The Durbin Amendment to the Dodd-Frank Act

Lucas Perin[†]

I. Introduction and Overview

The Wall Street Reform and Consumer Protection Act of 2010, henceforth called the "Dodd-Frank Act", was signed into law by President Obama on July 21, 2010. Section 1075, henceforth called the "Durbin Amendment", is a provision in the Dodd-Frank Act that introduces changes to the market for debit card transactions.

According to Senator Richard Durbin (D-IL), who introduced the law, its purpose is to "prevent giant credit card companies from using anti-competitive practices (...) by requiring debit card fees to be reasonable (...) making sure small businesses can grow and prosper."

The debit card market in the United States is very large, with more than 500 million debit cards in circulation. The two major debit card networks, Visa and MasterCard, processed $1.4 trillion dollars in debit card purchases in 2010, representing 19% of the personal consumption expenditures in nondurable goods and services excluding housing. Given the size and importance of this market, changes introduced by regulation can have significant impact in the economy.

As it is common with legal issues, terminology can play a major role in the actual impact of the law, as can be seen even in Sen. Durbin's quote above: even though the amendment targets specifically the **debit** card interchange fee, its purpose is to prevent "(...) giant **credit** card companies (...)" from using anti-competitive practices. Another terminology subtlety is that the law targets "interchange fees", which are particular to specific participants in the debit card market. In this work, I use the financial markets framework to analyze the

[†]lmperin@uw.edu. Prepared for B ECON 520 Winter 2011.

impact of this legislation.

This paper proceeds as following: Section II describes the mechanics of how the payment system and its fees work. Section III describes market power in the debit card market. Section IV describes the changes introduced by the Durbin Amendment and section V describes the reaction of market participants. Section VI discusses the impacts of the Durbin Amendment on the market for financial services. Section VII concludes. The models used throughout this paper are in the appendix. A model for financial markets is in Appendix A and a simple model for payment systems is in Appendix B.

II. The Debit Card Payment System and Interchange Fees

The debit card payment system is a two-sided platform business. A platform business provides the infrastructure for two different types of participants to interact. Loosely speaking, all regular markets are two-sided platforms. One of the main differences between a regular market and a two-sided platform is that a two-sided platform has always at least three parties: the two transacting parties and a third party, the party who controls the platform. This party, the platform controller, is usually a profit-maximizing firm, and profits by charging platform usage fees above its costs. The controller is successful if it can bring appropriately large numbers of each transacting party to its platform. Two-sided platform businesses are frequently called "two-sided markets".

To see an illustration of a two-sided platform business, consider the following two cases: A beauty salon **may** attract men and women as clients, but a (heterosexual) dating service **must** attract both men and women in a certain proportion in order to exist. For another example, computer operating systems are platform businesses that bring users and developers of applications to a single platform. Larger number of application developers make the

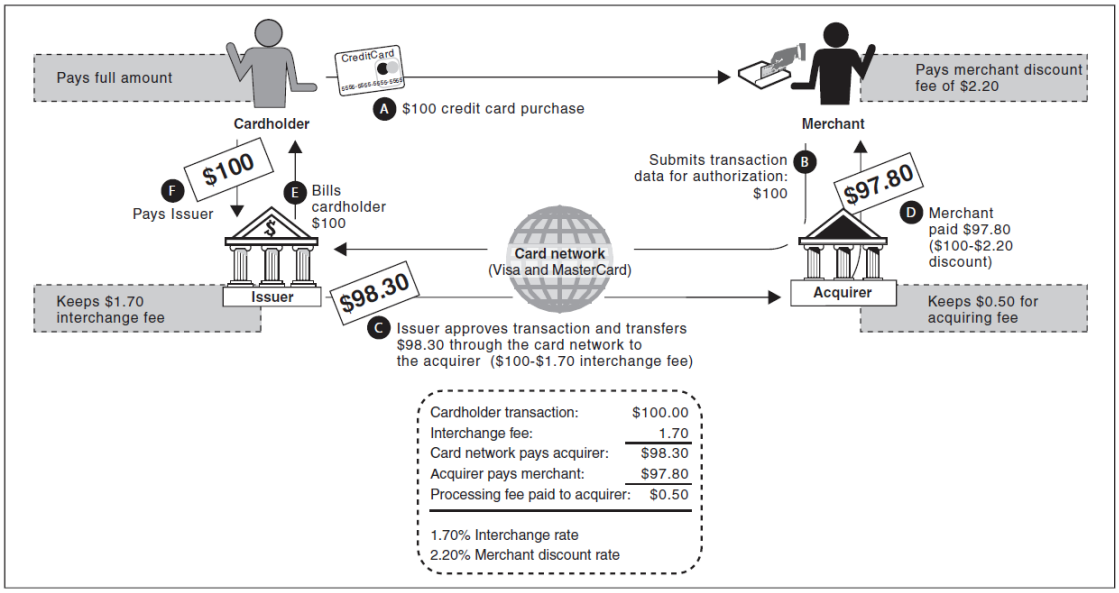

Figure 1 : A typical transaction

platform better for users, and large numbers of users make the platform better for application developers. The platform controller needs to find the appropriate pricing level and structure to bring both users and application developers to the platform in desirable proportions. Similarly, debit card payment systems must attract merchants and cardholders in a certain proportion in order to be successful. In two-sided platform businesses, frequently one of the users of the platform subsidizes the other to a certain extent, sometimes fully. In the operating systems example, users pay for the operating system, while developers usually get the operating system and many other applications for free. Therefore, in this case, users subsidize the participation of developers. In the debit card market, merchants subsidize cardholders.

