DEPARTMENT OF ECONOMICS AND FINANCE SCHOOL OF BUSINESS AND ECONOMICS UNIVERSITY OF CANTERBURY

CHRISTCHURCH, NEW ZEALAND

A News-Based Approach to Monitoring Trade Policy Uncertainty in a Small Open Economy: The Case of New Zealand

> John Ballingall Enrico Dorigo James Hogan Kirdan Lees

WORKING PAPER

No. 9/2020

Department of Economics and Finance School of Business University of Canterbury Private Bag 4800, Christchurch New Zealand

WORKING PAPER No. 9/2020

A News-Based Approach to Monitoring Trade Policy Uncertainty in a Small Open Economy: The Case of New Zealand

John Ballingall¹ Enrico Dorigo¹ James Hogan¹ Kirdan Lees^{2†}

May 2020

Abstract: Firms' investment in infrastructure or new staff is not easy to reverse. These irreversible costs mean firms prefer to wait and watch rather than investing in uncertain times. But how large are these effects in a small open economy such as New Zealand? We construct a Trade Policy Uncertainty Index from New Zealand media articles to gauge trade policy uncertainty over time. The index matches known historical periods of heightened trade policy uncertainty. Our results show that an increase in trade policy uncertainty decreases investment and slows hiring decisions by New Zealand firms, who prefer to wait rather than invest in uncertain times. We estimate uncertainty due to the early stages of the China-US trade war in 2018 decreased business investment by \$315 million and delayed 2,240 job hires. This points to the value of using the index to monitor trade policy uncertainty for (i) early warning signs of investment and hiring slowdowns; and (ii) calibrating government action to reduce uncertainty on global trade conditions and New Zealand's own trade policy initiatives. These initiatives are likely to be become more important if COVID-19 leads to increased trade protectionism.

Keywords: Trade policy uncertainty, Uncertainty shocks, Textual analysis, Investment

JEL Classifications: E2, E32, E66, F13

<u>Acknowledgments</u>: This work was supported by the Reserve Bank of New Zealand and the Ministry of Foreign Affairs and Trade.

¹ Sense Partners, Wellington, NEW ZEALAND

² Sense Partners, Wellington, NEW ZEALAND and Department of Economics and Finance, University of Canterbury, NEW ZEALAND

[†]Corresponding author: Dr. Kirdan Lees, email: kirdan@sense.partners

1. Introduction

Motivation

At the end of 2019, New Zealand business confidence was sitting at a ten-year low.¹ Firms were concerned about the trade war between the Unites States and China and rising protectionism. In the New Zealand Herald 'Mood of the Boardroom' survey, CEOs rated the trade war between the United States and China as the biggest international issue affecting business confidence.

But trade uncertainty doesn't just matter for individual firms. With exports accounting for nearly 20 percent of GDP, the outlook for trade and trade policy matters for New Zealand's macroeconomic performance.

Measuring the impacts of trade policy uncertainty could help improve understanding of the aggregate economy, especially in the current turbulent trade and political environment. Several economists have pointed to the risk of an increased in global protectionism after the impact of COVID-19 (see Baldwin 2020 for example), a period during we expect monitoring trade policy uncertainty to be particularly useful.

Why uncertainty matters

Uncertainty affects economic activity chiefly by influencing business investment, hiring decisions and household consumption.²

Business investment in plant, machinery, buildings, or new systems is often expensive and not easy to reverse if economic conditions worsen unexpectedly. These irreversible investment costs can be large and generate significant investment hurdles.³

When firms are uncertain about the economic outlook and the expected return on investment, the value of waiting and holding off investing increases. Firms hold an option value of waiting until uncertainty falls. The level of investment reduces, leading to lower trend levels of economic activity as the capital stock declines over time.

¹ See for example NZIER's September Quarterly Survey of Business Opinion that put expectations about the General Business Situation, in the next six months at -35.3 – the lowest value since the Global Financial Crisis.

² For example, Frank Knight 1921 distinguished between risk – where one can place a probability or likelihood of an event occurring to predict variation – from uncertainty, where the characteristics of the event are unknown, unmeasurable and produce unpredictable variation. According to Knight, our measure conflates both risk and uncertainty.
3 See Marshak 1949

³ See Marshak, 1949.

