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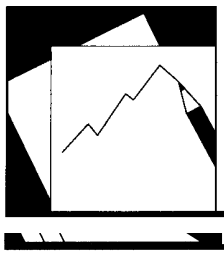

IMF Working Paper

Taxing Financial Transactions: Issues and Evidence

Thornton Matheson

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Taxing Financial Transactions: Issues and Evidence

Prepared by Thornton Matheson [1]

Authorized for distribution by Victoria Perry

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Abstract

In reaction to the recent financial crisis, increased attention has recently been given to financial transaction taxes (FTTs) as a means of (1) raising revenue for a variety of possible purposes and/or (2) helping to curb financial market excesses. This paper reviews existing theory and evidence on the efficacy of an FTT in fulfilling those tasks, on its potential impact, and on key issues to be faced in designing taxes of this kind.

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Author's E-Mail Address: Tmatheson2@imf.org

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I. INTRODUCTION

At their Pittsburgh meeting in September 2009, the G20 leaders tasked the IMF to explore "the range of options countries have adopted or are considering as to how the financial sector could make a fair and substantial contribution toward paying for any burdens associated with government interventions to repair the banking system." In its response, IMF (2010) adopted a dual approach: First, it recommended the adoption of levies on financial institutions to pay for the resolution of troubled institutions in the event of future failures and crises. Second, it examined the possibility of raising revenue from the sector's activities more generally (IMF, 2010). The report considered the possible use of financial transactions taxes (FTTs) for the latter purpose, but ultimately favored the use of a "financial activities tax" (FAT) levied on the sum of financial institutions profits and wages, variously defined. The report did not, however, rule out the use of FTTs for other purposes.

FTTs have indeed come under widespread scrutiny as a result of the recent financial crisis as well as general global economic developments. FTTs have gained support among several G20 governments, including France and Germany;[2] H.M. Treasury (2009) considers the implications of adopting an FTT for financial markets. In March the European Parliament released a study of financial transaction taxes (European Parliament, 2010) and charged the European Commission with developing plans for a European FTT. Numerous civil society organizations (CSOs), including the Leading Group on Innovative Financing for Development, also support adoption of some form of a global FTT.

Supporters of FTTs generally wish to use them to achieve one or more of the following goals: (1) raising revenue from the financial sector to help pay for the costs of the recent financial crisis or for global development; and (2) reducing financial market risk and waste and helping to prevent asset price bubbles. This report evaluates the efficacy of FTTs in accomplishing these alternative goals. Though FTTs appear to conform to the tax policy precept of levying a low rate on a broad base, they conflict with the precept that, because gross transaction taxes distort production, they should therefore be avoided when more efficient tax instruments are available. This report therefore describes income and consumption tax reforms that address these two objectives.

Despite common use of FTTs, many aspects of their economic impact remain largely unexplored. The literature shows a predictable effect of FTTs on asset valuation and trading volume, with implications for liquidity and price discovery, in various markets; however, their effect (or that of transaction costs more generally) on market dynamics as well as the value of incremental liquidity are poorly understood. There is also little written on the incidence of FTTs or their distortions relative to other types of taxes. This report summarizes the existing literature on FTTs and delineates areas that require further research.
Section II categorizes the different types of financial transactions taxes. Section III reviews the current use of financial transaction taxes and their revenue yields in the G20 countries and selected non-G20 financial centers. Section IV reviews the economics of securities

[2] Wall Street Journal (2010).

transaction taxes, including their incidence and behavioral effects. Section V discusses design considerations for a hypothetical STT to minimize distortions and evasion against this background and Section VI concludes.

II. A TYPOLOGY OF FINANCIAL TRANSACTIONS TAXES

Several different tax instruments are referred to generally as "financial transaction taxes." This paper defines a *securities transactions tax* (STT) as a tax on trades in all or certain types of securities (equity, debt and their derivatives). It may include original issuance (similar to a capital levy), or be restricted to secondary market trades. Though an STT may be levied as a flat fee per trade, it is more commonly an ad valorem tax based on the market value of the securities.

A *Tobin tax* is a securities transactions tax imposed specifically on foreign exchange transactions and possibly also their derivatives: currency futures, options and swaps. It is often used as a pecuniary foreign exchange control in lieu of administrative and regulatory measures.[3]

A *capital levy* or *registration tax* is imposed on increases in business capital in the form of capital contributions, loans and/or issuance of stocks and bonds. It may encompass all forms of business capital or be limited to a particular type of capital (e.g., debt or equity) or form of business, such as corporations or partnerships. A registration tax may also be charged to individuals on bank loans and/or mortgages.

A *bank credit or debit tax* (BDT) is a tax on deposits and/or withdrawals from bank accounts. Most commonly seen in Latin American and Asia, they are usually imposed on an ad valorem basis as a percentage of the deposit or withdrawal. Bank credit and debit taxes effectively tax purchases of goods and services, investment products and factor payments paid for with funds intermediated by banks.[4]

Some G20 countries levy *insurance premium taxes*. These special sales taxes are often imposed on insurance premiums in order to compensate for real or perceived undertaxation of the insurance industry under an income tax and/or value added tax. [5]

A *real estate transaction tax* is levied on the value of land and/or structures when sold. This type of tax is quite common at both national and subnational levels. Real estate cannot migrate offshore, and buyers frequently must pay this tax to register title to their property and ensure their ownership rights (while sellers wish to ensure that their futures liabilities are

[3] For a discussion of pecuniary and non-pecuniary foreign exchange controls, see Arivoshi, and others (2000).

[4] For analysis of BDTs, see for example Arbalaez et al. (2002) and Kirilenko and Summers (2003).

[5] On the difficulty of taxing the insurance industry, see Zee (2004).

eliminated). The base of a real estate transaction tax is thus less elastic than the base of a securities transaction tax, making it easier to enforce.

This report will focus on securities transaction taxes (STTs), since it is this type of tax that government and CSOS have most frequently been promoting in order to raise revenue from the financial and possibly curb financial market excesses

III. Current Financial Transaction Taxes and Revenue Yields

G20 countries currently levy several different types of financial transaction taxes (Table 1).

A. Equity

The most common form of FTT is an STT on secondary trading in equity shares. Brazil, China, India, Indonesia, Italy, South Africa, South Korea, and the United Kingdom all tax purchase and/or sale of company shares.[6] These STTs may apply only to shares traded on official exchanges, only to shares traded off exchange, or both. They may also apply only to corporate shares, or to shares in non-corporate businesses as well. They are generally ad valorem taxes based on the market value of the shares being exchanged, with the tax rate varying between 10 and 50 basis points. The UK and Brazil, however, levy a one-time higher-rate tax of 1.5 percent on equities of domestic company shares listed abroad as depository receipts. Among non-G20 members with major financial centers, Hong Kong, Switzerland, Singapore and Taiwan also impose stock transaction taxes of 10–30 basis points.

STTs on equity are sometimes extended to equity derivatives as well. India, for example, taxes equity futures and options as well as the underlying shares. Futures are taxed on the basis of their delivery price, while options are taxed both on the premium and on the strike price, if exercised.[7] U.K. stamp duty is levied on the strike price of equity options, if exercised, but is not applied to the option premium; it also applies to the delivery price of U.K. equities purchased via futures contracts.

Some G20 countries levy non-tax charges on listed shares. The United States' Securities and Exchange Commission (SEC), its equity market regulator, imposes a 0.17 basis point charge on stock market transactions to fund its regulatory operations.[8] Turkey charges companies listing on their stock exchange an initial fee of 10 basis points, followed by a 2.5 basis point annual maintenance charge.

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[6] Argentina has provincial STTs.

[7] The Indian securities transaction tax was introduced in 2004 as replacement for India's unsuccessful capital gains tax. Japan also has an optional 1 percent transactions tax on stock sales, which investors may elect in lieu of paying a 10–20 percent capital gains tax.

[8] The SEC resets the fee rate semiannually to meet a revenue target.

Table 1: Securities Transaction Taxes in G20 and Selected Other Countries, 2010

Country	Capital Levy	Equity	Bonds/Loans	Forex	Options	Futures	Capital inflow
Argentina	na	Federal stamp duty on share transfers abolished 2001	Provincial stamp tax, usually at 1%, may affect bonds and debentures.	na	na	na	na
Australia	na	State-level taxes may apply to shares	State-level taxes may apply to loans and bonds.	na	na	na	na
Brazil	na	1.5% tax on equity issued abroad as depository receipts (reduced from 3% 2008)	1.5% tax on loans (reduced from 3% in 2008).	0.38% on forex; 5.28% on short-term forex (<90 days).	na	na	2% tax on capital inflows to stock and bond markets
Canada	na	na	na	na	na	na	na
China	na	0.1% of principal	na	na	na	na	na
France	5% of capital contributions not subject to VAT	15-30 bps tax abolished 1/1/2008	na	na	na	na	na
Germany	na	na	na	na	na	na	na
India	na	0.25% on stock price; 0.025% on intraday transactions; local stamp taxes may also apply	Local stamp duties may apply		0.017% on premium; 0.125% on strike	0.017% of delivery price	na
Indonesia	na	0.1% on value of shares; local stamp duties may also apply.	Local stamp duties may apply	na	na	na	na
Italy	Euro 168 flat fee on share issuance; 3% on business purchases	0.01-0.14% of shares traded off exchange.	0.25-2% on loan principal	na	na	na	na
Japan	Registration tax of 0.4% on mergers and trusts.	na	na	na	na	na	na
Mexico	na	na	na	na	na	na	na
Russia	Capital duty of 0.2% of value of new share issues, but not upon formation or IPO of company		Capital duty of 0.2% of value of new bond issues, but not upon formation or IPO of company				
Saudi Arabia	na	na	na	na	na	na	na
South Africa	na	0.25% of value; new share issues excluded.	na	na	na	na	na
South Korea	0.1-0.4% tax on capital formation	0.5% on value of shares in corporations or partnerships					
Turkey	Stock issuance charge 0.2%	Initial charge for obtaining stock market quote: 0.1%; annual maintenance charge 0.025%	0.6-0.75% bond issuance charge; 5% charge to banks on interest income	0.1% tax levied on foreign exchange transactions by banks, bankers and insurance companies			
UK	na	Stamp duty 0.5% on secondary sales of shares and trusts holding shares.	na	na	50 bps on strike price, if executed.	50 bps on delivery price	na
US	na	SEC fees on stock trading: 0.0013%; NY state tax: $0.05 per share up to $350 per trade.	na	na	na	na	na
Non-G20 Countries							
Hong Kong SAR		10 basis points					
Singapore		20 basis points					
Switzerland	1% on share issuance in excess of CHF 1 mn.	15 bps on domestic shares; 30 bps on foreign shares.	6-12 bps on bond issuance				
Taiwan, Province of China		30 basis points	10 basis points on corporate bond principal		10-60 basis points on premiums.	Up to 0.025 basis points on interest rate futures; up to 6 basis points on stock index and other futures	
Source: International Bulletin for Fiscal Documentation, IMF staff							

The trend in share transaction taxes over the past several decades has been downward. The United States eliminated its stock transaction tax as early as 1966. Germany eliminated its stock transaction tax in 1991 and its capital duty in 1992. Japan eliminated its share transaction tax in 1999. Australia eliminated its federal stamp duty on share transfers in 2001. Italy sharply reduced its capital and transaction duties in 2000, and France eliminated its share transaction tax in 2009. Paramount to this trend are concerns about raising businesses' cost of capital and impairing the development and competitiveness of domestic financial markets, given increased cross-border mobility of capital.

