

FINANCIAL TRANSACTION TAXES IN THEORY AND PRACTICE

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We explore issues related to a financial transaction tax (FTT) in the United States. We trace the history and current practice of the tax in the United States and other countries, review evidence of its impact on financial markets, and explore the key design issues any such tax must address. We present new revenue and distributional effects of a hypothetical relatively broad-based FTT in the United States, finding that, at a base rate of 0.34 percent, it could raise a maximum of about 0.4 percent of GDP (\$75 billion in 2017) in a highly progressive manner.

Keywords: financial transaction tax, taxation of financial sector, FTT design, FTT revenues, FTT distributional effects

JEL Codes: H21, H25, G12

I. INTRODUCTION

The Great Recession, which was triggered by financial market failures, has prompted renewed calls for a financial transaction tax (FTT) to discourage excessive risk taking and recoup the costs of the crisis. The chorus of FTT advocates includes Bill Gates, Jr., George Soros, and Pope Benedict XVI (Greenhouse and Bowley, 2011). The idea is not new, however. Keynes proposed a FTT in 1936 as a way to discourage the kind of

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speculation that fueled the stock market bubble that led to the Great Depression. More recently, leading economists Tobin (1978), Stiglitz (1989), and Summers and Summers (1989) have advocated similar taxes.

Taxes on financial transactions have a long history. The British stamp duty was enacted in 1694 and remains in effect today. The United States imposed a nontrivial stock transaction tax from 1914 to 1965, as did New York State from 1905 to 1981. A miniscule securities transfer tax currently funds the Securities and Exchange Commission (SEC). FTTs have long been popular in less developed countries as a way to raise significant revenue from a small number of relatively sophisticated financial entities.

The FTT is experiencing a resurgence in the developed world. Ten European Union (EU) countries have agreed to enact a coordinated FTT that is scheduled to go into effect in January 2017 (assuming participant countries can work out some significant differences). France adopted a FTT in 2012 that will be integrated with the EU tax if and when it takes effect. In the United States, several recent Congressional proposals for FTTs have been introduced, including those put forth by Rep. Peter DeFazio (D-OR) and Sen. Tom Harkin (D-IA), and by Rep. Keith Ellison (D-MN) and Sen. (and Democratic primary presidential candidate) Bernie Sanders (I-VT).

Proponents advocate the FTT on several grounds. The tax could raise substantial revenue at low rates because the base — the value of financial transactions — is enormous. A FTT would curb speculative short-term and high-frequency trading, which in turn would reduce the diversion of valuable human capital into pure rent-seeking activities of little or no social value. They argue that a FTT would reduce asset price volatility and bubbles, which hurt the economy by creating unnecessary risk and distorting investment decisions. It would encourage patient capital and longer-term investment. The tax could help recoup the costs of the financial-sector bailout as well as the costs the financial crisis imposed on the rest of the country. The FTT — called the “Robin Hood Tax” by some advocates — would primarily fall on the rich, and the revenues could be used to benefit the poor, finance future financial bailouts, cut other taxes, or reduce public debt.

Opponents counter that a FTT is an “answer in search of a question” (Cochrane, 2013, p. 44). They claim it would be inefficient and poorly targeted. A FTT would boost revenue, but it would also spur tax avoidance. As a noncreditable tax that falls on intermediate inputs in the production process, it would cascade, resulting in unequal impacts across assets and sectors, which would distort economic activity. Although a FTT would curb speculative trading, it would also curb productive trading, which would reduce market liquidity, raise the cost of capital, and discourage investment. It could also cause prices to adjust less rapidly to new information. Under plausible circumstances, a FTT could actually increase asset price volatility. A FTT does not directly address the factors that cause the excess leverage that leads to systemic risk, so it is poorly targeted as a corrective to financial market failures of the type that precipitated the Great Recession. Opponents claim that even the progressivity of a FTT is overstated, as much of the tax could fall on the retirement savings of middle-class workers and retirees.

This paper addresses these issues, with particular attention to the question of the potential applications of a FTT in the United States. Our review and analysis of previ-

ous work suggests several conclusions. First, the extreme arguments on both sides are overstated. At the very least, the notion that a FTT is unworkable should be rejected. Most EU countries have or are planning to adopt FTTs, and many world financial centers, including Hong Kong, Switzerland, Singapore, South Africa, and the United Kingdom, thrive despite the presence of FTTs. On the other hand, the idea that a FTT can raise vast amounts of revenue — 1 percent of gross domestic product (GDP) or more — is inconsistent with actual experience with such taxes.

Second, a wide range of design issues are critical to the formulation of a FTT and can help explain why some FTTs are thought to be more successful (e.g., in the United Kingdom), while some are widely acknowledged to have been failures (e.g., Sweden).

Third, although empirical evidence demonstrates clearly that FTTs reduce trading volume, as expected, it does not show how much of the reduction occurs in speculative or unproductive trading versus transactions necessary to provide liquidity. The evidence on volatility is similarly ambiguous: empirical studies have found both reductions and increases in volatility as a result of the tax.

Fourth, the efficiency implications of a FTT are complex, depending on the optimal size of the financial sector, its impact on the rest of the economy, the structure and operation of financial markets, the design of the tax, and other factors.

We also present new revenue and distributional estimates for hypothetical U.S. FTTs using the Tax Policy Center microsimulation model (Urban-Brookings Tax Policy Center, 2013). We find that a FTT could raise a maximum of about 0.4 percent of GDP (\$75 billion in 2017) currently in the United States, allowing for reasonable behavioral responses in trading, and the maximum revenue would occur if the base rate were 0.34 percent.¹ We also find the tax would be quite progressive.

