



# Business uncertainty and investment: Evidence from Japanese companies



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## ABSTRACT

This study, using data from a representative quarterly business survey in Japan, constructs measures of business uncertainty, presents empirical findings about the time-series properties of business uncertainty measures, and analyzes the relationship between these measures and investments. The results show, first, that business uncertainty heightened at the time of the collapse of Lehman Brothers, but the effect of an increase in the consumption tax rate on business uncertainty was small. Second, manufacturing and small companies tend to face higher business uncertainty than non-manufacturing and large companies. Third, we detect a negative association between business uncertainty and investments.

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## 1. Introduction

The Japanese economy has experienced various putative uncertainty shocks in recent years, such as the global financial crisis (2008), the Great East Japan Earthquake (2011), and the transfer of political power between the Liberal Democratic Party and the Democratic Party (2009, 2012). In other advanced countries, especially the United States, the mechanisms of the Great Moderation—the period of reduced volatility of business cycle fluctuations from the mid-1980s—were studied extensively until the global financial crisis. However, recently, researchers have diverted their attention to macroeconomic volatility and uncertainty, and accordingly, both theoretical and empirical analyses on policy uncertainty have been advancing rapidly.<sup>1</sup>

Theoretically, because of irreversibility and adjustment costs of investment, economic uncertainty has a negative effect on investment, because firms avoid taking action and prefer to “wait and see” in uncertain circumstances (Bernanke, 1983; McDonald and Siegel, 1986; Pindyck, 1991). This is referred to as the option value of waiting. However, some theories suggest the possibility of uncertainty and investment having a positive relationship (Abel et al., 1996; Lee, 2016).

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<sup>1</sup> Davis and Kahn (2008) survey the literature on the Great Moderation. Studies on the Japanese economy include Kimura and Shiotani (2009) and Ko and Murase (2013). The work most closely related to this study is Campbell (2007), who analyzes volatility and uncertainty during the Great Moderation.

Empirical studies generally support the theoretical prediction that uncertainty has negative effects on equipment investment (Leahy and Whited, 1996; Guiso and Parigi, 1999; Ghosal and Loungani, 2000; Ogawa and Suzuki, 2000; Bloom et al., 2007; Baum et al., 2010; Bontempi et al., 2010; Kang et al., 2014; Kellogg, 2014; Arslan et al., 2015), R&D investment (Bloom, 2007; Caggese, 2012), and hiring of employees (Ono and Sullivan, 2013; Ghosal and Ye, 2015). Bloom (2009), Bachmann et al. (2013), and Leduc and Sill (2013) use time-series data to analyze the effects of uncertainty on GDP, industrial production, and employment, and find large negative effects of uncertainty on these macroeconomic variables.<sup>2</sup> Carruth et al. (2000), Bloom (2014), and Jurado et al. (2015) provide good surveys of the literature.

In past empirical studies, various measures of uncertainty have been developed and employed, specifically, 1) volatility of stock prices (Bloom et al., 2007; Bloom, 2009; Carriere-Swallow and Cespedes, 2013), 2) distribution of stock price forecasts (Ben-David et al., 2013), 3) cross-sectional dispersion/disagreement of forecasts by professional economists (Driver and Moreton, 1991; Dovern et al., 2012), 4) unexplained portion of macroeconomic variables derived from econometric models (Jurado et al., 2015), 5) subjective uncertainty in forecasting (Boero et al., 2008; Clements, 2008), 6) dispersion of companies' forecast errors (Bachmann et al., 2013; Arslan et al., 2015), and 7) frequency of newspaper articles regarding policy uncertainty (Baker et al., forthcoming; Gulen and Ion, 2016).

If the purpose of the analysis is to measure the uncertainty that economic agents (companies or households) face and to investigate the relationships between uncertainty and investment or consumption, the ideal measure is the point forecast and its probability distribution of individual companies or households (Pesaran and Weale, 2006). However, in reality, such data for individual companies or households rarely exist.<sup>3</sup>

Among the alternative proxies of uncertainty, this study, following Bachmann et al. (2013) and Arslan et al. (2015), adopts ex post companies' forecast errors as measures of economic uncertainty. In creating these measures, we utilize company-level information from a nationally representative quarterly business survey in Japan: the Short-Term Economic Survey of Enterprises in Japan ("Tankan survey") conducted by the Bank of Japan (BOJ). This study is the first attempt to employ micro-level information from this survey. After constructing these uncertainty measures in quarterly frequency from 2004 to 2014, we first observe the time-series properties of business uncertainty and differences between industry and by firm size. Then, we empirically analyze the relationship between business uncertainty and investment.

The novelty of this study is, first, while past studies using company survey data (Bachmann et al., 2013; Arslan et al., 2015) focus only on the manufacturing sector due to data constraints, our study covers both manufacturing and non-manufacturing sectors and makes a comparison between sectors. Second, we analyze the differences among large, medium, and small companies.<sup>4</sup> Third, in addition to uncertainty over business conditions, we analyze uncertainties over production capacity and employment conditions.

The major findings of this study are as follows. First, uncertainty over business conditions was greatly heightened amid the collapse of Lehman Brothers and the Great East Japan Earthquake, but there was only a small effect on business uncertainty of an increase in the consumption tax rate in 2014, which was an anticipated event. Second, manufacturing and small companies tend to show higher business uncertainty than non-manufacturing and large companies do. Third, we detect evidence of a negative association between business uncertainty and companies' investments. Fourth, the uncertainty measures constructed from micro data of the business survey have an advantage over the forecast errors calculated from the publicly available aggregated data.

The rest of this paper is structured as follows. Section 2 explains the data used in this study and the method of analysis. Section 3 reports the descriptive findings on the movements of business uncertainty, including differences by industry and company size. Section 4 presents regression results on the relationship between uncertainty and companies' investments. Section 5 concludes with policy implications.

## 2. Data and methodology

This study uses originally compiled quarterly data calculated from the micro data of the Tankan survey. This made-to-order data from the Tankan survey were obtained through the procedures determined by the Statistics Act. The sample period of this study is 42 quarters from 2004Q1 (the March survey) to 2014Q3 (the September survey).

The Tankan survey is a nationally representative business survey in Japan.<sup>5</sup> The purpose of the survey is to provide an accurate picture of business trends in Japan and to contribute to the appropriate implementation of monetary policy. The survey is conducted quarterly in March, June, September, and December and the number of sample companies is about 11,000. The survey covers both manufacturing and non-manufacturing companies. The sample companies are categorized into large companies (capital of 1 billion yen and more), medium-sized companies (capital of 100 million yen to 999.99 million yen),

<sup>2</sup> Choi (2013) replicates the empirical results of Bloom (2009) by splitting the sample period and indicates that the effect of economic policy uncertainty on macroeconomic variables is not confirmed after 1983.

<sup>3</sup> There are surveys for professional forecasters that ask about both point forecast and probability distribution (e.g., SPF in the US and SEF in the UK). However, such surveys for companies or households are rare, with some exceptions, such as Guiso et al. (1992), Guiso and Parigi (1999), Bontempi et al. (2010), Morikawa (2013), and Coibion et al. (2015).

<sup>4</sup> Ghosal and Loungani (2000) is a rare study investigating the different impacts of uncertainty on investment by large and small companies.

<sup>5</sup> The details of the Tankan survey (survey method, coverage, survey items, etc.) are described on the website of the BOJ (<http://www.boj.or.jp/en/statistics/outline/exp/tk/extk03.htm/>).

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