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Preparing for Export Opportunities*

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Abstract

This paper investigates how firms prepare their workforce to export. We employ a novel identification strategy to isolate how a firm's hiring decision at home responds to export opportunities that arise from exogenous changes to product demand abroad. Combining Brazilian exporter and linked employer–employee data, we show that firms act on better chances to export by hiring workers with prior experience at exporting firms. We find that firms concentrate this preparatory hiring of experts in skilled blue-collar occupations and that firms separate from the previously hired experts when the predicted export-market participation fails to materialize. The evidence is consistent with the tenet that a few exporting experts in select occupations shape 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

The extent to which a firm participates in export markets depends on investments and product upgrades that are made in preparation to exporting (e.g., López 2009, Iacovone and Javorcik 2012). The question arises whether firms also prepare their workforce to participate in export markets and, if so, what type of worker ability is most demanded in preparation to export. Theoretical arguments suggest that firms build up their workforce for export-market entry (Coşar, Guner and Tybout 2016, Fajgelbaum 2020). We provide direct evidence in support of these arguments.

We study how firms prepare their workforces in response to an export opportunity. Such opportunities may arise for non-exporters, prompting them to pursue entry, for current exporters seeking expansion into new destinations, or for incumbent exporters targeting new customer segments in existing destinations. We show that, when confronted with a favorable change in foreign product market conditions, firms actively prepare to export by recruiting *experts*—workers with previous experience at other exporters. We combine administrative exporter data with linked employer-employee data for the universe of formal Brazilian manufacturing firms to identify such experts in any occupation. To study firms' active preparations for export-market participation we use current trade flows from source countries other than Brazil to major potential export destinations as instrumental variables (IVs). The instruments strongly predict concurrent and future export-market participation of Brazilian firms, and a firm's predicted export status in turn spurs the preparatory hiring of experts. We document that the preparatory hiring is concentrated among skilled blue collar workers who may carry with them transferable production and design knowledge acquired at other exporting firms. The results support the idea that exporters actively build workforce expertise in preparation for export-market participation and are consistent with the premise that worker mobility spreads export-relevant knowledge through the economy.

We start the analysis by describing features of successful exporters in Brazil. Subsequently, we leverage insights from this descriptive analysis to design an empirical strategy to identify expert hiring in preparation for export opportunities. First, we show that Brazilian exporters largely differ in exporting performance. The most successful exporters ship, on average, 16 times as much as the marginal in-out switching exporter, and they employ four times as many workers. Second, we document that a ranking of Brazilian exporters by persistence of export-market participation closely mirrors a mono-

tonic ranking based on firm exports and employment. Third, in line with existing evidence (e.g., Bernard and Jensen 1997, Trefler 2004, Harrigan and Reshef 2015), we show that the vast performance heterogeneity between Brazilian exporters is not clearly reflected in conventional workforce characteristics such as education or occupation. Finally, we show that, conditioning on a comprehensive set of controls, the most successful exporters are consistently more likely to hire workers from another exporter than the least successful exporters—in line with the idea that perpetual success in seizing shifting export opportunities through expert recruitment may predict exporter persistence.

These empirical patterns inform our empirical strategy in three ways. First, in line with the final fact—that a worker's previous experience at an exporting firm is particularly salient at poaching firms—we define a worker as an *expert* if the worker's immediately preceding formal employment in any occupation was at an exporter. Measures of expert recruitment at the extensive and intensive margins are our main outcome variables of interest. Second, when it comes to the choice of an instrument that predicts export market participation, the persistence of export status suggests that elements of a firm's information set, such as foreign trade flows, are candidate covariates of future export market participation. Third, when it comes to the selection of an exogenous instrument, the persistence of export capabilities over time requires an instrument to be clear of lasting firm-level components to preserve validity. We therefore use industry-level imports into destinations outside of Latin American and Caribbean countries as instruments to predict a Brazilian firm's export status.[1] The only firm-specific attribute of the instrument is the affiliation of a firm with an industry, which we make time invariant by fixing a firm's industry in the year of first observation.

Our panel data allow us to simultaneously condition on a rich set of worker, firm and industry characteristics, including firm and year fixed effects, industry-level trends that control for the evolution of domestic and foreign market conditions, employment composition and industry-level domestic absorption, which controls for time varying local market conditions. The identification strategy picks up export preparations in economically stable times: we can causally relate the hiring of experts to a firm's endogenous export-market participation, as predicted by exogenous non-Brazilian trade flows into foreign destinations.

[1] Latin American and Caribbean countries account for the largest share of Brazilian exports and migration flows. We therefore exclude non-Brazilian imports in these countries from the set of instruments to address the concern that product demand in Latin America and Caribbean countries may simultaneously affect export demand and the availability of experts in Brazil.

Our instrumental-variable approach shows that an increase in the probability of export market participation causes significantly more expert hires from other exporters. The effects are sizeable at the extensive and at the intensive margins of expert hiring. Specifically, we estimate that an increase of 10 percentage points in the probability of export-market participation translates into an increase of 22 percentage points in the probability of hiring an expert, compared to an average of 19 percent. Conditional on hiring away at least one worker from an exporter, a 10 percentage-point increase in the probability of export-market participation leads to an increase of 17 percent in the number of hires from exporters.

We document that this preparatory expert hiring is concentrated among skilled blue-collar workers, reminiscent of recent similar findings for blue-collar expert hiring within French business groups (Cestone et al. 2023).[2] Among the skilled blue-collar occupations for manufacturing are tool preparers and machine operators in assembly-line production, computer numeric control machine operators, and occupations in numerous specific crafts. A possible explanation for the result is that skilled production workers carry with them transferrable production knowledge and design expertise previously honed at an exporter that are important for export market participation. In line with this argument, survey evidence indicates that two out of the three most recurrent business practices among successful exporters are the design of products to meet specific demand in foreign markets and the set of production practices that raise product quality, which both rely on skilled blue collar labor (Artopoulos, Friel and Hallak 2013). In line with existing studies on the effect of labor market conditions on export performance (e.g., Mion, Opromolla and Sforza 2023, Meinen et al. 2022), we also find that the previous hire of a manager with exporting experience is associated with the subsequent poaching of skilled blue-collar workers from exporters, suggesting that managers with exporter experience are important mediators for expert recruitment.

A corollary of our maintained hypothesis is that firms for which foreign product market conditions predict a high probability of export-market participation, but which subsequently fail to become exporters, should let go the recently poached experts. Our results show that unexpectedly unsuccessful exporters indeed separate from most of the recently hired experts.

These findings shed light on the importance of portable expertise beyond educational and occupa-

[2]We divide workers across occupations based on the five main occupation categories under the internationally common ISCO-88 classification. For details on this classification see Table A.3.

tional worker skills in shaping a firm's global competitive advantage. Learning by hiring allows firms to take advantage of favorable product-market conditions abroad through the recruitment of experts with export-specific skills. Firms are not just fortuitous beneficiaries of a skilled worker pool, they actively engage in the poaching of experts in preparation to seize export opportunity, consistent with targeted search for relevant skill.

Our paper relates to several strands of the literature. Research into firm-level preparations for export-market entry documents varying aspects of readiness. López (2009) invokes Granger causality and argues that capital investment precedes export entry. Iacovone and Javorcik (2012) show that soon-to-be exported products receive a domestic price premium one year prior to export entry, consistent with advance quality upgrading. Aw, Roberts and Xu (2011) structurally estimate a model of innovation and export entry and find that productivity gains result from investments in innovation in conjunction with exporting. Our paper documents preparation for export opportunities through worker recruitment.

Trade theory for heterogeneous firms explains how the employment of skilled workers or matching of workers to employers relates to export status. One line of research considers competitive labor markets (Manasse and Turrini 2001, Yeaple 2005, Verhoogen 2008, Bustos 2011, Monte 2011, Burstein and Vogel 2017, Furusawa, Konishi and Tran 2020), and another line analyzes search and matching frictions combined with efficiency wages or wage bargaining (Davidson, Matusz and Shevchenko 2008, Egger and Kreickemeier 2009, Helpman, Itskhoki and Redding 2010, Davis and Harrigan 2011, Amiti and Davis 2012). Our empirical design considers the targeted hiring of experts with specific exporting expertise, related to search and screening for unobserved ability similar to Helpman et al. (2017). Those are static frameworks.

Preparatory hiring prior to export-market participation, as in our empirical design, speaks to a dynamic setting. The substantive literature on firm-level export dynamics has largely set aside labor-market frictions (for a survey see Alessandria, Arkolakis and Ruhl 2021), but job-to-job transitions under frictions are important to explain anticipatory hiring. Coşar, Guner and Tybout (2016) combine firm dynamics and labor search to analyze labor-market institutions and trade openness. Most closely related to our empirical design is Fajgelbaum (2020) who studies export participation and employment growth under search frictions. Both Coşar, Guner and Tybout (2016) and Fajgelbaum (2020)

show that firms gradually build up employment prior to export-market entry, but abstract from heterogeneous workforce skills. Ma, Muendler and Nakab (2023) allow for learning-by-exporting in the presence of job-to-job transitions but lack closed-form solutions to inform a non-structural empirical design. By modelling firms with perfect foresight, Fajgelbaum (2020) obtains close-form solutions for special cases that relate preparatory hiring and poaching to future export-market entry similar to our approach. Beyond the theoretical focus on export-market entry, our empirical approach also permits the expansion of current exporters into new destinations or, within destinations, to new customer segments.

Empirical evidence and theoretical arguments indicate that firms learn about export demand while exporting (Crespi, Criscuolo and Haskel 2008), or from neighboring firms that export (Fernandes and Tang 2014), and that this learning reduces the costs associated with entering a new export market (e.g., Albornoz et al. 2012, Morales, Sheu and Zahler 2019). This evidence suggests that workers develop export-specific skills while employed at exporting firms. In line with this argument, recent research shows that the labor-market presence of managers with prior experience at other exporters improves a recruiting firm's export performance (Mion and Opromolla 2014, Mion, Opromolla and Sforza 2023, Meinen et al. 2022). The findings indicate that export-specific skills matter and, importantly, that they are portable from firm to firm. The existing evidence lends itself to the interpretation that favorable labor supply conditions, and the availability of managers with export experience in particular, facilitates export performance.

Our paper broadens the perspective to workers in any occupation and with any skill, and poses the reverse question as to how favorable product market conditions abroad translate into a firm's labor demand for expertise at home. Complementary to our export-market perspective, Cestone et al. (2023) document in the context of domestic product market opportunities that French business groups target their internal hiring at technical managers and skilled blue-collar workers for expansions. In the context of export markets, Davidson et al. (2014, 2020) study economy-wide labor-market outcomes and document that trade openness can raise match efficiency, cross-industry mobility, and career mobility along the job ladder.[3] Our paper provides firm-level evidence of a preparing-to-export

[3]Results for exporter responses to large-scale trade liberalization are mixed. Trefler (2004) detects no response of the educational workforce composition at Canadian exporters under the Canada-US Free Trade Agreement, whereas Bustos (2011) finds that Argentine firms employ more educated workers after the MERCOSUR agreement reduces tariffs in regional export markets. Findings are similarly mixed for major exchange rate shocks. Verhoogen (2008) argues

mechanism through which trade openness induces worker mobility. Related to the literature on demand for observed skills and product-market conditions (see for example Guadalupe 2007 and the survey by Fortin and Lemieux 1997), we provide evidence that typically unobserved ability, inferable from a worker's career trajectory, influences employment opportunities.

The remainder of the paper is organized as follows. We describe the data in Section 2 and document differences among exporters in Section 3. In Section 4 we present our conceptual approach and identification strategy. In Section 5 we turn to the empirical analysis of recruitment in response to foreign product market conditions. Section 6 offers concluding remarks.

2 Data

We combine data from three main sources. First, we use the universe of Brazilian exporters: a three-dimensional panel data set by firm, destination country and year. Second, we match these exporter data to the universe of formal firms and their formally employed workers: a three-dimensional linked employer-employee panel by firm, worker and year. Third, we combine the former two data sources with worldwide trade flows by industry to construct instrumental variables (IVs) for export status. Data from these three sources are jointly available for the years 1994 to 2009. To exclude potentially distortive effects of the Great Recession on trade and labor markets, we concentrate our analysis on the time period 1994-2007.

2.1 Exporter data

SECEX exporter data derive from the universe of Brazilian customs declarations for merchandise exports by any firm collected by Secretaria de Comércio Exterior (2014). Export values (fob) are reported in current USD. We deflate values to August 1994 when the Brazilian Real was introduced. Following the literature, we restrict the sample to firms in the manufacturing sector (see, e.g., Bernard

that Mexican exporters upgraded workforce skills, as reflected in wages, after the Peso devaluation in 1995, while Frías et al. (2018) support 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 instrumental variables isolate exporter responses during ordinary times.

and Jensen 1995, Clerides, Lach and Tybout 1998, Brooks 2006) using the firms' declared industry affiliation in the linked employer–employee data. We relegate additional details on the SECEX data to Appendix A.1.

2.2 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 (Ministério do Trabalho e Emprego 2015). The records cover 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 workers' earnings. We use annualized December wages deflated to August 1994 and express them in USD. There are 72 million worker-year observations for employment spells at 490,444 manufacturing firms (2,773,097 firm-year observations).[4] We provide additional detail on RAIS in Appendix A.2. Given the large sample size we report statistical significance at the 0.1 percent, 1 percent and 5 percent levels for regressions.

Matching the SECEX customs information to the RAIS records, we find 30,044 manufacturing firms that export in at least one sample year (135,805 exporter-year observations). These manufacturing exporters account for around five percent of formal manufacturing firms.[5] In terms of employment, manufacturing exporters account for 47 percent of Brazilian formal manufacturing employment during the sample period.

We trace a firm's hired worker back to the worker's previous 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 track the worker back to the last preceding formal-sector employment for up to three prior years and obtain the former employer's export status. This allows us to identify *hires from exporters* as acceding workers whose immediately

[4]Further restricting the sample to observations with a firm's annual employment change and two lags of employment levels in Section 5 reduces the sample size to 1,722,626 firm-year observations.

[5]Single-employee firms enter the RAIS records, explaining the apparently low share of exporters compared to data from other developing countries, which truncate firm samples at a minimum employment level of 10 or 20 employees. For the United States, Bernard et al. (2007) report that 18 percent of firms in the US Census of Manufactures self-declare exports but the figure includes indirect exporters shipping through intermediating firms. Indirect exporters are not counted as exporters in customs record matches.

preceding formal-sector employment during up to three past years was at an exporter (and, for a robustness exercise, to identify hires from non-exporters in a similar way). For these workers we also extract information on their occupation in the prior employment distinguishing among five ISCO-88 categories: professional or managerial occupations, technical or supervisory occupations, other white-collar, skilled blue-collar and unskilled blue-collar occupations (see Appendix Table A.3).

In some of our specifications, we also track workers into the future. Specifically, 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.

2.3 Worldwide trade flows by industry

For the instrumental variable approach of Section 4, we use imports into foreign destinations from source countries other than Brazil by 3-digit ISIC subsector. The import data come from the World Trade Flow (WTF) dataset on bilateral trade flows between 1994 and 2007 (Feenstra et al. 2005).[6] We consider seven destination groups: Asia-Pacific Developing (APD) countries, Central and Eastern European countries (CEE), Latin America and Caribbean countries (LAC), North American countries (NAM excluding Mexico), Other Developing countries (ODV), Other Industrialized countries (OIN), and Western European countries (WEU).[7] We link WTF imports by destination, region and industry to firm-level data from RAIS and SECEX based on the ISIC industry classification. In what follows we refer to a 3-digit ISIC category as an industry. Price indexes for imported goods are not recorded separately in Brazil, so we cannot use import-specific deflators. To account for changes in prices of imported goods, we include in our empirical specifications year fixed effects and industry-level trends.

[6] To concord 4-digit SITC (Rev. 2) industries in WTF with 3-digit ISIC (Rev. 2) industries we construct a comprehensive concordance, available at *econweb.ucsd.edu/muendler/html/resource.html#sitc2isic*. For additional details on the preparation of the WTF data for the analysis see Hanson, Lind and Muendler (2015).

[7] Online Supplement S5 presents the list of countries that belong to each destination group in the period 1994-2007.

Table 1: EXPORT STATUS ORDERING

Export status	Export period $t-2$	$t-1$	t	Firm-year observations (1)	Workers per firm (2)	Annual exports (3)
Non-Exporter						
Permanent non-exporter[a]	0	0	0	2,473,841	11.211	
Current non-exporter[a]	0	0	0	124,847	52.364	
Export Quitters						
Past quitter	1	0	0	15,675	69.781	
In-out switcher	0	1	0	11,632	64.628	
Recent quitter	1	1	0	11,297	87.157	
Export Starters						
Recent starter	0	0	1	25,129	88.484	379.080
Re-entrant	1	0	1	5,156	111.606	232.190
Past starter	0	1	1	17,876	121.875	1,050.618
Continuous Exporters	1	1	1	87,644	340.556	6,086.939

[a]Permanent non-exporters do not export in any sample year; current non-exporters export in at least one sample year.

Notes: Universe of 2,773,097 manufacturing firm-year observations. Exports (fob) in thousands of August-1994 USD and deflated using the U.S. consumer price index.

Source: SECEX 1994 through 2007 (t: 1996-2007), manufacturing firms (ISIC rev. 2 300-400).

3 Exporter Types and Workforce Characteristics

In this section we analyze the main features of successful exporters. The descriptive analysis will inform the choice of the empirical model to study hiring decisions in preparation for export opportunity.

3.1 Exporter heterogeneity in an intertemporal perspective

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 then record in which of the three years a firm was an exporter with at least one reported shipment ($2^3 = 8$ possible combinations). We first order firms by current-year export status (t), within current-year status by past-year 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). Table 1 shows our resulting ranking of export success, with the category in the upper-most row reporting the least successful exporters (permanent non-exporters) and the lower-most row containing the most successful exporters (continuous exporters).

