

Andreas Krause



Chapter 11.2
Introduction of innovations

Outline

- Problem and model assumptions
- Controversial innovations
- Phasing of innovations
- Selling innovations
- Optimal strategy for small banks
- Summary

- Investment banks often develop new securities, some of which become widespread as they have a lasting appeal to a wide range of clients, such as credit default swaps, while others are developed to exploit a specific regulatory gap or allows the reduction of tax payments. The latter type of financial innovations will be of interest only to a small number of clients and with the closing of regulatory gaps and the change of tax rules, their usefulness will often be short-lived.
- We will look here at financial innovations that are likely to be short-lived and will assess how investment banks will introduce such securities.

- We will now look at the incentives to introduce so-called 'controversial' financial innovations, that is financial innovation who are likely to trigger a regulatory response or a response in taxation rules that would eliminate the value of the innovation.
- Will then look at how such an innovation is best introduced, as a large innovation or whether it is better to be introduced in smaller steps to stay ahead of regulator and tax authorities, followed by the incentives of banks to sell the innovation to other investment banks rather than offering it only to their own clients.
- Will then look at the optimal strategy of smaller banks in particular.

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- We will start by introducing the key considerations in the introduction of financial innovations by investment banks.
- We will not analyse in detail the reasons for clients to request such innovation or see to determine their value to the client. Instead we will take it as given that using financial innovations provides a benefit to clients.

Phased introduction and sale of innovations

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- ▶ Clients **delaying adoption** might lose some benefits

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- ▶ Clients delaying adoption might lose some benefits, such as **tax avoidance**

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- ▶ Clients delaying adoption might lose some benefits, such as tax avoidance or **circumventing regulations**

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- ▶ They might also **sell** innovations to other investment banks

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- ▶ Investment banks are competing for clients and meeting the demands of their clients with innovative solutions might be a competitive advantage that leads to attracting new clients. These clients are also more likely to choose the investment bank then for advice in mergers, their IPO (if not yet listed), or other major corporate decision.
- ▶ Investment bank could not only sell an innovation to their clients, but also share the innovation with another investment bank, who could then offer it to their own clients.
- We will look at the incentives for investment banks to phase in innovations, but also to share they innovation with other investment banks.

Phased introduction and sale of innovations

- ▶ Financial innovations can be copied by other investment banks, but there might be a time delay
- ▶ Clients delaying adoption might lose some benefits, such as tax avoidance or circumventing regulations
- ▶ Regulators might intervene to prohibit an innovation
- ▶ Innovations might be split and introduced in phases
- ▶ Investment banks are competing and clients might be switching to take advantage of innovations
- ▶ They might also sell innovations to other investment banks

Phased introduction and sale of innovations

- Financial innovations is an abstract concept which comprises the creation of securities with specific pay-off profiles that suit the needs of the investment bank's clients. These payoff might provide a hedge against existing risks that otherwise cannot be conducted effectively, they might re-allocate profits from one business area to another or across subsidiaries, they might have implications for regulatory constraints imposed on clients, and many more.
- ▶
 - Financial innovations are relatively easy to copy by investment banks that have not had the initial idea to this innovation. The reason that such copying is easy arises from the need that all details of the innovation, thus how it works, has to be disclosed in the legal document between the investment bank and its client, making leakage to other investment banks easily possible if the client gives them access. In some cases the legal document might also have to be published as part of the disclosure requirements, such as the listing of stocks, issuing of new stocks or bonds, mergers, or as part of the general disclosure requirements a client or the investment bank might be subjected to.
 - Copying such financial innovation will, however, not be instantly as the other investment banks need time to understand and replicate the innovation; they will also need time to develop methods for pricing the innovation adequately.
- ▶
 - If clients do not use the innovation instantly as it becomes available, they will not gain the benefits associated with the innovation. Thus delaying the adoption of the innovation imposes opportunity costs on the client.
 - Such opportunity costs could be that they have to pay higher taxes than when using the financial innovation.
 - They might also benefit from circumventing existing regulations, which might give them direct benefits in the form higher profits or increased market share. There might also be indirect benefits such as higher remuneration for managers or higher stock prices that may be of benefit in a merger.
- ▶ Once an innovation has been introduced, regulators might change the rules such that the benefits associated with it are diminished or completely eliminated; they might also ban the innovation outright. Such a regulatory change will take time as the regulator only reacts once it observes the innovation being used.
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Costs and benefits of innovations

