Catalogue no. 11-622-M — No. 021
ISSN: 1705-6896
ISBN: 978-1-100-19204-8

Research Paper

**The Canadian Economy in Transition Series**

# Global Links: Exporting, Foreign Direct Investment, and Wages: Evidence from the Canadian Manufacturing Sector

by Sébastien Breau and W. Mark Brown

Micro-economic Analysis Division
18th Floor, R.H. Coats Building, 100 Tunney's Pasture, Ottawa,
K1A 0T6

Telephone: 1-800-263-1136

Statistics Canada Statistique Canada

Canada

**How to obtain more information**
Specific inquiries about this product and related statistics or services should be directed to the Media Hotline, Communications and Library Services Division, Statistics Canada, Ottawa, Ontario K1A 0T6 (telephone: 613-951-4636).

For information about this product or the wide range of services and data available from Statistics Canada, visit the Statistics Canada website, at www.statcan.gc.ca, or contact us by e-mail, at infostats@statcan.gc.ca, or by telephone from 8:30 a.m. to 4:30 p.m. Monday to Friday:

**Statistics Canada National Contact Centre**
Toll-free telephone (Canada and the United States):

| | |
|---|---|
| Inquiries | 1-800-263-1136 |
| National telecommunications device for the hearing-impaired | 1-800-363-7629 |
| Facsimile | 1-877-287-4369 |

**Local or international calls**

| | |
|---|---|
| Inquiries | 1-613-951-8116 |
| Facsimile | 1-613-951-0581 |

**Depository services program**

| | |
|---|---|
| Inquiries | 1-800-635-7943 |
| Facsimile | 1-800-565-7757 |

**Information to access the product**
This product, Catalogue no. 11-622-M, is available for free in electronic format. To obtain a single issue, visit the Statistics Canada website, at www.statcan.gc.ca. Under “Our agency”: click on “Site map > Statistics and studies” and select “Publications.”

**Standards of service to the public**
Statistics Canada is committed to serving its clients in a prompt, reliable, and courteous manner. To this end, the Agency has developed standards of service which its employees observe in serving its clients. To obtain a copy of these service standards, please contact Statistics Canada, toll-free, at 1-800-263-1136. The service standards are also published on www.statcan.gc.ca. Under “Our agency”: click on “About us > The agency >” and select “Providing services to Canadians.”

**The Canadian Economy in Transition**

**The Canadian Economy in Transition** is a series of new analytical reports that investigate the dynamics of industrial change in the Canadian economy. This new series brings together a coherent set of research reports that provide users with a wide variety of empirical perspectives on the economy’s changing industrial structure. These perspectives include the dynamics of productivity, profitability, employment, output, investment, occupational structure, and industrial geography. Readers are encouraged to contact the authors with comments, criticisms, and suggestions.

All papers in **The Canadian Economy in Transition** series go through institutional and peer review in order to ensure that they conform to Statistics Canada’s mandate as a government statistical agency and adhere to generally accepted standards of good professional practice.

The papers in the series often include results derived from multivariate analysis or other statistical techniques. It should be recognized that the results of these analyses are subject to uncertainty in the reported estimates.

The level of uncertainty will depend on several factors: the nature of the functional form used in the multivariate analysis; the type of econometric technique employed; the appropriateness of the statistical assumptions embedded in the model or technique; the comprehensiveness of the variables included in the analysis; and the accuracy of the data that are utilized. The peer group review process is meant to ensure that the papers in the series have followed accepted standards, in order to minimize problems in each of these areas.

**Statistics Canada**
**Economic Analysis Division**

# Global Links: Exporting, Foreign Direct Investment, and Wages: Evidence from the Canadian Manufacturing Sector

**Sébastien Breau and W. Mark Brown**

Published by authority of the Minister responsible for Statistics Canada



**August 2011**

Catalogue no. 11-622-M, no. 021
Frequency: Occasional

ISSN 1705-6896
ISBN 978-1-100-19204-8

Ottawa

Authors' names are listed alphabetically.

*La version française de cette publication est disponible (n$^{o}$ 11-622-M au catalogue, n$^{o}$ 021).*

**Note of appreciation**
Canada owes the success of its statistical system to a long-standing partnership between Statistics Canada, the citizens of Canada, and Canada's businesses, governments, and other institutions. Accurate and timely statistical information could not be produced without the continued cooperation and goodwill of these partners.

# Acknowledgements

The authors thank Robert Gibson for his assistance with data development as well as John Baldwin and Guy Gellatly for helpful suggestions. The paper also benefited from comments from three anonymous referees. It forms part of a broader research program supported by the Social Sciences and Humanities Research Council of Canada and Statistics Canada.

**Symbols**

The following standard symbols are used in Statistics Canada publications:

| | |
|---|---|
| . | not available for any reference period |
| .. | not available for a specific reference period |
| … | not applicable |
| 0 | true zero or a value rounded to zero |
| $0^s$ | value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded |
| $^p$ | preliminary |
| $^r$ | revised |
| x | suppressed to meet the confidentiality requirements of the *Statistics Act* |
| $^E$ | use with caution |
| F | too unreliable to be published |
| * | significantly different from reference category ($p < 0.05$) |

# Table of contents

## Abstract

Do exporters and foreign-controlled establishments pay their workers higher wages than non-exporters and domestic-controlled establishments? This paper draws on an employer-employee dataset to explore the existence of exporter and foreign-controlled wage premiums in the Canadian manufacturing sector. Results from wage regression models reveal that, on the whole, exporters and foreign-controlled plants do pay higher wages than non-exporters and domestic-controlled plants. These results hold even after controlling for other plant and worker characteristics though the wage differentials are substantially smaller. Furthermore, while the impact of foreign control on wages is found to be widespread across industries and regions, that of exporting is not. At the industry level, the wage effects of export market participation are strongest for workers in plants belonging to scale-based industries; regionally, they are strongest in Quebec and British Columbia.

**Keywords:** export wage premium; foreign control; manufacturing.

## Executive summary

Trade and foreign direct investment (FDI) are central to the process of globalization. Over the last 50 years, advocates of greater trade and FDI liberalization have been guided by the notion that removing barriers to both stimulates economic growth. An extensive body of work using newly available micro-data files has emerged comparing the productivity levels of exporters against those of non-exporters, and of foreign-controlled firms against those of domestic firms. With few exceptions, this work shows that exporting and foreign-controlled plants are significantly more productive though the direction of causality between internationalization and productivity remains a point of contention.

Many of these empirical studies also document important differences in how exports and FDI affect other plant-level performance measures. In particular, growing attention is given to the existence of exporter and foreign-control wage premiums. The question this finding begs is why exporters or foreign-controlled firms pay their workers higher wages than do non-exporters or domestic-controlled firms. On the one hand, this may relate to firm characteristics. For instance, it may be because exporters or foreign-controlled plants tend to be larger in size, and size is positively associated with wages. On the other hand, an exporter (or foreign-controlled firm) may be paying higher wages because it is employing more skilled workers. In other words, it may be hiring workers with a different set of individual characteristics (i.e., age, education, etc.), which are also important determinants of wages.

This paper documents the existence of exporter and foreign-control wage premiums in Canada and investigates whether or not these premiums reflect differences in firm characteristics and/or in the quality of labour, at both a national and a regional level of analysis. To the best of the authors' knowledge, no study has addressed these issues simultaneously in the Canadian context. The authors are able to do so by developing a novel employer-employee dataset that combines detailed information on manufacturing plants and the characteristics of their workers.

Four main findings emerge from the analysis.

First, there are clear benefits to working in an exporting or foreign-controlled establishment. Results from plant-level regressions controlling exclusively for a plant's export and foreign-control status reveal that exporters pay, on average, wages that are about 14% higher than those paid by non-exporters, and that foreign-controlled plants pay wages that are about 30% higher than those paid by domestic-controlled plants.

Second, these wage premiums appear to be in large part attributable to other plant characteristics. Adding controls for plant size, capital intensity, and multi-unit-firm status reduces the wage differentials in exporters to about 6% and in foreign-controlled plants to 19%.

Third, adding controls for individual worker characteristics further reduces the wage premiums observed, but only slightly. Furthermore, such controls do not purge the statistical significance of the export and foreign-control status of plants. In other words, the export and foreign-control wage premiums do not disappear after controlling for individual worker characteristics. These results hold at the national level.

Fourth, and perhaps most interesting, is the variation found in export wage premiums across regions. In contrast to Quebec and British Columbia, where exporters pay, on average, higher wages for identical workers, the export wage premium in Ontario is substantially smaller and disappears completely after controlling for other plant and worker characteristics. Such a finding for Ontario may be related to differences in the organizational and structural characteristics of plants as well as to the destination of goods exported.

In the end, the results presented in this paper suggest that a large portion (45% to 60%) of the raw export and foreign-control wage premiums can be attributed to plant and worker characteristics. However, the fact that significant wage premiums remain also points to the need for further analysis. For instance, it may be that important plant-level characteristics have not been taken into account in our models. In particular, one limitation of the Annual Survey of Manufactures is that it does not distinguish between foreign-control and multinational-corporation status. It may also be that there are unobserved worker skills that have not been taken into account. Or, if plants gain productivity through export-based learning, these productivity gains may be passed on to workers in the form of higher wages as the learning is likely embedded in the workers themselves. Therefore, a fuller understanding of the remaining export and foreign-control wage premiums rests on developing longitudinal data that provide even more detailed information on both workers and firms and on the evolution of these characteristics over time.