Most countries' laws distinguish between initial share offerings and secondary market trades. Taxes on share trades frequently exempt new share issuance, as in the U.K., but a capital levy on original issuance is sometimes imposed in addition to or as part of a transaction tax. Within the G20, Korea, Russia, and Turkey all impose some sort of tax on original issuance of equity. Elsewhere in Europe, Greece, Spain Cyprus, Austria, Poland, and Portugal also impose capital levies.

Like share transaction taxes, the trend in capital levies is downward. The European Union has encouraged the reduction and/or elimination of capital levies by capping them at 1 percent and prohibiting transactions taxes on new share offerings in the interest of fostering the development of EU capital markets.[9] In 2006, the European Commission recommended the abolition of all capital duties by 2010 "in order to support the development of EU companies…to create more jobs and growth" (European Commission, 2006).

B. Debt

Transaction taxes or capital levies may also be applied to debt finance, though taxes on loans and bonds are less common in the G20 than taxes on equity. At the national level, Brazil, Italy, Russia, Switzerland, and Turkey impose taxes on some forms of debt finance. Unlike equity STTs, bond taxes are usually levied solely on issuance rather than secondary transactions. However, Taiwan levies a 10 basis point transaction tax on corporate bond trades.

C. Foreign Exchange

Among the G20 countries, Brazil and Turkey levy Tobin taxes on foreign exchange. Brazil's general tax rate is 0.38 percent, but it also levies higher rates of 2.38 and 5.38 percent on certain transactions, and many transactions, such as those for exports, are tax-exempt. In November 2009, Brazil also imposed a 2 percent tax on foreign purchases of Brazilian stocks and bonds in an effort to stem the appreciation of the real in the face of buoyant capital

[9] European Council Directive 85/303/EEC.

inflows.[10] Turkey levies a 0.1 percent tax on foreign exchange transactions by banks, bankers, and insurance companies.

D. Revenue

Revenue experience from securities transaction taxes over the past two decades has varied widely (Table 2). France, Japan, Germany and Italy, which eliminated their stock market transaction taxes during this period, collected at most 0.2 percent of GDP in revenues from them since 1990.[11] India's STT, enacted in 2004, has also raised revenues in this range. The U.K., South Africa, South Korea, and Switzerland have reaped significantly more than this over the past decade, 0.2-0.7 percent of GDP. Hong Kong and Taiwan have seen the most buoyant revenue of the countries shown, raising as much as 1–2 percent of GDP. Predictably, STT revenue displays a cyclical pattern, rising and falling with financial market activity.

Table 2: Revenues from STTs, Selected G20 and Other Countries (% GDP)

Country	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
France	0.05	0.01	0.03	0.02	0.01	0.01	0.01	0.01	0.01	0.01	na	na
Germany	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	na	na
Hong Kong	na	na	na	na	na	na	na	na	na	na	2.10	1.32
India	na	na	na	na	na	na	0.02	0.07	0.12	0.19	0.10	na
Italy	0.08	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	na	na
Japan	0.18	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	na	na
South Korea	0.12	0.18	0.62	0.37	0.45	0.32	0.26	0.41	0.43	0.58	na	na
South Africa	na	na	na	0.34	0.36	0.36	0.46	0.54	0.58	0.49	0.51	na
Switzerland	0.56	0.38	0.85	0.67	0.50	0.46	0.47	0.44	0.46	0.46	na	na
Taiwan	na	na	na	0.65	0.77	0.72	0.85	0.65	0.79	1.07	0.77	na
UK	0.16	0.14	0.39	0.45	0.27	0.23	0.22	0.22	0.27	0.28	0.29	0.44

Source: OECD, EU Parliament, UK Treasury, Indian Treasury, World Economic Outlook

Several proponents of STTs and Tobin taxes have developed revenue estimates for hypothetical national or multilateral transaction taxes (Table 5). Pollin and others (2002) propose an STT whose tax rate varies with transaction costs: 0.2 basis points on futures (notional value), 1 bp times years to maturity on bonds; 2 bps time years to maturity on swaps (notional principle); and 50 bps on stocks and option premiums. The authors estimate that the tax would raise US$66–132 billion per annum. The low estimate assumes that trading volume contracts by 50 percent in reaction to the STT, while the high estimate assumes that it is unchanged. Schulmeister and others (2008), using a similar assumption that

[10] Explicit taxes on foreign exchange can perform a similar role to implicit taxation in the form of capital controls, though the latter are not considered here. For a recent analysis of foreign exchange controls, see Ostry et al. (2010).

[11] Japan collected 0.55 percent of GDP in securities transaction taxes at the peak of its stock market bubble in 1988 (OECD Revenue Statistics).

trading volume contracts between 10 and 40 percent in response to a one basis point STT on global stocks, bonds and derivatives (including commodity derivatives), estimate that it would raise US$202–266 billion.

Estimates for multicurrency Tobin taxes are generally lower, reflecting their smaller base: Schmidt (2007) estimates revenue from a 0.5 basis point tax on spot, forward and swap markets in the four largest trading currencies (U.S. dollar, Euro, Yen and Sterling) at $33 billion, based on an empirically calculated elasticity estimate of -0.4. Spratt (2006) estimates that a 0.5–1 basis point tax on spot and derivative transactions in those markets would raise $20–38 billion per annum. He assumes that trading volume would contract only 2.5 percent under a 0.5 basis point tax, and 5 percent under a one basis point tax. Given current spreads of 1–4 basis points in the interdealer market for the major currencies, these elasticities of trading volume with respect to the STT rate of 0.05–0.2 seem low.

IV. The Economics of Securities Transaction Taxes

A. Evolution of the Debate

Financial transaction taxes have inspired large theoretical, empirical, and (not least) polemical literatures debating their pros and cons. One of the earliest and most illustrious proponents of a securities transaction tax on stocks was Keynes, who highlighted the key tension in the FTT debate: the desire to curb speculative bubbles vs. the desire not to impair the financing of real enterprise. The development of liquid financial markets enables entrepreneurs to raise capital and diversify their risk, greatly expanding a society's capacity to undertake large-scale investment; it also enables savers to increase their returns and diversify their risk. Simultaneously, however, the availability of a liquid market can decouple investment from an assessment of fundamental asset yields and focus it on (short-term) capital gains. Thus, near-term returns can be driven not by fundamentals but by "what average opinion believes average opinion" of the future price to be—that is, by speculation (Keynes, 1936).

The second major proponent of a financial transaction tax levied specifically on foreign exchange transactions was Tobin (1978). Tobin proposed a one percent tax on all foreign exchange transactions to be levied multilaterally by world governments in order to limit cross-border capital flows that impair country governments' efforts to regulate aggregate demand. The Tobin tax is thus a pecuniary form of exchange control that would render unprofitable many cross-border financial transactions, particularly short-term round-trip flows.

Numerous authors have furthered the debate on transaction taxes. Proponents (e.g., Stiglitz, 1989; Summers and Summers, 1989) claim that an STT would curtail short-term speculation, thereby reducing wasted resources, market volatility and asset mispricing. Opponents (e.g., Habermeier and Kirilenko, 2003; Schwert and Seguin, 1993) focus on the fact that an STT would result in lower asset prices, increased cost of capital for businesses, and lower returns to savings. They also fear that it would reduce liquidity, producing greater

price volatility and interfering with price discovery, and lead to widespread tax evasion and distortion of financial markets. Sections IV-B through IV-D evaluate the theory and empirical evidence behind these competing claims.

Concern over the negative impact of FTTs on financial market function has led their advocates to call for lower tax rates than originally proposed by Keynes or Tobin. Whereas Keynes called for a "substantial Government transfer tax" and Tobin for a tax rate of one percent on foreign exchange, today's FTT advocates call for rates as low as one-half basis point in order to avoid impairing liquidity or driving activity offshore (Pollin and others, 2002; Schulmeister and others, 2008; Schmidt, 2007; Kapoor and others, 2007; Spratt, 2006; European Parliament, 2010). In this literature, the focus of imposing an FTT has largely shifted from financial market regulation to revenue raising; however, a therapeutic effect from curbing market excesses is sometimes still sought even from a very low-rate tax.

B. Asset Valuation and Cost of Capital

Imposition of an STT can be modeled as an increase in transaction costs analogous to a widening of the bid-ask spread. As Tobin points out, for any given level of expected return, a transaction tax therefore particularly discourages short-term trading.

Theoretical models generally confirm that higher transactions costs, including those imposed by transaction taxes, are associated with lower asset prices (Kupiecs, 1996; McCrae, 2002). Investors who must pay higher costs to acquire or dispose of a security require a higher return from holding it, and thus bid the price down. The valuation premium placed on liquidity can be large: Illiquid, privately held companies are valued at 20–25 percent less than comparable publicly traded firms (Block, 2007). Higher transaction costs therefore raise the cost of capital for entities emitting taxed securities.

Appendix A presents a model of the impact of a transactions tax on security valuation and cost of capital. The effect of a given transactions tax, levied once per transaction at the ad valorem rate T, depends on the holding period, N, the discount rate r, and the growth rate of dividends, g: $R = r - g$). The proportional reduction in the value of a security from the imposition of an STT, Δ, is shown here, under simplifying circumstances, to be given by:

$$\Delta = 1 - \frac{(1 - e^{-RN})}{1 - (1 - T)e^{-RN}}$$

Where $R=r-g$. This reduction in value is increasing in T (though at a decreasing rate), and decreasing in both the holding period N and the discount rate R (Table 3). As is also shown in the appendix,[12] the effect of an STT on the cost of capital is similar to an increase in the discount rate of T/N.

[12] McCrae (2002) also derives this effect.

