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Analyses of the Effects of Government Export Promotion Programs on Export Performance: Empirical Evidence for Small and Medium-Sized Enterprises in Korea*

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Abstract

Purpose – This study empirically examines the effect of the Korean government export promotion program (EPP) on small and medium-sized enterprise (SMEs) export performance using firm-level data. Unlike most previous studies that investigated some specific samples of firms, this study analyzes a vast amount of SME data of the Korean Small and Medium Business Administration over the period 2005 to 2008.

Design/methodology – An endogeneity problem arises when a firm's probability of being selected is correlated with the likelihood of successfully implementing EPPs. To control for the endogeneity of the EPPs in a relatively short-period sample, we employ 2-Stage Residual Inclusion (2SRI) RE-Tobit and bivariate Tobit procedure.

Findings – Analyses show that Korean government EPPs have positive significant effects on SME exports. Empirical results also show that SME export activities are significantly encouraged by R&D investment and capital intensity, but not obviously by labor productivity.

Originality/value – This study provides evidence that SME capital intensity, R&D investment, and the number of workers are significant determinants to SME exporting activities, whereas per worker labor cost and employee education are not. These results imply that even for SMEs, firm size is a major factor in promoting exporting activities.

Keywords: 2SRI, Government Export Promotion Program, Labor Productivity, SMEs
JEL Classifications: F13, F14

1. Introduction

International trade policies have often played a key role in economic development and growth in developing countries and industrial economies. For decades, much attention to trade and development issues has been attracted by successful performances in Asian countries. The export-oriented trade policies of these countries contribute to economic growth through market expansion, technology progress, and productivity improvement. Among other countries, Korea and Taiwan have particularly pursued active export promotion policies to enhance economic growth (Wade, 2003; Mah, 2010). However, the World Trade Organization (WTO), subsuming the Uruguay Round (UR) subsidies provision, imposed strict restrictions, or even prohibition, on the use of export and import-substituting subsidies.

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According to the UR Subsidy Code, a subsidy is defined as financial aid or tax benefit conferred by a government, or any public body. Actionable subsidies may be subject to the imposition of the counter-veiling duty (CVD), while non-actionables are not. Even in the case of subsidies, the CVD should be terminated if the subsidy did not exceed a certain threshold level. For example, a CVD investigation can be exempt if the subsidized import share was less than 4% of the total imports of the product (Mah, 2010). Thus, most export subsidies for small firms in developing countries can benefit from the provision on the *de minimis* value of the subsidy.

Under the WTO system that subsumes the UR provision on export subsidies, the Korean government has been focusing on small-scaled promotion programs for small and medium-sized enterprises (SMEs) rather than large-scaled subsidies to large firms. This is not because of the WTO's strict regulation, but because of SMEs' pivotal role in economic growth. In Korea, SMEs account for 99.9% of all enterprises (about 3 million SMEs), 87.7% of all employees (around 10.8 million employees), and 47.6% of production (Min, K.G, 2012). Many SMEs need funds for knowledge development, resource development, and commercialization in international markets. At the policy level, the Korean government, by supporting SMEs, plays an important role in encouraging technology innovation and exporting products and services globally. For example, the Korean Small and Medium Business Administration (SMBA), established in 1998 under the Ministry of Trade, Industry, and Energy (MOTIE), has been supporting the export promotion incentives and commercialization expenditures of SMEs.

Government, industries, and academic society are increasingly aware of the importance of SME exporting and economic activities, and have suggested the use of various support schemes. Korean government supported SME exporting activities at the policy level, and the SMBA and MOTIE provided a variety of support programs, such as international trade shows and networking global business centers around the world. These programs helped many SMEs by assisting them in expanding overseas and promoting their products, as well as in locating funding to manage an existing firm. Further, these programs helped SMEs by assisting in the accreditation of international standard certifications such as ISO 9000 and ISO 14000, and by supporting the development of global brands. Despite these support programs for SMEs, many still face difficulties in managing finances, sales, technologies, and the acquisition of business information (Craig *et al*, 2007; Noh, 2010; Shin and Park, 2010).

While controlling for the endogeneity of government EPPs, this paper empirically examines the effects of government EPPs on the export performance of Korean SMEs. The endogeneity problem arises when a firm's probability of being selected by the government is correlated with the likelihood of successfully implementing the promotion program. A small firm receiving government export incentives may have been selected by policymakers because it is likely to implement promotion programs successfully, and thus the selection procedure is 'picking the winner'. To control for this endogeneity, we apply 2SRI (Two-Stage Residual Inclusion) to both the RE-Tobit and the bivariate Tobit procedure (Cin *et al*., 2015; Terza *et al*., 2008).