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- From the client's perspective, financial innovations provide them with benefits and not using them imposes opportunity costs.
- ▶ We take the value of the innovation to the client as given and do not model its origin here.
- ▶ We also suggest that a client not taking up the innovation faces costs, these would be the opportunity costs from paying higher taxes or being subjected to more regulatory constraints.
- ▶ Clients can switch investment banks if their own investment bank does not offer an innovation the client seeks; switching investment bank to obtain this innovation imposes costs, which might consist of negotiating with a new and unknown investment bank, or the deteriorating relationship with their current investment bank if using services elsewhere.
- ▶ In addition, we assume that an innovation may be rendered worthless by a regulator after one time period, but there is degree of uncertainty about that, for example the view of a regulator might not be known or the speed at which they move to change regulations may not be known.
- We can now look at the incentives for investment banks to introduce financial innovations and how they are priced.

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- Problem and model assumptions
- **Controversial innovations**
- Phasing of innovations
- Selling innovations
- Optimal strategy for small banks
- Summary

- We consider here 'controversial' innovations, that is innovations that a regulator might prohibit or where regulatory changes will eliminate any benefits to clients.

Equilibrium adoption

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Equilibrium price

- We can now determine the equilibrium price of the innovation based on the previous expression.
- ▶ The price the investment bank can charge to clients adopting the innovation instantly is the value of the innovation if the costs of delaying the adoption are sufficiently high. For lower costs of delaying the adoption of the innovation, the price will be increasing in the delay costs. In both cases, the investment bank exploits its temporary monopoly by extracting any surplus the innovation generates to their client, taking into account the ability of the client delaying the adoption of the innovation.
- ▶ The more likely the regulator is rendering the innovation worthless (p), the higher the price the investment bank charges. This is because if the innovation is not available in the future, its entire value is only available now; it is unlikely that the regulators change regulations retrospectively and once the innovation has been adopted its value can be obtained in full.
- ▶ If we assume that the costs of developing a financial innovation is fixed, the price obtained, and hence the profits of the investment bank, are increasing in the likelihood of regulatory intervention and costs of delay. If an innovation is likely to be rendered worthless, it is usually because regulators do not approve of their use, either as they reduce their revenue, increase risks, or have other effects that are deemed undesirable. Such innovations are often seen as 'controversial'.
- We thus have seen that investment banks make most profits from the developing controversial innovations, as the likelihood of them being rendered worthless by regulators increases the pressure on their clients to not delay their adoption during the time where the investment bank developing the innovation has a monopoly and can extract all surplus from the client.

Equilibrium price

► This gives $P = \begin{cases} V & \text{if } C_D \geq (1-p)V \\ pV + C_D & \text{if } C_D < (1-p)V \end{cases}$

- We can now determine the equilibrium price of the innovation based on the previous expression.
- ▶ The price the investment bank can charge to clients adopting the innovation instantly is the value of the innovation if the costs of delaying the adoption are sufficiently high. For lower costs of delaying the adoption of the innovation, the price will be increasing in the delay costs. In both cases, the investment bank exploits its temporary monopoly by extracting any surplus the innovation generates to their client, taking into account the ability of the client delaying the adoption of the innovation.
- ▶ The more likely the regulator is rendering the innovation worthless (p), the higher the price the investment bank charges. This is because if the innovation is not available in the future, its entire value is only available now; it is unlikely that the regulators change regulations retrospectively and once the innovation has been adopted its value can be obtained in full.
- ▶ If we assume that the costs of developing a financial innovation is fixed, the price obtained, and hence the profits of the investment bank, are increasing in the likelihood of regulatory intervention and costs of delay. If an innovation is likely to be rendered worthless, it is usually because regulators do not approve of their use, either as they reduce their revenue, increase risks, or have other effects that are deemed undesirable. Such innovations are often seen as 'controversial'.
- We thus have seen that investment banks make most profits from the developing controversial innovations, as the likelihood of them being rendered worthless by regulators increases the pressure on their clients to not delay their adoption during the time where the investment bank developing the innovation has a monopoly and can extract all surplus from the client.

