

The impact of natural disasters in firm level trade: evidence from typhoons in China

Robert Elliott, Eric Strobl and Meng Tong

Abstract

We use rich firm level data to examine the impacts of typhoon on local economic activity and the process of economic recovery in China coastal regions. To capture the damages from an individual typhoon we use historical typhoon track data in conjunction with a detailed wind-field model. We then combine our damage proxy with the detailed geo-coding information of each individual firm to construct a panel data that allows us to estimate the impact of typhoons accurately. Our results show that typhoons have a negative and significant impact lagged one year time at maximum on TFP (total factor production). Such negative and significant impact has also been found on the output, intermediate inputs, revenue and value-added in the current year and one-year lagged suggesting that typhoon may badly damage the economic performance of individual firm in the year that typhoon happens and year follows. The annual damage value reduction is at ten million RMB level from our sample time period (2000-2006). The typhoon landing also leads to increase on current liabilities together with inventory, wage and employment welfare reduction in two-years time. It suggests that firms maintain their business by borrowing more funds and selling their finished products made before the typhoon landing. The stronger co-efficient value, in general, suggesting that the damage suffering typhoon at wind speed 278km/h is more severe than at wind speed 203km/h. However, the typhoon only have a negative and significant impact on import and export value in the year of occurrence.

Introduction

Benson *et al.* (2004) define a natural disaster as "... *the occurrence of an abnormal or infrequent hazard that affects vulnerable communities or geographical areas, causing substantial damage, disruption, and perhaps casualties and perhaps leaving the affected communities unable to function normally*". Natural disasters have attracted the interest of researchers and policymakers for many years. More recently increasing attention is being paid to the impact of natural disasters on the natural environment, infrastructure, individual firms and the populations in affected areas (Barro, 2009 and De Melo *et al.*, 2011).¹In a recent study that examines the predictions of climate change models it is argued that climate change will lead to more frequent and extreme weather events (Parry *et al.*, 2007). Certainly in the last 30 years the estimated physical damage from natural disasters is estimated to be US \$2.7 billion annually with direct physical damage from natural disasters estimated to be US \$1,527.6 billion between 1975 and 2008 according to UNISDR in 2009 (Neumeyer and Barthel, 2011). More recently, the tsunami that followed the earthquake at Fukushima in Japan in 2011 provides a good indication of the damage that can occur following a natural disaster including the environmental disaster as a result of the nuclear disaster at the Fukushima nuclear plant and the forced relocation of thousands of people.

However, research into the economic impact and consequence of natural disasters remains relatively limited and is primarily restricted to studies that examine disasters at the macro level (see e.g. Loayza *et al.*, 2009; Hochrainer, 2009; Hallegatte and Dumas, 2009; Noy, 2009; Strobl, 2011; Ahlerup, 2013 and Fomby *et al.*, 2013). The empirical results are fairly mixed with some finding positive, some negative and some finding no discernible impact on economic activity from natural disasters. One explanation for this lack of robust findings in empirical studies is how physical damage is measured. In the macro studies 12 out of 14 of the main articles that examine the economic impact of natural disasters use the EM-DAT database. Of the 369 points estimates in those 14

¹ Natural disasters are mainly geophysical which includes earthquakes, tsunamis and volcanic eruptions; biological including epidemics and insect infestations and hydro-meteorological which includes hurricanes and typhoons, floods, tidal waves, droughts, landslides and avalanches.

studies, 35% show a statistically insignificant result at 10% level. Of the statistical significant results, 44% are positive (Felbermayr and Groschl, 2013).

The coastal regions on China production activity and trade has played important role during the recent decades. Over 80% of its manufacturing enterprises located in just 11 of the 31 provinces that are considered to be coastal regions according to statistics of CASIF data (China Annual Survey of Industry Firms). In addition, most of the export-oriented manufacturing firms, especially foreign enterprises are also located within these coastal provinces. Hence, if a natural disaster were to hit a coastal region it is not surprising that the result could be considerable damage to China's economy which in turn, given the prevalence of the global value chain, to knock on effects for the rest of the world. This paper attempt to examine the impacts of typhoon on production activity proxy in the coastal regions in various aspects including productivity, employment salary and welfare, revenues, firms' financial maintenance and trading performance in China at micro-level from 2000 to 2006. We estimate the damage of typhoon disaster by generating indices based on wind-field model.

In general, our conclusions are typhoon disaster has significant negative impacts on production and trade activity in China in the current year and two years after at maximum during the time period. Employment wage and welfare has also decreased during economy recovery period. Typhoon also lead to higher leverage and motivate firms product more efficiently to cover the lost due to typhoon hits. However, the negative impacts on import and export are only found in the typhoon current year and the year follows.