This paper is organized as follows. In the following section, we review the related literature on the link between EPPs and the export performance of SMEs. In Section 3, we specify the model to be estimated, and then explain estimation procedures of the 2SRI RE-Tobit and bivariate Tobit procedure for analyses. In Section 4, we provide the results of the analyses. In Section 5, we discuss the results and provide implications for future research.

2. Literature Review

A number of economic justifications have been theoretically and empirically discussed on supporting or opposing government EPPs and policies (Aalto and Gustafsson, 2020). Theoretically, free markets should determine the most efficient allocation of scarce resources, based on supply and demand factors. However, market failures may prevent the market from operating at the most efficient level, which causes the market to either over-allocate or under-allocate resources to various economic activities, leading to economic waste. Thus, in order to remove such market failures and promote economic efficiency, some form of government intervention may be warranted. The existence of imperfect information in the market, spillovers, and imperfect competition are examples of market failures that often are cited as justifying government EPPs and policies (Aalto and Gustafsson, 2020).

From an economic perspective, much of the debate over export promotion involves whether some market failure actually has occurred, and whether government intervention can produce net benefits for the economy as a whole. Supporters of EPPs assume that market failures have occurred and have led to a significant misallocation of resources in the economy (Copeland, 2007; Lederman et al., 2010). Some view export promotion as a corrective tool to ensure that resources are directed to their most efficient use. Proponents argue that these policies can boost exports substantially, and increase output and employment (Munch and Schaur, 2018).

Opponents of EPPs dispute that significant market failures have occurred, and warn that government intervention may interfere with the efficient operation of the market. Such critics argue that export promotion policies are little more than distortive subsidies that favor some firms over others, reduce efficiency within the economy, and result in terms-of-trade losses.

Many empirical works have been done on the effectiveness of government EPPs. Early studies using firm-level data include Bernard and Jensen (2004) and Görg, Henry, and Strobl (2008). Bernard and Jensen (2004) found no effect of state-level export-promotion expenditures on export entry among US firms. Görg, Henry, and Strobl (2008) were also pessimistic about the possibility that export promotion affects export activity. Instead, they argued that indirect export promotion in the form of grant support, such as employment grants, R&D grants, and training grants, can affect productivity and therefore allow firms to compete successfully in foreign markets. They found that grant support to Irish firms did not encourage exporters to start exporting, but existing exporters increase export volumes if grants are large enough. Munch and Schaur (2018) found that export promotion facilitates entry into export markets and the continuation of export activity across all types of firms. The effect was largest for small firms with 1– 20 employees, where export promotion raised the probability of exporting relative to control firms. However, Girma et al. (2009) provided evidence that production subsidies stimulate export activity with other firm characteristics. Particularly, they found that the positive relationship between subsidies and exports strongest among profit-maximizing and capital-intensive industries in China. Ayob and Freixanel (2014) also showed that government EPPs significantly encouraged the export initiation and expansion of Malaysian SMEs. Still, the question of whether government EPPs are beneficial to SME exports is far from conclusive (Van Biesbroeck, et al., 2016; Wang et al., 2017).

From a government perspective, there is a relatively less clear relationship between government support policies and SME export performance. From the SME perspective, it is also unclear that there are enough support programs from the government. At the policy

level, the government provides different levels of support programs, such as staff training, technology innovations, international market access, funds and credit guarantee, commercialization, and links to international business partners.

Unfortunately, there are few empirical studies to show that firm-level support programs have direct impacts on Korean SMEs export activities. This is because the data used in this paper is neither publicly released nor readily available. This paper contributes to the body of knowledge in the area of international business, in particular, SME export activities, by examining the relationship between SME export and government export support for international marketing activities.

3. Model Specification and Estimation Method

3.1. Model Specification

To investigate the impacts of government EPPs on export performance at the firm level, we consider the censored characteristics of SME exporting activities. Some SMEs export, but not all, and thus export values y_{it}, are incompletely observed values of latent exports y_{it}^* as follows:

$$y_{it} = \begin{cases} y_{it}^* \; if \; y_{it}^* > 0 \\ 0 \; if \; y_{it}^* \leq 0 \end{cases} \tag{1}$$

$$\begin{aligned} y_{it}^* = \; & \beta_0 + \delta S_{it} + \beta_1 \ln (Age)_{it} + \beta_2 \ln (VA/L)_{it} + \beta_3 \ln (\frac{K}{L})_{it} + \beta_4 \ln (Size)_{it} \\ & + \beta_5 \ln (RD/L)_{it} + \beta_6 \ln (Edu/L)_{it} + \beta_7 \ln (Wage)_{it} \end{aligned}$$

where y_{it}^* denotes i^{th} firm export at period *t*, and *S, Age, VA/L, (K/L), Size, RD, Edu,* and *Wage* respectively denote government EPPs, firm age, value added per worker, capital-labor ratio, firm size, R&D intensity, education and job training expense per worker, and labor cost per worker in order. μ_{it} denotes the error term.

