When does Innovation Matter for Exporting?

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ABSTRACT

A growing number of studies that look at the relationship between innovation and exports find that more innovation tends to allow firms to export more. But very little is known about the heterogeneous impacts of innovation on exports. Since innovation is not a costless activity, it is important to know the specific situations in which a firm most likely needs to innovate to raise its exports. Using data from Chile, we combine information on innovation activities at the firm level with a rich dataset on exports at the transaction level. We find that the firms that engage in innovation tend to export more than other firms because they are able to sell goods and target markets that reward innovation. We show that the goods and markets in which innovative exporters outperform non-innovative exporters are those where innovation can lead to substantial differences in terms of quality. Innovative firms do not have an edge in exporting goods and in targeting markets that do not reward innovation. In particular, innovative firms do not outperform non-innovative firms when exporting goods and penetrating markets in which differentiation in terms of quality is not possible or not relevant.

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[*]. The views and interpretations in this paper are strictly those of the authors and should not be attributed to the Inter-American Development Bank, its Board of Directors, or any of its member countries

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1. Introduction

There is a growing literature on the relationship between innovation and exports. Many studies that carefully control for potential endogeneity biases find that more innovation allows firms to eventually export more (Lachenmaier and Wößmann, 2006; Aw et al., 2007; Damijan et al.., 2008; Van Beveren and Vandenbussche, 2010; Caldera, 2010; Becker and Egger, 2013). But very little is known about the heterogeneous impacts on exports when firms perform innovation. For instance, does innovation increase all the exports of the firm or only the exports of certain goods? Does the increase in exports occur in all the markets that a firm serves or only in particular markets? If the increase in exports occurs only in certain markets, do the exports of all the goods serving those markets increase, or only a subset of those goods? Until now, these questions have remained unanswered because the studies available in the literature have looked at the effect of innovation on crude measures of firm exports, either total exports or the export status. But addressing these questions can provide new insights into why innovation is relevant for exporting. For example, innovation might be important only when a firm seeks to penetrate certain markets, say high income countries. Likewise, exporting certain goods might require more innovative efforts than exporting others. Since innovation is not a costless activity, it is then relevant to analyze in detail the specific situations in which a firm most likely needs to innovate to raise its exports. This is the objective of this paper.

Using data from Chile, we combine information on innovation activities at the firm level with a rich dataset on exports at the transaction level. By merging these two datasets we identify at very disaggregated levels what type of goods innovative firms export and where. Our contribution to the literature it to analyze not only if innovative firms export more than non-innovative firms but also whether there are heterogeneous effects in terms of the type of goods that they export and the destination markets that they serve. The dataset also allows us to examine whether the potential increase in exports is channeled through a price or a quantity effect. This gives us another dimension to delve into the question of why innovation is important to export.

We find that innovative firms tend to export more than non-innovative firms and we show that they do so because they sell goods and target markets that rewards innovation. In particular, innovative firms exhibit better export performances than non-innovative firms in goods for which innovation can lead to substantial increases in quality and in markets that have higher quality-valuations. Innovative firms do not export more than non-innovative firms when it comes to goods and markets for which quality differences are not rewarded. The evidence also indicates the existence of important synergy effects for engaging in different types of innovation. In particular, the edge of innovative firms over non-innovative firms is more pronounced when the innovative firms are engaged in both product and process innovation than when they are engaged in only one type of innovation.

These results are robust to a series of tests. We show that the findings hold after controlling for potential reverse causality, after using different specifications of the econometric model, and after employing alternative definitions of the innovation variable.

Our study contributes to two different literatures. First, it extents the current body of analyses that use broad measures of exports (Lachenmaier and Wößmann, 2006; Aw et al., 2007; Damijan et al.., 2008; Van Beveren and Vandenbussche, 2010; Caldera, 2010 and Becker and Egger, 2013; Bravo-Ortega et al., 2013) to examine the impact of innovation across detailed dimensions of the export activity. Second, the study contributes to a growing literature that shows the importance of skill acquisition for exporting to high-income countries (Brambilla et al., 2012; Verhoogen, 2008; Matsuyama, 2007). Our analysis extends this notion to the role of innovation.

