Expertise Development, Network Effects, and Global Accounting Standards

Pingyang Gao*, Xu Jiang†, Gaoqing Zhang§

*University of Chicago
†Duke University
§University of Minnesota

2018 Columbia Workshop
March 23, 2018
Motivation: global accounting standard adoptions

- over 100 countries have switched to IFRS
Motivation: global accounting standard adoptions

- over 100 countries have switched to IFRS
- debate on economic consequences of IFRS adoption
Motivation: global accounting standard adoptions

- over 100 countries have switched to IFRS
- debate on economic consequences of IFRS adoption
- advocates of IFRS promote it as a global language of business and its associated network effects
Motivation: global accounting standard adoptions

- over 100 countries have switched to IFRS
- debate on economic consequences of IFRS adoption
- advocates of IFRS promote it as a global language of business and its associated network effects
- IFRS differs from local accounting standards in how precise it is in representing firms’ financial conditions
Motivation: global accounting standard adoptions

- over 100 countries have switched to IFRS
- debate on economic consequences of IFRS adoption
- advocates of IFRS promote it as a global language of business and its associated network effects
- IFRS differs from local accounting standards in how precise it is in representing firms’ financial conditions
- we develop a model to explicate network effect and precision effect and examine the consequences of adopting global accounting standards for firm value and liquidity
Motivation (continued): empirical identification

- IFRS adoption often occurs with other institutional and market changes, e.g., enforcement
Motivation (continued): empirical identification

- IFRS adoption often occurs with other institutional and market changes, e.g., enforcement.

  ![Diagram](image)

  - explicating network/precision effects helps to identify IFRS adoption’s consequences different from other changes.

  ![Diagram](image)
Preview of main results

- two prerequisites for the network effects
Preview of main results

- two prerequisites for the network effects
  - investors need expertise in accounting standards to extract information from financial reports
Preview of main results

- two prerequisites for the network effects
  - investors need expertise in accounting standards to extract information from financial reports
  - it is costly to develop expertise
Preview of main results

- two prerequisites for the network effects
  - investors need expertise in accounting standards to extract information from financial reports
  - it is costly to develop expertise

- accounting standard precision and expertise development are complements: the benefit of expertise is increasing in precision
two prerequisites for the network effects

- investors need expertise in accounting standards to extract information from financial reports
- it is costly to develop expertise

accounting standard precision and expertise development are complements: the benefit of expertise is increasing in precision

adoption may affect the switcher's liquidity and firm value in different directions
Preview of main results

- two prerequisites for the network effects
  - investors need expertise in accounting standards to extract information from financial reports
  - it is costly to develop expertise

- accounting standard precision and expertise development are complements: the benefit of expertise is increasing in precision

- adoption may affect the switcher’s liquidity and firm value in different directions

- adoption generates positive externality on earlier adopters
Related literatures

- global financial reporting literature
- information acquisition literature
The model
Timeline

- two economies each with a representative firm, indexed as the early adopter $E$ and the switcher $S$
Timeline

- two economies each with a representative firm, indexed as the early adopter $E$ and the switcher $S$
  - firm $E$ has been using the global accounting standard
Timeline

- two economies each with a representative firm, indexed as the early adopter $E$ and the switcher $S$
  - firm $E$ has been using the global accounting standard
  - firm $S$ switching from local standard to global standard, $A \in \{0, 1\}$
Timeline

- two economies each with a representative firm, indexed as the early adopter $E$ and the switcher $S$
  - firm $E$ has been using the global accounting standard
  - firm $S$ switching from local standard to global standard, $A \in \{0, 1\}$

- at date 0,
Timeline

- two economies each with a representative firm, indexed as the early adopter $E$ and the switcher $S$
  - firm $E$ has been using the global accounting standard
  - firm $S$ switching from local standard to global standard, $A \in \{0, 1\}$
- at date 0,
  - each firm’s entrepreneur chooses unobservable investment $K_j$
Timeline

- two economies each with a representative firm, indexed as the early adopter $E$ and the switcher $S$
  - firm $E$ has been using the global accounting standard
  - firm $S$ switching from local standard to global standard, $A \in \{0, 1\}$

- at date 0,
  - each firm’s entrepreneur chooses unobservable investment $K_j$
  - traders decide on developing expertise in accounting standards
Timeline

- two economies each with a representative firm, indexed as the early adopter $E$ and the switcher $S$
  - firm $E$ has been using the global accounting standard
  - firm $S$ switching from local standard to global standard, $A \in \{0, 1\}$

- at date 0,
  - each firm’s entrepreneur chooses unobservable investment $K_j$
  - traders decide on developing expertise in accounting standards

