Chapter 10

BANK DEBIT TAXES: YIELD VS. DISINTERMEDIATION

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1 Introduction

In the past fifteen years, a number of countries, mostly in Latin America, have imposed taxes on banking transactions. These taxes are usually levied on withdrawals from or other debits to bank accounts, including check clearance, cash withdrawals, and payments of loan installments.

Since 1988, bank debit taxes have been introduced in Argentina, Brazil, Colombia, Ecuador, Peru, and Venezuela. With the exception of Brazil, bank debit taxes were introduced at the time of crisis with the objective to quickly generate a burst of revenue.

These taxes have the support of many policymakers and virtually no organized popular opposition. Collection and administration costs of these taxes are minimal. In addition, the government gains an immediate and continuous revenue stream, since the taxes are collected from transactions in real time.

However, since bank debit taxes are levied on intermediated financial transactions, their imposition is likely to result in financial disintermediation. Broadly speaking, by disintermediation is meant the withdrawal of funds from financial intermediaries, with the payments being made in some other way (e.g., in cash, by barter, through accounts not subject to tax, etc.). Disintermediation results not only in the reduction of the tax base, but also in a possible misallocation of financial resources.

This chapter presents a first formal attempt to estimate the scale of disintermediation resulting from the introduction of a bank debit tax. Drawing on a model of financial intermediation, we derive a relationship between the disintermediation resulting from introduction of a bank debit tax and the deadweight welfare loss attributable to the tax.

Using data from four Latin American countries, we estimate the scale of disintermediation attributable to the tax and deduce the welfare loss. The calculations rely on two key assumptions, namely that the entire burden of the bank debit tax falls on bank borrowers and that the impact of the tax on financial intermediation does not yet arise in the first full month after its introduction.

We find that bank debit taxes have coincided with significant welfare losses, especially at higher rates. Expressed as a percentage of revenue, deadweight losses following the introduction of the tax reached up to 30 percent in Venezuela, up to 35 percent in Colombia, and up to 45 percent in Ecuador. However, we do not find significant deadweight losses in Brazil.

We also show that introduction of a bank debit tax resulted in disintermediation of up to 28 percent in Venezuela, up to 41 percent in Colombia, and up to 47 percent in Ecuador. This means that for every dollar in revenue raised by a bank debit tax there was a loss of financial intermediation equal to 28 cents in Venezuela, 41 cents in Colombia, and 47 cents in Ecuador. Again, we do not find significant disintermediation in Brazil. We also find that both the deadweight losses and disintermediation effects cumulate as the taxes remain in place.

While bank debit taxes can be used as a quick and effective way to generate revenue, pending the implementation of improvements in the arrangements for collecting more efficient taxes (Tanzi, 2000), our findings confirm that, as time passes, and especially at higher rates of tax, debit taxes may lead to significant welfare losses and financial disintermediation.

The rest of the paper is organized as follows. We give a brief description of bank debit taxes in Section 2, and discuss their productivity in Section 3. In Section 4 we point out the relationship between deadweight loss and disintermediation. Section 5 describes the data and estimation results. Selected descriptive evidence is in Section 6. Section 7 concludes. A formal model is presented in the Appendix.

2 Bank Debit Taxes in Latin America

Bank debit taxes are currently in effect in Argentina, Brazil, Colombia and Venezuela, and were in place previously in Ecuador and Peru.

With the exception of Brazil, bank debit taxes were introduced at a time of, and in response to, general economic crisis, as an emergency means of raising government revenue. In all cases, the tax was explicitly introduced on a temporary basis, though in some cases it was then extended.

- When a bank debit tax was introduced in 1988 in Argentina, tax revenues were declining dramatically owing to hyperinflation, increased evasion, and depressed economic activity. The tax was reintroduced in Argentina under similar circumstances in April 2001.
- In 1989, when the Impuesto a los Débitos Bancarios y Financieros was introduced as a temporary and extraordinary revenue measure, Peru was immersed in a deep economic crisis and central government revenues had fallen from 14.9 percent of GDP in 1985 to 6.1 percent of GDP in 1989.
- In Colombia, when a temporary Impuesto a las Transacciones Financieras (known as the "dos por mil") was adopted in November 1998, the health of the financial sector had already deteriorated markedly and the government had declared an economic emergency.[1]
- In Ecuador, the tax was introduced in 1999, at a time when the economy plunged into a major economic and financial crisis.
- In Venezuela, a temporary bank debit tax was collected during May-December, 1994 and May 1999-May 2000. The tax was reintroduced in Venezuela for 12 months beginning March 2002.

There is a considerable diversity in the design of these taxes from country to country. Transactions subject to or exempt from the tax as well as tax rates differ significantly.

