Elusive Safety:
The New Geography of Capital Flows and Risk

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Disclaimer. The views expressed in this presentation are those of the authors and do not necessarily reflect the position of the Federal Reserve Board or the Federal Reserve System.
Increasing Claims and Liabilities vis-a-vis THFC

U.S. Portfolios Claims and Liabilities to the Cayman Islands (2007-2018)

- U.S. Claims and Liabilities to Cayman Islands, main **Tax Haven and Financial Center (THFC)** for the United States grew very strongly after the GFC
Large increase in U.S. corporate bond holdings across all THFC (increased 7.4-fold from 2002 to 2019).

In 2019: THFC held 62% of all U.S. debt liabilities; < 2% of World Population; about 6% of World GDP.
The Research Question

**Micro Origins of Flows: New Geography of Risk**

- A vast and growing literature has proposed several macro explanations of the last decades U.S. imbalances
- Micro origins remained unexplored due to lack of data
- Tax havens-financial centers gravitation suggests to search micro incentives (tax avoidance, regulatory arbitrage, low interest rates-search for yield)
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**The Tool to Answer the Question: Confidential TIC data**

- Granular at issuer and investor level: can be matched with other micro variables
- Extensive time series: examine trends and key events
- Claims and Liabilities: (residents foreign investors are obliged to fill TIC survey)
- Official ”incentivized” reporting
How we Tackle the Question

- **Step 1: Stylized Facts**
  - Country flows in and out for asset and investors type (macro facts)
  - Sectorial flows: match with risk/uncertainty (GZS) metrics, Sharpe ratio, intangibility indices

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  - Includes corporate tax
  - Sub-sample: pre and post major financial regulation events
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- **Step 3: Model–Key ingredients**
  - Melitz’ style selection, heterogeneity on the firms’ default risk
  - Endogenous risk-taking a la Martinez-Miera and Repullo and endogenous entry in THFC
  - Debt contractual agreements: global liquidity through THFC affects firms’ risk
Main Findings

**Macro Facts**
- Privately held flows (in and out) increasingly intermediated through THFC and unregulated mutual funds increased after 2010
- Safe assets (U.S. Treasuries) held by foreign officials. U.S. official sector: nil safe assets.

**Gravity: PPML**
- Corporate taxes raise liabilities from THFC
- More so in post-regulation/low interest rates period

**Micro Facts: privately held flows**
- Flows channelled in THFC: riskier, higher Sharpe ratios, of intangible firms

**The Model: main mechanism**
- Given tax advantage, raise in global liquidity makes debt in THFC cheaper
- More firms enter: marginal firm entering is riskier (extensive margin of risk)
- Firms’ profits raise, firms appear elusively safe and monitoring declines (intensive margin of risk)
Related Literature

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- **U.S. Global Imbalances: THFC, Capital Flows, Risky Assets**
  - **Changing Landscape Capital Flows**: Lane/Milesi Ferretti (2008, 2018), Obstfeld (2018), Cucuru et al. (2008);
    - TIC Data (Bertaut et al. (2019), Liu et al. (2019): increasing share of US firms incorporated in THFC, intermediated through mutual funds, hedge funds; growth CLOS (risk taking); Propierity data (Morningstar): Maggiori et al. 2020, Coppola et al. (2019).
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  - **Safe Assets and Dollar Dominance** Caballero et al. (2008), Mendoza et al. (2009), Gourinchas and Rey (2011), Burger et al. (2017).
TIC Data

- Unique confidential dataset individual cross-border security holdings from custodians, end-investors, and issuers: granular information on U.S. Liabilities and Claims
  - Breakdown across countries
  - By security (debt, equities, ABS, etc.)
  - Type of investors (official versus private) and issuers
  - Ultimate destination of claims (equity of MNCS or mutual funds).
- Most accurate measurement of U.S. cross-border asset positions: Required by law
Claims and Liabilities per Security

(a) U.S. Liabilities and Claims per Type of Securities

(b) Claims
U.S. Claims and Liabilities of Top 10 Countries

(a) Claims

(b) Liabilities
U.S. Holdings of Foreign Securities (Claims)

Top 12 Countries and Type of Asset (2001-2018)

Cayman
United Kingdom
Japan
Canada
France
Ireland
Switzerland
Netherlands
Germany
Australia
Bermuda
Korea

Billions of dollars
Long-term debt
Short-term debt
Equity
U.S. Holdings of Foreign Debt (Claims)

Top 12 Countries and Currency Denomination (2011-2018)

[Bar charts showing the holdings of debt by different countries over the years 2011 to 2018.]