# 1 Introduction

Trade and foreign direct investment (FDI) are central to the process of globalization. Over the last 50 years, advocates of greater trade and FDI liberalization have been guided by the notion that removing barriers to both—for instance, by lowering tariff rates or having fewer restrictions on foreign control—stimulates economic growth. Cross-country evidence to the effect that greater openness is positively associated with growth now forms the general consensus within the macroeconomics literature (see, however, Rodriguez and Rodrik 2001 and Billmeier and Nannicini 2009 for dissenting viewpoints). More recently, the debate has shifted to the microeconomics literature, where researchers are trying to understand how export-market participation and foreign control are linked to the performance of firms. Following publication of Bernard and Jensen's (1995) seminal paper on exports across U.S. manufacturing establishments, an extensive body of work using newly available micro-data files has emerged comparing the productivity levels of exporters against those of non-exporters, and the productivity levels of foreign-controlled firms against those of domestic firms (see Lipsey 2004, Lopez 2005, Greenaway and Kneller 2007, and Wagner 2007 for comprehensive reviews of this literature). With few exceptions, this work shows that exporting and foreign-controlled plants are significantly more productive though the direction of causality between internationalization and productivity remains a point of contention.

Many of these empirical studies also document important differences in how exports and FDI affect other plant-level performance measures. In particular, growing attention is given to the existence of exporter and foreign-control wage premiums. Across developed countries, Bernard and Jensen (1999) estimate that U.S. exporters pay, on average, wages that are 9.3% higher than those paid by non-exporters. Arnold and Hussinger (2005) find a 25% export wage premium for German manufacturers. Similarly, Heyman, Sjoholm, and Tingvall (2007) report a 20% foreign-control wage premium across Swedish firms. The range of estimates for wage differentials in developing countries is even broader (see Aw and Batra 1999 for evidence from Taiwan, Hahn 2004 for Korea, Alvarez and Lopez 2005 for Chile, Van Biesebroeck 2005 for Sub-Saharan Africa; see also Flanagan 2006 for estimates from other developing countries).

The question these findings beg is why exporters or foreign-controlled firms pay their workers higher wages than do non-exporters or domestic-controlled firms. On the one hand, this may relate to firm characteristics. For instance, it may be because exporters and foreign-controlled plants tend to be larger in size, and size is positively associated with wages (Brown and Medoff 1989, Troske 1999). Or, as Lipsey (2004) suggests, foreign-controlled firms may be required to do pay higher wages because of host-country regulations, or to prevent—or at least reduce—leakages of proprietary technology stemming from worker turnover (see also Fosfuri, Motta, and Ronde 2001). On the other hand, an exporter (or foreign-controlled firm) may be paying higher wages because it is employing more skilled workers. In other words, hiring workers with a different set of individual characteristics (i.e., age, education, etc.), may also be important determinants of wages.

The goal of this paper is to document the existence of exporter and foreign-control wage premiums in Canada and to investigate whether or not these premiums reflect differences in firm characteristics and/or in the quality of labour. To the best of our knowledge, no study has

addressed these issues simultaneously in the Canadian context. The analysis is carried out by developing a novel employer-employee dataset that combines detailed information on manufacturing plants and the characteristics of their workers. A second contribution of the paper is that it examines regional differences in exporter and foreign-control wage premiums.

The paper proceeds as follows. Section 2 provides a brief discussion of the evolution in trade and FDI policy in Canada and reviews the relevant literature. Section 3 identifies and describes the data used for the analysis. Model specifications are discussed in Section 4. Section 5 presents the empirical results, while the final section highlights the paper's main conclusions.

# 2 Trade and foreign direct investment in the Canadian context

When it comes to trade and FDI, Canada has undergone a series of policy regime changes over the last 40 years. The implementation of the *Foreign Investment Review Act* (FIRA) in 1973−1974 gave rise to a more stringent regulatory framework whereby investments (above a certain threshold) by foreign firms had to be monitored, assessed, and approved by the federal government. The share of assets and revenues controlled by foreign firms generally declined over the decade following the introduction of FIRA (Baldwin and Gellatly 2005). This trend had reversed itself by the mid-1980s, following the passage of the *Investment Canada Act*, which eased the regulatory burden in order to attract foreign investments, recognizing that these delivered important economic benefits. With the implementation of the *Canada-U.S. Free Trade Agreement* (1989) and of the subsequent *North American Free Trade Agreement* (1994), the further liberalized regulatory regime led to increased levels of trade and greater shares of foreign-controlled assets and revenues through the late 1990s (Globerman and Shapiro 1999; Baldwin and Gellatly 2005).

Baldwin and Gu (2003) explore how such changes have affected the linkages between exports and productivity at the plant-level in Canada. They find evidence of significant productivity differentials between exporters and non-exporters with more productive plants typically self-selecting into export markets though some learning-by-exporting effect is also present. Gu and Sawchuk (2006) also find that greater integration has benefited productivity growth in the manufacturing sector. Perhaps more interesting, they argue that the benefits of economic integration are unevenly distributed across regions with Ontario, in particular, having benefited most from the liberalized post-FTA environment in terms of productivity growth at the plant-level. Furthermore, though the evidence they present is based on the analysis of plant-level data (from the Annual Survey of Manufactures (ASM)) with no controls for worker characteristics, they do suggest that part of these productivity gains were passed on to workers in the form of higher wages.

Globerman *et al.* (1994) study productivity and wage differentials across foreign-controlled and domestic establishments in Canada. Using a sample drawn from the 1986 Census of Manufactures, they find that foreign-controlled plants pay their workers higher wages than Canadian establishments but that these wage premiums tend to disappear after controlling for capital efficiency and plant size. This paper updates and extends this analysis by incorporating: (i) additional plant controls, including the export status of an establishment; and (ii) the characteristics of employees working in those establishments. This study also offers a spatial perspective by examining regional differences in the exporter and foreign-control wage premiums given differences in industrial structures, labour force characteristics, and levels of integration into international markets.

# 3 Data sources and description

The employer-employee dataset used for the analysis in this paper is constructed from two micro-data sources. The first is the 1999 Annual Survey of Manufactures (ASM), which covers all establishments engaged primarily in manufacturing activities in Canada. The ASM is administered to approximately 35,000 establishments across the country and comprises three different questionnaires: a long form; a short form; and a head office questionnaire. The long-form version of the ASM provides the most detailed establishment-level data, including information on each plant's shipments of goods, inventories, purchases of materials, labour, wages and salaries, and other production-related costs. It also includes information on the main business activity of each establishment–which is used to assign a plant to one of 236 possible four-digit Standard Industrial Classification (SIC) industry codes–and its geographical location. The short form is an abbreviated questionnaire typically sent out to smaller businesses to reduce response burden. Since it does not contain information on the destination of shipments (i.e., exports), short-form plants are dropped from the ASM sample for the purposes of this study. The head office (HO) questionnaire collects data on the operations, administrative functions, and service purchases of HO units only. Establishments reporting as HO locations are also dropped from the sample.[1] This leaves close to 13,000 manufacturing establishments in the initial ASM sample. We use a Geographic Information System (GIS) to generate the centroid coordinates of each establishment's postal code polygon.[2] Once *XY* coordinates are created, they are used to locate manufacturing establishments at the census-tract or census-subdivision level in order to be mapped to workers drawn from the Census file.

The second source of data is the long-form questionnaire of the 2001 Census of Population, which one-in-five Canadian households received. It contains information on each individual in the household, including age, sex, level of education, citizenship, and immigrant status. It also contains detailed information on the labour market activities of individuals aged 15 and older, including the number of hours worked, the general nature of the business carried out in the establishment where the individual worked–which is used to assign the individual to an industry–and the individual's place of work. The Census-based industry codes are equivalent to three-digit SIC codes. For manufacturing activities, there are 110 such industry codes. In 2001, some 359,000 individuals were employed in manufacturing industries in the one-in-five sample of the Census, earning a minimum of $1,200 in annual wages and salaries.[3] Place-of-work information for individuals working in metropolitan areas and select census agglomerations is available at the census-tract level; otherwise, place of work is defined at the census-subdivision level.

Once industry and geography codes are standardized across both data files, a probabilistic mapping of Census-based worker records to synthetic establishments derived from the ASM is used to create the employer-employee dataset.[4] This is an *ex post* probabilistic mapping that is similar to a matching model defined as: $M(w_{ij} \rightarrow p_{ij}) = f(c_{wij} + \varepsilon_{wij}, c_{pij} + \varepsilon_{pij})$. Here, the mapping of worker *w* and plant *p* is a function of the true worker industry-geography cell ($c_{wij}$) and the true plant industry-geography cell ($c_{pij}$), where *i* indexes industries and *j* locations. $\varepsilon_{wij}$ and $\varepsilon_{pij}$ are industry-geography error terms depicting the probabilistic nature of the mapping. In essence,

one can therefore think of the mapping algorithm as the overlaying of individual workers to a synthetic establishment based on the probability that both share the same industry and geography cells. As others using similar mapping techniques have pointed out (see Troske 1998 and Moretti 2004), it is important to note that this is an indirect probabilistic mapping technique, the validity of which rests on whether or not workers are mapped to the correct industry-geography cells. This question, along with procedural details regarding the mapping exercise itself and the imputation method used to create the synthetic establishments, is addressed in greater length in a related paper (see Breau and Rigby 2010). In the end, 79,062 individuals are mapped to 4,713 synthetic manufacturing establishments across Canada.