[1] 1n December 2000, the tax was made permanent and its rate was increased to 0.3 percent.

Tax rates have ranged between 0.2 and 2.0 percent.[2] In all cases, the rates have varied both across countries and across time, without any discernible trend.

The taxes have been imposed on debits to (withdrawals from) checking, savings, and term accounts in banks and other financial institutions, and on loan withdrawals (this is the case in Brazil, Colombia, and Venezuela). In Colombia the tax is additionally imposed on credits of bank interest to accounts and on repurchase agreements (repos). In Ecuador, the base of the tax was somewhat different, with the tax being imposed not only on withdrawals but also on credits to checking, savings, term, loan, and other accounts at financial institutions, as well as on remittances abroad and on payments abroad by exporters and importers. Thus both deposits to and withdrawals from the same accounts were be subject to the tax. The taxation of both debits and credits is also a feature of the tax introduced in Argentina in 2001.

Most countries provided exemptions for transactions by certain types of institutions (e.g., government agencies) and some specific transactions, including, for example, repos and transactions with the central bank. In Argentina (through 1992 and between April-December 2001) and Ecuador, a portion of the bank debit tax has been creditable against the income tax or the VAT.

Tighter anti-avoidance measures have been introduced in the more recent taxes. The measures included, for example, restrictions on the use of cash for settlements, prohibition of multiple endorsements of checks, and application of the tax to all but the first endorsement upon final settlement.

3 Revenue productivity

As can be seen from Table 1, the short-term revenue performance of transactions taxes, particularly in Brazil, Colombia, and Ecuador, has been quite strong.

In Brazil and Colombia, the taxes have produced revenues in the range of 0.60 to 1.33 percent of GDP for ad valorem tax rates in the range of 0.20 to 0.34 percent. The revenue performance of the tax in Ecuador was exceptionally strong in its first year, reflecting its application to a broader base including both debits and credits, though part of the gross revenues were creditable against other taxes. The taxes imposed in Argentina in 1988 and in Peru in 1990 were significantly less productive as gauged by the ratio of revenues as a percent of GDP to the average statutory rate.

Overall, the more recent taxes have been more productive than those introduced a decade ago. In Brazil, a high revenue yield has been sustained over several years. However, in Colombia and Ecuador, monthly real revenues from the tax were on a declining trend. In Venezuela, revenues held up through end-1999 from the tax's introduction earlier in that year, but declined rapidly in 2000. It should also be noted that revenue productivity appears to decline with higher tax rates. For example, while the tax base in Ecuador was much broader than in the other cases, revenue productivity was considerably lower in Ecuador than in Brazil and in Colombia, where the tax rates are lower.

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[2] The 2 percent tax rate was applicable in Peru during April-September 1990.

Table 1: Bank Debit Taxes

Country and Year	Tax Rate	Gross Revenue[1]	Productivity[2]
Argentina			
1989	0.70	0.66	0.94
1990	0.30	0.30	0.99
1991	1.05[3]	0.91	0.86
1992	0.60[3]	0.29	0.97[4]
2001	0.60[5]	1.46[4]	2.43
Brazil			
1994	0.25	1.06	4.24
1997	0.20	0.80	4.00
1998	0.20	0.90	4.50
1999	0.22[3]	0.83	3.79
2000	0.34[3]	1.33	3.96
2001	0.36[3]	1.45[7]	3.97
Colombia			
1999	0.20	0.73	3.66
2000	0.20	0.60	3.00
2001	0.30	0.76	2.53
Ecuador			
1999	1.00	3.50[6]	3.50
2000	0.80	2.33[6]	2.91
Peru			
1990	1.41[3]	0.59	0.42
1991	0.81[3]	0.46	0.57
Venezuela			
1994	0.75	1.30	2.60[4]
1999-2000	0.50	1.12	2.24
2002	0.75[8]	1.07[7]	1.43

Source: Coelho, Ebrill, and Summers (2001) and authors' estimates.

[1] Gross revenue in percent of GDP.
[2] Gross revenue in percent of GDP divided by average statutory rate.
[3] Average of rates, adjusted for the period tax was in effect.
[4] Adjusted for the period tax was in effect.
[5] On each side of a transaction. Roundtrip tax rate is 1.2 percent.
[6] Tax was levied on both debit and credit transactions.
[7] Estimate based on a part-year tax revenue data and projected GDP.
[8] The rate scheduled to be increased to 1 percent between August 2002 and March 2003.