Uncertainty can also affect firms' hiring decisions. Hiring and training new staff carries non-trivial resource costs for firms, which cannot easily be recouped. Again, this generates an option value for holding off on hiring decisions in times of uncertainty.⁴

Uncertainty can also affect household consumption. When uncertainty increases, households tend to put off purchasing large expenditure items in order to build up a wealth buffer against future negative shocks.⁵ Similar to firms, when uncertainty increases, the value of waiting before purchasing increases, reducing consumption of larger expenditure items.

What about trade uncertainty?

Over and above the general effects of uncertainty, effects specific to trade include the prospects of higher trade barriers on goods and services. This additional channel can reduce investment and hiring by firms in the tradable sector.

Additionally, trade policy uncertainty increases uncertainly about the cost of inputs forcing firms to think about substitutability of supply chain inputs.

So trade uncertainty will have a range of firm-level impacts depending on the extent of their exposure to export markets and the complexity of their supply chain.

Unlike investment, household consumption could increase initially as uncertainty rises. At least in principle, consumers' beliefs about future tariff increases along supply chains, could lead them to lock in prices for purchases today rather than risk future price increases.

We know the number of trade agreements signed varies over time, in-line with the eagerness to pursue trade agreements – both with New Zealand and with New Zealand's trading partners – so expect variation in trade policy uncertainty.⁶

2. Measuring trade policy uncertainty

Approaches to measuring uncertainty

Uncertainty is almost by definition unobserved, so we require quantitative proxies to measure the uncertainty experienced by firms. Several measurement approaches have been adopted in the recent literature including:

⁴ See Bloom 2009 for a detailed model of these firm-level effects.

⁵ See Carroll and Samwick 1998 for example.

⁶ Hawke 2004 notes the variation in enthusiasm for trade liberalisation across the 1990s.

- Disagreement measured using firms' forecasts of activity uncertainty can be expressed by the range of disagreement across forecasts or ex-post forecast errors and can be measured (and aggregated) on a firm-by-firm or industry basis.⁷
- Financial markets uncertainty can be measured by stock market volatility, such as the popular VIX derived from call and pull options. Increases in the VIX suggest a wider range of expectation about outcomes in the following month.
- Consumer surveys including for example, household views on whether now is a good time to purchase large consumer items, such as a car or other durable goods.⁸
- Text-based measures of uncertainty that construct quantitative indices from documents that include earnings calls and newspaper reports.

Does uncertainty impact on economic activity?

Most studies proceed by embedding quantitative measures for uncertainty in either Vector-Auto-Regressive (VAR) models of the economy or integrating uncertainty with Dynamic Stochastic General Equilibrium (DSGE) models of the economy. Most papers show material impacts from quantitative uncertainty that can reduce output and employment by about one percent up to four quarters after the initial impact of the uncertainty shock (see Bloom 2009 for example).

Some researchers (see Leduc and Lu 2016) suggest that the impacts of uncertainty are difficult to disentangle from general declines in aggregate demand or economic activity. For a small open economy like New Zealand, the measures may also tend to pick up declines in global activity.

Given uncertainty is inherently unobservable, it is perhaps not surprising that there is debate about what the different metrics show and how to interpret their impacts.

Text-based measures of uncertainty

Recently, improvements in computer search and document storage have allowed the construction of quantitative measures of uncertainty derived from text documents.

Baker, Bloom and Davis, 2016 lead the way, showing how an index constructed from newspaper articles back to 1987 captures key moments of economic uncertainty in US history. They construct their index by tracking the proportion of articles in a selection of 10 key newspapers that contain terms from each of three categories:

• "economic" or "economy";

⁷ See for example Bachmann, Elstner and Sims. 2013 or Rice, Vehbi and Wong 2013.

⁸ See Leduc and Lu 2016.

- "uncertain" or "uncertainty"; and
- "congress", "deficit", "Federal Reserve", "legislation", "regulation" or "White House".

Baker, Bloom and Davis, 2016, find their quantitative uncertainty index "foreshadows" declines in US investment, output and employment. Moreover, the index increases ahead of declines in output of twelve developed economies.

Measuring the impact of trade policy uncertainty

To measure – quantitatively – the recent reported qualitative increase in uncertainty related to US trade policy, researchers at the Federal Reserve Board of Governors adapted the process used by Baker, Bloom and Davis 2016. They search seven major newspapers using an algorithm to score articles a "one" if they contain entries in a set of terms associated with uncertainty and a one of a set of terms associated with trade policy.