**Table 1**
**Comparing the employer-employee dataset to the Annual Survey of Manufactures**

| | Employer-employee sample | | | | Annual Survey of Manufactures sample | | | |
|---|---|---|---|---|---|---|---|---|
| | Number of plants | Plant share | Employment share | Output share | Number of plants | Plant share | Employment share | Output share |
| | | | percent | | | | percent | |
| Exporters | 2,676 | 56.80 | 79.31 | 79.75 | 7,711 | 59.40 | 81.26 | 84.19 |
| Non-exporters | 2,037 | 43.20 | 20.69 | 20.25 | 5,272 | 40.60 | 18.74 | 15.81 |
| Foreign-controlled | 1,077 | 22.80 | 39.39 | 54.24 | 2,963 | 22.80 | 37.99 | 55.26 |
| Domestic-controlled | 3,636 | 77.20 | 60.64 | 45.76 | 10,020 | 77.20 | 62.01 | 44.74 |

Note: Annual Survey of Manufactures sample includes long-form plants only.
Sources: Census of Population (2001) and Annual Survey of Manufactures (1999).

Table 1 provides a comparison of the employer-employee dataset to the ASM sample in terms of the distribution of plants as either exporters or non-exporters and as either foreign-controlled or domestic-controlled. The representativeness of the probabilistic mapping is striking: 57% of plants in the employer-employee dataset are exporters, compared to 59% of plants in the ASM, while the share of foreign-controlled vs. domestic-controlled plants is exactly the same in both samples. Most of the plants (77.2%) are domestic-controlled plants while the remaining 22.8% are controlled by foreign interests. The relative importance of exporters and foreign-controlled plants in terms of overall employment and output (i.e., value of shipments) shares is also presented in Table 1. Plants that export account for about 80% of total employment and output; while fewer in numbers, foreign-controlled plants account for about 40% of all employment and for about 55% of output.

There is also significant cross-industry and regional variation in the shares of employment and output controlled by foreign multinationals, as well as differences in average export-intensity ratios (i.e., the ratio of exports to shipments). To depict variation across manufacturing sectors in the Canadian economy, the paper adopts an aggregate industrial classification employed by the Organization for Economic Co-operation and Development (OECD) to examine the composition of international exports (OECD 1987, 1992). Manufacturing industries are grouped into five categories: resource-intensive (e.g., food, smelting and refining); labour-intensive (e.g., textiles, apparel, furniture, fabricated metals); scale-based (e.g., pulp and paper, iron and steel, motor vehicles, industrial chemicals); product-differentiated (e.g., miscellaneous machinery and equipment, appliances, electrical products, toys, sporting goods); and science-based (e.g., pharmaceuticals, aircraft, telecommunications equipment, scientific instruments). These groupings are defined on the basis of the primary factor affecting the competitiveness of each activity. For the resource-intensive sector, the primary factor affecting competition is access to natural resources. Labour costs shape competitiveness in the labour-intensive sector, and length of production runs does so in the scale-based sector. Tailoring production to specific demand characteristics is the primary factor affecting competitiveness in the product-differentiated sector. For the science-based sector, it is the rapid application of new scientific discoveries. This classification was applied by

Baldwin and Rafiquzzaman (1994) to investigate structural industrial change in Canada and has since been widely used in studies based on establishment-level data from the ASM.[5]

**Table 2**
**Output and employment shares of foreign-controlled plants, and export intensity, by industry sector and region**

| | Foreign-controlled | | Average export intensity ratio |
|---|---|---|---|
| | Employment share | Output share | |
| | percent | | |
| **Industry sector** | | | |
| Resource-intensive | 34.62 | 45.46 | 14.67 |
| Labour-intensive | 24.44 | 36.19 | 15.90 |
| Scale-based | 48.38 | 64.78 | 26.45 |
| Product-differentiated | 46.86 | 65.14 | 24.55 |
| Science-based | 39.60 | 44.49 | 23.64 |
| **Region** | | | |
| Atlantic region[1] | 31.69 | 34.85 | 21.88 |
| Quebec | 28.01 | 36.29 | 16.44 |
| Ontario | 52.50 | 66.88 | 26.25 |
| Prairie provinces[2] | 37.58 | 61.48 | 14.07 |
| British Columbia | 34.87 | 48.01 | 19.73 |

1. The Atlantic region includes the provinces of Newfoundland and Labrador, Prince Edward Island, Nova Scotia, and New Brunswick.
2. The Prairie provinces include Manitoba, Saskatchewan, and Alberta.

Source: Annual Survey of Manufactures (1999).

Foreign multinationals control the largest shares of employment and output in scale-based and product-differentiated industries (see Table 2). Not surprisingly, these two industry sectors also have the highest average export intensities, since foreign-controlled plants account for a large share of exports in Canadian manufacturing. Science-based activities also have high levels of foreign-control and export intensity, followed by the resource-intensive and labour-intensive sectors.

By far, the largest regional market share controlled by foreign multinationals belongs to Ontario, where the highest average export-intensity ratio is also found. In terms of industrial structure, Ontario is home to some of the largest concentrations of scale-based, product-differentiated, and science-based manufacturing activities. The Prairie provinces, British Columbia, Quebec, and Atlantic Canada follow in terms of foreign-controlled output shares.

Differences in key establishment and worker characteristics between exporters and non-exporters and between foreign-controlled and domestic-controlled plants are reported in Table 3. On average, exporters tend to be larger in size, to be more productive, to pay higher wages (more on this below), to be more capital-intensive, and to be more likely to be part of a multi-plant firm than non-exporters. Workers in plants that export are slightly older, better educated, and more likely to be male, immigrant, non-visible-minority, and employed on a full-time basis than workers in plants that do not export. Compared to domestic-controlled plants, foreign-controlled plants tend to be larger in size, more productive, and more capital-intensive. As well, with the exception of the immigrant status variable, foreign-controlled vs. domestic-controlled differentials are also apparent across worker characteristics.

## Table 3
## Descriptive statistics, employer-employee dataset

| | Exporters | Non-exporters | Foreign-controlled | Domestic-controlled |
|---|---|---|---|---|
| **Establishment characteristics** | | | | |
| Plant size (number of employees) | 161 | 55 | 198 | 90 |
| Value of shipments (dollars) | 54,750,275 | 18,261,164 | 92,519,831 | 23,120,426 |
| Value-added per worker (dollars) | 114,461 | 86,981 | 157,937 | 86,188 |
| Wages and salaries per worker (dollars) | 37,797 | 31,585 | 44,013 | 32,475 |
| Capital-to-labour ratio (percent) | 68 | 64 | 71 | 65 |
| Export intensity (percent) | 34 | 0.0 | 26 | 17 |
| Percentage multi-plant | 49 | 33 | 80 | 31 |
| Number of observations | 2,676 | 2,037 | 1,077 | 3,636 |
| **Worker characteristics** | | | | |
| Age | 40 | 40 | 41 | 40 |
| Years of schooling | 13 | 13 | 13 | 13 |
| Percentage male | 75 | 69 | 76 | 73 |
| Percentage immigrant | 20 | 18 | 20 | 20 |
| Percentage non-visible-minority[1] | 87 | 88 | 88 | 86 |
| Percentage part-time | 3.1 | 4.0 | 2.6 | 3.7 |
| Number of observations | 61,887 | 17,175 | 28,936 | 50,126 |

1. The excluded categories are *visible minority* and *Aboriginal*.

Note: Means are reported unless otherwise indicated. Establishment characteristics are based on plant-level data reported in the Annual Survey of Manufactures. Worker characteristics are based on individual-level data derived from the 20% Census of Population sample and are weighted.

Sources: Census of Population (2001) and Annual Survey of Manufactures (1999).

Of particular interest is the observed wage differential across plant classifications: wages are, on the whole, 20% higher in exporting plants than in non-exporting plants and 36% higher in foreign-controlled plants than in domestic-controlled plants. However, there is significant variation in the extent of these wage premiums across industries and regions (see Table 4). The difference between average wages in exporting plants and average wages in non-exporting plants is much larger in scale-based industries than in other manufacturing activities. This difference is largest in the province of Quebec, even though the latter has a lower average export-to-shipments ratio relative to the other regions. The ratio of average wages in foreign-controlled plants to average wages in domestic-controlled plants is highest in resource-intensive and science-based industries; across regions, it is highest in Quebec and the Prairies, followed by British Columbia, the Atlantic provinces, and Ontario.

## Table 4
## Average wages and wage ratios, by industry and region

| | Exporters | Non-exporters | Wage ratio | Foreign-controlled | Domestic-controlled | Wage ratio |
|---|---|---|---|---|---|---|
| **Total** | 37,796.6 | 31,584.9 | 1.20 | 44,012.9 | 32,475.3 | 1.36 |
| **Industry sector** | | | | | | |
| Resource-intensive | 36,235.5 | 31,853.4 | 1.14 | 43,016.5 | 31,124.6 | 1.38 |
| Labour-intensive | 31,234.7 | 27,893.5 | 1.12 | 36,132.2 | 28,932.3 | 1.25 |
| Scale-based | 44,051.2 | 33,877.8 | 1.30 | 47,151.0 | 37,850.5 | 1.24 |
| Product-differentiated | 37,024.7 | 32,759.4 | 1.13 | 42,558.0 | 33,939.2 | 1.25 |
| Science-based | 41,556.6 | 36,622.8 | 1.13 | 47,087.1 | 35,348.8 | 1.33 |
| **Region** | | | | | | |
| Atlantic region[1] | 31,374.0 | 28,909.6 | 1.08 | 39,712.8 | 28,671.9 | 1.32 |
| Quebec | 33,994.8 | 27,723.5 | 1.23 | 40,531.3 | 29,246.3 | 1.38 |
| Ontario | 42,065.1 | 39,136.7 | 1.07 | 45,103.2 | 38,788.7 | 1.16 |
| Prairie provinces[2] | 36,457.1 | 33,034.1 | 1.10 | 43,910.2 | 31,874.4 | 1.38 |
| British Columbia | 43,884.9 | 37,564.8 | 1.17 | 51,033.9 | 38,517.9 | 1.32 |

1. The Atlantic region includes the provinces of Newfoundland and Labrador, Prince Edward Island, Nova Scotia, and New Brunswick.
2. The Prairie provinces include Manitoba, Saskatchewan, and Alberta.