- at date 1, firm $j$ issues report under its accounting standard
Timeline

- two economies each with a representative firm, indexed as the early adopter \( E \) and the switcher \( S \)
  - firm \( E \) has been using the global accounting standard
  - firm \( S \) switching from local standard to global standard, \( A \in \{0, 1\} \)

- at date 0,
  - each firm’s entrepreneur chooses unobservable investment \( K_j \)
  - traders decide on developing expertise in accounting standards

- at date 1, firm \( j \) issues report under its accounting standard
- at date 2, stock market opens and the entrepreneur sells at \( p_j \)
Timeline

- two economies each with a representative firm, indexed as the early adopter $E$ and the switcher $S$
  - firm $E$ has been using the global accounting standard
  - firm $S$ switching from local standard to global standard, $A \in \{0, 1\}$

- at date 0,
  - each firm’s entrepreneur chooses unobservable investment $K_j$
  - traders decide on developing expertise in accounting standards

- at date 1, firm $j$ issues report under its accounting standard
- at date 2, stock market opens and the entrepreneur sells at $p_j$
- at date 3, firms pay out
The payoffs

- firm’s terminal cash flow

\[ \nu_j = K_j + \theta_j \]
The payoffs

- firm’s terminal cash flow

\[ v_j = K_j + \theta_j \]

- unobservable investment \( K_j \)
The payoffs

- firm’s terminal cash flow

\[ \nu_j = K_j + \theta_j \]

- unobservable investment \( K_j \)

- fundamentals \( \theta_j \sim N \left( 0, \sigma_{\theta}^2 \right) \) independent across firms
The payoffs

- firm’s terminal cash flow

\[ \nu_j = K_j + \theta_j \]

- unobservable investment \( K_j \)

- fundamentals \( \theta_j \sim N(0, \sigma_{\theta}^2) \) independent across firms

- entrepreneur’s payoff (ex-ante firm value)

\[ V_j = E_0[p_j] - \frac{\kappa}{2} K_j^2 \]
The expertise development

- trader decides on developing expertise in accounting standards
The expertise development

- trader decides on developing expertise in accounting standards
  - cost $c$ to learn one standard and $2c$ to learn both standards
The expertise development

- trader decides on developing expertise in accounting standards
  - cost $c$ to learn one standard and $2c$ to learn both standards
- expertise enables traders to receive a signal from reports

$$r_j = v_j + (1 + 1_{j=S}A) \epsilon_j$$
The expertise development

- trader decides on developing expertise in accounting standards
  - cost $c$ to learn one standard and $2c$ to learn both standards
- expertise enables traders to receive a signal from reports
  \[ r_j = v_j + (1 + 1_{j=S}A)\varepsilon_j \]
- $\varepsilon_j \sim N(0, \sigma^2_{\varepsilon})$ and independent everywhere

<table>
<thead>
<tr>
<th></th>
<th>pre-adoption ($A = 0$)</th>
<th>post-adoption ($A = 1$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>firm $E$</td>
<td>$\varepsilon_E$</td>
<td>$\varepsilon_E$</td>
</tr>
<tr>
<td>firm $S$</td>
<td>$\varepsilon_S$</td>
<td>$(1 + m)\varepsilon_S$</td>
</tr>
</tbody>
</table>
The expertise development

- trader decides on developing expertise in accounting standards
  - cost $c$ to learn one standard and $2c$ to learn both standards
- expertise enables traders to receive a signal from reports
  \[ r_j = \nu_j + (1 + 1_{j=S} A \epsilon) \epsilon_j \]
- $\epsilon_j \sim N(0, \sigma^2_\epsilon)$ and independent everywhere

<table>
<thead>
<tr>
<th></th>
<th>pre-adoption ($A = 0$)</th>
<th>post-adoption ($A = 1$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>firm $E$</td>
<td>$\epsilon_E$</td>
<td>$\epsilon_E$</td>
</tr>
<tr>
<td>firm $S$</td>
<td>$\epsilon_S$</td>
<td>$(1 + m) \epsilon_S$</td>
</tr>
</tbody>
</table>

- $m \geq -1$: global standard can be more or less precise than local standard
The stock market

- three types of traders
The stock market

- three types of traders
  - $N_j$ expert traders in firm $j$’s standard choose demand $d_j$
The stock market

- three types of traders
  - $N_j$ expert traders in firm $j$’s standard choose demand $d_j$
  - non-expert traders don’t trade
The stock market

- three types of traders
  - \( N_j \) expert traders in firm \( j \)'s standard choose demand \( d_j \)
  - non-expert traders don't trade
  - liquidity traders \( \xi_j \sim N(0, \sigma_{\xi_j}^2) \) with the relative size of economy \( \chi = \frac{\sigma_{\xi_E}}{\sigma_{\xi_S}} \)
The stock market