In a typical debit card transaction shown in Figure 1, up to five parties are involved. The consumer starts the transaction by making a purchase (in Figure 1, for $100). When executing the transaction, the merchant pays a **discount fee** (in Figure 1, 2.2% of the transaction) to its bank, the *acquirer*. The acquirer keeps a portion of the $2.20 to itself (50¢), and pays

the remainder to the *issuer* as an **interchange fee**. Issuers and acquirers pay a percentage of the transaction to the *network* that connected them (the fee paid to the network is not represented in Figure 1). The debit card market worldwide usually takes one of two principal forms: three-party systems and four-party systems. Two of the parties are always cardholders and merchants. The remaining one or two parties are financial intermediaries, such as banks.

A three-party system is comprised of merchants, cardholders and a single intermediary that offers both payment processing and cards. Three-party systems are also called unitary payment systems, because there is just one intermediary. The intermediary performs the role of the issuing bank, the acquiring bank and the network in Figure 1. In the United States, American Express is such an example of a three-party system, as are cards offered by stores, such as Macy's and Neimann-Marcus. The intermediary usually chooses to obtain its revenues from merchants and subsidize the cardholders. For example, according to American Express' 2010 income statement issued in January 24, 2011, 66% of their revenue ($15B) came directly from merchant fees. Cardmembers paid $2B in membership and other fees, but received $5.6B in cardmember rewards and benefits.

The other type of a debit card market is a four-party system: merchants, cardholders, card issuing banks and merchant acquiring banks. A fifth participant, a network such as Visa or MasterCard, provides the platform that connects issuing banks and acquiring banks. In a debit card transaction, the card issuing bank and the merchant acquiring bank can be different, or they can be the same. If the acquiring and receiving bank are the same, the bank keeps both the acquirer fee and the issuer fee. Similarly to three-party systems, most revenues come from merchants: cardholders are usually subsidized.

Given its terminology, the Durbin Amendment is aimed specifically at the four-party debit card payment processing system, of which Visa (NYSE:V) has about 80% market share.

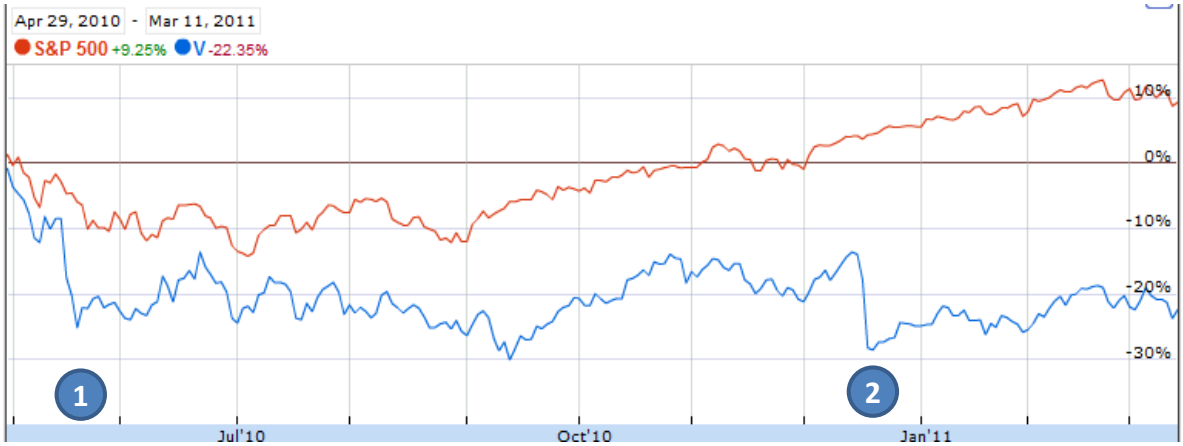

Figure 2 : Visa (NYSE:V) stock performance May 2010-Feb 2011

Figure 2 shows the impact of the Durbin Amendment on the valuation of Visa. The drop in stock price near item (1) in the figure happened on the day the amendment was passed, May 13, 2010, and the drop in stock price near item (2) happened on the day the Federal Reserve published its draft rules, December 16, 2010. As it can also be seen in the figure, Visa hasn't participated in the recent S&P 500 rally.

III. Market Power in the Debit Card Market

The debit card market has some features in common with markets where companies have large market power:

- **Concentration:** Visa and Mastercard held more than 90% of the market for debit signature-based cards in 2010[1].

[1]http://www.nilsonreport/com/pdf/1freeissue.pdf

- **Coordinated price adjustments:** Visa and Mastercard's prices are on average the same, and change at similar times[2].

- **Price discrimination:** Interchange fees have several price discrimination features. The interchange fee is different by volume, customer type and retailer type[3]. It also has a fixed component (usually 20¢) and a variable component, usually set as a percentage of the whole transaction. Merchants are contractually prohibited offering discounts for other payment systems or surcharges to debit cards. This is commonly called NSR (no surcharge rule) in the payment system industry.

- **Exclusivity agreements:** Cards are tied to specific networks and contracts prevent processing payments in other networks.

- **Bundling:** If a merchant honors one card from a network, it has to honor all cards. This type of rule is commonly called HAC (honor all cards) in the payment system industry.

Such features have attracted the attention of regulating authorities worldwide. The interchange fee was regulated in Australia and regulation and anti-trust actions are happening in the European Union[4].

IV. The Durbin Amendment

The Durbin Amendment introduces the following changes by inserting a new section (Sec. 920) in the Electronic Funds Transfer Act:

- Subsection (a) requires the Fed to regulate the interchange fee of debit cards. The Fed

[2]http://www.digitaltransactions.net/index.php/news/story/1311. No collusion is implied.
[3]http://usa.visa.com/download/merchants/october-2010-visa-usa-interchange-rate-sheet.pdf
[4]http://europa.eu/rapid/pressReleasesAction.do?reference=IP/07/1959

regulation imposes a cap of 12¢ on interchange fees, from a previous average level of 44¢. The law requires the interchange fee to be "reasonable and proportional to the cost incurred by the issuer with respect to the transaction". Small issuers, defined as issuers with assets less than $10B, are exempt from this portion of the legislation, as are prepaid cards and government cards. Unitary systems are also exempt, as even though they charge discount fees, they don't charge interchange fees. Note that by the definition of costs "incurred by the issuer with respect to the transaction" above, fixed costs and capital costs, as described in equation (3), are likely excluded from the calculation of the transaction cap.