Firm exports can be influenced by many factors, such as firm characteristics and government EPPs. First, among the explanatory variables (i.e independent variables), government EPPs can affect the export performance of SMEs. Generally, SMEs lack the resources, capabilities, motivation, and knowledge needed in successfully operating in foreign markets. Thus, government EPPs can be expected to improve price competitiveness by lowering production costs or reducing the cost of acquiring information about foreign markets to enhance export competitiveness, and ultimately to increase exports.

Second, firm age can affect export performance through accumulated knowledge and experience. It has a positive effect on SME export performance. This is because it is the easier for older firms to build export infrastructure, and the accumulated technology leads to an increase in export capability. This is also because the higher the level of export experience, the higher the export competitiveness, and thus firm exports increase.

Third, value added (VA) representing production or production capacity influences SMEs export performance. The greater the value added of a company, the higher the export competitiveness of the company, which can increase exports. Thus, VA per worker can have a positive effect on exports.

Fourth, capital intensity (*K/L*) corresponds to a typical determinant in the exemplary Heckscher-Olin trade theory, which explains trade patterns based on relative factor abundance. The theory states that labor-abundant countries export labor-intensive goods, and an increase in capital intensity may cause the export of capital intensive goods. If SMEs export labor-intensive products using general-purpose technology rather than capital-intensive products, we can expect that an increase in capital intensity can necessarily lead to an increase in exports.

Fifth, exports can be influenced by firm size (*Size*). This is because relatively large firms can easily finance the fixed entry cost required for export, and diversify risks caused by export fluctuations. In addition, the larger the firm, the higher the recognition of foreign consumer products and manufacturers, so it is relatively easy for larger firms to participate in the export market. According to Krugman (1979), there is a positive relationship between firm size and exports because the increase in international trade can induce market expansion and create economies of scale.

Next, firms active in R&D investment can have larger export effects. This is because R&D investment improves productivity, reduces costs, and increases the possibility of developing new products through the efficiency of the production process. Wakelin (1998) argued that technology level or R&D investment at the firm level has a positive relationship with exports.

Lastly, employee education and training expenses (*Edu/L*) are positively associated with export performance by improving the quality of human resources (World Bank, 1993). On the other hand, an increase in wages in SMEs can weaken price competitiveness due to an increase in production costs due to the increase in labor costs, thereby reducing exports.

3.2. Estimation Method

Since many non-listed or non-registered SMEs in Korea do not export (that is, non-exporters), their observed export values are censored at zero.[1] With the censoring of exports, negative values of exports are set to zero because SMEs with negative desired exports choose not to export. In order to consider the heterogeneity of SMEs with the truncation nature of export value, Equation (1) can be re-specified as follows.

$$y_{it}^{*} = \delta\, \mathrm{S}_{it} + X_{it}^{1}\, \mathrm{B} + u_{it},$$
$$u_{it} = \alpha_i + \epsilon_{it}, \quad u_{it} \sim \mathrm{N}(0, \sigma_u^2) \tag{2}$$

where y_{it}^{*} is i^{th} SME's observed exports at period *t*, S indicates government assistance for international exporting activities to SMEs, X^1 denotes a vector of explanatory variables, and B is a coefficient vector described in Equation (1). The error term u_{it} in Equation (2) is a composite error, composing of α_i, denoting a time-invariant and firm-specific effect, and ϵ_{it} indicating a time varying error distributed independently across firms and independently of all α_i. If $\alpha_i = \alpha\ \forall i$, the pooled OLS estimator can be consistent, whereas the random effects (RE) estimators should be consistent if the unobservable firm-specific effects α_i are random variables and independently identically distributed; that is, under the assumptions with $\alpha_i \sim \mathrm{N}(0,\ {\sigma_\alpha}^2)$ and $\epsilon_{it} \sim \mathrm{N}(0,\ {\sigma_\epsilon}^2)$. When the unobservable firm-specific effects α_i are

[1] Equation (1) can be expressed as a max(.) function, $y_{it} = \max(0,\ y_{it}^{*})$. Thus, $y_{it} = y_{it}^{*}\ if\ y_{it}^{*} > 0$; otherwise $y_{it} = 0$. See Wooldridge (2010), p.670 for further details about this expression.

correlated with independent variables, the fixed effects (FE) estimators turn out to be consistent, while the pooled OLS estimators are not. In the short panels, however, the FE estimators would be inconsistent due to incidental parameters, and there is no simple differencing or conditioning method that can provide a consistent estimator (Cameron and Trivedi, 2005).

