Price regulation in two-sided markets: Empirical evidence from debit cards

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ABSTRACT

This paper provides empirical evidence of a well-known theoretical concern that market failures in two-sided markets are hard to identify and correct. We study the reactions of banks, merchants, and consumers to Dodd-Frank's Durbin Amendment that lowered interchange fees on debit card transactions. Banks recouped a significant portion of their losses by charging consumers for products that they previously provided for free on the subsidized side of the two-sided market. The accelerated adoption of credit cards with higher interchange fees likely diminished—if not eliminated—merchants' savings. These effects impede the regulation's stated objective of enhancing consumers' welfare through lower retail prices.

1. Introduction

The conventional approach to regulation involves a two-step process. First, the regulator establishes the existence of a serious market failure—grounded in theory and validated in the data. Second, the regulator identifies the least distortionary way to address the market failure and checks "that the remedy will not be worse than the illness" (Rochet and Tirole, 2003).

In the payment cards industry, theory neither confirms nor refutes the presence of a market failure with respect to interchange fees (Rochet and Tirole, 2003b; Wright, 2004b). However, data shows that merchants paid more than $100 billion in processing fees for credit and debit card transactions in the U.S. in 2018 (Nilson Report, 2019). Moreover, while four card networks—Visa, Mastercard, American Express, and Discover—serve this market, the combined market share of Visa and Mastercard consistently exceeded 80 percent from 2007 to 2023 (Statista, 2024). The high concentration and the wide gap between the fees paid and processing costs incurred in an industry that touches every aspect of consumers' lives have long attracted the attention of antitrust authorities and policymakers concerned about excessive rents.

This paper explores the consequences of a regulatory intervention designed to curb these rents. The Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 (Dodd-Frank hereafter) sought to increase regulation of the financial services industry in the wake of the Global Financial Crisis. Section 1075 of the Act—known as the "Durbin Amendment" for its main sponsor, Senator Richard Durbin of Illinois—stipulated that debit card interchange fees should be "reasonable and proportional to the cost incurred." The Durbin Amendment (Durbin hereafter) sought to lower merchants' costs so they would pass their savings along to consumers in the form of lower retail prices. However, cost-based regulation can cause substantial distortions if the market failure it aims to correct is poorly understood—or non-existent (Rochet and Tirole, 2003). With this in mind, we investigate whether the amendment has addressed the problem it was created to solve. In other words, has the remedy been better or worse than the illness?

Our analysis demonstrates that the Durbin cap reduced interchange revenue by over 30 percent ($8.2 billion annually) for banks subject to the regulation—those with total assets over $10 billion. Smaller

institutions are exempt from this policy and have experienced no decline in interchange revenue. If merchants had lowered prices accordingly, and had banks *not* raised checking account fees to offset the revenue loss, annual consumer savings would have been about half the size of Agarwal et al.'s (2015) estimated welfare enhancement from the Credit Card Accountability Responsibility and Disclosure (CARD) Act.

The outcome of the Durbin Amendment has been different. Banks passed 14 percent of Durbin-induced losses onto their customers by raising checking account fees. Those subject to the regulation reduced the availability of free checking accounts[1] from 58 percent in Q2 2010 to 28 (20) percent in Q4 2011 (2013); increased monthly checking account fees from $4.30 in Q2 2010 to $6.65 ($7.62) in Q4 2011 (2013); and raised minimum balance requirements to avoid these fees from $1,049 in Q2 2010 to $1,399 ($1,339) in Q4 2011 (2013). Low-income consumers, whose account balances do not meet the monthly minimum required to waive the fee, are disproportionately subject to these higher fees. Some have closed their checking accounts because of the increase in monthly fees and become unbanked.

Merchants have experienced a reduction in interchange fees on debit card payments, and there is evidence consistent with pass-through of these savings to consumers. However, its extent remains unknown because the decrease in interchange appears negligible relative to combined sales including credit card and cash transactions. It is therefore not possible to determine whether the regulation accomplished its stated objective (to enhance consumer welfare through lower retail prices).

Moreover, since the Durbin Amendment made issuing debit cards less profitable for large banks, it has likely prompted them to more actively market and roll out credit cards subject to significantly higher interchange fees. Three pieces of evidence are consistent with this possibility, though none establishes a causal link between Durbin and the expansion of credit card use. First, large banks' participation in the debit card payments market has been decreasing more in the ZIP codes that were more affected by the amendment. These are locations with more branches or more deposits held at branches of banks that are subject to the regulation (those with total assets over $10 billion). Second, these ZIP codes exhibit higher credit card usage. Third, lower-income consumers residing in areas with more large banks have become more prone to carry unpaid credit card balances. Estimating the extent to which Durbin contributed to the expansion of credit cards is beyond the scope of this paper, but if large banks engaged in a credit-for-debit substitution, this would either diminish the drop in interchange fees or—if sufficiently large—result in higher total interchange fees.

The plethora of unintended consequences that have undermined the regulation's stated objective is not surprising. Even those concerned about high-priced financial services were wary that the intervention would not deliver tangible consumer benefits (Barr et al., 2009). Because financial products are often bundled, firms can offset regulation of one aspect of the bundle by raising other prices. Economists have long understood that firms generally adapt to regulation in this manner (Stigler, 1971, 1983): Kahn (1979) vividly describes regulation as complicated by a "dynamic industry [that] will perpetually find ways of opening new holes in the dike." The theoretical literature on the payments industry in particular is skeptical of intervention due to the challenge of identifying and effectively addressing market failures in complex two-sided markets (Rochet and Tirole, 2003; Wright, 2004; Rysman and Wright, 2014). Rochet and Tirole (2003) caution that without "a theoretical paradigm that gathers broad intellectual consensus and demonstrates a clear market failure, ... cost-based regulation [of interchange fees] could impose substantial distortions ... [and] would be an unfortunate precedent for two-sided markets."

The credit and debit card business run by banks and networks is an

example of a two-sided market. For this market to function, intermediaries must get merchants to accept payment cards and encourage consumers to use cards for payments. As Rochet and Tirole (2003) explain, the platforms choose price structures that "get both sides of the market on board." In such settings, both consumer surplus and total surplus are often maximized by treating one side of the market as a profit center and the other side as a loss leader (Rochet and Tirole, 2003). Accordingly, high prices on one side of a two-sided market are not obviously anticompetitive. This conclusion is at odds with the economics of traditional one-sided markets, in which the presence of prices that substantially exceed costs often indicates a market failure.

Historically, banks would offer consumers a free checking account and a linked debit card—potentially with rewards—and charge merchants significant fees to cover the transaction processing costs *and* the checking account costs. Following the introduction of a price ceiling on interchange, banks recouped some of their losses by charging consumers directly for checking accounts previously provided for free on the subsidized side of the two-sided market. Investigating the impact of regulation in two-sided markets is increasingly important because of the economy's growing reliance on them over time. For instance, in 1990, fewer than 15 percent of U.S. transactions were made with payment cards; in 2018, this had increased to nearly 70 percent (Eubanks and Smale, 2002; Kumar and O'Brien, 2019). In recent decades, technological advances have enabled two-sided platforms in a broad spectrum of industries including retail (eBay and Alibaba), transportation (Uber and Lyft), and media (Meta/Facebook and X/Twitter).

This article makes three contributions to the literature. First, it provides empirical support for theoretical work on two-sided markets (Rochet and Tirole, 2002, 2003, 2003b, 2006; Wright, 2004; Armstrong, 2006; Rysman, 2009; Weyl, 2010). Theory suggests that such markets may not be anticompetitive simply because prices are above cost on one side of the market. But it acknowledges that prices set by platforms at the privately optimal levels may differ from *socially* optimal ones (Rochet and Tirole, 2003b; Wright, 2004b). Our empirical evidence illustrates challenges that prevent cost-based regulation from generating tangible benefits for consumers in these markets.

Second, we contribute to an empirical literature on interchange (Chang et al., 2005; Rysman, 2007; Valverde et al., 2016) and on the Durbin Amendment. Like us, Manuszak and Wozniak (2017) and Kay et al. (2018) find evidence that banks passed through Durbin losses. However, our study differs considerably from theirs. We account for contemporaneous deposit growth at large banks and hence do not overestimate the recovery of Durbin losses. Our approach is also more comprehensive than theirs: we document the amendment's impact on all participants on both sides of the market (banks, merchants, and consumers). Wang et al. (2014) and Evans et al. (2015) use survey data to study how merchants respond to Durbin.

Third, and more broadly, we contribute to a literature that discusses the need for and analyzes the efficacy of consumer financial regulation (Campbell, 2006; Sunstein, 2006; Bar-Gill and Warren, 2008; Barr et al., 2009; Campbell et al., 2011; Campbell, 2016). In particular, our paper adds to important work on the CARD Act by Agarwal et al. (2015), who demonstrate that post-crisis price regulation of consumer credit cards reduced borrowing costs by nearly $12 billion annually. They find no evidence that other price terms adjusted in response to the CARD Act's restrictions. We discuss why Durbin had different consequences, which is surprising given the overall similarity of these regulations.

The rest of the paper proceeds as follows. Section 2 provides background information on interchange fees and describes the concerns that led to the Durbin Amendment. Section 3 describes the data sources. Section 4 examines Durbin's effect on banks' interchange revenue, how banks adjusted the pricing of checking accounts, the impact of new fees on bank customers, and whether merchants passed interchange savings to consumers through lower retail prices. Section 5 explores the distributional effects of Durbin and how it relates to credit card usage. Section 6 presents additional results on banks. Section 7 discusses the results and

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[1] Accounts with a $0 monthly minimum for all customers, regardless of account balance.

the final section concludes.

2. Background on the Durbin Amendment

2.1. Introduction to interchange

When a consumer uses a debit or credit card to pay a merchant,[2] the card reader contacts the bank that issued the card ("issuing bank") for authorization to transfer funds to the merchant's bank ("acquiring bank").[3] Upon authorization, the funds are moved from the consumer's account at the issuing bank to the merchant's account at the acquiring bank; the acquiring bank withholds a fee when debiting the merchant's account. Since the merchant receives less than what the customer spends, this fee is often called the merchant discount rate (MDR). The acquiring bank splits the MDR into three components—interchange fees (the largest chunk), assessment fees, and payment processing fees; each is sent to different types of institutions involved in a transaction.

The acquiring bank pays the *interchange fee* to the issuing bank. This fee covers the issuing bank's costs associated with handling the transactions as well as getting customers to sign up for (and use) its cards. Card networks (such as Visa and Mastercard) set a default interchange rate schedule between issuing and acquiring banks; otherwise, thousands of pairs of banks would have had to privately negotiate these fees (Rochet and Tirole, 2002).[4] Networks receive an *assessment fee* from each transaction. Finally, payment processors, which enable card acceptance and transmit transaction details to networks, earn a *payment processing fee*.[5]

Card networks are two-sided because the success of their platforms relies on their ability to recruit (1) cardholders to use their cards and (2) merchants to accept them. *Higher* interchange fees would allow issuing banks to get more card users on board. Interchange revenue could be used to market payment cards and to offer rewards for using them (e.g., cash back, points, miles). *Lower* interchange fees would allow acquiring banks to decrease MDRs and to convince more merchants to accept cards because it would be cheaper to do so. Card networks set interchange fees to balance both sets of demands (Rochet and Tirole, 2003).

In the decade leading up to the Great Recession, MDRs became a significant operating cost for merchants—in some cases even their second-highest cost after labor[6]—for two reasons. First, the use of payment cards increased substantially: in 1990, fewer than 15 percent of consumer payments were made using credit or debit cards; by 2018, it had increased to nearly 70 percent (Evans and Schmalensee, 1999; Eubanks and Smale, 2002; Kumar and O'Brien, 2019). The second reason is that card networks began introducing premium cards with higher interchange fees; card issuers launched attractive rewards programs to motivate consumers to use them. By 2008, merchants were paying $1 in interchange fees on a $40 purchase using a premium card (2.5 percent interchange rate) but around $0.60 for a $40 purchase on a basic card (1.5 percent) (Government Accountability Office, 2009).

2.2. Push for regulation and the Durbin Amendment

The regulatory community was aware of concerns about pricing practices in the interchange market well before the crisis (Pacheco and Sullivan, 2005; Government Accountability Office, 2009). Early proposals to address these issues considered fee caps on *credit* interchange rates (Sarin, 2019) because these were historically higher than debit rates. Furthermore, the bundling of transacting and borrowing services makes credit cards a riskier payment instrument (Bar-Gill, 2003). Predecessor legislation in Australia capped credit interchange rates to discourage excessive credit use and encourage a shift toward debit payments (Chang et al., 2005; Farrell, 2006).