4 Calculating disintermediation and the deadweight welfare loss

Many alternative models can be envisaged for assessing the impact of a bank debit tax on revenue, bank activity and the deadweight associated with this. For example, one might focus on the payments activity of banks, disregarding their lending and borrowing role. Traditional inventory models, such as that of Baumol, predict a downward-sloping demand curve for deposit balances depending on the cost per deposit-related transaction relative to the interest yield on illiquid assets. Introduction of a debit tax increases the cost per transaction, thereby reducing deposit balances. Alternatively, a model such as that sketched in the Appendix, which focuses on the intermediation role of banks and assumes that the debit tax is perceived by the depositor as, in effect, a reduction in the yield of bank deposits from r_b, say, to $r_b/(1-\tau)$, also predicts that deposit balances – and bank loans – will in equilibrium be lower by an amount depending directly on the tax rate.

Either form of model will predict that the volume of bank deposit and loans will decline by a fraction β of their initial value N, where β is a function of the tax rate τ. (A specific example is spelled out in the Appendix).

The deadweight welfare loss L caused by the tax is the area of the "Harberger[3] triangle" that can be calculated as one half of the tax times the change in the tax base βN:

$$2L = \tau\beta(\tau)N$$

This can be compared with tax revenues T which are equal to the tax rate times the new tax base:

$$T = \tau(1 - \beta(\tau))N$$

The deadweight loss as a fraction of revenues is thus

$$l = \frac{L}{T} = \frac{1}{2}\left(\frac{\beta(\tau)}{1-\beta(\tau)}\right), \text{ or equivalently } \beta = \frac{2l}{1+2l}.$$

A zero deadweight loss implies that the bank debit tax has no impact on financial intermediation. Alternatively, infinite deadweight loss corresponds to complete disintermediation.

6 Data and estimation

We use monthly series of bank debit tax revenues for four countries: Brazil (June 1999 - December 2001), Colombia (January 1999 - December 2001), Ecuador (January 1999 -

[3] Harberger (1964). See Hines (1999) for a discussion of Harberger's contribution to the estimation of deadweight welfare losses.

December 2000), and Venezuela (May 1999 - May 2000). The revenue data comes from the authorities of these countries.

We construct indices of bank debit tax revenues by expressing the real value of each month's revenue as a percentage of that in the first full month of the operation of the tax. The real value is obtained by deflating each month's nominal revenues by the corresponding month's consumer price index (CPI) drawn from *International Financial Statistics*. The base month for the indices is January 1999 for Colombia, January 1999 for Ecuador, and June 1999 for Venezuela. For Brazil we use two base dates: July 1999 and May 2000, thereby treating the sizable change in tax rate from the latter month as if it were a new tax.

The revenue indices are then divided by the statutory tax rate to obtain a measure of trends in the revenue productivity or yield of the tax. Thus, while the revenue index for Colombia in December 2000 is 85, jumping to 120 in January 2001, the fact that the tax rate increased from 0.2 per cent to 0.3 per cent between the same two months means that productivity index declines from 85 to 80 (=120 x 0.2/0.3).

In order to calculate the deadweight loss, we need an estimate of the revenue that would have resulted had there been no disintermediation. Here is where we use the assumption that during the first month after the introduction of the tax, there is minimal change in the behavior of borrowers and depositors. This assumption allows us to use actual bank debit tax revenues collected during the first full month following the introduction of the tax as an estimate of τN.[4]

Estimates of deadweight loss l for each country and each month after the first full month for which we have the data are expressed as a percentage of tax revenues and shown in Figure 3 as three-month moving averages. Deadweight losses following the introduction of the tax reached up to 30 percent in Venezuela, up to 35 percent in Colombia, and up to 45 percent in Ecuador. We do not find significant deadweight losses in Brazil.[5]

Using the relationship between the deadweight loss and disintermediation described in Equation (18), we translate our estimates for deadweight losses l into measures of disintermediation β for each country and month, also expressed as a percentage of tax revenues and shown in Figure 4 as three-month moving averages. Introduction of a bank debit tax resulted in disintermediation of up to 28 percent in Venezuela, up to 41 percent in Colombia, and up to 47 percent in Ecuador. Again, we do not find significant disintermediation effects in Brazil.

We also find that both the deadweight losses and disintermediation effects increase as the taxes remain in place.

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[4] For example, if the tax became effective on May 15, 1998, we use tax revenues for the month of June 1998.

[5] Because the tax was already being collected in Brazil between February 1997 and February 1999, it is likely that most of the behavioral changes in response to the tax have already taken place prior to July 1999. As a result our method, which assumes no behavioral response before July 1999, would likely result in an underestimate of the impact of the tax. In contrast, Albuquerque (2001) estimates the deadweight loss in Brazil to be 21.7 percent of the net tax revenue in 2000.