The rest of the paper is divided as follows. Section 2 provides a brief summary of the literature on innovation and trade and explains the contribution of our analysis to this literature. In this section we also introduce the econometric model. Section 3 describes the various datasets that we employ in the study. Section 4 discusses the empirical results while section 5 finalizes with some concluding remarks.

2. Previous studies and empirical specification

The relationship between innovation and international trade has been the subject of many studies, both theoretically and empirically. The empirical analyses that study the relationship between innovation and exports typically find a positive correlation between these two variables, but whether innovation *causes* exports has not always been carefully examined.

Recent contributions to the literature have started to control for the potential estimation biases that reverse causality could create when addressing the relationship between innovation and exports (Lachenmaier and Wößmann, 2006; Aw et al., 2007; Damijan et al.., 2008; Van Beveren and Vandenbussche, 2010; Caldera, 2010 and Becker and Egger, 2013). While different techniques have been used to control for this endogeneity issue, most studies find that innovation efforts tend to translate into larger exports. In the particular context of the Chilean economy, for example, Bravo-Ortega et al., (2013) find that firms that invest in R&D are more likely to export, but the reverse is not true.

As mentioned before, the common characteristic behind all these studies is their focus on the impact of innovation on a simple measure of export activity, either the total exports of the firm or its export status. The contribution of our study is to analyze the potential heterogeneous impacts of innovation on export activity across various dimensions, in particular the types of goods exported and the destination markets.

Empirical specification

We consider the exports of firms at the product and market destination level and exploit variations in innovation effort across those firms. In other words, we compare the export outcomes of the firms that innovate with that of the firms that do not innovate paying particular attention to the destination markets and the types of goods that they export. We start with the following baseline specification:

$$Y_{ipc} = \beta_0 + \beta_1 X_i + \beta_2 L_i + D_p + D_c + \varepsilon_{ipc} \qquad (1)$$

where Y_{icp} is the exports (in logs) of firm *i* of product *p* to destination country *c* ; X_i is a dummy variable that takes the value of one if the firm engages in innovation and zero otherwise; L_i is the employment level of the firm (in logs); D_p and D_c are fixed effects for product *p* and destination country *c*, respectively, and ε_{ipc} is an error term that is white noise. In all the regressions, we employ standard errors clustered by the firm level.

The variable L_i seeks to capture firm-level factors -different from innovation- that are correlated with exporting. In the recent literature of trade, for example, firm productivity is the single attribute that determines the firm's ability to export successfully (e.g. Bernard et al., 2003; Melitz, 2003; Chaney, 2008; Arkolakis, 2010). Unfortunately, the information in our dataset precludes us to construct a suitable measure of productivity. Accordingly, we use firm size instead, based on a large body of empirical analyses indicating that productivity and firm size are highly correlated (Bernard and Jensen, 1999a, b; Bernard, Jensen and Schott, 2006; Mayer and Ottaviano, 2007).[1]

The innovation variable in equation (1), X_i, captures both product and process innovations. In other words, the variable is equal to one if the firm engages in either product innovation, process innovation or both. Later in the paper we present specifications in which X_i captures product and process innovations separately. Another characteristic of our innovation measure is that it captures the outcome of innovation rather than the firm's expenditures in R&D. The advantage of using outcome rather than input measures of innovation is that not all the R&D expenditures of a firm necessarily materialize in actual innovations.

While our empirical analysis is a cross-section, X_i measures innovations that occurred one year prior to the exports of the firm.[2] This implies that the estimations will be capturing the short-run impacts of innovation. Being an outcome variable, it is not unreasonable to expect that the innovation completed by the firm in one year might show up in the exports of the following year. It is possible; however, that some innovations might

[1] In particular, most papers in this literature find that exporting firms are usually both larger and more productive than non-exporting firms.