This algorithm is applied to the full set of articles from 1960 to 2018. The index is defined by the monthly share of articles discussing trade policy uncertainty as a fraction of the total articles in the sample.

Caldara et al. (2019) also apply their method to transcripts of quarterly earnings conference calls of publicly listed companies and find increases in uncertainty curb firms' investment decisions. At an aggregate level, Caldara et al. (2019) use VAR models to trace impacts and find the Trade Policy Uncertainty index crimps investment by 1-2 percent (depending on the model and length of time elapsed after the initial shock).

3. Our trade policy uncertainty metric

Constructing our trade policy uncertainty index

We adapt the method developed by Caldara et al. (2019). For our application, we use New Zealand media, tracing stories that show evidence of trade policy uncertainty.

We include both direct uncertainty (e.g. changes in trade barriers between New Zealand and our trade partners) and indirect trade policy uncertainty (e.g. changes in trade policy agreements between third parties, such as China and the United States).

For the purpose of constructing the index, we began with the terms suggested by Caldera et al. (2019) and score individual articles a "one" if they contain any element from the following set of terms associated with trade policy:

• foreign competition, protectionism, tariff*, import dut*, import barrier*, trade treat*, trade polic*, trade act*, import fee*, tax* (within 10 words of foreign good*, foreign oil, or import*), import* (within 10 words of surtax* or surcharge*), and trade agreement*.

and, any element from the following set of terms related to uncertainty:

• concern*, fear*, pressure*, confusion, turmoil, challenge*, uncertain*, risk*, dubious, unclear, dispute*, issue*, potential*, probabl*, predict*, and danger*.

In practice we make two tweaks to the Caldera et al. (2019) search criteria.⁹

First, we find non-trivial numbers of articles are associated with domestic tax-related issues and combine the term 'tax' with the word 'important', passing the first criteria listed above. To rule out these articles we clarify the intent of the term "import*" by referring to:

importer, importers, importing, or imported.

Second, the electricity sector in New Zealand has periodically experienced proposals for alternative regulation and reform, including for example, a proposal in 2013 to establish a single state buyer of electricity for New Zealand. Electricity prices are often referred to as 'tariffs'. So when we apply the Caldera et al. (2019) search terms we catch several articles that relate to the domestic electricity sector.

Consequently, we adopt an exclusion term - NOT electricity - that drops these articles. Visual inspection of all the excluded articles and a selection of 250 of the remaining articles suggest this procedure is very effective in isolating media articles that relate to trade policy uncertainty rather than electricity reform.

The scope of our search

Since we normalise the index value by dividing the number of articles with trade policy uncertainty terms by the total number of articles published, and have available to us an electronic search engine, we work with a large number of newspapers and media.

This includes metropolitan and regional newspapers owned by the largest owners of New Zealand's press, including Fairfax, NZME and Stuff. We scan daily newswires that include Radio New Zealand, New Zealand's public-service radio broadcaster. Many of these sources serve a different audience and purpose to the Caldera et al. (2019) sources.¹⁰ We list the full list of newspapers in the Appendix.

In principle, we can present the index at a range of frequencies from daily to annual data. New Zealand's macroeconomic data tends to be quarterly, with no obvious industrial

⁹ We also considered tweaking the search criteria, for example, to better track uncertainty associated with some of New Zealand's key export industries. Such an approach helps capture broad trade uncertainty. But it comes at a cost – diluting the usefulness of the index as an index of trade policy uncertainty. At least for now, we target trade policy uncertainty and keep the same search terms as Caldera et al. 2019 to allow comparison across the two indices.

¹⁰ Caldara et al. 2019 base their index on articles from the Boston Globe, Chicago Tribune, Guardian, Los Angeles Times, New York Times, Wall Street Journal, and Washington Post.

production or investment series at a monthly frequency, and inflation only available on a quarterly basis. However, we choose to produce a monthly index to improve timeliness and then aggregate the monthly index for empirical work on a quarterly basis. Our search engine includes articles from the mid-1980s, but the volume of articles is sparse.¹¹ We instead choose a start date of 1995 when the volume of articles becomes much larger .