Equilibrium price

- ▶ This gives $P = \begin{cases} V & \text{if } C_D \geq (1 - p) V \\ pV + C_D & \text{if } C_D < (1 - p) V \end{cases}$
- ▶ The price increases in the likelihood the regulator **intervenes**

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- Problem and model assumptions
- Controversial innovations
- **Phasing of innovations**
- Selling innovations
- Optimal strategy for small banks
- Summary

- We will now focus our attention more on the behaviour of the investment bank when introducing financial innovations.
- We will in particular focus on the ability of the investment bank to introduce an innovation in multiple steps and when it is optimal to do so.

Dividing innovations

Dividing innovations

- We assume that we can divide an innovation into a certain number of steps that can be introduced one-by-one. We assume that neither regulators nor competitors can anticipate the full innovation and copying of innovations will only affect the currently available innovations, while regulatory changes would render any future phases worthless.
- ▶ If an innovation is split into multiple steps, the total benefits are independent of the number of steps taken, and each step provides a part of the benefits.
- ▶ We assume that the cost of delaying the adoption of each step is costly and that this cost does not depend on the number of steps; thus costs are not divided by steps, while the benefits are. The justification for this assumption might be that competitive advantages are similar, regardless the size of the innovation
- ▶ Indirectly the number of steps the investment bank uses is determined such that the total costs of delaying the adoption of the innovation
- ▶ The number of steps of an innovation is set such that waiting until the full innovation is revealed would eliminate all benefits from using the innovation.
- We can now use these assumptions to determine the profits of investment banks from introducing financial innovations.

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- ▶ Innovations can be split into T steps and $V = \sum_{t=1}^T V_t$

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Investment bank profits in each step

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→ We commence by determining the profits of the investment bank for step of the innovation.

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 - The investment bank has a monopoly with the current phase of the innovation and can therefore extract all surplus from their clients. As such the investment bank can charge at most the value that this step generates or the cost of delaying the adoption, whichever is less.
 - The investment bank cannot extract more than the surplus the innovation provides, but it can also not extract more than the cost of delaying the adoption as then the client would delay and the bank would not make any profits.
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 - They may not only offer the innovation to their own clients, but they might be able to attract additional clients from other investment bank that do not offer the innovation.
 - When offering the innovation to clients of other banks, they need to take into account the costs of switching investment banks. As the pricing for existing clients extracted all surplus, the switching of investment banks reduces the surplus to any new clients and the bank has to reduce its price accordingly.
 - ▶
 - Assume the market consists of a pre-determined number of clients, across all investment banks, that might benefit from the financial innovation.
 - The innovating investment bank has a market share α_i and will thus be able to extract the full surplus from their clients.
 - From the remaining clients, which are with other investment banks, they will be able to extract the lower surplus, taking into account switching costs.
 - ▶ *Formula*
 - ▶
 - In such a set-up, we can show that it is optimal to phase innovations into steps that provide equal benefits in each step. Any other strategy will lead to less profits as can be shown.
 - This implies that the benefits in each step are equal to the costs of delay. This arises from the equal size of the steps for the benefit creation and our assumption that the total costs of delaying adoption is equal to the total benefits of the full innovation: $V = TV_i = TC_T$.
 - ▶ We can insert this relation and obtain the *formula*.
- Having determined the profits of the investment bank in each step, assuming the costs of developing such innovations is nil, we can now determine the profits of the investment bank over time.