- three types of traders
  - $N_j$ expert traders in firm $j$’s standard choose demand $d_j$
  - non-expert traders don’t trade
  - liquidity traders $\xi_j \sim N(0, \sigma_{\xi_j}^2)$ with the relative size of economy $\chi = \frac{\sigma_{\xi_E}}{\sigma_{\xi_S}}$

- market maker observes total order flow $q_j = N_jd_j + \xi_j$ and sets stock price $p_j = E \left[ v_j \mid q_j \right]$
Equilibrium concept

an equilibrium is a set of decisions $\left\{ K_j^*, N_j^*, d_j^*, p_j^* \right\}$ such that

- entrepreneur chooses unobservable $K_j^*$ to maximize $V_j$
- trader earns zero profit after expertise cost $c$
- expert trader chooses $d_j^*$ to maximize trading profit and
  market maker sets stock price $p_j^*$ to break even
The equilibrium
Expert traders’ information

- expert traders’ estimate of firm value \( v_j \):

\[
E[v_j|r_j] = \tau_j r_j + (1 - \tau_j) K_j^*
\]

\[
\tau_j = \frac{\sigma^2_\theta}{\sigma^2_\theta + (1 + 1_{j=Am})^2 \sigma^2_\epsilon}
\]
Expert traders’ information

- expert traders’ estimate of firm value $v_j$:

$$E[v_j | r_j] = \tau_j r_j + (1 - \tau_j) K^*_j$$

$$\tau_j = \frac{\sigma^2_\theta}{\sigma^2_\theta + (1 + 1_{j=s} Am)^2 \sigma^2_\epsilon}$$

- $\tau_j$ measures expert traders’ information quality
Expert traders’ information

- expert traders’ estimate of firm value $v_j$:

$$E[v_j|r_j] = \tau_j r_j + (1 - \tau_j) K_j^*$$

$$\tau_j = \frac{\sigma^2_\theta}{\sigma^2_\theta + (1 + 1_{j=SAm})^2 \sigma^2_\epsilon}$$

- $\tau_j$ measures expert traders’ information quality
- expert traders’ information advantage

$$E[v_j|r_j] - E[v_j] = \tau_j (r_j - K_j^*)$$
The trading equilibrium

Expert traders set demand $d_j^* = \beta_j^* (E[v_j|r_j] - E[v_j])$
The trading equilibrium

- expert traders set demand \( d_j^* = \beta_j^*(E[v_j|r_j] - E[v_j]) \)
- the market maker sets the price as \( p_j^* = E[v_j] + \lambda_j^* q_j \)
The trading equilibrium

- Expert traders set demand $d_j^* = \beta_j^* (E[v_j | r_j] - E[v_j])$
- The market maker sets the price as $p_j^* = E[v_j] + \lambda_j^* q_j$
- $\lambda_j^*$ measures the market liquidity

\[
\beta_j^* = \sqrt{\frac{1}{N_j} \frac{\sigma_{\xi_i}^2}{\tau_j \sigma_\theta^2}} \\
\lambda_j^* = \sqrt{\frac{N_j}{(1 + N_j)^2} \frac{\tau_j \sigma_\theta^2}{\sigma_{\xi_i}^2}}
\]
Traders’ expertise development decisions

- expected profit to an expert trader from trading in firm $j$

$$
\pi_j^* = \frac{\sigma_\xi \sigma_\theta \sqrt{\tau_j}}{\sqrt{N_j}(N_j + 1)}
$$
Traders’ expertise development decisions

- expected profit to an expert trader from trading in firm $j$

$$\pi_j^* = \frac{\sigma_{\xi_j} \sigma_\theta \sqrt{\tau_j}}{\sqrt{N_j(N_j + 1)}}$$

- $A = 0$: learning either standard earns $\pi_j^*$

$$c = \pi_j^* = \frac{\sigma_\theta \sigma_{\xi_j} \sqrt{\tau_j}}{\sqrt{N_j^*(N_j^* + 1)}}$$
Traders’ expertise development decisions

- expected profit to an expert trader from trading in firm $j$

$$\pi^*_j = \frac{\sigma_{\xi_j} \sigma_\theta \sqrt{\tau_j}}{\sqrt{N_j(N_j + 1)}}$$

- $A = 0$: learning either standard earns $\pi^*_j$

$$c = \pi^*_j = \frac{\sigma_\theta \sigma_{\xi_j} \sqrt{\tau_j}}{\sqrt{N_j^*(N_j^* + 1)}}$$

- $A = 1$: both firms use the global standard

$$c = \pi^*_E + \pi^*_S = \frac{\sigma_\theta \sigma_{\xi_S} (\chi \sqrt{\tau_E} + \sqrt{\tau_S})}{\sqrt{N_j^*(N_j^* + 1)}}$$
Entrepreneurs’ investment decisions