- **Canada**
- **Cayman**
- **United Kingdom**
- **Japan**
- **Netherlands**
- **France**
- **Australia**
- **Germany**
- **Mexico**
- **Ireland**
- **IROT total**
- **Luxembourg**

Legend:
- Own
- USD

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Top 12 Countries (2006-2018)

- Japan
- Cayman
- China
- United Kingdom
- Luxembourg
- Canada
- Ireland
- Switzerland
- Belgium
- Taiwan
- Germany
- Netherlands

Billions of dollars

- Corp. equities
- Corp. debt
- Agencies
- Treasuries
Summary: Main Trends

- Increase in private U.S. claims and liabilities toward THFC; mostly after Q.E. and around 2010, a year in which most advanced economies had tightened prudential regulations.

  - The fact that most of these flows are intermediated through less-regulated funds seems to suggest a correlation with those events.

- Increase of U.S. Treasury securities abroad, mostly held by the official sector and around quantitative easing policies.

- Facts suggest that a combination of macro and micro factors are behind the recent trends in flows.

  - Macro: traditional global financial cycle variables
  
  - Micro: firms’ and investors’ incentives for cross-border activities
The Micro Origins of Capital Flows

Match our industry-level flow data with industry-level risk metrics, Sharpe ratios, and Intangibility index to

- Inform about risk-taking and source country characteristics
- Identify investors’ search for yield
- Explore role of expanding intangible-intensive economy: more prone to shift profits or relocate for tax/regulation reasons
Industry Classification: Caveats and Challenges

- TIC annual survey data are provided by vendor and then reviewed and adjusted by NY Fed and Board of Governors.
  - Large volume: 1M or so securities
- Some firms do not fall neatly into one classification.
  - The activities of some firms (especially funds) can be opaque, difficult classification.
- Vendor-provided classifications are sometimes wrong.
- Series breaks: Starting with the 2014 claims survey, NAICS classifications used instead of GICS.
  - The mapping from GICS to NAICS is not always clean.
  - The GICS classification system was substantially revised in 2006
  - Official securities (liabilities/asset)
Variables: Definitions

- Realized Volatility and Sharpe Ratios: Compustat

- Country-year averages: Composition of holdings across industries.

\[ x_{jt}^{av} = \sum_{i \in I} x_{i}^{av} \]

\[ \frac{MV_{i,j,t}}{\sum_{i \in I} MV_{i,j,t}} \]

- Normalized country-year totals: Combine information on average risk (etc.) with size of positions

- Uncertainty: time-varying equity volatility purged of the forecastable variation in expected returns (Gilchrist, Sim, Zakrajsek, 2014)

- Intangible capital, dataset from WRDS (Peters and Taylor, 2017).
(a) Realized Volatility: THFC and non

(b) Realized Volatility: Countries

- THFC hold U.S. debt liabilities in riskier U.S. industries
- Risk difference has increased over time
Trends in Sharpe Ratios

(a) Sharpe Ratios: THFC and non

(b) Sharpe Ratio: Countries

- Sharpe ratios slightly higher for THFC ⇒ THFC portfolios have higher returns
Graph shows kernel densities over country averages

THFC hold riskier U.S. debt liabilities

U.S. debt liabilities shifted to riskier industries between 2007 and 2019
Average Uncertainty against Average Realized Volatility for U.S. Debt Liabilities
**Asset Intangibility and THFC Status**