7 Descriptive evidence

Anecdotal evidence suggests that bank debit taxes are distortionary and have contributed to significant financial disintermediation. First, following the introduction of the tax, individuals and businesses substitute out of bank-intermediated transactions into cash. In Brazil, Colombia, and Ecuador where taxes were in effect during 1998-2000, the ratio of currency outside banks to narrow money has increased by between 15 and 150 percent.[6]

Second, in order to avoid the tax, individuals and enterprises conduct a greater proportion of their bank transactions off-shore. For example, in order to avoid paying bank debit taxes, Argentinians opened bank accounts in Uruguay and Ecuadorians used Aquas Verdes, a town on the border with Peru.

Third, economic agents create new instruments and practices to minimize the impact of the tax. Multiple endorsement of checks is among the most common practices that emerge following the introduction of the bank debit tax. For example, in Colombia, the volume of cleared checks was cut in half from an average of about 60000 per month to about 30000 per month within days after the introduction of the tax. Another popular practice is to set up separate clearing and settlement bank accounts so that intraday payments between customers can be aggregated and debited on a net basis at the end of the day, with only that transaction being subject to the tax. In some cases, e.g., in Colombia, banks deposited the net payment into their tax-exempt accounts with the central bank, thus avoiding the tax altogether. In addition, financial institutions in Brazil offered investment and privatization funds in which an investor pays the tax only at the time of the initial transaction and subsequent transactions done on the behalf of the investor are not taxed, because money transfers between financial institutions are tax-exempt.[7]

Finally, trading volume in the domestic treasury bill, foreign exchange, equity, and inter-bank money markets may fall, if transactions in these markets are subject to the tax. For example, in Colombia, immediately after the introduction of the tax in November 1998, the volume in interbank foreign exchange and money markets declined to about 20 percent of the average pre-tax level, while the volume in the Treasury bill market declined to about 10 percent of the average pre-tax level. In Venezuela, according to the Caracas Stock Exchange annual report, after the tax was introduced in 1999, trading volume on the exchange dropped by 47 percent compared to the previous year.

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[6] This substitution can sometimes lead to a systemic crisis. For example, the introduction of a one percent tax on any bank transaction in Ecuador in December 1998, led to a widespread preference for cash which seriously exacerbated the ongoing liquidity crisis in the banking system. A blanket deposit insurance guarantee introduced at the same time as the financial transaction tax, was not sufficient to restore confidence in the banking system. In the three months after the introduction of the tax, amidst a run on the currency, 6 small banks and the second largest bank had to be closed. In March 1999, fearing a run on the whole banking system, the government froze all demand and savings deposits for six months and all time deposits for one year.

[7] Such funds were authorized by the central bank in order to minimize the disintermediation effects of the tax.

Conclusion

This paper was motivated by the incidences of taxes on banking transactions which are usually levied on debits to bank accounts. In the last fifteen years, a number of countries in Latin America repeatedly implemented and revoked these taxes. These taxes are currently in effect in Argentina, Brazil, Colombia, and Venezuela, where they have been quite effective in generating revenue in the short run.

This paper makes the first formal attempt to estimate deadweight losses and disintermediation following the introduction of bank debit taxes using data from Brazil, Colombia, Ecuador, and Venezuela. We find that, especially at higher rates, these taxes have coincided with significant welfare losses and financial disintermediation. We find that deadweight losses following the introduction of the tax reached up to 30 percent in Venezuela, up to 35 percent in Colombia, and up to 45 percent in Ecuador.

We also derive a relationship between deadweight welfare losses and disintermediation. Using this relationship, we show that the introduction of a bank debit tax resulted in disintermediation of up to 28 percent in Venezuela, up to 41 percent in Colombia, and up to 47 percent in Ecuador. We do not find significant disintermediation or deadweight losses in Brazil, for which our data series is not really long enough to allow effective use of our method.

We also find that both the deadweight losses and disintermediation effects cumulate over time as the taxes remain in place.

Our findings support a view that at low rates and for a limited time, bank debit taxes can be used as a quick and effective way to generate revenue, while the implementation of more traditional taxes is being improved. However, at higher rates or over an extended period of time, the taxes may lead to significant financial disintermediation.

Appendix: A Formal Model

In this Appendix we present a formal model and derive a measure of financial disintermediation following the introduction of a bank debit tax.

A.1 Model

Consider an economy populated by a continuum of identical risk-neutral agents indexed by *i*. Agents maximize the expected utility of consuming a single consumption good. Each agent is endowed with one unit of labor which can be allocated either to an investment project or to a constant returns to scale (CRS) technology. The CRS technology produces one unit of capital from one unit of labor. The investment project available to agent *i* returns y_i units of the consumption good from one unit of labor and one unit of capital. y_i is a realization of the normally distributed random variable *y* with mean equal to 1 and variance equal to δ_y^2.