Introducing the Trade Policy Uncertainty index

Error! Reference source not found. shows the Trade Policy Uncertainty index alongside the index average and shaded bands that represent periods of recession. The index captures at least 3 elements of trade policy uncertainty: indirect impacts from third party tensions, multilateral trade negotiations and bilateral trade negotiations. An index value of 1 represents 1 percent of the stories meet our trade policy uncertainty criteria.

Figure 1: The Trade Policy Uncertainty Index



¹¹ This means we miss, for example, trade policy uncertainty related to the mid-1980s reform period such as the unilateral reduction of tariffs and subsidies or Closer Economic Relations negotiations. But given the multitude of economy-wide reform initiatives of this period, attributing changes in economic activity to trade policy uncertainty alone would have been challenging.

Recent observations are high, reflecting the US-China trade war. These values are significantly lower than the spikes identified in Caldara et al. (2019) for US media, because the impacts of the trade war would be felt directly on US exports and imports (rather than indirectly, as in New Zealand).

The index also picks up significantly high readings associated with the United States withdrawing from the Trans-Pacific Partnership negotiations at the beginning of January 2017 so multi-lateral negotiations are picked up by the index.

But bilateral negotiations also matter. The index peaks in April 2008 when New Zealand signed the historic Free Trade Agreement with China.12 Subsequent to this trade agreement, there is a long period from 2008-2016, where the trade policy uncertainty index is below average. New Zealand didn't conclude any major Free Trade Agreements in this period.

4. Impacts of our trade policy index

Our method

The question now becomes: does increased trade policy uncertainty flow through to the real economy (investment, output, employment etc.)? Vector Autoregressive (VAR) models are well suited to the task.¹³

First, we set up a series of bi-variate VAR models that include the Trade Policy Uncertainty index and a variety of investment, consumption and aggregate activity series, in particular:

- Gross Fixed Capital Formation
 Consumption
- Private Gross Fixed Capital Formation
- Business Investment (that accounts for deprecation)

- Consumption of durables
- Gross Domestic Product
- Gross Domestic Product per capita
- GFCF in Plant Machinery and Transport Equipment
- Hiring

We order the Trade Policy Index first within a Cholesky decomposition to identify structural shocks that we can attribute to trade policy uncertainty.

¹² The Free Trade Agreement with China was positive for the New Zealand economy. We note that output declines for the impacts of the GFC prior to this period. So from an econometric perspective, our results do not simply ascribe the fall in output associated with the GFC to the signing of a Free Trade Agreement with China.

¹³ Caldera et al. (2019) provide a Dynamic Stochastic General Equilibrium model of uncertainty.

Second, we want to isolate the impact of the Trade Policy Uncertainty index from any monetary policy response and any adjustment in the exchange rate. So we set up a VAR that includes aggregate economic activity (as measured by Gross Domestic Product), the 90 day interest rate to isolate relevant policy responses, and the nominal trade-weighted exchange rate to account for impacts on output that might accrue from adjustment in the exchange rate.

Again, we set up the Trade Policy Uncertainty index as the first variable in a Cholesky decomposition followed by output, and then the interest rate and the exchange rate, allowing financial variables to respond to economic activity.

Third, we want to know if shocks to the Trade Policy Uncertainty index are in fact conflated with movement in generalized world uncertainty and global economic activity. So we establish a final VAR model that includes the World Uncertainty Index,14 a global economic growth index that traces economic activity within the OECD, New Zealand's economic activity and allows for exchange rate adjustments.

Across all the VAR specifications, we allow for constants and trends within each series and use the Akaike Information Criteria to select the appropriate lag length from a maximum of six quarterly lags.

We begin the series of bilateral VARs from the first quarter of 1995, sourcing data from the Reserve Bank of New Zealand and Statistics New Zealand. Since the World Uncertainty index begins in January 1996, we start the final VAR in the first quarter of 1996.

Results

We first define a shock to trade policy uncertainty that then impacts on each measure of economic activity.

Initially, each shock is approximately equivalent to an increase in the proportion of trade policy uncertainty articles of 0.1 percent. This is approximately one-fifth of the increase in trade policy uncertainty associated with the US withdrawal from the Trans-Pacific Partnership negotiations in the peak month of July 2018. The shock decreases in magnitude over subsequent quarters and is essentially zero 18 months after the initial shock.