- Subsection (b)(1) prevents issuers and networks from restricting the number of payment card networks to a single network or only to networks affiliated with the issuer.
- Subsection (b)(3) prevents issuers and networks from forbidding merchants to offer discounts or in-kind incentives for payment types.

V. Reaction to the Durbin Amendment

Large banks and networks have firmly opposed the amendment[5]. Small merchants, on the other side, have shown strong support for it[6]. Rep. Barney Frank (D-MA), the "Frank" in the Dodd-Frank Act, also opposed the amendment [7]. Small banks, defined by the law as banks with assets less than $10B, are exempt from the fee cap and also oppose it[8] [9].

When the legislation was introduced, Senator Durbin's argument was that networks and large banks were using their market power to make large profits by hiking fees and preventing

[5]http://www.reuters.com/article/2011/03/11/financial-regulation-interchange-idUSN1112859420110311

[6]http://thehill.com/blogs/on-the-money/banking-financial-institutions/148639-small-business-owners-head-to-capitol-to-push-durbin-amendment

[7]http://blogs.reuters.com/columns/2011/03/09/u-s-16-bln-debit-fee-clampdown-needs-a-do-over/

[8]http://www.cuna.org/newsnow/11/wash031011-3.html

[9]http://www.washingtonpost.com/wp-dyn/content/article/2011/02/04/AR2011020406110.html

competitors from entering the market, and that his proposed legislation would increase competition[10]. Interestingly, although banks opposed the measure, their argument is also based on the existence of their market power: banks claim that the debit card fees are very profitable, and if restricted, some services that are now "free" (more precisely, subsidized by the debit card fees) will become paid[8]. Some of these services, according to the banks, are debit card membership and checking accounts.

When a similar measure was enacted in Australia in 2006, consumers faced increased fees and reduced benefits. According to a study performed by Australia's central bank, the average increase in checking account fees was 12% and the reduction in benefits was 7%. In contrast, the reduction in average interchange fees paid was 43%[11], indicating that funds have, in fact, left the payment system and possibly the banking system as a whole. To my knowledge, there is no study that shows whether this reduction in funds improved social surplus in Australia.

VI. Impact of the Durbin Amendment on Financial Services

This section uses the models in Appendix A and B to analyze the impact of the Durbin Amendment in the US financial market.

A. The interchange fee cap

The major impact from the Durbin Amendment comes from the provision that institutes a cap on the transaction fee. As discussed in Appendix B, having a low-cost provider of a payment system can increase social surplus. If the transaction fee cap is set below its current level but at or above the costs that financial intermediaries incur in order to provide the

[10] http://durbin.senate.gov/showRelease.cfm?releaseId=324958
[11] http://www.rba.gov.au/publications/annual-reports/psb/2010/html/dev-payments.html

service, financial intermediaries' profits will be lower. If financial intermediaries can increase prices by the same amount in other services, such as free checking, or reduce benefits, such in as credit card rewards, social surplus for the financial market that includes payment system and the other services will be the same.

If the financial intermediary cannot increase the prices in other services, costs of financial intermediation for borrowers and savers will decrease, and this can result in larger surplus for both. Financial companies will become less profitable, and either merchants will become more profitable, consumers will have more funds to save or there will be a linear combination of these two.

If the transaction fee cap is set below the total costs of financial services providers, some providers will exit the market. Total costs, as shown in equation (4), include the capital costs. The major criticism of the rules set by the Fed is that they do not take capital costs into account: they are just considering transaction costs, as mandated by the law in section 920(a)(4)(B)(ii)[12]. This may mean that some issuers will stop offering debit cards.

The cap is targeted at banks that have assets larger than $10B. Therefore, these banks are more likely to reduce their participation than smaller banks, but these larger banks are also more likely to have the larger economies of scale. For example, JP Morgan's initial assessment from their last analyst call is that may have to reduce their current customers by 5%[13].

The main diseconomy, however, is likely to come from diseconomies of scope. The debit card market profitably provides financial institutions with information: by analyzing transactions, they can monitor merchants, which lowers the cost for their monitoring. Banks can also get better information for project valuation, since the payment system provides information on

[12]http://financialservices.house.gov/media/pdf/021711floum.pdf

[13]http://www.paymentssource.com/news/another-durbin-outcome-could-be-more-unbanked-3004689-1.html

revenue streams of retailers. A larger number of retailers and consumers in their network also reduces counterparty search costs, as more retailer consumer information will be in the system used by other bank-provided services. Analyzing a larger set of transactions also helps financial institutions better estimate liquidity needs and detect fraud. If a financial institution is forced to leave this market, these economies of scope may be lost.

In summary, the interchange fee cap is likely to make revenues in equation (8) less than costs, especially by not taking capital costs into consideration, which in turn will make some providers exit this market or direct consumers to other payment systems that have unregulated pricing, causing diseconomies of scale, scope and specialization.

B. Preventing contractual restrictions on number of networks for a card

The law requires that each debit payment instrument should accept a minimum number of two networks. In the US, debit cards identify customers in two different ways: using a PIN and using a signature. The law requires two networks per instrument, and the Fed is tasked with deciding whether PIN and signature cards are the same instrument or two different instruments. The law also enables merchants to decide to which network they will route a consumer's purchase. Being rational, is expected that they are going to route it to the lowest cost provider given a quality threshold.

The major diseconomy that this regulation could bring is in fraud detection. If more than one network exists, it is harder to detect fraudulent behavior, especially if the detection depends on time differences between purchases. Both the issuing bank and the network provider have access to the data necessary to provide fraud detection. This service is currently provided by the network (Visa or Mastercard), as there are economies of scale, scope and specialization of having this service being provided by the network instead of being provided by the issuing banks. With more than one network, issuing banks will be required to perform it themselves,

causing diseconomies.

