Exports, imports, growth and causality: a study of Slovakia

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Abstract

In this article, we analyse the trade-growth nexus for Slovakia. This country represents a critical case for such research because it is one of the most open economies in the world, by several measures it is the most open economy in the EU, with the most Eurocentric trade, and has maintained one of the best growth performances within the EU over a sustained period of time. In contrast to most contributions to the trade-growth literature, we analyse all six possible causal relationships between Slovakia's exports, imports and growth, using the technique developed by Toda and Yamamoto (1995), on quarterly data from 1997:1 to 2014:4. We find evidence supporting both the export-led-growth hypothesis and the import-led-growth hypothesis. None of the other four relationships was found to be significant.

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Introduction

The post-war period has seen the advance of globalisation, the progressive reduction of trade barriers, and rising rates of economic growth. In particular in the context of economic development, exports were seen as the way to drive growth and development, with the emergence of the Asian Tiger economies acting as leading flag-bearers. Thus the pursuit of export-led-growth (ELG) took off. Over time, analyses extended to considering whether imports could also enhance growth. From this, it was logical to ask whether domestic growth could drive exports and imports. Indeed, is there a causal link between exports and imports? Despite the logical inter-connectedness of these different hypotheses, however, hardly any study in the trade-growth literature analyses all six possible causal relationships.

The purpose of this paper is to do precisely that, for Slovakia. This country represents a critical case study given that it is one of the most open economies in the world, by several measures it is the most open economy in the EU, with one of the best growth performances in the EU over a sustained period of time. Given the number of possible trade-related explanations for this growth, this paper offers an important contribution to the trade-growth literature generally, but especially to the scant literature on Slovakia, to consider the various causal relationships in the same study.

In addition, the choice of analytical technique is, as always, of critical importance. Despite being over 20 years old, the technique developed by Toda and Yamamoto (1995) (henceforth the TY procedure) has not been applied universally in the trade-growth literature generally, and remains unused in analyses of Slovakia. We use the TY procedure because of its econometric advantages, explained further below, in avoiding problems associated with identifying orders of integration of data series as experienced with other cointegration tests, which undermine the robustness of the econometric and economic validity of their results.

Our research question is, therefore, what are the causal links between trade and growth in Slovakia? We apply the TY procedure to quarterly data from 1997:1 to 2014:4, in order to analyse six potentially causal relationships. Our hypotheses are thus as follows. For Slovakia:

H1: There is a positive relationship from exports to GDP growth

H2: There is a positive relationship from GDP growth to exports

H3: There is a positive relationship from imports to GDP growth

H4: There is a positive relationship from GDP growth to imports

H5: There is a positive relationship from exports to imports

H6: There is a positive relationship from imports to exports

We are therefore testing not only for the most common relationship examined in the literature, export-led growth (ELG), via H1; but also for possible reverse causality, growth-led exports, via H2, and for four more possible relationships that have appeared in the trade-growth literature more recently: import-led growth (H3), growth-led imports (H4), and causal linkages between exports and imports (H5 and H6).

The rest of the paper is organised as follows. The next section presents a brief review of some of the relevant literature on the causal links between exports, imports and growth, in developed, emerging and transition economies. Following that, we describe the data and method employed. We then present the empirical results, before offering our concluding thoughts on the results and their implications for trade, growth, and related policy.

Literature review: the ambiguous links between trade and growth

The nature of causal relationships between trade and economic growth has long been the focus of attention in the literature, although disagreements still persist regarding the direction

of causality and size of the impacts (Awokuse, 2008; Edwards, 1998). This literature grew out of empirical observations of various countries' experiences, most notably the apparent link between exports and growth as witnessed in the Asian Tigers. Developing an economy capable of exporting goods competitively to many more consumers than was possible domestically promoted domestic economic growth. That said, export-led growth (ELG) is not a universal finding in the empirical literature. Whilst some studies have found evidence for the ELG hypothesis (*inter alia* Awokuse, 2003; Doyle, 1998; Federici & Marconi, 2002; Fountas, 2000; Paul & Chowdhury, 1995; Pomponio, 1996; Serletis, 1992; Sharma, Norris, & Cheung, 1991; Yamada, 1998), evidence has also been found of reverse causality, from GDP growth to exports (*inter alia*, Henriques & Sadorsky, 1996; Jin & Yu, 1995; Oxley, 1993; Shan & Sun, 1998; Sharma et al., 1991). Evidence has also been found for two-way causality between exports and GDP growth (Awokuse, 2006, 2008; Chow, 1987; Hatemi, 2002; Kónya, 2006; Marin, 1992; Ramos, 2001; Thornton, 1997).