**Realized Volatility and Intangibility for U.S. Debt Liabilities**

- **Intangible capital measure from Peters and Taylor (2017)**
- **U.S. debt liabilities to THFC concentrated in high-intangibility industries**
Table 1: Average Realized Volatility, Sharpe ratios, GSZ Uncertainty, and Intangibility of U.S. Liabilities, for Debt and equities and THFC Status

<table>
<thead>
<tr>
<th></th>
<th>(1) Real. Volatility</th>
<th>(2) Sharpe Ratio</th>
<th>(3) GSZ Uncertainty</th>
<th>(4) Intangibility</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tax Haven</strong></td>
<td>0.297***</td>
<td>0.270**</td>
<td>0.0263***</td>
<td>123.6***</td>
</tr>
<tr>
<td></td>
<td>(0.0377)</td>
<td>(0.105)</td>
<td>(0.00338)</td>
<td>(13.58)</td>
</tr>
<tr>
<td><strong>Time FE</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>1931</td>
<td>1931</td>
<td>1931</td>
<td>1931</td>
</tr>
<tr>
<td><strong>$R^2$</strong></td>
<td>0.244</td>
<td>0.170</td>
<td>0.281</td>
<td>0.264</td>
</tr>
</tbody>
</table>
The increasing flows in and out of offshore locations suggests role of tax avoidance considerations and regulatory arbitrage.

Tighter regulation enacted in most advanced economies after the 2007-2008 financial crisis potential explanation.

We use corporate taxes, KPMG database, and prudential regulation indices from Cerutti et al. (2017).

- In a sectorial regression where taxes are interacted with intangibility
- In gravity equations for country level claims and liabilities
A reduction in the corporate tax rate increases a country’s holdings of U.S. liabilities for high-intangibility industries relative to low-intangibility industries.
<table>
<thead>
<tr>
<th></th>
<th>Liabilities</th>
<th></th>
<th>Claims</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2) Interaction</td>
<td>(3) Full</td>
<td>(4) Interaction</td>
</tr>
<tr>
<td>Tax Haven</td>
<td>2.337***</td>
<td>2.400***</td>
<td>-0.177</td>
<td>0.166</td>
</tr>
<tr>
<td></td>
<td>(0.688)</td>
<td>(0.806)</td>
<td>(0.468)</td>
<td>(0.513)</td>
</tr>
<tr>
<td>Post 2010</td>
<td>0.289</td>
<td>0.691***</td>
<td></td>
<td>0.691***</td>
</tr>
<tr>
<td></td>
<td>(0.186)</td>
<td>(0.135)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ln Distance</td>
<td>-1.459***</td>
<td>-1.456***</td>
<td>-0.834***</td>
<td>-0.830***</td>
</tr>
<tr>
<td></td>
<td>(0.529)</td>
<td>(0.527)</td>
<td>(0.292)</td>
<td>(0.298)</td>
</tr>
<tr>
<td>Observations</td>
<td>749</td>
<td>749</td>
<td>739</td>
<td>739 [t]</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.538</td>
<td>0.538</td>
<td>0.464</td>
<td>0.505</td>
</tr>
</tbody>
</table>

Note: This table regresses the log of U.S. debt liabilities and claims at the country-year level on a tax haven dummy and a set of standard gravity variables. The sample runs from 2002 to 2019 and covers 50 countries with positive holdings of U.S. liabilities. Controls on GDP, population, market capitalization, and dummies of sharing language and religion are also included.
The Model

- To explain the two main facts for private securities:
  - the increase in THFC flows and in debt risk
- General equilibrium model - multinationals:
  - Entering THFC
  - Funded by less-regulated global intermediaries
- Model Features
  - Firms heterogeneous in default probabilities
  - Choose to shift profits paying a cost, and to enjoy tax benefit
  - Firms fund activity with risky debt from global intermediaries
  - Loan spreads based on an incentive-compatible contract and endogenous monitoring intensity
Structure