Investment bank profits in each step

- ▶ Maximum price that can be charged for each innovation phase is $\min \{V_t, C_D\}$

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Investment bank profits in each step

- ▶ Maximum price that can be charged for each innovation phase is $\min \{V_t, C_D\}$, otherwise delaying is more beneficial
- ▶ They can attract **new clients** from investment banks not innovating

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- ▶ Maximum price that can be charged for each innovation phase is $\min \{V_t, C_D\}$, otherwise delaying is more beneficial
- ▶ They can attract new clients from investment banks not innovating by charging a lower price that is reduced by the switching costs: $\max \{\min \{V_t, C_D\} - C_S, 0\}$

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- ▶ We have N clients and a market share α_i , and they can attract **all remaining** clients

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- Having determined the profits of the investment bank in each step, assuming the costs of developing such innovations is nil, we can now determine the profits of the investment bank over time.

Investment bank profits in each step

- ▶ Maximum price that can be charged for each innovation phase is $\min \{V_t, C_D\}$, otherwise delaying is more beneficial
- ▶ They can attract new clients from investment banks not innovating by charging a lower price that is reduced by the switching costs: $\max \{\min \{V_t, C_D\} - C_S, 0\}$
- ▶ We have N clients and a market share α_i , and they can attract all remaining clients
- ▶ Profits: $\Pi_B^{i,t} = \alpha_i N \min \{V_t, C_D\} + (1 - \alpha_i) N \max \{\min \{V_t, C_D\} - C_S, 0\}$

Investment bank profits in each step

- We commence by determining the profits of the investment bank for step of the innovation.
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 - They may not only offer the innovation to their own clients, but they might be able to attract additional clients from other investment bank that do not offer the innovation.
 - When offering the innovation to clients of other banks, they need to take into account the costs of switching investment banks. As the pricing for existing clients extracted all surplus, the switching of investment banks reduces the surplus to any new clients and the bank has to reduce its price accordingly.
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 - Assume the market consists of a pre-determined number of clients, across all investment banks, that might benefit from the financial innovation.
 - The innovating investment bank has a market share α_i and will thus be able to extract the full surplus from their clients.
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- ▶ Innovation steps are all of **equal size** in equilibrium

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Total investment bank profits

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- ▶ The innovation will be prohibited, or rendered worthless, with some probability in each step. In this case, the innovation will not provide any benefits from adopting future phases. This also implies, that if no regulatory changes are made, the investment bank can continue to sell future phases of the innovation.
 - ▶ The profits of the investment bank from the entire innovation is then given by the profits from each phase, where we take into account that the innovation can only continue if no regulatory changes are made.
 - ▶ Rather than phasing in the innovation, they could sell the innovation in a single step ($T = 1$) and they could obtain the entire market if the benefits are higher than the costs of delaying the adoption and the switching costs, as only then will they be able to attract clients from other investment banks.
 - ▶ As long as this is the case, the investment bank can charge a price that prevents the delay of adoption from all clients, new and old.
 - ▶ *Formula*
- We can now compare the incentives to phase in innovations compared to the immediate introduction of the full innovation.

Total investment bank profits

- ▶ If the innovation is prohibited in each time period with probability p , the investment bank can **continue** to **sell** it with probability $1 - p$ until T steps are used

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- ▶ They charge C_D to **prevent** clients **delaying** adoption

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- ▶ Investment bank profits: $\hat{\Pi}_B^i = NC_D$

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Choosing to introduce innovations phased