In estimating Equation (1) with assumptions in Equation (3), we can have three econometric problems that may lead to improper estimation results, and thus need correcting. The first possible problem is related to the censored characteristics of export and government assistance at the firm level. Data for SME exports are bounded at the lower limit of zero. Because we have both exporters and non-exporters in our firm data set, we can only observe positive export values of those firms that export. For firms that do not export, the values of their exports are zero. Many zeros are observed for exports in the data set because many firms do not export. Failing to take this censoring into account may produce sample selection bias.

Further, the censoring process is not random. Heterogeneous-firm trade theories suggest that SMEs do self-select into exporting, and exporters and non-exporters are systematically different via a selection process. To mitigate the censoring bias, we employ the Type I Tobit model bounded with the lower limit of zero[2], and to consider firm-specific heterogeneous effects, we employ the RE Tobit model rather than the FE model because it is not clear in the fixed effect model how any correlation between the firm-specific effects α_i would be handled, whereas the RE treatment in the RE Tobit provides better results.[3]

The second possible problem is associated with the endogeneity of government export promotion programs in firm export activities. If both SME export and government export promotion assistance variables are correlated, simple treatment of the latter variable as exogenous can produce biased results (Wooldridge, 2010; Cin et al., 2017). This can happen while government EPPs affect exporting activities of SMEs, their export performance can also affect the government's decision of export assistance, conversely. Therefore, the bi-directional causal relationship between export performance and government promotion programs can be anticipated. The presence of the bidirectional causal relationship implies that simple estimation by the Tobit method should create an endogeneity problem, unless the potential interdependent relationship between government supports and SME exporting is adequately considered.

To alleviate the endogeneity problem, two-stage estimation methods are generally used: the standard Two-Stage Predictor Substitution (2SPS) method and Two-Stage Residual Inclusion (2SRI) method, which was proposed by Terza et al. (2008). Both methods are similar in that the following first stage involves a regression of a potentially endogenous variable against the instrumental variables. However, the two methods differ in estimating the model in the second stage. While the traditional 2SPS includes the predicted value obtained for the export promotion assistance variable (S) from the first stage as an independent variable in the second stage equation (1), 2SRI includes the residuals from the first stage as an independent variable in the second stage to address the endogeneity problem. In the linear model, the estimation methods for both 2SPS and 2SRI are identical. In the non-linear model, the 2SRI estimator is inconsistent, while the 2SPS estimator is not. Terza *et al.* (2008) showed that the use of the 2SPS method in a non-linear model when the endogeneity problem is considered can

[2] Among others, Sterlacchini (1999), Nassimbeni (2001), and Wagner (2001) employed the Type I Tobit model to estimate the export model.

[3] See Greene (2012), p.785 for detailed discussion.

produce biased results. In particular, while the 2SPS estimators from the simultaneous probit models and count data model where the data are non-negative integers can be biased, the 2SRI estimator is not biased. To consider the endogeneity of the EPP, this paper employs the 2SRI procedure for estimation of the RE Tobit model because the 2SPS method is subject to a potential non-linearity bias.

The third problem is related to inefficiency from ignoring the correlation across errors in a system equation of both export performance and government export promotion support. The government's decision for export promotion to SMEs can be affected by firm export performance. Like SMEs exports, the export promotion support variable can be censored at zero because some SMEs are supported by the government, whereas most are not. This is specified as follows:

$$S_{it} = \max(0,\ S_{it}^{*}), \qquad S_{it}^{*} = \gamma y_{it} + X_{it}B + v_{it} \tag{4}$$
$$\begin{pmatrix} u_{it} \\ v_{it} \end{pmatrix} \sim \mathrm{N}(0, \Sigma),$$

where $X_{it} = [X_{it}^{1}, X_{it}^{2}]$ X^{2} denotes the vector of explanatory variables that are not included in the export model. v_{it} is a time varying error in government export promotion assistance, and $\Sigma = \begin{pmatrix} {\sigma_u}^2, & \rho_{uv} \\ \rho_{uv}, & {\sigma_v}^2 \end{pmatrix}$ is the covariance matrix of errors in the system equation of the two censored Equations (1) and (4). If the estimated correlation coefficient for ρ_{uv} is not equal to zero, the estimation of Equation (1) by the simple Tobit method can produce inefficient results. To mitigate this problem, we estimate the bi-variate Tobit model by the Maximum Likelihood using the Conditional Mixed Process Program (Roodman, 2011).