Each agent can become either an entrepreneur (a borrower of capital) or a worker (a lender). The choice depends on the private value of a noisy signal, s_i about y_i. We assume that s_i is of the following form,

$$s_i = y_i + \varepsilon, \quad (1)$$

where ε is an independently normally distributed random variable with mean zero and variance δ_ε^2.

The entrepreneur can borrow either from a bank by getting a loan or directly from the lenders by issuing claims on output. The banks accept deposits from workers and issue loans to entrepreneurs. In addition, unlike direct lenders, the banks can monitor the realization of returns on projects. Specifically, we assume that y_i is observable, but cannot be verified in court unless a (monitoring) cost $C > 0$ is spent. Therefore, without the ex post monitoring, contracts specifying y_i cannot be enforced. Accordingly, an entrepreneur can keep a fraction of the project's return without the investors' consent and escape punishment. However, if the value of y_i is discovered through monitoring, if the entrepreneur cannot deliver on her contractual obligations, the project is declared bankrupt, its assets liquidated, and all liquidation proceeds are transferred to the lender(s).

The timing is as follows. First, each of the *i* agents receives a signal s_i about y_i. Second, each agent makes a decision of whether to become an entrepreneur or a worker. Third, entrepreneurs borrow from banks or contract with the workers for a share of final output. Finally, y_i is realized, the consumption good is distributed and consumed.

The equilibrium consists of interest rates offered by banks r^b, and in direct lending markets r^m and the corresponding face values of loans, H_b and H_m, such that (i) payoff functions are maximized, (ii) the supply of capital is equal to the demand for capital, and (iii) the contracts are incentive compatible.

A.2 Optimal contract

From the lenders' perspective, because the optimal consumption cannot be negative and returns on investment projects are not verifiable without a cost, a standard debt contract, dominates other types of contracts.[8] The standard debt contract is a contract which requires a fixed payment when the firm can pay

[8] This is a standard result in the literature on financial contracting with costly state verification. See, for example, Townsend (1979), Diamond (1984), and Diamond (1991).

the promised rate of return and, otherwise, requires the entrepreneurial project to be declared bankrupt, its assets liquidated, and liquidation proceeds transferred to the lender(s).

Denote by r the minimum expected rate of return (in units of consumption good per unit of capital) at which the lenders are willing to lend capital to the borrowers. We assume that r is no greater than the unconditional expected return on projects, $E(y) = 1$, so that entrepreneurs undertake their projects if they have enough capital resources available to them.

The optimal contract on project i is of the form,

$$S(y_i) = \begin{cases} H & \text{if } y_i \geq H, \\ \max\{y_i - C, 0\} & \text{otherwise,} \end{cases} \qquad (2)$$

where H must satisfy the incentive compatibility constraint,

$$H \Pr ob(y_i \geq H \mid s_i) + E(\max\{y_i - C, 0\} \mid s_i) \Pr ob(y_i < H \mid s_i) = r \qquad (3)$$

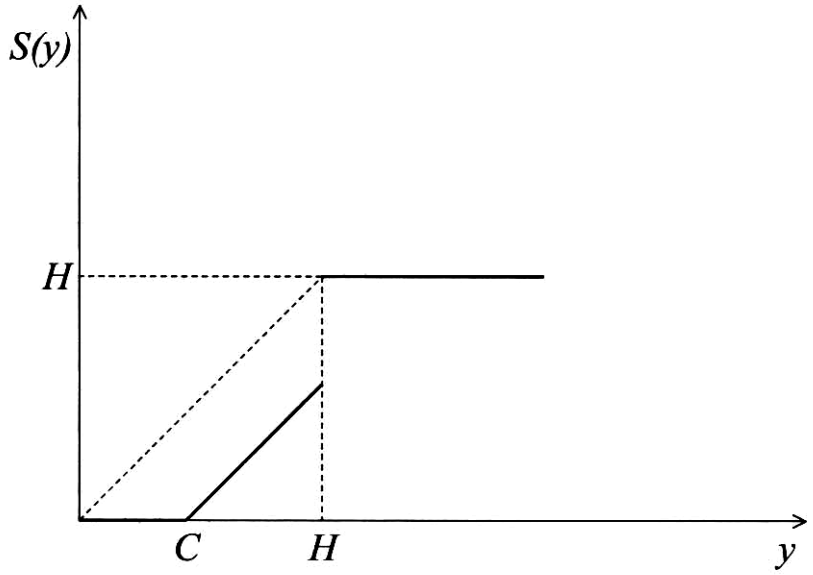
H is the smallest face value of a debt contract which provides the lenders with the expected rate of return of at least r. The debt contract is not monitored if y_i is greater than the face value and is monitored otherwise.

Graphically (Figure 1), the optimal contract is a function that is equal to zero for the values *of* $y_i < C$, equal to $y_i - C$ (an upward-sloping part) for the values *of* $C \leq y_i \leq H$, and equal to H for $y_i \geq H$.