Choosing to introduce innovations phased

- By comparing the profits of the phased and full introduction of innovations, we can now determine the condition under which a phased introduction is preferred.
- ▶ If the profits to investment banks of phased introductions are higher than those of a immediate introduction, then the phased introduction is used.
 - ▶ We can solve the condition for the minimum market share required to introduce innovations phased. To obtain this, we also solve the geometric sum and note that $C_D - \max\{C_D, C_S\} = \min\{C_D, C_S\}$.
 - ▶
 - This condition implies that small investment banks will introduce the innovation immediately in full,
 - while large investment banks would prefer to used a phased introduction of their innovation.
 - ▶
 - The benefit to small investment banks of phasing in innovations immediately is that they obtain the full market share at a price that is equal to the cost of delaying adoption.
 - Using a single step will generate only a small profit as the maximum price that can be charged is the delay costs, while for a phased introduction, this price can be charged multiple times. However, with a phased introduction, the price charged to new clients would have to be reduced by their switching costs, reducing the revenue on a large fraction of their sales. Hence, small investment banks will make larger profits from a single sale of the innovation to the remaining market, than charging lower amounts to the large fraction of new clients repeatedly.
 - ▶
 - For large investment banks, the situation is reversed. The frequent extraction of surplus from the sizeable number of their own clients outweighs the smaller profits they make from attracting relatively few new clients.
 - Therefore, large investment banks would prefer to phase in innovations.
- We have thus established that small investment banks will introduce financial innovations in a single step, while larger investment banks would seek to phase innovations in, provided that this is possible. Not all financial innovations can be phased in; it might be possible to offer an initial basic version, such as a plain European option, and then add additional properties, such as changes to the final payoff (for example digital options), allow for exercise prior to maturity (American options), make the payoff path-dependent.

Choosing to introduce innovations phased

- ▶ Investment banks phase innovations in if $\hat{\Pi}_B^i \leq \Pi_B^i$

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Choosing to introduce innovations phased

- ▶ Investment banks phase innovations in if $\hat{\Pi}_B^i \leq \Pi_B^i$
- ▶ This gives $\alpha_i \geq \alpha^* = \frac{pC_D - (1-(1-p)^T) \max\{C_D - C_S, 0\}}{(1-(1-p)^T) \min\{C_D, C_S\}} < 1.$

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- ▶ **Small** investment banks prefer to introduce innovations in **one step**

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Choosing to introduce innovations phased

- ▶ Investment banks phase innovations in if $\hat{\Pi}_B^i \leq \Pi_B^i$
- ▶ This gives $\alpha_i \geq \alpha^* = \frac{pC_D - (1 - (1-p)^T) \max\{C_D - C_S, 0\}}{(1 - (1-p)^T) \min\{C_D, C_S\}} < 1$.
- ▶ Small investment banks prefer to introduce innovations in one step, **large** investment banks prefer to **phase in** innovations

Choosing to introduce innovations phased

- By comparing the profits of the phased and full introduction of innovations, we can now determine the condition under which a phased introduction is preferred.
- ▶ If the profits to investment banks of phased introductions are higher than those of a immediate introduction, then the phased introduction is used.
 - ▶ We can solve the condition for the minimum market share required to introduce innovations phased. To obtain this, we also solve the geometric sum and note that $C_D - \max\{C_D, C_S\} = \min\{C_D, C_S\}$.
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- ▶ Small investment banks prefer to introduce innovations in one step, large investment banks prefer to phase in innovations
- ▶ Small investment banks attract the large remaining market, even though they make little profits from the **single step**

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- Problem and model assumptions
- Controversial innovations
- Phasing of innovations
- Selling innovations**
- Optimal strategy for small banks
- Summary

- Investment banks do not necessarily have to sell their innovations directly to the clients of other investment banks. Instead they may sell the innovation to other investment banks, who then in turn sell the innovation to their own clients.
- We will explore the desirability of following such a strategy now.

Sale price

- We will look first at the price the investment bank can obtain when selling an innovation to another investment bank.
- ▶ We assume here that the innovating investment bank may sell the innovation to one other investment bank and that investment bank has then exclusive use of the innovation; the purchaser of the innovation is itself not allowed to sell the innovation to the clients of other investment banks, just its own client base. We assume further that the original innovator selling the innovation forfeits its right to sell the innovation, it will only be the purchaser of the innovation who is able to sell the innovation; this is done to avoid perfect competition between the two (or more) banks for clients, eroding profits.
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 - The highest price that can be obtained for selling the innovation is the profits the purchaser obtains.
 - These profits are given by its own client base, thus its own market share is relevant for the assessment of the price.
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 - The innovation cannot be sold for more than the cost of delaying its adoption
 - as otherwise the clients would delay adopting the innovation.
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 - The price the purchaser can charge can also not exceed the switching costs,
 - as we also need to prevent the clients of the purchaser of switching to the original innovator.
- ▶ The maximal price that can be charged will thus be the charge the purchaser will make to each of its clients, where we take into account the number of clients the investment bank in the market. Although the purchaser has obtained the exclusive right to sell the innovation to its own clients, we assume that they would not charge a price that is higher makes clients worse off than when they had purchased the innovation from the innovator directly; this is done to prevent the clients accusing their investment bank of profiteering at their expense.
- We will now look at the profits the innovating investment bank will make when not selling the innovation.