4. Data and Empirical Results

The panel data to analyze export performance was constructed by merging the Annual Report of the Financial Statement of the Korean manufacturing firms and export promotion program data. We collected firm financial data from the National Information and Credit Evaluation. The financial data include individual accounting items from the balance sheet, as well as the income statement of both listed and unlisted companies for years 2005 through 2008. The advantage of this data is the extensive coverage of private companies for a variety of firm sizes for all industries. The data on the export promotion program for the same period was provided by the SMBA.[4]

Table 1 shows the operating definitions for the variables used in the paper. As a proxy for labor productivity, we use value-added (VA) productivity or value-added per employee.[5] Since quantities produced by firms are not available and many firms produce multiple products, we use the firm's VA as a proxy for firm production (Tsang et al., 2008). Firms' total sales are frequently used as a proxy for production, but they can be over-estimated because

[4] Although the Korean government of the Korean SMBA may not release such data in depth publicly, our data includes the extensive coverage of private companies for a variety of firm sizes for all industries for the period.

[5] Based on the definition of The Bank of Korea (i.e. the central bank of Korea), we calculate Value-added (VA) for firms. See OECD (2001) for further discussion about various productivity measures.

intermediate material costs are not excluded. Since firms' intermediate material costs are not precisely known, we calculate VA by following the definition of the Bank of Korea as shown in the Table 1.

The export promotion programs refer to small direct financial support to SMEs that does not require repayment. The programs implemented by the Korean SMBA include government financial support for international trade shows, transforming domestic firms into export businesses, acquisition of international certification, networking business centers globally, and global branding businesses.

Table 1. Definitions of Variables in Equations

Variables	Definition/Description
lexport	Dependent variable: Ln(Export)
lworker	Ln(Number of employees)=Ln(L)
VA	Value added = (operating surplus + labor costs + interest expenses + taxes & dues + depreciation & amortization)
pva	Value-added productivity = Ln(VA/L)
pcapit	Capital Intensity = Ln(Fixed asset of the firm/L)
pedu	Ln(Education and job training expenses/L)
pwage	Ln(Labor Cost/L)
R&D	R&D expenses = ordinary development expenses + ordinary research and development expenses + amortization of research and development expenses + changes of research and development expenses
prd	R&D intensity =Ln(R&D/L)
S	Ln(Government financial assistance for export promotion)
lage	Firm age; Ln(2007-founding year)
Industry	A dummy variable; take the value '1' if the firm belongs to k industry and '0' otherwise,
Year	A dummy variable for a specific year

The paper uses unbalanced panel data that covers a relatively short period of four years.[6] In short unbalanced panels, the FE Tobit estimator is inconsistent since there is no simple differencing or conditioning method that can provide a consistent estimator. Because of the inconsistency of the FE estimator, the RE estimation method is more commonly used.[7] Thus, to consider heterogeneous firm characteristics, we use the RE Tobit model with both industry dummy variables and year dummies.

Table 2 shows SMEs by industry with export promotion incentives. For four years, the SMBA has been supporting about 2,500 firms out of 20,790 SMEs. For firms supported by the government's export promotion programs, the machinery and equipment sector (ISIC 29) is ranked first, and the telecommunications (ISIC 32), chemical products (ISIC 24), and medical precision sectors (ISIC 33) follow in order.

[6] We do not use balanced panel data because conversion of an unbalanced panel into a balanced panel by including in the sample only those firms with data available in all years should reduce efficiency due to the loss of many observations.

[7] For further discussion, see Cameron and Trivedi (2005), p.800.