Yet, the Durbin Amendment eventually targeted *debit* interchange after substantial lobbying by credit card networks and financial firms.[7] Its sponsor, Senator Durbin, asserted that its focus on debit would mitigate any offsetting behavior by banks (Durbin, 2010).

As a late addition to Dodd-Frank, the amendment passed by a vote of 64–33 on May 13, 2010 without hearings or debate, which prompted significant criticism (Nichols, 2016). Durbin called on the Federal Reserve Board to promulgate a rule to ensure that issuer interchange fees for debit transactions are "reasonable and proportional" to the incurred costs. In June 2010, the Board issued Regulation II to implement the Durbin Amendment. The Board's initial rule called for a $0.12 fee cap; after input from industry and academic experts, this cap was raised to $0.21 per transaction plus five basis points of the transaction value and an additional $0.01 if the issuer has implemented certain anti-fraud measures.[8] The final rule was announced on June 29, 2011 to be enacted in October of that year.

3. Data

We use data from a variety of sources to analyze Durbin's effects. Our initial bank sample includes all bank holding companies with more than $500 million in assets for which quarterly data is available in the regulatory Call Reports (FR Y-9C) from 2009 to 2013. We are primarily concerned with data on bank assets, deposits, interchange income, and service charges on deposit accounts (which captures all fees associated with deposit accounts, including monthly maintenance fees, overdraft charges, check-cashing fees, and ATM fees). We exclude (a) banks that experienced a significant merger[9] from 2009 to 2013, (b) banks that

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[2] Our abridged description relies on Scott (2021).

[3] In practice, the acquiring and issuing banks can be the same. For example, a consumer may pay with a Bank of America Visa or Mastercard when shopping at a merchant using Bank of America for payment processing. American Express and Discover started as closed-loop card networks that issue cards *and* offer merchant account services (i.e., serve as issuing and acquiring banks at the same time). American Express became more flexible in 2014, allowing participating merchants to accept its cards even if their merchant accounts were with other providers (Business Wire 2014). Discover started partnering with issuers and acquirers soon after the U.S. Supreme Court denied in 2004 an appeal by Visa and Mastercard of a ruling that had revoked their policies prohibiting banks in their networks from partnering with Discover (Discover Financial Services 2004).

[4] Historically, interchange fees were 1–3 percent of the value of a customer's transaction. The levels may vary, for instance, depending on the merchant's category code and volume of transactions, the type of card, and the type of transaction. While card networks set default rates, issuing and acquiring banks may bilaterally negotiate their fees (see Mastercard's "Interchange Myths and Facts").

[5] According to Scott (2021), assessment fees range from 10 to 20 basis points per transaction, with potential markups based on transaction characteristics. Payment processors use a variety of pricing models. Their rates could be inclusive of interchange and assessment fees (e.g., PayPal and Square charge 2.6–2.9 percent plus 10–30 cents per transaction) or exclusive of those. In the latter case, processors could charge flat (e.g., $50 monthly) or proportional (e. g., 35 basis points) fees.

[6] Merchant complaints about high and rising interchange fees spilled over to the popular press, for example, Gackle (2009).

[7] Lobbyists' ability to shape Durbin exemplifies Stigler's concerns about regulatory capture (Stigler 1971, 1983).

[8] For banks over the $10 billion threshold, the regulation capped interchange fees on an average debit card transaction ($40) at $0.24 ($0.21 + 0.05% x $40 + $0.01), nearly half that of pre-regulation levels (Wang, Schwartz, and Mitchell 2014).

[9] We classify a merger as significant if a bank's assets changed by more than 20 percent in the relevant quarter.

changed Durbin status during this period, and (c) the American Express Company.[10]

RateWatch, a data collection firm, surveys bank branches weekly about their pricing practices. For checking accounts, it provides data on monthly maintenance fees and the minimum account balances required to avoid such fees. For non-transactional (savings and money market) accounts, RateWatch also tracks withdrawal fees. We average this weekly data to generate quarterly snapshots of branches' fee-setting practices (see Appendix B.1 for details).

We use the FDIC's Summary of Deposits to (1) quantify a geographic area's exposure to the Durbin Amendment and (2) calculate its Herfindahl-Hirschman Index.

To evaluate the pass-through of merchants' savings to consumers, we use data on gas prices from the Oil Price Information Service (OPIS, see Appendix B.2 for details) and proprietary data on interchange fees from a leading payments industry player. For 121 retail merchant categories (ranging from grocery stores to barber shops and gas stations), we received aggregated annual data for 2014, 2015, and 2016 at the ZIP code level on the total volume of regulated (card issued by bank above $10 billion Durbin threshold) and unregulated (card issued by bank below $10 billion threshold) debit card transactions, as well as the number of transactions and the interchange fees collected. (Appendix B.3 discusses the differences between regulated and unregulated rates, visualized in Appendix Figure A.1.) For gas retailers, data is also available on credit card volumes and interchange in 2016.

To determine how consumers experienced Durbin, we use the Survey of Consumer Payment Choice, the Survey of Consumer Finances, and the FDIC National Survey of Unbanked and Underbanked Households.

4. Main consequences of Durbin

4.1. Bank interchange revenue falls post-Durbin

Table 1 reports relevant summary statistics for the Durbin treatment and control groups. It presents averages for the key balance sheet and income statement variables as of year-end 2010 (pre-Durbin) and 2011 (immediately following its enactment). During this period, interchange revenue fell by 29.1 log points, on average, for Durbin banks—equivalent to a 25.2 (=exp(−0.291)−1) percent drop—despite a moderate growth in assets and deposits—especially non-interest-bearing deposits (i.e., checking accounts or demand deposits linked to debit cards generating interchange fees). In the control group institutions, however, assets and deposits grew at a *slower* pace but interchange income *increased* by 13.5 log points (or 14.5 percent).[11] This difference is statistically significant at the 1 percent level.

Fig. 1 demonstrates the amendment's impact on banks' interchange revenue. The basic univariate results exhibit a significant decline from $6.4 billion to $4.7 billion in quarterly interchange revenue for banks

above the $10 billion threshold immediately following Durbin's enactment. There is no commensurate decrease for banks below the $10 billion threshold.

Fig. 2 estimates the change in banks' interchange revenue post-Durbin using a generalized difference-in-differences event study:

$$Ln\big(Y_{i,t}\big) = \alpha_i + \phi_t + \sum_{s \neq 10Q2} \beta_s \times \text{Durbin}_i \times \mathbb{1}[s = t] + \epsilon_{i,t} \qquad (1)$$

where $Y_{i,t}$ is interchange income, α_i is a bank holding company fixed effect to control for time-invariant bank characteristics, and ϕ_t is a year-quarter fixed effect to control for time trends. *Durbin$_i$* is an indicator that takes a value of 1 if a bank holding company is above the $10 billion threshold. We cluster standard errors at the bank holding company level.

The plotted coefficients represent the change in interchange income during our sample period. The omitted category is Q2 2010 (when Durbin was passed). The identifying assumption is that had it *not* been passed, the interchange revenue of banks above and below the $10 billion threshold would have followed parallel trends. The near-zero and statistically insignificant pre-period estimates suggest that this assumption is valid. After Durbin was enacted, interchange revenue fell by 37 percentage points.[12]

4.2. Unintended consequences: bank account fees

4.2.1. Baseline results

Table 2 presents relevant summary statistics for the fee-setting practices of branches in the treatment and control groups. These include fees associated with checking, interest checking, savings, and deposit accounts in Q4 2010 (pre-Durbin) and Q4 2011 (immediately following Durbin's enactment). We define a free checking or savings account as one with a $0 monthly maintenance fee, regardless of the account balance. The univariate differences displayed in the table indicate that the incidence of free checking accounts at treated institutions decreased by 25.7 percent. Other reported products exhibit no such changes. Subsequent analyses ascertain these findings in a multivariate setting.

Fig. 3 illustrates Durbin's impact on the availability of free checking accounts ($0 monthly fee, regardless of account balance) and monthly maintenance fees. It reveals no differential trends for large banks (Durbin treatment) vs. small banks (control) in the pre-Durbin period. These parallel pre-trends give us confidence that the identifying assumption is satisfied, and that we can attribute the changes in checking account pricing to Durbin's passage.

We estimate the impact of Durbin and provide more formal support for our parallel-trends assumption in Fig. 4, using the same event-study approach described above. In the quarters prior to and following the amendment's passage, we estimate the change in the provision of free checking accounts and monthly maintenance fees for branches of banks above, relative to below, the Durbin threshold in a series of quarters relative to Q2 2010 (Durbin's passage). We estimate:

$$Y_{i,t} = \alpha_i + \phi_t + \sum_{s \neq 10Q2} \beta_s \times \text{Durbin}_i \times \mathbb{1}[s = t] + \epsilon_{i,t} \qquad (2)$$

We cluster standard errors at the bank holding company level and include branch (α_i) and time (ϕ_t) fixed effects. We benchmark against Q2 2010 because we hypothesize—and empirically confirm—that at least some banks started adjusting their prices in response to Durbin's passage in anticipation that their interchange revenues would decrease after the regulation came into effect. Indeed, Fig. 4 depicts a downward drift in the availability of free checking accounts and a concomitant increase in monthly maintenance fees soon after the amendment was passed.

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[10] We exclude American Express for two reasons. First, its interchange income in the sample period derives entirely from credit card transactions, which are not covered by the Durbin Amendment. Second, its interchange income immediately before and after Durbin's enactment was $4.2 and $4.3 billion, respectively (66 percent and 93 percent of the combined interchange income earned by all other affected bank holding companies in these two quarters). Though our results are qualitatively the same with American Express in the sample, excluding it improves the accuracy of our analysis.

[11] Table 1 expresses the changes from 2010 Q4 to 2011 Q4 in log differences and percentages. The average percentage changes are more influenced by outliers experiencing an unusually high growth in interchange. For instance, for two Durbin banks, the interchange rate increased by more than 200 percent; for 35 non-Durbin banks it rose by more than 100 percent. Five from the latter group experienced an increase over 1,000 percent. These outliers typically earn low levels of interchange income compared to other banks and account for a trivial share of total interchange earnings. Log differences eliminate their influence.

[12] Obtained by exponentiating −0.459, the 2011 Q4 point estimate in Figure 2.

Table 1
Descriptive statistics for Call Reports data.

	Treated ($K)		Untreated ($K)		11Q4 vs 10Q4			
					Log differences		Percentage change	
	2010 Q4	2011 Q4	2010 Q4	2011 Q4	Treated	Untreated	Treated	Untreated
Interchange income	134,509	108,451	574	591	−29.1	13.5***	−12.7	42.7
	[307,792]	[252,701]	[1,263]	[1,236]	[55.7]	[56.5]	[88.5]	[258.3]
Deposit fees	130,194	136,366	1,414	1,396	−0.6	−2.9	0.0	2.0
	[278,269]	[295,850]	[3,643]	[3,677]	[11.8]	[24.6]	[11.8]	[73.3]
Assets	244,459,169	246,277,771	1,544,298	1,578,421	2.6	1.3	2.9	2.0
	[536,391,202]	[535,716,247]	[1,495,298]	[1,545,663]	[7.3]	[15.9]	[7.4]	[9.5]
Deposits	122,119,909	132,089,145	1,227,615	1,263,762	5.4	1.9	5.8	2.7**
	[248,065,610]	[270,458,868]	[1,136,431]	[1,193,382]	[7.3]	[16.7]	[7.6]	[10.0]
Deposits,	27,746,530	35,870,694	196,044	231,600	26.6	14.2**	108.6	20.6***
non-interest bearing	[61,203,920]	[80,470,302]	[239,215]	[291,754]	[53.9]	[34.8]	[589.8]	[40.8]
Observations	47	47	511	511				

This table compares banks holding companies above and below the $10 billion Durbin threshold (i.e., treated and untreated, respectively) in 2010 Q4 (pre-Durbin) and 2011 Q4 (immediately post-Durbin). Reported are means and standard deviations (in brackets). Included in the summaries are bank holding companies with positive interchange income in 2010 Q4. The data is from Call Reports and covers bank holding companies with assets over $500 million. *, **, *** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.
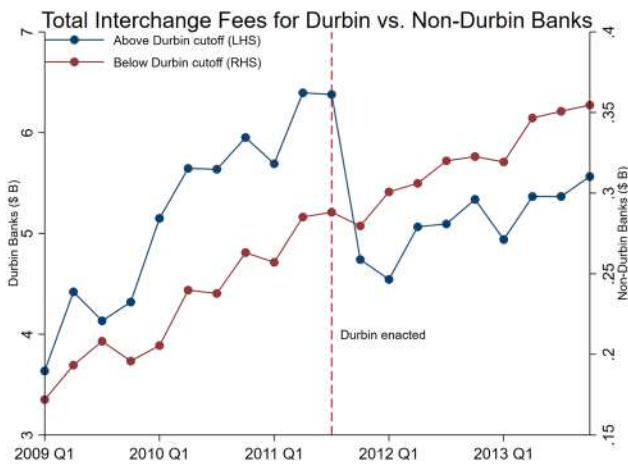
Fig. 1. Impact of Durbin on interchange revenue.
This figure plots the evolution of bank interchange fees for banks with assets over and under the $10 billion Durbin threshold. The data is from Call Reports and covers bank holding companies with assets over $500 million. Included in the chart are bank holding companies present in the data every quarter from 2009 to 2013.