Sale price

- ▶ An investment can **sell** an innovation to another investment bank rather than introducing it itself

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- ▶ Price: $P = \alpha_j N \min \{C_D, C_S\}$

- We will look first at the price the investment bank can obtain when selling an innovation to another investment bank.
- ▶ We assume here that the innovating investment bank may sell the innovation to one other investment bank and that investment bank has then exclusive use of the innovation; the purchaser of the innovation is itself not allowed to sell the innovation to the clients of other investment banks, just its own client base. We assume further that the original innovator selling the innovation forfeits its right to sell the innovation, it will only be the purchaser of the innovation who is able to sell the innovation; this is done to avoid perfect competition between the two (or more) banks for clients, eroding profits.
- ▶
 - The highest price that can be obtained for selling the innovation is the profits the purchaser obtains.
 - These profits are given by its own client base, thus its own market share is relevant for the assessment of the price.
- ▶
 - The innovation cannot be sold for more than the cost of delaying its adoption
 - as otherwise the clients would delay adopting the innovation.
- ▶
 - The price the purchaser can charge can also not exceed the switching costs,
 - as we also need to prevent the clients of the purchaser of switching to the original innovator.
- ▶ The maximal price that can be charged will thus be the charge the purchaser will make to each of its clients, where we take into account the number of clients the investment bank in the market. Although the purchaser has obtained the exclusive right to sell the innovation to its own clients, we assume that they would not charge a price that is higher makes clients worse off than when they had purchased the innovation from the innovator directly; this is done to prevent the clients accusing their investment bank of profiteering at their expense.
- We will now look at the profits the innovating investment bank will make when not selling the innovation.

Sale price

- ▶ An investment can sell an innovation to another investment bank rather than introducing it itself
- ▶ The most it can be sold for is the profit it gives the buyer, who has market share α_j
- ▶ Maximum price for selling the innovation to clients is C_D to avoid then delaying adoption
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High switching costs

High switching costs

- We first consider the case where switching costs are high, namely above the costs of delaying the adoption of the innovation.
- ▶ If the costs of switching are higher than delaying the adoption, it is clear that clients rather wait to adopt the innovation than switch to another investment bank to obtain the innovation immediately. Thus the original investment bank will only be able to sell the innovation to its own clients and they will seek to extract all surplus by charging the delay costs to each of its clients.
- ▶ Using that the switching costs are higher than the delay costs, the price the investment bank can obtain from selling the innovation is given by the *formula*.
- ▶ Comparing profits, it is clear that the innovating bank would sell its innovation to the largest bank in the market that would give the larger profits, provided the largest investment bank is larger than the innovator itself.
- ▶ We thus find that, except for the case of the larger investment bank, an innovation will always be sold if switching costs are high. This is because the innovating bank cannot attract new clients and hence would benefit from the larger market share of other investment banks.
- The market share of investment banks here have to be interpreted as the market share in the clients to whom the innovation is providing benefits, it would not be the size of the investment bank overall in terms of client numbers; we have to focus on the fraction in the relevant part of the market for the specific innovation.