Table 2. Sample Profiles of Export Promotion Recipients by Industry

ISIC	Industry Name	No. of Firms without Support	No. of Firms with Support	Total No. of Firms
15	Manufacture of food products and beverages	940	39	979
16	Manufacture of tobacco products	6	0	6
17	Manufacture of textiles	708	50	758
18	Manufacture of wearing apparel; dressing and dyeing of fur	554	15	569
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	175	10	185
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	128	2	130
21	Manufacture of paper and paper products	431	9	440
22	Publishing, printing and reproduction of recorded media	508	8	516
23	Manufacture of coke, refined petroleum products and nuclear fuel	86	5	91
24	Manufacture of chemicals and chemical products	1,728	201	1,929
25	Manufacture of rubber and plastics products	1,094	99	1,193
26	Manufacture of other non-metallic mineral products	906	15	921
27	Manufacture of basic metals	1,538	113	1,651
28	Manufacture of fabricated metal products, except machinery and equipment	1,228	133	1,361
29	Manufacture of machinery and equipment and etc.	2,261	549	2,810
30	Manufacture of office, accounting and computing machinery	176	76	252
31	Manufacture of electrical machinery and apparatus and etc.	873	178	1,051
32	Manufacture of radio, television and communication equipment and apparatus	1,894	445	2,339
33	Manufacture of medical, precision and optical instruments, watches and clocks	488	195	683
34	Manufacture of motor vehicles, trailers and semi-trailers	1,790	187	1,977
35	Manufacture of other transport equipment	453	135	588
36	Manufacture of furniture; manufacturing and etc.	325	36	361
Total		18,290	2,500	20,790

Note: ISIC denotes International Standard Industrial Classification of All Economic Activities by UN Revision 3.1.

Table 3 shows the Pearson correlation matrix of variables included in the analyses. SME export is positively correlated with firm age (lage), the number of workers (lworker), R&D intensity (prd), education and job training expenses (pedu), and government financial assistance for export promotion (S). This simple correlation analysis does not show significance between SMEs exports and labor productivity (pva), though the parameter estimate is positive. The analysis also shows that labor productivity is positively correlated with capital intensity (pcapit), number of workers, R&D intensity, education and job training expenses, labor cost (pwage), and government financial assistance for export promotion.

Table 3. Descriptive Statistics and Correlation Matrix of Variables

	Mean	lexport	lage	pva	pcapit	lworker	prd	pedu	pwage
lexport	5.271								
lage	2.712	0.048*							
pva	17.292	0.009	-0.016*						
pcapit	18.575	0.006	0.036*	0.579*					
lworker	4.279	0.115*	0.272*	-0.336*	-0.332*				
prd	6.382	0.146*	0.011	0.243*	0.106*	0.100*			
pedu	9.035	0.053*	0.050*	0.445*	0.304*	0.044*	0.295*		
pwage	16.599	0.013	0.017*	0.810*	0.455*	-0.257*	0.234*	0.401*	
S	1.854	0.308*	-0.046*	-0.022*	-0.042*	0.022*	0.090*	0.025*	-0.008

Note: * indicates 5% significance levels.

Table 4 provides the estimated results from the pooled OLS and Tobit methods. The results show that estimated coefficients for capital intensity (pcapit), the number of workers (lworker) and R&D investment per worker (prd) are all positive and statistically significant regardless of estimation methods. Those for EPPs are also positive and significant, but these results may be biased because of ignoring the heterogeneity of SMEs and the potential endogeneity problem with the EPPs.

Table 5 shows the results estimated by the 2SRI RE Tobit and bivariate Tobit procedures to address the endogeneity problem of the government export financial support. First, three of the four estimated coefficients for residuals (υ) are statistically significant, meaning that the government export promotion variable should be endogeneous. In the RE Tobit model, the σ_α for the firm-specific effects α_i is found to be statistically significant. The correlation coefficient(ρ_u) approaches one (i.e. ρ_u=0.942, 0.941) if the σ_α is large relative to the σ_ϵ.[8] This means that the σ_α for the firm-specific effects are significant enough to infer that the RE Tobit model should be more appropriate than the simple Tobit or pooled OLS model. Furthermore, the result that about 62% of the observations (7,560 of 12,286) are left-censored implies that the Tobit model should be more valid than the simple OLS model. In the bivariate Tobit model, the estimated correlation coefficients for ρ_{uv} are statistically significant, implying that results could have a simultaneous bias if the specified models are estimated separately by the simple OLS method.

[8] This is because the composite error is $u_{it} = \alpha_i + \epsilon_{it}$ and the correlation coefficient is $\rho_u = \frac{\sigma_\alpha^2}{\sigma_\alpha^2+\sigma_\epsilon^2}$. Thus, ρ_u approaches one if the σ_α is large relative to the σ_ϵ