[2] In the next section, we will describe in more detail the specific time periods of the datasets

take longer to materialize in foreign markets, but this only increases the bar for finding a significant effect in our analysis.

One problem with equation (1) is the possible existence of endogeneity between the exports and the innovation activity of the firm. As mentioned before, the causality between these two variables can go in either direction and not controlling for this issue could introduce a bias in the estimation of β_1. We address this potential endogeneity problem using an instrumental-variable (IV) estimation. In particular, we follow Lachenmaier and Wößmann (2006) and Becker and Egger (2013) and use exogenous innovation impulses taken from the innovation survey that are significantly correlated with the innovation outcome but not with the exports of the firm. These innovation impulses, which we describe in more detail in the next section, are used as instruments for the innovation measure in equation (1). In section 4 we show some formal tests that assess the validity of these variables as instruments.

3. Data description

The information on exports is taken from the Chilean National Customs Authority, *Servicio Nacional de Aduanas*. The data include the universe of the Chilean exports at the transaction level. Specifically, each record includes a firm identifier, the good exported (at 8-digit HS level), the destination country, the export value in US dollars, the quantity (weight) in kilograms and the unit price. We select the year 2009 from this dataset so there is at least a one year gap between the year of the innovation (described in the next paragraph) and the year of the export. There are 7430 exporters during this year.

The information about innovation activities is taken form the Chilean Innovation Survey, *Encuesta de Innovación*, conducted by the Chilean National Statistics Institute, the *Instituto Nacional de Estadisticas (INE)*. The information is collected biyearly covering the two years prior to the year in which the survey is conducted. The survey uses a stratified random sample for firms in the agriculture, mining, manufactures and the service sectors. Since we are interested in analyzing the impact of innovation on exports, we drop from the analysis the firms in the service sectors. One important limitation from this survey is that the structure of the questions has changed somewhat over the years. Accordingly, working with several rounds of this survey is challenging since we employ a number of variables that has not remained stable in the questionnaires over time. Therefore, we use the year 2009, which reports information on innovation activities for 2007 and 2008. The data then cover the innovation outcomes of the firms one or two years prior to the information that we use for exports, the year 2009. For the most part of the survey, and particularly for all the variables that we employ, firms are not required to provide separate answers for the year 2007 and the year 2008 but one answer that applies for the entire period of two years.

The survey includes input measures of innovation, like R&D expenditures, and also output measures, like whether the firm successfully developed an innovation in products or in processes. We use the innovation outcome variables. In particular, we construct a dummy variable equal to one if the firm develops an innovation in products or processes or both (in any of the two years). The dummy is equal to zero if no innovation is performed. After excluding the firms in the service sectors, there are 1498 firms in this dataset.

Similar to other innovation surveys used in the literature, the Chilean survey includes information on the so called exogenous impulses and obstacles to innovation (for the case of Germany, see Lachenmaier and Wößmann, 2006; and Becker and Egger, 2013). These are questions about the relevance that a number of factors have exerted on the innovations carried by the firm. In the Chilean survey there are 6 impulses (or incentives) and 16 obstacles (impediments). The firms are asked to answer these questions with a scale from 1 (not important) to 5 (high important). From all these factors, only 3 impulses were found to have a statistically significant impact on the probability to innovate: cost reduction, quality improvement, and environmental impact reduction. Following the strategy by Lachenmaier and Wößmann (2006) of using this type of factors as instrumental variables, we employ these three impulses in our IV estimation. In the next section we provide tests that determine the suitability of these variables as instruments. While these variables enter the regressions in their original categorical form, but also present results when they are transformed into binary variables.

The innovation survey also includes additional information that is relevant for our exercise, namely, the firm size in terms of employment, the sector (at the 4 digit ISIC rev3 level) and the region where the firm is located.[3]

After merging the two datasets on innovation and exports, we have 469 firms. This is the group of firms that we employ in the analysis. Table 1 shows some descriptive statistics for these firms. The typical firm has an average export per product and destination equal to 2.1 million US dollars, and it employs 314 workers. About 60% of the firms in the sample introduced an innovation during the period examined. The percentages of firms indicating that cost reduction, quality increase and environmental impact reduction were highly important determinants to their innovations were 18%, 25% and 20%, respectively. Finally, the last two rows of the table indicate that the average exports per product and country were 2.2 million US dollars for the innovative firms and 1.9 million US dollars for the non-innovative firms.