However, the point estimates do not become statistically significant until a quarter before it came into effect in Q4 2011.

Many more banks responded to Durbin after it was enacted: by Q4 2011 (2013), it produced a 30 (38) percentage-point decrease in free checking. We can rule out, at the 95 percent confidence level, an effect on free checking that is smaller than 8 (15) percentage points. Monthly maintenance fees, which averaged $4.30 for the affected banks in Q2 2010, also increased by $2.34 ($3.32) as of Q4 2011 (2013).

Table 3 presents the results of a basic difference-in-differences approach that estimates the following model for a broader set of fees and accounts:

$$Y_{i,t} = \alpha_i + \phi_t + \beta_d \times Durbin_i \times Post_t + \epsilon_{i,t} \qquad (3)$$

The coefficient of interest, β_d, can be interpreted as the change in pricing for banks above vs. below the $10 billion threshold that is attributable to Durbin.

We observe that banks' responses to Durbin are concentrated in basic checking accounts, which (prior to regulatory intervention) generated more interchange revenue. In addition to a decrease in the availability of free checking and an increase in monthly fees, we also observe a $266 increase (or 25 percent compared to the pre-Durbin average of $1,049)
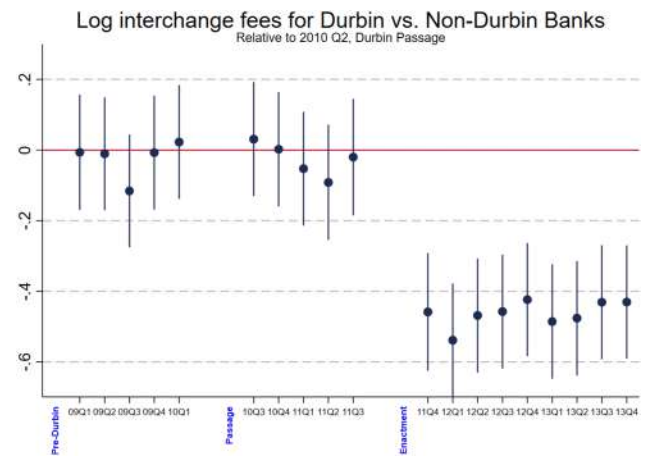
Fig. 2. Impact of Durbin on interchange revenue, event study approach.
This figure examines the effect of the Durbin Amendment on bank interchange revenue. The results are from the following event study regression: $\mathrm{Ln}(Y_{i,t}) = \alpha_i + \phi_t + \sum_{s \neq 10Q2} \beta_s \times \mathrm{Durbin}_i \times \mathbb{1}[s=t] + \epsilon_{i,t}$ *Durbin* is an indicator that takes a value of 1 for banks with assets over $10 billion. The omitted category is Q2 2010 (Durbin's passage). Coefficients on *Durbin × Time* indicators are reported, along with their 95 percent confidence intervals. The data is from Call Reports and covers bank holding companies with assets above $500 million. Standard errors are clustered at the bank holding company level. Bank and year-quarter fixed effects are included.

in the minimum account balance required to waive monthly fees. These results suggest that banks adjusted each aspect of basic checking accounts' price to recover the revenue that was previously generated by interchange from debit cards linked to such accounts.

There is some evidence of price adjustment for other accounts, but it is less pronounced. For example, Durbin banks raised minimum balance requirements for interest checking accounts by $2,655.57 (53 percent), but did not change monthly fees.

4.2.2. What economic model explains banks' responses?

Banks and regulators contemplated the increased checking account fees we document before the amendment passed. For example, TCF National Bank, which challenged Durbin's constitutionality in the Supreme Court, warned "who is going to pay for this? That customer that gets that debit card for free." The Federal Reserve's argument in response to TCF relied on the ability of large banks to adjust other checking account prices to cover interchange losses.

Table 2
Descriptive statistics for RateWatch data.

Figures in $ unless indicated otherwise	Treated		Untreated		11Q4 vs 10Q4	
	2010 Q4	2011 Q4	2010 Q4	2011 Q4	Treated	Untreated
Basic checking account						
Free account (%)	53.62	27.90	61.61	63.85	−25.73	2.23***
Monthly fee	4.46	6.35	2.42	2.37	1.88	−0.05***
Observations	1,535	1,645	1,883	2,068		
Monthly min to avoid fee	1,167.99	1,301.44	560.60	555.11	133.44	−5.49***
Observations	622	1,080	546	575		
Interest checking account						
Free account (%)	1.49	2.37	3.72	4.65	0.89	0.93
Monthly fee	15.45	15.95	8.84	8.95	0.50	0.11*
Observations	1,548	1,644	1,888	2,069		
Monthly min to avoid fee	5,252.39	6,599.64	1,462.58	1,583.07	1,347.25	120.49***
Observations	1,525	1,602	1,810	1,967		
Savings account						
Free account (%)	4.78	4.85	15.71	13.37	0.07	−2.34*
Monthly fee	4.54	4.56	3.27	3.29	0.02	0.02
Observations	1,552	1,649	1,878	2,063		
Monthly min to avoid fee	317.51	290.41	200.20	168.92	−27.11	−31.28
Observations	1,482	1,569	1,592	1,792		
Excessive withdrawal fee	4.05	6.60	2.12	2.60	2.55	0.48***
Observations	442	1,470	190	1,286		
Money market account						
Free account (%)	7.92	5.94	9.41	9.19	−1.98	−0.22
Monthly fee	9.93	11.15	9.27	9.60	1.23	0.33***
Observations	1,546	1,645	1,881	2,067		
Monthly min to avoid fee	2,681.57	3,589.95	2,304.87	2,385.39	908.39	80.52***
Observations	1,425	1,548	1,715	1,877		
Excessive withdrawal fee	9.53	10.24	6.50	6.96	0.71	0.46
Observations	1,544	1,644	1,878	2,063		

This table compares branches of bank holding companies above (treated) and below (untreated) the $10 billion Durbin threshold in 2010 Q4 (pre-Durbin) and 2011 Q4 (immediately post-Durbin). Differences relative to Q4 2010 are reported in two columns on the right. The data covers bank holding companies with assets over $500 million. *, **, *** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.
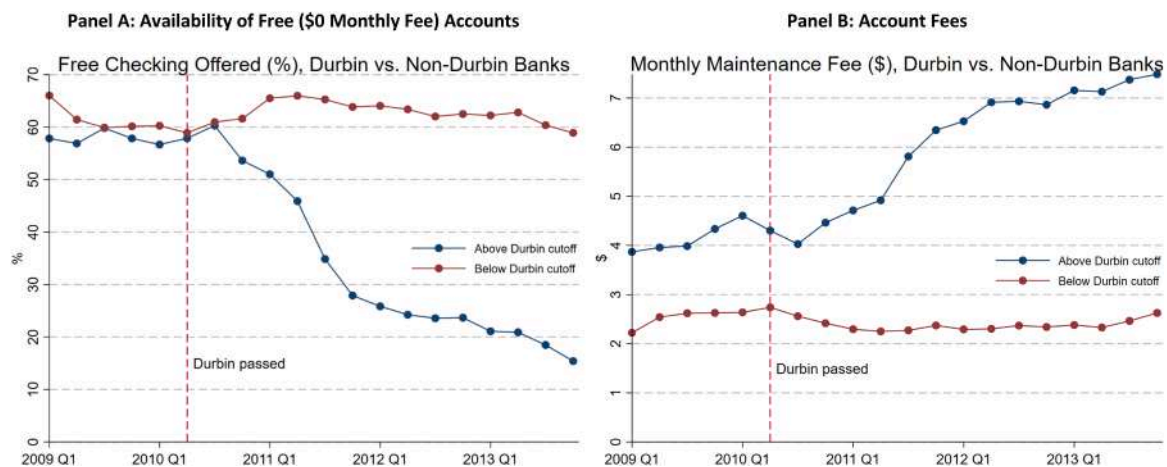
Fig. 3. Impact of Durbin on checking account fees.
This figure plots the evolution of checking account fees for banks with assets over and under the $10 billion Durbin threshold. Panel A reports the share of banks that offer $0 monthly fee accounts to customers, regardless of account size; Panel B reports average checking account fees. The data is from RateWatch and covers bank holding companies with assets above $500 million.

When formulating the rule to align debit interchange fees with costs, the Board limited "allowable costs" to those related to the authorization, clearance, and settlement of a transaction (Federal Reserve System, 2011). It excluded costs that "may be incurred in effecting a transaction (such as costs related to customer inquiries and the costs related to rewards programs)" as well as those "not incurred to effect a ... transaction" (such as "corporate overhead..., establishing the account relationship, card production and delivery, [and] marketing"). The final rule articulates the reasoning behind the Board's definition of "allowable costs" (Federal Reserve System, 2011). (Deliberations on this rule included a detailed comparison of electronic debit and check transactions.) Its narrow interpretation of allowable costs, which debit card interchange fees ought to be commensurate with, explains the increase in prices for services that were previously financed with interchange revenue (such as maintaining a checking account).

Yet if profit-maximizing banks could generate additional income from consumers by eliminating free checking, why did they not do so before Durbin? We identify two reasons for this. First, raising checking account fees risks losing customers. The next subsection presents suggestive evidence that prohibitively high account fees have driven some customers to sever their banking relationship and become unbanked. The second reason is that banks treat checking accounts as a bundle:
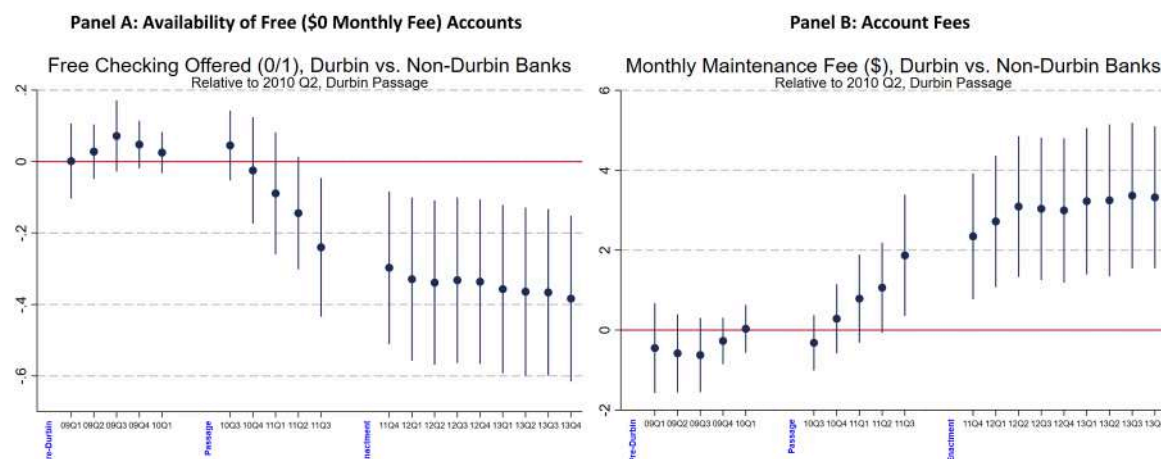
Panel A: Availability of Free ($0 Monthly Fee) Accounts

Free Checking Offered (0/1), Durbin vs. Non-Durbin Banks
Relative to 2010 Q2, Durbin Passage

Panel B: Account Fees

Monthly Maintenance Fee ($), Durbin vs. Non-Durbin Banks
Relative to 2010 Q2, Durbin Passage

Fig. 4. Impact of Durbin on checking account fees, event study approach.
This figure examines the effect of the Durbin Amendment on the checking account fees banks charge. The results are from the following event study regression, reported separately for a free checking indicator that takes the value of 1 if branches offer $0 monthly fee accounts to customers, regardless of account size; and the dollar value of banks' checking account fees. $Y_{i,t} = \alpha_i + \phi_t + \sum_{s \neq 10Q2} \beta_s \times \text{Durbin}_i \times \mathbb{1}[s = t] + \epsilon_{i,t}$ *Durbin* is an indicator that takes a value of 1 for banks with assets over $10 billion. The omitted category is Q2 2010 (Durbin's passage). Coefficients on *Durbin* × *Time* indicators are reported, along with their 95 percent confidence intervals. The data is from RateWatch and covers bank holding companies with assets above $500 million. Standard errors are clustered at the bank holding company level. Branch and year-quarter fixed effects are included.

what matters is that the total revenue from interchange and account fees meets or exceeds the marginal cost. Durbin made it unprofitable for large banks to subsidize free checking for consumers who generate revenue primarily through (now paltry) debit interchange fees. Other prices within a bundle had to adjust. (The bundled nature of checking account pricing explains why banks did not change fees on interest checking, savings, or money market accounts in response to Durbin, as shown in Table 3.) Banks' immediate response was to levy a $5 monthly fee on customers who used their debit cards to directly recoup interchange losses. Only after substantial consumer outcry—Bank of America debit cards were being burned in the street, and Vice President Joe Biden called the fee "incredibly tone-deaf" (Schwartz 2011)—did banks abandon this fee and shifted to a monthly maintenance fee.

