000), manufacturing firms (subsectors IBGE 2-13).

Notes: Linear regressions, controlling for firm fixed effects, sector and year effects, and sectoral absorption as well as workforce and MNE control variables as in Table 5; for linear sector trends in specification 4. Specifications 2, 3 and 4 use instrumented binary future exporter indicator. Workforce changes between December 31st of two consecutive years. Omitted workforce categories: Primary school education and Unskilled blue-collar occupations. Additional workforce and MNE control variables as in Table B.1. Binary future exporter indicator represents firms that start exporting at $t+1$ or that continue exporting at $t+1$. F statistics for the joint zero effect of IVs on the first stage (full first-stage results available upon request). Robust standard errors, clustered at the firm level, in parentheses; asterisk marks significance at 1-percent level.

Table C.1: FOREIGN DEMAND, FUTURE EXPORT-MARKET PARTICIPATION BY REGION

	Export Status by Region ($t+1$)		
	São Paulo state	South/ SouthEast	North/NorthEast CenterWest
Instrument (t)	(1)	(2)	(3)
A: Sectoral Foreign Imports by Region, no trend (IV)			
Non-Brazil Imports in OIN (t)	-.223	.027	.002
	(.051)*	(.036)	(.017)
Non-Brazil Imports in WEU (t)	.032	-.001	-.0005
	(.010)*	(.009)	(.004)
Non-Brazil Imports in NAM (t)	-.022	-.018	.004
	(.013)	(.011)	(.005)
Observations	1,199,227	1,199,227	1,199,227
F statistic	9.83	1.55	0.58
B: Sectoral Foreign Imports $\times$ Exporter Status, no trend (IV $\times$ Exp.)			
Non-Brazil Imports WW (t) $\times$ Cont. Exp. (t)	-.037	-.040	-.010
	(.005)*	(.005)*	(.002)*
Non-Brazil Imports WW (t) $\times$ Start. Exp. (t)	.003	-.057	-.015
	(.006)	(.005)*	(.002)*
Non-Brazil Imports WW (t) $\times$ Quit. Exp. (t)	-.042	.013	.008
	(.005)*	(.005)*	(.002)*
Observations	1,199,227	1,199,227	1,199,227
F statistic	42.88	59.63	26.69
C: Sectoral Foreign Imports $\times$ Exporter Status, with sector trend (IV $\times$ Exp.)			
Non-Brazil Imports WW (t) $\times$ Cont. Exp. (t)	-.037	-.041	-.011
	(.005)*	(.005)*	(.002)*
Non-Brazil Imports WW (t) $\times$ Start. Exp. (t)	.003	-.058	-.016
	(.006)	(.005)*	(.002)*
Non-Brazil Imports WW (t) $\times$ Quit. Exp. (t)	-.042	.013	.008
	(.005)*	(.005)*	(.002)*
Observations	1,199,227	1,199,227	1,199,227
F statistic	44.40	60.10	26.98

Sources: SECEX and RAIS 1990-2001 (t: 1992-2000), manufacturing firms (subsectors IBGE 2-13).
Notes: Linear regressions, controlling for firm fixed effects, sector and year effects, and sectoral absorption, panel C also controlling for linear sector trends. Binary future exporter indicator represents firms in a given region that start exporting at $t+1$ or that continue exporting at $t+1$; future and current export status as defined in Table 1. Non-Brazilian imports in Other Industrialized countries (OIN), Western European countries (WEU), North American countries (NAM excluding Mexico), and worldwide (WW excluding Latin America and Caribbean). Additional regressors: current export status, workforce characteristics and MNE indicator as in Table 5. Robust standard errors, clustered at the firm level, in parentheses; asterisk marks significance at 1-percent level.