Investment

Figure 1 shows the impact of the shock on the level of total investment (measured by real Gross Fixed Capital Formation from Statistics New Zealand). Investment declines by one

¹⁴ The World Uncertainty Index is developed by Ahiri, Bloom and Furceri (2018) and traces general uncertainty in the global economy.

percent immediately after the shock, increasing a little before returning towards a one percent decline twelve quarters after the shock.¹⁵

The figure also shows 10 and 90 percent confidence bands for the impact of the shock. Although the upper band is below zero initially, after four quarters, the confidence interval is relatively wide, so the impact on investment could be much stronger or much weaker than our central estimate suggests

Figure 1: Trade policy uncertainty reduces investment Bilateral VAR, Trade Policy Uncertainty Index and Change in GFKF, % Impact



Total investment contains both government investment and private investment. Trade policy uncertainty might be expected to have larger impacts on private investment due to the option value of waiting before investing for firms. Error! Not a valid bookmark self-reference. shows a similar sized impact for private investment as for total investment.¹⁶ Private investment declines slowly before settling at a level one percent lower than prior to the shock. The confidence intervals span a wide range, but are all below zero, indicating a fall in investment is highly likely.

¹⁵ Caldara et al. (2019) report decreases in private investment of between 1.5 and 2 percent from a two standard deviation shock to investment - very similar in magnitude to the effects in Figure 3 given we present a one standard deviation shock. ¹⁶ Private investment is about 75 percent of total investment.

Figure 2: Private investment declines by about 1 percent after the shock

Bilateral VAR, Trade Policy Uncertainty Index and Change in Private GFKF, % Impact



To better understand sectoral differences, we present investment impact estimates on plant machinery and transport equipment in Figure 3 and construction sector investment in Figure 4. The impact on plant, machinery and transport equipment investment is stronger than on construction sector investment.

Figure 3: Weaker investment in plant, machinery and transport equipment Bilateral VAR, TPU Index and Change in GFCF, Plant, Machinery and Transport Equipment



Figure 4: Impacts on the construction sector are less pronounced

Bilateral VAR, TPU Index and GFCF in Residential and non-residential construction



Consumption

Caldara et al.'s (2019) DSGE model features a pronounced fall in consumption when trade policy uncertainty rises.

Figure 5 and Figure 6 show no material impact from this transmission channel in a New Zealand context. Neither consumption nor durables consumption are affected, rising less than 0.1 percent with wide confidence intervals.

Figure 5: Consumption is largely unaffected by trade policy uncertainty Bilateral VAR, Trade Policy Uncertainty Index and Consumption



Figure 6: Consumption is largely unaffected by trade policy uncertainty

Bilateral VAR, Trade Policy Uncertainty Index and Durables Consumption



Aggregate activity

Consumption is a large fraction ($\sim 60\%$) of economic activity, it is not surprising to find trade policy uncertainty has little immediate impact on either GDP or GDP per capita. We show these small impacts in Figure 7 and

Figure 8. Note the scale differs from previous charts.

Figure 7: Aggregate activity is largely unaffected by the shock Bilateral VAR, Trade Policy Uncertainty Index and Gross Domestic Product



Figure 8: In the short run GDP per capita is not impacted by the shock

Bilateral VAR, Trade Policy Uncertainty Index and Gross Domestic Product per capita



Hiring Impacts

Uncertainty increases the option value of waiting rather than hiring staff. So we expect to see the impacts of uncertainty most clearly in hiring data rather than aggregate employment data that can be impacted by job separations.

We use Statistics New Zealand's Linked Employer-Employee Dataset that tracks a range of employment outcomes at the firm-level and allows us to separate the impacts on private sector firms from public sector organisations. Since the data is sourced from the tax system, the data is only available with a lag. We use data from June 1999 to December 2018 to estimate bivariate VAR models that relate trade policy uncertainty to private and public hiring.

Figure 9 shows that private sector hiring falls by 0.62 percent after the shock, before returning towards its previous level.



Figure 9: Private sector hiring falls after the shock

Impacts for public sector hiring in Figure 10 are more modest – as we would expect since most government agencies' budgets are not directly affected by global uncertainty – with impacts peaking at about 0.5 percent and returning to the previous hiring rate after about 8 quarters.