On the other hand, having more networks in the market can lead to technical innovation. As more networks enter the market, they will compete for market share, and this can lead to technical improvements. Suppose that a technical innovation would make consumers and merchants better off but the exclusive network provider slightly worse off. For example, the innovation could improve checkout time but would cost the network slightly more. There is no incentive for the network provider to introduce this innovation: because of the exclusivity contracts, the network cannot increase their market share and no other entity can introduce this innovation. By forcing instruments to work in more than one network, the law increases the probability of innovations being introduced and increasing social surplus.

C. Preventing contractual restrictions on incentives for alternative payment methods

Current contracts between networks and merchants prevent merchants from charging fees and from offering discounts if a consumer chooses a payment type. The Durbin Amendment changes this by allowing the merchant to offer discounts for payment types.

Suppose that there exists a payment type that provides better social surplus than debit cards. To prevent the case where the merchants would have foreseen and priced this, assume this happened because of an unforeseen shock - for example, Visa and Mastercard increased the prices of debit card usage. Suppose also that for the new payment method, the surplus for the consumer is slightly lower, but the surplus for the merchant is much higher, more than offsetting the loss in surplus by the consumer. With the current contractual rules, this payment method won't be chosen by the consumer at the checkout, and therefore, won't be used. The additional social surplus will be lost.

For another example, rewards cards have higher interchange fees than cards with no rewards.

When estimating the return on accepting debit cards, merchants have to make estimates of the proportion of types of cards that will be presented to them during a given period. Imprecise estimates will affect the merchants' profitability. Banks and networks can collect rent from merchants by increasing the usage of rewards cards by giving away more rewards cards, or by creating promotions that drive more usage of these cards. "Honor All Cards" and "No-Surcharge" rules prevent merchants from responding to these promotions.

The positive effect of the amendment is that the merchant can now compensate the customer for the loss in surplus from using a different payment type. The negative side is that this can increase the complexity at the checkout. Some efficiency may be lost as consumers try to decide what is the better option for them, especially as the option may be complex and change very frequently given the potential large number of promotions from multiple networks, issuers and acquirers.

On the other hand, diseconomies can happen if a significant portion of consumers moves to cash or moves to institutions that do not yet have the necessary expertise to collect the appropriate information (such as smaller banks), as there will be much less information in the system. Also, by observing patterns in debit and credit transactions, banks can better estimate the true price of consumer credit. If transactions leave the system, banks will have more difficulty discovering the true price of consumer credit. One such example is transaction amounts - in the debit card system banks can have access to transaction amounts per consumer and per merchant. If consumers move to cash, this information is not available any more - even if the merchant keeps an account with the financial institution, all the financial institution will see is a deposit at the end of the day or at the end of the week. Collecting the necessary information for better estimates can become more costly.

VII. Summary and Conclusion

The Durbin Amendment to the Dodd-Frank Act introduces changes that stimulate competition between financial institutions and a provision that reduce revenues for financial institutions by setting a price cap. The former can increase surplus, although there are potential diseconomies. The latter is likely to reduce social surplus, unless regulators can set the revenue cap precisely.

The price-setting provision may be unnecessary, as the two other provisions may be sufficient to empower merchants and consumers to adjust prices in the market without being constrained by the contractual rules currently imposed by financial institutions. Setting a price cap would require very precise estimates and constant adjustments, which are costly. Also, the law constrains the types of inputs that can be used in order to determine the estimates, by requiring that only costs related to the transaction to be included, making it even harder for government to set an optimal cap.

The Durbin Amendment also requires the Fed to offer periodic reports about the payment systems market. This is generally positive. It gives more researchers and policymakers access to data that can be used to better understand the effect of policies in this area. Banks have argued that the amendment will just shift profits from the banks to the merchants and consumers will not see the effects. By analyzing economic profits of financial institutions and retailers and using the data about usage of the payment system, it may be possible to test the validity of this argument.

Appendix

A – The Financial Markets Model

A. Participants - Borrowers, Lenders and Intermediaries

People can participate in financial markets as savers, borrowers and intermediaries. Borrowers and lenders participate in financial markets to:

- **smooth consumption:** People may increase their utility by borrowing to consume at a higher level than their income would allow at a given period, or by lending when they have excess funds and would prefer to save in order to consume in a future period.
- **finance investments:** Net present value projects increase wealth, which increases consumption, which increases utility. However, some investments are large enough that owners of firms need to finance them by selling claims to other (and sometimes, multiple) entities.
- **share risks:** people may have different risk preferences, and financial markets enable people with high risk aversion to pay to transfer risk to people with low risk aversion.
- **diversify risks:** financial markets enables people to construct portfolios that match their risk preference, reducing the cost of capital for borrowers. This increases the net present value of projects, increasing wealth, which increases consumption, which increases utility.

Financial markets and intermediaries exist to reduce the costs that savers and borrowers would incur in order to transact. These costs are information costs and transaction costs. A financial market is operationally efficient if it minimizes these costs, therefore maximizing investors' and savers' surpluses.

B. A Perfect Financial Market

In a **perfect financial market**, transaction and information costs are zero. All information is communicated to all borrowers and savers instantaneously and costlessly. In such a market, investors' demand for funds is downward sloping due to the law of diminishing returns. This line is denoted "I perfect market" in Figure 3. The height of the line denotes the marginal rate of return on that quantity of investment. Similarly, we can describe the supply of funds provided by savers by an ascending curve. The height of the curve is the rate of time preference - as the rate increases, more savers are going to be willing to forfeit present consumption in order to save for future consumption.

The market converges to equilibrium instantaneously, and clears at the point where the borrowers' demand for funds equals the lenders' supply of funds. The interest rate paid by the borrowers is equal to the interest rate received by the lenders and the amounts borrowed and lent are as large as they can simultaneously be. In the classical economic framework of supply and demand, this maximizes both savers' and borrowers' surpluses.