For very short holding periods, (e.g., one day), an STT at even the very low rate of one basis point reduces securities value by almost half. For very long holding periods (e.g., 10 years), the drop in value from even a 50 basis point STT is quite small (1.4 percent). The impact on the cost of capital for securities with an average holding period of one year is equal to the tax rate; this impact is higher for securities with a shorter holding period and lower for those with a longer holding period. In 2009, the average holding period for stocks in the Standard and

Table 3

Percentage Reduction in Security Valuation due to an STT

	Average Holding Period (Years)							
Tax Rate (T), Basis Points	**0.10**	**0.25**	**0.5**	**1**	**2**	**3**	**3.7**	**10**
1	3.2%	1.3%	0.7%	0.3%	0.2%	0.1%	0.1%	0.0%
5	14.3%	6.2%	3.2%	1.6%	0.8%	0.5%	0.4%	0.1%
10	25.0%	11.7%	6.2%	3.2%	1.6%	1.1%	0.8%	0.3%
50	62.5%	39.9%	24.9%	14.1%	7.5%	5.0%	4.1%	1.4%

Discount rate less dividend growth rate: R = 0.03

Increase in Cost of Capital - Percentage Points

	Average Holding Period (Years)							
Tax Rate (T), Basis Points	**0.10**	**0.25**	**0.5**	**1**	**2**	**3**	**3.7**	**10**
1	0.10	0.04	0.02	0.01	0.01	0.00	0.00	0.00
5	0.50	0.20	0.10	0.05	0.03	0.02	0.01	0.01
10	1.00	0.40	0.20	0.10	0.05	0.03	0.03	0.01
50	5.00	2.00	1.00	0.50	0.25	0.17	0.14	0.05

Poors 500 stock index was 0.4 years, or about 3.5 months. (This is down sharply from the average holding period of 1.8 years in 1990.)[13] A one basis point STT on stocks with this turnover rate would have a fairly small impact, reducing their market value by 0.8 percent and increasing their cost of capital by about 3 basis points; a ten basis point STT would reduce their value by 7.6 percent and increase their cost of capital by about 25 basis points. For smaller capitalization stocks, which have wider bid-ask spreads and longer average holding periods, these impacts would be less.

By raising transactions costs, an STT would also lengthen the average holding period of securities, particularly for securities with initially narrow bid-ask spreads, such as large-cap stocks. This would reduce the impact of a given STT on securities values and capital costs. Since corporate bonds are generally traded less frequently than stocks, the impact of a given STT on corporate borrowing costs would likely be smaller than the impact on stocks. The

[13] Datastream.

overall impact of a low-rate (5 basis points or less) STT on the corporate cost of capital is thus likely to be quite modest.

Empirical studies of the impact of STTs on financial markets generally confirm the theoretical proposition that they reduce asset prices. Umlauf (1993) notes that the 1983 imposition of a one percent tax on equity trades in Sweden resulted in a market decline of about 5.3 percent on the Stockholm stock exchange in the 30 days leading up to the introduction of the tax. Hu (1998), studying 14 separate STT changes in Hong Kong, Japan, Korea, and Taiwan during 1975–1994, finds that on average, a 23 percent rise in transaction costs (including the tax rate) causes an immediate one percent decline in daily market returns. Based on a review of the literature, Schwert and Seguin (1993) estimate that imposition of a 0.5 percent STT in the U.S. would increase the cost of capital by between 10 and 180 basis points. Oxera (2007) estimates that abolition of the 0.5 percent U.K. stamp duty would increase share prices by 7.2 percent and reduce the cost of capital by between 66 and 80 basis points.

The impact of an STT on a company's cost of capital depends positively on the frequency with which its shares are traded. Bond and others, (2004) find that the 50 percent cut in Britain's Stamp Duty enacted in 1986 increased share prices, particularly for shares with high turnover rates. They predict that eliminating the remaining 50 basis point stamp duty would increase share prices between 2.5 and 6.3 percent, depending negatively on dividend yield and positively on market turnover. This finding corroborates Amihud and Mendelson's (2000) finding of the existence of liquidity clienteles, in which investors with longer (shorter) time horizons specialize in trading less (more) liquid assets. STTs are therefore capitalized more heavily into the prices of assets with high turnover, such as large-capitalization stocks.

C. Turnover, Liquidity and Price Discovery

As noted above, because STTs render some trades unprofitable, they reduce trading volume.[14] This generally also reduces liquidity, defined as the price impact from a given trade (Amihud and Mendelson, 1986 and 1992; Kupiecs, 1996). Lower liquidity can in turn slow price discovery, the process by which financial markets incorporate the effect of new information into asset prices (Froot and Perold, 1995; Frino and West, 2003). By contrast, Subrahmanyam (1998) and Dupont and Lee (2007) present models in which the impact of a securities transaction tax on liquidity may be either positive or negative, depending on market microstructure.[15]

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[14] Kiefer (1990) notes that, because institutional investors generally face lower non-tax transaction costs than retail investors, an STT will reduce institutional trading more than retail trading.

[15] Imposition of an STT can have varying effects on liquidity in markets with asymmetrical information. Subrahmanyam finds that introducing a transactions tax reduces liquidity in oligopolistic markets, since it causes Cournot-competitive traders to scale back their trading; however, in the presence of a monopolist market maker, introduction of an STT may not decrease liquidity, and may even raise it if the monopolist market maker has information that other traders lack, because the tax effectively reduces the information asymmetry in the

(continued…)

In empirical studies, higher transaction costs are usually found to decrease trading volume, with a broad range of elasticities across markets (Table 4). Some studies calculate elasticities solely with respect to a tax change, others to bid-ask spreads, and some to total transaction costs. Where the elasticity of trading volume with respect to a subcomponent of transactions costs (such as STT or bid-ask spreads) is measured, the implied elasticity with respect to total transactions costs will be higher.

Table 4: Estimated Elasticities of Trading Volume with respect to Transaction Costs

Source	Country	Market	Elasticity	Measure
Baltagi et al. (2006)	China	Stock market	-1	TTC
	China	Stock market	-0.5	STT
Chou and Wang (2006)	Taiwan	Futures market	-1	STT
	Taiwan	Futures market	-0.6 to -0.8	BAS
Ericsson and Lindgren (1992)	Multinational	Stock markets	-1.2 to -1.5	TTC
Hu (1998)	Multinational	Stock markets	0	STT
Jackson and O'Donnell (1985)	UK	Stock market	-0.5 (-1.7)*	TTC
Lindgren and Westlund (1990)	Sweden	Stock market	-0.9 to -1.4	TTC
Schmidt (2007)	Multinational	Foreign exchange	-0.4	BAS
Wang et al. (1997)	US	S&P 500 Index Futures (CME)	-2	BAS
	US	T-bond futures (CBT)	-1.2	BAS
	US	DM futures (CME)	-2.7	BAS
	US	Wheat futures (CBT)	-0.1	BAS
	US	Soybean futures (CBT)	-0.2	BAS
	US	Copper futures (COMEX)	-2.3	BAS
	US	Gold Futures (Comex)	-2.6	BAS
Wang and Yau (2000)	US	S&P 500 Index Futures (CME)	-0.8 (-1.23)*	BAS
	US	DM futures (CME)	-1.3 (2.1)	BAS
	US	Silver futures (CME)	-0.9 (1.6)	BAS
	US	Gold futures (CME)	-1.3 (1.9)	BAS
*Long-run elasticities in parentheses				
TTC = Total Transaction Costs				
STT= Security Transaction Tax				
BAS = Bid-Ask Spread				

Stock market trading volume elasticities generally range between -0.5 and -1.7. Jackson and O'Donnell (1985) find a short-run trading volume elasticity of -0.5 and a long run elasticity of -1.7 for the UK. Umlauf (1992) reports that the 100 percent increase in the Swedish STT in 1986 resulted in a 60 percent fall in trading of the 11 most actively traded stocks on the Stockholm exchange. Lindgren and Westlund (1990) find an overall transaction cost elasticity of –0.85 to -1.35 for Sweden. Baltagi and others (2006) find that the 1997 increase in China's STT from 0.3 to 0.5 percent reduced trading volume by one third, implying an elasticity of -0.5 with respect to the tax and an elasticity of about -1 with respect to total

market. Similarly, Dupont and Lee find that in a market with informed and liquidity traders, an STT may increase liquidity by driving informed traders out of the market.

transaction costs. Liu (2007) finds a trading volume elasticity of -1 with respect to Japan's STT on stocks. One study finding no response of trading volume to transactions costs is Hu (1998); the author infers that the tight regulation of most Asian markets during the period under study limited the potential for trade to migrate toward (untaxed) overseas markets.

There are several studies of turnover elasticities with respect to transaction costs in other types of financial markets. In fixed-income markets, Froot and Campbell (1994) find that Sweden's imposition of a 0.2 to 3 basis point STT on bonds (the rate increasing with maturity) produced a sharp drop in trading volume. Trading in long-term bonds, for which there existed several untaxed alternatives including corporate loans and variable rate notes, fell a remarkable 85 percent upon announcement of the tax, though bill volume fell a more modest 20 percent. The authors attribute the sharp drop in bond trading volume to the availability of untaxed substitutes, including bank loans and variable rate notes (an OTC product traded without a broker).

In the foreign exchange market, Schmidt (2007) estimates the elasticity of foreign exchange trading with respect to transaction costs for a multilateral tax on the four largest trading currencies (U.S. dollar, euro, sterling, and yen) at -0.4.[16] This relatively low elasticity reflects the broad multilateral base, which reduces opportunities for avoidance. In futures markets, Wang, and others (1997) and Wang and Yau (2000) find a negative relationship between bid-ask spreads and trading volume in seven U.S. futures markets. They also estimated long-run elasticities to exceed short-run elasticities. Chou and Wang (2006) find that a 50 percent reduction in Taiwan's STT on futures markets resulted in a commensurate increase in trading volume, controlling separately for changes in the bid-ask spread.

Several studies find evidence that STTs lead to reallocation of trading volume both across markets and across borders—an important aspect of trading volume elasticity with respect to STTs. Umlauf (1993) and Froot and Campbell (1994), studying the Swedish STT, find that it resulted in a massive migration of trading in Swedish stocks from Stockholm to London, as noted above. Froot and Campbell also find that the Swedish tax shifted fixed-income trading activity within Sweden from fixed-income securities and futures markets to the markets for corporate loans, variable-rate notes, forward rate agreements, and swaps, none of which were subject to the tax. Similarly, Chou and Wang (2006) find that the reduction of the STT on Taiwanese futures markets induced a significant migration of trade from Singapore to Taiwan. These findings highlight the importance of an STT's design to its effectiveness and administrability: The high rate and narrow base of Sweden's STT and the availability of foreign trading venues in Taiwan undermined their STT performance. These issues will be dealt with in greater detail in Section V.

A few studies attempt to measure the impact of transaction costs, including STTs, on the price discovery process. These studies generally examine changes in the autocorrelation of

[16] Schmidt's measure of transaction costs is the bid-ask spread, Since this is endogenous to trading volume (higher turnover usually lowers bid-ask spreads due to lower liquidity and inventory risk), Schmidt estimates a two-stage least squares using external trade as an instrument for trading volume in the bid-ask spread equation.

market returns in response to changes in STT rates. In theory, efficient price discovery would mean zero or very low autocorrelation of returns, since new information would be immediately incorporated into new market valuations. With a transaction tax reducing trades, information may be incorporated into trading more slowly, resulting in greater autocorrelation of returns. Liu (2007) finds that the reduction of Japanese STT in 1989 reduced the first order autocorrelation observed in Japanese stock price changes, bringing their level of autocorrelation more in line with that of untaxed Japanese depository receipts trading on the U.S. stock market. Similarly, Batalgi, and others (2006) find that an increase in China's STT rate increases the autocorrelation of returns.