Table C.2: FOREIGN DEMAND AND FUTURE EXPORT-MARKET PARTICIPATION, SIZE

	Export Status ($t+1$)	Employment ($t+1$)
Instrument (t)	(1)	(2)
A: Sectoral Foreign Imports by Region, no trend (IV)		
Non-Brazil Imports in OIN (t)	-.193	-.693
	(.059)*	(.263)*
Non-Brazil Imports in WEU (t)	.031	.007
	(.013)	(.056)
Non-Brazil Imports in NAM (t)	-.037	-.185
	(.017)	(.073)
Observations	1,199,490	1,199,490
F statistic	7.76	14.62
B: Sectoral Foreign Imports $\times$ Exporter Status, no trend (IV $\times$ Exp.)		
Non-Brazil Imports WW (t) $\times$ Cont. Exp. (t)	-.087	-.501
	(.006)*	(.029)*
Non-Brazil Imports WW (t) $\times$ Start. Exp. (t)	-.069	-.321
	(.008)*	(.030)*
Non-Brazil Imports WW (t) $\times$ Quit. Exp. (t)	-.020	-.088
	(.007)*	(.028)*
Observations	1,199,490	1,199,490
F statistic	64.24	102.58
C: Sectoral Foreign Imports $\times$ Exporter Status, with sector trend (IV $\times$ Exp.)		
Non-Brazil Imports WW (t) $\times$ Cont. Exp. (t)	-.089	-.504
	(.006)*	(.029)*
Non-Brazil Imports WW (t) $\times$ Start. Exp. (t)	-.070	-.323
	(.008)*	(.030)*
Non-Brazil Imports WW (t) $\times$ Quit. Exp. (t)	-.022	-.090
	(.007)*	(.027)*
Observations	1,199,490	1,199,490
F statistic	67.62	105.54

Sources: SECEX and RAIS 1990-2001 (t: 1992-2000), manufacturing firms (subsectors IBGE 2-13).
Notes: Linear regressions, controlling for firm fixed effects, sector and year effects, and sectoral absorption, panel C also controlling for linear sector trends. Binary future exporter indicator represents firms that start exporting at $t+1$ or that continue exporting at $t+1$; future and current export status as defined in Table 1. Non-Brazilian imports in Other Industrialized countries (OIN), Western European countries (WEU), North American countries (NAM excluding Mexico), and worldwide (WW excluding Latin America and Caribbean). Additional regressors: current export status, workforce characteristics and MNE indicator as in Table 5. Robust standard errors, clustered at the firm level, in parentheses; asterisk marks significance at 1-percent level.

Table C.3: FOREIGN DEMAND AND FUTURE EXPORT-MARKET PARTICIPATION AT $t+2$

	Export Status (t+2)		
	Continuous	Start	Quit
Instrument (t)	(1)	(2)	(3)
A: Sectoral Foreign Imports by Region, no trend (IV)			
Non-Brazil Imports in OIN (t)	.166	.032	.066
	(.056)*	(.054)	(.052)
Non-Brazil Imports in WEU (t)	-.090	-.003	-.075
	(.012)*	(.013)	(.012)*
Non-Brazil Imports in NAM (t)	-.239	-.122	-.056
	(.017)*	(.017)*	(.015)*
Observations	1,035,386	1,035,386	1,035,386
F statistic	191.28	41.44	66.32
B: Sectoral Foreign Imports × Exporter Status, no trend (IV × Exp.)			
Non-Brazil Imports WW (t) × Cont. Exp. (t)	-.251	-.038	.0007
	(.007)*	(.005)*	(.006)
Non-Brazil Imports WW (t) × Start. Exp. (t)	-.094	-.044	-.042
	(.007)*	(.006)*	(.008)*
Non-Brazil Imports WW (t) × Quit. Exp. (t)	-.053	-.059	-.032
	(.004)*	(.007)*	(.006)*
Observations	1,035,386	1,035,386	1,035,386
F statistic	402.52	39.04	22.09
C: Sectoral Foreign Imports × Exporter Status, with sector trend (IV × Exp.)			
Non-Brazil Imports WW (t) × Cont. Exp. (t)	-.242	-.032	.010
	(.007)*	(.005)*	(.006)
Non-Brazil Imports WW (t) × Start. Exp. (t)	-.089	-.040	-.036
	(.007)*	(.006)*	(.008)*
Non-Brazil Imports WW (t) × Quit. Exp. (t)	-.047	-.055	-.025
	(.004)*	(.007)*	(.006)*
Observations	1,035,386	1,035,386	1,035,386
F statistic	373.91	31.37	20.29

Sources: SECEX and RAIS 1990-2001 (t: 1992-2000), manufacturing firms (subsectors IBGE 2-13).
Notes: Linear regressions, controlling for firm fixed effects, sector and year effects, and sectoral absorption, panel C also controlling for linear sector trends. Future exporter indicators represents firms that start exporting at t+2, continue exporting at t+2, or quit exporting at t+2; future and current export status as defined in Table 1. Non-Brazilian imports in Other Industrialized countries (OIN), Western European countries (WEU), North American countries (NAM excluding Mexico), and worldwide (WW excluding Latin America and Caribbean). Additional regressors: current export status, workforce characteristics and MNE indicator as in Table 5. Robust standard errors, clustered at the firm level, in parentheses; asterisk marks significance at 1-percent level.