[3] Chile is divided into 15 regions, the largest administrative division of the country.

4. Empirical results

As mentioned before, we employ an IV-estimation to control for potential endegeneity between exports and innovation. In particular, we run a 2-stage least squares regression and employ the impulse variables, cost reduction, quality improvement, and environmental impact reduction, as instruments. Column (1) in table 2 shows the results of the first-stage of the estimation. The coefficients are all positive and significant at conventional levels and the F-statistic suggests that there is not a weak-instrument problem. In column (2) we show a regression in which the impulse variables are used directly as covariates in a regression on exports. In this case, the coefficients are not statistically significant. The results from both columns give support to our choice of instruments: while they affect the innovation outcome, they do not exert a direct impact on exports.

Column (1) of table 3 shows the second stage of the estimation. The Hansen test of overidentifying restrictions shows that we cannot reject the null hypothesis that the instruments are valid, providing further support to our identification strategy. As expected, there is a positive relationship between the level of employment and exports. The impact of innovation on exports is also positive and significant. The size of the effect is economically meaningful. The coefficient implies that firms that engage in innovation tend to export 101% [exp (0.70) – 1] more than the firms that do not engage in innovation. A series of robusteness checks are presented in columns (2) to (6). In particular, column (2) employs a more stringent set of product-country fixed effects instead of product and country fixed effects separately; column (3) includes a region-fixed effect to control for potential locational effects like agglomeration or proximity to other firms or markets; column (4) shows the results when the instruments enter the estimation (on the first stage) as binary variables instead of categorical variables; column (5) drops potential outlier observations, in particular, the exports above the 99^{th} percentile and below the 1^{st} percentile; while column (6) drops potential outlier observations in terms of labor size, in particular, the firms with employment above the 99^{th} percentile and below the 1^{st} percentile. As shown, the estimated impact of innovation on exports holds across all these robustness checks.

Heterogeneous effects

Now we proceed to examine whether the effects of innovation on the exports of the firm vary across a series of dimensions. First, we explore the existence of potential heterogeneous effects across destination markets. There might be reasons to expect that firms would have to engage in different innovation intensities when targeting different markets. In a different context, for example, Brambilla et al., (2012) finds that Argentinian firms exporting to high income countries use more skills than firms exporting to low income countries. The authors provide evidence indicating that high-income countries tend to exhibit higher valuation for quality which leads to higher-quality products and higher use of skilled labor. In the context of this paper, it is possible that firms innovate to sell in markets that reward innovation, for instance because they have a higher valuation for quality. What we would like to do is to explore whether the positive impact of innovation on exports that we found in table 3 is related to this hypothesis that innovative firms penetrate more successfully high income countries for which innovative efforts are more properly rewarded.

Using the same specification as in column (3) of table 3, table 4 shows the results when we separate the exports in two groups according to the income level of the destination countries. In particular we separate the high income countries from the medium-low income countries. This is done using the World Bank's country income classification. The first group consists on the World Bank's high-income OECD category and the second group includes the rest of the countries. The idea is that the insertion into high income countries might be especially difficult, for example, because of their high-valuation for quality, and thus any exporter would need to engage in particularly intensive innovation efforts to successfully penetrate into these markets.[4] The results from table 4 show the existence of heterogeneity effects in terms of market destinations. In particular, the effect of innovation on exports is positive and significant in both markets but much more pronounced in high income countries. Specifically, firms that innovate tend to export 1.7 times more [exp(1.029)-1] than firms that do not innovative when they target high income countries, and 1.1 times more [exp(0.751)-1] when they target medium-low income countries. In other words, the edge of innovative firms over non-innovative firms is larger when they penetrate high income countries than when they penetrate the rest of the countries. This result suggests that penetrating high income markets can be particularly difficult and thus the difference in performance between innovative and non-innovative firms is much more evident in these markets than when they target less-challenging destinations. In the next section we explore whether this larger edge of innovative firms when they serve high income countries has to do with the notion that these markets have particularly high valuation for quality and thus large innovation efforts are required to penetrate them successfully.