These export-status categories clarify that there is considerable heterogeneity not just between exporters and non-exporters but also among exporters in participation over time as well as in terms of workforce sizes and export values. Table 1 shows that our lexicographic ranking of export-market participation over time is almost perfectly mirrored in the firms' cross-sectional ranking by employment (column 2) and annual exports (column 3). For example, permanent non-exporters have an average size of eleven workers, in-out switchers who recently quit exporting employ 64 workers, recent export starters employ 88 workers, while continuous exporters employ 341 workers on average. This employment size monotonicity is preserved for all but one pair of adjacent rows.[8]

The observation counts in Table 1 show that the vast majority of formal-sector manufacturing firms (roughly 90 percent) never exports in any year between 1994 and 2007. The 86,765 firms that quit or start exporting make up approximately half of all firms that export in at least one year between 1994 and 2007 but account for only 5.2 percent of all export sales. Continuous exporters ship close to 95 percent of Brazilian exports and employ approximately four in five exporter workers and two-fifths of all Brazilian manufacturing workers.[9] The evidence in Table 1 documents that export success is persistent over time at the dominant exporters, prompting us to search for instrumental variables that do not require firm-level variation. Moreover, in all regressions in Sections 4 and 5 we condition on export status with one and two lags to control for this persistence.

3.2 Exporter heterogeneity in a cross-sectional perspective

Table 2 reports summary statistics for the universe of manufacturing firms in the cross section. The evidence confirms substantive heterogeneity among exporters under cross-sectional measures of export success such as a firm's destination count (a measure of market reach) and the value of exports per destination (a measure of market penetration). Compared to firms that start exporting, continuous exporters serve 2.7 times (about one log unit) more destinations and have 4.6 times (about one-and-a-half log units) larger exports per destination. The heterogeneity in size among exporters previously shown in Table 1 is also reflected in the employment means of Table 2. To capture aspects of job turnover, Table 2 also reports employment changes over time and the average job destruction (the

[8] About 36 percent of manufacturing exporters are starters; they account for five million worker-year observations out of a total of 34 million in manufacturing and command 5 percent of export sales.

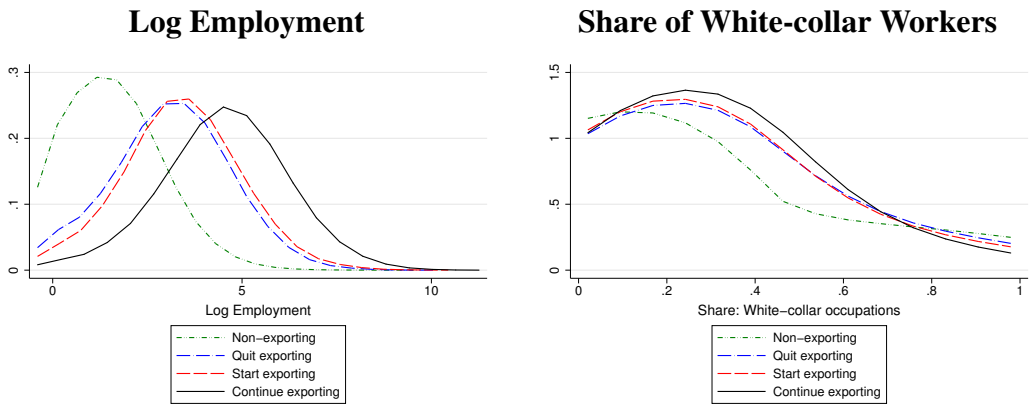
[9] For a breakdown of export-market participation and employment by industry, see Table A.1 in the Appendix.

Table 2: SUMMARY STATISTICS

	All firms	Exporters (t)	Exporters ($t+1$)	Export Status (t)		
				Continuous	Start	Quit
	(1)	(2)	(3)	(4)	(5)	(6)
Foreign-market participation						
Indic.: Exporter	.049	1.000	.795	1.000	1.000	.000
Indic.: Anticip. Exporter ($t+1$)	.050	.810	1.000	.902	.647	.197
Log # Destinations	1.044	1.044	1.220	1.402	.392	
Log Exports/Destination	3.669	3.669	3.995	4.218	2.660	
Size						
Employment	25.938	256.436	251.149	340.556	103.353	73.313
Log Employment	1.759	4.126	4.120	4.528	3.395	3.120
Employment change ($t-1$ to t)	.531	3.348	5.741	1.153	7.640	-3.566
Job destruction rate	.248	.268	.257	.261	.280	.301
Job creation rate	.264	.278	.288	.247	.335	.253
Job turnover rate	.256	.273	.272	.254	.308	.277
Workforce characteristics						
Share: Unskilled blue-collar occupation	.130	.167	.161	.170	.161	.154
Share: Skilled blue-collar occupation	.612	.542	.549	.538	.548	.542
Share: White-collar occupation	.258	.291	.291	.291	.290	.304
Share: Primary school education	.645	.556	.569	.547	.574	.590
Share: High school education	.316	.335	.325	.335	.335	.324
Share: Tertiary education	.038	.108	.107	.118	.091	.086
Workforce background						
Gross Hires from Exporters	1.137	13.481	13.438	15.224	10.310	2.765
Indic.: Hires from Exporters	.190	.673	.684	.721	.586	.455
Log Gross Hires from Exporters	.737	1.683	1.675	1.834	1.345	1.046
Share: Hires from Exporters (in total hires)	.151	.503	.509	.540	.436	.334
Observations	2,773,097	135,805	127,033	87,644	48,161	38,604

Notes: Exporters at t (column 2) and $t+1$ (column 3) include firms that export at time t or $t+1$, respectively. Continuous exporters (column 4), export starters (column 5) and export quitters (column 6) are defined as in Table 1. The variables *Ind.: Exporter* and *Indic.: Anticip. Exporter ($t+1$)* are binary indicators that take a value of one if a firm exports at t or $t+1$ respectively, and zero otherwise. The variable *Indic.: Hires from Exporters* is a binary indicator that takes a value of one if a firm at time t hires a worker with preceding employment at an exporter, and zero otherwise. Workforces on December 31st. The *Job destruction rate* is the number of separations during year t divided by employment on December 31st of t. The *Job creation rate* is the number of hires during year t divided by employment on December 31st of t. The *Job turnover rate* is the average of *Job destruction rate* and *Job creation rate* in year t. Exports (fob) in thousands of August-1994 USD and deflated using the U.S. consumer price index.
Sources: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

number of separations in year t relative to end-of-year employment), creation (the number of hires in year t relative to end-of-year employment) and turnover rates (the average of job destruction and job creation rate in a firm-year). Exporters grow their workforces 6 times faster than the average firm and, among exporters, the starters grow 7 times faster than continuing exporters while quitters shrink. Job destruction, creation and turnover rates are relatively similar between exporters and non-exporters.



Note: Export status as defined in Table 1. Workforces on December 31st. Epanechnikov kernels with bandwidths .4 (employment) and .2 (white-collar occupations).
Sources: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

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

Among exporters, however, quitters tend to have higher job destruction rates while starters tend to have higher job construction rates.

Perhaps surprisingly, the wide disparity in employment size and growth among exporters is not reflected in substantial differences in workforce composition. The most prevalent occupation in manufacturing, skilled blue-collar work, is performed by around 54 percent of workers at exporters regardless of the exporter's status in terms of export-market participation over time. Similarly, white-collar occupations are performed to a comparable degree across exporters, varying only between 29 and 30 percent. Finally, there is limited variation among exporters in terms of primary school educated workers (between 55 and 59 percent) or highly educated workers (between 9 and 12 percent).

Figure 1 confirms the findings of Table 2 beyond the mean values. We plot nonparametric estimates of densities for firm characteristics. In the left graph of the Figure, the kernel estimates for log employment confirms the marked size rankings from Table 1, 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 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 workforce compositions that are similar to those at less successful and smaller exporters.

Beyond skill and occupation categories, linked employer-employee data allow us to elicit aspects of the workforce background, including a worker's expert status from previous employment at an exporter. Table 2 shows substantive differences, not just between exporters and the average firm but also among exporters, in the frequency and scale of expert hiring. The share of expert hires in total hires is around one-in-seven at the average firm but half at exporters in general, more than half at continuous exporters and about one-third among export-market quitters. Relative to the firm's overall workforce size, the number of expert hires accounts for a limited share of employment, suggesting that a few such experts may shape a firm's competitive advantage.

In Online Supplement S1 we investigate differences among exporters conditional on sector, year fixed effects and other firm characteristics such as workers' tenure. We find results that are in line with Table 2 with continuous exporters that are substantially more likely to hire experts than starters or quitters conditional on firm and sector controls. Importantly, differences among exporters in occupational and educational characteristics are economically and statistically less stark compared to the marked discrepancies in experts' hiring.

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. Commonly observed workforce characteristics such as educational attainment and occupations, however, are quite similar among exporters despite substantive diversity in exporter size and performance. In contrast, the typically unobserved worker characteristic of a worker's prior experience at another exporting firm varies systematically among exporters. These descriptive facts inform our choice of empirical model for the analysis of hiring in preparation for export opportunities.

4 Identification

To causally isolate a firm's labor demand as the firm prepares to seize export-market opportunities in a dynamic decision problem, we turn to an identification strategy based on foreign product-market

conditions beyond a firm's control and independent of domestic labor-market conditions.

4.1 Conceptual considerations

Learning by hiring raises a firm's returns from sales in existing and new markets because the firm can bring technological knowledge to bear (Parrotta and Pozzoli 2012, Braunerhjelm, Ding and Thulin 2020, Poggi and Natale 2020), reach additional customers and penetrate export markets more deeply (Arkolakis 2010), or reduce marginal production costs or shipping costs to foreign markets (Bustos 2011). Conversely, additional demand in export markets can raise the firm's returns to employment, and the return to hiring an expert in particular. Product demand shocks are important contributors to firm performance, including exporter success (Foster, Haltiwanger and Syverson 2016, Arkolakis, Ganapati and Muendler 2021). Static firm-level models with trade can explain the origin of firm-level productivity in worker sorting (Yeaple 2005) and equilibrium matching of workers and firms (Davidson, Matusz and Shevchenko 2008, Helpman, Itskhoki and Redding 2010), but they are not intended to address employment adjustments over time and anticipatory hiring.

Three dynamic models of exporting consider multi-worker firms in a labor market with frictions: Coşar, Guner and Tybout (2016), Felbermayr, Impullitti and Prat (2018) and Fajgelbaum (2020). Only Fajgelbaum (2020) has job-to-job transitions. A recent fourth model by Ma, Muendler and Nakab (2023) allows for learning on the job in addition to on-the-job search.[10] Frictionless labor markets would generate instantaneous hiring at the time of a firm's discrete expansion in the product market. Coşar, Guner and Tybout (2016) allow for uncertainty because of firm-level productivity shocks and for vacancy posting at a size-dependent cost. Felbermayr, Impullitti and Prat (2018) show that convex adjustment costs generate a within-firm wage distribution because workers hired earlier in a firm's life cycle receive higher pay. Ma, Muendler and Nakab (2023) allow for uncertainty under foreign demand shocks and for worker heterogeneity. The common approach of the latter three papers is to quantify a parametric model for simulations. Fajgelbaum (2020), in contrast, chooses a deterministic setting in which firms have perfect foresight and decide on the age at which they enter the export

[10] Ritter (2015) analyzes multiple skill groups but adopts a setting with single-worker firms and no job-to-job transitions. Dix-Carneiro et al. (2021) add firm informality to Coşar, Guner and Tybout (2016). Elsby and Gottfries (2022) offer a tractable matching model under labor-market frictions with multi-worker firms and job-to-job transitions but do not allow for intertemporal firm decisions on export status or investment.

market (or choose to be perpetual non-exporters) and in which firms can raise the worker contact rate at a cost. Important for our context of worker poaching from incumbent exporters, Fajgelbaum (2020) can state closed-form solutions of optimality conditions for special cases. We therefore discuss our estimation approach in the context of the Fajgelbaum (2020) model. Unlike that model, we invoke uncertainty in our empirical specification.

4.2 Empirical model

We adopt an empirical model of the firm's employment and export decision under uncertainty in two steps. In the first step, a firm i observes export-market conditions z_{st} at time t in its industry or sector s. The firm uses the conditions z_{st} abroad to predict its own export-market participation x_{isT} for $T \geq t$, taking into account its characteristics and additional market conditions $\mathbf{y}_{ist}$. We assume that the foreign market conditions z_{st} affect a firm's choice of expert hiring only through its expected export-market participation, not through any domestic product or labor market effect. Below, we probe this assumption empirically and rule out candidates for alternative channels. In a dynamic model of firm choice under uncertainty, the state variables $\mathbf{y}_{ist}$ and z_{st} form the information set to predict export-market participation. The empirical model has in common with the deterministic model by Fajgelbaum (2020, equations (3.17) and (4.24)) that a larger return to exporting and a higher firm productivity relative to entry cost accelerate entry, thus raising the frequency of export-market participation at a given age.

For estimation of the first-step prediction, when the firm assesses its expected export-market participation, we use a linear probability model:

$$x_{isT} = z_{st}\gamma_z + \mathbf{y}'_{ist}\boldsymbol{\gamma}_y + \eta_{ist} \tag{1}$$

for $T \geq t$. We measure export-market conditions with a single variable z_{st} as industry-level imports into foreign destinations from source countries other than Brazil. Under empirically plausible conditions that we discuss in detail in the next subsection, the import volume in distant locations z_{st} provides exogenous variation in the probability of Brazilian export-market participation. Some existing studies use major macroeconomic shocks (such as real exchange rate devaluations) or large-scale policy changes (such as the elimination of trade barriers) to capture exogenous sources of variation

for export-market participation. Our approach allows us to analyze exporter behavior in ordinary times. Our instrument is therefore arguably less likely to capture concomitant general-equilibrium consequences that may be associated with economy-wide experiments.

We define export-market participation x_{isT} as an indicator of shipping to at least one destination abroad and do not discern individual destinations in our benchmark specification, for two main reasons. One reason is that a firm's choice of destinations is an endogenous outcome, so that segmenting the sample by conditioning on the destination choice would lead to biased estimates. The other reason is that considering export-market participation across all destinations allows us to account for potential knowledge spillovers within a firm between destinations, consistent with the evidence on export paths (e.g., Morales, Sheu and Zahler 2019). Hiring experts in response to favorable export market conditions in one destination abroad may allow a firm to also export to related destinations. By considering export market participation across all destinations we capture the totality of these responses.

To control for firm characteristics and market conditions, in this first step and the second subsequent step, we include in the estimation equations a comprehensive vector of controls $\mathbf{y}_{ist}$. In particular, we use firm fixed effects to condition on time-invariant firm characteristics. To account for the persistence of exporter performance that emerges from the analysis of Section 3, we include indicators for the firm's export status at $t-1$ and $t-2$, so we continue to capture a firm's export history as in Table 1. We include changes in general employment between $t-1$ and t, net of expert hires, to remove otherwise potentially confounding hiring effects. We add firm size as a control to account for the fact that larger employers export more frequently and, under proportionally larger employment turnover, may happen to hire more workers from exporters. To control for workforce composition we include employment shares by education and occupation categories and an indicator of a firm's high-skill intensity (an indicator for firm-year observations with employment shares of technical/supervisory and professional/managerial occupations in the top quintile).[11] To account for concomitant macroeconomic shocks and industry-level fluctuations of global product demand and supply, as well as trends in domestic labor market conditions including industry-level vacancy-filling rates, we include linear industry-level trends, year fixed effects and a measure of domestic absorption

[11] In a robustness check, we augment the baseline specification to include a measure of the stock of workers with exporting experience at a firm in year t and find similar results. We report the estimates in Appendix Table B.3.

(production plus imports less exports) at the industry level in our specification.[12] The importance of these market conditions for a firm's decisions is reflected in the deterministic export-market entry rule in Fajgelbaum (2020, equations (3.17) and (4.24)). We condition on a firm's foreign ownership to separate the effects of exports on expert hiring from those of multinational production.

In the second step, firm i uses its predicted export status $\hat{x}_{isT} = z_{st}\hat{\gamma}_z + \mathbf{y}'_{ist}\hat{\boldsymbol{\gamma}}_y$ from equation (1) to make hiring decisions h_{ist}:

$$h_{ist} = \hat{x}_{isT}\beta_x + \mathbf{y}'_{ist}\boldsymbol{\beta}_y + \epsilon_{ist} \tag{2}$$

for a single $T \geq t$. Our main hypothesis is that the coefficient β_x in equation (2) is strictly positive. When firms observe a favorable foreign import-demand shock, they expect a higher chance of exporting, and thus prepare their workforces. Existing models of firm-level dynamics with labor-market frictions do not allow for worker heterogeneity, so there is no direct counterpart to selective expert poaching in models to date. However, labor-market frictions in Fajgelbaum (2020) and Coşar, Guner and Tybout (2016, when making productivity draws permanent) imply that firms engage in preparatory hiring prior to export-market entry with gradual workforce expansions towards their optimal size under export status.

Informed by the descriptive evidence of Section 3, in our baseline specification we focus on the hiring of experts, whose immediately preceding formal employment was at an exporter. In a robustness check, we consider also the hiring of workers whose preceding employment is at a non-exporting firm. We consider hiring decisions at the extensive and at the intensive margins. For hiring decisions at the extensive margin, the dependent variable h_{ist} in equation (2) takes a value of one if firm i hires an expert (a worker from another exporter) in year t, and zero otherwise. At the intensive margin, h_{ist} is defined as the log number of hires of experts by firm i in year t and only exists for non-zero hires. We control for firm fixed effects, so our identifying variation hinges on within-firm changes in export-status predictions over time. These predictions can vary also among continuing exporters but are arguably starkest among firms that change export status.

The forward-looking behavior of firms, based on observed firm and industry conditions $\mathbf{y}_{ist}$ at time t, suggests that we can also use export-market participation x_{isT} in a future period $T > t$ in

[12] We construct industry-level trends as the interaction between a linear trend and industry dummies that take a value of one if firm i belongs to industry s and zero otherwise. Changes in foreign market demand for a product may induce firms to enter or exit a specific industry, so we link each firm exclusively to the first industry in which it appears in the administrative records.

equation (1) and its prediction $\hat{x}_{isT}$ in equation (2). We consider such specifications in our analysis with leads of predicted export status by one, two and three years—x_{ist+1}, x_{ist+2} and $x_{i,t+3}$—in combination with the same dependent variable h_{ist} at time t when the information on export-market conditions arrives, and the same right-hand side variables in equations (1) and (2). Our data are annual, while firms may make joint export-market participation and expert hiring decisions at shorter horizons of quarters or months, so we consider the concomitant timing within a year our benchmark specification with $T = t$.