Whilst there has been awareness of the potential for import-led growth (ILG) for some time, via the transfer of technology and knowledge (Coe & Helpman, 1995; Grossman & Helpman, 1991), only in recent years has it more regularly been incorporated into studies. Examples include Awokuse (2008) and Ramos (2001), both of whom found evidence of two-way causality between imports and GDP growth in, respectively, Argentina and Portugal.

Studies which have focused on transition economies have also found mixed results. Awokuse (2007) analysed three countries that are now full EU members, but using data from the time-period when they were going through economic transition (1993-2004). Evidence was found for ELG in Bulgaria and Czechia, although in Bulgaria it was also found that GDP drove both exports and imports. In both Czechia and Poland, evidence was found supporting ILG. A wider-ranging analysis by Çetintaş and Barişik (2009) covered thirteen transition economies over the period 1995-2006. Their results revealed a very mixed picture with, for

different countries, GDP growth driving exports, bidirectional causality between imports and GDP growth, and bidirectional causality between exports and imports.

Recent studies by Bilas, Bošnjak and Franc (2015), and Trošt and Bojnec (2016), have investigated the directions of causality between exports and GDP, respectively, for Croatia over 1996-2012 and Slovenia and Estonia over 2000-2014. They have found evidence for ELG in these countries. Trošt and Bojnec (2015), for Slovenia, expanded their study of exports and growth by including the public wage bill. They found evidence of ELG, but not of reverse causality. They also found evidence of significant causal links from public wage bill to both exports and growth and from exports to public wage bill.

The only studies we are aware of that focus on Slovakia are Fitzová and Žídek (2015) and Szkorupova (2014), the first of these analysing both Slovakia and Czechia. Szkorupova finds evidence of ELG, but does not include imports in her analysis. Fitzová and Žídek (2015) find evidence of ELG, and growth-led exports. They also find evidence of ILG and growth-led imports, but only at the 10 percent significance level. In addition, Bajo-Rubio and Diaz-Roldan (2012) look for evidence, albeit just of ELG and growth-led-exports, in the eight ex-transition economies that joined the EU in 2004. The only significant result they find is for ELG in Czechia. Compared with these papers, the present research offers an important contribution, both in terms of the possible range of causal relationships tested for and, by adopting the TY procedure, the robustness of the procedure used for the cointegration tests; and thus the robustness of the results obtained.

Openness and growth in the Slovak economy

Following the 'velvet divorce' from Czechia in 1993, the Slovak economy experienced strong growth from the late 1990s through to the economic crisis, supported by the election of a pro EU government in 1998 and accession to the EU in 2004. This performance was affected by

the crisis, but by this point Slovakia was working towards adoption of the euro, which it did in 2009. Nominal annual GDP growth averaged over 12 percent between 1995 and 2008, exceeded only by the Baltic states and Romania.[1] For the period 1995-2016 annual growth averaged 8.5 percent, exceeded only by those same four countries. The respective figures for annual real GDP growth are 5.2 percent and 4 percent, exceeded in both cases only by the Baltic States and Ireland. Moreover, relative to a base index of 100 in 2005, by 2016 real GDP was the second highest in the EU (147.5), second only to Poland (150.7).[2]

Over the period 2002[3] to 2008, Slovakia's total merchandise exports grew at 21.4 percent annually, the highest figure of all EU countries, despite experiencing the largest appreciation in real effective exchange rate of any EU country (European Commission, 2010). Over the period 2002-2016, exports grew on average at 12.2 percent annually, a figure exceeded only by Cyprus and Latvia. The respective figures for imports were 19.3 percent (to 2008) and 10.9 percent (to 2016), the former exceeded only by Bulgaria and Romania, the latter being the highest of all EU countries.