The second dimension that we explore regarding heterogeneous impacts of innovation on exports is related to the type of goods. For example, the innovation required to develop and export successfully a computer is likely to be different than the innovation efforts required to export a cathode of copper. Accordingly, we would like to explore whether the finding that innovative firms export more is related to the hypothesis that these firms tend to export more successfully some kind of goods that reward innovation, for instance, because innovation can lead to substantial differences in the quality of the good.

It is reasonable to expect that the possibility to make a substantial difference in the quality of the good is likely to be low for raw materials and basic goods. At the extreme, for example, commodities tend to vary only slightly across markets and thus a successful penetration of foreign markets with those goods might not

[4] We employ alternative classifications for separating the countries according to their level of development. The results, available from the authors upon request, are qualitatively similar.

require a great deal of differentiation in terms of quality. Following this notion, we separate all the exports in two groups, differentiated and non-differentiated products, following the classification developed by Rauch (1999). This classification distinguishes among homogeneous goods that are traded in organized exchanges, reference-priced goods that have prices quoted in specialized publications, and differentiated goods that are neither traded in organized exchanges nor have reference prices (i.e., prices do not convey all the relevant information for international trade on these goods). In this analysis, we pool together homogeneous and reference-priced goods and specifically follow the liberal classification.[5] The results, shown in table 5, confirm the existence of heterogeneity in terms of types of goods. In particular, innovative firms tend to export 1.8 times more differentiated goods than non-innovative firms, but they do not export more of non-differentiated goods. The result suggests that innovative firms are able to sell abroad more than other firms the type of products for which innovation allows them to differentiate their varieties. In the next section we explore whether this differentiation is related to the quality of the good.

While tables 4 and 5 examined the effects of innovation on exports across goods and destination markets separately, table 6 combine both dimensions. The results show that innovative firms do not export more non-differentiated goods than non-innovative firms when they target either high income countries or the rest of countries (columns 1 and 3). However, innovative firms export more differentiated goods in both markets, with an edge that is larger when targeting high income countries (columns 2 and 4).

Channels

In this section we use additional information from the export database to explore the channels by which the larger exports induced by innovation are achieved. In particular, we examine whether the positive effects of innovation on exports are accrued via higher prices or higher quantities. The results are shown in table 7. For completeness, column (1) shows again the regression on exports. In columns (2) and (3) we use, respectively, the quantities and the prices of those exports as the dependent variables. As shown in the table, the coefficient for the regression on quantity is statistically significant but not the one for the regression on prices. This result indicates that more innovative firms are able to export more than non-innovative firms essentially because they sell more quantities.

If we consider the price of a good as a proxy for its quality, not finding a relationship between innovation and prices could initially be viewed as an indication that the outcome of the innovation is not a higher quality product. But the unit value of a good is not necessarily a good proxy for quality because export prices might vary for reasons other than quality, including differences in cost structures (Hallak and Schott, 2011). In the

[5] Results do not change when using the conservative version of the Rauch classification

context of a cross-country analysis, Hallak and Schott (2011) identify product quality by combining information on the countries' trade balances with the observed export prices. The identification strategy that the authors employed is based on the notion that among countries with identical export prices, the country with the higher trade balance is revealed to possess higher product quality. We apply the same intuition here at the firm level. That is, among two firms with identical export prices, the firm exporting more quantities is revealed to possess a higher product quality. In terms of our estimation, this is akin to re-running the regression on quantities after controlling for differences in prices. This is done in column (4) of table 7. The result shows that innovative firms sell more quantities abroad than non-innovative firms, even after holding prices constant. This implies that innovative firms are able to penetrate foreign markets with larger quantities of exports because their exports are associated with higher quality goods.