Regardless of the exact timing, our two-step empirical exercise is predicated on the causal sequence that runs from a firm's observation of foreign market conditions now to the firm's predicted export status and then back to the firm's hiring decision now that matches the concurrent export-market information—hence our emphasis that expert hiring happens in preparation for export opportunity.

4.3 Export-market shocks as instruments

The descriptive analysis of Section 3 provides two important insights for the choice of potential instruments. First, the persistence of export status suggest that elements of a firm's information set, such as foreign trade flows, are likely drivers of export market participation. Second, the persistence of export capabilities over time requires the instrument to be unrelated to persistent firm-level characteristics to be valid. We therefore consider as candidate instruments z_{st} for export-market participation x_{isT} the observed trade flows of goods in industry s and year t into any group of destinations abroad, where imports can originate from any country in the world except from Brazil. We assign a firm to the industry in which it first appears in RAIS to address concerns about endogenous firm exit from or entry into an industry. Our empirical model has one endogenous variable x_{isT}, so we need exactly one instrument to be just identified.

To find an instrument from foreign import flows that predicts Brazilian firms' export status, we consider six country groups abroad (as described in section 2.3), offering six candidate IVs: Asia-Pacific Developing (APD) countries, 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 exclude from the set of potential instruments

non-Brazilian imports in Latin American and Caribbean countries (LAC). Due to their geographical proximity to Brazil, these countries account for a large share of Brazilian trade and migration flows. As a result, changes in product demand in LAC may simultaneously affect export demand and the availability of workers with exporting experience in Brazil, creating potential issues to the validity of the instrument.

Given the fast expansion of trade in the emerging economies of East Asia and in Eastern European transition economies during 1994-2007, the regions APD and CEE expectedly exert strong import demand growth. From 1994 to 2007, Brazil's real exports grew by a factor of 2.7 overall but by factors of 4.4 to APD and 3.7 to CEE. In 2007, Brazil shipped 15.4 percent of its exports to APD but only 1.6 percent to CEE. Relative to exports to ODV, which also grew at a fast pace in our sample period, exports to APD account for a larger share of overall exports (see Table S.6 in the Online Supplement). These observations make demand from the APD region the leading candidate for a relevant instrument in our setting.

To select instruments that are relevant, we first regress the export indicator x_{isT} on all six potential IVs and the vector of firm controls $\mathbf{y}_{ist}$. We find that only imports in Asia-Pacific Developing (APD) countries predict export-market participation of Brazilian firms during the sample period of interest (see Appendix Table B.1). Since imports in regions other than APD are not predictive of export status, we exclude those instruments from the analysis to avoid bias from weak instruments in over-identified models (see for instance Bekker 1994, Bound, Jaeger and Baker 1995 and Angrist and Kolesár 2023).[13] The fact that we only have one relevant instrument prevents us from estimating separate effects for continuous exporters, starters and quitters—such a specification would require at least one instrument for each type of export status.

Weak instruments can distort standard inference in IV models (for a recent survey see Andrews, Stock and Sun 2019). The statistical significance of an instrument in the first-stage based on t tests may not fully rule out a weak instrument problem (Lee et al. 2020), so we report with all our upcoming results the Anderson-Rubin Wald test and reduced-form estimates. In line with the high predictive power of APD imports for Brazilian firms' export market participation, the Wald test statistics and

[13] We obtain qualitatively similar results when we use all six potential instruments for export status. In that specification, however, five out of the six available instruments are insignificant in the first-stage regression, resulting in a weak instrument problem and potential bias in the second-stage estimates.

reduced-form estimates consistently reject the absence of an effect, thus mitigating concerns that standard inference may mislead.

Validity of our industry-level instrument requires that foreign market conditions in an industry and in destinations outside Latin America z_{st} must affect the hiring of experts h_{ist} in Brazil only through export market participation x_{isT}, conditional on other firm characteristics and domestic markets conditions $\mathbf{y}_{ist}$. One potential concern with the use of industry-level imports as an instrument is that expanding firms may endogenously launch products in industries that experience better foreign demand. Such industry-level changes would create a spurious correlation between a firm's employment growth and the instrument. We address this concern by assigning each firm to the industry in which it first appears in our data. The time invariant industry affiliation prevents the instrument from capturing potential shifts in a firm's main industry in response to trade shocks.

Another potential source of concern is the putative existence of industry-level global market trends that simultaneously affect the demand for experts in Brazil and the global import demand in an industry. To mitigate this concern we include in our specifications an extensive set of controls for industry-related effects. As mentioned, we condition on firm fixed-effects, which absorb unobserved time-invariant factors affecting the demand for experts, and we control for year effects and industry-level linear trends that capture time-varying factors jointly affecting demand for experts and global product markets. Finally, we control for absorption, which measures the domestic demand for an industry's products.

One concern with industry-level instruments may be that they might capture generic labor demand changes and therefore general hiring beyond the specific demand for experts. To assess this possibility, we present results from an additional set of regressions, in which we use our IV approach to estimate the effects of export-market participation on the hiring of workers from non-exporting firms. Non-exporters are arguably less likely to help their workers build export-market specific expertise. We find evidence that export-market participation shocks lead to a lower and often insignificant response on the hiring from non-exporters.

In general, the geographic distance of Asia-Pacific Developing (APD) countries to Brazil renders it unlikely that unobserved social or political factors jointly affect demand of experts in Brazil and the success of other countries than Brazil in shipping to APD. For a problem of reverse causality to

arise, expert hiring in Brazil would have to generate sizeable changes in global imports to the Asia-Pacific region. During our sample period, Brazil does not command a dominant fraction of trade flows into APD, with a share in total APD imports of 0.57 percent in 1994 and of 0.98 percent in 2007.[14] Moreover, if the mobility of experts in Brazil's labor market drove Brazilian export success in APD, the higher frequency of export status among Brazilian firms would displace other countries' exports and would therefore be negatively correlated with non-Brazilian imports into APD. In contrast, the correlation is strictly positive (Table B.1).

External migration, and the potential labor supply of experts through immigration (Andrews, Schank and Upward 2017), is a conceivable further concern for reverse causality. Our linked employer-employee data RAIS report the foreign nationality of workers who are not naturalized Brazilian. In the early sample years (from 1994-1997), for workers with a migration background from Asian countries we can only discern between Japanese nationals and workers from any other Asian country. However, inasmuch as immigrants from any Asian country may bring relevant expertise about APD countries to Brazil, the share of foreign nationals from any Asian country may be the relevant measure of labor supply with APD-related expertise. The share of Asian nationals, except from Japan, in the Brazilian workforce slightly increases from .003 percent in 1994 to .005 percent in 2007 and, when including Japanese nationals, from .035 percent in 1994 to .040 percent in 2007. The absolute numbers are small and do not clearly support the hypothesis that migrant stocks with APD expertise alter the local Brazilian labor supply of experts. Even in the absence of sizeable migration flows from Asian countries to Brazil, trade-related migration could be problematic if export market conditions in APD countries are affected by the availability of skilled foreign workers in Brazil through changes in migration to Brazil from countries outside of the APD region. The bulk of migration flows to Brazil is from other Latin American countries. Reassuringly, our baseline results are robust to excluding imports into APD countries from any Latin American country (not just from Brazil, see Appendix Table B.2). We conclude that external migration is unlikely to be a major concern for identification.

Table 3: FOREIGN DEMAND AND EXPORT-MARKET PARTICIPATION

	Exporter at time t		**Exporter at time $t+1$**	
Dependent Variable:	Entire Sample Indic. Exp. (t) (1)	Firms with hires>0 Indic. Exp. (t) (2)	Entire Sample Indic. Exp. ($t+1$) (3)	Firms with hires>0 Indic. Exp. ($t+1$) (4)
Log Non-Brazil Imports in APD	0.014*** (0.004)	0.042*** (0.008)	0.017*** (0.003)	0.041*** (0.007)
F-stat. excluded instrument	15.182	25.059	29.889	22.124
Partial R2 excluded instrument	7.74e-05	2.41e-04	9.42e-05	1.83e-04
Observations	1,722,626	281,465	1,542,882	249,419
Firm and year fixed effects	yes	yes	yes	yes
Industry-level linear trends	yes	yes	yes	yes

Notes: Each cell shows the coefficient from a separate regression. APD stands for Asia-Pacific Developing countries. All regressions include the following controls: firm and year effects, sectoral linear trends, employment changes between $t-1$ and t net of hires from exporters, contemporaneous and one-period lagged firm size, shares of worker by education (primary, secondary and tertiary) and occupation (unskilled blue-collar, skilled blue-collar and white-collar) categories, an indicator of a firm's high-skill intensity, an indicator of foreign ownership, one- and two-period lagged export status, and absorption. In the specification of this table in which we have one endogenous regressor and one instrument, the Kleibergen-Paap rk Wald F-statistic corresponds to the F-statistic of the excluded instrument. Standard errors in parentheses, clustered at the 3-digit ISIC subsector level. $^{*}p < 0.05$,$^{**}p < 0.01$,$^{***}p < 0.001$.
Sources: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

4.4 Foreign product-market shocks and export participation

The first-stage equation (1) shows the identification mechanism at work: the effect of foreign-to-foreign country trade flows on the probability of exporting by Brazilian firms. Table 3 reports results from estimating this linear probability model. There is no a-priori expected sign for the effect of APD imports from countries other than Brazil. A positive sign is consistent with favorable import demand conditions in APD countries 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 presence of large competing shipments by non-Brazilian exporters.

The consistently positive and statistically significant coefficients of Table 3 suggest that non-Brazilian shipments to Asia-Pacific Developing countries do not strongly displace Brazilian exports.[15]

[14] In select industries where Brazil has a strong comparative advantage, such as metal ore mining, the share of Brazil's shipments to APD in total APD imports can exceed 10 percent with a slight increase over the sample period.

[15] In Online Supplement S4 we break down Brazilian exports by industry and document that Brazil's dominant export industries also command most APD exports in our period of interest. Brazil's main export industries worldwide and to APD are primary consumption goods. In line with this fact, we find suggestive evidence of stronger first-stage effects among firms that manufacture consumption goods (see Online Supplement Table S.11).

This is the case for the sample of all firms (column 1), and the sub-sample of firms that hire at least one worker with export experience at an incumbent exporter (column 2).The coefficients of columns 3 and 4 indicate that imports into APD countries remain positively and significantly correlated with Brazilian export market participation in the following year, suggesting that there is persistence in the effects of foreign-demand on export-market participation. It is worth noting that in all specifications imports into APD countries strongly predict export-market participation of Brazilian firms, with an F-statistic larger than 15—in excess of the common critical value of 10 in applied work (Andrews, Stock and Sun 2019). We have a relevant instrument to analyze the domestic hiring decisions of Brazilian firms in response to favorable export-market conditions.

5 Hiring to Seize Export Opportunity

We now implement the identification strategy and turn to the analysis of firms' expert hiring in response to export-market opportunities.

5.1 Hiring away exporter workers

Table 4 presents the effects export-market participation on the hiring of experts at the extensive (columns 1 to 3) and intensive (columns 4 to 6) margin of hiring. We show IV estimates of equation (2) in columns 2 and 5, and the OLS counterpart without instrumentation in columns 1 and 4. Columns 3 and 6 present estimates from reduced-form (RF) regressions of the hiring of experts directly on the instrument. These specifications provide an additional way to query the presence of potentially weak instruments (Lee et al. 2020).

Panel A uses current export-market participation x_{isT} as the regressor for hiring, and Panel B future export-market participation $x_{is,t+1}$. While the timing of information and decisions in Panel B is closest to our conceptual considerations, in practice, firms may receive export-market information quarters or months rather than years in advance. We therefore consider within-year relations in Panel A the as the benchmark.

We report the Anderson-Rubin Wald test p-values in addition to the reduced-form regressions to assess significance in case instruments are weak despite favorable F statistics (Lee et al. 2020). For

Table 4: HIRES FROM EXPORTERS

Dependent Variable (t):	Indic. Hire			log(Hires)		
	OLS	IV	RF	OLS	IV	RF
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Exporter at time t						
Indic. Exporter (t)	0.028***	2.151***		0.041***	1.734**	
	(0.004)	(0.559)		(0.007)	(0.646)	
Log Non-Brazil Imports in APD			0.030***			0.073*
			(0.004)			(0.028)
F-stat. excluded instrument		15.182			25.060	
Anderson-Rubin Wald test p-value		8.15e-08			0.016	
Observations	1,722,626	1,722,626	1,722,626	281,465	281,465	281,465
Panel B: Exporter at time $t+1$						
Indic. Exporter ($t+1$)	0.036***	1.630***		0.042***	1.465*	
	(0.005)	(0.379)		(0.009)	(0.735)	
Log Non-Brazil Imports in APD			0.028***			0.059*
			(0.005)			(0.026)
F-stat. excluded instrument		29.889			22.124	
Anderson-Rubin Wald test p-value		4.32e-06			0.029	
Observations	1,542,882	1,542,882	1,542,882	249,419	249,419	249,419
Firm and year fixed effects	yes	yes	yes	yes	yes	yes
Industry-level linear trends	yes	yes	yes	yes	yes	yes

Notes: Binary exporter indicator represents firms that export at t in Panel A or at $t+1$ in Panel B. Each cell shows the coefficient from a separate regression. All regressions include the following controls: firm and year effects, sectoral linear trends, employment changes between $t-1$ and t net of hires from exporters, contemporaneous and one-period lagged firm size, shares of worker by education (primary, secondary and tertiary) and occupation (unskilled blue-collar, skilled blue-collar and white-collar) categories, an indicator of a firm's high-skill intensity, an indicator of foreign ownership, one- and two-period lagged export status, and industry-level absorption. Workforces on December 31st. First-stage results are presented in Table 3. In the specification of this table in which we have one endogenous regressor and one instrument, the Kleibergen-Paap rk Wald F-statistic corresponds to the F-statistic of the excluded instrument. Standard errors in parentheses, clustered at the 3-digit ISIC subsector level. $^{*}p<0.05,^{**}p<0.01,^{***}p<0.001$.
Sources: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

both Panels A and B, the Anderson-Rubin Wald test statistic and the reduced form estimates are in line with IV estimates, indicating that weak instruments are unlikely to be an issue. In all specifications, we cluster the standard errors at the industry level to account for correlated unobservables among firms in the same industry.[16]

In line with our hypothesis and conceptual considerations, Panel A shows that predicted export-market participation within the same calendar year statistically significantly and positively affects the

[16]Given the limited number of 29 clusters at the ISIC rev. 2 3-digit level, in Appendix Table B.6 we also present p-values from a wild bootstrap procedure that has been found to reduce over-rejection rates when the number of clusters is small (Cameron, Gelbach and Miller 2008, Davidson and MacKinnon 2010).

hiring of experts (former exporter workers) during the calendar year, both at the extensive margin of hiring (columns 1 and 2) and at the intensive margin (columns 4 and 5). The IV coefficients of column 2 imply that an increase of 10 percentage points in the probability of export-market participation translates into an increase of 22 percentage points in the probability of hiring an expert, compared to an average probability of 19 percent (see Table 2). Conditional on hiring at least one worker from an exporting firm, a 10 percentage-point increase in the probability of export-market participation leads to an increase of 17 percent in the number of hires from exporting firms (column 5). This increase corresponds to 0.36 extra hires for the average firm and approximately one extra hire for an average exporter. Conditional on hiring at least one former exporter worker, the average firm hires 2.09 workers (.737 log points), while the average exporter hires 5.38 workers (1.683 log points, see Table 2).[17]

In magnitude, coefficient estimates are strictly larger in the IV than in the OLS regressions. One explanation for the observed negative bias in OLS estimates is that OLS estimates capture the confounding effect of favorable firm-level productivity shocks, which prompt firms to access export markets while benefitting from labor savings in production. An additional factor contributing to the larger magnitude of IV estimates may be that the IV regressions measure the local average treatment effect of export-market participation on responding firms that are susceptible to favorable foreign demand conditions. In contrast, the OLS regressions measure the average effects on the universe of firms, including the bulk of never-exporting firms that are not susceptible to favorable foreign demand opportunities.

Panel B of Table 4 shows the estimated effects of predicted export participation one year in the future ($t + 1$) on the current hiring of workers from incumbent exporters. Similar to Panel A, the estimated effects are positive and statistically significant at the intensive and extensive margins of hiring. The evidence suggests that, in line with our conceptual considerations in Section 4.1, Brazilian firms begin to hire experts prior to the anticipated export-market opportunity. They do so most significantly at the extensive margin of hiring (column 2) while effects at the intensive margin are imprecisely estimated and only significant at a lower confidence level (column 5). This anticipatory behavior is

[17] In Table S.7 of the Online Supplement we break down the effects by Brazilian regions finding suggestive evidence of stronger effects in the Southern part of Brazil where the concentration of exporters, and consequently of exporting experts, is higher.

restricted to a one-year window. For later years ($t + 2$ and $t + 3$), the IV effects lose statistical significance and imports in APD hold limited predictive power on export decisions (see F statistics on the excluded instrument in Appendix Table B.5). Overall, the patterns are consistent with a waning effect of predicted export status the further into the future a firm's planning horizon extends.[18]

5.2 Hiring away exporter workers by occupation

When firms poach workers in preparation for exporting they may differentially target worker skills that are particularly valuable for export-market participation. To investigate this possibility more closely, in Table 5 we present the results from estimating equation (2) separately for the hiring of workers grouped by occupation at the previous employer. Earlier studies have shown that the hiring of general managers and high-wage workers is related to improved export-market performance (Mion and Opromolla 2014, Masso, Roigas and Vahter 2015, Mion, Opromolla and Sforza 2023, Meinen et al. 2022) but recent evidence also points to the importance of technical managers and skilled blue-collar workers for firm expansions (Cestone et al. 2023).