Table C.4: FOREIGN DEMAND AND FUTURE EXPORT-MARKET PARTICIPATION AT $t+3$

	Export Status ($t+3$)		
	Continuous	Start	Quit
Instrument (t)	(1)	(2)	(3)
A: Sectoral Foreign Imports by Region, no trend (IV)			
Non-Brazil Imports in OIN (t)	.527	.277	.135
	(.064)*	(.050)*	(.055)
Non-Brazil Imports in WEU (t)	-.186	-.117	-.044
	(.014)*	(.014)*	(.014)*
Non-Brazil Imports in NAM (t)	-.258	-.040	-.161
	(.022)*	(.021)	(.021)*
Observations	872,537	872,537	872,537
F statistic	209.71	87.31	81.96
B: Sectoral Foreign Imports × Exporter Status, no trend (IV × Exp.)			
Non-Brazil Imports WW (t) × Cont. Exp. (t)	-.317	-.031	-.025
	(.008)*	(.006)*	(.006)*
Non-Brazil Imports WW (t) × Start. Exp. (t)	-.098	-.069	-.089
	(.007)*	(.006)*	(.008)*
Non-Brazil Imports WW (t) × Quit. Exp. (t)	-.064	-.057	-.085
	(.006)*	(.007)*	(.007)*
Observations	872,537	872,537	872,537
F statistic	512.75	49.53	67.15
C: Sectoral Foreign Imports × Exporter Status, with sector trend (IV × Exp.)			
Non-Brazil Imports WW (t) × Cont. Exp. (t)	-.304	-.024	-.014
	(.008)*	(.006)*	(.006)
Non-Brazil Imports WW (t) × Start. Exp. (t)	-.091	-.065	-.083
	(.007)*	(.006)*	(.008)*
Non-Brazil Imports WW (t) × Quit. Exp. (t)	-.056	-.053	-.078
	(.006)*	(.007)*	(.007)*
Observations	872,537	872,537	872,537
F statistic	478.49	43.81	59.25

Sources: SECEX and RAIS 1990-2001 (t: 1992-2000), manufacturing firms (subsectors IBGE 2-13).
Notes: Linear regressions, controlling for firm fixed effects, sector and year effects, and sectoral absorption, panel C also controlling for linear sector trends. Future exporter indicators represents firms that start exporting at $t+3$, continue exporting at $t+3$, or quit exporting at $t+3$; future and current export status as defined in Table 1. Non-Brazilian imports in Other Industrialized countries (OIN), Western European countries (WEU), North American countries (NAM excluding Mexico), and worldwide (WW excluding Latin America and Caribbean). Additional regressors: current export status, workforce characteristics and MNE indicator as in Table 5. Robust standard errors, clustered at the firm level, in parentheses; asterisk marks significance at 1-percent level.

Table C.5: FOREIGN DEMAND AND FUTURE EXPORT-MARKET PARTICIPATION, CONDITIONAL ON WORKFORCE COMPOSITION

	Exporter	Export Status ($t+1$)		
	($t+1$)	Continuous	Start	Quit
Instrument (t)	(1)	(2)	(3)	(4)
A: Sectoral Foreign Imports by Region, no trend (IV)				
Non-Brazil Imports in NAM (t)	-.038	.013	-.051	-.002
	(.017)	(.011)	(.015)*	(.013)
Non-Brazil Imports in OIN (t)	-.189	-.122	-.068	.068
	(.060)*	(.039)*	(.052)	(.044)
Non-Brazil Imports in WEU (t)	.031	.005	.026	-.026
	(.013)	(.009)	(.012)	(.010)*
Observations	1,199,490	1,199,490	1,199,490	1,199,490
F statistic	7.75	3.43	6.33	3.95
B: Sectoral Foreign Imports $\times$ Exporter Status, no trend (IV $\times$ Exp.)				
Non-Brazil Imports WW (t) $\times$ Cont. Exp. (t)	-.084	-.038	-.046	.037
	(.006)*	(.006)*	(.004)*	(.005)*
Non-Brazil Imports WW (t) $\times$ Start. Exp. (t)	-.063	-.009	-.054	.032
	(.008)*	(.005)	(.006)*	(.007)*
Non-Brazil Imports WW (t) $\times$ Quit. Exp. (t)	-.022	-.008	-.015	-.018
	(.007)*	(.003)*	(.006)	(.006)*
Observations	1,199,490	1,199,490	1,199,490	1,199,490
F statistic	57.78	13.60	49.33	29.53
C: Sectoral Foreign Imports $\times$ Exporter Status, with sector trend (IV $\times$ Exp.)				
Non-Brazil Imports WW (t) $\times$ Cont. Exp. (t)	-.085	-.039	-.047	.041
	(.006)*	(.006)*	(.004)*	(.005)*
Non-Brazil Imports WW (t) $\times$ Start. Exp. (t)	-.064	-.010	-.054	.034
	(.008)*	(.005)	(.006)*	(.007)*
Non-Brazil Imports WW (t) $\times$ Quit. Exp. (t)	-.023	-.009	-.015	-.016
	(.007)*	(.003)*	(.006)	(.006)*
Observations	1,199,490	1,199,490	1,199,490	1,199,490
F statistic	60.8	15.24	49.39	31.69