The equilibrium interest rate for the perfect market will be denoted by r_{pm}, and will be the same for borrowers and savers. At this rate, a quantity q_{pm} of savings and investments are made. Note that for investments less than q_{pm}, the marginal rate of return is greater than the market equilibrium rate r_{pm}, and, therefore, these projects have positive net present value. Therefore, this market creates a surplus for borrowers represented in Figure 3 by the area below the borrowers' demand curve labeled "I perfect market" the and above the market interest rate r_{pm}: investors would have paid more for capital to acquire funds for investments to the left of q_{pm}, but the market enabled them to acquire funds at a lower cost of capital.

Similarly, for savings less than q_{pm}, savers would have lent money even at a rate lower than r_{pm}. Therefore, the market also created a surplus for savers. In Figure 3, this surplus is

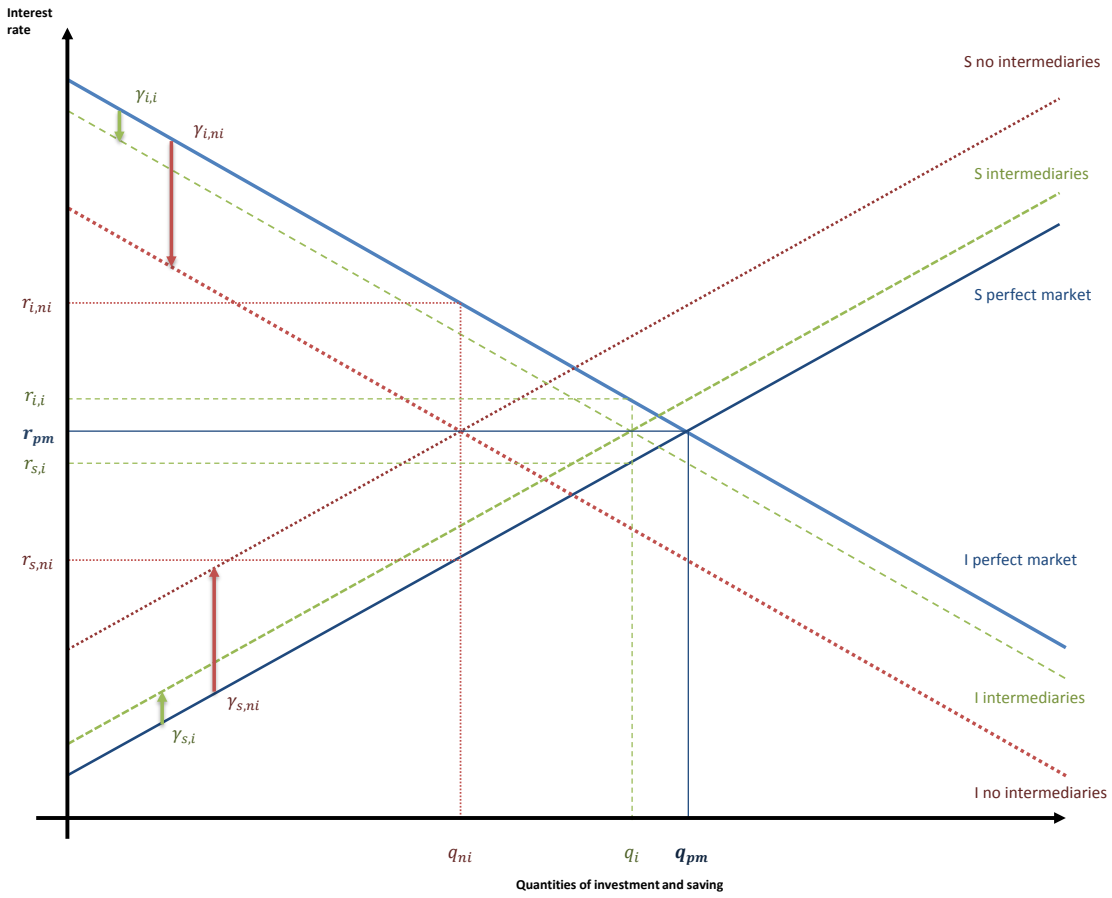

Figure 3 : The Financial Market Model

represented by the area above the "S perfect market" curve and below the r_{pm} line. The perfect market framework will be the benchmark used to measure the benefits of financial intermediation.

C. A market with no intermediaries

In contrast, in a **financial market with transaction costs but no intermediaries**, borrowers and lenders face transaction and information costs. Transaction costs are costs such as negotiating the terms of the transactions, writing contracts for the transactions, ensuring synchronized communication of the terms in multi-party transactions, transferring funds between lenders and borrowers, storing and transporting such funds, and adequately providing records of the transactions.

Information costs include costs on finding suitable trading parties to transact, estimating risks and payoffs for investments, discovering price, and monitoring the performance of borrowers to ensure that the funds are being appropriately. For this model, we assume that these costs are represented by $\gamma_{i,ni}$ for the costs faced by the borrowers and $\gamma_{s,ni}$ for the costs faced by savers. These costs shift both the savers' and borrowers' demand curves to the left.

Because of such costs, the net marginal rate of return on investments is equal to the marginal rate of return in a perfect market less the costs of acquiring funds, $\gamma_{i,ni}$. Similarly, the compensation required by savers for foregoing present consumption is the rate of time preference they would have in a perfect market plus the costs of saving $\gamma_{s,ni}$. The quantity of funds lent and borrowed clears at the quantity q_{ni}. Borrowers must now pay $r_{i,ni}$, a rate that covers$\gamma_{i,ni} + \gamma_{s,ni}$, as savers must receive the $r_{s,ni}$ to be induced to save q_{ni}. Therefore, the spread between the borrowing rate and the saving rate is the cost of participating in the market.

$$r_{i,ni} - r_{s,ni} = \gamma_{i,ni} + \gamma_{s,ni} \tag{1}$$

Since the rate paid by borrowers $r_{i,ni}$ is higher than the rate they would pay in a perfect market, r_{pm}, investors' surplus is smaller when there are transaction costs. The investors' surplus is now the area above $r_{i,ni}$ and below the "I perfect market" curve. Similarly, savers' surplus is also reduced, and is now represented by the area above the curve "S no intermediaries" and below $r_{s,ni}$. The collective loss in surplus is equal to the total cost of trading, and is represented by the rectangle with height $r_{i,ni} - r_{s,ni} = \gamma_{i,ni} + \gamma_{s,ni}$ and width q_{ni}.