Table 4. Effects of Export Promotion Programs on Exporting Activities

Variables	Pooled OLS1	Pooled OLS2	Pooled Tobit1	Pooled Tobit2
S	0.358***	0.359***	0.746***	0.751***
	(0.013)	(0.012)	(0.030)	(0.029)
lage	0.472***	0.478***	1.160***	1.178***
	(0.116)	(0.112)	(0.302)	(0.292)
pva	-0.036		-0.155	
	(0.080)		(0.207)	
pcapit	0.305***	0.273***	0.698***	0.574***
	(0.058)	(0.055)	(0.152)	(0.144)
lworker	1.032***	1.037***	2.457***	2.502***
	(0.101)	(0.097)	(0.263)	(0.253)
prd	0.078***		0.195***	
	(0.009)		(0.023)	
pedu	-0.022	-0.011	-0.053	-0.029
	(0.017)	(0.016)	(0.043)	(0.041)
$pwage_{t-1}$	0.015	-0.084	0.056	-0.242
	(0.054)	(0.080)	(0.138)	(0.201)
pva_{t-1}		0.093		0.295
		(0.101)		(0.256)
prd_{t-1}		0.065***		0.165***
		(0.009)		(0.022)
Year Dummy	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes
Adjusted R2	0.136	0.132	0.034	0.033
F	65.243	67.688		
Corrected χ^2			1,679.441	1,748.390
Number of uncensored observations			4,726	5,074
Number of left-censored observations			7,560	8,127
Total number of observations	12,286	13,201	12,286	13,201

Note: ***, **, and * indicates the 1%, 5%, and 10% significance levels, respectively.

Table 5. Effects of Export Promotion Programs on Exporting Activities

Variables	2SRI RE-Tobit	2SRI RE-Tobit	Bivariate Tobit1	Bivariate Tobit2
S	0.436***	0.143***	1.398***	1.647***
	(0.023)	(0.040)	(0.066)	(0.035)
υ	-0.352***	-0.059	0.319***	0.060**
	(0.019)	(0.038)	(0.062)	(0.023)
lage	2.115***	1.795***	-0.400***	0.043
	(0.374)	(0.394)	(0.137)	(0.097)
pva	0.634***		-0.545***	
	(0.115)		(0.112)	
pcapit	0.355***	0.228**	0.081	0.201***
	(0.101)	(0.102)	(0.073)	(0.063)
lworker	1.226***	1.444***	1.141***	0.944***
	(0.239)	(0.250)	(0.152)	(0.146)
prd	-0.041***		0.113***	
	(0.015)		(0.022)	
pedu	-0.117***	0.017	0.108***	0.007
	(0.027)	(0.027)	(0.025)	(0.015)
$pwage_{t-1}$	-0.068	-0.288**	0.050	-0.057
	(0.084)	(0.122)	(0.055)	(0.065)
pva_{t-1}		0.528***		0.125
		(0.174)		(0.131)
prd_{t-1}		0.059***		0.093***
		(0.020)		(0.020)
Year Dummy	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes
σ_α	16.921***	16.803***		
	(0.279)	(0.276)		
σ_ϵ	4.199***	4.190***		
	(0.058)	(0.058)		
ρ_u	0.942	0.941		
σ_u			2.556***	2.555***
			(0.012)	(0.012)
σ_v			2.806***	2.810***
			(0.022)	(0.022)
ρ_{uv}			-2.918***	-2.903***
			(0.034)	(0.034)
Corrected χ^2	7,735.445	7,668.637	7,038.190	7,048.754
Number of uncensored observations	4,726	4,726	4,726	4,726
Number of left-censored observations	7,560	7,560	7,560	7,560
Total number of observations	12,286	12,286	12,286	12,286

Notes: ***, **, and * indicates the 1%, 5%, and 10% significance levels, respectively.

Second, all estimated coefficients for EPPs are positive and statistically significant, regardless of estimation methods, which implies that government EPPs encourage the exporting activities of SMEs in Korea. These results are consistent with the results of Mah (2010), Ayob and Freixanel (2014), Van Biesebroeck et al. (2016), Wang et al. (2017), and Munch and Schaur (2018), but these are not consistent with Bernard and Jensen (2004) and Görg, Henry, and Strobl (2008). In particular, Mah (2010) found that export values in Korea have increased substantially due to the export promotion policies. Van Biesebroeck et al. (2016) found a steady and positive link between Trade Commissioner Service (TCS) programs and export activities. These results imply that EPPs should play a key role in enhancing economic growth through exporting in Korea. This means that, as the World Bank argued, export-oriented policies are important in explaining economic growth in both developing countries and industrial economies.

Third, the empirical results show that the estimated coefficients for firm age in the RE-Tobit model are statistically significant, while they are not in the bivariate Tobit model. This suggests that SME age should not necessarily be an important factor in pursuing exporting.

Fourth, estimated coefficients for the number of workers were all found to be statistically significant, whereas all except one for lagged labor cost per worker were not.[9] This means that firm size matters even in SME exporting activities. These results for firm size effects are consistent with those of Majocchi et al. (2005) and Hernandez (2016).

