The effects of uncertainty dynamics on exports, imports and productivity growth[☆]

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A B S T R A C T

This paper investigates the trade-productivity growth relationship by incorporating uncertainty/volatility in a VECM-GARCH model. Using Singapore as a case study, we find evidence supporting the crucial role of imports as a beneficial conduit for growth in both total factor productivity (TFP) and labour productivity even after controlling for economic uncertainty in the model. Differences in the causality test results for TFP, labour productivity and trade growth between models with and without uncertainty show the importance of incorporating uncertainty in drawing robust inferences about their causal relationships. The findings that volatility in productivity growth impedes import growth while volatility in export and import growth has varied impacts on productivity growth carry important implications for trade and productivity growth policies not considered before.

1. Introduction

Policy makers have long recognized the importance of macroeconomic stability and the impact that it has on an economy. Since the 1980s, this has underpinned growing research interest in economic uncertainty arising from variability in output growth or business cycles and its effects on macroeconomic variables (see Blackburn & Pelloni, 2005; Easterly, Islam, & Stiglitz, 2001; Fountas & Karnasos, 2007, amongst many others).[2] A significant number of these studies have centred on inflation uncertainty and output growth and volatility (notably Blackburn & Pelloni, 2005; Grier, Henry, Olekalns, & Shields, 2004) while another strand of the literature has focused on the sources of volatility (such as financial development and trade integration, terms of trade fluctuations and fiscal policy) and its impact on the dynamic relationship between volatility and growth (Fatas & Mihov, 2003; Kose et al., 2004; Mendoza, 1997; Turnovsky & Chattopadhyay, 2003). It is thus somewhat surprising that the research interest surrounding uncertainty has yet to find its way into the important work on the trade-productivity growth nexus.

The important results from the existing theoretical and empirical literature on uncertainty suggest that policies and exogenous shocks that affect volatility can have an impact on output growth. Incorporating uncertainty into modeling efforts can thus offer a better understanding of the dynamics in the trade-productivity growth relationship. With global integration and the increase in regional groupings in the form of bilateral and multilateral trade agreements, there has been a surge in cross-country trade linkages in the last two decades. Based on the impact this has had on many economies, it is evident that trade openness could lead to greater volatility in trade flows, economic growth and hence, productivity growth. Evidence on the trade-growth nexus from previous analyses is at best mixed and often contradictory is indication that the relationship between trade and productivity growth should not be investigated independently from volatility.

This current study offers a more rigorous empirical assessment of the evidence on the trade-growth nexus and overcomes a number of problems in the existing trade-productivity growth literature. First, most studies on the export or import-led productivity growth hypothesis have not considered or sufficiently checked for robustness with regard to the stability of the estimated parameters underlying the hypotheses. For example, some studies use dummy variables to account for specific events while others have used the cumulative sum and cumulative sum of squares (CUMSQ) based on the estimated residuals to obtain critical bounds at 5% significance level. The problem with using dummy variables lies in the implicit assumption that events which could change responses are known before hand but this is not necessarily true. With the CUMSQ test, not only are the correct critical values difficult to calculate, they are also likely to induce low power (Hendry, 1995). Furthermore, the use of dummies is static as it only accounts for specific events. They do not incorporate the lagged effects of the events or any other form of volatility arising from unknown events within the economy and/or related to the external trade and economic environment. Some studies measure uncertainty or volatility using the standard deviation of the variables concerned but this measure only captures predictable fluctuations and neglects the variability of the unpredictable component of the variable (Grier & Perry, 1998).

To deal with this, the present study considers an alternative but more robust method of detecting uncertainty in a dynamic framework by modeling the conditional variance of the variables concerned using a generalised autoregressive conditional heteroskedastic (GARCH) model. This measure is able to capture the underlying perceptions of the market, particularly when there is greater uncertainty on the part of the market regarding the change in the direction of the variable including market responses per se. The GARCH model also has the advantage of allowing current conditional variance to be correlated with past ones and therefore captures persistence in uncertainty.

The second contribution is that this study goes beyond the consideration of uncertainty in just one variable which is often the case in other areas of research. Specifically, this study looks into the possible impacts of uncertainty in exports, imports and productivity growth on each of the trade-productivity growth relationships. The use of both labour productivity and total factor productivity (TFP) growth also provides a more comprehensive and comparative productivity analysis with trade.

The third contribution is that exports and imports are considered separately, in contrast to the conventional use of the trade openness variable which entails the summation of exports and imports. The separate analysis will shed light on the specific relationship that exports and imports have with productivity (which, in turn, will allow more targeted trade policy arrangements) as opposed to the trade openness measure which may result in the impact of exports or imports being masked by the other. As it turns out, the results are in fact quite different for each of the trade components.

At the outset, it must however be noted that this paper's objective is to provide a first step towards studying uncertainty by incorporating volatility without identifying the channels via which growth in trade and productivity, and their volatility, impact on each other. This is beyond the scope of this paper for two reasons. First, it calls for a different exercise requiring more rigorous investigation based on a fully modified structural model to explore the factors that determine volatility in these variables in order to provide a link between them. Second, models incorporating volatility are data-intensive as adding any one extra factor would require the estimation of an additional large number of parameters using the current model. This would result in a considerable loss in the degrees of freedom which may affect the statistical validity of the model.

This study uses Singapore as a case study since it is a classic case of successful export-led growth through a rapid process of industrialisation and openness. Given the economy's openness and reliance on exports and imports, Singapore is vulnerable to the regional and international climate such as the oil shocks of the 1970s, the 1985 world recession, the 1997/1998 Asian financial crisis, the electronics industry slump in the early 1990s and in 2001, as well as the 2001 September 11 attack. External shocks are likely to have indirect effects on trade through the fall in the demand for Singapore's exports. Singapore is also exposed to import volatility as she is heavily reliant on imports for intermediate inputs and foreign technology, and thus, imported inflation (which not only affects the demand for imports but also affects the cost of production and hence productivity) has always been a major concern.

Several studies (Broda, 2004; Kose, 2002; Mendoza, 1997) have shown that a high degree of openness to foreign trade could induce sharp swings in the terms of trade depending on the nature of the country's exchange rate regime. Singapore's managed exchange rate regime can be expected to allow fluctuations in the terms of trade to be a source of trade volatility. Furthermore, given its smallness, Singapore is a price taker of imports and exports in the world market.

The rest of the paper is organised as follows. The next section provides an overview of the theoretical and empirical literature on uncertainty and the relationship to the trade-growth nexus. Section 3 sets out the data and methodology used. Section 4 discusses the econometric models and empirical results while Section 5 concludes.