Source: Annual Survey of Manufactures (1999).

The observed wage premiums in exporting and foreign-controlled plants may be caused by a series of factors. It was argued earlier that larger establishments typically pay their workers higher wages than smaller establishments. Similarly, highly-educated workers on average garner higher wages than less-educated workers, such that plants employing a great number of workers with higher levels of schooling may be expected to pay generally higher wages. The following section describes the empirical approach adopted in this paper to further explore these questions.

# 4 Modeling approach

Having pointed out the existence of important wage differentials between exporters and non-exporters and between foreign-controlled and domestic-controlled plants, the next step is to examine more closely the significance of these premiums after taking into account a set of control variables for other establishment and worker characteristics. The analysis begins with a log-wage equation specified as:

$$\ln \overline{WS}_{ij} = \alpha + \beta_1 EXPORT_{ij} + \beta_2 FOREIGN_{ij} + \delta PLANTS_{ij} + \gamma \overline{WORKERS}_{ij} + \varepsilon_{ij}, \quad (1)$$

where *i* is the index for individual workers employed in plant *j*. The dependent variable ($\overline{WS}_{ij}$) represents average wages and salaries per worker, defined simply as the total annual wages and salaries paid out by plant *j* divided by the number of workers in plant *j*. $EXPORT_{ij}$ is a binary variable capturing the export status of plant *j* (=*1* if the plant exports to international markets, *0* if not), and $FOREIGN_{ij}$ is a binary variable capturing the foreign-control status of plant *j* (=*1* if the plant is foreign-controlled, *0* if not)[6]. $PLANTS_{ij}$ is a vector of control variables reflecting other plant-level characteristics. These include the log of each plant's size (i.e., based on total employment), the log of its capital-to-labour ratio,[7] a binary variable to capture whether or not plant *j* is part of a multi-establishment firm, and a binary variable to capture the 'city effect' of plants located in metropolitan areas.[8] There is a rich empirical literature showing that individuals working in urban areas are typically paid higher wages (see: Glaeser and Maré 2001; Wheeler 2001; Yankow 2006; Combes, Duranton, and Gobillon 2008; Lehmer and Moller 2010; Beckstead *et al.* 2010). $\overline{WORKERS}_{ij}$ is a vector of control variables reflecting average worker characteristics at the plant level. Included as worker controls are the log of the average age of workers in a plant, the log of workers' average level of education (i.e., measured in total years of schooling), and the percentage of workers *i* in plant *j* that are male, non-visible-minority, and recent immigrants. In this case, the coefficient estimate $\beta_1$ represents the export wage premium; it shows the percentage difference in average wages paid out by exporters to their workers, compared to non-exporters. The foreign-control wage premium is given by the coefficient estimate $\beta_2$.

Equation (1) is thus estimated across plants using plant-level averages or percentages for wages, establishment, and worker characteristics. As such, the model does not fully capture the heterogeneity present across individual workers. In order to do so, equation (1) is re-estimated as:

$$\ln WS_{ij} = \alpha + \beta_1 EXPORT_{ij} + \beta_2 FOREIGN_{ij} + \delta PLANTS_{ij} + \gamma WORKERS_{ij} + \varepsilon_{ij}, \quad (2)$$

where the dependent variable ($WS_{ij}$) represents the annual wages and salaries of worker *i* in plant *j*, and where $WORKERS_{ij}$ represents each individual worker's actual personal attributes. That is, the individual's age, level of schooling, sex, race, and immigration status.

Both models are estimated using ordinary least squares and the Huber-White sandwich estimator to produce robust variance estimates (White 1980). Equation (2), which is estimated across individual workers, uses person weights to project the information from the one-in-five Census-based sample to the full population and also controls for potential clustering at the establishment-level given that several workers may be mapped to the same plant (Moulton 1986).

# 5 Results

The results for the estimation of the establishment-level wage equation (equation 1) are presented in Table 5. Model 1 of Panel (A) is the simplest specification, where the only variables included are the export and foreign-control dummies. Coefficient estimates for both variables are significant at the .05 level and consistent with the findings reported in Table 4. On average, wages in plants that export are 14% higher than wages in plants that do not export. Wages in foreign-controlled establishments are, on average, 30% higher than those in domestic establishments.

Model 2 includes additional plant-level characteristics that are also thought to influence wages. Compared to Model 1, controlling for a plant's size, capital-to-labour ratio, multi-unit status, and metropolitan area status considerably reduces the export and foreign-control wage differentials: the export wage premium drops to 6%, while the foreign-controlled wage premium falls to 19%. In other words, much of the export and foreign-control wage premiums can be attributed to differences in other establishment-level characteristics, in particular, plant size and capital intensity.[9] The employer-size wage premium is positive and significant with a coefficient estimate of .057 for the log employment, while that of the capital-to-labor ratio is .098. Plants that are part of a multi-unit firm also, on average, pay higher wages, as do those located in metropolitan areas. Such results are consistent with findings from previous empirical studies.

In Model 3, the estimates shown include controls for average worker characteristics at the plant-level. The value of the *R-squared* increases, and the partial regression coefficients for age, education, and sex are all statistically significant; thus, plants will, on average, pay higher wages to older (i.e., a proxy for experience), better educated, and male workers. Though the coefficient estimates for percent non-visible-minority and percent immigrant display the expected signs, both variables are not statistically significant. One reason for such a finding is that the heterogeneity found in worker attributes is likely obscured when averaged out at the plant level. The estimate for the urban wage premium of approximately 9% is similar to that found by Beckstead *et al.* (2010) and roughly within the range of estimates for U.S. urban wage differentials produced by Dumond, Hirsch, and Macpherson (1999), Glaeser and Maré (2001), and Yankow (2006), after controlling for observed and unobserved individual characteristics using a broader set of workers covering a wide range of industries. For the purposes of this paper, what is most interesting to note is that the coefficient estimates for the export and foreign-control binary variables are reduced only slightly compared to those found in Model 2, and, more importantly, they remain statistically significant. In other words, even after introducing additional controls for worker characteristics, exporters and foreign-controlled plants still pay higher wages on average. To be sure, the wage premiums are smaller—about 40% and 55%, respectively, of the original estimates found in Model 1—but nonetheless statistically significant. These results support recent findings by Schank, Schnabel, and Wagner (2007) for Germany and by Heyman, Sjoholm, and Tingvall (2007) for Sweden.

## Table 5
## Establishment-level wage regression models

| | Panel (A) | | | | | | Panel (B) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Model 1 | | Model 2 | | Model 3 | | Model 1 | | Model 2 | | Model 3 | |
| | coefficient | standard error | coefficient | standard error | coefficient | standard error | coefficient | standard error | coefficient | standard error | coefficient | standard error |
| **Establishment characteristics** | | | | | | | | | | | | |
| Export profile | | | | | | | | | | | | |
| Export (yes = 1)[1] | 0.141 * | 0.011 | 0.061 * | 0.011 | 0.058 * | 0.011 | … | … | … | … | … | … |
| Export intensity | … | … | … | … | … | … | 0.224 * | 0.020 | 0.097 * | 0.021 | 0.073 * | 0.019 |
| Foreign-controlled (yes = 1)[1] | 0.298 * | 0.012 | 0.188 * | 0.013 | 0.162 * | 0.012 | 0.301 * | 0.012 | 0.188 * | 0.013 | 0.162 * | 0.012 |
| Log of plant size (employment) | … | … | 0.057 * | 0.005 | 0.060 | 0.004 | … | … | 0.059 * | 0.005 | 0.062 * | 0.004 |
| Log of capital-to-labour ratio | … | … | 0.107 * | 0.015 | 0.097 * | 0.014 | … | … | 0.110 * | 0.016 | 0.100 * | 0.014 |
| Multi-plant status (yes = 1)[1] | … | … | 0.132 * | 0.011 | 0.108 * | 0.010 | … | … | 0.134 * | 0.011 | 0.110 * | 0.010 |
| Metropolitan (yes = 1)[1] | … | … | 0.097 * | 0.010 | 0.086 * | 0.011 | … | … | 0.099 * | 0.010 | 0.086 * | 0.011 |
| **Worker characteristics** | | | | | | | | | | | | |
| Mean age | … | … | … | … | 0.006 * | 0.001 | … | … | … | … | 0.006 * | 0.001 |
| Mean education | … | … | … | … | 0.036 * | 0.003 | … | … | … | … | 0.036 * | 0.003 |
| Percent male | … | … | … | … | 0.278 * | 0.017 | … | … | … | … | 0.278 * | 0.017 |
| Percent non-visible-minority | … | … | … | … | 0.019 | 0.035 | … | … | … | … | 0.020 | 0.035 |
| Percent immigrant | … | … | … | … | -0.017 | 0.029 | … | … | … | … | -0.011 | 0.029 |
| Constant | 10.200 * | 0.008 | 10.000 * | 0.020 | 9.140 * | 0.059 | 10.300 * | 0.007 | 10.000 * | 0.020 | 9.150 * | 0.059 |

| | Panel (A) | | | Panel (B) | | |
|---|---|---|---|---|---|---|
| | Model 1 | Model 2 | Model 3 | Model 1 | Model 2 | Model 3 |
| Weighted | No | No | No | No | No | No |
| *F*-statistics | 473.2 | 264 | 206.1 | 465.9 | 267.6 | 206.3 |
| *R-squared* | 0.153 | 0.241 | 0.324 | 0.146 | 0.24 | 0.322 |
| Number of observations | 4713 | 4713 | 4713 | 4713 | 4713 | 4713 |

1. *yes=1* indicates the presence of the attribute.
Note: Standard errors are heteroscedasticity-consistent and are also robust to possible clustering at the plant level; * significant at the .05 level; **significant at the .10 level.
Sources: Census of Population (2001) and Annual Survey of Manufactures (1999).