Figure 10: Impacts for public sector hiring are more modest



5. Robustness checks

Robustness check: beyond bivariate VARs

To test the robustness of our result that investment falls in response to a trade policy uncertainty shock we set-up two alternative VAR models.

The first includes open economy variables – the exchange rate, the level of consumer price inflation and the ninety-day interest rate, allowing for monetary policy and the exchange rate to adjust in response to the shock given New Zealand is small open economy.

We find small adjustments (about 1 percent of the ninety-day interest rate and about 0.2 percent in the trade-weighted index) and a decline in private investment that peaks at 0.65 percent three quarters after the initial shock.

Figure 11: Investment declines in our open economy setting

VAR: TPU Index, Private Investment, CPI, 90-day interest rate, Trade-weighted exchange rate



Finally, to check if our index simply proxies global uncertainty, we test estimate a VAR model that include the World Uncertainty Index (see Ahir et al. 2018). Including the index moderates effects a little with private investment decline peaking at -0.75% after the shock (see Figure 12).

Figure 12: Accounting for global uncertainty moderates impacts a little

VAR: World Uncertainty Index, TPU Index, Private Investment



6. Summary and directions for future research

We show that New Zealand media can be used to construct a plausible Trade Policy Uncertainty index based on criteria similar to existing literature. The peaks in the trade policy uncertainty index square with known key events in New Zealand's recent trade history. The index registers impact from the China-US trade war in 2019, but these indirect effects are smaller in magnitude than a similar index constructed for the case of the United States (see Caldara et al. 2019).

We find material impacts of trade policy uncertainty on the investment decisions of New Zealand firms. The level of private investment falls by about one percent across a range of alternative specifications of models, in response to a one standard deviation shock to trade policy uncertainty. This squares with material real option costs of investment that incentivise firms to wait rather than make costly investment decisions when trade policy uncertainty is high.

Using data that can isolate the hiring decisions of firms, we also find trade policy uncertainty has modest negative impacts on hiring decisions. Our shock to trade policy uncertainty decreases private sector hiring by about 0.62 percent and public sector hiring by 0.5 percent. Based on our modelling strategy, we conjecture trade policy uncertainty can motivate firms to hold off hiring decisions that can be expensive to reverse.

We believe there are several potential avenues that could help improve understanding of the impact of trade policy uncertainty.

First, the impact of trade policy uncertainty operates at the firm level. Our results connect aggregate investment and labour data to our trade policy uncertainty index. Linked firm-

level unit records are available for all economically significant New Zealand firms, from a large number of administrative sources (see Fabling and Sanderson 2016), and could be used to test impacts that could differ across firms of varying sizes and sectors.

Second, our trade policy uncertainty index is constructed prior to observing investment or aggregate activity data. But machine learning and other artificial intelligence techniques could be used to calibrate selection of articles into the index to match changes in investment growth.

Third, we note there is no news-based uncertainty index that captures general economic policy for New Zealand. Such an index could be used to compare the impacts of tradepolicy uncertainty to domestic policy uncertainty and highlight if the origin of uncertainty matters for firms in a small open economy such as New Zealand.

References

Ahir, H, N Bloom, and D Furceri 2018, "World Uncertainty Index", Stanford, mimeo.

Baldwin, Richard 2020, "The Greater Trade Collapse of 2020: Learnings from the 2008-09 Great Trade Collapse" 7 April 2020, https://voxeu.org/article/greater-trade-collapse-2020

Baker, Scott R. Nicholas Bloom and Steven J. Davis, 2016. "Measuring Economic Policy Uncertainty," *The Quarterly Journal of Economics*, Oxford University Press, vol. 131(4), pages 1593-1636.

Bernanke, Ben S. 1983. "Irreversibility, Uncertainty, and Cyclical Investment." Quarterly Journal of Economics 98(1): 85–106.

Bloom, Nicholas, 2009, "The Impact of Uncertainty Shocks", *Econometrica*, vol. 77(3), pages 623-685.

Bachmann, Rüdiger, Steffen Elstner, and Eric R. Sims. 2013. "Uncertainty and Economic Activity: Evidence from Business Survey Data" *American Economic Journal: Macroeconomics*, 5 (2): 217-49.