D. A market with financial intermediaries

Suppose now that there are financial intermediaries that can reduce the costs $\gamma_{i,ni}$ and $\gamma_{s,ni}$ to market participants. With the reduction, information costs to participants are now $\gamma_{i,i}$ and transaction costs are now $\gamma_{s,i}$. When compared to a market with no intermediaries, the reduced costs will attract more savers and borrowers to the financial markets, as some investments that were unfeasible because of higher transaction costs will now become feasible with the reduced transaction costs. Similarly, lower transaction costs will increase the interest rate paid to savers, increasing the incentive to save, and therefore, the amount saved.

Consequently, the amount of funds lent and borrowed is going to be larger than in a market with no intermediation, and is represented as q_i in Figure 3. Hence, when compared to that market, investors' and savers' surplus will increase. Savers' surplus is the area above the curve "S no intermediaries" and below $r_{s,i}$ and borrowers' surplus is now the area below the curve "I no intermediaries" and $r_{i,i}$. From the borrowers and savers points of view, the spread is represented by:

$$r_{i,i} - r_{s,i} = \gamma_{i,i} + \gamma_{s,i} \tag{2}$$

From the financial intermediaries' point of view, however, the spread must cover their average variable costs, their average fixed costs, the percentage of expected loan losses and hopefully,

still leave some profits. Letting the variable costs be denoted by wL, the fixed costs be denoted by rK, the loan losses be denoted by LL and the profits be denoted by π, in order for financial intermediaries to exist we have to have:

$$\gamma_{i,i} + \gamma_{s,i} \geq \frac{wL}{q_i} + \frac{rK}{q_i} + \frac{\mathbb{E}(LL)}{q_i} + \frac{\pi}{q_i} \tag{3}$$

E. Cost levers of financial intermediaries

Assuming that w and r are determined by the market and that the costs of financial intermediaries are represented by the first three terms on the right-hand side of equation (3), financial intermediaries can reduce costs by:

- increasing the average product[14] of labor $\frac{q_i}{L}$,
- increasing the average product of capital $\frac{q_i}{K}$, or
- reducing expected loan losses.

Banks can achieve these costs reductions through **economies of scope**, **economies of scale** and **economies of specialization**.

Economies of specialization exist when specialized workers can perform a task faster and with better quality than non-specialized workers, and therefore produce more output using the same amount of labor. This ratio can be advantageous to the financial intermediary even if the wage of specialized work is higher, as long as the product $\frac{wL}{q_i}$ is lower for specialized workers. Economies of specialization are achieved by training, education and, most commonly, on-the-job experience.

Economies of scale exists when the financial institutions can spread fixed costs over larger quantities of output. Some of the latest investments to reduce average fixed costs were the

[14]Note the equations for average product of labor and capital are incorrect in the lecture notes, p.106

heavy investments in computing and equipment and the consolidation and outsourcing of several services, such as back-office paperwork processing and customer services operations.

Economies of scope exist when the joint production is less costly than separate production. Financial institutions appear to have economies of scope in many of the services they sell due to the reuse of information. For example, if a company has its payroll, accounts payable and accounts receivable with a bank, and lends money from the same bank in a separate transaction, it is easier for the bank to assess the company's ability to repay the loan and also to monitor the performance of the company after the loan is made.

In this model, financial institutions make their revenue through interest $r_{i,i} \times q_i$ and pay interest $r_{s,i} \times q_i$ to savers. Adding taxes and paid-in capital to the right-hand side of equation (3), we can have the financial institution profit equation:

$$\pi = IR - IE - FC - LLP - LC - TX - CC \tag{4}$$

where

- **IR:** Interest revenue, $r_{i,i} \times q_i$
- **IE:** Interest expense, $r_{s,i} \times q_i$
- **FC:** Total fixed costs, rK
- **LLP:** Loan loss provisions
- **LC:** Labor costs, wL
- **TX:** Taxes
- **CC:** Financial institution cost of capital, the amount of paid-in capital NW times the institution investors' required rate of return k_e.

F. Services provided by financial intermediaries

Financial intermediaries provide the following information services:

- **Counterparty search:** It is costly for borrowers to find matching savers and vice-versa. Financial intermediaries can facilitate the matching process by either taking a position in the transaction and asynchronously finding the other party (acting as a dealer), or by conducting the search without taking a position in the transaction (acting as a broker). Performing this service usually requires the intermediary to incur costs such as a meeting place, telecommunication systems and software to match borrowers and savers. Efficient financial institutions reduce their costs by spreading their fixed costs over a large number of transactions and by becoming more efficient in finding the appropriate borrowers and savers.

- **Project valuation:** Borrowers have incentives to understate the risk of their projects and to overstate their ability to repay a loan. The financial intermediary can provide valuations at lower costs if it possesses confidential information about the project, especially when taking a position in the project. The intermediary can also have economies of specialization, as data used for previous valuations can be used for future valuations. Many other services provided by intermediaries (monitoring, counterparty search, price discovery and payment systems) can also provide additional information that is used as an input for project valuation, generating economies of scope.

- **Price discovery:** If the market is imperfect, much of the information used to create estimates for interest rates for borrowing and lending can be incorrect. Therefore, the rates offered can also be incorrect, leading to over-investment or underinvestment, and consequently, sub-optimal amounts of savings and investments. Large financial institutions have information about a large segment of the market, and can more

precisely identify what the interest rates should be. As pointed before, there are economies of scope between this service and project valuation.