This repricing aligns with the theoretical predictions of Rochet and Tirole (2003), who emphasize the role of competition among issuers in balancing interchange fees and the prices charged to cardholders.[13] They argue that issuers will pass on an *increase* in interchange fees to cardholders (e.g., via lower account/card fees or higher rewards); a *decrease* in interchange fees should trigger a similar offset.[14] At the core of this logic is the idea that "the interchange fee is not a fee for service ... [and] is not retained as profit ..., but ... goes toward lowering the net costs on the side of the system that receives the [interchange fee]" (Rochet and Tirole 2003).

4.2.3. Potential impact on the unbanked

The FDIC National Survey of Unbanked and Underbanked Households indicates a steady decrease in the percentage of unbanked households—from 8.2 percent in 2011 to 7.0 percent in 2015 (see Panel A of Table 4). However, during the same period, there was a notable increase in the proportion of the unbanked population that cited high account fees as the primary reason for not having a bank account: from 5.4 percent in 2011 to 9.7 percent in 2015 (Appendix C describes the results related to other reasons). This increase, significant at the 1

percent level, likely underestimates the true change due to differences between the 2011 and 2015 questionnaires (see Appendix C for a discussion of these changes).

Consistent with the idea that a Durbin-induced increase in checking account fees can partially explain why some households do not have a banking relationship, the fraction of unbanked households that had their account closed in the preceding year rose from 9.3 percent in 2011 to 11.2 percent in 2015. The flow of households from banked to unbanked has increased, though it has not reversed the steady decline in the number of unbanked.

Panel B of Table 4 examines the heterogeneity in survey responses based on how exposed a respondent's state was to the Durbin Amendment. Panel B1 quantifies this exposure using the fraction of deposits in that state as of 2010 held at branches of banks subject to the regulation, while Panel B2 uses a similar measure based on the number of branches. Respondents are grouped into terciles based on their state's Durbin exposure.

States with the highest exposure to the amendment—according to both metrics—exhibit the largest increase in the percentage of recently unbanked households. The difference between the top and bottom terciles is statistically significant. High account fees have become a more common reason for being unbanked in states with greater exposure than in those with lower exposure. This difference is statistically significant at the 5 percent level (Panel B1) or 10 percent level (Panel B2), depending on the exposure metric used.

The theoretical literature on interchange has warned that tampering with interchange fees can cause the network effect to unravel (Rochet and Tirole, 2003). Even a monopoly acquirer that is aware of network externalities would be cautious about reducing these fees. Lower interchange rates would compel issuers to increase cardholder fees, diminishing consumers' willingness to hold and use cards. While unbanked households do not have traditional debit or credit cards, they are not entirely excluded from card networks, as they can load prepaid debit cards with cash. However, the absence of a bank account adds frictions to card payments, likely reducing the total value of transactions.[15]

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[13] Prices charged to cardholders can be negative, factoring in rewards and interest-free benefits contingent on card usage (Guthrie and Wright 2007).

[14] Guthrie and Wright (2007) draw similar conclusions. In their model, the interchange fee influences the *allocation* of fees between cardholders and merchants (i.e., the structure of fees) but not the *overall level* of fees; the per-transaction sum of cardholder and merchant fees is constant and independent of the interchange fee.

[15] Complementing our results, Higgins (2024) documents the expansion of a two-sided network: the Mexican government's rollout of debit cards to poor households increased small merchants' propensity to accept cards, which led to higher sales.

Table 3
Difference-in-differences: Impact of Durbin on bank fees.

	Free (1)	Fee (2)	Minimum (3)	Withdrawal (4)
Basic checking				
Durbin x Post	−0.31***	2.78***	266.21*	
	[0.09]	[0.72]	[158.81]	
LHS Q2 '10 Avg, Durbin	0.58	4.30	1,049.17	
Observations	70,876	70,876	29,262	
Adjusted R-squared	0.679	0.741	0.797	
Interest checking				
Durbin x Post	−0.01	1.20	2,655.57**	
	[0.01]	[0.77]	[1,124.98]	
LHS Q2 '10 Avg, Durbin	0.01	14.71	5,025.37	
Observations	71,076	71,076	68,576	
Adjusted R-squared	0.700	0.822	0.658	
Savings				
Durbin x Post	0.00	−0.09	119.75	0.33
	[0.02]	[0.24]	[129.00]	[0.37]
LHS Q2 '10 Avg, Durbin	0.04	4.56	305.29	2.75
Observations	70,992	70,992	64,263	37,223
Adjusted R-squared	0.788	0.800	0.154	0.851
Money market				
Durbin x Post	−0.02	0.68	1,053.69	−0.15
	[0.03]	[0.60]	[1,101.79]	[0.72]
LHS Q2 '10 Avg, Durbin	0.06	10.08	2,655.95	9.02
Observations	70,998	70,998	65,788	70,918
Adjusted R-squared	0.760	0.831	0.636	0.754
Branch FEs	Yes	Yes	Yes	Yes
Year-Quarter FEs	Yes	Yes	Yes	Yes

This table examines the effect of the Durbin Amendment on bank account fees. The results are from the following difference-in-differences regression that compares fee-setting practices of banks above and below the $10 billion Durbin threshold, reported separately for basic checking, interest checking, savings, and money market accounts.

$$Y_{i,t} = \alpha_i + \phi_t + \beta_d \times Durbin_i \times Post_t + \in_{i,t}$$

Durbin is an indicator that takes a value of 1 for banks above the $10 billion threshold. *Post* is an indicator that takes a value of 1 in Q4 2011 (Durbin's enactment) and all quarters thereafter. Coefficients on *Durbin* × *Post* indicators are reported. Column names specify the dependent variable in each model. The data is quarterly from RateWatch and covers bank holding companies with assets over $500 million. Standard errors clustered at the bank holding company level are reported in brackets. Branch and time fixed effects are included. The dependent variables are measured in dollars, except for *Free*, which is binary and equals 1 for branches offering $0 monthly fee accounts to customers, regardless of account size. *, **, *** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

These results suggest that at least some bank customers responded to Durbin fee increases by severing their banking relationship and potentially turning to more expensive alternative financial services providers such as payday lenders and check-cashing facilities.

4.3. Durbin's effect on retail prices

In this section we study the extent to which merchants have passed the Durbin-induced reduction in interchange fees onto their customers. Assessing the amendment's effect on consumer prices is complicated because the cap is on the interchange fee—paid by acquirers to issuers—but not the MDR fee that merchants pay to their acquiring banks (Wang et al., 2014; Haltom and Wang, 2015).

The study is limited by our inability to quantify the extent to which acquirers reduced MDRs after Durbin. When implementing the rule, the Board expressed confidence that "acquirers would pass on their savings from lower interchange fees to their merchant customers, regardless of merchant size" because "[the] merchant-acquiring business, broadly speaking, is competitive" (Federal Reserve System, 2011). Lacking a viable alternative, we similarly assume that acquirers fully pass through interchange savings onto merchants via lower MDRs.[16]

Under this assumption, how much a merchant benefits from the Durbin Amendment depends on its customers' payment choices—cash, credit card, debit card issued by a small or large bank—and the interchange fees associated with each. The geographic heterogeneity in payment choices and their interchange fees have caused merchants' savings from Durbin to be unevenly distributed across the nation. If the overall level of savings is non-trivial, its regional variation can be used to assess how much consumers gained from Durbin as a result of lower retail prices. We contrast this estimate with extra spending on higher checking account fees to gauge consumers' net gain or loss from Durbin.

Our analysis of prices focuses on the retail gasoline industry because debit interchange expenses declined substantially in this sector post-Durbin: gas retailers account for around 15 percent of total Durbin savings. Furthermore, gas prices are set locally and are typically quoted to three decimal digits, and products are standardized, which allows us to identify relatively small price movements.

For this analysis, we need three types of data: (1) debit card transaction volumes and interchange fees tabulated according to the issuing bank's size, (2) credit card transaction volumes, and (3) gas prices. Since all three are available for 2016, we use that year to calculate how much the Durbin Amendment reduced gas merchants' interchange fees—in absolute terms and, most importantly, per gallon of gas sold.

Examining this question more than 4 years after Durbin's enactment allows sufficient time for prices to adjust to the new cost structure. Even if earlier data were available, the "rockets-and-feathers" phenomenon (Bacon, 1991) would have complicated detecting pass-through immediately after Durbin's enactment: Prices tend to rise quickly with cost increases but fall more slowly with cost reductions (Borenstein et al., 1997; Deltas, 2008; Owyang and Vermann, 2014; Peltzman, 2000).

Panel A of Table 5 reports the relative shares of payment methods—credit cards, debit cards issued by larger banks, and debit cards issued by smaller banks—at gas stations across 13,349 ZIP codes in 2016 as well as the interchange fee rates applied to each instrument. Payments with debit cards issued by larger banks incur the lowest fees. This suggests a simple directional test: all else equal, in 2016, did gas stations located in ZIP codes with a higher penetration of larger banks' debit cards charge less for gas?

Panel B of Table 5 examines this question. It reports the results of cross-sectional regressions of gas prices on the relative shares of payment methods at gas stations: credit cards, debit cards issued by larger banks, and debit cards issued by smaller banks (omitted category). The market share of large banks' debit cards has a negative and statistically significant coefficient. Within a county, gas is cheaper in ZIP codes where more customers pay for gas with debit cards issued by Durbin banks.[17]

This result suggests the presence of pass-through but does not indicate its extent, which we aim to quantify next. Table 6 illustrates how we calculate gas merchants' savings after Durbin using the example of an anonymous ZIP code (undisclosed for data privacy reasons) in 2016 (the only year for which credit card volumes and interchange fees are available for this sector).

Panel A of Table 6 shows that the 39,836 transactions made using debit cards issued by large banks generated $9,276.05 in interchange

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[16] Appendix D.1 provides further support for this assumption.

[17] Granular data that permits the inclusion of county fixed effects is critical for this result. Appendix D.2 provides and discusses the estimates without county fixed effects.

Table 4

Unbanked and reasons for being unbanked.