D. Volatility and Waste

Adoption of a broad-based STT has often been promoted to curb perceived negative externalities in financial markets. The reasoning behind these prescriptions is generally as follows: Falling transactions costs have led to an explosion of short-term securities and derivatives trading. Most short-term trading is speculative noise-trading, based on trend-following technical analysis rather than fundamentals, and it therefore promotes excess volatility and asset bubbles. By raising transactions costs, an STT would curb short-term trading, thereby reducing volatility and asset mispricing. Further, short-term trading is a zero-sum game that adds no real value to the economy, and is therefore a waste of resources. (Schulmeister, and others, 2008).

Transaction costs and trading volume

Transaction costs have indeed fallen dramatically across financial markets over the past 35 years due to advances in information technology, deregulation and product innovation. In the U.S. equity market, commission deregulation (1975) and decimalization (2000) both substantially lowered transactions costs. Bid/ask spreads on the NYSE now average about 0.1 percent (Jiang, and others, 2009), vs. 1.3 percent in the mid-1980s (Clark, and others, 1992). In the foreign exchange market, bid-ask spreads for major currencies are currently as little as 1–4 basis points, half the level of a decade ago. Spreads in interest rate futures and swaps are also on the order of a few basis points. Development of the interest rate and credit default swap markets has enabled investors to tailor their fixed-income exposure more cheaply than by trading the underlying bonds.

As economic theory would predict, this steep decline in financial transaction costs has produced an increase in financial transactions relative to real activity. The value of world financial transactions, which was 25 times world GDP in 1995, rose to70 times that value by 2007 (European Parliament, 2010). The growth of transactions has been concentrated in derivatives markets, which often have much lower transaction costs relative to notional values than spot markets. Growth in interest rate and equity derivatives transactions has far outstripped growth in business investment in North America and Europe, while the ratio of spot transactions to investment has remained fairly steady (Schulmeister, and others, 2008).[17]

[17] These statistics measure derivatives by their notional amounts, which can greatly overstate net exposures.

As theory would also predict, lower transactions costs have particularly spurred short-term trading. The past decade has witnessed explosive growth in algorithm or computer-driven trading that relies on high-speed transactions. In 2009, algorithm trading accounted for at least 60 percent of U.S. equity trading volume (up from about 30 percent in 2006), and 30–40 percent of European and Japanese equity trading. Algorithm trading also accounts for 10–20 percent of foreign exchange trading volume, 20 percent of U.S. options volume, and 40 percent of U.S. futures volume (Reuters, 2009). Much algorithm trading is aimed at providing best execution of orders posted by institutional investors; however, a significant portion represents "high frequency trading" (HFT), in which computer programs drive trading as well as execution decisions. High-frequency trading can have very short-term intraday trading horizons aimed at exploiting minor price fluctuations.

This explosion of (short-term) securities and derivatives trading raises several concerns. Growth in derivatives trading, often favored over spot trading due to lower capital requirements and transactions costs, implies a corresponding growth in leverage, which increases liquidity and default risk, and may promote asset bubbles (Allen and Gale, 2000). Bursting of debt-fuelled asset bubbles can result in widespread macroeconomic disruption that imposes costs on society and taxpayers in general. The growing dominance of computer-generated trades raises the risk of market dislocation due either to technical malfunction or to cascading of correlated trades.[18] Algorithm trading is suspected of being more highly correlated than human trading, which if true could increase "herding" behavior and exacerbate price trends.[19] Imposition of an STT that decreased short-term trading could therefore dampen these risks.

Volatility

There are two types of volatility that could be affected by the presence of an STT: short-term price volatility[20] and long-term asset price swings, that may develop into bubbles and crashes. These concepts are sometimes not clearly differentiated in the literature. Both are of concern to market participants, since they both distort price signals about fundamental asset values; however, long-term mispricing is of greater concern from a social point of view, since market bubbles and crashes have serious macroeconomic externalities. While market tops and bottoms are often marked by high short-term price volatility, the two types of volatility are not necessarily correlated: For example, six months prior to the sharp slide in U.S. equity markets that began in September 2007, volatility of the S&P 500 as measured by the VIX volatility index had been at historical lows for an extended period.

[18] Examples of this in the U.S. stock market include the October 1987 crash attributed to "program trading" and the May 2010 "flash crash."

[19] Chabouti, and others (2009), examining foreign exchange trading data for 2006 and 2007, find that algorithm trades are more correlated than human trades. However, they do not find that algorithmic trades produce higher volatility.

[20] Kupiecs (1996) also distinguishes between short-term price volatility and return volatility; he demonstrates that, while introduction of an STT may lower price volatility, by reducing asset prices it unambiguously increases return volatility, which is of greater concern to investors.

The theoretical relationship between an STT and short-term price volatility is ambiguous. In general, if an STT reduces trading volume, it may decrease liquidity or, equivalently, may increase the price impact of trades, which will tend to heighten price volatility. However, the net effect of an STT on volatility depends on market microstructure and the composition of trading. The tax may reduce activity by "noise traders," who trade on spurious information such as past price movements and are thought to destabilize markets (De Long, and others, 1990a; Froot, and others 1992). However, it may also suppress activity by liquidity providers and arbitrageurs, whose trading tends to stabilize prices and push them toward their fundamental values.[21] And even activity by noise traders adds to market liquidity, so that driving them out of the market has a double-edged effect. Both Song and Zhang (2005) and Pellizzari and Westerhoff (2007) present models demonstrating that volatility may either rise or fall upon introduction of an STT, depending on the market microstructure. This inability of an STT to discriminate between discouraging stabilizing and destabilizing trading activity is a principal reason for its rejection by many analysts.

Since theoretical models cannot resolve the impact of STTs on short-term volatility, the question of their effect is left to empirical investigation. Several empirical studies examine the impact of exogenous changes in STTs and other types of transaction costs on financial markets. Almost invariably, these studies consider short-term price volatility, rather than long-term asset mispricing, and most show either no effect of transaction costs on volatility or a positive effect.[22] Roll (1989), studying the relationship between transaction costs and volatility across 23 countries, finds no consistent relationship. Baltagi, and others (2006) also find no impact of China's STT increase on volatility. Several studies do find a positive relationship between transaction costs (including STTs) and volatility. Jones and Seguin (1997) find that U.S. stock commission deregulation, which led to a decline in transaction costs, led to decreased price volatility. Hau (2006) finds that this relationship holds for the French equities market as well, where tick-size reduction led to a fall in volatility. Green and others (2000) find that increases the U.K. stamp duty generally lead to higher short-term price volatility.

There is some evidence that trading activity itself generates short-term price volatility. Studies of intra-week market closures in both the U.S. (French and Roll, 1986) and Japanese (Barclay, and others, 1990) stock markets show that, controlling for the arrival of new information, price volatility is higher during trading sessions than between them. French and

[21] In De Long, and others (1990a), it is the interaction between uninformed noise traders and informed traders that destabilizes prices: Informed traders, anticipating a rise in demand from noise traders, buy the asset to sell to noise traders at a price in excess of fundamental value.

[22] An exception to this is Green, and others (2000), which attempts to decompose volatility into market, fundamental, and excess volatility. They find that the U.K. stamp duty positively affects market and excess volatility, but negatively affects fundamental volatility. However, their proxy for fundamental volatility, the short-term risk-free interest rate, is somewhat unconvincing. Short-term government rates are largely driven by the central banking system rather than stock market investors, and increases in stock transaction taxes may drive liquidity into the fixed-income market, thereby increasing liquidity and reducing short-term interest rate volatility.

Roll thus conclude that a significant portion of stock price volatility is generated by trading itself (although information arrival counts for a larger share). Thus, a transactions tax that generally depresses trading activity could reduce that source of short-term price volatility.

There is a lack of research on the relationship between transaction costs and long-term price volatility, or bubbles and crashes. The economic literature (e.g., Allen and Gale, 2000, Reinhart and Rogoff, 2009, and Akerlof and Shiller, 2008) generally attributes bubbles and crashes to excesses of the leverage cycle: As asset prices rise during a recovery, lenders are more willing to extend credit and reduce collateral requirements for their acquisition, which further raises asset prices, until the market becomes overextended and the reverse cycle sets in. In the wake of the financial crisis, a growing body of literature is exploring methods of combating excessive leverage to prevent bubbles: e.g., Geanakoplos (2010), Adrian and Shin (2009), Barlevy (2008).

Though transactions costs may play a role in determining market cycles, they are clearly not a decisive factor. Bubbles and crashes are common in real estate markets, where transaction costs (including taxes) are extremely high compared to securities transaction costs, generally on the order of several percentage points. This suggests that a low-rate STT will not prevent asset bubbles. By deterring transactions, an STT might slow the upswing of the asset cycle; however, it could also slow a correction of prices toward their fundamental values. A transactions tax on derivatives or other leveraged trades would have a side effect of discouraging leverage, particularly if the tax base were the notional value of the underlying security; in that case, reducing the equity deployed in the trade would not reduce the tax liability, so the effective tax rate would rise with leverage. Rather than generally discouraging securities transactions, a more direct means of preventing asset bubbles would be to discourage leveraged asset purchases via increased margin requirements or collateralization, particularly during the upswing of the market cycle.

Does the increased short-term trading brought about by lower transaction costs fuel asset price swings? Froot, and others (1992) show that short-term trading can result in "herding" behavior that causes securities prices to depart from fundamental values. Studies have shown that short-term trading tends to focus on technical analysis, a practice frequently identified with "noise trading" (Gehrig and Menkhoff, 2007). However, not all technical analysis consists of momentum-following strategies; it also comprises contrarian strategies such as arbitrage that counteract price movements. (And although technical trading may dominate short-term activity, it is also frequently used to inform longer-term investments).[23] If computer-driven HFT strategies tend to be highly correlated, they may create or exacerbate market price trends. Studying foreign exchange trading in 2006–07, Chaboud, and others (2009) find that algorithm trades are more correlated than other trades; however, they also find that computer-driven trades do not increase price volatility. Further study of these

[23] Dow theory, one of the earliest forms of technical analysis, was developed during the 19th century, when transaction costs were substantially higher. A basic tenet of technical analysis is that price formations that develop over longer periods predict future price movements more powerfully than short-term price formations (Murphy, 1986).

issues is required to gauge the impact of increase short-term trading on securities market function and asset prices.