- There are two countries, a large country, F, and a tax haven, THFC.
- Firms can only produce in the large country: where there are two sectors, one producing a homogeneous good that serves as a numeraire, and one sector with heterogeneous firms producing different varieties.
  - Homogeneous good sector: firms produce CRS technology, zero profits.
  - Differentiated good sector: firms produce different varieties under monopolistic competition, funding production with debt.
- Firms are heterogeneous with respect to their default risk
  - Riskier firms pay higher credit spreads (safe rate plus a premium related to the monitoring intensity)
- Firms endogenously decide whether to become MNCs.
  - Opening an affiliate in the THFC; fixed cost of entering the THFC: benefit from tax savings through profit shifting.
  - Given the heterogeneity in default probabilities, only a fraction of them opens an affiliate in the THFC.
Consumers and Producers

- Consumers’ Preferences

\[ U = \alpha \ln Q + q_0 \text{ with } Q = \int_{\Omega} \left( q(\omega) \frac{\sigma-1}{\sigma} \right)^{\frac{\sigma}{\sigma-1}}, \]  

(2)

\[ q(\omega) = \frac{p(\omega)^{-\sigma}}{P^{-\sigma}Q}, \]  

(3)

- Production of each Variety

\[ \int_{R_p}^{\infty} g(\theta_p) = a(R_p)^{-\zeta} = x_p, \]  

(4)

which implies:

\[ R_p = R(x_p) = \left( \frac{x_p}{a} \right)^{-\frac{1}{\zeta}}. \]  

(5)
Firms’ Pricing Decision

- Firms are heterogeneous in their riskiness or probability of default, which determines the loan rate they pay, according to the contractual agreement.

- $m[0, p]$, intermediary monitoring intensity: Monitoring reduces the default probability, but entails a convex cost for the intermediary

$$\tilde{R} = \begin{cases} R & \text{with probability } 1 - r + m \\ 0 & \text{with probability } r - m \end{cases} \quad (6)$$

- Firms charge a constant markup over price

$$p(r) = \frac{\sigma}{\sigma - 1} R_b(r) \quad (7)$$

- Firms profits are given by expected revenues, $(1 - r + m)p(r)q(r)$, minus the cost of debt:

$$\pi(r) = (1 - r + m)p(r)q(r) - R_b(r) \quad (8)$$
Debt Rates - The Contract

In the optimal contract, intermediaries choose monitoring intensity, $m$ rate to offer to investors to maximize the expected profit, net of returns to investors, $R_I$

$$\max_{\{R^h, m\}} \left[ (1 - r + m)(R_b - R_I) - c(m) \right]$$  \hspace{1cm} (9)

subject to the intermediaries’ incentive compatibility constraint:

$$m^* = \arg \max_m \left\{ [ (1 - r + m)(R_b - R_I) - c(m) ] \right\}$$, \hspace{1cm} (10)

the intermediaries’ participation constraint:

$$(1 - r + m^*)(R_b - R_I) - c(m) \geq 0$$  \hspace{1cm} (11)

and a depositor’s participation constraint:

$$(1 - r + m^*)R_I \geq R^S$$  \hspace{1cm} (12)
Global Investors

\[
\max_{(R', m)} \left[ (1 - r + m)(R_b - R_t) - c(m) \right]
\]

Intermediaries

\[
m^* = \arg \max_m \{(1 - r + m)(R_b - R_t) - c(m)\}
\]

\[
(1 - r + m^*)(R_b - R_t) - c(m) \geq 0
\]

Funds

\[
R^b(r) = \left( 1 - t_{THFC} \right) R_h(r) - 4
\]

Firm

\[
g(\theta_p) = a \zeta(\theta_p)^{-\zeta+1}
\]

\[
\bar{R} = \begin{cases} R, & 1 - r + m \\ 0, & r - m \end{cases}
\]

Home Country

Entry Decision

\[
\pi^b(\tau) = (1 - t_{THFC}) \pi(\tau) \cdot \mathbf{x}
\]

Tax Heaven Financial Center

Consumers

\[
U = \alpha \ln Q + q_0
\]

\[
Q = \int_0^{\infty} \left( q(\omega) \omega^{\omega-1} \right) d\omega
\]
Intermediaries choose the monitoring intensity: \((R_b - R_I) - c'(m) = 0\)