Slovakia is one of the most open economies in the EU. In 2016, Slovakia was the fourth most open EU economy for goods and services (94.6 percent for exports, 91.1 percent for imports[4]). That said, since before the crisis Slovakia has had the highest share of trade in goods as a percentage of goods and services of all EU member states (roughly 89 percent on both exports and imports in recent years[5]). Not surprisingly, therefore, both exports and imports of goods as a percentage of GDP have also been higher in Slovakia than in any other EU member state (84.7 percent and 81.8 percent, respectively, in 2016[6]). As a result, in 2016 Slovakia was the seventh most open economy in the world.[7]

Slovak GDP has grown strongly in this very open setting. Moreover, growth has been strong (in nominal and real terms) despite the very highly Eurocentric nature of trade and the backdrop of the economic crisis and, in some EU countries, the sovereign debt crisis. 2016

data on trade in merchandise goods show that Slovakia has the third highest[8] Eurocentricity (80.2 percent) on imports, the highest on exports (85.5 percent) and the highest on imports and exports combined (82.8 percent). That said, Slovakia's reliance on exports has been perceived in the past as having dangers, with more recent assessments highlighting the extent to which Slovak exports are concentrated in just a few industries, notably automotive and electrical machinery & equipment (European Commission, 2016, p. 8).[9] This follows an observation by the Ministry of Finance of the Slovak Republic (2015, p. 22) that in 2014, stronger 'domestic demand pulled import growth, which increased more speedily than export, and thus, for the first time in five years, foreign trade contributed slightly negatively to GDP development.' On the other hand, in 2016[10] export growth once again rose slightly above import growth. Importantly, Slovakia's position is helped by having a highly deregulated domestic market: OECD data show that, in 2013, it had the (joint) eighth-lowest PMR (product market regulation) score.[11]

Data and methodology

In this study, for reasons explained below, the casual relationship between national income and trade (both exports and imports) is analysed using the Granger causality testing procedure developed by Toda and Yamamoto (1995). The size of the VAR model requires quarterly rather than annual data to generate enough degrees of freedom for estimation. Following the literature (see Kónya, 2006; Shan and Sun, 1998), the long-run multivariate relationships between national income and trade are set as follows:

$$ly_t = \alpha_0 + \sum_{i=1}^{k} \beta_{1i} ly_{t-i} + \sum_{j=k+1}^{d_{max}} \beta_{2i} ly_{t-i} + \sum_{i=1}^{k} \beta_{3i} lz_{t-i} + \sum_{j=k+1}^{d_{max}} \beta_{4i} lz_{t-i} + \varepsilon_{1t} \qquad (1)$$

$$lz_t = \alpha_1 + \sum_{i=1}^{k} \lambda_{1i} lz_{t-i} + \sum_{j=k+1}^{d_{max}} \lambda_{2i} lz_{t-i} + \sum_{i=1}^{k} \lambda_{3i} ly_{t-i} + \sum_{j=k+1}^{d_{max}} \lambda_{4i} ly_{t-i} + \varepsilon_{2t} \qquad (2)$$

where ly is the logarithm of real GDP; lz represents, respectively, the logarithms of real exports (lex in Tables 1 and 2 below) and real imports (lim in Tables 1 and 2); k is the optimal lag length, determined by the Akaike Information Criterion (AIC); d_{max} is the maximal order of integration of the variables in the VAR system; and ε_1 and ε_2 are the error terms. From equation (1), causality implies that 'exports Granger-cause GDP' and 'imports Granger-cause GDP' provided that $\beta_{3i} \neq 0 \forall_i$. Similarly, from equation (2), causality implies that 'GDP Granger-causes exports' and 'GDP Granger-causes imports' provided that $\lambda_{3i} \neq 0 \forall_i$.

Quarterly data on nominal GDP, exports, and imports, from 1997Q1 to 2014Q4 have been collected from the Eurostat website. GDP deflator, export price index and import price index, which are also obtained from Eurostat, are used to convert nominal values of the relevant variables into real values. These three variables are free of seasonal effects.