Caldara, D, M Iacoviello, P Molligo, A Prestipino and A Raffo, 2019, "The economic effects of trade policy uncertainty. *Journal of Monetary Economics*, available online, 8 November 2019

Carroll, Christopher D and Andrew A Samwick, 1998. "How Important Is Precautionary Saving?", *The Review of Economics and Statistics*, MIT Press, vol. 80(3), pages 410-419.

Dixit, A. and R. Pindyck, 1994, "Investment Under Uncertainty', Princeton University Press, Princeton.

Eberly, Janice. 1994, "Adjustment of Consumers' Durables Stocks: Evidence from Automobile Purchases." *Journal of Political Economy*, 102(3): 403–36

Fabling, Richard and Lynda Sanderson, 2016, "A Rough Guide to New Zealand's Longitudinal Business Database (2nd edition)," Working Papers 16_03, Motu Economic and Public Policy Research.

Guthrie, Graeme, 2009. "Real Options in Theory and Practice," OUP Catalogue, Oxford University Press.

Hawke, Gary (2004), "New Zealand: Developing and Sustaining Economic Liberalisation", in The Asia-Pacific: A region in transition, Published 2004 by the Asia-Pacific Center for Security Studies, Honolulu, United States

Leduc, Sylvain and Zheng Liu, 2016, "Uncertainty shocks are aggregate demand shocks", *Journal of Monetary Economics*, vol. 82, issue C, pages 20–35

Marschak, J. 1949. "The Role of Liquidity Under Complete and Incomplete Information", *American Economic Review* Vol. 39, No. 3, 182-195.

Rice, A., Vehbi, T., & Wong, B. 2018. Measuring uncertainty and its impact on the New Zealand economy (No. AN2018/01). Reserve Bank of New Zealand.

Zarnowitz, Victor and Louis A. Lambros, 1987, "Consensus and Uncertainty in Economic Prediction," *Journal of Political Economy*, vol 95(3), pages 591-621.

Appendix: News Sources

Fairfax Newspapers

- The Dominion
- The Dominion Post
- The Evening Post
- Manawatu Standard
- Marlborough Express
- Motor Times
- Nelson Mail
- The Press
- Sunday Star Times
- Sunday News
- The Southland Times
- Taupo Times
- The Taranaki Daily News
- The Timaru Herald
- Truth
- Waikato Times
- Whangarei Leader

STUFF Newspapers

- Auckland City Harbour News
- Auckland Now
- Central Leader
- Dargaville News
- East and Bays Courier
- Eastern Courier
- Feilding Herald
- Franklin County News
- Hamilton Press
- Hauraki Herald
- Horowhenua Mail
- Kaikoura Star
- Manawatu Standard
- Manukau Courier
- Matamata Chronicle
- North Harbour News
- North Shore Times
- North Waikato News
- North Waikato Tatler
- Northern News
- Norwest Brief
- Otago Daily Times
- Otago Southland Farmer
- Papakura Courier
- Piako Post
- Timeout
- Travel
- Waihi Leader
- Waikato News
- Waipa Post
- Wanganui Chronicle
- Wednesday Herald Homes
- Weekender
- Weekender Rotorua

- Rodney Times
- Rotorua Review
- Ruapehu Press
- South Waikato News
- The Bay Chronicle
- The Marlborough Express
- Western Leader

NZME Newspapers

- Bay News
- Bay of Plenty Times
- BOP Indulge
- Bush Telegraph
- The Business
- CHB Mail
- Coastal News
- The Daily Post
- Dannevirke News
- DriveBy
- Drive Time
- The Guardian Manawatu
- Hamilton News
- Hastings Leader
- Havlock North Village Press
- Hawkes Bay Today
- Herald Homes
- Herald on Sunday
- Horowhenua Chronicle
- Indulge HBT
- Kapiti News
- Katikati Advertiser
- Midweek Chronicle Wanganui
- Napier Courier
- New Zealand Herald
- The Northern Advocate
- The Northland Age Compact
- NZ Herald Features
- NZS C Edition
- Rangitikei Mail
- Rural Roundup
- Saturday Driven
- Stratford Press
- Sunday Homes
- Taupo Weekender
- Te Awamutu Courier
- Te Puke Times

Newztext - Daily newswires

Scoop

•

•

•

•

•

• The Whangarei Report

1XX Radio news

Rural News

BusinessDesk

Radio New Zealand Newswire