Participation constraint: \(R_I = \frac{R^S}{(1-r+m^*)}\)

\(R_b = \frac{R^S}{(1-r+m^*)} + c'(m)\)

**Extensive** margin of risk: Cut-off below which firms are not monitored (considered safe):
\[
\hat{r} = 1 - \sqrt{\frac{R^S}{c''(0)}}
\]

For monitored firms, **intensive** margin of risk, \(m^*\), (to simplify we assume \(c(m) = k(m^2)\)):
\[
m^* = \begin{cases} 
0 & \text{when } r < \hat{r} \\
(1 - \sqrt{R^S/2k}) & \text{when } r < \hat{r} 
\end{cases}
\]

Cut-off off firms entering:
\[
(1-t^F_i) [(1-r+m)p(r)q(r) - R_b(r)q(r)] = (1-t^H_i) [(1-r+m)p(r)q(r) - R_b(r)q(r)] - \kappa
\]
A Raise in Global Savings

- Debt market clearing condition:

\[ F(R^*_S) = \int_0^1 R^{-1}(R^*_p)dr = w, \quad (15) \]

- Since \( R'(x_p) < 0 \) and since \( R^*_p \) is decreasing in \( R^*_S \) we have:

\[ \frac{dR_S}{dw} = \frac{1}{F'(R^*_S)} < 0 \quad (16) \]

- An increase in the supply of global savings leads to an increase in investment (visible from \( x_p = R^{-1}(R^*_p) \)) and a fall in the loan rate per equation

\[ R_b = \frac{R^S}{(1-r+m^*)} + c'(m). \]
Global Savings and Risk

- In presence of a tax advantage, an increase in global savings, which induces a fall in $R_S$
  
  i) raises the fraction of entrants and shifts its distribution toward riskier firms;
  
  ii) it also increases risk at the intensive and extensive margin.

- A decline in $R_S$ induces an increase in $\tilde{r}$
  
  Larger fraction of firms shift profits: distribution of entrants shifts toward riskier

- Increase in the extensive margin of risk: number of firms that are not monitored,
  
  $$R_b = \frac{R_S}{(1-r+m^*)} + c'(m).$$

- Decrease in the intensive margin (monitoring intensity):
  
  $$\frac{dm^*}{dR^S} = -\left(\frac{1}{(1-p+m^*)}\right)\left[c''(m^*) - \frac{R^S}{(1-p+m^*)^2}\right]^{-1}$$
Simulations

**Figure 6: Simulation: Changes in Global Safe Rates**

Left panel shows the responses of the entry threshold and the monitoring threshold to change in in safe rates. Right panel show changes in the relation between monitoring intensity and default probability with respect to changes in safe rate.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\gamma$</td>
<td>Monitoring Cost</td>
<td>1</td>
</tr>
<tr>
<td>$\kappa$</td>
<td>Entry Cost</td>
<td>0.035</td>
</tr>
<tr>
<td>$t_H$</td>
<td>Domestic Tax-Rate</td>
<td>15%</td>
</tr>
<tr>
<td>$t_F$</td>
<td>Foreign Tax Rate</td>
<td>0%</td>
</tr>
<tr>
<td>$R^S$</td>
<td>Risk-Free Rate</td>
<td>2%</td>
</tr>
<tr>
<td>$\sigma$</td>
<td>Varieties Elasticity</td>
<td>6</td>
</tr>
</tbody>
</table>
Conclusions

Summary:

- U.S. debt liabilities increasingly held through Tax Havens and Financial Centers (THFC)

- THFC hold debt liabilities in industries that are riskier, have higher Sharpe ratios, and more intangibles

- Corporate taxation, regulation, and asset intangibility can explain some of the shift of flows towards THFC

- Model with endogenous entry into THFC and endogenous monitoring intensity by global intermediaries can rationalize these facts

Main takeaways

- **Composition of flows** key to understanding what is behind shift to THFC. Less regulation and transparency of THFC may make assets and the world less safe.

- Additional adverse effects of THFC besides tax base losses for other countries