Sources: SECEX and RAIS 1990-2001 (t: 1992-2000), manufacturing firms (subsectors IBGE 2-13).
Notes: Linear regressions, controlling for firm fixed effects, sector and year effects, and sectoral absorption, panel C also controlling for linear sector trends. Binary future exporter indicator represents firms that start exporting at $t+1$ or that continue exporting at $t+1$; future and current export status as defined in Table 1. Non-Brazilian imports in Other Industrialized countries (OIN), Western European countries (WEU), North American countries (NAM excluding Mexico), and worldwide (WW excluding Latin America and Caribbean). Additional regressors: current export status, workforce characteristics, MNE indicator and absorption as in Table B.1. F statistics for the joint zero effect of the IVs. Robust standard errors, clustered at the firm level, in parentheses; asterisk marks significance at 1-percent level.

References

Álvarez, Roberto, and Ricardo A. López. 2005. "Exporting and Performance: Evidence from Chilean Plants." *Canadian Journal of Economics*, 38(4): 1384–1400.

Álvarez, Roberto, and Ricardo A. López. 2008. "Is Exporting a Source of Productivity Spillovers?" *Review of World Economics*, 144(4): 723–749.

Amiti, Mary, and Donald R. Davis. 2011. "Trade, Firms, and Wages: Theory and Evidence." *Review of Economic Studies*, 79(1): 1–36.

Aw, Bee Yan, Mark J. Roberts, and Daniel Yi Xu. 2011. "R&D Investment, Exporting, and Productivity Dynamics." *American Economic Review*, 101(4): 13121344.

Balsvik, Ragnhild. 2011. "Is Labor Mobility a Channel for Spillovers from Multinationals? Evidence from Norwegian Manufacturing." *Review of Economics and Statistics*, 93(1): 285–97.

Bazzi, Samuel, Naércio Aquino Menezes-Filho, and Marc-Andreas Muendler. 2014. "Labor Reallocation in Response to Trade Reform." University of California, San Diego, unpublished manuscript.

Bernard, Andrew B., and J. Bradford Jensen. 1995. "Exporters, Jobs, and Wages in U.S. Manufacturing: 1976-1987." *Brookings Papers on Economic Activity: Microeconomics*, 1995(1): 67–112.

Bernard, Andrew B., and J. Bradford Jensen. 1997. "Exporters, Skill Upgrading, and the Wage Gap." *Journal of International Economics*, 42(1-2): 3–31.

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

Bernard, Andrew B., and Joachim Wagner. 1997. "Exports and Success in German Manufacturing." *Review of World Economics/Weltwirtschaftliches Archiv*, 133(1): 134–57.

Bernard, Andrew B., J. Bradford Jensen, and Peter K. Schott. 2009. "Importers, Exporters, and Multinationals: A Portrait of Firms in the U.S. that Trade Goods." In *Producer Dynamics: New Evidence from Micro Data*. Vol. 68 of *Studies in Income and Wealth*, , ed. Timothy Dunne, J. Bradford Jensen and Mark J. Roberts, Chapter 14, 513–552. Chicago:University of Chicago Press.

Brambilla, Irene, Daniel Lederman, and Guido Porto. 2012. "Exports, Export Destinations, and Skills." *American Economic Review*, 102(7): 3406–38.

Brooks, Eileen L. 2006. "Why Don't Firms Export More? Product Quality and Colombian Plants." *Journal of Development Economics*, 80(1): 160–78.

Burstein, Ariel, and Jonathan Vogel. 2012. "International Trade, Technology, and the Skill Premium." UCLA, unpublished manuscript.