- **Monitoring:** After a borrower has received the funds, it can use the money in unintended ways. Lenders usually issue covenants when lending money, but it is costly to monitor compliance. Financial intermediaries may have a cost advantage in monitoring: they can have economies of specialization since they see many similar projects and can possibly detect undesired behavior. They can also have economies of scope - if the borrower uses their payment system (e.g., for accounts payable and accounts receivable), the financial institution may monitor the borrower at lower costs.

Financial intermediaries also provide the following transaction services:

- **Payment systems:** Financial transactions sometimes require the transfer of large sums, or the transfer of sums across geographical boundaries. Financial intermediaries have specialized software and telecommunication infrastructure that can be used to peform transfers of funds more efficiently.

- **Diversification:** Due to providing counterparty search, financial institutions have access to a large number of loans, bonds and stocks. They can have economies of scale by spreading their fixed costs over this large number of items. They also gain specialization by observing the returns and risk of a large number of securities, enabling them to have more accurate estimates of efficient portfolio frontiers, and, therefore, better portfolio management. There are economies of scope between search and diversification.

- **Maturity intermediation:** Borrowers typically demand credit for long-term projects or investments. Savers, however, want to have their money returned to spend in consumption. The maturities of borrowers may not always match the maturities of savers. Observing the behavior of borrowers and savers allows financial intermediaries to have

more accurate estimates of withdrawals and deposits, allowing financial intermediaries to provide instruments to best serve both borrowers and savers.

- **Denomination intermediation:** Projects usually require large amounts of capital, while most savers are households that save relatively small amounts. Financial intermediaries can break the large loans into small pieces and resell these smaller pieces to small savers. There are economies of scope between denomination and counterparty search.

- **Liquidity:** Both savers and borrowers value the ability of perform trades as fast as they risk preferences or estimates change. Financial institutions can provide liquidity by having a large pool of borrowers and savers from its search activities, and also by offering denomination and maturity intermediation services. Therefore, there is an economy of scope when financial intermediaries are used to perform trades. Financial institutions also perform a large number of transactions, and therefore may be able to estimate liquidity needs more accurately, reducing the cost of providing liquidity through specialization.

- **Hedging:** People have different risk preferences. Financial intermediaries can lower the cost of capital by enabling the transfer of risk between parties. There are economies of scope with counterparty search, diversification and maturity intermediation. There are also lower costs due to specialization as intermediaries can more accurately assess and create products that better match their clients' risk preferences.

B – A Payment Systems Model

A. Participants - Sellers, Buyers and Intermediaries

People participate in a payment system market as buyers, sellers and intermediaries. In the initial setup, I assume that there is a competitive market for only one product, and that transactions are costless, and done using a costless instrument: buyers and sellers have no cost acquiring or keeping that instrument.

B. A Costless Transaction Market

In **costless transaction market**, transaction costs are zero. The market converges instantly to an equilibrium price and quantity at the intersection of the demand curve from the buyers "B" and the supply curve from the sellers "S". I assume that the natural level of these curves are exogenous to the model.

The equilibrium price for the perfect market will be denoted by P_{pm}, and will be the same for buyers and sellers. At this price , a quantity q_{pm} of the product is sold and consumed. This market creates a surplus for buyers represented in Figure 4 by the area below the buyers' demand curve labeled "B perfect market" the and above the market price P_{pm}: buyers would have paid more to acquire product quantities to the left of q_{pm}, but the market enabled them to acquire the products at a lower cost. Similarly, for quantities less than q_{pm}, sellers would have sold at a price lower than P_{pm}. Therefore, the market also created a surplus for sellers. In Figure 4, this surplus is represented by the area above the "S perfect market" curve and below the P_{pm} line. The perfect market framework will be the benchmark used to measure the benefits of payment intermediation.