In table 8 we show that the penetration of foreign markets by innovative firms with larger quantities of high quality exports is relevant only for the case of differentiated goods (columns 8 and 16) but not when firms export non-differentiated products (columns 4 and 12). This evidence is important because it indicates that investing in innovation provides an edge in penetrating foreign markets only in goods in which innovation leads to substantial differentiation in terms of quality. The table also shows that the difference between innovative and non-innovative firms when exporting differentiated goods is even larger when targeting high income countries than when serving medium-low income countries (column 8 versus 16). This last result gives support to the idea that there is a higher valuation for quality in high income countries than in the rest of the countries.

Types of innovation

In the last part of this study we explore whether there are heterogeneous effects regarding the type of innovations that the firm performs. So far, we have lumped in the same variable the innovations in either products, processes or both; but further insights could be potentially gained by estimating separate effects for these two classes of innovations. This is done in table 9 in which we show the impacts not only for export values but also for quantities, prices and quantities after controlling for price differences (our proxy for quality). The structures of the regressions are as follows: columns (1) to (4) analyze the firms that only performed product innovation; columns (5) to (8) analyze the firms that only performed process innovation, and columns (9) to (12) analyze the firms that performed both types of innovations at the same time. In all the cases, the control group is the same, that is, the firms that did not perform any innovation.

The results suggest the existence of important synergy effects for engaging in both types of innovation. In particular, the edge of innovative firms over non-innovative firms is more pronounced when the innovative firms are engaged in both product and process innovation than when they are engaged in only one type of innovation. Indeed, we find that the effect of innovation on exports is not statistically different between the non-innovative firms and the firms that only perform product innovations. The table also shows that the synergy effects -- the relatively larger edge of innovative firms over non-innovative firm when performing both types of innovation-- transpire not only in terms of the export values but also in terms of quantities as well as in the proxy for quality.

5. Concluding remarks

Innovation is not a costless activity. Therefore, firms investing in R&D expect to generate a return. Such return could be accrued, at least partially, by selling products abroad. But firms targeting foreign markets must face the competition from other exporters; therefore, the outcome of their innovation must give them an edge in those markets.

In this paper we show that the firms that engage in innovation tend to export more than other firms because they are able to sell goods and target markets that reward innovation. Innovative firms do not have an edge in exporting goods and in targeting markets that do not reward innovation. We show that the goods in which innovative exporters outperform non-innovative exporters are those where innovation can lead to substantial differences in terms of quality. Innovative firms do not export more the types of goods in which differentiation in terms of quality is not possible or not relevant. Similarly, we show that innovative firms have a larger edge over non-innovative firms in highly-developed countries where the high-valuation for quality means that the outcome of the innovation is more properly rewarded.

This study provides a contribution to the literature on innovation and exports by showing that the positive relationship between these two variables arises in situations where the outcome of the innovation leads to quality improvements that can generate returns to innovation but it vanishes when the innovation does not give an edge over non-innovative competitors either because quality differences are not possible or are not rewarded by the market.

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Table 1: Descriptive statistics

Variable \ Statistics	Mean	St. Dev
Exports per product and country ('000 US$)	2,090.02	36,119.71
Employment	313.76	616.75
Innovation dummy	0.60	0.49
Impulse 1: cost reduction; high importance	0.18	0.39
Impulse 2: increase in quality; high importance	0.25	0.43
Impulse 3: reduce environmental impact, high importance	0.20	0.40
Exports per product and country, innovative firms ('000 US$)	2,212.72	44,521.79
Exports per product and country, non-innovative firms ('000 US$)	1,906.65	17,093.63

Table 2: First Stage Results

	Innovation	Exports
	(1)	(2)
Impulse 1: cost reduction; high importance	0.0915***	0.1659
	(0.0000)	(0.3113)
Impulse 2: increase in quality; high importance	0.113***	-0.0578
	(0.0000)	(0.6993)
Impulse 3: reduce environmental impact, high importance	0.0777***	0.0742
	(0.0000)	(0.5894)
Labor	0.0161**	0.8344***
	0.0417	(0.0000)
F - Statistic	0.0000	0.1991
Sector fixed effect	yes	yes
Region fixed effect	yes	yes
Observations	469	469
R^2	0.8553	0.2659