- entrepreneur’s FOC on $K_j$

$$K_j^* = \frac{1}{\kappa} \frac{\partial E_0[p_j^*]}{\partial K_j} < \frac{1}{\kappa}$$
Entrepreneurs’ investment decisions

- entrepreneur’s FOC on $K_j$

$$K_j^* = \frac{1}{\kappa} \frac{\partial E_0[p_j^*]}{\partial K_j} < \frac{1}{\kappa}$$

- the equilibrium investment and firm value

$$K_j^* = \frac{1}{\kappa} \frac{N_j^*}{N_j^* + 1} \tau_j$$

$$V_j^* = \frac{1}{2\kappa} - \frac{\kappa}{2} \left( \frac{1}{\kappa} - K_j^* \right)^2$$
The consequences of global accounting standard adoption
Stock price informativeness

\[
\frac{\text{Var}[v_j] - \text{Var}[v_j|p_j]}{\text{Var}[v_j]} = \tau_j \rho_j
\]

Expert traders’ information quality

\[
\tau_j = \frac{\sigma^2_\theta}{\sigma^2_\theta + (1 + 1_{j=S Am})^2 \sigma^2_\varepsilon}
\]
Stock price informativeness

\[
\frac{\text{Var} [v_j] - \text{Var} [v_j | p_j]}{\text{Var} [v_j]} = \tau_j \rho_j
\]

- expert traders’ information quality

\[
\tau_j = \frac{\sigma^2_\theta}{\sigma^2_\theta + (1 + 1_{j=SAm})^2 \sigma^2_\varepsilon}
\]

- trading efficiency: the fraction of the experts’ information impounded in the equilibrium stock price

\[
\rho_j = \frac{N^*_j}{N^*_j + 1}
\]
Divergent effects on switcher’s firm value and liquidity

\[ m^*(\chi) \]

- Liquidity increases but firm value decreases
- Liquidity increases and firm value increases
- Liquidity decreases but firm value increases

\( m \) represents the inverse of precision
\( \chi \) represents the early adopter's relative size
Distinct determinants of firm value and liquidity
The externality for the early adopter

- positive externality: adoption leads to both higher firm value and liquidity for early adopter
The externality for the early adopter

- positive externality: adoption leads to both higher firm value and liquidity for early adopter
- adoption does not affect early adopter’s reporting precision but improves $\rho_E$ through network effects
The externality for the early adopter

- positive externality: adoption leads to both higher firm value and liquidity for early adopter
- adoption does not affect early adopter’s reporting precision but improves $\rho_E$ through network effects
- positive externality may provide one justification for mandating the adoption of global accounting standards
The empirical and policy implications

- empirical implications
  - controlling for precision, adoption increases both ...rm value and liquidity for the switcher and the early adopter
  - divergent effects of adoption on ...rm value and liquidity depending on the global standard's relative precision
  - policy implications
    - the global standard's precision is an incomplete measure of economic consequences of adopting global standards
    - liquidity ceases to be an accurate proxy for ...rm value when the global standard is either sufficiently precise or noisy
The empirical and policy implications

- empirical implications
  - controlling for precision, adoption increases both firm value and liquidity for the switcher and the early adopter
The empirical and policy implications

- empirical implications
  - controlling for precision, adoption increases both firm value and liquidity for the switcher and the early adopter
  - divergent effects of adoption on firm value and liquidity depending on the global standard’s relative precision
The empirical and policy implications

- empirical implications
  - controlling for precision, adoption increases both firm value and liquidity for the switcher and the early adopter
  - divergent effects of adoption on firm value and liquidity depending on the global standard’s relative precision

- policy implications
The empirical and policy implications

- **empirical implications**
  - controlling for precision, adoption increases both firm value and liquidity for the switcher and the early adopter
  - divergent effects of adoption on firm value and liquidity depending on the global standard’s relative precision

- **policy implications**
  - the global standard’s precision is an incomplete measure of economic consequences of adopting global standards
The empirical and policy implications

- **empirical implications**
  - controlling for precision, adoption increases both firm value and liquidity for the switcher and the early adopter
  - divergent effects of adoption on firm value and liquidity depending on the global standard’s relative precision

- **policy implications**
  - the global standard’s precision is an incomplete measure of economic consequences of adopting global standards
  - liquidity ceases to be an accurate proxy for firm value when the global standard is either sufficiently precise or noisy
Takeaways

- Global accounting standard adoption trades off network effect with precision effect.
- Global standard adoption has divergent effects on the switcher’s firm value and liquidity.
- Global standard adoption has a positive externality on the early adopter’s liquidity and firm value.