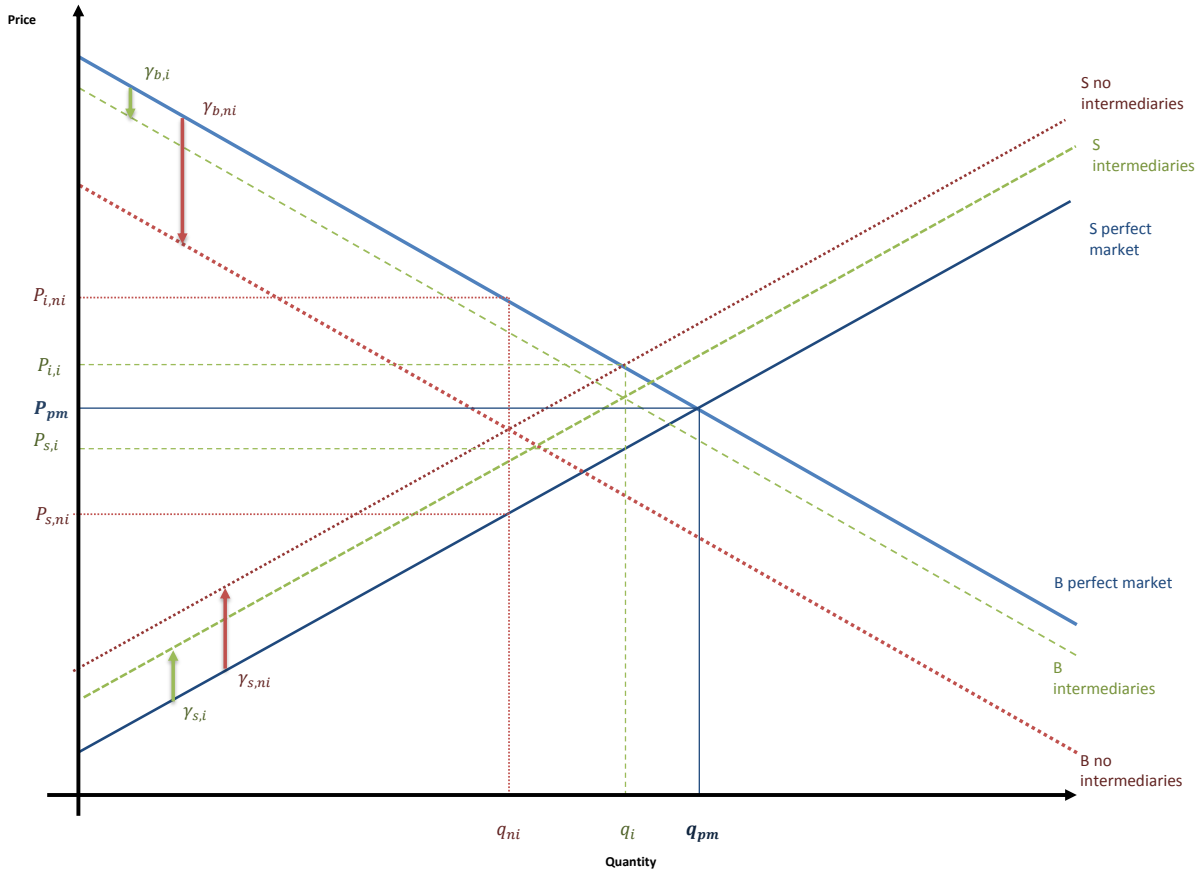

Figure 4 : A Payment Systems Model

C. A Costly Payment System

In contrast, we can assume that buyers and sellers face transaction costs. Assuming for illustration that the instrument is cash, some transaction costs for the buyer, represented as $\gamma_{b,ni}$ in Figure 4 are:

- The cost of obtaining cash (e.g. the time and expense to drive to a bank, the potential ATM fee)
- The cost of protecting oneself of risk of carrying cash for large purchases
- The cost of creating reports for controlling expenses

Similarly, there are costs for the sellers, represented as $\gamma_{s,ni}$ in Figure 4. Using cash as an illustration, some potential costs are:

- The cost of maintaining a cash balance in several denominations for change
- The cost of detecting counterfeiting
- The cost of the time and expense to withdraw and deposit cash
- The potential losses from theft
- The cost of creating reports to control revenues

These costs shift both the sellers' supply curve and the buyers' demand curve to the left. Usually, we would just determine the new price and quantity at the intersection of the shifted demand and supply curves, but to make the costs clear, we will assume instead that the net price $P_{b,ni}$ paid by the buyer in this framework is the new equilibrium price plus the buyers' transaction costs γ_b. Similarly, the net price received by the seller $P_{s,ni}$ is the new equilibrium price less the sellers' transaction costs γ_s. The quantity of product transacted is still determined at the intersection of the new supply and demand lines, and is now q_{ni}.

The transaction costs are:

$$P_{b,ni} - P_{s,ni} = \gamma_{b,ni} + \gamma_{s,ni} \tag{5}$$

Since the price paid by buyers $P_{b,ni}$ is higher than the price they would pay in a perfect market, P_{pm}, buyers' surplus is smaller when there are transaction costs. The investors' surplus is now the area above $P_{b,ni}$ and below the "B perfect market" curve. Similarly, sellers' surplus is also reduced, and is now represented by the area above the curve "S no intermediaries" and below $P_{s,ni}$. The collective loss in surplus is equal to the total cost of trading, represented by the rectangle with height $P_{b,ni} - P_{s,ni} = \gamma_{b,ni} + \gamma_{s,ni}$ and width q_{ni}.

D. A Cost-Efficient Intermediary

Suppose now that there is an intermediary that that can enable buyers and sellers to transact at a cost lower than the sum of $\gamma_{i,ni}$ and $\gamma_{s,ni}$. Assume that when this intermediary enters the market, the costs for sellers become $\gamma_{s,i}$ and the costs for buyers become $\gamma_{s,i}$. When compared to a market with no intermediaries, the reduced costs will enable more sales, as some sales that wouldn't be done because the price was too low for some sellers or because the price was too high for some buyers are now going to happen. This quantity of sales is represented as q_i in Figure 4. Also, buyers' and sellers' surpluses will increase when compared to the market with transaction costs and no intermediaries. The new sellers' surplus is the area above the curve "S no intermediaries" and below $P_{s,i}$ and the new buyers' surplus is now the area below the curve "B no intermediaries" and $P_{i,i}$. From the borrowers' and savers' points of view, the transaction costs are now:

$$P_{i,i} - P_{s,i} = \gamma_{i,i} + \gamma_{s,i} \tag{6}$$

From the intermediaries' point of view the transaction costs paid by the buyers and sellers must cover their average variable costs, their average fixed costs, the percentage of expected losses due to fraud or defaults and hopefully, still have some profits. Letting the variable costs be denoted by wL, the fixed costs be denoted by rK, the losses be denoted by ϕ and the profits be denoted by π, in order for financial intermediaries to provide payment systems we have to have:

$$\gamma_{b,i} + \gamma_{s,i} \geq \frac{wL}{q_i} + \frac{rK}{q_i} + \frac{\mathbb{E}(\phi)}{q_i} + \frac{\pi}{q_i} \tag{7}$$

Assuming that w and r are determined exogenously, intermediaries can reduce costs by increasing the average product of labor $\frac{q_i}{L}$, by increasing the average product of capital $\frac{q_i}{K}$, or by reducing expected fraud losses ϕ.

In this model, the intermediary revenues are $R = (P_{s,i} - P_{b,i}) \times q_i$. Adding taxes and paid-in capital to the right-hand side of equation (3), we can have the intermediary's economic profit equation:

$$\pi = R - FC - FL - LC - TX - CC \tag{8}$$

where

- **R:** receipts $(P_{s,i} - P_{b,i}) \times q_i$
- **FC:** Total fixed costs, rK
- **FL:** Fraud loss
- **LC:** Labor costs, wL
- **TX:** Taxes
- **CC:** Cost of capital, the amount of paid-in capital NW times the investors' required rate of return k_e.