Exporting Uncertainty: The Impact of Brexit on Corporate America

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Cornell University & NBER
What does Brexit Mean?

BREXIT MEANS...

- Norway model
- Hard Brexit
- Free movement
- Article 50
- Soft Brexit
- Single market access
- Passporting rights
Big Picture

- Brexit was a shock to the “Global Economy”
  - Rare: Advanced economies do not often witness sharp swings
  - Unexpected: Polls pointed to “Remain” vote safely winning
  - Global reach: Involves a relevant share of the world economy
    [UK + EU > 20% World GDP]

- Uncertainty-filled events like Brexit are becoming frequent in a world gone wary of the workings of the global financial markets, international trade, and immigration

- These are new phenomena of much interest, yet with poorly understood consequences
Big Picture

- Brexit is about \textit{uncertainty} affecting many markets all at once:
  - \textit{Labor market uncertainty}: EU citizens working in UK; vice-versa
  - \textit{Capital market uncertainty}: Financial regulation, banks moving
  - \textit{Trade uncertainty}: Negotiations can be pro-integration (\textit{soft Brexit}) or pro-isolation (\textit{hard Brexit})

- There were no clear, binding mandate for Brexit at inception, impossible to put “bounds” around potential outcomes

- Notably, there were (\textit{both}) pros and cons…\textit{not just “bad news”}
Turbulence and Uncertainty for the Market After ‘Brexit’

By PETER S. GOODMAN  JUNE 23, 2016

In Depth

LONDON — No one really knows what happens now. The collective imagination leads to dark places.

The world map has been redrawn with the rules of commerce across Europe, the largest marketplace on earth. Britain’s vote on Thursday to leave the European Union has set in motion an unprecedented and unpredictable process that threatens turbulence and potential crisis — for Britain, for Europe and for the global economy.

Of most immediate consequence, Britain’s vote to leave Europe sent global markets on a wild descent. Investors gaped at this major refashioning of the global landscape and decided it looked perilous — or at least so pockmarked with uncertainty that they preferred to pull their money out of riskier corners like stock markets.
Reactions in the U.S.

How Brexit impacts the U.S. economy

by Patrick Gillespie  @CNNMoney
June 24, 2016: 12:18 PM ET

The United Kingdom shocked the world when its citizens voted to leave the European Union Thursday.

The so-called Brexit has wide implications for the U.S. economy, which is already facing a slew of headwinds.

The chief of the U.S. central bank and top monetary policy setting official, Janet Yellen, forewarned earlier this week that Brexit "would negatively affect financial conditions and the U.S. economy."

Trade between the two nations only makes up 0.5% of U.S. economic activity. However, the connections go well beyond direct trade between the two global powers.

The effect on America can come through a number of chain reactions -- a Brexit domino effect on the global economy. Here are four ways the wake of Brexit could hurt the U.S. economy.
US–UK trade relations became “uncertain”

UK-US trade could be derailed by 19 lost deals after Brexit, say MPs

Closer trade links between the UK and the US after Brexit could be derailed by the loss of a series of complex US-EU commercial agreements covering aviation, food and duties on whisky among other things, a campaign group has said.

Open Britain, a collection of MPs and other campaigners battling against a hard Brexit, said it had identified 19 bilateral and multilateral agreements connected to commercial matters which could be in jeopardy.

The promise of reinvigorated trade with the US has been high on the list of priorities for Brexit’s leading lights, with Theresa May making a swift visit to see Donald Trump following his election last year.
How big was Brexit for global uncertainty?

• Measuring political global uncertainty
  – Baker et al. (2016) created 16 national indices of *Economic Policy Uncertainty* (EPU) covering 2/3 of global output
  – News-based index counts number of articles with words related to “Economic Policy Uncertainty”

  *FT & The Times:* (E) economic OR economy +
  (P) spending OR policy OR deficit OR budget OR tax OR regulation OR Bank of England +
  (U) uncertain OR uncertainty

  – Davis (2016) aggregated national indices into a GDP-Weighted Index of *Global* Economic Policy Uncertainty
    • Each national EPU Index is normalized to a mean of 100 before calculating the Global EPU Index
How big was Brexit for global uncertainty?

Global Economic Policy Uncertainty Index

Brexit

Asian & Russian Financial Crises

9/11, Iraq Invasion

Global Financial Crisis

Eurozone Crises, US Fiscal Battles

Immigration Crisis, China Economy Fears
How big was Brexit for UK uncertainty?

- Pre-Brexit average (1997–2015) of UK EPU Index was 133 vs. 542 Post-Brexit (2016)…
- 3.4-standard deviation shock to the history of the series
How to gauge the *global impact* of Brexit?