In this analysis, to determine causality we apply the modified Wald (MWald) test developed by Toda and Yamamoto (1995). The traditional F-test is ineffective for determining whether some coefficients in a regression model are jointly zero, when the variables are integrated or cointegrated, and the test statistics do not have a standard distribution (Gujarati, 1995). The TY Procedure involves the estimation of an augmented vector autoregressive model (VAR) in levels (rather than in first differences of the variables, as in the Granger causality test). This reduces the risks associated with the possibility of wrongly identifying the order of integration of the variables (Mavrotas & Kelly, 2001). This test has an asymptotic chi-squared distribution when a VAR model is estimated with the optimum lag order of $(k+d_{max})$, where d_{max} is the maximal order of integration. Zapata and Rambaldi (1997) provide evidence that the MWald test has a comparable performance in size and power to the Likelihood Ratio and standard Wald tests, provided that a sample of 50 or more observations is available. Despite the advantages from using this technique, however, it

is noticeable how many of the papers above, post-dating the paper by Toda and Yamamoto, have not adopted their technique. This includes those whose analysis focuses on Slovakia, despite its extensive use in a wide range of applied economics literatures over two decades.

Empirical results

Using the augmented Dickey-Fuller (ADF) test, we check whether the univariate processes of exports, imports, and GDP contain unit roots or not. The lag length for the ADF tests was selected based on the AIC, with estimation of an initial eleven lags on the first-differenced dependent variable. The results of the unit root tests are shown in Table 1, indicating that the ADF test statistics mean we cannot reject the null hypothesis of a unit root at the 1 percent level of significance in the log-level of all variables. When the first differences of the variables are taken, the tests clearly reject the null hypothesis at the 1 percent significance level, demonstrating that all variables in the system are integrated of order one, I (1).

INSERT TABLE 1 HERE

After conducting the ADF tests and having determined that $d_{max} = 1$, we then proceed to estimate the lag structure of the VAR models (equations 1 and 2). In selecting the optimum lag length for each VAR model, the AIC results indicate that the optimal lag length is 1, that is k = 1. Thus, the estimated VAR models use 2 lags as the optimum lag length. The results of the Granger causality test are presented in Table 2, where the computed F-statistics with their probabilities are reported.

INSERT TABLE 2 HERE

According to the estimation results, the null hypotheses of Granger no-causality from output growth to exports and output growth to imports cannot be rejected, whilst the null hypotheses of Granger no-causality from exports to output growth and imports to output growth can be rejected at the 1 percent significance level. In other words, we find strong evidence of export-led growth and import-led growth, but we do not find evidence that growth has had a significant impact on exports or imports. Moreover, we find no evidence that there are causal links from exports to imports, or from imports to exports.

Discussion and conclusions

Trade has long been perceived to be an important driver of economic growth. Whether it is in reality, however, remains an open and empirical question. In this paper we have explored the six possible causal relationships between exports, imports and growth for Slovakia, using quarterly data for 1997Q1 to 2014Q4. This country represents a critical case study because it is one of the most open economies in the world, by several measures the most open economy in the EU and one of the fastest growing economies in the EU. Moreover, the impacts of the economic crisis on some EU countries notwithstanding, Slovakia has achieved this performance despite having the most Eurocentric trade patterns of all EU countries.

Our findings lead us to accept Hypotheses 1 and 3, but to reject Hypotheses 2, 4, 5 and 6. That is, we find a significant positive relationship existing from exports to growth and from imports to growth: Slovakia's growth performance has been both export-led and import-led. We find no evidence, however, that growth has driven exports or imports. That is to say, there is no evidence that other, domestic, drivers of growth in Slovakia have led to increased export and import volumes, the overall pace of growth notwithstanding. Furthermore, we find no evidence that imports have driven exports, nor that exports have driven imports. This is

critical, because when taken with the first two results, it allows us to rule out any indirect causality between exports and imports influencing our key findings for Hypotheses 1 and 3.

Our results, taken together, represent our first important contribution to the literature. A great many studies analyse the relationship between exports and growth. Rather fewer studies analyse the relationship between imports and growth. Far fewer still analyse both in the same study. It is our contention, however, that only by analysing both of these pairs of possible causal relationship – and possible causal links between exports and imports *as well* – that one can rule out, as well as rule in, the actual causal relationships between exports, imports and growth.