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- ▶ If $C_S > C_D$, no clients will switch, seller i obtains $\Pi_B^{i,t} = \alpha_i N C_D$ if retaining the innovation

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- We now turn to the more realistic case of low switching costs; those that are below the costs of delaying the adoption of the innovation.
- ▶ In the case of low switching costs, the innovating bank would attract new clients from other investment banks and makes profits as outlined above.
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- ▶ The profits of the innovating investment bank is the price it obtains from selling the innovation and it would do so only if it is more profitable than selling the innovation itself.
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- ▶ We thus see that small investment banks prefer to sell their innovations, while larger investment banks sell the innovation to clients directly. The reason is similar to before in that the larger client base of the purchasing investment bank allows them to make higher profits, even though the original would be able to attract new clients, albeit at a low profit margin due to switching costs. We easily see that for this condition to be fulfilled, the purchasing investment bank has to be larger than the selling investment bank.
- ▶ The larger the purchasing investment bank is, α_j , the larger the selling investment bank can be. However, it is now not only the largest investment bank that would not sell the innovation, but due to the attraction of new clients, some smaller - but still relatively large, investment bank might also not sell their innovation.
- We have thus established that small investment banks tend to sell their innovations to larger investment banks rather than sell directly to clients.

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- ▶ If $C_S \leq C_D$, then the revenue from not selling is
$$\Pi_B^{i,t} = \alpha_i N C_D + (1 - \alpha_i) N \max \{C_D - C_S, 0\}$$

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- Problem and model assumptions
- Controversial innovations
- Phasing of innovations
- Selling innovations
- **Optimal strategy for small banks**
- Summary

- Having established that small investment banks are introducing financial innovations immediately and selling the innovation to larger investment banks, we can now compare the profits from selling an innovation and its phased introduction.
- From this comparison, we can then derive the optimal strategy of small investment banks.
- We have already seen that larger investment banks would not sell their innovations and use a phased introduction.

Selling, phasing in, immediate release

- We can now use the profits generated to innovating investment banks to sell the innovation, or retain it and then either phase it in or release the innovation immediately.
- ▶ For small switching costs, we see that the profits from immediate release of the innovation and obtaining the full market share, is preferable to selling the information to an investment bank that is only able to capture a part of the market. Hence, the investment bank will introduce the innovation immediately and not sell it.
- ▶ We also know that larger investment banks will phase in the innovation, regardless of switching costs.
- ▶ We also know that smaller investment banks will sell their innovations, regardless of switching costs.
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 - We can now show that the choice between phasing in innovations and selling them is made in favour of selling the innovation, if the *formula* is fulfilled.
 - This condition requires that the investment bank purchasing the innovation, α_j , is sufficiently large.
- The smallest investment banks never sell their innovations but release it immediately to gain the full market share

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- ▶ If $C_S \leq C_D$, then $\Pi_B^{i,t} = NC_D \geq \alpha_j NC_D$ and the innovation is not sold but **immediately introduced**

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- ▶ If $\alpha_i \geq \alpha^*$, innovations are **phased in**

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 - We can now show that the choice between phasing in innovations and selling them is made in favour of selling the innovation, if the *formula* is fulfilled.
 - This condition requires that the investment bank purchasing the innovation, α_j , is sufficiently large.
- The smallest investment banks never sell their innovations but release it immediately to gain the full market share

Selling, phasing in, immediate release

- ▶ If $C_S \leq C_D$, then $\Pi_B^{i,t} = NC_D \geq \alpha_j NC_D$ and the innovation is not sold but immediately introduced
- ▶ If $\alpha_i \geq \alpha^*$, innovations are phased in
- ▶ If $\alpha_i \leq \alpha^{**}$, innovations are **sold**

- We can now use the profits generated to innovating investment banks to sell the innovation, or retain it and then either phase it in or release the innovation immediately.
- ▶ For small switching costs, we see that the profits from immediate release of the innovation and obtaining the full market share, is preferable to selling the information to an investment bank that is only able to capture a part of the market. Hence, the investment bank will introduce the innovation immediately and not sell it.
- ▶ We also know that larger investment banks will phase in the innovation, regardless of switching costs.
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Sale and introduction strategy