Waste

Is the increased short-term trading brought about by lower transaction costs a waste of resources? Keynes (1936) and Stiglitz (1989) argue that chasing short-term trading gains, though it may augment individual profits, is a zero-sum game for society as a whole and therefore a waste of valuable resources.[24] By reducing short-term trading, an STT could encourage a lengthening of investment horizons that reduces effort wasted on collection of spurious information, as in Subrahmanyan (1998). However, while securities trading may be a zero-sum game in terms of its payoffs, it can still add value if it permits a more efficient allocation of risk among transactors; this is the justification usually cited for asset securitization. Nonetheless, it is difficult to see how very short-term trades—e.g., those reversed within a day—contribute to better risk allocation.

Financial interests generally maintain that increased short-term trading, including algorithm trading, improves liquidity and price discovery for all market participants. Hendershott, and others (2010), studying U.S. equity trading for 2003–07, find that algorithm trading lowers the cost of trading and facilitates price discovery. Their study does not seek to quantify the incremental value of these benefits relative to their resource cost. The opposing viewpoint is that markets were already "liquid enough" before the past decade's decline in transaction costs spurred the boom in high-frequency trading: Chairman of the U.K. Financial Services Agency, Lord Turner, has stated that "Market liquidity is beneficial up to a point but not beyond that point" (Financial Times, 2010). More research on the costs and benefits of short-term trading is needed to determine the validity of these counterclaims.

Research in behavioral finance shows that retail investors—particularly males—trade excessively, reducing their investment returns by paying too much in transaction costs (Barber and Odean, 1998 and 1999). By discouraging (short-term) trading, a financial transactions tax could improve investors' returns to savings. If investors are rational, however, this would not constitute correcting an externality: Investors may simply enjoy trading, much as they would golf or gambling, and therefore accept lower investment returns in exchange for the pleasure of doing so.

E. Incidence

A large part of the burden of an STT would fall on owners of traded securities, at the time the tax was introduced, as the value of stocks, bonds and derivatives subject to the STT fell by the present value of the expected future STT liabilities on those securities. Like any tax on capital income, the distribution of this effect would likely be highly progressive: High-income individuals possess a disproportionate share of financial assets, and so would suffer from the initial fall in taxed securities prices. For example, in the United States in 2007

[24] For a discussion of the potential negative effects of financial market "short-termism," see Kiefer (1990).

(Table 5), the top decile in terms of income owned 81 percent of bonds, 63 percent of stocks, 57 percent of investment funds, and 56 percent of retirement account assets. Dividing the population into deciles by net wealth, these shares are significantly higher. The tax would also affect older taxpayers disproportionately: At least 52 percent of these four asset groups are held by taxpayers 55 and older, and at least 88 percent are held by taxpayers 45 and older.

Table 5: U.S. Distribution of Financial Assets by Income and Net Wealth, 2007

Family characteristic	Bonds	Stocks	Pooled investment funds	Retirement accounts
All families	**574.0**	**220.8**	**309.1**	**147.6**
Percentile of income				
Less than 20	*	82.9	104.4	17.9
20–39.9	*	54.0	67.0	36.0
40–59.9	*	51.8	109.3	56.7
60–79.9	77.0	94.6	136.2	101.4
80–89.9	152.2	77.9	126.9	147.8
90–100	950.3	620.6	728.3	456.9
Percentile of net worth				
Less than 25	*	3.5	*	7.2
25–49.9	*	8.7	14.0	21.4
50–74.9	*	22.9	37.8	64.6
75–89.9	*	53.4	91.3	158.6
90–100	773.4	682.9	733.6	548.8
Age of head (years)				
Less than 35	*	24.4	65.4	24.9
35–44	361.1	92.0	139.0	80.1
45–54	1,100.4	224.4	273.5	154.9
55–64	543.5	270.0	532.3	270.5
65–74	457.1	475.4	504.5	267.0
75 or more	557.6	366.2	252.9	105.6
	3,019.6	1,452.3	1,767.7	903.0
* Ten or fewer observations.				
Source: U.S. Federal Reserve, 2007 Survey of Consumer Finances				

In the longer run, market forces would work to equalize the after-tax return to capital in the taxed and untaxed capital markets. The increase in the cost of capital to firms issuing taxed securities would reduce their demand for capital relative to firms whose finance was untaxed; or, firms would finance more of their investment from untaxed sources, such as bank loans. The lower supply of taxed securities and the increased demand for untaxed forms of capital would lower the yield (or raise the price) on taxed securities and raise the yield (or lower the

price) on untaxed capital until their after-tax price equalized.[25] This effect would, of course, be the same for any tax initially imposed on capital income.

How much overall investment would fall as a result of the STT would depend on the relative elasticities of capital supply and demand. In a small, open economy, the after-tax return on capital is determined on the world market. In response to imposition of the STT, capital would flow out until its after-tax return was restored to the world market level. In the long run, capital owners would therefore not bear the burden of the STT; it would fall on workers, who as a result of the smaller capital stock would be less productive and receive lower wages. If, however, the capital supply is less than perfectly elastic, the STT will lower the return on capital, and capital owners will share the burden of the tax with workers.[26]

As the increase in transactions costs reduced financial transactions and investment, financial firms' dealing, trading and underwriting profits would contract. Since the tax on surviving transactions would apply to all financial firms, they would likely be able to pass its cost on to their customers. The contracting financial sector would employ fewer resources. Compensation levels for resources that it uses intensively, such as highly skilled workers, could therefore decline.[27]

While all taxes create economic distortions, taxes on gross transaction values, such as gross receipts taxes, turnover taxes, and STTs, are more distortive than taxes on net income or value added. Diamond and Mirrlees (1971) show that, where optimal taxes on final products (i.e., consumer goods) are available, taxes on intermediate transactions (e.g., business purchases of inputs) should be avoided because they distort production decisions and thus lead to an inefficient allocation of resources. Since different industries use taxed inputs with varying intensity, and the cost of transactions taxes paid is not creditable against transaction taxes charged, such taxes cascade through the production process in arbitrary ways, burdening some sectors more heavily than others and distorting production decisions.

Securities transactions generally function as intermediate inputs. Corporations issue securities to raise capital. Hedgers trade securities to manage risk. Dealers charge buyers a markup and sellers a discount; for them, an STT is a tax on both inputs and outputs. For traders and professional managers, who seek to augment the value of capital by shifting it among securities, the tax applies to the "production process" itself. Individual investors, who seek to transform current earnings into higher future consumption, have a similar relationship to the tax as professional investors, but their trading activity may also contain a significant element of consumption.

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[25] This discussion, which is analogous to the effect of the corporate income tax on corporate and non-corporate capital found in Harberger (1962), is adapted from Kiefer (1990).

[26] For a discussion of the incidence of capital income taxes on workers vs. capital owners, see for example Randolph (2006) and Hassett and Mathur (2006).

[27] Stolper and Samuelson (1941).

An STT disproportionately burdens sectors and activities that issue or trade securities more heavily. These sectors include the financial sector itself, which is the single largest commercial consumer of financial services,[28] as well as pension funds, public corporations, firms engaged in international commerce, and public entities (assuming that the tax was imposed on government bonds). The cascading effect of a transactions tax would impose multiple layers of tax on some transactions, so that even an apparently low-rate STT might result in a high tax burden on some activities.

F. Alternatives to an STT

Because gross transaction taxes distort production decisions, they should in principle be avoided where more efficient taxes, such as those on net income or consumption, are available. This section considers options other than an STT for both curbing financial sector excesses and raising revenue from the financial sector, the two rationales most frequently cited for adopting an STT.

In addition to the arguments for using an STT to address market bubbles discussed in the previous section, the European Parliament (2010) considers a low-level STT as a method of second-best financial regulation to limit the potential dangers from inadequate financial regulation. By this argument, the fast pace of financial innovation and trade distribute risks in ways that are often opaque and poorly understood by both regulators and market participants alike. Derivatives, through their implicit leverage, have the power to shift and concentrate financial risk in ways that are difficult to measure and monitor, while automated trading can cause sudden cascades in market activity. Dislocations from these types of developments have surfaced repeatedly in recent decades, from the 1987 U.S. market crash (program trading) to the current financial crisis (securitization and credit default swaps). The European Parliament therefore argues that, where the regulatory regime is imperfect, it may make sense to slow the pace of poorly understood but potentially explosive financial activity with a general STT; it could be imposed provisionally, until such time as more optimal financial taxes and regulations could be established.

Where the goal is to curb financial market excesses, STTs offer a less specific remedy for the excessive leverage that is believed to cause them than other tax and/or regulatory solutions. Financial complexity does not derive solely or even primarily from trading activity. The buildup of hidden financial risks in the recent crisis resulted predominantly from excess leverage, risk concentration and product innovation such as asset securitization, which would have been largely unaffected by a transactions tax. An STT also does not directly address systemic risk.

To discourage leverage at the institutional level, a tax on balance sheet debt (net of insured deposits and equity), such as the financial sector contribution (FSC), could be used (IMF, 2010). The FSC could be tailored to tax systemically important institutions more heavily, since their risks pose a greater danger to the broad economy. Another means of

[28] Input-output tables, U.S. Department of Commerce: www.bea.gov.

combating leverage at the firm level is reform of the corporate income tax (CIT), which encourages debt over equity finance due to its disparate treatment of interest and earnings. To discourage debt finance while raising revenue, interest deductibility could be reduced or even eliminated, as in a comprehensive business income tax[29]; alternatively, an allowance for corporate equity (ACE) could be introduced, with a corresponding reduction of interest deductibility to conserve revenue.

As noted in the previous section, to discourage excessive leverage at the level of securities transactions, increased collateral or margin requirements could be used. An STT levied on the full notional value of leveraged transactions, including derivatives, could also have this effect.

If the goal is to raise revenue from the financial sector, one option is to improve the application of the standard VAT to financial services. Due to the difficulty of taxing services compensated through a financial margin, such as lending, deposit-taking and market-making, financial services are often exempted under VATs. This practice overtaxes their provision to businesses, who do not receive a credit for the VAT paid on financial sector inputs, but undertaxes them to consumers, who do not pay VAT on the value added by financial institutions. Huizinga (2002) estimates that this results in net undertaxation of financial services. Extension of VAT coverage to include all fee-based financial services, as is currently the practice in South Africa, for example, would partially rectify these distortions. Systems for applying VAT to bank interest margins have also been developed but not yet implemented.[30]

To the extent that reforming the VAT still leaves financial services undertaxed, an "financial activities tax" (FAT), such as that proposed in IMF (2010), could be applied, either to a comprehensive value added base or to compensation and profits above a certain threshold—i.e., to financial sector rents. Since either type of FAT would not be creditable to business users of financial services, it would cause some cascading. However, insofar as a FAT taxes net value added rather than the gross value of transactions, it should be less distortive than an FTT in raising a given amount of revenue.