Bustos, Paula. 2011. "Trade Liberalization, Exports, and Technology Upgrading: Evidence on the Impact of MERCOSUR on Argentinian Firms." *American Economic Review*, 101(1): 30440.

Cameron, A. Colin, Jonah B. Gelbach, and Douglas L. Miller. 2008. "Bootstrap-Based Improvements for Inference with Clustered Errors." *Review of Economics and Statistics*, 90(3): 414–27.

Clerides, Sofronis K., Saul Lach, and James R. Tybout. 1998. "Is Learning by Exporting Important? Micro-dynamic Evidence from Colombia, Mexico, and Morocco." *Quarterly Journal of Economics*, 113(3): 903–47.

Coşar, A. Kerem, Nezih Guner, and James Tybout. 2011. "Firm Dynamics, Job Turnover, and Wage Distributions in an Open Economy." *IMDEA Working Paper*, 2011/06.

Costantini, James A., and Marc J. Melitz. 2008. "The Dynamics of Firm-Level Adjustment to Trade Liberalization." In *The Organization of Firms in a Global Economy*. , ed. Elhanan Helpman, Dalia Marin and Thierry Verdier, Chapter 4, 107–141. Cambridge, Mass.:Harvard University Press.

Crespi, Gustavo, Chiara Criscuolo, and Jonathan Haskel. 2008. "Productivity, Exporting and the Learning-by-Exporting Hypothesis: Direct Evidence from U.K. Firms." *Canadian Journal of Economics*, 41(2): 619–638.

Davidson, Carl, Steven J. Matusz, and Andrei Shevchenko. 2008. "Globalization and Firm Level Adjustment with Imperfect Labor Markets." *Journal of International Economics*, 75(2): 295–309.

Davidson, Russell, and James G. MacKinnon. 2010. "Wild Bootstrap Tests for IV Regression." *Journal of Business and Economic Statistics*, 28(1): 128–144.

Davis, Donald R., and James Harrigan. 2011. "Good Jobs, Bad Jobs, and Trade Liberalization." *Journal of International Economics*, 84(1): 26–36.

Dixit, Avinash K. 1989. "Hysteresis, Import Penetration, and Exchange Rate Pass-Through." *Quarterly Journal of Economics*, 104(2): 205–28.

Egger, Hartmut, and Udo Kreickemeier. 2009. "Firm Heterogeneity and the Labor Market Effects of Trade Liberalization." *International Economic Review*, 50(1): 187–216.

Fajgelbaum, Pablo D. 2013. "Labor Market Frictions, Firm Growth, and International Trade." *NBER Working Paper*, 19492.

Feenstra, Robert C., Robert E. Lipsey, Haiyan Deng, Alyson C. Ma, and Hengyong Mo. 2005. "World Trade Flows: 1962-2000." *NBER Working Paper*, 11040.

Fortin, Nicole M., and Thomas Lemieux. 1997. "Institutional Changes and Rising Wage Inequality: Is There a Linkage?" *Journal of Economic Perspectives*, 11(2): 75–96.

Frías, Judith A., David S. Kaplan, and Eric A. Verhoogen. 2009. "Exports and Wage Premia: Evidence from Mexican Employer-Employee Data." Columbia University, unpublished manuscript.

Gershenberg, Irving. 1987. "The Training and Spread of Managerial Know-How, a Comparative Analysis of Multinational and Other Firms in Kenya." *World Development*, 15(7): 931–939.

Gomez-Mejia, Luis R. 1988. "The Role of Human Resources Strategy in Export Performance: A Longitudinal Study." *Strategic Management Journal*, 9(5): 493–505.

Görg, Holger, and Eric Strobl. 2005. "Spillovers from Foreign Firms through Worker Mobility: An Empirical Investigation." *Scandinavian Journal of Economics*, 107(4): 693–709.

Granger, Clive W.J. 1969. "Investigating Causal Relations by Econometric Models and Cross-spectral Methods." *Econometrica*, 37(3): 424–38.

Guadalupe, Maria. 2007. "Product Market Competition, Returns to Skill, and Wage Inequality." *Journal of Labor Economics*, 25(3): 439–74.

Harrigan, James, and Ariell Reshef. 2011. "Skill Biased Heterogeneous Firms, Trade Liberalization, and the Skill Premium." *NBER Working Paper*, 17604.

Helfat, Constance E., and Marvin B. Lieberman. 2002. "The Birth of Capabilities: Market Entry and the Importance of Pre-history." *Industrial and Corporate Change*, 11(4): 725–60.