- We can now summarize the different strategies that are employed by investment banks when developing financial innovations.
- ▶ We can look at innovating investment banks of different sizes and clients with different switching costs, as well as different sizes of the bank purchasing the innovation, if applicable.
- ▶ Very small investment banks would introduce innovations immediately and thereby attract the entire market, making selling the innovation not attractive.
- ▶ Larger investment banks would phase in the introduction of the innovation rather than sell it, provided they are either relative large ($\alpha_i > \alpha^{**}$) or the largest investment bank willing to purchase the innovation is relatively small ($\alpha_j \leq \bar{\alpha}$). Here the benefits from a sale or low as the market of the innovating investment bank itself is already sufficiently large.
- ▶ If their the switching costs are small or the purchasing investment bank is large, the innovating investment bank would sell the innovation.
- We can thus conclude that small investment bank will tend to either immediately introduce innovations or sell them; the large an investment bank becomes the more likely it is that they would phase in the innovation instead.

Sale and introduction strategy

	$C_S > C_D$		$C_S \leq C_D$
	$\alpha_j \leq \bar{\alpha}$	$\alpha_j > \bar{\alpha}$	
$\alpha_i \leq \alpha^*$			
$\alpha^* < \alpha_i \leq \alpha^{**}$			
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- Problem and model assumptions
- Controversial innovations
- Phasing of innovations
- Selling innovations
- Optimal strategy for small banks
- **Summary**

- We can now summarize the key results we have obtained about the way investment banks introduce financial innovations.

Strategies for banks of different sizes

- We can differentiate the strategies banks should following, depending on their size. Size here refers to their market share in the number of clients that would benefit from the specific financial innovation that has been developed. While there will in general be a correlation between the general size of an investment bank, for example in terms of its revenue, there can be substantial differences, especially for innovations that are aimed at the needs of clients in specific countries, industries, or with other specific characteristics.
- ▶ We have seen that the smallest investment banks will always introduce financial innovations themselves and immediately in full. This allows them to gain the full market for their innovation by attracting a large number of new clients.
- ▶
 - Slightly larger investment banks will either seek to extract more surplus from clients by phasing in the innovation, even if they attract only few new clients with this strategy.
 - If another, sufficiently large investment bank will buy their innovation, they might sell it.
- ▶ Larger investment banks will always phase in innovations as selling it would not give them sufficient additional revenue, given the large market share they already have.
- ▶ If clients have low switching costs, then phasing in innovations is not feasible as a sale of the innovation gives the investment bank a higher profit.
- We also see from this result that large investment bank will either phase in their own financial innovations or acquire financial innovations that have been developed by smaller investment banks.

Strategies for banks of different sizes

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Strategies for banks of different sizes

- ▶ Investment banks with small market share will always seek to introduce innovations immediately to gain market share
- ▶ **Medium-sized** investment banks will either **phase in** any innovations to extract more surplus from their clients

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- ▶ Investment banks with small market share will always seek to introduce innovations immediately to gain market share
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- ▶ Investment banks with small market share will always seek to introduce innovations immediately to gain market share
- ▶ Medium-sized investment banks will either phase in any innovations to extract more surplus from their clients, or if a sufficiently large investment bank buys their innovation, sell it
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Innovative investment banks

- We can now look at the implications of these strategies for the perception of investment banks in the market.
- ▶ Small investment banks will be seen as the most innovative investment banks due to them introducing any innovations in a single step, making it look like they have developed a significant financial innovation.
- ▶ In contrast to that, larger investment banks will often be seen as only offering small, incremental innovations that improve existing products or process. Financial innovations might also include innovations in the process such as making payments, online facilities, the use of artificial intelligence to the benefit of clients, and similar.
- ▶ For mid-sized investment banks it seems that they are often cooperating with larger investment banks; often the sale of an innovation is marketed as a cooperation between the two investment banks such that the purchasing investment bank is seen in a more positive light as (wrongly) implying that they have contributed to the financial innovation in a meaningful way. they might have used their larger client base to adjust the details of the financial innovations to a larger number of clients, while the key innovations might well have been provided by the smaller investment bank.
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