Panel (B) of Table 5 reports on three similar specifications of equation (1), replacing the export binary variable with a measure of export intensity. Overall, the results do not differ from those reported in Panel (A), with every coefficient estimate robust to this change in specification. Furthermore, as control variables are added to the model, the parameter estimate for the export-intensity variable falls from .224 to .073. That is, a ten-percentage-point increase in export intensity gives rise to a .73 percent increase in the average wages and salaries of workers.[10]

## Table 6
## Worker-level wage regression models

| | Model 1 | | Model 2 | | Model 3 | |
|---|---|---|---|---|---|---|
| | coefficient | standard error | coefficient | standard error | coefficient | standard error |
| **Establishment characteristics** | | | | | | |
| Export (yes = 1)[1] | 0.183 * | 0.029 | 0.061 * | 0.024 | 0.044 * | 0.016 |
| Foreign-controlled (yes = 1)[1] | 0.211 * | 0.029 | 0.106 * | 0.028 | 0.067 * | 0.020 |
| Log of plant size (employment) | … | … | 0.073 * | 0.015 | 0.060 * | 0.011 |
| Log of capital-to-labor ratio | … | … | 0.102 * | 0.030 | 0.086 * | 0.023 |
| Multi-plant status (yes = 1)[1] | … | … | 0.216 * | 0.023 | 0.133 * | 0.016 |
| Metropolitan (yes = 1)[1] | … | … | 0.060 * | 0.025 | 0.079 * | 0.016 |
| **Worker characteristics** | | | | | | |
| Age | … | … | … | … | 0.023 * | 0.000 |
| Years of education | … | … | … | … | 0.053 * | 0.002 |
| Male (yes = 1)[1] | … | … | … | … | 0.406 * | 0.009 |
| Non-visible-minority (yes = 1)[1] | … | … | … | … | 0.205 * | 0.023 |
| Immigrant (yes = 1)[1] | … | … | … | … | -0.066 * | 0.015 |
| Constant | 10.20 * | … | 9.79 * | … | 7.84 * | 0.056 |

| | Model 1 | Model 2 | Model 3 |
|---|---|---|---|
| Weighted | Yes | Yes | Yes |
| *F*-statistics | 61.2 | 47 | 637.4 |
| *R-squared* | 0.031 | 0.083 | 0.287 |
| Number of observations | 410,239 | 410,239 | 410,239 |

1. *yes=1* indicates the presence of the attribute.
Note: Standard errors are heteroscedasticity-consistent and are also robust to possible clustering at the plant level; * significant at the .05 level; **significant at the .10 level.

As others working with employer-employee data have pointed out, establishment-level regression models may suffer from an aggregation bias because the full heterogeneity of individual worker characteristics is not taken into account (Schank, Schnabel, and Wagner 2007). To address this issue, results from the worker-level wage regressions (equation 2) are reported in Table 6. A look at Models 1 through 3 shows results comparable to those found in Table 5 though there are a few noticeable differences. First, across all three models, the difference in exporter and foreign-controlled wage premiums is smaller. Second, the estimate for the foreign-controlled wage premium (6.7%) is substantially reduced from that found by using the plant-level wage regression models, whereas the export wage premium (4.4%) is only slightly lower. Heyman, Sjoholm, and Tingvall (2007) report a similar drop in the foreign-control wage premium in Sweden when switching from firm-level to individual-level estimations. As for the regression coefficients on other plant and worker characteristics, they are consistent with earlier results. Moreover, as suspected, the coefficient estimates for the non-visible-minority-status and immigrant-status binary variables are now statistically significant. The estimate for the latter variable suggests that immigrants receive, on average, wages and salaries that are 6.6% lower than those of non-immigrant workers. This is twice the magnitude of the wage

differential reported by Hall and Kahn (2008) in a study looking at the performance of immigrant workers in high-tech sectors across Canadian cities. The difference between the two estimates likely reflects the fact that all industrial sectors are included in this analysis, not only high-tech industries, where workers are, on average, paid higher wages than elsewhere (a point returned to later on).

The analytical results obtained so far can be summarized as follow. First, it is clear that exporters and foreign-controlled plants pay higher wages than non-exporters and domestic-controlled plants. This result holds even after controlling for other plant and worker characteristics. Second, the above results also suggest that much of the export and foreign-control wage premiums can be accounted for by other plant characteristics (such as size and capital intensity) rather than by worker characteristics.

The wage ratios presented earlier (see Table 4) also suggest that the wage effects of export-market participation and foreign control differ across industries and regions. In particular, the export wage premium appears to be driven by scale-based activities, whereas the wage effects of foreign control are much more widespread across industries. To explore the possibility of industry-specific wage effects, equation (1) is re-estimated by adding a set of interaction terms that allow for the effect of export-market participation to vary across industrial sectors. Table 7 reports the results of these wage differential effects on the basis of the OECD five-category industry classification, with the resource-intensive sector serving as the benchmark industrial sector.

## Table 7
## Establishment-level wage regressions, industry-sector models

| | Model 1 | | Model 2 | | Model 3 | |
|---|---|---|---|---|---|---|
| | coefficient | standard error | coefficient | standard error | coefficient | standard error |
| **Establishment characteristics** | | | | | | |
| Export (yes = 1)[1] | 0.120 * | 0.018 | 0.035 * | 0.016 | 0.045 * | 0.016 |
| Export x labour-intensive | 0.001 | 0.029 | -0.014 | 0.027 | -0.240 | 0.025 |
| Export x scale-based | 0.140 * | 0.029 | 0.080 * | 0.026 | 0.049 ** | 0.025 |
| Export x product-differentiated | 0.001 | 0.036 | -0.015 | 0.033 | -0.010 | 0.021 |
| Export x science-based | 0.036 | 0.046 | 0.013 | 0.041 | -0.021 | 0.040 |
| Foreign-controlled (yes = 1)[1] | ... | ... | 0.165 * | 0.012 | 0.148 * | 0.012 |
| Log of plant size (employment) | ... | ... | 0.055 * | 0.004 | 0.057 * | 0.004 |
| Log of capital-to-labour ratio | ... | ... | 0.099 * | 0.012 | 0.094 * | 0.013 |
| Multi-plant status (yes = 1)[1] | ... | ... | 0.118 * | 0.011 | 0.100 * | 0.010 |
| Metropolitan (yes = 1)[1] | ... | ... | 0.105 * | 0.010 | 0.090 * | 0.011 |
| Labour-intensive (yes = 1)[1] | -0.142 * | 0.021 | -0.080 * | 0.020 | -0.047 * | 0.019 |
| Scale-based (yes = 1)[1] | 0.063 * | 0.022 | 0.085 * | 0.020 | 0.081 * | 0.019 |
| Product-differentiated (yes = 1)[1] | 0.044 | 0.028 | 0.086 * | 0.027 | 0.051 ** | 0.028 |
| Science-based (yes = 1)[1] | 0.118 * | 0.037 | 0.083 * | 0.034 | 0.077 * | 0.033 |
| **Worker characteristics** | | | | | | |
| Mean age | ... | ... | ... | ... | 0.005 * | 0.001 |
| Mean education | ... | ... | ... | ... | 0.032 * | 0.003 |
| Percent male | ... | ... | ... | ... | 0.253 * | 0.017 |
| Percent non-visible-minority | ... | ... | ... | ... | 0.015 | 0.034 |
| Percent immigrant | ... | ... | ... | ... | 0.004 | 0.028 |
| Constant | 10.0 * | 0.02 | 10.0 * | 0.020 | 9.22 * | 0.059 |

| | Model 1 | Model 2 | Model 3 |
|---|---|---|---|
| Weighted | No | No | No |
| *F*-statistics | 76.5 | 139.0 | 135.6 |
| *R-squared* | 0.129 | 0.284 | 0.348 |
| Number of observations | 4,713 | 4,713 | 4,713 |

1. *yes=1* indicates the presence of the attribute.

Note: Standard errors are heteroscedasticity-consistent and are also robust to possible clustering at the plant level; * significant at the .05 level; **significant at the .10 level.

The findings are generally consistent with expectations. In terms of industry-specific effects, wages are on average lowest in the labour-intensive sector and highest across plants in the science-based and scale-based sectors. The coefficient estimate for the scale-based-industry binary variable is lower than expected, given the wage differential identified in Table 4. However, this discrepancy is in large part explained by the estimate for the interaction term between exporting and scale-based industries, which suggests that the wage effect of export-market participation is highest in the scale-based sector. In contrast, the export wage premium is not significantly different in other industrial sectors when compared to the resource-intensive sector. Though not shown here, results for a similar set of models using interaction terms for foreign-control status and industry sectors correspond to the findings presented in Table 4.