V. STT DESIGN

This section addresses the major design issues that face countries that wish to raise revenue using an STT. Specification of an STT can greatly influence the elasticity of the tax base and revenue performance. The broader the tax base in terms of including potential substitutes for taxed securities, the less likely it is that revenues will erode over time as traders and investors seek to avoid the tax. Taxing both debt and equity instruments will also reduce distortion of

[29] Taxation of interest at the investor level would correspondingly be eliminated, though this reform generally results in a revenue increase due to the presence of tax-exempt and foreign investors.

[30] Poddar (2007), Poddar and English (1997). Application of VAT to trading/market-making, which is compensated through the bid-ask spread commingled with capital gains, remains problematic.

investment and financing decisions. Given a revenue target, a broad base will also permit a lower rate, which in addition to reducing distortions will reduce incentives for specific classes of financial market participants to seek exemption from the STT.

In general, it is not possible to design an STT that imposes the same tax burden on all financial contracts that deliver the same economic outcomes. Financial theory, such as "put-call parity," shows that economically identical contracts can be structured in myriad ways that have varying transactional intensity and would thus incur different amounts of transaction tax (Campbell and Froot, 1993). In selecting an STT base and rate for different derivatives, arbitrage opportunities should of course be taken into account, but since weaving a seamless transaction tax regime is impossible, practical considerations such as taxing readily identifiable quantities should play a significant role.

A. Tax Base

The first decision that must be made in introducing an STT is to what financial instruments it should apply: stocks, bonds, foreign exchange and/or their derivatives. In choosing the base, the relationship between taxed and untaxed instruments should be considered. For example, taxing equities without taxing bonds could strengthen the debt bias imposed by the deductibilty of interest but not of the return to equity under the standard corporate income tax (IMF, 2009). Not taxing debt instruments could complicate the base of a tax on foreign exchange, since products such as foreign exchange swaps combine elements of foreign exchange trading with fixed income investment. Taxing securities without taxing their derivatives could result in migration of trade from the spot market to derivatives markets, with an accompanying increase in leverage and risk.

To limit such distortions, an STT should be applied to transactions in all types of traded securities—equity, debt and foreign exchange—and their derivatives. Taxation of public sector debt is likely to be controversial, however. Imposing higher transaction costs on sovereign debt will raise government borrowing costs, and so could potentially generate a net fiscal loss. Where government bonds markets are not well developed, reducing their liquidity could also interfere with their provision of a pricing benchmark. Failure to tax public bonds in the same manner as private bonds would, however, draw liquidity out of the private bond market, raising capital costs for private issuers.

Derivatives

As noted above, an STT applied to securities should also be applied to their derivatives to prevent trading activity from migrating from spot to derivatives markets.[31] One example of

[31] If the cost of an STT is capitalized into securities values, then the value of those securities' derivatives will be reduced. However, this does not mean that derivatives can be exempted from taxation with no effect. Taxing only the spot market will drive trading into untaxed derivatives markets, lowering the capitalized discount of the tax in the spot market. In the extreme, except for initial issuance of securities (which may be exempt under the STT), all trading would take place in derivatives markets; the capitalized discount of the STT would be zero; and the tax would collect no revenue and have no impact on securities prices.

this is the U.K. market for "contracts for difference" (CFDs), short-term equity swaps that, because they are cash-settled, do not result in share purchase and therefore incur no stamp duty. The U.K. market for CFDs has grown rapidly since its inception in the early 1990s, in part due to its exemption from stamp duty.[32] Similarly, the Brazilian foreign exchange tax has spurred the creation of an (untaxed) cash-settled futures market that is large relative to the (taxed) spot market for the Brazilian real.

What is the appropriate tax base for derivatives? On-market futures and swaps have zero market value when initiated, so this cannot serve as their base. Futures and forwards, which incur a certain obligation to deliver the underlying (or its cash value) at a certain point in the future, can be taxed either on the basis of the spot price or upon the delivery price. These two prices are closely linked: the delivery price is in theory equal to the initial spot price compounded forward to the maturity date at the risk-free rate plus (minus) any cost (benefit) of carrying the underlying commodity or security. The U.K. and India, which levy stamp duty on equity futures, tax them on the basis of the delivery price.

Swaps, which represent a 100 percent leveraged investment in the reference asset, could be taxed on their notional value. In theory, swaps should even be taxed at twice the rate of trades in the underlying security, since they represent offsetting long and short positions in that asset. Swaps present a unique enforcement challenge: Since no principle changes hands, an obvious way to avoid an STT applied to the notional principle of a swap would be to divide the principle by an arbitrarily large factor and multiply all its payments by the same factor. This would leave the cash flows of the instrument unchanged but arbitrarily shrink the size of the tax base. Therefore STT legislation should specify that if swap cash flows are multiplied by a factor, the notional principle on which the tax is based should also be multiplied by the same factor. Since most swaps specify a market rate (e.g., LIBOR or the return on a particular equity) on at least one leg of the swap, this anti-abuse rule would likely stem most abuses; it may sometimes be necessary, however, to "normalize" some swap rates to a market rate of return.

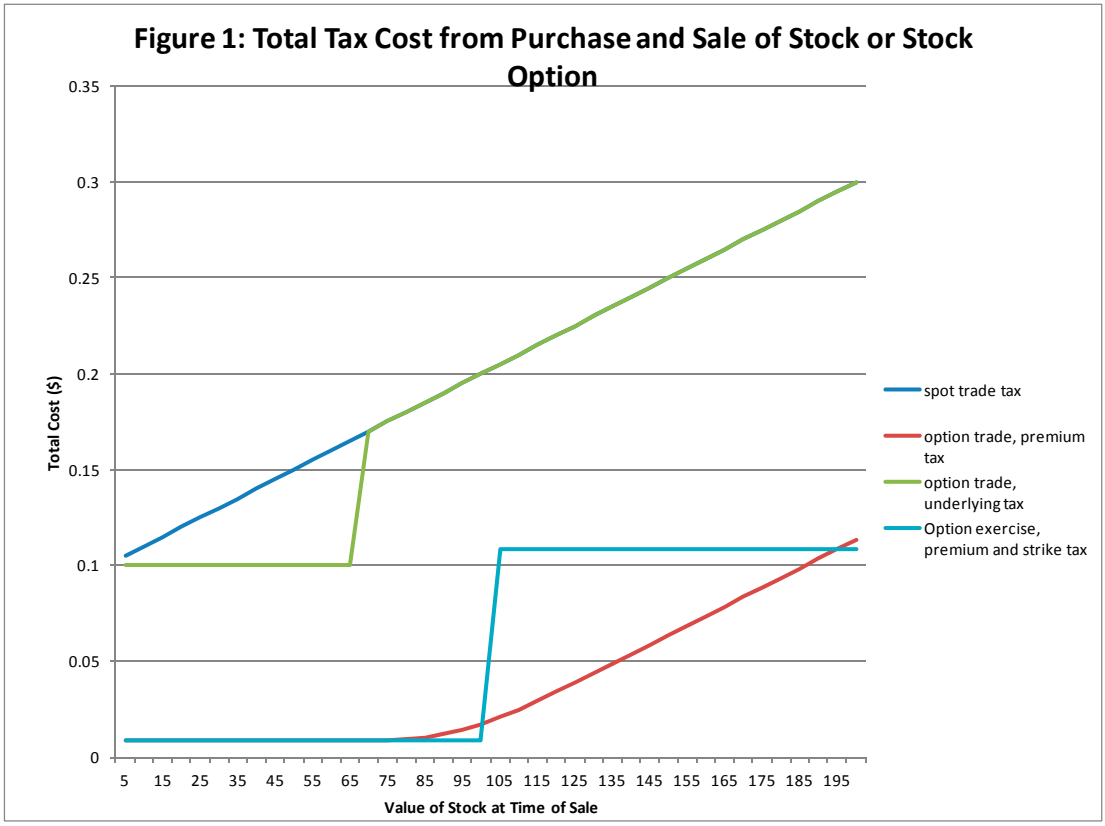
Options have several parameters: the option's initial market value, or premium; the strike price, at which the option holder may buy or sell the underlying security; and the spot price or notional value of the underlying security.[33] An option may be taxed on the value of the premium, plus the value of the strike price, if executed (as in India). Alternatively, only the strike price may be taxed, if executed (as in the U.K.). Or, option transactions could be taxed on the spot value of the underlying at the time of the transaction. In selecting a tax regime for options, tax arbitrage opportunities among options, futures and spot trades must be taken into account. Taxing option transactions on their full notional value will have the effect of

[32] In 2009, CFDs accounted for 40 percent of trading on the London Stock Exchange (City Credit Capital, 2010).

[33] The premium may be a small fraction of the spot price for an out-of-the-money option. For a call option, the premium varies negatively with the strike price, while the reverse is true for a put option. If an option matures out of the money, it is not executed and the strike price is never paid.

penalizing their inherent leverage, since the premium for out-of-the-money options (which carry the most leverage) is a fraction of the underlying's notional value.

Figure 1 shows the tax revenue generated by these different regimes on three hypothetical transactions, with an STT rate of one percent: (1) purchase of a stock at $100 and its subsequent sale ("spot trade"); (2) purchase of an at-the-money one-year option for that stock and its subsequent sale, if profitable ("option trade"); and (3) purchase of an at-the-money option on that stock and its subsequent exercise, if profitable ("option exercise"). The "spot trade, spot tax" case shows the STT revenue collected on purchase and sale of the stock, as the underlying spot price varies. The "option trade, spot tax" shows the revenue collected from purchase and sale of the option, where the tax base is the market value of the underlying stock. It differs from the first regime only because, for low values of the underlying, it does not pay the option holder to sell the option if the STT incurred by doing so exceeds the premium value; instead, the option is allowed to expire. The "option trade, premium tax" case shows the revenue from an STT levied on the option premium from purchase and sale of the option. It reflects the typical convex relationship of call option value to the underlying spot price. The "option exercise, premium and strike tax" show the revenue from an STT levied on both premium and strike price.



For a given tax rate, taxing options based on the value of the underlying security imposes a heavier burden than taxing them on the value of option cash flows (although a higher rate could always be applied to the premium and/or strike). The major difference between spot

and option trade taxation is that, while the former is linear in the stock price, all option tax regimes—even option trade taxation based on the underlying stock price—are independent of the underlying stock price over some range. This dissociation is most pronounced in the case of the premium and strike tax, which is essentially a step function conditioned on option exercise. Further research is necessary to determine the potential distortions that these alternative STT regimes would introduce into arbitrage relations among stocks, options and futures markets.

Which Transactions/Transactors?

Definition of the STT base includes not only what instruments are covered, but under what circumstances. An important decision in defining the base of an STT is whether it will apply to over-the-counter (OTC) as well as exchange-traded instruments. Most STTs apply to exchange-traded securities that are usually cleared through a central clearing house, which greatly facilitates tax administration. However, exempting OTC securities while taxing exchange-traded securities provides an incentive for more securities to be traded over the counter, which has non-fiscal costs in terms of less transparency to financial market participants (HM Treasury, 2009).[34] To provide an incentive for standardized products to be traded on exchanges, governments might even wish to apply a higher STT rate to OTC instruments; however, a tax on OTC products would likely be more costly to administer and enforce, since financial institutions would have to report their own transactions rather than remit the tax through a clearing house.