We use five main occupation categories under the internationally common ISCO-88 classification, to which we map the RAIS reported Brazilian occupation classification CBO for the period 1994-2007 (see Appendix Table A.3). In OLS regressions, the indicator of expert hires (column 1) is positively and statistically significantly associated with predicted export status for all occupations, but the log number of expert hires (column 3) is statistically significantly associated (at the 95-percent confidence level) with predicted exporting only for workers hired from skilled blue-collar occupations at the previous employer. This exclusive importance of experts in skilled blue-collar occupations carries through to the causal IV regressions (columns 2 and 4).[19] Expert hiring in preparation for export opportunity is exclusively concentrated among workers in skilled blue-collar occupations at the previous employer (Panel D), with statistically significant coefficients at the 99 and 99.9-percent confidence levels. We do not find a statistically significant relationship between predicted export participation and the hiring of workers in any other occupation, including managers and professional

[18] In line with the hypothesis that firms prepare for export opportunity by hiring disproportionately workers with region-specific export experience, we find suggestive evidence of greater effects on hires from firms that export to the APD region (see Table S.8 in the Online Supplement).

[19] The first-stage regressions are reported in Table S.9 of the Online Supplement.

Table 5: HIRES FROM EXPORTERS BY OCCUPATION

Dependent Variable (t):	Indic. Hire		log(Hires)	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Panel A: Hiring of exporter workers from professional or managerial occupations				
Indic. Exporter (t)	0.024***	0.210	0.018	-0.023
	(0.003)	(0.288)	(0.014)	(0.829)
F-stat. excluded instrument		15.182		3.501
Anderson-Rubin Wald test p-value		0.476		0.979
Observations	1,722,626	1,722,626	44,133	44,133
Panel B: Hiring of exporter workers from technical or supervisory occupations				
Indic. Exporter (t)	0.030***	0.323	0.018	-0.378
	(0.003)	(0.260)	(0.012)	(0.662)
F-stat. excluded instrument		15.182		6.156
Anderson-Rubin Wald test p-value		0.229		0.546
Observations	1,722,626	1,722,626	59,480	59,480
Panel C: Hiring of exporter workers from other white-collar occupations				
Indic. Exporter (t)	0.016***	0.327	0.008	-0.562
	(0.003)	(0.301)	(0.013)	(0.733)
F-stat. excluded instrument		15.182		6.410
Anderson-Rubin Wald test p-value		0.285		0.468
Observations	1,722,626	1,722,626	36,480	36,480
Panel D: Hiring of exporter workers from skilled blue-collar occupations				
Indic. Exporter (t)	0.024***	2.003***	0.024*	1.651**
	(0.004)	(0.546)	(0.009)	(0.617)
F-stat. excluded instrument		15.182		20.905
Anderson-Rubin Wald test p-value		2.08e-06		0.014
Observations	1,722,626	1,722,626	205,985	205,985
Panel E: Hiring of exporter workers from unskilled blue-collar occupations				
Indic. Exporter (t)	0.022***	0.692	0.0003	1.616
	(0.003)	(0.547)	(0.014)	(1.180)
F-stat. excluded instrument		15.182		6.574
Anderson-Rubin Wald test p-value		0.159		0.140
Observations	1,722,626	1,722,626	67,669	67,669
Firm and year fixed effects	yes	yes	yes	yes
Industry-level linear trends	yes	yes	yes	yes

Notes: Binary exporter indicator represents firms that export at t. Each cell shows the coefficient from a separate regression. All regressions include the following controls: firm and year effects, sectoral linear trends, employment changes between $t-1$ and t net of hires from exporters, contemporaneous and one-period lagged firm size, shares of worker by education (primary, secondary and tertiary) and occupation (unskilled blue-collar, skilled blue-collar and white-collar) categories, an indicator of a firm's high-skill intensity, an indicator of foreign ownership, one- and two-period lagged export status, and industry-level absorption. Workforces on December 31st. Reduced-form and first-stage results are presented in Online Supplement Tables S.2 and S.9 respectively. In the specification of this table in which we have one endogenous regressor and one instrument, the Kleibergen-Paap rk Wald F-statistic corresponds to the F-statistic of the excluded instrument. Standard errors in parentheses, clustered at the 3-digit ISIC subsector level. $^{*}p < 0.05,^{**}p < 0.01,^{***}p < 0.001$.
Sources: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

workers (Panels A, B, C, and E). The Anderson-Rubin Wald test p-values in Table 5, and the reduced-form estimates (reported separately in Online Supplement Table S.2), show significant effects only in skilled blue collar occupations and thus lend additional credibility to our IV estimation.

Among the skilled blue-collar occupations in the Brazilian occupation classification CBO are tool preparers and machine operators in assembly-line production, computer numeric control machine operators, and workers in numerous specific crafts. In contrast, marketing and sales related occupations in the CBO are considered white-collar technical activities. A literature in development economics that draws on case studies and interviews points to the relevance of foreign-market knowledge for export success but also to modern organization and management methods (e.g., Easterly and Reshef 2010), the importance of organizational capital in addition to the understanding of global market conditions (e.g., Sutton and Kpentey 2012), and the adoption of new business practices in product design, production processes and marketing (e.g., Gonzalez and Hallak 2013). Artopoulos, Friel and Hallak (2013) condense their interviews with successful Argentine export managers into three regularly adopted export business practices: (i) product practices by which exporters design products to meet demand in targeted foreign markets, (ii) production practices to raise quality and innovate the process techniques through improved management beyond novel equipment, and (iii) marketing practices that involve quality consistency and timely delivery as well as packaging in addition to advertising. Except for the marketing related activities, these business practices invariably involve tasks covered by skilled blue-collar occupations. Our evidence on hiring experts from skilled blue-collar occupations is therefore consistent with the reported regularities behind successful export business practices. Moreover, Muendler (2008) documents for the period of Brazil's trade reform in the 1990s that Brazil's expanding export industries with a comparative advantage are intensive in skilled blue-collar occupations. Recent evidence on hiring practices in French business groups by Cestone et al. (2023) suggests that skilled blue-collar workers are crucial also for manufacturing success in high-income countries. The knowledge that skilled blue-collar workers with exporter experience bring to bear on production can benefit the firm across multiple foreign destinations.

We further query the potential importance of exporter managers for firms' export-market participation, as documented in earlier research (Mion and Opromolla 2014, Masso, Roigas and Vahter 2015). We investigate the possible association between the poaching of skilled blue-collar (SBC)

Table 6: HIRES OF SKILLED BLUE-COLLAR WORKERS AND EXPORTER MANAGERS

Dependent Variable (t):	Indic. Hire SBC		log(Hires SBC)	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Panel A: Hiring workers from skilled blue-collar (SBC) occupations				
Indic. Exporter (t)	0.023***	2.004***	0.023*	1.655**
	(0.004)	(0.545)	(0.009)	(0.616)
Ind. Hire Exporter Manager ($t-1$)	0.051***	0.015	0.054***	0.042***
	(0.003)	(0.009)	(0.008)	(0.012)
F-stat. Export (t) inst.		15.010		20.797
Anderson-Rubin Wald test p-value		2.56e-06		0.014
Observations	1,722,626	1,722,626	205,985	205,985
Panel B: Hiring workers from skilled blue-collar (SBC) occupations, manager-exporter interaction				
Indic. Exporter (t)	0.024***	2.041***	0.018	1.679**
	(0.004)	(0.562)	(0.009)	(0.642)
Ind. Hire Exporter Manager ($t-1$)	0.053***	0.123*	0.039***	0.103
	(0.004)	(0.056)	(0.009)	(0.136)
Ind. Exporter (t) $\times$ Ind. Hire Exporter Manager ($t-1$)	-0.005	-0.245	0.027**	-0.113
	(0.005)	(0.140)	(0.009)	(0.262)
F-stat. interaction instr.		11.246		10.700
F-stat. Export (t) inst.		9.996		4.621
Kleibergen-Paap F-stat.		7.210		10.407
Anderson-Rubin Wald test p-value		1.25e-05		0.035
Observations	1,722,626	1,722,626	205,985	205,985
Firm and year fixed effects	yes	yes	yes	yes
Industry-level linear trends	yes	yes	yes	yes

Notes: Hires of exporter workers restricted to skilled-blue-collar occupations at previous employer. Binary exporter indicator represents firms that export at t. Each cell shows the coefficient from a separate regression. All regressions include the following controls: employment changes between $t-1$ and t net of hires from exporters, contemporaneous and one-period lagged firm size, shares of worker by education (primary, secondary and tertiary) and occupation (unskilled blue-collar, skilled blue-collar and white-collar) categories, an indicator of a firm's high-skill intensity, an indicator of foreign ownership, one- and two-period lagged export status, and industry-level absorption. Workforces on December 31st. Reduced-form and first-stage results are presented in Online Supplement Tables S.3 and S.10 respectively. Standard errors in parentheses, clustered at the 3-digit ISIC subsector level. $^{*}p < 0.05, ^{**}p < 0.01, ^{***}p < 0.001$.
Sources: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

workers and the presence of managers with export experience. We use the past hiring of exporter managers (the hiring of exporter managers one year prior) as a predictor of skilled blue-collar hiring from exporters. We also investigate the interaction of exporter managers' presence with export status as an additional predictor. Table 6 presents the results. In Panel A, we use imports into APD from countries other than Brazil as the single instrument to predict export status and find the preceding hiring of managers from incumbent exporters is associated with a greater number of hires of experts

in skilled blue collar occupations in the current period (column 4).[20] However, the presence of previously hired exporter managers is not a statistically significant correlate of expert poaching at the extensive hiring margin at conventional confidence levels (column 2). We further explore in Panel B whether the interaction of previously hired exporter managers with predicted export status, instrumented with the interaction between APD imports and an indicator for hired exporter managers, adds explanatory power to predicted expert hiring. There is no statistically significant evidence at conventional confidence levels that the interaction improves the fit (columns 2 and 4). Based on the results in Panel A, we conclude that the presence of exporter managers is associated with more poaching of skilled blue-collar workers from previous exporters.

5.3 Hiring away non-exporter workers

One potential source of concern is that our industry-level instrument may correlate with aggregate shifts in product demand (beyond year effects, industry-level trends and domestic absorption) so that the estimated effects on expert hires may reflect a generic increase in labor demand rather than an increase in demand of exporting skill. To investigate this hypothesis, in Table 7 we use our empirical model to estimate the effect of changes in export market conditions on hiring of workers from non-exporting firms. If the instrument captures only changes in export market opportunity, we expect to find lower or insignificant effects of export demand shocks on the hiring of workers from non-exporters.

Table 7 shows that export-market participation predicted with industry-level imports in APD countries has a lower and only marginally significant impact on hiring of workers from non-exporting firms at the extensive margin (column 2). Compared to the effects on hiring from exporters in Tables 4 and 5, the magnitude of the coefficients in Table 7 (column 2) is statistically significantly lower for hires from non-exporters. At the intensive margin (column 4), the effects on hiring from non-exporters is not statistically significantly different from zero at our consistently used levels of confidence across occupations (and statistically significant only at the 95-percent confidence level for the important skilled blue-collar occupations). Compared to the effects on hiring from exporters in Table 4, the magnitude of the coefficient in Table 7 (column 4) is lower for hires from non-exporters across all

[20]The first-stage regressions are reported in Table S.10 of the Online Supplement.

Table 7: HIRES FROM NON-EXPORTERS

Dependent Variable (t):	Indic. Hire		log(Hires)	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Panel A: Hiring of non-exporter workers				
Indic. Exporter (t)	0.015***	0.858*	-0.015*	0.723
	(0.003)	(0.344)	(0.007)	(0.458)
F-stat. excluded instrument		15.182		15.382
Anderson-Rubin Wald test p-value		0.015		0.078
P-value hiring exporters = hiring from non-exporters	0.001	0.012	6.25e-06	0.209
Observations	1,722,626	1,722,626	136,303	136,303
Panel B: Hiring of non-exporter workers from skilled blue-collar occupations				
Indic. Exporter (t)	0.012***	0.598*	-0.017	1.140*
	(0.003)	(0.264)	(0.009)	(0.554)
F-stat. excluded instrument		15.182		16.389
Anderson-Rubin Wald test p-value		0.036		0.007
P-value hiring from exporters = hiring from non-exporters	0.002	0.019	0.008	0.504
Observations	1,722,626	1,722,626	96,272	96,272
Firm and year fixed effects	yes	yes	yes	yes
Industry-level linear trends	yes	yes	yes	yes

Notes: Binary exporter indicator represents firms that export at t. Each cell shows the coefficient from a separate regression. All regressions include the following controls: firm and year effects, sectoral linear trends, employment changes between $t-1$ and t net of hires from exporters, contemporaneous and one-period lagged firm size, shares of worker by education (primary, secondary and tertiary) and occupation (unskilled blue-collar, skilled blue-collar and white-collar) categories, an indicator of a firm's high-skill intensity, an indicator of foreign ownership, one- and two-period lagged export status, and industry-level absorption. Workforces on December 31st. P-values of the difference between the effects on the hiring from exporters (Table 4 and 5) and the hiring from non-exporters (Table 7) are based on pooled IV regressions. Reduced-form and first-stage results are presented in Online Supplement Table S.4 and Table 3 respectively. In the specification of this table in which we have one endogenous regressor and one instrument, the Kleibergen-Paap rk Wald F-statistic corresponds to the F-statistic of the excluded instrument. Standard errors in parentheses, clustered at the 3-digit ISIC subsector level. $^{*}p < 0.05, ^{**}p < 0.01, ^{***}p < 0.001$.
Sources: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

occupations. Compared to Table 5 for skilled blue-collar occupations, the coefficient is again lower for hires from non-exporters.[21] These checks suggest that favorable export market conditions prompt prospective exporters to predominately poach workers from incumbent exporters.

5.4 Firing recent exporter hires upon unexpected export failure

Regression specifications so far offer evidence for the hypothesis that a firm hires away exporter workers when it can expect to realize export-market opportunities. A corollary of this hypothesis

[21] We do not find significant effects on the hiring of workers from non-exporters in other occupations.

Table 8: SEPARATIONS OF EXPORTER HIRES AT UNEXPECTEDLY UNSUCCESSFUL FIRMS

Dependent Variable ($t+1$):	Indic. Separation of experts (1)	log(Separations of experts) (2)
Panel A: Unsuccessful Exporters, *Pred. Ind. Exporter* above Median		
Pred. Indic. Exporter (t)	2.705***	5.364**
	(0.413)	(1.845)
Observations	765,651	122,401
Panel B: Unsuccessful Exporters, *Pred. Ind. Exporter* above 75th Percentile		
Pred. Indic. Exporter (t)	2.262***	4.700*
	(0.650)	(2.126)
Observations	335,274	83,341
Firm and year fixed effects	yes	yes
Industry-level linear trends	yes	yes

Notes: The predicted exporter status at t is estimated from equation (1). In Panel A we consider non-exporting firms at t with predicted exporter status strictly above the sample median, and in Panel B strictly above the 75th percentile. Each cell shows the coefficient from a separate regression. All regressions include the following controls: firm and year effects, sectoral linear trends, employment changes between $t-1$ and t net of hires from exporters, contemporaneous and one-period lagged firm size, shares of worker by education (primary, secondary and tertiary) and occupation (unskilled blue-collar, skilled blue-collar and white-collar) categories, an indicator of a firm's high-skill intensity, an indicator of foreign ownership, one- and two-period lagged export status, and industry-level absorption. Workforces on December 31st. The variable *Pred. Indic. Exporter (t)* is a generated regressor, so we bootstrap the standard errors. Standard errors from 50 bootstraps over both stages in parentheses. $^{*}p < 0.05,^{**}p < 0.01,^{***}p < 0.001$.
Sources: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

is that a firm in an industry with favorable foreign demand conditions, which predict a heightened probability of export-market participation, should lay off its currently poached hires from exporters if it unexpectedly fails to become an exporter.[22] To pursue this placebo-like treatment, we define *separations of exporter hires* as hires from exporters in the current year whose new employment terminates before December 31st of the following year. We then restrict the firm sample in two ways. First, we keep only those firm-observations whose predicted export indicator in year t from equation (1) 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 observed as non-exporters in the year. Second, we keep only firm observations with predicted export status above the 75th percentile in year t, and of those only the observed non-exporters in the year.

For each restricted sample of unexpectedly failing exporters, we replicate equation (2) and regress

[22] We thank Don Davis for this idea.

separations from current exporter hires at the extensive margin (an indicator of at least one separation of exporter hires at a firm) and at the intensive margin (the log number of separations of exporter hires) on the prediction of the firm's export status $\hat{x}_{isT}$ and the control variables.

Table 8 reports the results from OLS regression on predicted export status.[23] Results support our placebo-like corollary. Coefficient estimates on the exporting predictor are strictly positive and significant for separations at the extensive separation margin (column 1) and at the intensive separation margin (column 2). This evidence indicates that unexpectedly failing exporters let go recent exporter hires if the exporting predictor induced them to poach more exporter workers in the current year. This is the case for unexpectedly failing exporters above the median (Panel A) and above the 75th percentile of the predicted export probability (Panel B). Comparing the magnitude of the estimates in Table 8 to the hiring estimates for the same sample of firms suggests that unexpectedly failing exporters separate from between 50 and 65 percent of the recently poached experts.[24]

The results of Table 8, however, may reflect a general increase in separation rates at unsuccessful exporters rather than an increase in separations from workers with exporting skills. In order to discern effects between experts and hires from non-exporters, in Table 9 we replicate the analysis of Table 8 for separations of workers who were previously hired from non-exporting firms (non-experts). Consistent with the hypothesis that unsuccessful exporters separate from experts that are no longer needed, we find smaller and mostly insignificant effects on separation rates from non-experts at the extensive (column 1) and intensive (column 2) margins of firing.

5.5 Wage changes and hiring from exporters

In Table 10 we investigate whether workers hired in preparation for export opportunities earn higher salaries at the poaching firm. In particular, for every worker j who is hired from an exporter, we compute the difference in the log salary between the current job and the preceding one ($\ln w_{jt} - \ln w_{j,t-\tau}$). We then use the mean of this log salary difference among experts at each firm i as the dependent variable in our main regression equation (2). To determine the source of the wage increase,

[23] In this specification predicted export status is a generated regressor. We use 50 bootstraps to compute standard errors for the coefficient on the generated regressor.