From the borrowers' perspective, for a given face value of the optimal contract, $H > 0$, the expected profit function of borrower i when banks monitor, has the following form:

$$E\{\pi_b(y_i, H) \mid s_i\} = E\{y_i - H \mid s_i, y_i \geq H\} \Pr ob(y_i \geq H \mid s_i) \qquad (4)$$

Figure 1: The Optimal Contract



From the incentive compatibility constraint, (3),

$$E\{\pi_b(y_i, H) \mid s_i\} = E(y_i \mid s_i) - r - C \Pr(y_i < H \mid s_i). \qquad (5)$$

By assumptions about y_i and s_i,

$$E\{y_i \mid s_i\} = \frac{\frac{1}{\delta_y^2} + \frac{s_i}{\delta_2^2}}{\frac{1}{\delta_y^2} + \frac{1}{\delta_2^2}} = \alpha s_i + (1-\alpha) \qquad (6)$$

where $\alpha = \delta_y^2 / (\delta_2^2 + \delta_y^2)$ is a constant between zero and one.

Consequently, for $H = H_b$ and $r = r_b$,[9]

$$E\{\pi_b(y_i, H_b) \mid s_i\} = \alpha s_i + (1-\alpha) - r_b - C \Pr ob(y_i < H_b \mid s_i). \qquad (7)$$

Assuming a competitive banking industry, for a marginal bank borrower with a project *y'* and signal *s'*,

$$\alpha s' + (1-\alpha) - C \Pr ob(y' < H_b \mid s') = r_{b.} \qquad (8)$$

A.3 Bank debit tax and disintermediation

Suppose that a bank debit tax of rate, $0 < \tau \leq 1$ is introduced in the model economy. Following the introduction of the tax, pre-tax return on deposits increases to $r_b/(1-\tau)$, where r_b *is* the minimum expected return at which the lenders are willing to lend capital to the borrowers through a bank. Consequently, banks require their borrowers to deliver a minimum return of $r_b/(1-\tau)$.[10] In other words, the entire burden of the bank debit tax is transferred to the borrowers.

The incentive compatibility constraint (3) takes the form,

$$H \Pr ob(y_i \geq H \mid s_i) + E(\max\{y_i - C, 0\} \mid s_i) \Pr ob(y_i < H \mid s_i) = r_b/(1-\tau) \qquad (9)$$

Following the same derivation that led to Equation (8), after the introduction of the tax, for a marginal borrower with signal s",

$$\alpha s'' + (1-\alpha) - C \Pr ob(y'' < H_b \mid s'') = r_b/(1-\tau) \qquad (10)$$

Combining equations (8) and (10), and assuming

$$\Pr ob(y' < H_b \mid s') \approx \Pr ob(y'' < H_b \mid s''), \qquad (11)$$

we get

$$s'' - s' \approx \frac{\tau r_b}{\alpha(1-\tau)} > 0 \qquad (12)$$

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[9] The derivation of the expected profit function for a borrower in the direct debt market is given in the Appendix.

[10] This insight is due to Caminal (1997).

This means that a marginal bank lender has a higher value of the private signal if the banking system is subject to a bank debit tax than in the absence of it. Therefore, after the introduction of the tax, the number of borrowers goes down. As a result, the amount of funds intermediated by the banks goes down.

A.4 Deadweight and disintermediation

Suppose that before the tax, a total of *N* depositors brought one dollar each into the banks. Banks made *N* dollars worth of loans, earning $r_b N$ on their lending operations.

After the introduction of a bank debit tax τ the marginal lending interest rate increases to $r_b/(1-\tau)$, and the amount of bank loans declines to (1 - β) *N*, where $\beta = \tau r_b / \alpha(1-\tau) > 0$ from Equation (12).[11]

The deadweight welfare loss *L* caused by the tax is the area of the "Harberger triangle" that can be calculated as one half of the tax on the interest on a unit deposit $r_b/(1-\tau)$, times the change in the tax base βN,,

$$L = \frac{1}{2}\frac{\tau r_b \beta N}{(1-\tau)} \qquad (13)$$

Substituting the definition of β into the equation above, the deadweight loss is given by

$$L = \tau^2 \left(\frac{r^b}{1-\tau}\right)^2 \frac{N}{2\alpha} \qquad (14)$$

Note that here the deadweight welfare loss is quadratic in both the tax rate τ and after-tax interest rate $r_b/(1-\tau)$.

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[11] Strictly speaking, the pre-tax equilibrium interest rate should be denoted by r_b' and the after-tax rate by r_b''. We assume that $r_b'' = r_b^0/(1-\tau)$ and drop the superscripts. We thank Patrick Honohan for making this point.