Regional variations in export and foreign-control wage differentials are shown in Table 8, where equation (1) is re-estimated separately for each region. Panel (A) estimates include only the export and foreign-control binary variables; additional plant-level controls are left out for the moment. Consistent with results from the national level models, the foreign-control status of a plant plays a larger role in determining wages than does its exporting status. Geographically, the foreign-control wage premium is statistically significant across all regions. With the

exception of Atlantic Canada, the export wage premium is also present across all regions. The influence of export-market participation on wages is particularly high in Quebec and British Columbia whereas it is much smaller in Ontario and in the Prairies.[11]

The difference in the size of regional export wage differentials may be related in part to the production of goods destined for overseas markets. Greenaway and Kneller (2007) argue that the origin and destination of trade/FDI are likely contributors to firm-level productivity and wage outcomes, as potential for learning from exporting and asymmetries in size or technology varies across trading regions. In this case, Ontario, compared to Quebec and British Columbia, is much more integrated with the U.S. market (Brown and Anderson 1999; Gu and Sawchuk 2006). Roughly 93% of the province's exports in 2001 were destined for the U.S., with a large portion of these shipments consisting of intermediate goods traded within the same industries. British Columbia, in contrast, exported more than 30% of its manufactured products to non-U.S. destinations with Japan, China and South Korea topping the list. Likewise, a large share of Quebec's exports was shipped overseas to European markets (i.e., primarily to the United Kingdom, Germany, France, and the Netherlands).[12]

## Table 8
## Establishment-level wage regression models, by region

| | Panel (A) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Atlantic region[1] | | Quebec | | Ontario | | Prairie provinces[2] | | British Columbia | |
| | coefficient | standard error | coefficient | standard error | coefficient | standard error | coefficient | standard error | coefficient | standard error |
| **Establishment characteristics** | | | | | | | | | | |
| Export (yes = 1)[3] | 0.011 | 0.04 | 0.152 ** | 0.015 | 0.048 ** | 0.021 | 0.047 * | 0.026 | 0.104 ** | 0.033 |
| Foreign-controlled (yes = 1)[3] | 0.304 ** | 0.054 | 0.263 ** | 0.022 | 0.133 ** | 0.018 | 0.276 ** | 0.03 | 0.249 ** | 0.04 |
| Log of plant size (employment) | … | … | … | … | … | … | … | … | … | … |
| Log of capital-to-labour ratio | … | … | … | … | … | … | … | … | … | … |
| Multi-plant status (yes = 1)[3] | … | … | … | … | … | … | … | … | … | … |
| Metropolitan (yes = 1)[3] | … | … | … | … | … | … | … | … | … | … |
| **Worker characteristics** | | | | | | | | | | |
| Mean age | … | … | … | … | … | … | … | … | … | … |
| Mean education | … | … | … | … | … | … | … | … | … | … |
| Percent male | … | … | … | … | … | … | … | … | … | … |
| Percent non-visible-minority | … | … | … | … | … | … | … | … | … | … |
| Percent immigrant | … | … | … | … | … | … | … | … | … | … |
| Constant | 10.2 ** | 0.028 | 10.1 ** | 0.014 | 10.5 ** | 0.021 | 10.3 ** | 0.025 | 10.4 ** | 0.029 |

| | Panel (A) | | | | |
|---|---|---|---|---|---|
| | Atlantic region[1] | Quebec | Ontario | Prairie provinces[2] | British Columbia |
| Industry dummies | Yes | Yes | Yes | Yes | Yes |
| *F*-statistics | 11.6 | 84.6 | 29.2 | 24.4 | 18.1 |
| *R-squared* | 0.15 | 0.214 | 0.132 | 0.187 | 0.174 |
| Number of observations | 358 | 1,984 | 1,204 | 676 | 491 |

See notes at end of table.

## Table 8
## Establishment-level wage regression models, by region (continued)

| | Panel (B) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Atlantic region[1] | | Quebec | | Ontario | | Prairie provinces[2] | | British Columbia | |
| | coefficient | standard error | coefficient | standard error | coefficient | standard error | coefficient | standard error | coefficient | standard error |
| **Establishment characteristics** | | | | | | | | | | |
| Export (yes = 1)[3] | -0.048 | 0.039 | 0.055 * | 0.015 | 0.02 | 0.021 | -0.02 | 0.027 | 0.085 * | 0.035 |
| Foreign-controlled (yes = 1)[3] | 0.167 * | 0.048 | 0.133 * | 0.021 | 0.081 * | 0.017 | 0.174 * | 0.033 | 0.123 * | 0.039 |
| Log of plant size (employment) | 0.079 | 0.015 | 0.065 * | 0.006 | 0.037 * | 0.008 | 0.062 * | 0.012 | 0.038 * | 0.014 |
| Log of capital-to-labour ratio | 0.04 ** | 0.023 | 0.132 * | 0.024 | 0.053 * | 0.022 | 0.127 * | 0.034 | 0.069 ** | 0.039 |
| Multi-plant status (yes = 1)[3] | 0.098 * | 0.038 | 0.097 * | 0.017 | 0.021 | 0.018 | 0.069 * | 0.029 | 0.111 * | 0.033 |
| Metropolitan (yes = 1)[3] | 0.12 * | 0.036 | 0.091 * | 0.014 | 0.049 * | 0.02 | 0.003 | 0.03 | -0.035 | 0.036 |
| **Worker characteristics** | | | | | | | | | | |
| Mean age | 0.008 * | 0.002 | 0.005 * | 0.001 | 0.005 * | 0.001 | 0.003 ** | 0.002 | 0.01 * | 0.003 |
| Mean education | 0.031 * | 0.011 | 0.024 * | 0.004 | 0.033 * | 0.005 | 0.027 * | 0.008 | 0.037 * | 0.008 |
| Percent male | 0.302 * | 0.061 | 0.229 * | 0.022 | 0.326 * | 0.033 | 0.121 * | 0.039 | 0.193 * | 0.065 |
| Percent non-visible-minority | -0.101 | 0.174 | 0.061 | 0.076 | 0.108 * | 0.052 | 0.097 | 0.069 | -0.012 | 0.081 |
| Percent immigrant | -0.038 | 0.12 | -0.035 | 0.051 | -0.055 | 0.044 | -0.119 ** | 0.061 | -0.163 * | 0.08 |
| Constant | 9.04 * | 0.253 | 9.23 * | 0.101 | 9.41 * | 0.11 | 9.53 * | 0.14 | 9.37 * | 0.169 |

| | Panel (B) | | | | |
|---|---|---|---|---|---|
| | Atlantic region[1] | Quebec | Ontario | Prairie provinces[2] | British Columbia |
| Industry dummies | Yes | Yes | Yes | Yes | Yes |
| *F*-statistics | 15.8 | 72.8 | 26.4 | 19.1 | 17.2 |
| *R-squared* | 0.359 | 0.369 | 0.278 | 0.313 | 0.316 |
| Number of observations | 358 | 1,984 | 1,204 | 676 | 491 |

1. The Atlantic region includes the provinces of Newfoundland and Labrador, Prince Edward Island, Nova Scotia, and New Brunswick.
2. The Prairie provinces include Manitoba, Saskatchewan, and Alberta.
3. *yes=1* indicates the presence of the attribute.

Note: Standard errors are heteroscedasticity-consistent and are also robust to possible clustering at the plant level; * significant at the .05 level; **significant at the .10 level.
Source: Annual Survey of Manufactures (1999).

Panel (B) estimates include additional controls for plant and worker characteristics that, for the most part, behave as expected. The foreign-control premium continues to be significant across all regions though coefficient estimates are generally less pronounced than those found in Panel (A). On the other hand, when these controls are added to the establishment-level specification, the export wage premium disappears in Ontario and the Prairies. Only exporters in Quebec and British Columbia continue to, on average, pay their workers higher wages.

This finding appears at first glance puzzling given that the export wage premium is highest across plants in the scale-based sector, many of which are located in Ontario. To be sure, the estimate for Ontario's export wage premium in Panel (A) is already markedly smaller than the estimates for the other regions. In order to further investigate this matter, the regional models were re-estimated with a set of interaction terms allowing for the effect of exporting to differ across industries (as in Table 7). First, when the export binary variable is included in the model by itself and interacted with industry dummies, only the scale-based industry interaction term is statistically significant. In other words, for Ontario, the scale-based industry-specific wage effects of exporting are present—which is consistent with expectations from national-level results. Second, when other plant controls are added to the specification, the coefficient estimate for the interaction term (export x scale-based sector) is smaller but remains statistically significant. Again, the export wage premium present across Ontario manufacturers is driven primarily by scale-based industries. However, when plant-level worker characteristics are added to the mix, the coefficient estimate on the interaction term is no longer statistically significant. This suggests exporters in Ontario pay, on average, higher wages because they employ workers with different characteristics than do non-exporters. Among the latter, the education premium appears to be particularly high in Ontario compared to other regions (with the exception of British Columbia). This is also the case with the wage premium paid to male and non-visible-minority workers.