[24] The coefficient ratios range between 52 percent under the specification in column 2 of Panel A and 62 percent in column 2 of Panel B (for a comparison see Appendix Table B.7).

Table 9: SEPARATIONS OF NON-EXPORTER HIRES AT UNEXPECTEDLY UNSUCCESSFUL FIRMS

Dependent Variable ($t+1$):	Indic. Separation of non-experts (1)	log(Separations of non-experts) (2)
Panel A: Unsuccessful Exporters, *Pred. Ind. Exporter* above Median		
Pred. Indic. Exporter (t)	0.904**	2.664
	(0.338)	(1.385)
P-value separations of experts = separations of non-experts	0.002	0.368
Observations	409,962	81,282
Panel B: Unsuccessful Exporters, *Pred. Ind. Exporter* above 75th Percentile		
Pred. Indic. Exporter (t)	-0.457	0.385
	(0.741)	(2.741)
P-value separations of experts = separations of non-experts	0.006	0.166
Observations	164,549	46,339
Firm and year fixed effects	yes	yes
Industry-level linear trends	yes	yes

Notes: The predicted exporter status at t is estimated from equation (1). In Panel A we consider non-exporting firms at t with predicted exporter status strictly above the sample median, and in Panel B strictly above the 75th percentile. Each cell shows the coefficient from a separate regression. All regressions include the following controls: firm and year effects, sectoral linear trends, employment changes between $t-1$ and t net of hires from exporters, contemporaneous and one-period lagged firm size, shares of worker by education (primary, secondary and tertiary) and occupation (unskilled blue-collar, skilled blue-collar and white-collar) categories, an indicator of a firm's high-skill intensity, an indicator of foreign ownership, one- and two-period lagged export status, and industry-level absorption. Workforces on December 31st. The p-values of the difference between estimates of separations from experts (Table 8) and separations from non-experts (Table 9) are based on pooled OLS regressions. Standard errors from 50 bootstraps over both stages in parentheses. $^{*}p < 0.05, ^{**}p < 0.01, ^{***}p < 0.001$.
Sources: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

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):[25] The first term $\boldsymbol{z_{jt}}'\hat{\boldsymbol{\vartheta}}_t$ captures the salary component that is explained by an expert's observable characteristics such as education, occupation, labor force experience, gender, and age. Then, we isolate the component of the salary that is explained by a plant fixed effect $\psi_{i(j)t}$. This component reflects both pure plant characteristics and unobserved characteristics of a plant's workforce, such as the average plant-worker match effect. Finally, we have the residual component ν_{jt}. We use the mean difference in each of these salary components among experts at a given firm i as the left-hand side variables in our main regression equation (2).

[25]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.

Table 10: LOG SALARY CHANGES FOR HIRES FROM EXPORTERS

	OLS	IV
	(1)	(2)
Panel A. Dependent Variable: Change in mean Log Salary		
Indic. Exporter (t)	0.004	0.779
	(0.005)	(0.642)
Anderson-Rubin Wald test p-value		0.261
Panel B. Dependent Variable: Change in mean Workers Observable Log Salary Component		
Indic. Exporter (t)	-0.002	0.109
	(0.002)	(0.213)
Anderson-Rubin Wald test p-value		0.609
Panel C. Dependent Variable: Change in mean Plant-fixed Log Salary Component		
Indic. Exporter (t)	0.009*	0.143
	(0.003)	(0.399)
Anderson-Rubin Wald test p-value		0.730
Panel D. Dependent Variable: Change in mean Log Salary Residual Component		
Indic. Exporter (t)	-0.004	0.527
	(0.004)	(0.454)
Anderson-Rubin Wald test p-value		0.289
F-stat. excluded instrument		24.936
Observations	192,941	192,941
Firm and year fixed effects	yes	yes
Industry-level linear trends	yes	yes

Notes: Log salary change is the difference between the current log salary (component) and the log salary (component) at the preceding exporter. Log salary components from Mincer (1974) regressions by year for the cross section of plants, decomposing the log salary into a worker observable component, a plant-fixed component, and an individual worker residual, and then averaging over current employer's hires from exporters. All regressions include the following controls: firm and year effects, sectoral linear trends, employment changes between $t-1$ and t net of hires from exporters, contemporaneous and one-period lagged firm size, shares of worker by education (primary, secondary and tertiary) and occupation (unskilled blue-collar, skilled blue-collar and white-collar) categories, an indicator of a firm's high-skill intensity, an indicator of foreign ownership, one- and two-period lagged export status, and industry-level absorption. Workforces on December 31st. Annualized December wages are deflated to August 1994 using the Brazilian consumer price index (INPC). Reduced-form and first-stage results are presented in Online Supplement Table S.5 and Table 3 respectively. In the specification of this table in which we have one endogenous regressor and one instrument, the Kleibergen-Paap rk Wald F-statistic corresponds to the F-statistic of the excluded instrument. Standard errors, clustered at the sector level, in parentheses. $^{*}p < 0.05, ^{**}p < 0.01, ^{***}p < 0.001$.
Sources: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

We find positive OLS effects of export-market participation on salaries of workers with previous export experience (column 1). These effects are driven by the fixed-plant component (with statistical significance at the 95-percent confidence level), indicating that the salary premium associated with exporting skill stems from the new employer's plant-wide pay. The existence of a plant-fixed effects in wages is consistent with surplus sharing between employer and workers (Helpman et al. 2017, Frías

et al. 2018). Our finding of an increase in the plant-fixed salary component is, in turn, consistent with a larger export surplus generated at the new employer, in excess of the previous employer's surplus. The result is also consistent with research that has documented the existence of a wage premium for managers with exporting skill (e.g., Mion and Opromolla 2014). When we use the more demanding IV model to isolate salary changes due to preparatory hiring, however, we do not find a statistically significant change in the plant-fixed salary component.[26]

5.6 Export knowledge versus experience at high productivity firms

Exporters are relatively more productive (see, e.g., Clerides, Lach and Tybout 1998). The analysis so far leaves open the question of whether firms prepare for export opportunity by hiring workers with previous experience at exporting firms as opposed to workers with experience at highly productive firms. To discern these two sources of worker expertise, in Appendix Table B.4 we augment our baseline specification to include controls for the number of hires from firms in each quintile of the productivity distribution in an industry and year.

Common measures of firm productivity, such as sales or value added per worker, are not available in RAIS. To proxy for firm productivity we use the plant fixed effect in wages ($\psi_{i(j)t}$) obtained from a Mincer log wage regression. These plant fixed wage effects strongly correlate with sales per employee in the sample of firms in RAIS that can be linked to manufacturing survey data that include sales (Menezes-Filho, Muendler and Ramey 2008). For multi-plant firms we take the average $\psi_{i(j)t}$ across plants to obtain a unique measure of productivity.

The coefficient for preparatory hiring from exporters in Table B.4 remains of similar magnitude and statistical significance once we condition on the number of hires from highly productive firms. This finding suggests that, when it comes to hiring in preparation to export, firms actively seek export knowledge rather than productivity-related expertise.

[26] In the Online Supplement (Table S.12) we report results from comparable regressions for salaries of non-experts, hired from non-exporters. We find a decline in the worker-characteristics component in linear predictions but no statistically significant effect in the IV model specifications.

6 Concluding Remarks

We combine firm-level export information with linked employer-employee data to track Brazilian manufacturing firms, their exports and individual workers over more than a decade. We document that more successful exporters tend to hire more experts—workers with previous work experience at exporting firms. To measure the extent of active workforce preparations for exporting, we use import demand for non-Brazilian goods in Asian-Pacific developing countries as an instrument. We find that firms hire former exporter workers in response to favorable demand conditions abroad and in preparation for expected export-market opportunity. This preparatory poaching of experts from exporters is concentrated among workers in skilled blue-collar occupations, suggesting that skills from these occupations can be particularly important for export market success in an emerging economy. Our results are consistent with the idea that firms actively contract a competitive workforce to add to their initial advantage, and then size export opportunities. Firms expect to learn by hiring and prepare for expected export-market opportunity through workforce upgrading. A firm's competitive advantage in this view is partly under its control, and firms share in an economy's knowledge pool through mobile workers.

These findings have implications for labor-market institutions and related policy. Legally induced labor market frictions, such as non-compete clauses and explicit or indirect impediments to hiring and firing, limit worker mobility and consequently the spread of valuable knowledge from firm to firm. In our specific context, barriers to worker mobility may reduce the firms' ability to recruit experts and hamper domestic firms' chances at successful competition abroad. The presence of portable skills, and the importance of worker mobility to promulgate them, can inform the design of labor market policies and related institutions.

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Appendix

A Data Appendix

A.1 SECEX export data

All export values in the SECEX exports data are reported in current US dollars (USD), free on board (fob). We have observations on exporting plants, declared export values and export destinations for the years 1990 through 2009. In our analysis we focus on the years 1994 through 2007 for which it is possible to link SECEX exports data to the other two sources of data that we use. We aggregate monthly plant-level export information to years and firms. We deflate export sales to their August-1994 equivalents using the monthly US 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 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.

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* (RAIS) and typically concluded at the parent firm by March of the following year. 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 informa-

tion 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 ties, in a given year and estimate cross-sectional employer fixed effects at the plant level.)

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. An 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 1994 through 2007, 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*).

We obtain industry information for every firm. Starting from the year 1994, RAIS reports industries under the CNAE classification, which mirrors the International Standard Industrial Classification (ISIC). CNAE industries are recorded by plant. For multi-plant firms, we assign the mode industry associated with most employees in a given year to multi-plant firms. Our identification strategy relies on variation in trade shocks across industries, so we assign each firm to only one industry over the sample period, using the industry in which the firm first appears in RAIS. For the concordance to worldwide trade flows by SITC category, we map the CNAE industry classification to the ISIC (Rev. 2) classification at the 3-digit subsector level. At that subsector level, there are 29 manufacturing industries in RAIS. 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 informa-

Table A.1: FIRM CHARACTERISTICS BY INDUSTRY

Subsector: 3-digit ISIC	Firm-year observ.	Workers per firm	Share (%) exporters	Workers per exp.	Exports per exp.
Food manufacturing (311)	359,203	30.293	.018	833.129	16799.600
Food manufacturing (312)	56,323	24.148	.041	243.960	3354.037
Beverage industries	24,440	83.027	.060	506.338	3508.831
Tobacco manufactures	1,723	150.140	.211	625.028	36543.050
Manufacture of textiles	113,519	37.434	.059	365.958	2044.622
Manufacture of wearing apparel, except footwear	413,675	14.510	.018	149.101	271.714
Manufacture of leather	38,638	25.573	.079	176.968	4693.771
Manufacture of footwear	82,707	42.464	.085	334.031	2250.403
Manufacture of wood and wood and cork products	187,021	16.402	.056	114.216	1551.871
Manufacture of furniture and fixtures	176,345	13.753	.033	115.726	839.677
Manufacture of paper and paper products	35,295	50.449	.067	403.256	7307.993
Printing, publishing and allied industries	178,821	14.054	.013	192.750	220.705
Manufacture of industrial chemicals	13,579	57.505	.153	242.484	9890.896
Manufacture of other chemical products	75,549	43.144	.126	213.527	2060.816
Petroleum refineries	348	73.759	.032	341.182	55577.550
Manufacture of petroleum and coal products	187	31.374	.118	142.273	4449.997
Manufacture of rubber products	31,915	33.928	.059	326.708	4671.183
Manufacture of plastic products not elsewhere classified	94,458	31.759	.082	166.236	828.816
Manufacture of pottery, china and earthenware	17,571	30.464	.058	241.783	1694.682
Manufacture of glass and glass products	6,067	56.580	.092	414.454	3804.224
Manufacture of other non-metallic mineral products	185,290	14.895	.022	129.890	1223.526
Iron and steel basic industries	39,595	56.156	.089	449.445	16561.250
Non-ferrous metal basic industries	32,222	32.789	.072	266.905	11191.510
Manufacture of fabricated metal products	267,897	16.479	.034	176.682	1263.200
Manufacture of machinery except electrical	111,675	32.916	.146	135.467	2153.327
Manufacture of electrical equipment and supplies	69,275	56.340	.121	340.990	4879.409
Manufacture of transport equipment	64,315	66.001	.088	566.801	17701.890
Manufacture of measuring and control devices	25,667	22.174	.125	93.729	446.809
Other manufacturing industries	69,777	14.029	.069	76.666	525.329
Total	2,773,097	25.938	.049	256.436	4124.779

Notes: Employment on December 31st. Exports (fob) in thousands of August-1994 USD.
Sources: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

tion) and select firm characteristics by 3-digit ISIC subsector.[27] On average, only about 5 percent of Brazilian formal-sector manufacturing firms are exporters, a considerably smaller share than reported for Chile (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,

[27] 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.

see Iacovone and Javorcik 2012). A reason is that the Brazilian data are not censored at a minimum employment but include single-worker plants. Exporting is most frequent in machinery and equipment manufacturing industries, where workforce sizes per firm also tend to be large.

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.

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*)

Occupation indicators derive from the 3-digit CBO classification codes in our nationwide RAIS data and are reclassified to conform to ISCO-88.[28] We map RAIS occupations into ISCO-88 occupations and regroup them into five categories as shown in Table A.3.

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*)

A.4 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

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

the December USD 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 US consumer price index (from Global Financial Data).

A.5 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.

B Additional Results and Robustness Checks

Table B.1 presents estimation results for the first-stage equation (1) for a vector of possible IVs: import flows into six destination groups from anywhere in the world except from Brazil. The six destination groups are Asia-Pacific Developing (APD) countries, 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 do not consider imports into Latin America as a possible IV. We take four different samples: a sample of all firms with a well defined indicator of export status at t, a sample of all firms that hire at least one expert at t and have a well defined indicator of export status at t, a sample of all firms with a well defined indicator of export status one year into the future $t+1$, and a sample of all firms that hire at least one expert at t and have a well defined indicator of export status at $t+1$. Each entry in Table B.1 reports the coefficient from a regression of export status on the candidate IV and the same set of controls that we consider in the main specifications in the text. Results show that only imports into APD are a statistically significant predictor of export status of Brazilian firms, and that APD imports consistently predict export status in any sample.

Table B.1: ALTERNATIVE FIRST STAGE REGRESSIONS: IMPORTS IN ALL REGIONS

	Exporter at time t		**Exporter at time $t+1$**	
Dependent Variable (t):	Entire Sample Indic. Exp. (t) (1)	Firms with hires>0 Indic. Exp. (t) (2)	Entire Sample Indic. Exp. ($t+1$) (3)	Firms with hires>0 Indic. Exp. ($t+1$) (4)
Log Non-Brazil Imports in APD	0.017***	0.043***	0.021***	0.048***
	(0.004)	(0.009)	(0.004)	(0.008)
Log Non-Brazil Imports in CEE	0.005	-0.002	0.004	0.003
	(0.003)	(0.010)	(0.004)	(0.014)
Log Non-Brazil Imports in NAM	0.003	0.009	0.008	0.022
	(0.005)	(0.017)	(0.008)	(0.026)
Log Non-Brazil Imports in ODV	-0.003	-0.007	0.001	-0.0002
	(0.005)	(0.015)	(0.006)	(0.018)
Log Non-Brazil Imports in OIN	0.0003	-0.003	-0.006	-0.025
	(0.004)	(0.014)	(0.008)	(0.027)
Log Non-Brazil Imports in WEU	-0.010	-0.009	-0.021	-0.029
	(0.008)	(0.021)	(0.013)	(0.034)
F-stat excluded instruments	7.873	9.596	6.124	8.913
Partial R2 excluded instruments	9.15e-05	2.53e-04	1.24e-04	2.32e-04
Observations	1,722,626	281,465	1,542,882	249,419
Firm and year fixed effects	yes	yes	yes	yes
Industry-level linear trends	yes	yes	yes	yes

Notes: All regressions include the following controls: employment changes between $t-1$ and t net of hires from exporters, contemporaneous and one-period lagged firm size, shares of worker by education (primary, secondary and tertiary) and occupation (unskilled blue-collar, skilled blue-collar and white-collar) categories, an indicator of a firm's high-skill intensity, an indicator of foreign ownership, one- and two-period lagged export status, and absorption. The country groups 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). Standard errors, clustered at the sector level, in parentheses. $^{*}p < 0.05,^{**}p < 0.01,^{***}p < 0.001$. *Sources*: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

In Table B.2 we use as the instrument imports into APD countries from countries outside of Latin America, excluding not only Brazil but any Latin American or Caribbean country's shipments. OLS regressions in columns 1 and 3 are the same as those reported in Table 4 in the text. In the IV regressions in columns 2 and 4, we find the sign and significance patterns broadly confirmed. Coefficient magnitudes are almost the same for the indicator of expert hires and similar for the log number of hires. However, the coefficients on predicted export status for the log number of hires (in column 4) are now statistically significant only at the 95-percent confidence level.

Table B.3 presents results from an augmented specification in which we control for a measure of the stock of workers with exporting experience in year t. We compute a proxy to the stock of workers using the cumulative past flows of experts across firms. Specifically, in each firm and year we

Table B.2: HIRES FROM EXPORTERS, EXCLUDING APD IMPORTS FROM LATIN AMERICA

Dependent Variable (t):	Indic. Hire		log(Hires)	
	OLS	IV[a]	OLS	IV[a]
	(1)	(2)	(3)	(4)
Panel A: Exporter at time t				
Indic. Exporter (t)	0.028***	2.126***	0.041***	1.696*
	(0.004)	(0.545)	(0.007)	(0.660)
F-stat. excluded instrument		15.519		26.032
Anderson-Rubin Wald test p-value		6.21e-08		0.020
Observations	1,722,626	1,722,626	281,465	281,465
Panel B: Exporter at time t+1				
Indic. Exporter ($t+1$)	0.036***	1.635***	0.042***	1.439
	(0.005)	(0.379)	(0.009)	(0.736)
F-stat. excluded instrument		18.645		15.407
Anderson-Rubin Wald test p-value		4.07e-06		0.032
Observations	1,542,882	1,542,882	249,419	249,419
Firm and year fixed effects	yes	yes	yes	yes
Industry-level linear trends	yes	yes	yes	yes

[a]IV is Log Non-LAC Imports in APD: trade flows into Asia-Pacific Developing (APD) countries originating from countries outside Latin America.