Panel A: Changes over time					
	2011	2013	2015	2013 vs 2011	2015 vs 2011
Unbanked	8.2	7.7	7.0	−0.5**	−1.2***
Observations	44,905	40,998	36,189		
Became unbanked in last year	9.3	9.2	11.2	−0.1	1.9**
Observations	3,093	2,718	2,275		
Main reason for being unbanked					
Account fees are too high	5.4		9.7		4.3***
Account fees are unpredictable			1.9		
Account fees and too high/unpredictable		13.5			
Not enough money	32.7	37.9	40.2	5.2***	7.6***
Don't trust banks	7.5	15.4	11.2	7.9***	3.8***
ID/credit/banking history problems	6.6	7.0	6.0	0.4	−0.6
Inconvenient hours/locations	1.4	2.7	5.3	1.3***	3.9***
Lack of needed products/services	0.4	1.2	1.3	0.8***	0.9***
Privacy concerns		3.8	3.6		
Don't need/want an account	21.0				
Don't know how to open/manage an account	1.3				
Previous account closed by bank	6.4				
Other reason	13.2	7.8	11.2	−5.4***	−2.0**
Unknown reason	4.3	10.7	9.6	6.4***	5.3***
Total	100.0	100.0	100.0		
Observations	3,156	2,718	2,275		

Panel B: Changes conditional on a state's exposure to the Durbin Amendment								
Durbin Exposure Tercile								
	1st (Low)		2nd (Med)		3rd (High)		2015 vs 2011		
	2011	2015	2011	2015	2011	2015	Low	Med	High
B1: Deposits-based Durbin exposure measure								
Unbanked	8.5	7.6**	8.2	7.2***	8.0	6.5***	−0.8	−1.0	−1.5
Became unbanked in last year	9.3	8.7	9.9	11.0	8.6	13.0***	−0.6	1.1	4.4**
Account fees are too high	5.9	6.7	4.2	10.1***	6.2	11.2***	0.8	5.9	5.0**
Not enough money	31.6	38.3***	32.4	41.4***	33.6	40.3***	6.7	9.0	6.7
Don't trust banks	8.5	9.7	7.8	11.4**	6.4	12.1***	1.2	3.6	5.7**
ID/credit/banking history problems	5.1	6.1	7.0	5.4	7.1	6.6	1.0	−1.6	−0.5
Inconvenient hours/locations	1.3	7.2***	1.6	5.2***	1.3	4.2***	5.9	3.6	2.9**
Lack of needed products/services	0.5	1.4**	0.5	0.6	0.3	2***	0.9	0.1	1.7
Other reason	14.1	12.4	11.6	10.2	14.1	11.4*	−1.7	−1.4	−2.7
Unknown reason	3.5	11.6***	4.5	10.2***	4.6	7.6***	8.2	5.6	3.0***
Observations (reason why unbanked)	958	832	1,043	719	1,155	724			
B2: Branches-based Durbin exposure measure								
Unbanked	8.3	7.6**	8.6	7.1***	7.8	6.6***	−0.8	−1.5	−1.2
Became unbanked in last year	9.8	9.4	9.5	11.6	8.6	12.1**	−0.4	2.2	3.5**
Account fees are too high	5.6	6.7	3.9	11***	6.6	10.8***	1.0	7.1	4.2*
Not enough money	31.2	38.0***	33.0	43.0***	33.5	39.4***	6.8	10.0	5.9
Don't trust banks	8.1	10.6*	7.5	10.8**	6.9	12.2***	2.5	3.3	5.3
ID/credit/banking history problems	5.2	5.7	6.0	5.5	8.2	6.7	0.5	−0.5	−1.4
Inconvenient hours/locations	1.2	6.5***	1.9	4.8***	1.2	5.0***	5.3	2.8	3.8
Lack of needed products/services	0.4	1.2**	0.4	0.8	0.4	1.9***	0.8	0.4	1.5
Other reason	14.2	11.8	11.3	10.5	14.3	11.4*	−2.4	−0.8	−2.9
Unknown reason	4.3	12.7***	4.2	8.9***	4.4	7.8***	8.4	4.7	3.4***
Observations (reason why unbanked)	1,070	903	984	648	1,102	724			

This table uses the data from the FDIC National Survey of Unbanked and Underbanked Households and shows the fraction of individuals who are unbanked (i.e., without a bank account), the fraction who became unbanked in last year (among the unbanked), and how the unbanked answered the multiple-choice question on the main reason why no one in their household had an account. The two right-most columns show changes since 2011 for statistics available in later years. Panel B presents results for subsamples depending on the Durbin Amendment exposure of a respondent's state. The exposure measure is the as-of-2010 fraction of deposits (bank branches) in a state that are held in branches of (owned by) banks subject to the regulation. Panel B also shows the within-tercile differences between 2011 and 2015 and whether the difference-in-differences between the lowest and highest terciles is statistically significant. In Panel B, the displayed number of observations applies to the reason for being unbanked. *, **, *** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

fees.[18] The average regulated interchange fee rate of 0.93 percent is less than the average rate of 1.29 percent levied on transactions covered by debit cards issued by small banks. Credit card transactions at gas stations carry an average interchange fee of 2.10 percent.

Panel B of Table 6 uses these values and the average gas price in this ZIP code in 2016 to estimate Durbin-induced savings of $0.0018 per gallon. (Appendix D.3 explains each step of this calculation.) If merchants passed through all savings to their customers, the regulation must have lowered gas prices in this ZIP code by that amount.

We apply this calculation to all the ZIP codes in our sample. The distribution of per-gallon savings is tight with a mean of $0.0015 and a standard deviation of $0.001. To gauge the economic significance of how much merchants saved, we compare these parameters with the

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[18] The difference between the actual interchange fees collected ($9,276.05) and the cap-implied amount ($9,260.43, assuming the extra 1 cent for fraud adjustment applies to all transactions) is negligible, especially when divided by the combined value of underlying transactions.

Table 5
Gas prices and exposure to the Durbin Amendment.

Panel A: Market shares and interchange-fee rates of payment methods

Payment method	Market share (%)	Interchange fee rate (%)
Debit cards	42.5	1.15
Issued by small banks	24.0	1.32
Issued by large banks (Durbin applies only here)	18.5	0.95
Credit cards	57.5	2.03
Total	100.0	1.66

Panel B: Regression results

	Gas Prices	
	(1)	(2)
Market share of debit cards	−0.059***	−0.046**
issued by large banks	[0.020]	[0.018]
Market share of credit cards	0.066***	0.038***
	[0.015]	[0.013]
Log Household Income		0.045***
		[0.007]
Unit of Analysis	ZIP	ZIP
County FEs	Yes	Yes
SEs Clustered by State	Yes	Yes
Observations	13,863	13,672
Adjusted R-squared	0.889	0.897

Panel A presents market shares and interchange fees for debit cards (overall and separately for cards issued by banks with assets over and under $10 billion) and credit cards based on gas-station transactions in 2016. Panel B presents results of cross-sectional OLS regressions of gas prices on the payment methods' market shares. The analysis is at the ZIP code level. The dependent variable is the average per-gallon gas price across all gas stations in that ZIP code in 2016. Market shares are computed by value within all 2016 gas station transactions paid with debit or credit cards. The average household income is as of 2016. The market share of large banks' debit cards captures that ZIP code's exposure to the Durbin Amendment. Excluded is the market share of debit cards issued by small banks. Standard errors clustered by state are reported in brackets. *, **, and *** denote significance at the 10 %, 5 %, and 1 % levels, respectively.

distribution of gas prices in the same ZIP codes and find that the standard deviation of per-gallon gas prices ($0.252) is 168 times larger than the average per-gallon Durbin savings ($0.0015). Given the relative magnitudes of interchange fee savings per gallon (relatively small) and the variation in gas prices (relatively large), it is virtually impossible to quantify the extent of pass-through with statistical significance. Examining the ZIP codes that benefited the most from Durbin would not make a difference. The 99th percentile of savings per gallon ($0.005) is 50 times smaller than the standard deviation of gas prices. (Appendix D.3 argues that accounting for cash transactions further impedes our ability to quantify the extent of pass-through.)

Panel A of Table 6 suggests why Durbin-induced interchange fee savings for gas merchants were too small for their pass-through—even if full—to be discerned with statistical significance. Debit cards issued by large banks subject to the regulation accounted for 18.5 percent of all card payments at gas stations in 2016. The realized interchange fee rate on debit cards subject to the regulation (0.95 percent) was 37 basis points lower than that on unregulated ones (i.e., issued by banks with total assets under $10 billion). Though tangible, this difference pales in comparison to how much more expensive credit card interchange is. The average interchange fee rate on credit card transactions at gas stations in 2016 was 2.03 percent—108 basis points higher than the regulated rate for debit cards. Moreover, credit card payments accounted for the lion's share (57.5 percent) of all card transactions at gas stations.

5. Other consequences of Durbin

Our results on retail prices suggest that the Durbin Amendment has had at best a modest intended effect on a small segment of the payments market. This renders statistically accurate pass-through quantification

Table 6
Savings of merchants in an illustrative ZIP code.

Panel A: Gas station transactions in an illustrative ZIP code

Payment instrument	Transactions		Interchange fees	
	Value ($)	Count	Value ($)	Rate (%)
Debit cards issued by:				
Small banks	225,192.83	9,249	2,915.63	1.29
Large banks	993,022.13	39,836	9,276.05	0.93
Credit cards	2,836,901.75	96,681	59,593.45	2.10

Panel B: Step-by-step calculations for an illustrative ZIP code

Gas sales Paid by debit cards issued by:		7: Debit volume subject to the interchange-fee regulation=(2)	993,022.13
1: Small banks	225,192.83	Interchange-fee rates on regulated debit (i.e., debit cards issued by large banks):	
2: Large banks	993,022.13		
3: Paid by credit cards	2,836,901.75	8: Under regulation	0.93
4: Total sales= (1)+(2)+ (3)	4,055,116.70	9: In the absence of regulation	1.29
5: Average gas price	2.0338	10: Durbin savings=(7) x [(9)–(8)]	3,580.87
6: Gallons sold=(4)/ (5)	1,993,819.89	11: Savings per gallon= (10)/(6)	0.0018

This table illustrates how we calculate gas merchants' savings after the Durbin Amendment, which lowered interchange fees on debit cards issued by banks with assets over $10 billion (i.e., large banks). Panel A tabulates payments data in 2016 for an illustrative ZIP code. Panel B estimates Durbin-induced savings in this ZIP code.

impossible. Yet, the evidence strongly suggests that the regulation made checking accounts less affordable. This section discusses the distributional consequences.

In addition, since the Durbin Amendment made it less profitable for large banks to issue debit cards, it might have prompted them to more actively market and roll out *credit* cards, which are subject to significantly higher interchange fees. Thus, the Durbin Amendment might have inadvertently increased merchants' total interchange fees—debit and credit combined. In this section, we present evidence that is consistent with this possibility.

5.1. Durbin's effect on the use of debt and credit cards

We have annual ZIP-code-level data on debit card transaction volumes, tabulated according to the issuing bank's Durbin status, for 2014–2016.[19] We calculate large banks' share of these transactions and how it changed during this period. Column 1 of Table 7 indicates that large banks' participation in the debit card payments market decreased more in ZIP codes that were more affected by the Durbin Amendment. Panel A quantifies exposure to Durbin using the fraction of deposits in a ZIP code held at branches of banks subject to the regulation in 2010; Panel B relies on a similar measure based on the number of branches. All specifications in the table control for county fixed effects.

Columns 2–4 explore the factors driving the market share of credit cards in transaction volume—debit and credit combined—in the 2016 cross-section of ZIP codes. We cannot examine the change in credit card use over time because we only have credit card use data for 2016. While the dependent variable in Column 1 uses all 121 MCCs in our debit card

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[19] The 2015 and 2016 data covers the full years; the 2014 data covers March to December. This truncation does not impede the analysis because our measures rely on the relative shares of payment instruments rather than absolute spending levels.

Table 7
Impact of Durbin on the use of debit and credit cards.

	$\Delta\dfrac{\text{Regulated Debit}}{\text{Total Debit}}$	Market Share of Credit Cards (gas only)		
	(1)	(2)	(3)	(4)
Panel A: Deposits-based Durbin exposure measure				
$\dfrac{\text{Durbin Deposits}}{\text{Total Deposits}}$	−0.006***	0.014**	0.015***	0.025***
	[0.002]	[0.005]	[0.005]	[0.005]
$\Delta\dfrac{\text{Regulated Debit}}{\text{Total Debit}}$			−0.099**	0.036
			[0.039]	[0.042]
$\Delta\dfrac{\text{Regulated Debit}}{\text{Total Debit}}$ (gas only)				−0.179***
				[0.050]
Log Household Income	−0.008***	0.083***	0.084***	0.085***
	[0.003]	[0.007]	[0.007]	[0.008]
Adjusted R-squared	0.637	0.602	0.617	0.688
Panel B: Branches-based Durbin exposure measure				
$\dfrac{\text{Durbin Branches}}{\text{Total Branches}}$	−0.006***	0.012*	0.014**	0.026***
	[0.002]	[0.006]	[0.006]	[0.006]
$\Delta\dfrac{\text{Regulated Debit}}{\text{Total Debit}}$			−0.099**	0.035
			[0.039]	[0.043]
$\Delta\dfrac{\text{Regulated Debit}}{\text{Total Debit}}$ (gas only)				−0.179***
				[0.050]
Log Household Income	−0.008***	0.083***	0.084***	0.086***
	[0.003]	[0.007]	[0.007]	[0.008]
Adjusted R-squared	0.637	0.602	0.617	0.687
Unit of Analysis	ZIP	ZIP	ZIP	ZIP
County FEs	Yes	Yes	Yes	Yes
SEs Clustered by State	Yes	Yes	Yes	Yes
Observations	18,634	18,133	17,901	17,022

This table presents results of cross-sectional OLS regressions relating the Durbin Amendment exposure to the change in the share of regulated debit card transactions (Column 1) and credit card usage (Columns 2–4). The analysis is at the ZIP code level. The dependent variable in Column 1 is the change in the market share of large banks (assets over $10 billion) in debit card transactions from 2014 to 2016. The dependent variable in Columns 2–4 is the market share of credit cards in all gas station transactions with debit or credit cards in 2016. The average household income is as of 2016. Panel A measures Durbin Amendment exposure by the fraction of a ZIP code's deposits held at branches of Durbin banks in 2010. Panel B uses a similar measure based on the number of branches. Standard errors clustered by state are reported in brackets. *, **, and *** denote significance at the 10 %, 5 %, and 1 % levels, respectively.

data, the dependent variable in Columns 2–4 is based solely on gas pump transactions because we have credit card data only for that MCC.