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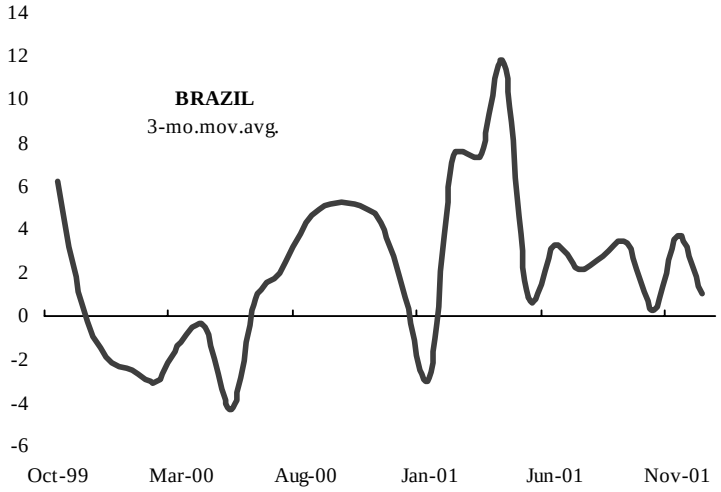
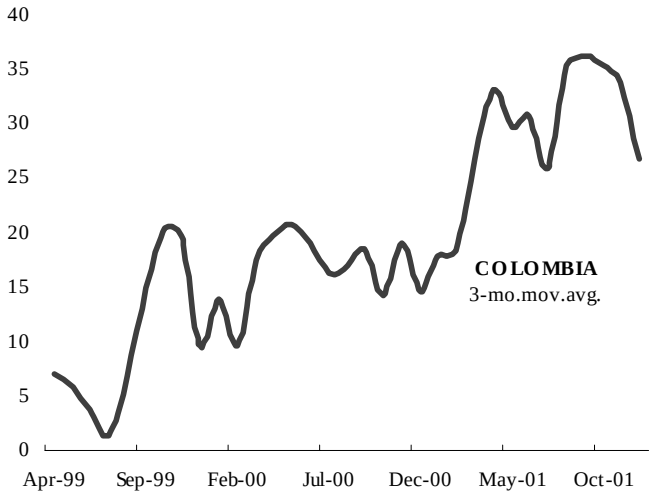
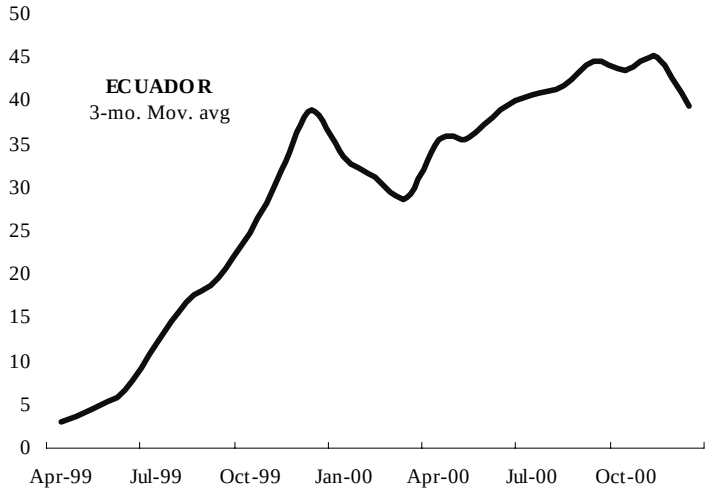
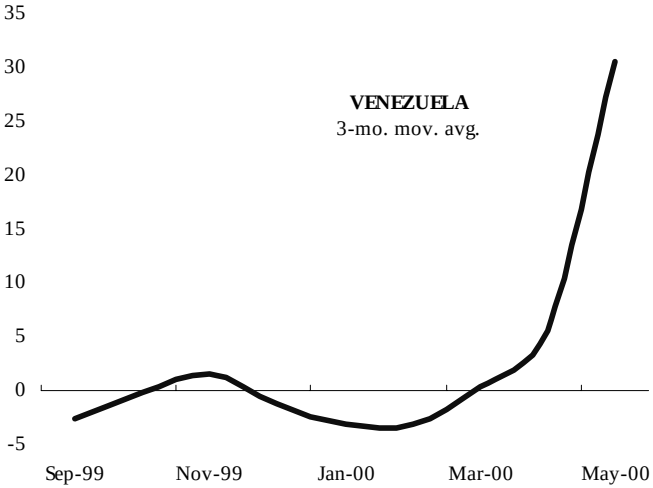
Figure 3: Deadweight Loss from Bank Debit Taxes

(In real terms; month following the introduction of the tax=100)