Notes: Binary exporter indicator represents firms that export at t in Panel A or at $t+1$ in Panel B. Each cell shows the coefficient from a separate regression. All regressions include the following controls: employment changes between $t-1$ and t net of hires from exporters, contemporaneous and one-period lagged firm size, shares of worker by education (primary, secondary and tertiary) and occupation (unskilled blue-collar, skilled blue-collar and white-collar) categories, an indicator of a firm's high-skill intensity, an indicator of foreign ownership, one- and two-period lagged export status, and industry-level absorption. Workforces on December 31st. In the specification of this table in which we have one endogenous regressor and one instrument, the Kleibergen-Paap rk Wald F-statistic corresponds to the F-statistic of the excluded instrument. Standard errors in parentheses, clustered at the 3-digit ISIC subsector level. $^{*}p < 0.05,^{**}p < 0.01,^{***}p < 0.001$.
Sources: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

determine the number of hires from exporters and the number of separations from workers previously hired from exporters. At each time t we then determine the stock of experts in a firm as the cumulative difference between hires of, and separations from, experts up to year t. We start to count hires and separations in the year 1986, which is the first year available in our Brazilian matched employer-employee data. This measure is limited to workers who switch jobs during the sample period and ignores initial stocks of experts in 1986. For consistency with the definition of experts throughout the paper, we identify experts based only on the export status of the last employer before the job switch. Results in Table B.3 are closely comparable to the main results in Table 4.

In Table B.4 we augment our baseline specification to include controls for the number of hires

Table B.3: HIRES FROM EXPORTERS CONTROLLING FOR THE STOCK OF EXPERTS

Dependent Variable (t):	Indic. Hire		log(Hires)	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Panel A: Exporter at time t				
Indic. Exporter (t)	0.028***	2.155***	0.041***	1.735**
	(0.004)	(0.560)	(0.007)	(0.646)
F-stat. excluded instrument		15.189		24.975
Anderson-Rubin Wald test p-value		8.13e-08		0.016
Observations	1,722,626	1,722,626	281,465	281,465
Panel B: Exporter at time t+1				
Indic. Exporter (t+1)	0.036***	1.633***	0.042***	1.468*
	(0.005)	(0.379)	(0.009)	(0.735)
F-stat. excluded instrument		29.906		22.198
Anderson-Rubin Wald test p-value		4.36e-06		0.029
Observations	1,542,882	1,542,882	249,419	249,419
Firm and year fixed effects	yes	yes	yes	yes
Industry-level linear trends	yes	yes	yes	yes

Notes: Binary exporter indicator represents firms that export at t in Panel A or at $t+1$ in Panel B. Each cell shows the coefficient from a separate regression. All regressions include the following controls: firm and year effects, sectoral linear trends, employment changes between $t-1$ and t net of hires from exporters, contemporaneous and one-period lagged firm size, shares of worker by education (primary, secondary and tertiary) and occupation (unskilled blue-collar, skilled blue-collar and white-collar) categories, an indicator of a firm's high-skill intensity, an indicator of foreign ownership, one- and two-period lagged export status, and industry-level absorption. Workforces on December 31st. First-stage results are presented in Table 3. In the specification of this table in which we have one endogenous regressor and one instrument, the Kleibergen-Paap rk Wald F-statistic corresponds to the F-statistic of the excluded instrument. Standard errors in parentheses, clustered at the 3-digit ISIC subsector level. $^{*}p < 0.05,^{**}p < 0.01,^{***}p < 0.001$.
Sources: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

from firms in each quintile of the productivity distribution in an industry and year. We discuss details in Section 5.2.

In Table B.5 we look further into the future to query the extent to which firms may plan ahead for two or even three years, using export participation two and three years in advance (x_{ist+2} and $x_{i,t+3}$), for otherwise the same right-hand side variables in equation (2) and the first stage (1). For the indicator of expert hires (column 2) we find the instrument to remain strong in the Anderson-Rubin test but the coefficient estimates are not statistically significant at conventional confidence levels. In IV regressions of the log number of expert hires, the Anderson-Rubin test fails to reject the absence of a second-stage effect at 10-percent confidence levels.

Given the limited number of 29 clusters, in Table B.6 we assess the statistical significance of our results showing p-values from a wild bootstrap in square brackets. Simulations have shown the wild

Table B.4: HIRES FROM EXPORTERS VERSUS HIRES FROM PRODUCTIVE FIRMS

Dependent Variable (t):	Indic. Hire		log(Hires)	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Panel A: Hiring of exporter workers from all occupations				
Indic. Exporter (t)	0.02683***	2.13368***	0.04084***	1.61964*
	(0.00359)	(0.55479)	(0.00709)	(0.63740)
# Hires from Productivity Quintile 1	0.00007	0.00008	0.00013	0.00017
	(0.00007)	(0.00009)	(0.00014)	(0.00016)
# Hires from Productivity Quintile 2	0.00012	-0.00006	0.00090*	0.00080*
	(0.00012)	(0.00015)	(0.00033)	(0.00034)
# Hires from Productivity Quintile 3	0.00120*	0.00084*	0.00353***	0.00355***
	(0.00048)	(0.00042)	(0.00079)	(0.00081)
# Hires from Productivity Quintile 4	0.00042	0.00028	0.00144	0.00149
	(0.00029)	(0.00017)	(0.00085)	(0.00082)
# Hires from Productivity Quintile 5	0.00008	0.00002	0.00088**	0.00087**
	(0.00005)	(0.00005)	(0.00028)	(0.00028)
F-stat. excluded instrument		15.005		25.080
Anderson-Rubin Wald test p-value		9.12e-08		0.026
Observations	1,722,626	1,722,626	281,465	281,465
Panel B: Hiring of exporter workers from skilled blue-collar occupations				
Indic. Exporter (t)	0.02256***	1.97639***	0.02415*	1.56203**
	(0.00377)	(0.54041)	(0.00889)	(0.60092)
# Hires from Productivity Quintile 1	0.00011	0.00012	0.00016	0.00020
	(0.00009)	(0.00010)	(0.00013)	(0.00016)
# Hires from Productivity Quintile 2	0.00018	0.00001	0.00094**	0.00086**
	(0.00014)	(0.00016)	(0.00032)	(0.00033)
# Hires from Productivity Quintile 3	0.00149**	0.00116*	0.00342***	0.00346***
	(0.00053)	(0.00048)	(0.00074)	(0.00077)
# Hires from Productivity Quintile 4	0.00054	0.00041	0.00134	0.00140
	(0.00035)	(0.00024)	(0.00079)	(0.00076)
# Hires from Productivity Quintile 5	0.00012	0.00007	0.00089**	0.00087***
	(0.00006)	(0.00005)	(0.00026)	(0.00026)
F-stat. excluded instrument		15.005		20.970
Anderson-Rubin Wald test p-value		2.48e-06		0.023
Observations	1,722,626	1,722,626	205,985	205,985

Notes: Binary exporter indicator represents firms that export at t. Each cell shows the coefficient from a separate regression. All regressions include the following controls: firm and year effects, sectoral linear trends, employment changes between $t-1$ and t net of hires from exporters, contemporaneous and one-period lagged firm size, shares of worker by education (primary, secondary and tertiary) and occupation (unskilled blue-collar, skilled blue-collar and white-collar) categories, an indicator of a firm's high-skill intensity, an indicator of foreign ownership, one- and two-period lagged export status, industry-level absorption and number of hires from firms in each quintile of the distribution of firms productivity. We refer to the Section 5.2 for more details on our measure of firm productivity. Workforces on December 31st. We round coefficients and standard errors to the 5th decimal points to account for the fact that some of the coefficients would be indistinguishable from 0 with fewer than 5 decimals. First-stage results are available on request. In the specification of this table in which we have one endogenous regressor and one instrument, the Kleibergen-Paap rk Wald F-statistic corresponds to the F-statistic of the excluded instrument. Standard errors in parentheses, clustered at the 3-digit ISIC subsector level. $^{*}p < 0.05,^{**}p < 0.01,^{***}p < 0.001$.
Sources: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

Table B.5: HIRES FROM EXPORTERS AND FUTURE EXPORT STATUS

Dependent Variable (t):	Indic. Hire		log(Hires)	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Panel A: Exporter at time t+2				
Indic. Exporter ($t+2$)	0.031***	2.281	0.038***	0.405
	(0.003)	(1.663)	(0.007)	(0.957)
F-stat. excluded instrument		3.057		4.631
Anderson-Rubin Wald test p-value		0.001		0.674
Observations	1,369,317	1,369,317	220,269	220,269
Panel B: Exporter at time t+3				
Indic. Exporter ($t+3$)	0.025***	1.394	0.024*	0.610
	(0.004)	(0.824)	(0.009)	(0.663)
F-stat. excluded instrument		8.277		6.361
Anderson-Rubin Wald test p-value		0.007		0.355
Observations	1,200,722	1,200,722	192,114	192,114
Firm and year fixed effects	yes	yes	yes	yes
Industry-level linear trends	yes	yes	yes	yes

Notes: Binary exporter indicator represents firms that export at $t+2$ in Panel A or at $t+3$ in Panel B. Each cell shows the coefficient from a separate regression. All regressions include the following controls: firm and year effects, sectoral linear trends, employment changes between $t-1$ and t net of hires from exporters, contemporaneous and one-period lagged firm size, shares of worker by education (primary, secondary and tertiary) and occupation (unskilled blue-collar, skilled blue-collar and white-collar) categories, an indicator of a firm's high-skill intensity, an indicator of foreign ownership, one- and two-period lagged export status, and industry-level absorption. Workforces on December 31st. First-stage results are available on request. In the specification of this table in which we have one endogenous regressor and one instrument, the Kleibergen-Paap rk Wald F-statistic corresponds to the F-statistic of the excluded instrument. Standard errors, clustered at the sector level, in parentheses. $^{*}p < 0.05,^{**}p < 0.01,^{***}p < 0.001$.
Sources: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

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. In 999 replications, we find results to be near the borderline of significance around the 95-percent confidence level for the indicator of hiring and around the 90-percent confidence level for the log of hired experts.

In Section 5.4 we study unexpectedly failing exporters: firms that have a predicted export indicator in year t from equation (1) above the sample median or the 75th percentile but that are not observed exporting during t. For these unexpectedly failing firms we observe their expert hires at t and the subsequent expert layoffs at $t+1$. To compare magnitudes of predicted hires and predicted separations (in Table 8 in the text), we present in Appendix Table B.7 the preceding predicted expert hires (see

Table B.6: ALTERNATIVE INFERENCE: WILD BOOTSTRAP p-VALUES

Dependent Variable (t):	Indic. Hire		log(Hires)	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Panel A: Exporter at time t				
Indic. Exporter (t)	0.028	2.151	0.041	1.734
	[<1.0e-05]	[0.054]	[<1.0e-05]	[0.124]
Observations	1,722,626	1,722,626	281,465	281,465
Panel B: Exporter at time t+1				
Indic. Exporter ($t+1$)	0.036	1.630	0.042	1.465
	[<1.0e-05]	[0.088]	[<1.0e-05]	[0.158]
Observations	1,542,882	1,542,882	249,419	249,419
Firm and year fixed effects	yes	yes	yes	yes
Industry-level linear trends	yes	yes	yes	yes

Notes: Binary exporter indicator represents firms that export at t in Panel A or at $t+1$ in Panel B. Each cell shows the coefficient from a separate regression. All regressions include the following controls: employment changes between $t-1$ and t net of hires from exporters, contemporaneous and one-period lagged firm size, shares of worker by education (primary, secondary and tertiary) and occupation (unskilled blue-collar, skilled blue-collar and white-collar) categories, an indicator of a firm's high-skill intensity, an indicator of foreign ownership, one- and two-period lagged export status, and industry-level absorption. Workforces on December 31st. First-stage results are presented in Table 3. Wild bootstrap p-values from 999 replications in brackets. The notation *<1.0e-05* indicates p-values that are smaller than 0.0000, the lowest figure provided by *boottest* in Stata.
Sources: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

also footnote 24).

Table B.7: HIRES FROM EXPORTERS AT UNEXPECTEDLY UNSUCCESSFUL EXPORTERS

Dependent Variable ($t+1$):	Indic. Hire (1)	log(Hires) (2)
Panel A: Unsuccessful Exporters, *Pred. Ind. Exporter* above Median		
Pred. Indic. Exporter (t)	3.353***	8.521***
	(0.431)	(1.802)
Observations	765,651	122,401
Panel B: Unsuccessful Exporters, *Pred. Ind. Exporter* above 75th Percentile		
Pred. Indic. Exporter (t)	2.278**	9.034***
	(0.749)	(2.603)
Observations	335,274	83,341
Firm and year fixed effects	yes	yes
Industry-level linear trends	yes	yes

Notes: The predicted exporter status at t is estimated from equation (1). In Panel A we consider non-exporting firms at t with predicted exporter status strictly above the sample median, and in Panel B strictly above the 75th percentile. Each cell shows the coefficient from a separate regression. All regressions include the following controls: firm and year effects, sectoral linear trends, employment changes between $t-1$ and t net of hires from exporters, contemporaneous and one-period lagged firm size, shares of worker by education (primary, secondary and tertiary) and occupation (unskilled blue-collar, skilled blue-collar and white-collar) categories, an indicator of a firm's high-skill intensity, an indicator of foreign ownership, one- and two-period lagged export status, and industry-level absorption. Workforces on December 31st. The variable *Pred. Indic. Exporter (t)* is a generated regressor, so we bootstrap the standard errors. Standard errors from 50 bootstraps over both stages in parentheses. $^{*}p < 0.05,^{**}p < 0.01,^{***}p < 0.001$.
Sources: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

Online Supplement to

Preparing to Export

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This Online Supplement collects evidence to complement the paper "*Preparing for Export Opportunities*" (Labanca, Molina and Muendler 2023). In Section S1 we present log premium regressions for firms with different export status. In Section S2 we collect supplemental robustness exercises. In Section S3 we turn to additional supplemental empirical evidence, in Section S4 we discuss a breakdown of Brazilian exports by industry, and in Section S5 we report the mapping of countries into six relevant export destination groups for Brazil (outside Latin America and the Caribbean) in the period 1994-2007.

S1 Exporter Premium Regressions

Log premium regressions are frequently used to describe firm heterogeneity and show that non-exporters significantly differ from exporters along several dimensions, including workforce characteristics (Bernard and Jensen 1995, Bernard et al. 2007). We use log premium regressions to also investigate differences among exporters. Table S.1 presents the results of exporter-premia regressions that project average firm earnings and other workforce characteristics on indicators for export status (continuous, starting or quitting exporters), controlling for industry and year effects. The omitted reference category is a non-exporter for at least three years.

Table S.1 shows in Panel A that workers at continuous exporters earn, on average, more than twice as much (.72 log units) as workers at non-exporters, and even workers at recent export-market quitters earn 55 percent (.44 log units) more than workers at firms with no exports for three years. To assess the extent to which these wage premia can be explained by differences in the composition of the firm workforce, in Panel A of Table S.1 we also present regressions based on residual earnings after controlling for the educational and occupational composition of the firm's workforce and for the

workers' average tenure at the firm. The exporter premia based on residual earnings are, if anything, larger than those based on plain earnings, suggesting that much earnings variation remains to be explained by other firm or workforce characteristics. These patterns are consistent with the hypothesis that mostly the unobserved worker characteristics are associated with a firm's export status and that an exporter's surplus may be shared with workers through wages.[29]

The regressions in Panel B of Table S.1 show that differences in workforce composition among exporters are relatively small and, in some cases, not statistically significant at conventional significance levels. While educational attainment still shows some dissimilarities, occupational characteristics are almost the same. Consider white-collar occupations, for instance. These associated premia are similar for exporters of any status and in the case of starting and continuing exports not statistically different at conventional significance levels. A similar pattern prevails for other occupations. When it comes to employment of skilled or unskilled blue-collar occupations, continuous exporters are neither statistically distinguishable from starting exporters nor from export quitters. Turning to educational attainment, continuous exporters employ 2.5 percent (0.024 log points) and 3 percent (0.03 log points) more tertiary educated workers than starters and quitters respectively. On the contrary, continuous exporters show 1.6 percent (0.016 log points) and 4.2 percent (0.042 log points) fewer primary educated workers than starters and quitters respectively. Compared to the drastic discrepancies in size and export performance, however, these differences in education are noticeably less stark. Overall, the mean differences of Panel B of Table S.1 suggest that compositional differences are unlikely to explain the marked differences in export market performance among exporters.

One typically unobserved worker characteristic is the worker's prior work experience at an exporter. Panel C in Table S.1 shows that continuous exporters are, respectively, 15 percent (.13 log points) and 30 percent (.26 log points) more likely than starters and quitters to hire such an expert—a worker from another exporter. Conditional on hiring a worker from another exporter, continuous exporters hire 63 percent (.49 log units) more workers from other exporters than export starters and export starters hire 35 percent (.30 log points) more workers with prior exporter experience than export quitters. Relative to the total number of hires in a year, continuous exporters are, respectively, 11 percent (.10 log points) and 23 percent (.20 log points) more likely to hire from exporters than export

[29] Helpman et al. (2017) offer structural evidence on surplus sharing in the cross section of Brazilian firms.