Our second important contribution to the literature comes in our use of the econometric technique developed by Toda and Yamamoto (1995). This was developed to allow for a robust determination of causality, avoiding the pitfalls of earlier techniques. This choice, therefore, represents a robust basis for conducting our analysis. Given its absence from analyses of trade and growth in Slovakia – and indeed from many studies exploring these relationships in the last twenty years for different countries – our findings offer an important contribution to the extremely small literature on Slovakia.

The application of the TY procedure to all six possible causal relationships between exports, imports and growth has helped us to avoid misreading spurious relationships in our data and thus in the interpretation of our results. By using this technique on data from such an important case study country with its exceptionally high levels of openness, growth and trade Eurocentricity, exploring simultaneously all possible linkages between exports, imports and growth, we offer this paper as an important step forward in how we seek to understand the importance and relevance of trade on a country's economic growth.

Our findings also have important implications for policy. Given the significance of imports and exports for Slovakia's growth, further gains may be possible from enhancing

trade liberalisation. The EUs 2015 Single Market Strategy is aimed at further intra-EU liberalisation.[12] Slovakia's very high trade Eurocentricity makes this policy push of considerable interest. Externally, the EU continues to negotiate trade liberalisation agreements with other countries and regional trade blocs. It has been estimated, for example, that Slovakia could see GDP rise by over 4 percent as a result of a successful conclusion to the Transatlantic Trade and Investment Partnership (TTIP), with Slovakia's government being encouraged to make sure the country's needs are reflected in the EU-US talks.[13] Bohac (2016) explores whether Slovakia could expand its trade links with Asia, given its currently highly Eurocentric trade. Future research can build on this, to explore the potential gains for Slovakia from such policy liberalisation and diversification in trade partners, given the much greater scope for trade growth and trade policy liberalisation on extra-EU trade than intra-EU.

To facilitate Slovakia's further export development, following the ideas of Akamatsu (1962) export industries should focus increasingly on producing high value added goods involving high-level technologies (see also Pokrivčák & Záhorský, 2016). The car industry has been extremely important for Slovakia (see, e.g., Switzerland Global Enterprise, 2015), but is there scope for diversifying into other sectors? Equally, further research is needed to determine the types of imported goods (such as capital goods and intermediate goods) that contribute most to economic growth. This is especially important for a small country like Slovakia, where such imports could be expected, *a priori*, to be used to boost the manufacture of goods for export. Our results suggest that, currently, there is no significant causal link from imports (of capital and intermediate goods) to export (of finished goods) – but this may change over time.

In summary, Slovakia's trade and growth performance over the last 20 years have both been very impressive. Indeed, we have demonstrated in this paper that the two are linked: growth has been driven, separately, by imports and by exports. Beyond this, however, we

have shown that these relationships are unidirectional. The travails of the eurozone notwithstanding, being the most open EU economy, with the most Eurocentric trade of all EU countries, has had a highly (statistically and economically) significant impact on growth in Slovakia.

Disclosure Statement

No potential conflicts of interest were reported by the authors.

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Table 1: Results of Unit Root Tests

Variables		Level	First Difference	Results
ly		-0.69 (0)	-3.17 (4)**	I(1)
lex		-0.39 (0)	-6.72 (0)***	I(1)
lim		-0.74 (1)	-6.45 (0)***	I(1)
Critical	1%	-3.53	-3.53	
Values	5%	-2.90	-2.91	

Note: Figures in parentheses in the first two columns represent the number of lags chosen with respect to the AIC. Superscripts *** and ** denote the rejection of null hypothesis (that variables are non-stationary) at the 1 percent and 5 percent significance levels, respectively. The critical values for the ADF tests are obtained from MacKinnon (1996). Estimations are carried out using Eviews econometric software.

Table 2: Results of the Toda and Yamamoto Causality Test for Slovakia

Dependent Variables	ly	lex	lim
	MWald Statistics		
ly	-----	1,33 (0,25)	0,43 (0,52)
lex	10.03 (0,002)***	-----	1,77 (0,18)
lim	6.92 (0,01)***	0,38 (0,68)	-----

Note: Modified F-statistics are displayed with the probability values in parentheses. *******
denotes significance at the 1 percent level. Estimations are conducted using Eviews.