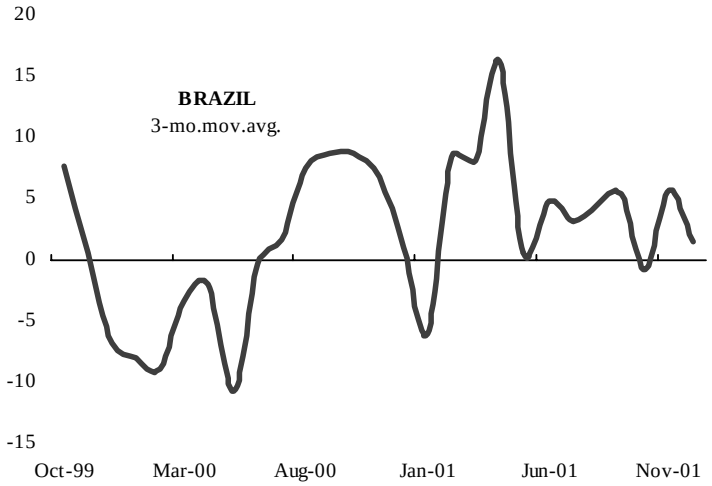


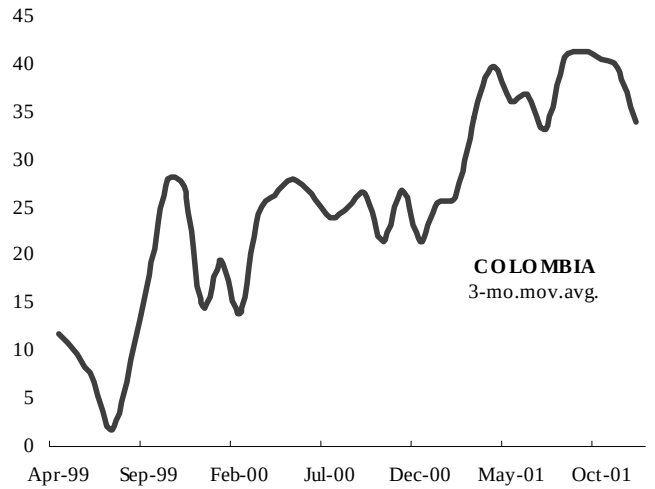


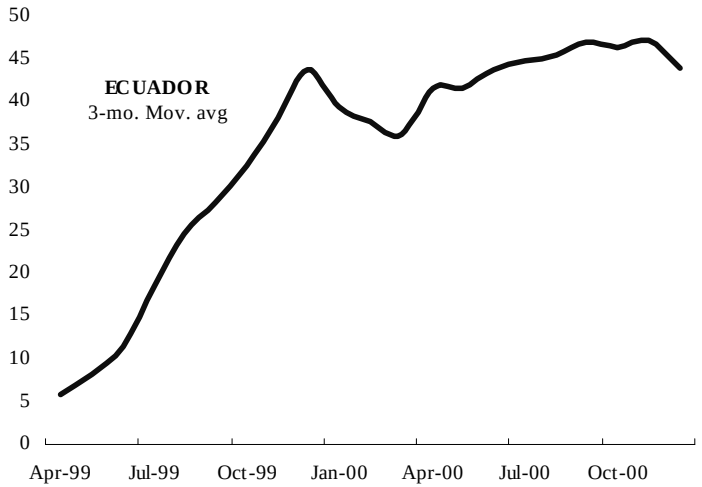
Source: Country data and IFS database.

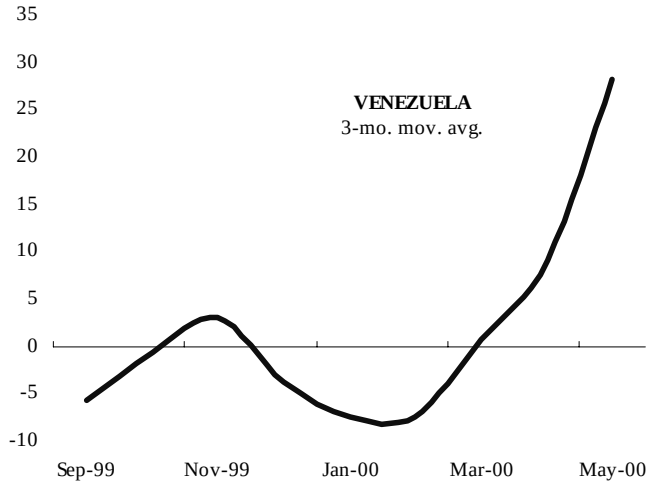
Figure 4: Disintermediation due to Bank Debit Taxes

(In percent of tax revenues)









Source: Country data and IFS database.