Table S.1: EXPORTER PREMIA

	Export Status			p-value of null-hypothesis		Obs.
	Continuous	Start	Quit			
Firm characteristic	(1)	(2)	(3)	(1)==(2)	(1)==(3)	
Panel A: Earnings						
Log Annual Wage	.720***	.467***	.441***	8.94e-11	9.08e-09	2,735,184
	(.058)	(.043)	(.036)			
Residual Log Annual Wage	.932***	.572***	.559***	1.12e-11	6.24e-09	2,735,184
	(.078)	(.057)	(.046)			
Panel B: Observed workforce composition						
Share: Any white-collar occupation	.033*	.038***	.050***	.318	.044	2,773,097
	(.014)	(.010)	(.008)			
Share: Unskilled blue-collar occupation	.023	.022*	.016*	.739	.336	2,773,097
	(.014)	(.010)	(.008)			
Share: Skilled blue-collar occupation	-.057***	-.060***	-.067***	.627	.283	2,773,097
	(.016)	(.011)	(.010)			
Share: Primary school education	-.084***	-.068***	-.042***	.021	.00007	2,773,097
	(.014)	(.010)	(.007)			
Share: High school education	.010	.018**	-.002	.033	.022	2,773,097
	(.008)	(.006)	(.005)			
Share: Tertiary education	.074***	.050***	.044***	.00004	.0003	2,773,097
	(.010)	(.007)	(.005)			
Panel C: Typically unobserved workforce background						
Indic.: Hires from Exporters	.528***	.394***	.265***	1.03e-13	6.97e-21	2,773,097
	(.018)	(.021)	(.017)			
Log Hires from Exporters	1.295***	.809***	.513***	9.38e-12	1.38e-14	526,285
	(.076)	(.063)	(.046)			
Ratio: Hires from Exporters per Firm Size	.009**	.037***	.003	1.90e-13	.0002	2,773,097
	(.003)	(.004)	(.002)			
Share: Hires from Exporters (in total hires)	.384***	.282***	.180***	3.99e-14	2.34e-21	2,773,097
	(.013)	(.016)	(.012)			

Notes: Premia are coefficients from linear regressions of the firm characteristic on export status dummies, controlling for sector and year effects. Export status as defined in Table 1. The omitted baseline category is non-exporters for three years. The residual log annual wage is from a linear regression of average firm earnings on the share of workers in three occupation groups (white-collar, skilled blue-collar, unskilled blue-collar), three education categories (primary, secondary and tertiary) and average tenure of workers at the firm. Log Hires from Exporters is missing in firms reporting zero hires of former exporter workers at time t. Workforces on December 31st. Annualized December wages are deflated to August 1994 using the Brazilian consumer price index (INPC). Standard errors in parentheses, clustered at the 3-digit ISIC subsector level. $^{*}p < 0.05,^{**}p < 0.01,^{***}p < 0.001$.
Sources: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

starters and quitters. These differences are statistically significant and economically meaningful. The variation between exporters is considerably more pronounced in Panel C for this typically unobserved worker characteristic than it is for usually observed characteristics in Panel B. Relative to the overall size of the firm, the number of hires with exporting experience accounts for a limited share of employment in large firms with a more continuous exporting history, suggesting that a few such experts

Table S.2: HIRES FROM EXPORTERS BY OCCUPATION: REDUCED FORM ESTIMATES

Dependent Variable (t):	Indic. Hire	log(Hires)
	RF	RF
	(1)	(2)
Panel A: Hiring of exporter workers from professional or managerial occupations		
Non-Brazil Imports in APD	0.003	-0.001
	(0.004)	(0.046)
Observations	1,722,626	44,133
Panel B: Hiring of exporter workers from technical or supervisory occupations		
Non-Brazil Imports in APD	0.004	-0.023
	(0.004)	(0.037)
Observations	1,722,626	59,480
Panel C: Hiring of exporter workers from other white-collar occupations		
Non-Brazil Imports in APD	0.005	-0.030
	(0.004)	(0.040)
Observations	1,722,626	36,480
Panel D: Hiring of exporter workers from skilled blue-collar occupations		
Non-Brazil Imports in APD	0.028***	0.072*
	(0.005)	(0.027)
Observations	1,722,626	205,985
Panel E: Hiring of exporter workers from unskilled blue-collar occupations		
Non-Brazil Imports in APD	0.010	0.060
	(0.007)	(0.040)
Observations	1,722,626	67,669
Firm and year fixed effects	yes	yes
Industry-level linear trends	yes	yes

Notes: Binary exporter indicator represents firms that export at t. Each cell shows the coefficient from a separate regression. All regressions include the following controls: firm and year effects, sectoral linear trends, employment changes between $t-1$ and t net of hires from exporters, contemporaneous and one-period lagged firm size, shares of worker by education (primary, secondary and tertiary) and occupation (unskilled blue-collar, skilled blue-collar and white-collar) categories, an indicator of a firm's high-skill intensity, an indicator of foreign ownership, one- and two-period lagged export status, and industry-level absorption. Workforces on December 31st. Standard errors in parentheses, clustered at the 3-digit ISIC subsector level. $^{*}p < 0.05, ^{**}p < 0.01, ^{***}p < 0.001$.
Sources: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

may shape a firm's competitive advantage.

Table S.3: HIRES OF SKILLED BLUE-COLLAR WORKERS AND EXPORTER MANAGERS: REDUCED FORM ESTIMATES

Dependent Variable (t):	Indic. Hire SBC	log(Hires SBC)
	RF	RF
	(1)	(2)
Panel A: Hiring workers from skilled blue-collar (SBC) occupations		
Log Non-Brazil Imports in APD	0.028***	0.072*
	(0.005)	(0.027)
Ind. Hire Exp. Mang.(t-1)	0.051***	0.054***
	(0.003)	(0.008)
Observations	1,722,626	205,985
Panel B: Hiring workers from skilled blue-collar (SBC) occupations, manager-exporter interaction		
Log Non-Brazil Imports in APD	0.028***	0.072*
	(0.005)	(0.028)
Log Non-Brazil Imports in APD $\times$ Ind. Hire Exp. Mang.(t-1)	-0.001	-0.003
	(0.002)	(0.005)
Ind. Hire Exp. Mang.(t-1)	0.070*	0.100
	(0.029)	(0.077)
Observations	1,722,626	205,985
Firm and year fixed effects	yes	yes
Industry-level linear trends	yes	yes

Notes: Hires of exporter workers restricted to skilled-blue-collar occupations at previous employer. Binary exporter indicator represents firms that export at t. Each cell shows the coefficient from a separate regression. All regressions include the following controls: employment changes between $t-1$ and t net of hires from exporters, contemporaneous and one-period lagged firm size, shares of worker by education (primary, secondary and tertiary) and occupation (unskilled blue-collar, skilled blue-collar and white-collar) categories, an indicator of a firm's high-skill intensity, an indicator of foreign ownership, one- and two-period lagged export status, and industry-level absorption. Workforces on December 31st. Standard errors in parentheses, clustered at the 3-digit ISIC subsector level. $^{*}p < 0.05,^{**}p < 0.01,^{***}p < 0.001$. *Sources*: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

S2 Supplemental Robustness Exercises

Table S.2 presents reduced-form estimates for the effects of imports in APD countries (from countries other than Brazil) on Brazilian firms' hiring from exporters at the extensive (columns 1) and intensive margins (columns 2) of hiring by occupation category. These effects are in line with IV estimates of Table 5 in the text and show significant and positive responses on the hiring of workers in skilled blue collar occupations and insignificant responses on the hiring in other occupations.

Table S.3 presents reduced-form estimates relative to the IV specifications of Table 6 in the text. In line with IV estimates of Table 6, Table S.3 shows that the preceding hire of managers with export experience is associated with more frequent hiring of experts in skilled blue collar occupations.

Table S.4: HIRES FROM NON-EXPORTERS: REDUCED FORM ESTIMATES

Dependent Variable (t):	Indic. Hire	log(Hires)
	RF	RF
	(1)	(2)
Panel A: Hiring of non-exporter workers		
Log Non-Brazil Imports in APD	0.012*	0.035
	(0.005)	(0.019)
Observations	1,722,626	136,303
Panel D: Hiring of non-exporter workers from skilled blue-collar occupations		
Log Non-Brazil Imports in APD	0.008*	0.061**
	(0.004)	(0.021)
Observations	1,722,626	96,272
Firm and year fixed effects	yes	yes
Industry-level linear trends	yes	yes

Notes: Binary exporter indicator represents firms that export at t. Each cell shows the coefficient from a separate regression. All regressions include the following controls: firm and year effects, sectoral linear trends, employment changes between $t-1$ and t net of hires from exporters, contemporaneous and one-period lagged firm size, shares of worker by education (primary, secondary and tertiary) and occupation (unskilled blue-collar, skilled blue-collar and white-collar) categories, an indicator of a firm's high-skill intensity, an indicator of foreign ownership, one- and two-period lagged export status, and industry-level absorption. Workforces on December 31st. Standard errors in parentheses, clustered at the 3-digit ISIC subsector level. $^{*}p < 0.05,^{**}p < 0.01,^{***}p < 0.001$.
Sources: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

Differently from Table 6 in the text, the positive correlation between the previous hiring of managers with export experience and the current hiring of skilled blue collar experts is statistically significant at the intensive and extensive margins of hiring. This evidence suggests that the IV estimates of Table 6 may be seen as a conservative assessment of the role of export managers on the hiring of skilled blue collar workers.

Table S.4 presents reduced-form estimates for the IV specifications of Table 7 in the text. In line with the IV estimates of Table 7, Table S.4 shows that the positive correlation between the previous hiring of managers with export experience and the current hiring of skilled blue collar experts is statistically significant at the intensive and extensive margins of hiring. This pattern suggests that the IV estimates of Table 6 may be a conservative assessment of the role played by expert managers on the hiring of skilled blue collar workers.

Table S.5 presents reduced-form estimates for the IV specifications of Table 10 in the text. Table S.5 shows, in line with the IV estimates, that changes of imports in APD countries only marginally

Table S.5: LOG SALARY CHANGES FOR HIRES FROM EXPORTERS: REDUCED FORM ESTIMATES

	RF
	(1)
Panel A. Dependent Variable: Change in mean Log Salary	
Log Non-Brazil Imports in APD	0.035
	(0.030)
Panel B. Dependent Variable: Change in mean Workers Observable Log Salary Component	
Log Non-Brazil Imports in APD	0.005
	(0.009)
Panel C. Dependent Variable: Change in mean Plant-fixed Log Salary Component	
Log Non-Brazil Imports in APD	0.006
	(0.018)
Panel D. Dependent Variable: Change in mean Log Salary Residual Component	
Log Non-Brazil Imports in APD	0.023
	(0.022)
Observations	192,941
Firm and year fixed effects	yes
Industry-level linear trends	yes

Notes: Log salary change is the difference between the current log salary (component) and the log salary (component) at the preceding exporter. Log salary components from Mincer (1974) regressions by year for the cross section of plants, decomposing the log salary into a worker observable component, a plant-fixed component, and an individual worker residual, and then averaging over current employer's hires from exporters. All regressions include the following controls: firm and year effects, sectoral linear trends, employment changes between $t-1$ and t net of hires from exporters, contemporaneous and one-period lagged firm size, shares of worker by education (primary, secondary and tertiary) and occupation (unskilled blue-collar, skilled blue-collar and white-collar) categories, an indicator of a firm's high-skill intensity, an indicator of foreign ownership, one- and two-period lagged export status, and industry-level absorption. Workforces on December 31st. Annualized December wages are deflated to August 1994 using the Brazilian consumer price index (INPC). Standard errors, clustered at the sector level, in parentheses. $^{*}p < 0.05, ^{**}p < 0.01, ^{***}p < 0.001$.
Sources: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

affect the hiring of workers without exporting experience. Relative to the reduced-form effects of Table 4, in fact, the effects in Table S.5 are lower in magnitude and not statistically significant at our commonly used confidence levels, suggesting that changes in export demand in APD countries prompt Brazilian firms to predominantly poach workers from incumbent exporters.

S3 Supplemental Empirical Evidence

Table S.6 documents the exceptional growth of Brazilian exports to the APD region in our sample period. The table shows that Brazilian exports to the APD region grew by a factor of 4.4 between the first and final year (1994 and 2007). In the final sample year, Brazilian exports to the APD account

Table S.6: BRAZILIAN EXPORT PATTERNS BY REGION

Destination group:	APD	CEE	LAC	NAM	ODV	OIN	WEU
Brazilian real exports in 2007 relative to 1994	4.38	3.74	2.82	2.18	4.45	1.37	2.26
Percentage share in Brazilian exports 2007	15.42	1.56	22.83	16.58	12.71	3.74	27.13

Notes: Brazilian export to a destination group: Asia-Pacific Developing countries (APD), Central and Eastern European countries (CEE), Latin America and Caribbean countries (LAC including Mexico), North American countries (NAM excluding Mexico), Other Developing countries (ODV), Other Industrialized countries (OIN), and Western European countries (WEU). See section S5 for the country lists by destination group. Exports in 2007 and 1994 in USD, adjusted for inflation using the US CPI (Urban Wage Earners and Clerical Workers, US Bureau of Labor Statistics).
Source: WTF 1994 and 2007.

for 15.5 percent of overall exports. With the exception of Brazilian exports to Other Developing countries (ODV) that rose at a similar rate, Brazilian exports to all other regions increased at a much slower pace than exports to APD. Relative to exports to ODV, exports to the APD region account for a lager share of overall Brazilian exports. This combination of high growth and relatively large volume render demand from the APD region a particularly powerful source of variation for the decision of Brazilian firms to participate in export markets.

In Table S.7 we show separate estimates for the three main geographical regions in Brazil: the region of São Paulo state (Panel A); the South and South East region excluding São Paulo state (Panel B); and the North, North East and Central West regions (Panel C). We find suggestive evidence of greater hiring responses among firms that are located in the southern part of Brazil, where the concentration of exporters is higher.

In Table S.8 we explore whether firms prepare to export to the APD region by hiring workers from exporters to the APD region. We do so for hires across all occupations (Panel A) and for hires in skilled blue collar occupations (Panel B). In these specifications we use (log) non-Brazilian imports in APD as an instrument for exporting to the APD region. We find IV effects (columns 2 and 4) that are larger in magnitude than the effects estimated for all hires in Table 4 and Table 5. These effects, however, are noisier and significant only based on the Anderson-Rubin test. For this reason we interpret these results as suggestive of stronger effects on the hiring of workers with previous experience in exporting to the APD region.

Table S.9 reports the first-stage regressions underlying the IV regressions in Table 5 (columns 2 and 4) in the text. The according IV specifications under equation (2) alter the second-stage dependent variable and measure the hiring of workers grouped by occupation at the previous employer in

Table S.7: HIRES FROM EXPORTERS BY REGION

Dependent Variable (t):	Indic. Hire		log(Hires)	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Panel A: Sao Paulo state				
Indic. Exporter (t)	0.020***	2.721***	0.042***	1.702*
	(0.004)	(0.729)	(0.009)	(0.822)
F-stat. excluded instrument		13.200		16.089
Anderson-Rubin Wald test p-value		1.07e-06		0.071
Observations	577411	577411	109295	109295
Panel B: South and South East excluding Sao Paulo state				
Indic. Exporter (t)	0.032***	1.927**	0.037***	2.129***
	(0.005)	(0.674)	(0.009)	(0.617)
F-stat. excluded instrument		10.165		14.686
Anderson-Rubin Wald test p-value		4.91e-05		0.003
Observations	843850	843850	139728	139728
Panel C: North, North East and Central West				
Indic. Exporter (t)	0.046***	1.685	0.069**	-0.201
	(0.009)	(0.864)	(0.024)	(1.157)
F-stat. excluded instrument		13.353		3.686
Anderson-Rubin Wald test p-value		0.135		0.864
Observations	301360	301360	32442	32442

Notes: This tables shows the estimated effects of exporting on the hiring of workers with exporting experience by location of the poaching firm. We divide firms into regions based on the location in which they first appear in *Rais*. Each cell shows the coefficient from a separate regression. All regressions include the following controls: firm and year fixed effects, sectoral linear trends, employment changes between $t-1$ and t net of hires from exporters, contemporaneous and one-period lagged firm size, shares of worker by education (primary, secondary and tertiary) and occupation (unskill ed blue collar, skilled blue collar and white collar) categories, an indicator of a firm's high-skill intensity, an indicator of foreign ownership, one- and two-period lagged export status, and sectoral absorption. Panel D shows tests of the difference between coefficients in Panel A and B that are based on pooled regressions. Workforces on December 31st. In the specification of this table in which we have one endogenous regressor and one instrument, the Kleibergen-Paap rk Wald F-statistic corresponds to the F-statistic of the excluded instrument. Standard errors in parentheses, clustered at the 3-digit ISIC sector level. $^{*}p < 0.05,^{**}p < 0.01,^{***}p < 0.001$.
Sources: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

five main occupation categories (under the internationally common ISCO-88 classification, to which we map the RAIS reported Brazilian occupation classification CBO for the period 1994-2007). The Anderson-Rubin Wald test statistic exceeds a p-value of 5 percent in all occupations except skilled blue-collar (SBC) occupations. In other words, we fail to reject the absence of a second-stage effect in the specifications except those for skilled-blue-collar occupations. On the first stage, the F statistic for the entire sample (column 1 in Table S.9) exceeds 15, but in the restricted sample with only firms

Table S.8: HIRES OF WORKERS WITH EXPERIENCE IN THE APD REGION

Dependent Variable (t):	Indic. Hire		log(Hires)	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Panel A: Hiring of exporter workers from all occupations				
Indic. Exporter to APD (t)	0.029***	3.520	0.052**	3.683
	(0.005)	(1.953)	(0.018)	(1.995)
F-stat. excluded instrument		9.477		7.624
Anderson-Rubin Wald test p-value		0.033		0.064
Observations	1722626	1722626	121252	121252
Panel B: Hiring of exporter workers from skilled blue collar occupations				
Indic. Exporter to APD (t)	0.027***	3.152	0.044*	3.646
	(0.006)	(1.616)	(0.019)	(2.010)
F-stat. excluded instrument		9.477		5.701
Anderson-Rubin Wald test p-value		0.016		0.069
Observations	1722626	1722626	82870	82870

Notes: This tables shows the estimated effects of exporting to the APD region on the hiring of workers with previous experience at firms that export to the APD region. In columns 2 and 4 we use log non-Brazilian imports in APD as an instrument for exporting to the APD region at time t. In Panel A we consider hiring across all occupations, in Panel B we consider hiring in skilled blue collar occupations only. Each cell shows the coefficient from a separate regression. All regressions include the following controls: firm and year effects, sectoral linear trends, employment changes between $t-1$ and t net of hires from exporters, contemporaneous and one-period lagged firm size, shares of worker by education (primary, secondary and tertiary) and occupation (unskill ed blue collar, skilled blue collar and white collar) categories, an indicator of a firm's high-skill intensity, an indicator of foreign ownership, one- and two-period lagged export status, and sectoral absorption. Workforces on December 31st. In the specification of this table in which we have one endogenous regressor and one instrument, the Kleibergen-Paap rk Wald F-statistic corresponds to the F-statistic of the excluded instrument. Standard errors in parentheses, clustered at the 3-digit ISIC sector level.$^{*}p < 0.05$,$^{**}p < 0.01$,$^{***}p < 0.001$. *Sources*: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

that hire at least one exporter worker from the respective occupation group the F statistic falls short of a critical value of 10—except in the case of skilled blue-collar workers.