Column 2 shows that credit card use is more prevalent in the ZIP codes that were more affected by the Durbin Amendment. Column 3 adds the change in large banks' debit card market share (i.e., the dependent variable in Column 1) as a control; its point estimate is negative and significant. Since large banks are more active than small banks in the credit card business, this result is consistent with large banks pivoting from debit to credit. By making debit card transactions less profitable for large banks, the Durbin Amendment has likely accelerated this shift.

Column 4 reinforces this interpretation by adding another control variable—the change in large banks' debit card market share of gas pump transactions. This regressor, which is more closely aligned with the dependent variable (the fraction of gas pump transactions paid with credit cards), obtains a coefficient of greater magnitude and statistical significance and renders the broader independent variable's point estimate insignificant. Thus, rather than being spurious, the results appear to be explained by large bank customers being more likely to pay with credit than debit cards. Since the change in Durbin banks' debit card market shares is computed using debit card transaction volumes (not debit and credit combined), the relation we document is not mechanical and is not driven simply by the expansion of the credit card business. The findings are most consistent with large banks steering their customers from debit to credit.[20]

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[20] The fact that customers complied with this steering aligns with Guthrie and Wright (2007). In their model, buyers with multiple cards use the one with the lowest fees for cardholders. Higher interchange fees on credit card transactions allow banks to offer more generous rewards and benefits, effectively resulting in *negative* costs for cardholders when they use credit cards. They point out that the ability to set negative prices for card use without creating unlimited consumption makes payment cards a unique two-sided market.

Table 7 does not establish causality vis-à-vis the Durbin Amendment. Taken in isolation, these results are consistent with a secular trend of larger banks transitioning from debit to credit cards. After all, credit cards were a more profitable product before the Durbin Amendment and would have stayed more profitable if the regulation was never enacted. However, the rule change made credit cards even more attractive for large banks relative to debit cards, and this would have inevitably accelerated the shift between products. Using bank-specific data on checking account fees, the first part of this paper established that the interchange fee regulation caused banks to decrease their provision of free checking accounts. Without similarly granular data on credit cards, it is difficult to establish another causal link. It would have been interesting to disentangle large banks' secular vs. Durbin-induced shift from debit to credit. But even the suggestive, correlation-based evidence presented so far adds important nuances to the discussion of the regulation's intended and unintended consequences.

The last nuance to consider is how individuals' credit card use has changed after the Durbin Amendment. We do so in Table 8 using data from the Survey of Consumer Payment Choice (2009–2014) administered to the RAND American Life Panel (ALP). We estimate the following regression:

$$Y_{i,z,t} = \alpha_i + \phi_t + \beta \times \text{Durbin Exposure}_z \times \text{Post}_t + \Theta_{i,t} + \epsilon_{i,z,t}$$

where i is an individual, z is a ZIP code, and t is the year (annually from 2009 to 2014). The four dependent variables are: unpaid credit card balance (binary), number of credit cards, number of rewards credit cards, and fraction of rewards credit cards. α_i and ϕ_t are individual and year fixed effects, respectively. $\Theta_{i,t}$ captures time-variant family income. Post_t equals one for 2012–2014 and zero for other years. The Durbin Amendment exposure metrics—based on the distributions of deposits and branches—are identical to those used in Table 7. The analysis is performed separately for each tercile in the family income distribution.

Table 8
Personal finance outcomes.

Annual household income subsample	Durbin Exposure Measure	Dependent variable			
		Unpaid credit card balance (1)	Number of credit cards (2)	Number of rewards credit cards (3)	Fraction of rewards credit cards (4)
$40K and less	Deposits	0.084**	0.215	0.307*	0.188**
		[0.039]	[0.279]	[0.171]	[0.081]
	Branches	0.106***	0.326	0.341**	0.182**
		[0.041]	[0.289]	[0.165]	[0.091]
Observations:		3,555	3,555	3,555	1,849
$40–75K	Deposits	−0.027	−0.364	−0.064	0.037
		[0.044]	[0.367]	[0.257]	[0.058]
	Branches	−0.044	−0.444	−0.113	0.044
		[0.050]	[0.396]	[0.277]	[0.062]
Observations:		3,343	3,343	3,343	2,643
$75K and more	Deposits	0.031	0.222	0.228	0.030
		[0.033]	[0.271]	[0.223]	[0.043]
	Branches	0.049	0.305	0.247	0.006
		[0.039]	[0.286]	[0.239]	[0.044]
Observations:		3,717	3,717	3,717	3,415

This table presents the analysis relating a ZIP code's Durbin Amendment exposure to the personal finance outcomes of individuals living in that ZIP code. The full specification is: $Y_{i,z,t} = \alpha_i + \phi_t + \beta \times \text{DurbinExposure}_z \times \text{Post}_t + \Theta_{i,t} + \epsilon_{i,t}$ where i is an individual, z is a ZIP code, and t is year (annually from 2009 to 2014). The data on individuals (personal finance outcomes, annual household income, and residential ZIP code) are from the Survey of Consumer Payment Choice (2009–2014) administered in the RAND American Life Panel (ALP). The four dependent variables are: unpaid credit card balance (binary), number of credit cards, number of rewards credit cards, and fraction of rewards credit cards. α_i and ϕ_t are, respectively, individual and year fixed effects. Post_t equals 1 in years 2012–2014 and 0 otherwise. The deposits-based Durbin Exposure$_z$ is the fraction of a ZIP code's deposits held at branches of Durbin banks in 2010; the branches-based measure derives similarly from the number of branches. $\Theta_{i,t}$ captures time-variant family income. The analysis is performed for each tercile in the family income distribution. Reported are only estimates for the coefficient of interest, β, from 24 (= 4 dependent variables × 2 Durbin-exposure measures × 3 subsamples) regressions. Standard errors clustered by county are reported in brackets. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

The results vary by income level. Individual credit card use after Durbin is sensitive to how strongly the regulation affected respondents' ZIP code of residence only for the lowest income tercile. Poorer consumers living in areas with a greater fraction of large banks' branches or deposits held by them are more likely to carry unpaid credit card balances. This difference does not appear to be driven by extending credit to consumers who previously lacked access to it because the number of credit cards a person has is not sensitive to the local ZIP code's Durbin impact. However, the composition of their credit card portfolio *is* sensitive to the local area: poorer individuals residing in more-affected ZIP codes have shifted from non-rewards to rewards credit cards.[21] Rewards cards offer benefits to consumers, but these perks typically do not outweigh the interest incurred for failing to pay the full balance on time. Poorer individuals have been affected by the Durbin Amendment in another way, too, as discussed in the next subsection.

5.2. Low-income consumers more heavily affected by new fees

Checking account fees nearly doubled in response to Durbin.

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[21] Large banks active in the credit cards market can certainly reach customers residing in areas far from their branches. It is possible that a bank's brick-and-mortar branch serves as an additional marketing tool and that poorer consumers are more responsive to it.

However, only customers who do not maintain a minimum balance have to pay them. In some cases, customers who receive regular direct deposits into their checking account (e.g., from an employer) can avoid these fees. The Federal Reserve Board's 2013 Survey of Consumer Finances contains detailed individual demographic and financial information, including annual income, checking and savings account balances, and mortgage information. Unfortunately, this information is not bank specific, so we are not able to observe, for example, the differences in average checking account size for large vs. small bank customers.

Unsurprisingly, the data illustrates that wealthier households have higher average account balances. Thus low-income consumers were subject to most of the new account fees associated with Durbin. Nearly three-quarters (70 percent) of those in the lowest income quintile (annual household income of $20,500 or less) potentially paid higher account fees since they did not have the 2013 average monthly minimum balance required to avoid a monthly maintenance fee ($1,338) (Appendix Figure A.2). By contrast, only 3 percent of households in the top decile ($153,500 or more) fall below this threshold.

6. Additional results for banks

6.1. Quantifying banks' Durbin offset

We next measure the extent to which banks over the $10 billion threshold recovered their lost interchange revenue by charging higher account fees. To do so, we use two series from bank regulatory data, Call Reports: (a) interchange fees and (b) service charges on deposit accounts. The latter variable is broader than monthly maintenance fees; it captures all fees associated with deposit accounts, such as overdraft fees and check cashing fees. For this reason, much of our prior analysis only uses RateWatch's data on account fees. However, the lack of quantities in RateWatch makes it insufficient to determine how much of Durbin's losses banks recovered through higher prices.

To allow for bank-specific growth trends of interchange income and service charges on deposits, we estimate the model in differences. We assume interchange income and deposit fees follow the process:

$$\text{Ln}(Y_{i,t}) = \alpha_i + \phi_t + g_i \cdot t + \beta_d \cdot \text{Durbin}_i \times \text{Post}_t + \gamma \cdot \text{Ln}(\text{Deposits}_{i,t}) + \epsilon_{i,t} \tag{4}$$

where g_i is a bank-specific growth trend and *Deposits* is the dollar total of banks' non-interest-bearing deposits. *Durbin* is an indicator that takes a value of 1 for banks above the $10 billion threshold. *Post* is an indicator that takes a value of 1 in Q4 2011 (Durbin's enactment) and all quarters thereafter.

When estimating Durbin's impact on fee revenue, we control for contemporaneous deposit growth to avoid conflating an increase in deposits—which mechanically increases deposit fees—with Durbin's effect. After all, as reported in Table 1, depositors were shifting toward larger banks around the time of Durbin's passage. During our sample period, Durbin banks grew faster than their non-Durbin counterparts: between Q4 2010 and Q4 2011 deposits increased by 5.8 percent at Durbin banks relative to 2.7 percent at non-Durbin banks. The difference in growth rates was wider for non-interest-bearing deposits,[22] which are a common source of deposit fees for banks.

Differencing Eq. 4 leads to Eq. 5 (estimated in Table 9, Panel A):

$$\Delta \text{Ln}(Y_{i,t}) = \Delta \phi_t + g_i + \beta_d \times \Delta[\text{Durbin}_i \times \text{Post}_t] + \gamma \cdot \Delta \text{Ln}(\text{Deposits}_{i,t}) + \epsilon_{i,t} \tag{5}$$

where $\Delta \text{Ln}(Y_{i,t}) = \text{Ln}(Y_{i,t}) - \text{Ln}(Y_{i,t-k})$ with k taking on values of 2, 4,

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[22] Table 1 indicates that the growth rates of non-interest-bearing deposits expressed as log points and percentage points are far apart, especially for treated banks, because of outliers.

6, or 8 quarters. Panel B of Table 9 uses these estimates to calculate the fraction of lost interchange income that banks recouped through higher deposit fees. Interchange income fell by 33.7 percent for banks above the Durbin threshold, and deposit fees rose by 4.7 percent. This implies that banks over the $10 billion threshold lost $8.2 billion annually in interchange revenue because of the regulation, and recovered $1.2 billion of these losses (14.3 percent) by charging higher account fees.[23]

6.2. Impact of competition

We next test whether market power impacts the speed or size of banks' responses to Durbin, again using an event-study approach. This inquiry is closely related to Drechsler et al. (2021), who find that banks exploit their market power to offset the impact of interest rates on profitability. We explore whether banks' adjustment to a different profitability shock—Durbin—also depends on the local market structure. In Table 10, we estimate Eq. 2 separately for banks located in counties where deposits-based HHI is above the median (significant market power) and those where HHI is below the median (closer to perfect competition).