Countries implementing an STT must also choose whether to tax original issuance, only secondary market trades, or both. The U.S. transactions tax abolished in 1965, for example, taxed both issuance and secondary market trades, but levied a higher rate on issuance (10 basis points, vs. 4 basis points on secondary market trades). The difference between a capital levy and an STT on secondary market trades is that the latter burdens more actively traded securities (usually those of larger issuers) more heavily, since their anticipated higher turnover produces a greater tax discount. A uniform tax on securities issuance may therefore be fairer insofar as it levies the same charge on the issuance of all types of companies; conversely, taxing large issuers more heavily could be viewed as leveling the playing field for smaller issuers, who generally face a higher cost of capital due to the lower liquidity of their securities.

In fixed-income markets, the question of taxing original issuance vs. secondary trades highlights the distinction between loans and bonds. Traditionally, only bonds were traded, while loans (including mortgages) were held by the original lender. Accordingly, a tax on secondary trading would apply only to bonds. The issue here is similar to that with stocks: For issuers of a minimum size, the cost of issuing bonds is lower than that of issuing debt, so large companies face a lower cost of capital than small companies who are restricted to the loan market. Imposition of an STT on secondary market trades would therefore raise the cost

[34] In recognition of this, the Obama administration has set a goal of encouraging more derivatives to become exchange-traded (U.S. Treasury, 2009).

of capital for larger companies that issue bonds relative to smaller companies (who are restricted to borrowing in the loan market).

Current practices in fixed-income markets, however, complicate the distinction between (non-traded) loans and (traded) bonds. With securitization, many types of loans—e.g., mortgages, consumer, automotive, and commercial—are contributed to a securitization trust, whose tranches are tradable securities. Even if originations are exempted under an STT, securitizations should be taxed like secondary trades in order to prevent discontinuities between the bond and CDO markets.

In the bond market, liquidity has migrated over the past two decades from trading in bonds to trading in credit and interest rate swaps. The average rate of total U.S. bond market turnover has consequently fallen from 8.5 times per year in 2005 to 5.9 times per year in 2009.[35] Rather than engage in transactions involving an exchange of principal, fixed-income investors increasingly find it cheaper to remain fully invested and tailor their interest rate and credit exposures in the swap market. This development highlights the importance of taxing derivatives as well as the underlying securities to avoid exacerbating the migration of trading from securities to derivatives markets. Since many derivatives, particularly OTC products, do not trade actively, an STT should cover their initial issuance as well as any subsequent trades.

Trades in pass-through entities that pool or securitize taxable securities, including investment trusts (e.g., unit trusts, mutual funds, and exchange-traded funds), should be subject to an STT. Otherwise, the STT could be avoided by pooling securities that would be taxed if traded individually and trading them in a trust. For this reason, trades in investment trusts are taxable under the UK stamp duty.[36] However, taxation of pooled investment funds that actively trade securities poses the problem of whether to tax trades by the fund, trades of shares of the fund itself, or both. Taxing both would lead to double taxation, but taxing only at one level or the other would create opportunities for avoidance. If only fund trades were taxed, then funds could hold narrow portfolios that investors could buy and sell tax-free; if only fund shares were taxed, then investors could avoid tax by holding actively managed funds.[37]

Designation of the STT base can greatly influence its elasticity and the consequent erosion of revenues over time. For example, the Swedish transaction tax on equities, in effect from 1984 through 1991, was only levied on trades placed through registered Swedish brokers and thus functioned as a type of sales tax on Swedish brokerage services.[38] As such, it was easily avoided by using non-Swedish brokers to trade Swedish equities, and much of the volume

[35] SIFMA, www.sifma.org/research

[36] Taxation of unit trusts under the U.K. stamp duty is subject to certain restrictions. HM Treasury (2010).

[37] Kiefer (1990).

[38] The Swiss transactions tax shares this structure.

from the Swedish stock exchange migrated to London. By contrast, the U.K. stamp duty is a tax on the registration of shares in U.K. registered companies. Investors purchasing shares in U.K. companies anywhere in the world must pay stamp duty in order to ensure their legal claim on the shares. There is therefore less incentive for share trading to migrate outside the home country. Generally speaking, the base of an STT should be set as comprehensively as possible in order to deter avoidance, and should also take advantage of legal and administrative handles (such as share registration or contract recognition) to ensure compliance.

The evolution of centralized clearance mechanisms in most major financial markets can provide an important handle for STT administration.[39] STT proponents note that these mechanisms can make STT extremely cost-efficient to administer: For example, the U.K. stamp duty, collected largely through the CREST central clearance system, costs 0.09 pence per pound sterling to collect, vs. an all-tax average cost of 1.11 pence. However, since financial trading mechanisms are in a state of constant flux, the base of an STT should not be defined in relation to any particular market structure. The past two decades have been marked by rapid innovation not only in financial products but also in trading platforms due to technological innovation and increasing global integration. Numerous new exchanges, notably electronic platforms such as Archipelago (now part of the NYSE), have arisen to challenge traditional trading floors. This has been accompanied by intense mergers and acquisition activity, such as the formation of Euronext from the Amsterdam, Brussels and Paris bourses and its merger with NYSE. Design of an STT should take this type innovation into account, and not apply a tax on the basis of existing trading or clearance structures, since these may soon give way to new forms.

In addition to determining which transactions are covered by an STT, its designers may exempt certain transactions based on the status of the transactor. For example, to avoid tax cascading, U.K. stamp duty provides "intermediary relief" to market-makers in equities. This provides a blanket exemption for bank trading in U.K. equities, including proprietary trading for the bank's own profit. (It is not, however, a blanket exemption for all financial institutions: Hedge funds, pension funds and insurance companies are subject to stamp duty, but registered charities are not.) While reduction of cascading is a sound reason for exempting trades by financial intermediaries, providing a complete exemption for all their trades undermines the STT base and invites avoidance. To the extent possible, financial institutions should be taxed on trades undertaken for their own account, although in practice these may be difficult to distinguish from intermediary trades, since many banks combine trading and market-making activities.

Another important consideration in base definition is territoriality. An STT may be applied to transactions based on the location of the trade, the nationality of the transactors, and/or the nationality of the securities issuer. The definition of the tax's territoriality will have implications for potential evasion and adminsitrability. A tax that applies to transactions on a particular country's financial exchanges may drive trading activity offshore. A tax that

[39] A separate paper is planned on administrative aspects of FTTs.

applies to all trades made by a country's taxpayers, regardless of the trading location, would in theory avoid this incentive, but there would be an obvious compliance problem with regard to the reporting of offshore transactions.

B. Tax Rate

Decisions to be made in selecting an STT rate include whether to use an ad valorem or flat rate structure, and whether to tax different markets at different rates according to the elasticity of their base or their non-tax transaction costs.

Most STTs are ad valorem, based on the value of the traded security, although some are structured as flat fees. For example, New York State levies a tax of up to five cents per share on within-state stock trades with a cap of $350 per trade,[40] and in 1993 the Clinton Administration proposed a fixed 14-cent tax on trades of futures and options on futures. Relative to the more commonly seen ad valorem rate structure, fixed-rate STTs tax small trades and/or trades in low-value securities more heavily than large trades. They thus encourage order aggregation, which would counteract the current trend toward "order shredding", or breaking large trades into small packets, which has resulted from trading automation. Insofar as order shredding aims at minimizing the market impact of trade execution, order aggregation may undermine trading efficiency.

Another consideration in setting STT rates is their relationship to non-tax transaction costs. Imposing the same rate of tax on notional values traded in markets with different pretax transaction costs will raise total transaction costs proportionately more in markets with lower initial trading costs. If policymakers wish to tax transactions on the basis of their resource costs, or to minimize disruption of pretax patterns of trade, they may choose to impose lower rates of tax on markets with lower pretax transactions costs. Pollin, and others (2002) proposed such a tax for the U.S., and some countries appear to have followed this principle in designing STTs. India, for example, taxes stock option premiums and futures prices at lower rates than stocks (1.7 basis points vs. 12.5 basis points).

However, as Campbell and Froot (1993) point out, market resource costs may include externalities. If leverage is believed to be a source of systemic risk, then policymakers may not wish to apply low tax rates to derivatives, whose structure contains inherent leverage, even though they tend to have low transaction costs. Similarly, OTC markets are generally more opaque than registered exchanges, offering less pricing and positional information to both transactors and regulators. Partly on account of this informational asymmetry, spreads in OTC markets tend to be higher than on exchanges, as market makers both earn higher rents and demand compensation for greater risk. The same rate STT applied to both exchange-traded and OTC products will therefore increase costs on OTC markets proportionately less,

[40] Since 1981, the New York State tax, which was enacted in 1905, has been subject to full rebate upon application.

but policymakers may wish to raise them at least proportionately in order to push as many transactions as possible onto exchanges.[41]

In the bond market, the impact of a uniform STT may vary according to the maturity of the instrument. If, for example, only original issuance were taxed, then one ten-year bond would pay ten times less tax than ten one-year bonds with the same principle amount. This could induce issuers to issue longer maturities, altering their risk profiles. This problem also applies to swaps. Due to this distortion, some countries (e.g., Sweden) have set a lower rate on short-term paper than longer-term paper. Similarly, Pollin, and others (2002) propose multiplying a base STT rate on bonds and swaps by the number of years to maturity. As long-term bonds mature, they would need to be subjected to lower rates of transaction tax.

C. Multilateralism

This evaluation has generally assumed that individual governments are responsible for imposing STTs, since fiscal policy is generally determined at the national level. However, the ever increasing integration of world financial markets and consequent global impact of the recent financial crisis have led G-20 countries to consider greater fiscal coordination, particularly with regard to financial sector taxation (IMF, 2010). International fiscal coordination raises challenging governance issues, including allocation of the authority to determine the tax rate and base, which are beyond the scope of this report. However, the effect of international coordination on revenue collection and allocation will be briefly considered.

Unilateral STTs, even if levied on fairly narrow bases, are certainly feasible as witnessed by their use in numerous developed countries. The fact that major financial centers such as the U.K., Switzerland, Hong Kong, Singapore, and South Africa levy forms of STTs indicates that such taxes do not automatically drive out financial activity to an unacceptable extent. Indeed, given the apparent agglomeration effects in financial activity, established financial centers may face a less elastic base than peripheral countries. Other factors than taxes, including regulatory regimes, legal institutions, and clientele location, also impact the cost of transacting in a particular financial center. Nonetheless, since increasing cross-border integration of financial markets presents a challenge to the imposition of unilateral STTs, collaborate in imposing an STT will reduce the elasticity of the tax base and enhance revenue collection.