Fifth, estimated coefficients for capital intensity (*pcapit*) are statistically significant. These results imply that capital intensity is a key determinant in the Heckscher-Olin trade theory, which explains trade patterns based on relative factor abundance. That is, an increase in capital intensity in the SMEs of Korea would lead to an increase in exporting capital intensive goods, rather than labor-intensive products.

Next, VA per worker (pva) does not significantly affect exporting, but the lagged one does in the RE-Tobit model.[10] In the bivariate Tobit model, coefficients for the lagged productivity variables turn out to be statistically insignificant. These results mean that higher productivity might lead to higher exports.

Finally, the coefficients for the R&D intensity variables are statistically significant. The results are consistent with Bleaney and Wakelin (2002) and Love and Roper (2001), supporting the product cycle models (Vernon, 1966) and the neo-technology models in which product differentiation and innovations translate into competitive advantage in international markets. This can be interpreted as evidence for another type of self-selection of SME exporting activities. This implies that SME self-selection may enhance market competitiveness by improving product quality through an increase in R&D investment.

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[9] The lagged labor cost variable ($pwage_{t-1}$) was used to control for a potential multi-collinearity problem with labor productivity, which could be created by the high correlation between the two variables (Bernard et al, 2007; Cin, 2018a). This might happen when SMEs attempt to maximize profits by reducing the labor cost and increasing labor productivity at the same time. The log of number of workers (lworker) is included for a proxy for a scale effect of production and firm size.

[10] We employ the lagged variables for labor productivity and R&D intensity to control for their potential endogeneity problems (Bernard et al., 2007; Cin, 2018a). For explaining the interdependence between exporting an R&D intensity which can cause an endogeneity problem of the R&D intensity in the export model, see Van Biesebroke et al.(2010), Van Beveren and Vnadenbusche(2010), and Cin(2018a).

5. Conclusions and Implications

The Korean government, to promote economic development and growth, has been operating various EPPs for SMEs. As the WTO has imposed strict restrictions on and prohibited export subsidies, the Korean government's export promotion policy has focused more on SMEs, rather than large firms. We empirically examined the effects of the Korean government's EPPs on SME exporting activities by employing both the 2SRI RE-Tobit and the bivariate Tobit procedure. To do so, we controlled for the potential endogeneity of the government's EPPs with firms being selected based on the likelihood of successfully implementing programs.

Our empirical findings are summarized as follows. First, the government export promotion variable was found to be endogenous. This means that simple treatment of EPPs as exogenous can produce biased results. While government EPPs affect the exporting activities of SMEs, their export performance can also affect the government's decision for export assistance, conversely. Therefore, a bi-directional causal relationship between export performance and government promotion programs was found to exist. The presence of a bidirectional causal relationship implies that simple estimation by the Tobit method should create an endogeneity problem, unless the potential interdependent relationship between government support and SME exporting is adequately considered.

Second, we found evidence that the Korean government's EPPs have a positive significant effect on SME exporting performance. This finding provides strong incentives for governments to implement EPPs to expand SME exporting, and thus stimulate economic growth. Our results imply that EPPs to SMEs should play a key role in enhancing economic growth in Korea. This means that as the World Bank argued, export-oriented policies are important in explaining economic growth in developing countries and industrial economies.

Third, we also found evidence that older SMEs could be more willing to pursue exporting activities. These findings imply that SMEs tend to export by self-selecting export markets rather than through learning-by-exporting. SME capital intensity, R&D investment, and number of workers were found to be major contributing factors to SME exporting activities.

Next, capital intensity was found to have a positive effect on export. This confirmed that capital intensity is a key determinant in the Heckscher-Olin trade theory, which explains trade patterns based on relative factor abundance. That is, an increase in the capital intensity in the SMEs of Korea would cause the export of capital intensive goods, rather than labor-intensive products.

Finally, the coefficients for the R&D intensity variables were found to be statistically significant, which supports the product cycle models and the neo-technology models in which product differentiation and innovations translate into competitive advantage in international markets. This can be interpreted as evidence for another type of self-selection of SME exporting activities. This implies that SME self-selection may enhance market competitiveness by improving product quality through an increase in R&D investment.

While this study shows that the government's financial support of various export supporting programs promotes economic development and growth, our interpretation of the empirical results is subject to relatively old data due to the unavailability of recent data. Nevertheless, results suggest that it would be beneficial to consider the effects of regional or sector-specific support programs on SME exporting activities.

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