Differences between regulated (large) banks located in more vs. less competitive counties emerge as early as Q1 2011. Durbin branches in counties with an above-median HHI were 10 percentage points less likely to offer free checking ahead of Durbin's enactment than Durbin branches in more competitive counties: the triple interaction term's negative point estimate is significant at the 5 percent level in Q1 2011 and at the 10 percent level in Q3 2011. By Q1 2011, Durbin branches in more (less) competitive counties reduced the provision of free checking by 5 (13) percentage points relative to Q2 2010. Over time, both groups further decreased the availability of free checking. Though the wedge between them does not expand, it is more robust in later quarters: the last insignificant point estimate on the triple interaction term is in Q2 2012. By Q4 2013, the probability of a Durbin branch located in a county with a below-median (above-median) HHI offering a free checking account is 34 (42) percentage points lower than it was in Q2 2010; the difference is statistically significant at the 5 percent level.[24]

6.3. Robustness

6.3.1. Large vs. small bank trends

One possible concern with our identification strategy is that it may capture general differences in revenue and pricing for large vs. small banks that are independent of Durbin. The amendment's passage and enactment coincides with a post-crisis overhaul of the financial sector that significantly increased the regulatory burden for all banks, but particularly the largest "too-big-to-fail" financial institutions. If this heightened regulatory burden triggered pricing changes, then we risk mistakenly ascribing them to Durbin. To test for this possibility, we perform a series of robustness checks.

In Table 11, we address this concern by performing our difference-in-differences estimation on different subgroups of banks. In Panel A, we estimate Eq. 3 for narrower and narrower subgroups, eventually considering banks with only $5–20 billion in total assets. This final specification is closer in spirit to a regression discontinuity design that

would compare banks directly above and below the $10 billion threshold. Although we lose power as our subsample shrinks (only 34 banks with assets of $5–20 billion are in both pre and post periods, including 10 Durbin banks), the coefficients are comparable across all specifications. Unsurprisingly given these results, we conduct all our bank-level analyses excluding megabanks with more than $100 billion in total assets and find largely similar results (see Appendix Table A.1 and Figure A.3).

Next, Panel B of Table 11 reports a series of placebo tests. We perform our difference-in-differences estimation and compare the availability of free checking at banks above vs. below alternate asset thresholds following Durbin's Q4 2011 enactment. In many cases, these are regulatory thresholds: for example, $50 billion in total assets was the former threshold for Dodd-Frank annual stress testing, and $5 billion was the threshold for longer and more detailed Call Report submission.

If what we call the "Durbin effect" instead captures a general difference in fee-setting practices by large vs. small banks in response to a heightened post-crisis regulatory burden for large financial institutions, we would expect to see price differences at alternative asset thresholds. Instead, we observe no statistically significant differences in pricing by banks above and below "placebo Durbin" thresholds; in some cases the estimated coefficients go in the opposite direction, implying an increase in the availability of free checking for larger banks at alternative asset cutoffs.

6.3.2. Other regulations

A series of regulations limited banks' ability to charge overdraft fees during the sample period.[25] To what extent have these changes contributed to the post-Durbin increase in checking account fees? Based on the empirical evidence presented and discussed in Appendix E, their contribution is marginal for two reasons. First, if the documented increase in deposit fees since 2011 Q4 was a response to overdraft regulations, then the banks experiencing this increase would be those that lost revenue when the overdraft rules came into effect. This has not been the case. Second, the timelines of the overdraft and interchange regulations and the dynamics of checking account fees suggest the increase in deposit fees was primarily a response to the Durbin Amendment.

Another potential concern with our identification strategy is that we may be conflating banks' offsetting of Durbin with their offsetting of other regulations that kick in at the $10 billion asset threshold. This is unlikely for three reasons. First, Dodd-Frank required that banks with more than $10 billion in assets perform annual company-run stress tests and subjected these banks to Consumer Financial Protection Bureau (CFPB) supervision. Since the first company-run stress tests were not performed until 2013, it seems improbable that the costs associated with them drove the price movements we document in Durbin's immediate aftermath. Second, we observe the strongest offset in the pricing of checking accounts, which is—not coincidentally—the product most closely linked to the interchange income targeted by the amendment.[26] Finally, banks reported plans to respond to Durbin by increasing their checking account fees (Bank of America, 2011; TCF, 2011).

Together, these considerations reassure us that our results are attributable to the debit interchange regulation rather than banks' response to other policies.

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[23] The total income of Durbin banks from interchange and deposit fees—$24.4 billion and $25.2 billion, respectively—over four quarters before Durbin's enactment in Q4 2011 is based on the Figure 1 sample of banks.

[24] Table 10 uses HHI recomputed each year. It is also possible to sort counties based on HHI computed for some pre-Durbin year (e.g., 2010 or prior). Doing so reduces the magnitude of the triple interaction term's point estimate to 0.10 or less and renders it insignificant, even though the correlation between HHI used in Table 10 and the as-of-2010 (2008) HHI is high: 96.47 (91.59) percent. This suggests that branches' fee-setting practices are sensitive to the contemporaneous competitive pressures (or lack thereof) in the local market.

[25] For example, in November 2009, the Federal Reserve Board introduced an opt-in requirement for overdraft on ATM and one-time debit card (point-of-sale) transactions. The rule was set to be effective as of January 2010, with a mandatory compliance date of July 1, 2010.

[26] This local approach is similar to that taken by Fuster et al. (2018) to study the impact of CFPB supervision on the mortgage industry. These authors suggest that focusing narrowly on outcomes related to consumer lending can isolate the effects of CFPB oversight from Durbin and stress-testing requirements; we maintain that we can isolate Durbin's effect by honing in on consumer account fees.

Table 9
Quantifying bank pass-through.

Panel A: Change in interchange and deposit fees post-Durbin

	Δ Log Interchange Income				Δ Log Deposit Fees			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δ Durbin × Post	−0.399***	−0.429***	−0.426***	−0.390***	0.040***	0.039**	0.059***	0.044**
	[0.056]	[0.049]	[0.043]	[0.054]	[0.013]	[0.019]	[0.021]	[0.019]
Δ Log Deposits	0.034	0.034	0.024	0.044	0.018*	0.028*	0.033***	0.034**
	[0.026]	[0.029]	[0.036]	[0.039]	[0.010]	[0.014]	[0.013]	[0.014]
Lag size (quarters):	2	4	6	8	2	4	6	8
Bank FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,548	8,925	7,421	6,042	10,548	8,925	7,421	6,042
Adjusted R-squared	0.064	0.187	0.318	0.481	0.215	0.271	0.368	0.442

Panel B: Durbin impact offset by account fees

	Interchange income	Deposit fees
(a) Durbin banks total four quarters pre-Durbin ($B)	24.4	25.2
(b) average $\widehat{\beta}_d$ across four specifications	−0.411	0.046
(c) Durbin-induced %Δ = exp$(\widehat{\beta}_d)$ − 1 (%)	−33.7	4.7
(d) Durbin-induced $Δ = (a) × (c) ($B)	−8.2	1.2

This table quantifies the extent to which banks offset decreases in interchange revenue with increases in account prices. Interchange income and deposit fees are assumed to follow the following process:
$\text{Ln}(Y_{i,t}) = \alpha_i + \phi_t + g_i \cdot t + \beta_d \cdot \text{Durbin}_i \times \text{Post}_t + \gamma \cdot \text{Ln}(\text{Deposits}_{i,t}) + \epsilon_{i,t}$ where g_i is a bank-specific growth trend, *Deposits* is the dollar total of banks' non-interest bearing deposits. *Durbin* is an indicator that takes a value of 1 for banks with assets over $10 billion. *Post* is an indicator that takes a value of 1 in Q4 2011 (Durbin's enactment) and all quarters thereafter. Panel A estimates that model in differences: $\Delta\text{Ln}(Y_{i,t}) = \Delta\phi_t + g_i + \beta_d \times \Delta[\text{Durbin}_i \times \text{Post}_t] + \gamma \cdot \Delta\text{Ln}(\text{Deposits}_{i,t}) + \epsilon_{i,t}$ where $\Delta\text{Ln}(Y_{i,t}) = \text{Ln}(Y_{i,t}) - \text{Ln}(Y_{i,t-k})$ with k taking on values of 2, 4, 6, or 8 quarters. Panel B uses these estimates to quantify the extent to which higher account fees enabled banks to offset interchange losses from the Durbin Amendment. The data is from Call Reports and covers bank holding companies with assets over $500 million. Standard errors clustered at the bank holding company level are reported in brackets. Bank and year-quarter fixed effects are included. *, **, *** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

6.3.3. Bunching

Our identification strategy assumes that the Durbin Amendment is a natural experiment that exposed banks to the treatment (decrease in interchange revenue) based on an arbitrary asset threshold of $10 billion. If banks strategically avoided this threshold during our sample period, this would cast doubt on our exogeneity assumption.

To test for this possibility, we look for strategic manipulation around the $10 billion threshold. We implement a variation of the McCrary (2008) test using Cattaneo et al.'s (2019) local polynomial density estimator to estimate the density of the distribution of bank assets around the discontinuity of interest ($10 billion) with quarterly data on bank assets. The goal is to ascertain whether banks sorted themselves out of the treatment to prevent Durbin from reducing their interchange revenue. If they did not systematically sort, then the density near the cutoff should be continuous. Fig. 5 provides the results of our manipulation test. Panel A establishes the density's continuity near the Durbin threshold during the sample period validating our empirical approach.

When we expand outside our sample period, we find a large and statistically significant gap in bank assets immediately above the $10 billion threshold (t-statistic of –3.17, Panel B of Fig. 5). This result is consistent with Ballew et al. (2022), who find that in recent years banks below the $10 billion threshold have been less likely to engage in acquisitions. In other words, banks appear to be aware of this threshold's significance and may deliberately limit their growth to avoid crossing it.

7. Discussion

7.1. The varied efficacy of Durbin and the CARD Act

Agarwal et al. (2015) show that post-crisis price regulation of

consumer credit cards—the CARD Act—reduced borrowing costs by nearly $12 billion annually. They find no evidence that other price terms adjusted in response to the Act's restrictions. In recent work, Nelson (2022) confirms that the CARD Act increased the overall consumer surplus.

Durbin and the CARD Act appear to be similar: they are both post-crisis price regulations of payment instruments issued by the same financial institutions. So, their varied efficacy is surprising. However, they regulate different sides of the two-sided card market. Durbin regulates the prices paid by merchants who accept cards, while the CARD Act regulates prices paid by the consumers who use them.

Price regulation can successfully lower consumer costs if markets are imperfectly competitive and prices are non-salient (Gabaix and Laibson, 2006; Agarwal et al., 2014). The CARD Act regulated hidden fees that consumers ignore, such as late payment fees. In the absence of regulation, sophisticated firms exploited this ignorance and raised these prices above cost. No third party is being "brought on board" into the card market by above-cost late fees.

The joint lessons of the Durbin Amendment and the CARD Act suggest that price regulations that limit firms' ability to take advantage of consumers' behavioral biases can deliver welfare gains. But in the absence of such exploitation, traditional skepticism that intervention will lead regulated firms to "whac-a-mole" losses rings true (Kahn, 1979; Barr et al., 2009). Understanding the intended and unintended consequences of these regulations seems especially important for examining the Credit Card Competition Act introduced by U.S. Senators Dick Durbin and Roger Marshall in 2022 (and re-introduced in 2023). This proposed legislation seeks to reduce interchange fees on *credit* card transactions.

Table 10
Market power and impact of Durbin on bank fees.