In Table 6 in the text, we investigate the relation between poaching of skilled blue-collar (SBC) workers and the presence of managers with exporting experience. Table S.10 reports the associated first-stage regressions. In Panel A, we use APD imports as the single instrument to predict export status. In Panel B, we need two instruments: one to predict export status and one additional instrument to predict the interaction of previously hired exporter managers with predicted export status. We use the interaction between APD imports and an indicator for hired exporter managers as the second instrument. Except for the interaction-term instrument for the intensive margin of hiring (column 4), all instruments pass the F test with a conventional critical value.

Table S.9: HIRING BY OCCUPATION: FIST-STAGE REGRESSIONS

Dependent Variable (t):	Entire Sample Indic. Exp. (t) (1)	Firms with hires>0 Indic. Exp. (t) (2)
Panel A: Hiring of exporter workers from professional or managerial occupations		
Non-Brazil Imports in APD	0.014***	0.054
	(0.004)	(0.029)
F-stat. excluded instrument	15.182	3.501
Partial R2 excluded instrument	7.74e-05	2.58e-04
Observations	1,722,626	44,133
Panel B: Hiring of exporter workers from technical or supervisory occupations		
Non-Brazil Imports in APD	0.014***	0.060*
	(0.004)	(0.024)
F-stat. excluded instrument	15.182	6.156
Partial R2 excluded instrument	7.74e-05	3.03e-04
Observations	1,722,626	59,480
Panel C: Hiring of exporter workers from other white-collar occupations		
Non-Brazil Imports in APD	0.014***	0.053*
	(0.004)	(0.021)
F-stat. excluded instrument	15.182	6.410
Partial R2 excluded instrument	7.74e-05	2.55e-04
Observations	1,722,626	36,480
Panel D: Hiring of exporter workers from skilled blue-collar occupations		
Non-Brazil Imports in APD	0.014***	0.043***
	(0.004)	(0.009)
F-stat. excluded instrument	15.182	20.905
Partial R2 excluded instrument	7.74e-05	2.64e-04
Observations	1,722,626	205,985
Panel E: Hiring of exporter workers from unskilled blue-collar occupations		
Non-Brazil Imports in APD	0.014***	0.037*
	(0.004)	(0.015)
F-stat. excluded instrument	15.182	6.574
Partial R2 excluded instrument	7.74e-05	1.49e-04
Observations	1,722,626	67,669

Notes: Each cell shows the coefficient from a separate regression. APD stands for Asia-Pacific Developing countries. All regressions include the following controls: firm and year effects, sectoral linear trends, employment changes between $t-1$ and t net of hires from exporters, contemporaneous and one-period lagged firm size, shares of worker by education (primary, secondary and tertiary) and occupation (unskilled blue-collar, skilled blue-collar and white-collar) categories, an indicator of a firm's high-skill intensity, an indicator of foreign ownership, one- and two-period lagged export status, and absorption. Standard errors in parentheses, clustered at the 3-digit ISIC subsector level. $^{*}p < 0.05,^{**} p < 0.01,^{***} p < 0.001$.

Sources: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

Table S.10: HIRES OF SKILLED BLUE COLLARS AND MANAGERS: FIRST STAGE REGRESSIONS

Dependent Variable (t):	Ind. Exp. (t) Entire Sample (1)	Ind. Exp. (t) × Ind. Hire Exp. Man. ($t-1$) Entire Sample (2)	Ind. Exp. (t) Firms with hires>0 (3)	Ind. Exp. (t) × Ind. Hire Exp. Man. ($t-1$) Firms with hires>0 (4)
Panel A: Hiring workers from skilled blue-collar (SBC) occupations				
Non-Brazil Imports in APD	0.014***		0.043***	
	(0.004)		(0.010)	
F-stat. Export (t) inst.	15.010		20.797	
Partial R2 Export (t) inst.		7.76e-05	2.65e-04	
Observations	1,722,626		205,985	
Panel B: Hiring workers from skilled blue-collar (SBC) occupations, manager-exporter interaction				
Non-Brazil Imports in APD	0.014***	0.001	0.043***	0.005
	(0.004)	(0.001)	(0.009)	(0.004)
Non-Brazil Imports in APD	0.004*	0.035**	-0.000006	0.024*
× Ind. Hire Exp. Man. ($t-1$)	(0.001)	(0.011)	(0.001)	(0.011)
F-stat. Export (t) inst.	11.246		10.700	
F-stat. interaction instr.		9.996		4.621
Partial R2 Export (t) inst.	9.62e-03		4.06e-03	
Partial R2 interaction instr.		1.07e-04		2.65e-04
Observations	1,722,626	1,722,626	205,985	205,985
Firm and year fixed effects	yes	yes	yes	yes
Industry-level linear trends	yes	yes	yes	yes

Notes: APD stands for Asia-Pacific Developing countries. All regressions include the following controls: firm and year effects, sectoral linear trends, employment changes between $t-1$ and t net of hires from exporters, contemporaneous and one-period lagged firm size, shares of worker by education (primary, secondary and tertiary) and occupation (unskilled blue-collar, skilled blue-collar and white-collar) categories, an indicator of a firm's high-skill intensity, an indicator of foreign ownership, one- and two-period lagged export status, and absorption. In the specification of this table in which we have one endogenous regressor and one instrument, the Kleibergen-Paap rk Wald F-statistic corresponds to the F-statistic of the excluded instrument. Standard errors in parentheses, clustered at the 3-digit ISIC subsector level. $^{*}p < 0.05, ^{**}p < 0.01, ^{***}p < 0.001$.
Sources: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

In Table S.11 we show a breakdown of the first-stage results of Table 3 between firms that manufacture consumer products and capital goods and firms that manufacture basic material. In line with the fact that Brazilian exports tend to concentrate in consumption goods, the results of Table S.11 are suggestive of stronger effects of imports in APD on export probabilities among firms that manufacture consumer products and capital goods. Due to the lower number of observations, however, estimates in Table S.11 are noisier than the results of Table 3 and their interpretation requires caution.

Complementing Table 10 in the main text for salary changes of expert hires, in Table S.12 we report salary changes for hires of non-experts, from non-exporters. Export status is a statistically weak

Table S.11: FOREIGN DEMAND AND EXPORT-MARKET PARTICIPATION BY SUB-SECTOR

	Exporter at time t		**Exporter at time $t+1$**	
Dependent Variable:	Entire Sample Indic. Exp. (t) (1)	Firms with hires>0 Indic. Exp. (t) (2)	Entire Sample Indic. Exp. ($t+1$) (3)	Firms with hires>0 Indic. Exp. ($t+1$) (4)
Panel A: Manufacture of basic material				
Log Non-Brazil Imports in APD	0.0047	0.0005	0.0088*	0.0132
	(0.0032)	(0.0103)	(0.0029)	(0.0083)
F-stat. excluded instrument	2.197	0.002	9.418	2.522
Partial R2 excluded instrument	5.40e-06	2.23e-08	1.72e-05	1.58e-05
Observations	324746	64696	291308	57449
Panel B: Manufacture of consumer products and capital goods				
Log Non-Brazil Imports in APD	0.0157*	0.0502***	0.0158*	0.0390*
	(0.0059)	(0.0123)	(0.0055)	(0.0149)
F-stat. excluded instrument	6.983	16.618	8.213	6.857
Partial R2 excluded instrument	8.08e-05	2.72e-04	6.53e-05	1.37e-04
Observations	1,397,880	216,769	1,251,574	191,970
Firm and year fixed effects	yes	yes	yes	yes
Industry-level linear trends	yes	yes	yes	yes

Notes: Each cell shows the coefficient from a separate regression. APD stands for Asia-Pacific Developing countries. All regressions include the following controls: firm and year effects, sectoral linear trends, employment changes between $t-1$ and t net of hires from exporters, contemporaneous and one-period lagged firm size, shares of worker by education (primary, secondary and tertiary) and occupation (unskilled blue-collar, skilled blue-collar and white-collar) categories, an indicator of a firm's high-skill intensity, an indicator of foreign ownership, one- and two-period lagged export status, and absorption. We round coefficients and standard errors to the 4th decimal points to account for the fact that some of the coefficients would be indistinguishable from 0 with fewer than 4 decimals. In the specification of this table in which we have one endogenous regressor and one instrument, the Kleibergen-Paap rk Wald F-statistic corresponds to the F-statistic of the excluded instrument. Standard errors in parentheses, clustered at the 3-digit ISIC subsector level. $^{*}p < 0.05,^{**}p < 0.01,^{***}p < 0.001$.
Sources: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

predictor of wage changes between the previous and new employer also for hires from non-exporters. In contrast to the hiring of experts, for non-experts the worker observable component, reflecting returns to observed skills and other reported worker characteristics, is statistically significantly negative in the OLS specification. This estimate is consistent with the possibility that common skills generate less surplus at exporters than at the average firm from where the workers originate because exporters value specific skills, such as expert status.

Table S.12: LOG SALARY CHANGES FOR HIRES FROM NON-EXPORTERS

	(1) OLS	(2) IV
Panel A. Dependent Variable: Change in mean Log Salary		
Indic. Exporter (t)	-0.005	0.850
	(0.007)	(0.460)
Anderson-Rubin Wald test p-value		0.163
Panel B. Dependent Variable: Change in mean Workers Observable Log Salary Component		
Indic. Exporter (t)	-0.006*	-0.120
	(0.003)	(0.174)
Anderson-Rubin Wald test p-value		0.503
Panel C. Dependent Variable: Change in mean Plant-fixed Log Salary Component		
Indic. Exporter (t)	0.002	0.450
	(0.003)	(0.448)
Anderson-Rubin Wald test p-value		0.373
Panel D. Dependent Variable: Change in mean Log Salary Residual Component		
Indic. Exporter (t)	-0.002	0.520
	(0.005)	(0.286)
Anderson-Rubin Wald test p-value		0.142
F-stat. excluded instrument		16.983
Observations	140,900	140,900
Firm fixed effects	Yes	Yes
Industry-level linear trend	Yes	Yes

Notes: Log salary change is the difference between the current log salary (component) and the log salary (component) at the preceding exporter. Log salary components from Mincer (1974) regressions by year for the cross section of plants, decomposing the log salary into a worker observable component, a plant-fixed component, and an individual worker residual, and then averaging over current employer's hires from exporters. All regressions include the following controls: firm and year effects, sectoral linear trends, employment changes between $t-1$ and t net of hires from exporters, contemporaneous and one-period lagged firm size, shares of worker by education (primary, secondary and tertiary) and occupation (unskilled blue-collar, skilled blue-collar and white-collar) categories, an indicator of a firm's high-skill intensity, an indicator of foreign ownership, one- and two-period lagged export status, and industry-level absorption. Workforces on December 31st. Annualized December wages are deflated to August 1994 using the Brazilian consumer price index (INPC). In the specification of this table in which we have one endogenous regressor and one instrument, the Kleibergen-Paap rk Wald F-statistic corresponds to the F-statistic of the excluded instrument. Standard errors, clustered at the sector level, in parentheses. $^{*}p < 0.05,^{**}p < 0.01,^{***}p < 0.001$.
Sources: SECEX and RAIS 1994-2007, manufacturing firms (ISIC rev. 2 300-400).

S4 Brazilian export industries to APD countries

To identify Brazil's dominant export industries (to APD and worldwide), we use the same WTF data as for the instruments and isolate the top-5 export industries to APD (and the rest of the world for comparison) in the years 1992, 1997, 2002 and 2007. We use five-year intervals close to our 1994-2007 sample period for comparable reporting of top industries over time. We also perform a comparison to trade flow data from the US ITC, which include services, so we can assess the relevance of merchandize exports (agriculture, mining and manufacturing trade), on which our approach in this paper is based, as compared to services trade.

At the ISIC Rev. 2 level and using the WTF data, *Metal ore mining*, *Iron and steel basic industries* and *Food manufacturing* are among Brazil's top-5 industries shipping to APD in all four years 1992, 1997, 2002 and 2007. *Agriculture and livestock production* is among the top-5 industries in three out of the four years.

Most of these top export industries are not just Brazil's leading exports to APD but *Agriculture and livestock production* and *Food manufacturing* are also among Brazil's top-5 export industries worldwide in all four years, and *Metal ore mining* and *Iron and steel basic industries* each in three out of four years. In other words, several of Brazil's dominant export industries also control most shipments to APD. However, some dominant Brazilian export industries do not succeed among the top-5 in ADP while among the strongest otherwise. Concretely, *Manufacture of transport equipment* (including aircraft) is among Brazil's top-5 export industries worldwide in all four years and *Manufacture of machinery except electrical* is among the top 5 in two out of four years, but neither of those two more advanced manufacturing industries ranks among the top-5 from Brazil to APD in any of the four years.

WTF data do not include services trade. We use the ITPD-E data from the US ITC for the years 2002 and 2007 to assess the relevance of services exports from Brazil to APD. We map the ITPD-E industries to ISIC Revision 3 codes for comparability to our main industry classification in this paper (ISIC Revision 2). We find that *Mining of iron ores*, *Growing of cereals and other crops*, *Manufacture of basic iron and steel*, and *Production, processing and preserving of meat and meat products* are four of the five top-5 industries shipping from Brazil to APD in 2002 and 2007 also according to ITPD-E data and that no services industry places among the top exporters from Brazil to APD.

S5 Country Groups

Asia-Pacific Developing countries (APD): Bhutan, Bouvet Island, British Indian Ocean Territory, Burma, Cambodia, Canton and Enderbury Islands, China, Christmas Island, Cocos (Keeling) Islands, Cook Islands, East Timor, Fiji, French Polynesia, Heard Island and McDonald Islands, Hong Kong, Indonesia, Kiribati, People's Democratic Republic of Korea, Republic of Korea, People's Democratic Republic of Laos, Macao, Malaysia, Maldives, Marshall Islands, Mayotte, Micronesia, Federated States of Mongolia, Myanmar, Nauru, New Caledonia, New Hebrides, Niue, Norfolk Island, Pacific Islands (trust territory), Palau, Papua New Guinea, Philippines, Pitcairn, Samoa, Singapore, Solomon Islands, Taiwan, Thailand, Timor-Leste, Tokelau, Tonga, Tuvalu, Vanuatu, Viet Nam, Wallis and Futuna.

Central and Eastern European countries (CEE): Albania, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Former Yugoslav Republic of Macedonia, Republic of Moldova, Poland, Romania, Serbia and Montenegro, Slovakia, Slovenia, Ukraine, Yugoslavia.

Latin American and Caribbean countries (LAC, including Mexico):[30] Anguilla, Antigua and Barbuda, Argentina, Aruba, Bahamas, Barbados, Belize, Bolivia, Brazil, British Virgin Islands, Cayman Islands, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Falkland Islands, French Guiana, Grenada, Guadeloupe, Guatemala, Guyana, Haiti, Honduras, Jamaica, Martinique, Mexico, Montserrat, Netherlands Antilles, Nicaragua, Panama, Paraguay, Peru, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and The Grenadines, South Georgia and The South Sandwich Islands, Suriname, Trinidad and Tobago, Turks and Caicos Islands, Uruguay, US Virgin Islands, Venezuela.

North American countries (NAM, excluding Mexico): American Samoa, Bermuda, Canada, Greenland, Guam, Johnston Island, Midway Islands, Northern Mariana Islands, Saint Pierre and Miquelon, Puerto Rico, US Miscellaneous Pacific Islands, US Minor Outlying Islands, Wake Island.

[30] Latin American and Caribbean countries are excluded from the set of instrumental variables in this paper.

Other Developing countries (ODV) Afghanistan, Algeria, Angola, Antarctica, Armenia, Azerbaijan, Bahrain, Bangladesh, Benin, Botswana, British Antarctic Territory, Brunei Darussalam, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Democratic Republic of the Congo, Côte D'Ivoire, Dahomey, Djibouti, Dronning Maud Land, Egypt, Equatorial Guinea, Eritrea, Ethiopia, French Southern and Antarctic Territories, Gabon, Gambia, Georgia, Ghana, Guinea, Guinea-Bissau, India, Islamic Republic of Iran, Iraq, Israel, Jordan, Kazakhstan, Kenya, Kuwait, Kyrgyzstan, Lebanon, Lesotho, Liberia, Libyan Arab Jamahiriya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Nepal, Neutral Zone, Niger, Nigeria, Oman, Pakistan, Occupied Palestinian Territory, Qatar, Russian Federation, Rwanda, Réunion, Saint Helena, São Tome and Principe, Saudi Arabia, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sri Lanka, Sudan, Swaziland, Syrian Arab Republic, Tajikistan, United Republic of Tanzania, Togo, Tunisia, Turkey, Turkmenistan, Uganda, United Arab Emirates, Uzbekistan, Western Sahara, People's Democratic Republic of Yemen, Zaire, Zambia, Zimbabwe.

Other Industrialized countries (OIN): Australia, Japan, New Zealand.

Western European countries (WEU): Andorra, Austria, Belgium, Canary Islands, Ceuta, Melilla, Cyprus, Denmark, Faroe Islands, Finland, France (including Metropolitan France), Germany, Gibraltar, Greece, Holy See (Vatican City State), Iceland, Ireland, Italy, Liechtenstein, Luxembourg, Malta, Monaco, Netherlands, Norway, Portugal, San Marino, Spain, Svalbard and Jan Mayen, Sweden, Switzerland, United Kingdom, Åland Islands.