This finding is similar to that obtained by Breau and Rigby (2006) in the case of exporters in the Los Angeles area, but it does not reconcile with the findings of Gu and Sawchuk (2006) for Canadian regions. Recall that Gu and Sawchuk (2006) argue that the impact of deepening North American integration is positively related to productivity growth in Ontario, more so than in other parts of the country. They also argue that workers enjoyed higher real wage growth in Ontario. There are several plausible explanations for the difference between these findings and those reported herein. For one, the analysis presented in this paper focuses on wage levels. In contrast, Gu and Sawchuk (2006) use a difference-in-difference specification comparing the annual percentage change in real wages across two specific periods: pre-FTA (1980 to 1988) and post-FTA (1988 to 1999). It may be that the real wage gains found during the post-FTA era were experienced early on. Likewise, the trade integration measure developed by Gu and Sawchuk (2006) is different in that it encompasses both imports and exports between Canada and the U.S. This paper is focused on plant-level exports and not imports. Interestingly, when changes in trade integration are decomposed across those two categories, Gu and Sawchuk (2006) find that import growth is the main factor underlying regional differences in the pace of integration with the U.S., not export growth. Finally, though their model controls for the capital-to-labour ratio and industry fixed-effects, it does not include other plant-level characteristics, nor does it include controls for worker characteristics.

As an aside, the fact that the coefficient estimate on the interaction term for the scale-based sector is considerably reduced by the addition of other plant-level controls also suggests that these establishment characteristics overshadow the effects of export-market participation *per se* on wages. Differences in the production structure of plants, in particular, are likely contributors to the non-significance of the export wage premium observed in Ontario. Recent evidence presented by Baldwin, Brown, and Gu (2011) seems to support this hypothesis. They argue that regional differences in levels of trade integration lead to regional differences in how plants

reorganize their production structure over time. Using a longitudinal micro-data file covering the 1974-to-1999 period, Baldwin, Brown, and Gu find that exporters in Ontario have become relatively larger in size, adopted longer production-runs, and decreased their product-line diversity, all of which are seen as enhancing productivity growth. In contrast, exporters located further away from the industrial heartland have experienced smaller increases in plant size and in length of production-runs. The benefits of export-market participation, in other words, are perhaps not directly transmitted to workers in the form of higher wages but are instead reallocated via induced effects that operate through other structural plant characteristics (see also Melitz 2003 for industry-level reallocation effects). The wage effects of plant size and capital intensity are certainly present in Ontario, and analysis of standardized coefficients confirms that these are (with foreign control) the primary plant-level determinants of wages.

In short, the impact of foreign-control on wages is widespread across both industries and regions. On the other hand, the effect of export-market participation on wages is found to be greatest across plants in scale-based industries and differs across regions.

# 6 Conclusion

This paper uses an employer-employee dataset to investigate the effects of exporting and FDI on wages in the manufacturing sector in Canada. Four main findings emerge from the analysis. First, there are clear benefits to working in an exporting or foreign-controlled establishment. Results from plant-level regressions controlling exclusively for a plant's export and foreign-control status reveal that exporters pay, on average, wages that are about 14% higher than those paid by non-exporters and that foreign-controlled plants pay wages that are about 30% higher than those paid by domestic-controlled plants.

Second, these wage premiums appear to be in large part attributable to other plant characteristics. Adding controls for plant size, capital intensity, and multi-unit firm status reduces the wage differentials in exporters to about 6% and in foreign-controlled plants to 19%.

Third, adding controls for individual worker characteristics further reduces the wage premiums observed, but does so only slightly. Furthermore, such controls do not purge the statistical significance of the export and foreign-control status of plants. In other words, the export and foreign-control wage premiums do not disappear after controlling for individual worker characteristics. These results hold at the national level.

Fourth, and perhaps most interesting, is the variation found in export wage premiums across regions. In contrast to Quebec and British Columbia, where exporters pay, on average, higher wages for identical workers, the export wage premium in Ontario is substantially smaller and disappears completely after controlling for other plant and worker characteristics. Such a finding for Ontario may be related to differences in the organizational and structural characteristics of plants as well as to the destination of the goods exported.

In the end, the results presented in this paper suggest that a large portion (45% to 60%) of the raw export and foreign-control wage premiums can be attributed to plant and worker characteristics. However, the fact that significant wage premiums remain also points to the need for further analysis. For instance, it may be that important plant-level characteristics have not been taken into account in the models. In particular, one limitation of the ASM is that it does not distinguish between foreign-control status and multinational-corporation status. Recent studies have shown that there are important differences in results obtained using multinational-corporation and non-multinational-corporation status, rather than foreign-controlled and domestic-controlled status. It is often the case that the foreign-control wage premium is in fact a multinational corporation wage premium (Doms and Jensen 1998; Richardson 2005; Heyman, Sjoholm, and Tingvall 2007). Baldwin and Gu (2005) find similar results for Canada by linking the ASM to 1993 data on the international operations of Canadian firms derived from the Survey of Innovation and Advanced Technology. It may also be that there are unobserved worker skills that have not been taken into account. Or, if plants gain productivity through export-based learning, these productivity gains may be passed on to workers in the form of higher wages as the learning is likely embedded in the workers themselves. Therefore, a fuller understanding of the remaining export and foreign-control wage premiums rests on developing longitudinal data that provide even more detailed information on both workers and firms and on the evolution of these characteristics over time.

# References


Alvarez, R., and R.A. Lopez. 2005. “Exporting and performance: evidence from Chilean plants.” *Canadian Journal of Economics*. Vol. 38. No. 4. p. 1384−1400.

Arnold, J.M., and K. Hussinger. 2005. “Export Behavior and Firm Productivity in German Manufacturing: A Firm-Level Analysis.” *Review of World Economics.* Vol. 141. No. 2. p. 219−243.

Aw, B.Y., and G. Batra. 1999. “Wages, firm size, and wage inequality: How much do exports matter?” *Innovation, Industry Evolution, and Employment.* D.B. Audretsch and A.R. Thurik (eds.). Cambridge, United Kingdom. Cambridge University Press. p. 13−56.

Baldwin, J.R., and W.M. Brown. 2005. *Foreign Multinationals and Head Office Employment in Canadian Manufacturing Firms*. Statistics Canada Catalogue no. 11F0027M. Ottawa, Ontario. Economic Analysis (EA) Research Paper Series. No. 34.

Baldwin, J.R., W.M. Brown, and W. Gu. 2011. “Geographic Market Access and the Effects of Trade on the Length of Production Runs, Product Diversity and Plant Scale of Canadian Manufacturing Plants, 1974 to 1999.” *Journal of Economic Geography*. Forthcoming.

Baldwin, J.R., and G. Gellatly. 2005. *Global Links: Long-Term Trends in Foreign Investment and Foreign Control in Canada, 1960 to 2000*. Statistics Canada Catalogue no. 11-622-M. Ottawa, Ontario. The Canadian Economy in Transition Series. No. 8.

Baldwin, J.R., and W. Gu. 2003. “Export-market participation and productivity performance in Canadian manufacturing.” *The Canadian Journal of Economics.* Vol. 36. No. 3. p. 634−657.

Baldwin, J.R., and W. Gu. 2005. *Global Links: Multinationals, Foreign Ownership, and Productivity Growth in Canadian Manufacturing*. Statistics Canada Catalogue no. 11-622-M. Ottawa, Ontario. The Canadian Economy in Transition Series. No. 9.

Baldwin, J.R., and M. Rafiquzzaman. 1994. *Structural Change in the Canadian Manufacturing Sector, 1970-1990*. Statistics Canada Catalogue no. 11F0019M. Ottawa, Ontario. Business and Labour Market Analysis (Analytical Studies Branch Research Paper Series). No. 61.

Beckstead, D., W.M. Brown, Y. Guo, and B. Newbold. 2010. *Cities and Growth: Earnings Levels Across Urban and Rural Areas: The Role of Human Capital*. Statistics Canada Catalogue no. 11-622-M. Ottawa, Ontario. The Canadian Economy in Transition Series. No. 20.

Bernard, A.B., and J.B. Jensen. 1995. “Exporters, Jobs, and Wages in U.S. Manufacturing: 1976−1987.” *Brookings Papers on Economic Activity: Microeconomics*. Washington, D.C. The Brookings Institution. Vol. 1995. p. 67−112.

Bernard, A.B., and J.B. Jensen. 1999. “Exceptional exporter performance: cause, effect, or both?” *Journal of International Economics.* Vol. 47. No. 1. p. 1−25.

Billmeier, A., and T. Nannicini. 2009. “Trade Openness and Growth: Pursuing Empirical Glasnost.” *IMF Staff Papers*. Washington, D.C. International Monetary Fund. Vol. 56. No. 3. p. 447−475.

Breau, S., and D.L. Rigby. 2006. “Is There Really an Export Wage Premium? A Case Study of Los Angeles Using Matched Employee-Employer Data.” *International Regional Science Review*. Vol. 29. No. 3. p. 297−310.

Breau, S., and D.L. Rigby. 2010. “International trade and wage inequality in Canada.” *Journal of Economic Geography*. Vol. 10. No. 1. p. 55−86.

Brown, C., and J. Medoff. 1989. “The Employer Size-Wage Effect.” *Journal of Political Economy*. Vol. 97. No. 5. p. 1027−1059.

Brown, W.M., and W.P. Anderson. 1999. “The Influence of Industrial and Spatial Structure on Canada-U.S. Regional Trade.” *Growth and Change.* Vol. 30. No. 1. p. 23−47.

Combes, P.-P., G. Duranton, and L. Gobillon. 2008. “Spatial wage disparities: Sorting matters!” *Journal of Urban Economics*. Vol. 63. No. 2. p. 723−742.