Note: Robust standard errors clustered by firms reported in parentheses

*** ; ** ; * significant at the 1%, 5% and 10% level respectively

Table 3: Second Stage Results

	(1)	(2)	(3)	(4)	(5)	(6)
Labor	0.0952*	0.1764*	0.2176*	0.2338*	0.2145	0.2705*
	(0.0847)	(0.0925)	(0.0959)	(0.0727)	(0.1187)	(0.0772)
Innovation	0.7019***	1.0957**	0.8417***	0.8312***	0.7924**	0.8182**
	(0.0084)	(0.0438)	(0.0088)	(0.0071)	(0.0144)	(0.0118)
Hansen Test	0.219	0.127	0.267	0.222	0.275	0.311
Product fixed effect	yes	no	no	no	no	no
Country fixed effect	yes	no	no	no	no	no
Product-Country fixed effect	no	yes	yes	yes	yes	yes
Region fixed effect	no	no	yes	yes	yes	yes
Observations	13,393	13,393	13,393	13,393	12,778	13,179
R^2	0.0960	0.8908	0.1420	0.1434	0.1450	0.1435

Note: Robust standard errors clustered by firms reported in parentheses

*** ; ** ; * significant at the 1%, 5% and 10% level respectively

Table 4: Heterogeneous Effects on Destination Markets

	High income	Medium-low income
	(1)	**(2)**
Labor	0.2108*	0.2127
	(0.0964)	(0.2151)
Innovation	0.9759***	0.7541**
	(0.0055)	(0.0477)
Product-Country fixed effect	yes	yes
Region fixed effect	yes	yes
Observations	4,062	9,175
R^2	0.2093	0.1040

Note: Robust standard errors clustered by firms reported in parentheses

*** ; ** ; * significant at the 1%, 5% and 10% level respectively

Table 5: Heterogeneous Effects on Types of Goods

	Non-differentiated	Differentiated
	(1)	(2)
Labor	0.2071	0.2168
	(0.1576)	(0.2391)
Innovation	0.2004	1.0342***
	(0.6323)	(0.0051)
Product-Country fixed effect	yes	yes
Region fixed effect	yes	yes
Observations	3,988	8,935
R^2	0.0817	0.1727

Note: Robust standard errors clustered by firms reported in parentheses

*** ; ** ; * significant at the 1%, 5% and 10% level respectively

Table 6: Heterogeneous Effects on Destination Markets and Types of Goods

	High income		Medium-low income	
	Non-differentiated	Differentiated	Non-differentiated	Differentiated
	(1)	(2)	(3)	(4)
Labor	0.2409**	0.1558	0.1639	0.2293
	(0.0477)	(0.4254)	(0.5105)	(0.2777)
Innovation	0.4300	1.3258***	-0.1521	0.8861**
	(0.2807)	(0.0014)	(0.7979)	(0.0396)
Product-Country fixed effect	yes	yes	yes	yes
Region fixed effect	yes	yes	yes	yes
Observations	1,565	2,384	2,394	6,427
R^2	0.147	0.254	0.077	0.131

Note: Robust standard errors clustered by firms reported in parentheses

*** ; ** ; * significant at the 1%, 5% and 10% level respectively

Table 7: Channels

	Export	Quantity	Price	Quantity
	(1)	**(2)**	**(3)**	**(4)**
Labor	0.2176*	0.1962	0.01637	0.2113
	(0.0959)	(0.1348)	(0.6559)	(0.1027)
Innovation	0.8417***	0.8614***	-0.02297	0.8402***
	(0.0088)	(0.0057)	(0.8291)	(0.0082)
Price				-0.9230***
				(0.0000)
Product-Country fixed effect	yes	yes	yes	yes
Region fixed effect	yes	yes	yes	yes
Observations	13,393	13,393	13,393	13,393
R^2	0.1420	0.1355	0.0101	0.2225