- EU–UK ties “caused” (are endogenous to) Brexit itself; we need a “degree of separation”
- For its strong ties with the UK, the US is an interesting case for assessing cross-border spillovers of Brexit
  - *Trade*: UK is the 5th top export and 7th top import partner of US
  - *Finance*: US banks hold 4% of US GDP in claims w/ UK banks; UK banks hold 37% of UK GDP in claims w/ US banks
- Corporate America saw Brexit as a concern:
  - Survey of 500 US CFOs on Sept. 2016: 6/10 of medium and large firms indicated that Brexit was a “significant concern”
- Sensible to look at the largest player in the Global Economy
Intuition about the impact of “uncertainty”

- A firm facing uncertainty becomes more cautious in making decisions about $K$ and $L$... such activities suffer cuts and delays.
What we contribute

• We are the first to provide a firm-level analysis of the international transmission of an unprecedented, global political uncertainty shock

• What we do:
  – We look at how Brexit is transmitted over to the US economy
    • We identify American firms exposed to uncertainty in the UK economy and track their behaviors before and after Brexit

• What we find:
  – UK-exposed American firms observed no decline in expected profits vs. similar control firms following the Brexit vote; yet…
  – They hired less workers and invested less in fixed capital (also divested less), while increasing R&D expenditures
  – Job losses and investment cuts took place in the US (low skill L)
  – Each channel (K, L) is amplified by degree of input irreversibility
  – Firms also saved more cash and cut NWK
Macroeconomic Evidence
Macroeconomic evidence: VAR

- We estimate a $B$VAR model of the US and UK economies
  - **Forcing variable:** UK EPU Index
  - We’re interested in the responses of **US real variables**
- Variables:
  1. Policy Uncertainty Index
  2. USD/GBP FX Rate
  3. Stock Market Index
  4. Short-Term Interest Rate
  5. Gross-Fixed Investment
  6. Unemployment Rate
  7. Real GDP
- Each variable enters system twice (once for US, once for UK)
Brexit-size shock to UK uncertainty: US GDP

- I.R.F.s: How US GDP would respond to a Brexit-size UK EPU shock (3.4 std. dev.), *in the absence of any other reactions (e.g., monetary/fiscal policy changes)*
- Let’s start with the impact of UK uncertainty on UK GDP
- Impact on US GDP: Weaker (*as expected*), but potentially harmful
Brexit-size shock to UK: US investment

- Negative effect of UK EPU on **US investment**
  - A decline of about 2% in aggregate investment 6-10 quarters after the shock hits, dying off after 10 quarters
  - I.e.: US investment rate would drop from 17% to 15% of GDP
  - Less sharp than effect on UK investment, yet likely significant

![Graph showing impact of UK EPU on US Investment](image1)

![Graph showing impact of UK EPU on UK Investment](image2)
Firm-Level Evidence
Testable empirical hypotheses

- Our model implies that uncertainty reduces firms’ regular investments and that this effect is moderated by the exposure to the uncertainty factor:

  **Hypothesis 1.** American firms with a high exposure to UK uncertainty cut investment in capital and labor in response to Brexit. Firms with low exposure to UK uncertainty have a less pronounced response to Brexit

- It also implies that an increase in uncertainty increases firms’ investment in R&D according to their exposure:

  **Hypothesis 2.** American firms with a high exposure to UK uncertainty increase their investment in R&D in response to Brexit. Firms with low exposure to UK uncertainty have a less pronounced response to Brexit
Testable empirical hypotheses

• The model also implies that an increase in uncertainty reduces firms’ disinvestment:

  **Hypothesis 3.** American firms with a high exposure to UK uncertainty reduce their disinvestment in capital in response to Brexit

• Adjustment costs of K and L influence the relation between uncertainty and capital and labor investment:

  **Hypothesis 4.** American firms with a high exposure to UK uncertainty facing a lower degree of asset redeployability reduce their investment in capital more pronouncedly in response to Brexit

  **Hypothesis 5.** American firms with a high exposure to UK uncertainty facing a higher degree of labor adjustment costs reduce their hiring more pronouncedly in response to Brexit
Empirical counterparts

- Firms are differentially affected by demand uncertainty, $\beta_i$
- An empirical counterpart of demand sensitivity parameter $\beta_i$ is obtained by taking variances on the definition of $v_{it}$:
  \[ \text{Var}(v_{it}) = \beta_i^2 \cdot \text{Var}(V_t) + \sigma^2_{\epsilon} \]
- Taking square roots of both sides (to get at “risk–volatility”):
  \[ \text{Vol}(v_{it}) = \beta_i \cdot \text{Vol}(V_t) + \sigma_{\epsilon} \]
- We use a market-based, regression approach to ID “$\beta_i^{UK}$”, it captures the exposure of US firm $i$’s return to UK uncertainty:
  \[ \text{Vol}(r_{it}) = \beta_i^{UK} \cdot \text{Vol}(\text{FTSE100}_t) + \text{Controls}_t + \epsilon_{it} \]
  - $\text{Controls}_t$ include $\text{Vol}(\text{S&P500}_t)$ and $\text{Vol}(\text{FX}_t^{\$\text{\£}})$
- $\beta_i^{UK}$ is estimated over 2010:M1–2014:M12, before Brexit
As an alternative, we develop a text-based measure constructed by parsing firms’ 10-K filings for fiscal 2015