Doms, M.E., and J.B. Jensen. 1998. “Comparing Wages, Skills, and Productivity between Domestically and Foreign-Owned Manufacturing Establishments in the United States.” *Geography and Ownership as Bases for Economic Accounting*. R.E. Baldwin, R.E. Lipsey, and J.D. Richardson (eds.). National Bureau of Economic Research (NBER Studies in Income and Wealth). Chicago, Illinois. University of Chicago Press. Vol. 59. p. 235−258.

Dumond, J.M., B.T. Hirsch, and D.A. Macpherson. 1999. “Wage Differentials Across Labor Markets and Workers: Does Cost of Living Matter?” *Economic Inquiry*. Vol. 37. No. 4. p. 577−598.

Flanagan, R.J. 2006. Globalization and Labor Conditions: Working Conditions and Worker Rights in a Global Economy. Oxford, United Kingdom. Oxford University Press.

Fosfuri, A., M. Motta, and T. Ronde. 2001. “Foreign direct investment and spillovers through workers' mobility.” *Journal of International Economics.* Vol. 53. No. 1. p. 205−222.

Glaeser, E.L., and D.C. Maré. 2001. “Cities and Skills.” *Journal of Labor Economics*. Vol. 19. No. 2. p. 316−342.

Globerman, S., J.C. Ries, and I. Vertinsky. 1994. “The Economic Performance of Foreign Affiliates in Canada.” *The Canadian Journal of Economics*. Vol. 27. No. 1. p. 143−156.

Globerman, S., and D.M. Shapiro. 1999. “The Impact of Government Policies on Foreign Direct Investment: The Canadian Experience.” *Journal of International Business Studies*. Vol. 30. No. 3. p. 513−532.

Greenaway, D., and R.A. Kneller. 2007. “Firm heterogeneity, exporting and foreign direct investment.” *The Economic Journal*. Vol. 117. No. 517. p. F134-F161.

Gu, W., and G.D. Sawchuk. 2006. *How are Canadian Regions Adjusting to a Larger and More Integrated North American Market?* Statistics Canada Catalogue no. 11F0027M. Ottawa, Ontario. Economic Analysis (EA) Research Paper Series. No. 39.

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

Hall, P.V., and A.J. Khan. 2008. "Differences in high-tech immigrant earnings and wages across Canadian cities." *The Canadian Geographer.* Vol. 52. No. 3. p. 271−290.

Heyman, F., F. Sjoholm, and P.G. Tingvall. 2007. "Is there really a foreign ownership wage premium? Evidence from matched employer-employee data." *Journal of International Economics*. Vol. 73. No. 2. p. 355−376.

Lehmer, F., and J. Moller. 2010. "Interrelations between the urban wage premium and firm-size differentials: a microdata cohort analysis for Germany." *The Annals of Regional Science.* Vol. 45. No. 1. p. 31−53.

Lipsey, R.E. 2004. "Home- and Host-Country Effects of Foreign Direct Investment." *Challenges to Globalization: Analyzing the Economics*. R.E. Baldwin and L.A. Winters (eds.). Chicago, Illinois. University of Chicago Press. p. 333−382.

Lopez, R.A. 2005. "Trade and Growth: Reconciling the Macroeconomic and Microeconomic Evidence." *Journal of Economic Surveys.* Vol. 19. No. 4. p. 623−648.

Melitz, M.J. 2003. "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity." *Econometrica*. Vol. 71. No. 6. p. 1695−1725.

Moretti, E. 2004. "Workers' Education, Spillovers, and Productivity: Evidence from Plant-Level Production Functions." *The American Economic Review*. Vol. 94. No. 3. p. 656−690.

Moulton, B.R. 1986. "Random Group Effects and the Precision of Regression Estimates." *Journal of Econometrics.* Vol. 32. No. 3. p. 385−397.

Organization for Economic Co-operation and Development (OECD). 1987. *Structural Adjustment and Economic Performance*. Paris, France. Organization for Economic Co-operation and Development.

Organization for Economic Co-operation and Development (OECD). 1992. *Industrial Policy in OECD Countries: Annual Review 1992*. Paris, France. Organization for Economic Co-operation and Development.

Richardson, J.D. 2005. "Uneven Gains and Unbalanced Burdens? Three Decades of American Globalization." *The United States and the World Economy: Foreign Policy for the Next Decade.* C.F. Bergsten (ed.). Washington, D.C. Institute for International Economics. p. 111−119.

Rodriguez, F., and D. Rodrik. 2001. "Trade Policy and Economic Growth: A Skeptic's Guide to the Cross-National Evidence." *NBER Macroeconomics Annual 2000*. B.S. Bernanke and K. Rogoff (eds.). National Bureau of Economic Research. Cambridge, Massachusetts. The MIT Press. Vol. 15. p. 261−338.

Schank, T., C. Schnabel, and J. Wagner. 2007. "Do exporters really pay higher wages? First evidence from German linked employer-employee data." *Journal of International Economics.* Vol. 72. No. 1. p. 52−74.

Statistics Canada. 2002. *Geography Catalogue, 2001 Census*. Statistics Canada Catalogue no. 92-405-XIE. Ottawa, Ontario.

Statistics Canada. 2005. *Corporations Returns Act 2003*. Statistics Canada Catalogue no. 61-220-XIE. Ottawa, Ontario.

Troske, K.R. 1998. "The Worker-Establishment Characteristics Database." *Labor Statistics Measurement Issues.* J. Haltiwanger, M.E. Manser, and R. Topel (eds.). Chicago, Illinois. The University of Chicago Press. p. 371−404.

Troske, K.R. 1999. "Evidence on the Employer Size-Wage Premium for Worker-Establishment Matched Data." *The Review of Economics and Statistics.* Vol. 81. No. 1. p. 15−26.

Van Biesebroeck, J. 2005. "Exporting raises productivity in sub-Saharan African manufacturing firms." *Journal of International Economics*. Vol. 67. No. 2. p. 373−391.

Wagner, J. 2007. "Exports and Productivity: A Survey of the Evidence from Firm-Level Data." *The World Economy*. Vol. 30. No. 1. p. 60−82.

Wheeler, C.H. 2001. "Search, Sorting, and Urban Agglomeration." *Journal of Labor Economics.* Vol. 19. No. 4. p. 879−899.

White, H. 1980. "A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity." *Econometrica.* Vol. 48. No. 4. p. 817−838.

Yankow, J.J. 2006. "Why do cities pay more? An empirical examination of some competing theories of the urban wage premium." *Journal of Urban Economics.* Vol. 60. No. 2. p. 139−161.

# Notes

1. For an in-depth treatment of head office locations and foreign multinational corporations in Canada, see Baldwin and Brown (2005).
2. With the exception of block-faces, the six-character postal code is the most disaggregated geographical unit available (there are more than 750,000 postal code units across the country (Statistics Canada 2002)).
3. The $1,200 cutoff ensures that the sample covers only those workers actively engaged in the labour market.
4. These synthetic establishments represent the average values for shipments, total employment, value-added, and other key characteristics of the initial 13,000 ASM plants considered for the mapping. As such, they represent combinations of ASM plants found across industry-geography cells. To create these establishments, we use an imputation method based on a series of underlying assumptions relating to the defining characteristics of actual ASM plants. For example, if two plants within the same industry-geography cell are (i) exporters or non-exporters, (ii) foreign-controlled or domestic, (iii) part of multi-unit or single-unit production facilities, or any paired combination thereof, then the synthetic establishment represents their average values. More details relating to this imputation method are available in Breau and Rigby (2010).
5. These broadly-defined industrial sectors, along with the use of aggregate regions, are adopted in order to preserve confidentiality when disclosing results for certain units with smaller sample counts.
6. The foreign-control status of a plant in the 1999 ASM is based on the *Corporations and Labour Unions Returns Act*—now the *Corporations Returns Act*—definition of *foreign control*. The latter considers a corporation as foreign-controlled when either 'direct' or 'effective' control (i.e., usually when more than 50% of the voting equity of a corporation) is held by a person, group, or corporation not resident in Canada (Statistics Canada 2005).
7. The capital-to-labour ratio used in the analysis is proxied by the difference between manufacturing value-added and the wage bill for production workers divided by manufacturing value-added for each establishment. Following Baldwin and Gu (2003), a three-year-mean of the capital-to-labour ratio is also used to eliminate some of the volatility which inevitably accompanies such data. Multi-plant is a binary variable that takes on a value of *1* (one) when an establishment is part of a firm with two or more plants and a value of *0* (zero) otherwise.
8. *Metropolitan areas* are defined as the 47 tracked census metropolitan areas and census agglomerations used in the 2001 Census of Population.
9. That is, controlling only for plant size and capital intensity produces point estimates for the export and foreign-control status dummies that are qualitatively unchanged.
10. Note also that post-estimation diagnostics of variance inflation factors reveal no issues of multicollinearity across the independent variables for all models.
11. Note also that the coefficient estimate on the export binary variable for the Prairie provinces is statistically significant only at the .10 level.
12. The logic is as follows: the costs of exporting to non-U.S. markets (e.g., European and Asian markets) are higher than the costs of exporting to the U.S. market. Plants that export to those non-U.S. markets should therefore be more productive than those plants that export to U.S. markets in order to overcome the higher costs of entry into those markets. As more productive plants generally pay higher wages, those plants that export to non-U.S. markets will also pay higher wages. We thank an anonymous reviewer for this point of clarification.