Helpman, Elhanan, Oleg Itskhoki, and Stephen Redding. 2010. "Inequality and Unemployment in a Global Economy." *Econometrica*, 78(4): 1239–1283.

Helpman, Elhanan, Oleg Itskhoki, Marc-Andreas Muendler, and Stephen Redding. 2012. "Trade and Inequality: From Theory to Estimation." *NBER Working Paper*, 17991.

Iacovone, Leonardo, and Beata S. Javorcik. 2012. "Getting Ready: Preparation for Exporting." *CEPR Discussion Paper*, 8926.

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

Jaffe, Adam B., Manuel Trajtenberg, and Rebecca Henderson. 1993. "Geographic Localization of Knowledge Spillovers as Evidenced by Patent Citations." *Quarterly Journal of Economics*, 108(3): 577–98.

Krishna, Pravin, Jennifer P. Poole, and Mine Z. Senses. 2011. "Trade Liberalization, Firm Heterogeneity, and Wages: New Evidence from Matched Employer-Employee Data." *World Bank Policy Research Working Paper*, 5711.

Leonidou, Leonidas C., Constantine S. Katsikeas, and Dafnis N. Coudounaris. 2010. "Five Decades of Business Research into Exporting: A Bibliographic Analysis." *Journal of International Management*, 16(1): 7891.

López, Ricardo A. 2009. "Do Firms Increase Productivity in Order to Become Exporters?" *Oxford Bulletin of Economics and Statistics*, 71(5): 621–642.

Manasse, Paolo, and Alessandro Turrini. 2001. "Trade, Wages, and 'Superstars'." *Journal of International Economics*, 54(1): 97–117.

Menezes-Filho, Naércio Aquino, Marc-Andreas Muendler, and Garey Ramey. 2008. "The Structure of Worker Compensation in Brazil, with a Comparison to France and the United States." *Review of Economics and Statistics*, 90(2): 324–346.

Mincer, Jacob. 1974. *Schooling, experience, and earnings.* New York:Columbia University Press for the National Bureau of Economic Research.

Minondo, Asier. 2011. "Learning to Export with New Managers." *Empirical Economics Letters*, 10(1): 7–11.

Mion, Giordano, and Luca David Opromolla. 2014. "Managers' Mobility, Trade Performance, and Wages." *Journal of International Economics*, 94(1): 85–101.

Monte, Ferdinando. 2011. "Skill Bias, Trade, and Wage Dispersion." *Journal of International Economics*, 83(2): 202–218.

Moretti, Enrico. 2004. "Workers' Education, Spillovers, and Productivity: Evidence from Plant-Level Production Functions." *American Economic Review*, 94(3): 656–90.

Parrotta, Pierpaolo, and Dario Pozzoli. 2012. "The Effect of Learning by Hiring on Productivity." *RAND Journal of Economics*, 43(1): 167–85.

Poole, Jennifer P. 2013. "Knowledge Transfers from Multinational to Domestic Firms: Evidence from Worker Mobility." *Review of Economics and Statistics*, 95(2): 393–406.

Rhee, Yung Whee. 1990. "The Catalyst Model of Development: Lessons from Bangladesh's Success with Garment Exports." *World Development*, 18(2): 333–46.

Sala, Davide, and Erdal Yalcin. 2012. "Export Experience of Managers and the Internationalization of Firms." University of Southern Denmark Odense, unpublished manuscript.

Schank, Thorsten, Claus Schnabel, and Joachim Wagner. 2007. "Do Exporters Really Pay Higher Wages? First Evidence from German Linked Employer-Employee Data." *Journal of International Economics*, 72(1): 52–74.

Stock, James H., Jonathan H. Wright, and Motohiro Yogo. 2002. "A Survey of Weak Instruments and Weak Identification in Generalized Method of Moments." *Journal of the American Statistical Association*, 20(4): 51829.

Trefler, Daniel. 2004. "The Long and Short of the Canada-U.S. Free Trade Agreement." *American Economic Review*, 94(4): 870–95.

Van Biesebroeck, Johannes. 2005. "Exporting Raises Productivity in Sub-Saharan African Manufacturing Firms." *Journal of International Economics*, 67(2): 373–91.

Verhoogen, Eric A. 2008. "Trade, Quality Upgrading, and Wage Inequality in the Mexican Manufacturing Sector." *Quarterly Journal of Economics*, 123(2): 489–530.

Yeaple, Stephen R. 2005. "A Simple Model of Firm Heterogeneity, International Trade, and Wages." *Journal of International Economics*, 65(1): 1–20.