- We look for the number of entries of keywords related to Brexit (“Uncertainty” and “Great Britain”, and “Brexit”)
- We classify firms with a high (> 5) number of entries as treated (High UK-Exposure) firms, and those with zero entries as control (Low UK-Exposure) firms

Text-based measure correlates highly with market-based $\beta_i^{UK}$
We center our test time window in 2016:Q1–Q2

We compare:

- The two quarters after event: 2016:Q3–Q4
- With the same quarters in the prior year (avoids seasonal effects): 2015:Q3–Q4
DID estimation

• We estimate the following DID model:

\[ Y_{it} = \alpha + \delta \cdot [Post_t \times High \, UK \, - \, Exposure_i] \]

\[ + \theta Controls_{it} + \sum_i Firm_i + \sum_j \sum_t [Industry_j \times Quarter_t] + \epsilon_{it} \]

• We’re interested in the real effects of Brexit. \( Y \) is:
  – Investment: Fixed capital and R&D expenditures
  – Disinvestment: Sales of property, plant and equipment (quarterly, scaled by assets)
  – Labor: Employment growth (only annual)

• But we also look at related outcomes:
  – Cash savings
  – Non-cash working capital
  – Profits
• DID for $K$ and $L$ of US firms show that the impact of Brexit is higher for more UK-exposed firms

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<td></td>
<td>(1)</td>
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<tr>
<td><strong>Post</strong></td>
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<td>-1.909</td>
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<td>R-squared</td>
<td>0.64</td>
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<td>0.70</td>
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## Results: R&D and disinvestment

- DIDds for R&D of US firms show that Brexit increased R&D expenditures for more UK-exposed firms (growth options)
- DIDds confirm that UK-exposed firms also *disinvest* less

<table>
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<tr>
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<th>Linear Model</th>
<th>Treatment is Top Tercile of $\beta_{i}^{UK}$</th>
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<td>0.007</td>
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<td>-0.041**</td>
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<td><strong>Post $\times High 10-K Entries</strong></td>
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### Controls
- Firm: Yes, Yes, Yes, Yes
- Macroeconomic: Yes, No, No, Yes

### Fixed Effects
- Firm: Yes, Yes, Yes, Yes
- Industry×Time: No, Yes, Yes, Yes

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<td>11,781</td>
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<td>45,930</td>
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<td>18,740</td>
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<td>26,289</td>
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According to our model, capital irreversibility modulates the effect of uncertainty on firm investment decisions. We use the measure of Kim & Kung (2017), which gauges how easy it is for a firm to sell its assets.
According to our model, labor adjustment costs modulate the effect of uncertainty on firm employment decisions.

We use industry unionization rate to proxy for labor frictions:

- Firms with unionized labor face greater difficulties adjusting workforce to macro conditions.

### Amplification: Labor adjustment costs

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<th>Labor Unionization</th>
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<td>Post × High $\beta_{iU}^K$</td>
<td>−4.542***</td>
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<td>(1.099)</td>
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- Controls:
  - Firm: Yes
  - Fixed Effects:
    - Firm: No
    - Industry: Yes
    - Time: Yes
    - Industry × Time: No

- Observations: 1,512
- R-squared: 0.20
We measure labor skills using the LSI index which ranks occupations on a 1–5 scale based on education, experience, and training required [Ghaly et al. (2017)]

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<tr>
<td></td>
<td>(1)</td>
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<td>(3)</td>
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<tr>
<td>(Post \times High \beta^U_{it})</td>
<td>−5.861***</td>
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<td>(0.370)</td>
<td>(1.689)</td>
<td>(1.533)</td>
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<td>(Post \times High \beta^U_{it})\times Low Labor Skills</td>
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<td>R-squared</td>
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Robustness and falsification checks

- Are results driven by exposures to other economies?
- Calculate analogous measures to $\beta_{i}^{UK}$ w.r.t. EU, China, Japan, India, and Canada
- Results are robust (but weaker) for EU-exposed firms
- Results are not driven by events in other relevant countries

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<td>0.68</td>
<td>0.67</td>
<td>0.73</td>
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Concluding Remarks
Concluding remarks

- *Brexit* spilled uncertainty across UK international borders, with significant effects crossing over onto *Corporate America*
- A warning about extreme political swings — even for historically stable economies like the UK
- Such “swings” seem ever more likely in the Global Economy
- Politicians should be careful not only with their policies destabilizing their own country’s economy, but also potentially others via the uncertainty they create