	Availability of free checking (binary)							
	All branches		Below-median HHI		Above-median HHI		DDD	
	(1)		(2)		(3)		(4)	
	Pt. Est.	[St. Errors]	Pt. Est.	[St. Errors]	Pt. Est.	[St. Errors]	Pt. Est.	[St. Errors]
Pre-Passage								
2009 Q1	0.00	[0.05]	0.02	[0.05]	−0.01	[0.08]	−0.05	[0.04]
2009 Q2	0.03	[0.04]	0.02	[0.04]	0.03	[0.05]	−0.01	[0.04]
2009 Q3	0.07	[0.05]	0.06	[0.05]	0.08	[0.06]	−0.01	[0.04]
2009 Q4	0.05	[0.03]	0.04	[0.03]	0.06	[0.05]	−0.01	[0.04]
2010 Q1	0.03	[0.03]	0.01	[0.02]	0.05	[0.04]	0.02	[0.04]
Post-Passage								
2010 Q3	0.05	[0.05]	0.05	[0.04]	0.04	[0.06]	−0.04	[0.04]
2010 Q4	−0.02	[0.08]	−0.01	[0.07]	−0.04	[0.09]	−0.06	[0.04]
2011 Q1	−0.09	[0.09]	−0.05	[0.07]	−0.13	[0.12]	−0.10**	[0.05]
2011 Q2	−0.14*	[0.08]	−0.12*	[0.07]	−0.16	[0.11]	−0.07	[0.06]
2011 Q3	−0.24**	[0.10]	−0.21**	[0.09]	−0.27**	[0.12]	−0.08*	[0.05]
Post-Enactment								
2011 Q4	−0.30***	[0.11]	−0.28***	[0.11]	−0.32**	[0.13]	−0.06	[0.05]
2012 Q1	−0.33***	[0.12]	−0.31***	[0.12]	−0.35***	[0.13]	−0.06	[0.05]
2012 Q2	−0.34***	[0.12]	−0.32***	[0.12]	−0.36***	[0.13]	−0.06	[0.05]
2012 Q3	−0.33***	[0.12]	−0.30**	[0.12]	−0.36***	[0.13]	−0.09*	[0.05]
2012 Q4	−0.34***	[0.12]	−0.30***	[0.12]	−0.37***	[0.13]	−0.09*	[0.05]
2013 Q1	−0.36***	[0.12]	−0.31***	[0.12]	−0.39***	[0.14]	−0.10**	[0.04]
2013 Q2	−0.36***	[0.12]	−0.32***	[0.12]	−0.40***	[0.14]	−0.11**	[0.04]
2013 Q3	−0.37***	[0.12]	−0.32***	[0.12]	−0.41***	[0.13]	−0.12**	[0.05]
2013 Q4	−0.38***	[0.12]	−0.34***	[0.12]	−0.42***	[0.13]	−0.11**	[0.05]
Branch FEs	Yes		Yes		Yes		Yes	
Year-Quarter FEs	Yes		Yes		Yes		Yes	
Observations	70,876		35,489		35,381		70,876	
Adjusted R-squared	0.684		0.689		0.693		0.685	

This table examines how market concentration impacts the effect the Durbin Amendment has had on the availability of free checking ($0 monthly fee accounts, regardless of account size). Columns 1–3 present the results from the following event study regression, reported separately for all bank branches, branches in competitive counties (below-median HHI), and branches in less competitive counties (above-median HHI). $Y_{i,t} = \alpha_i + \phi_t + \sum_{s \neq 10Q2} \beta_t \times \text{Durbin}_i \times \mathbb{1}[s = t] + \epsilon_{i,t}$ *Durbin* is an indicator that takes a value of 1 for banks with assets over $10 billion. The omitted category is Q2 2010 (Durbin's passage). Coefficients on *Durbin* × *Time* indicators are reported, and column names indicate the relevant samples. To ascertain the significance of differences between Columns 2 and 3, Column 4 presents a triple-difference event study regression: $Y_{i,t} = \alpha_i + \phi_t + \sum_{s \neq 10Q2} \beta_t \times \text{Durbin}_i \times \mathbb{1}[s = t] + \sum_{s \neq 10Q2} \beta_s^{High} \times \text{HHI}_{i,t}^{High} \times \mathbb{1}[s = t] + \sum_{s \neq 10Q2} \beta_s^{DDD} \times \text{Durbin}_i \times \text{HHI}_{i,t}^{High} \times \mathbb{1}[s = t] + \epsilon_{i,t}$ where HHI^{High} is a binary variable that takes a value of 1 for branches with above-median HHI. The coefficients on the triple interaction, β_s^{DDD}, are reported. The data is from RateWatch and covers bank holding companies with assets over $500 million. Standard errors clustered at the bank holding company level are reported in brackets. Branch and year-quarter fixed effects are included. *, **, *** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

7.2. Final thoughts

To lower merchants' costs and reduce retail prices, the Durbin Amendment imposed a price ceiling on interchange fees for transactions involving debit cards issued by banks with assets exceeding $10 billion. Banks subject to the regulation experienced a more than 30 percent drop in interchange revenue, amounting to $8.2 billion annually.

Gas has become marginally cheaper in ZIP codes where consumers are more likely to use debit cards from large banks at the pump. This suggests that acquiring banks have passed through the reduction in interchange fees to merchants via lower MDRs, and that merchants have, in turn, passed these savings on to consumers via lower prices. However, given the variability in gas prices, the cost reduction has been too small to quantify the pass-through with statistical significance.[27] While its exact extent remains unknown, past work helps us estimate an upper bound.

Since interchange fees are assessed on the receipt value, their reduction resembles a sales tax cut. Doyle and Samphantharak (2008) found that 70 percent of a gasoline tax suspension was passed on to consumers as lower prices. In their setting, policymakers ensured the tax reduction was publicized to prevent merchants from capturing the benefits through strategic coordination. By contrast, the Durbin Amendment's reduction

in interchange rates was not publicized, and a merchant's card processing costs depend on the payment instrument. Additionally, while we assume that acquiring banks have passed the entire reduction in interchange fees on to merchants via lower MDRs, they may have only passed on some savings. Therefore, 70 percent can be considered an upper bound for the merchant pass-through. Multiplying the $8.2 billion reduction in banks' interchange revenue by 70 percent provides a partial equilibrium estimate of maximum potential consumer savings of $5.7 billion, ignoring the ripple effects we document.

Accounting for general equilibrium considerations reduces this estimate for two reasons. First, banks have recovered 14.3 percent ($1.2 billion) of the Durbin-induced losses in interchange revenue by raising checking account fees. Second, by making debit cards less profitable, Durbin has likely prompted banks to more actively market and roll out credit cards subject to higher interchange fees. While estimating the extent of this pivot is beyond the scope of this paper, back-of-the-envelope calculations suggest the following bounds. If credit cards' market share rose by 7.8 percentage points because of Durbin, the reduction in interchange fees and retail prices—assuming a 70 percent pass-through—is just enough to offset higher checking account fees; consumers break even. If credit cards gained at least 9.9 percentage points, Durbin's net effect would be *higher* interchange fees and MDRs,

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[27] Appendix D.4 discusses additional obstacles to merchants' pass-through.

Table 11

Difference-in-differences subgroup and placebo results: Impact of Durbin on bank fees.

Panel A: Durbin subsamples around the $10B threshold

	Availability of free checking (binary)		
Subsample:	Banks > $500M	$5–75B	$5–20B
	(1)	(2)	(3)
Durbin × Post	−0.31***	−0.27*	−0.19
	[0.09]	[0.15]	[0.18]
Branch FEs	Yes	Yes	Yes
Year-Quarter FEs	Yes	Yes	Yes
Observations	70,876	12,745	8,353
Adjusted R-squared	0.679	0.660	0.653

Panel B: Placebo Durbin at different thresholds

	Availability of free checking (binary)				
Subsample:	Banks > $15B			Banks < $9B	
Placebo Threshold:	$25B	$50B	$100B	$5B	$1B
	(1)	(2)	(3)	(4)	(5)
Threshold × Post	−0.07	−0.02	−0.09	0.10	0.01
	[0.16]	[0.14]	[0.15]	[0.11]	[0.04]
Branch FEs	Yes	Yes	Yes	Yes	Yes
Year-Quarter FEs	Yes	Yes	Yes	Yes	Yes
Observations	29,858	29,858	29,858	39,147	39,147
Adjusted R-squared	0.628	0.628	0.629	0.705	0.704

This table examines the effect of the Durbin Amendment on the availability of free chee checking accounts ($0 monthly fee, regardless of account size). Panel A reports the difference-in-differences estimates in subsamples (reported in column headers) that narrow in on the $10 billion regulatory cutoff. Panel B documents the effect of "placebo" Durbin Amendments, at hypothetical cutoffs that are unrelated to interchange regulation. *Post* is an indicator that takes a value of 1 in Q4 2011 (Durbin's enactment) and all quarters thereafter. *Durbin* is an indicator that takes a value of 1 for banks with assets over $10 billion. *Threshold* is an indicator that takes a value of 1 for banks with assets over a threshold reported in the column name. The data is from RateWatch and covers bank holding companies with assets over $500 million. Standard errors clustered at the bank holding company level are reported in brackets. Branch and year-quarter fixed effects are included. *, **, *** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.
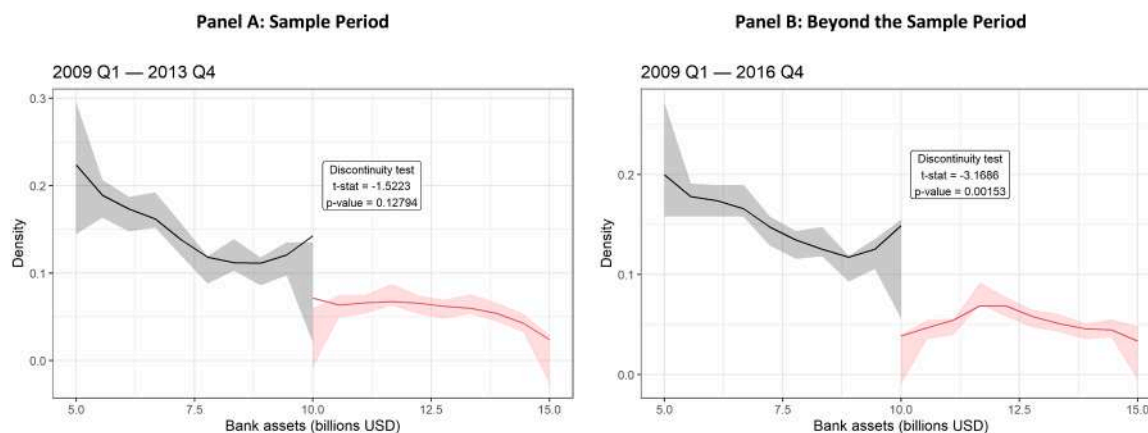
Fig. 5. Bunching tests of the Durbin threshold.
This figure explores whether banks strategically avoid the $10 billion Durbin threshold. Panels A and B provide an estimation of the density of the distribution of bank assets using Cattaneo et al. (2019) local polynomial density estimator to test for any discontinuities around the $10 billion threshold. This estimation is provided both for the sample period (Panel A) and for the more recent epoch (Panel B). The data is quarterly from Call Reports and covers bank holding companies with assets between $5 billion and $15 billion.

resulting in *higher* retail prices.[28]

Regardless of the merchant pass-through or the impact on overall welfare, Durbin's distributional effects have been undesirable in two

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[28] $7.8 \approx (1.73 - 1.66) \times (1 - 0.143/0.70)/(2.03 - 1.32)$, where 2.03 percent and 1.32 percent are the pre-Durbin interchange fees of gas merchants on credit and debit, respectively. The term $(1 - 0.143/0.70)$ represents the fraction of the partial-equilibrium interchange drop (from 1.73 percent to 1.66 percent) that this calculation offsets through credit-for-debit substitution. The equation for 9.9 is analogous; $9.9 \approx (1.73 - 1.66)/(2.03 - 1.32)$.

ways. First, the fraction of unbanked households citing high account fees as the primary reason for not having a bank account nearly doubled after the amendment's enactment. Second, poorer households in areas most exposed to the new regulation are now more likely than pre-Durbin to carry unpaid credit card balances.

Could these distortions have been avoided? On the one hand, the dislocations would arguably have been less severe if credit card interchange fees were also regulated. In this scenario, the Durbin Amendment represents the first step of a process that might eventually subject credit card interchange fees to a similar cap, reducing Durbin's initial distortions. On the other hand, these distortions might have arisen

because the amendment lacked a solid theoretical framework, which would confirm a clear market failure in the payments industry. As Rochet and Tirole (2003) note, "there is no reason to think that privately optimal [interchange fees] are higher or lower than socially optimal ones." Extending the regulation to credit cards could therefore exacerbate the distortions.

8. Conclusion

The conventional view is that if prices are higher than costs, this indicates a market failure that regulation can usefully address. This belief motivated regulators to adopt the Durbin Amendment, capping debit interchange fees in hopes of increasing consumer welfare.

We find that cost-based regulation on one side of the market has been offset by increases in unregulated prices on the other side. Banks doubled account fees to recover 14 percent of their Durbin losses. Moreover, since Durbin made issuing debit cards less profitable for large banks, it has likely prompted these institutions to more actively market and roll out credit cards, which are subject to higher interchange fees. The amendment might therefore have paradoxically led to higher total—debit and credit combined—interchange fees, contrary to its stated objective.

While our data is not detailed enough to estimate demand and directly assess the regulation's effect on consumer surplus, the empirical evidence we present is consistent with a long-standing concern in the theoretical literature that cost-based regulation of two-sided markets can create substantial distortions (Rochet and Tirole, 2003).

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used ChatGPT-4o (OpenAI) to improve readability and language of the work. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

CRediT authorship contribution statement

Vladimir Mukharlyamov: Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Natasha Sarin:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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