Note: Robust standard errors clustered by firms reported in parentheses

*** ; ** ; * significant at the 1%, 5% and 10% level respectively

Table 8: Heterogeneous Effects on Destination Markets and Types of Goods, Decomposed by Channels

	High income								Medium-low income							
	Non-differentiated				Differentiated				Non-differentiated				Differentiated			
	E	Q	P	Q	E	Q	P	Q	E	Q	P	Q	E	Q	P	Q
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Labor	0.2409**	0.2706**	-0.01694	0.2666**	0.1558	0.1019	0.05425	0.1403	0.1639	0.1359	0.01021	0.1480	0.2293	0.2421	0.01056	0.2532
	(0.0477)	(0.0228)	(0.1483)	(0.0269)	(0.4254)	(0.5950)	(0.2107)	(0.4698)	(0.5105)	(0.5914)	(0.7715)	(0.5501)	(0.2777)	(0.2671)	(0.8809)	(0.2183)
Innovation	0.4300	0.5477	-0.06222	0.5329	1.3258***	1.3466***	0.005118	1.3502***	-0.1521	-0.06456	-0.07829	-0.1572	0.8861**	0.8910**	-0.03276	0.8566**
	(0.2807)	(0.1678)	(0.2492)	(0.1766)	(0.0014)	(0.0007)	(0.9678)	(0.0008)	(0.7979)	(0.9240)	(0.6445)	(0.7954)	(0.0396)	(0.0468)	(0.8342)	(0.0395)
Price				-0.2377				-0.7079***				-1.1834**				-1.0516***
				(0.7968)				(0.0005)				(0.0431)				(0.0000)
Product-Country fixed effect	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Region fixed effect	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	1,565	1,565	1,565	1,565	2,384	2,384	2,384	2,384	2,394	2,394	2,394	2,394	6,427	6,427	6,427	6,427
R^2	0.1471	0.1732	0.0916	0.1743	0.2544	0.2468	0.0561	0.2825	0.0779	0.0756	0.0219	0.1399	0.1313	0.1196	0.0125	0.2618

Note: E (exports), P (price) and Q (quantity). Robust standard errors clustered by firms reported in parentheses

*** ; ** ; * significant at the 1%, 5% and 10% level respectively

Table 9: Heterogeneous Effects by Type of Innovation

	Exports	Quantity	Price	Quantity	Exports	Quantity	Price	Quantity	Exports	Quantity	Price	Quantity
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Labor	0.0212	0.0573	-0.0325	0.0248	0.1147	0.0942	0.0227	0.1110	0.1210	0.1101	0.0116	0.1214
	(0.8587)	(0.6211)	(0.4547)	(0.8214)	(0.3319)	(0.3976)	(0.5520)	(0.3191)	(0.3827)	(0.4483)	(0.8010)	(0.3524)
Product Innovation	0.1620	0.0823	0.0639	0.1462								
	(0.7682)	(0.9106)	(0.8416)	(0.7859)								
Process Innovation					0.7668**	0.8615**	-0.0814	0.8009**				
					(0.0284)	(0.0131)	(0.4758)	(0.0206)				
Product and Process Innovation									1.0931**	1.0703**	-0.0185	1.0524**
									(0.0362)	(0.0324)	(0.9148)	(0.0468)
Price				-0.9998***				-0.7453***				-0.9696***
				(0.0000)				(0.0000)				(0.0000)
Product-Country fixed effect	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Region fixed effect	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	6,309	6,309	6,309	6,309	7,167	7,167	7,167	7,167	10,595	10,595	10,595	10,595
R^2	0.0097	0.0150	0.0166	0.1371	0.0636	0.0665	0.0190	0.1242	0.1907	0.1832	0.0093	0.2780

Note: Robust standard errors clustered by firms reported in parentheses

*** ; ** ; * significant at the 1%, 5% and 10% level respectively