Given the movement to introduce an STT or Tobin tax on a multilateral basis, the question arises as to how the revenue from such a multilateral tax should be apportioned. Since financial activity tends to concentrate in certain locations, countries such as the U.K. that host major financial centers will have greater capacity to raise revenue with an STT than others, whose companies and investors may transact in foreign financial centers. If there is a multinational agreement to enact an STT or Tobin tax and the relative size of pact members' financial sectors is disproportionate to their GDP, then total revenue from the tax could be

[41] In selecting the OTC rate, however, policymakers must take into account the higher compliance and enforcement costs for OTC transactions, which may offset the benefit of discouraging opacity.

reallocated according, for example, to the member countries' GDP or total use of financial services.

VI. Conclusions and Areas for Further Research

Many G20 countries currently impose some sort of financial transactions tax, most commonly an ad valorem tax on share trades of 10–50 basis points. On average, these taxes tend to raise less than 0.5 percent of GDP, although their yields fluctuate over the market cycle. The general trend in STTs over the past two decades has been downwards, as governments seek to lower capital costs and boost the competitiveness of domestic financial markets in the face of globalization.

Empirical research on securities transaction taxes shows that they have the following effects on securities trading: (1) They reduce security values and raise the cost of capital for issuers, particularly issuers of frequently traded securities. (2) They reduce trading volume, particularly in shorter-term transactions, which in turn reduces liquidity and may slow price discovery. (3) They do not reduce short-term price volatility. And (4) they displace securities trades from taxed to untaxed venues, including foreign financial markets.

The impact of a low-rate (five basis points or less) STT on corporate securities would be fairly modest. If an STT of 5 bps reduced turnover on the S&P 500 to the average level of 2005 (0.8 years), it would initially lower stock values by roughly 2 percent and raise the cost of capital by 6 basis points. Since corporate bond holding periods are typically longer, the effect of a same-rate tax on debt finance would be less.[42]

Studies of existing STTs and other transaction costs suggest that the elasticity of trading volume with respect to transactions costs ranges broadly between -0.4 and -2.6, depending on the market studied. Markets with products for which there are more untaxed substitutes, such as derivatives or foreign listings, have higher elasticities. A broad-based STT will therefore be more difficult to avoid than a narrow-based tax, although the base of any STT is vulnerable to erosion over time in the face of financial innovation and international financial market integration.

More research is needed on the effect of transaction costs on long-term volatility, or asset bubbles. By reducing (short-term) trading activity, higher transactions costs may reduce herding effects that contribute to price swings; however, the common appearance of asset bubbles in markets with high transaction costs, such as real estate, suggests that a low-rate STT would not prevent long-term price swings. An STT levied on the notional value of derivatives trades would discourage their inherent leverage. More direct policies to discourage leveraged trades would be to increase margin or collateral requirements. An FSC

[42] SIFMA data (http://www.sifma.org/research) indicate that the average holding period for corporate bonds in 2009 was 1.6 years.

on financial institutions' balance sheet liabilities (less Tier one capital, insured deposits and insurance reserves) could be used to discourage excessive leverage at the firm level.

Administrative costs of an STT are likely to be low relative to other taxes, if central clearing mechanisms such as the U.K. CREST are used to collect revenues. However, to avoid pushing transactions off exchanges with the resultant increase in risk and loss of transparency, any STT on exchange-traded securities should also apply to over-the-counter transactions.

In the short-run, imposition of an STT would burden current securities owners, as securities values decline. The incidence of this effect would be quite progressive. In the longer-run, the burden of an STT shifts to all capital owners, if the supply of capital is relatively inelastic. The more elastic the supply of capital, the more the long-run burden of an STT would fall on labor, as the capital stock and labor productivity shrank.

Financial activity, particularly short-term trading, would fall in response to a broad-based STT, lowering financial sector profits. Release of resources from the contracting financial sector could lower the equilibrium return to highly skilled labor. Financial firms would likely pass the cost of STT on surviving activity on to clients. An STT would impose higher costs on entities that use finance more intensively, such as financial institutions, institutional investors (including pension funds), publicly listed companies, and firms involved in cross-border trade and investment. As a tax on gross transactions, the STT would cascade through financial activities, so although it applied a low rate to a broad base, its cumulative impact in certain activities could be substantial.

Current estimates of the revenue potential of a low-rate (0.5-1 basis point) multilateral Tobin tax on the four major trading currencies suggest that it could raise about $20–40 billion annually, or roughly 0.05 percent of world GDP. A one basis point STT on global stocks, bonds and derivatives is estimated to raise approximately 0.4 percent of world GDP. To the extent that STTs are levied on a multilateral basis, their base will be less elastic than national STTs, and hence a given level of revenue can be raised with a lower rate.

The impact on financial markets from a low-rate (less than 5 basis points), broad-based (applying to OTC and derivatives trades) STT would likely be fairly modest, beyond its reduction of very short-term trading. Multilateral introduction of such a tax would reduce cross-border distortion of trading as well, though it would raise challenging governance issues. However, the reduction in short-term trading would be unlikely to have any beneficial effect on market function, either. The major inefficiencies revealed during crisis—e.g., excessive leverage—could be more directly addressed by higher collateral and margin requirements. An FTT on the notional value of derivatives would also discourage leveraged trades, though less specifically. Firm-level debt could be addressed by introduction of an FSC.

Due to the large size of the base, a low-rate STT on stocks, bonds, foreign exchange and their derivatives could raise substantial revenues. It is difficult to make a strong economic case for introducing a Tobin tax, since it would raise much less revenue on a considerably more

elastic base. If the goal is simply to raise revenues from the financial sector, however, a FAT or improved VAT tax on financial services would do so in a more efficient manner than an STT.

Appendix. Impact of a Transactions Tax on Share Prices and the Cost of Capital

This appendix sets out a simple framework for exploring the impact of a transactions tax on share prices and the cost of capital.

Valuation effects

Consider a share that, very mechanically, will be traded every N periods. The tax-inclusive price to the buyer is V, so that, denoting the ad valorem transactions tax rate by T, the seller receives $(1-T)V$. Supposing the interest rate to be fixed, perhaps on world markets, at an unchanging rate r, and assuming too that there are no issues of new equity, the demand price of the share at time zero will be given by

$$V(0) = \int_0^N D_t e^{-rt} dt + (1-T)e^{-rN} V(N) \qquad (A.1)$$

where D_t denotes the dividend paid at time t. Solving this forward gives, under the assumption that

$$\lim_{y\to\infty} (1-T)^y e^{-y2N} V(y2N) = 0 \ , \qquad (A.2)$$

the demand price of the share as

$$V(0) = \sum_{s=0}^{\infty} (1-T)^s \left\{ \int_{sN}^{sN+N} D_t \, e^{-rt} dt \right\} \quad . \qquad (A.3)$$

Suppose, to take a convenient special case, that the dividend grows at a constant rate g. Then (A.3) becomes

$$V(0) = D \sum_{s=0}^{\infty} (1-T)^s \left\{ \int_{sN}^{sN+N} e^{-Rt} \, dt \right\} \qquad (A.5)$$

where $R \equiv r - g$ (assumed >0). Noting that

$$\int_{sN}^{sN+N} e^{-Rt} \, dt = \frac{-1}{R}\left(e^{-R(sN+N)} - e^{-RsN}\right) = \frac{e^{-RsN}}{R}(1 - e^{-RN}) \qquad (A.6)$$

and

$$\sum_{s=0}^{\infty} (1-T)^s \, e^{-RsN} = \sum_{s=0}^{\infty} [(1-T)e^{-RN}]^s = \frac{1}{1-(1-T)e^{-RN}} \ , \qquad (A.7)$$

equation (A.5) becomes

$$V(0) = \frac{D(1 - e^{-RN})}{R[1 - (1 - T)e^{-RN}]} . \qquad (A.8)$$

Since the asset price in the absence of taxation is *D/R*, the proportional reduction in its (buying) price due to the tax is

$$\Delta(T) = 1 - \frac{(1 - e^{-RN})}{1 - (1 - T)e^{-RN}} \qquad (A.9)$$

$$= \frac{Te^{-RN}}{1 - (1 - T)e^{-RN}} \qquad (A.10)$$

which is increasing (as one would expect) and concave in *T*, the implication of the latter being that the marginal proportional reduction in price from the tax is greater the *lower* is the initial tax rate.

A further sense of the likely valuation effects comes on using the approximation $e^x \approx 1 + x$ in (A.8) to find

$$\mathrm{V}(0) \approx \left(\frac{D}{R}\right)\left(\frac{RN}{1 - (1 - T)(1 - RN)}\right) = \frac{D}{R + \left(\frac{1}{N}\right)T - TR} \quad , \qquad (A.11)$$

so that, taking $TR \approx 0$, the valuation effect of the transaction tax is like an increase in discount rate by an amount $(1/N)T$

Effect on the cost of capital

The framework above is not well-suited to deriving the impact of the tax on investment incentives, since the tax has no impact on policies that affect dividends only in the interval in which the tax is not traded. As an alternative approach, note from (A.5) that the transactions tax acts like a permanently increasing dividend tax rate (starting from a level of zero).

Exploiting this analogy, suppose that (again assuming no new equity sales) that the firm's maximand is

$$\sum_t (1 - \theta_t) D_t \, (1 + r)^{-t} \qquad (A.12)$$

where θ_t is the dividend tax rate at t and dividends are given by $D_t = F(K_t) - I_t$ „ where I denotes investment and $K_t = I_t + (1 - \delta)K_{t-1}$ the capital stock, with δ being its rate of deprecation (the further assumption being made here of no debt finance). The maximand can then be written

$$\sum_t (1 - \theta_t)\{F(K_t) - K_t + (1 - \delta)K_{t-1}\}(1 + r)^{-t} \qquad (A.13)$$

At an optimum, any perturbation of K_t must have zero value, so that

$$(1-\theta_t)\{F'(K_t)-1\}+(1-\theta_{t+1})(1-\delta)(1+r)^{-1}=0\ , \qquad (A.14)$$

and hence the value-maximizing marginal product of capital is given by:

$$F'(K_t)=1-\left(\frac{1-\theta_{t+1}}{1-\theta_t}\right)\left(\frac{1-\delta}{1+r}\right)\ . \qquad (A.15)$$

Taking $\theta_t=0$, and $\theta_{t+1}=qT$, where $q=(1/N)$ is the probabiliy of selling at *t+1*, this becomes

$$F'(K_t)=\frac{r+\delta}{1+r}+\frac{(\frac{T}{N})(1-\delta)}{1+r} \qquad (A.16)$$

The effect of the transactions tax is thus to increase the cost of capital by the second term on the right of (A.16), and thus is roughly equivalent—exactly so, if $\delta=0$—to an increase in the firm's discount rate by $(1/N)T$.

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