The plan of the paper is as follows. Section II provides background information on FTTs. Section III discusses design issues. Section IV explores the issues with the financial sector that motivate consideration of FTTs. Section V reviews the effect of FTTs on the financial sector and implications for economic efficiency and administrative and compliance costs. Section VI presents our estimates of the revenue and distributional effects of a FTT. Section VII offers conclusions. Appendix A provides additional detail on the methodology and data we use to estimate FTT revenue and distributional effects.

II. BACKGROUND

A. FTT Defined

A FTT is simply a tax imposed on a financial transaction, usually the purchase and/or sale of securities. The tax may be assessed on the buyer, the seller, or both, and is typically an ad valorem tax, that is, a percentage of the market value of the security

¹ Sometimes the tax may be expressed in “basis points.” One basis point is 0.01 percent of the value of the underlying financial instrument. For example, a 0.34 percent rate could be expressed equivalently as 34 basis points.

that is traded. FTT rates typically range from 0.1 to 0.5 percent, although much smaller taxes have often been levied in the United States. In the case of derivative transactions — such as options to buy or sell securities in the future — the tax may be levied on the value of the referenced securities or on the market value of the derivative itself.² Often, the tax is levied only upon resale of an asset, not upon original issuance. The ultimate burden of the tax on a particular security depends on the frequency of trading. Liquid assets like government bonds or shares of blue chip stocks could be taxed many times over the course of a year (without taking into account behavioral responses), whereas relatively illiquid assets that turn over infrequently would rarely be subjected to the tax.

Matheson (2011) suggests a nomenclature for the variety of such taxes. Securities transaction taxes (STTs) apply to the issuance and/or trading of financial securities and potentially include stocks, debt, and related derivatives.³ Currency transaction taxes (also known as Tobin taxes) apply to transactions involving foreign exchange and related derivatives. Bank transaction taxes or bank debit taxes, which are commonly found in Latin American and Asian countries, apply to deposits and withdrawals from bank accounts, often including checking accounts. In addition, some countries tax insurance premiums, real estate transactions, or additions to business capital. A financial transaction tax might also apply to commodities, although no current proposal extends this far.⁴ In this paper, we focus on STTs (with some discussion of currency transaction taxes).⁵

B. History of FTTs in the United States

Although the United States has not had a significant FTT for several decades, the United States actually has a long history with the FTT. Stock transfer taxes existed in the early days of the Republic, during the Civil War, and during the Spanish-American War (Thorndike, 2008).

From 1914 to 1966, a federal FTT was levied on sales and transfers of stock. The rate was originally 0.02 percent of the stock's par value (the value stated in the charter, which is usually lower than current market value). In 1932, the tax rose to between 0.04 and 0.06 percent depending on the type of transaction. In 1959, after firms had become practiced at manipulating par value to avoid tax, the base was changed to market value, and the rate was cut to 0.04 percent. From 1960 to 1966, stocks were taxed at the rate of 0.10 percent at issuance and 0.04 percent on transfer (Keightley, 2010).

Three historical points about the American FTT are worth noting. First, this tax was in place during the 1920s; whatever its effects, it did not reduce speculation sufficiently to avert the stock market crash in 1929. The tax, however, was only 0.02 percent at that time, which might not have been large enough to deter speculation. Second, it was

² Derivatives are financial instruments that derive their value by reference to another asset or index.

³ Derivatives include assets such as commodity futures contracts, but we focus our analysis on financial assets because they are the primary target of FTTs.

⁴ There now is extensive speculation in the U.S. commodities markets, according to testimony of Gary Gensler, Chairman of the Commodities Futures Trading Commission (Gensler, 2011).

⁵ For analysis of bank transaction taxes, see Arbelaez, Burman, and Zuluaga (2005) and Baca-Campodónico, Mello, and Kirilenko (2006).

in place at 0.04 to 0.06 percent when Keynes called for a more substantial FTT in the 1930s. Third, U.S. Department of the Treasury economist Carl Shoup studied the tax and, in a 1934 report, found it did not raise much revenue and “except as a check on speculative activity, the tax probably has little to justify it” (Thorndike, 2008).

In 1934, the Securities Exchange Act granted the SEC the authority to fund its oversight operations with fees on self-regulatory bodies such as the New York Stock Exchange. At present, a 0.00184 percent fee is levied on sales of securities, and a \$0.0042 fee per transaction is levied on futures transactions (SEC, 2015). Debt instruments are exempt from the tax.

The state of New York imposed a stock transfer tax from 1905 to 1981. The tax is still levied, but since 1981 it has been refunded upon request. The tax is \$0.0125 per share for stocks with prices under \$5, rising in steps to \$0.05 per share for stocks with prices of \$20 or more (New York State Department of Taxation and Finance, 2010).

C. Experience in Other Countries

Many G20 countries tax some financial transactions (Table 1). The most common form is a tax on secondary market equity sales at a rate of 0.10 to 0.50 percent. Such taxes are imposed in China, India, Indonesia, Italy, France, South Africa, South Korea, and the United Kingdom. Russia and Turkey impose taxes and/or capital levies on issuance of debt financing (Matheson, 2012). But several developed nations have repealed FTTs in recent decades, presumably because of competitive pressures stemming from globalization and technological changes that have made shifting trading to other markets less costly. Germany, Italy, Japan, the Netherlands, Portugal, and Sweden have repealed STTs in the last 25 years (Matheson, 2012; Hillman and Ashford, 2012).⁶

Experiences with FTTs have varied dramatically. The United Kingdom has a long history with FTTs. The British stamp tax, first enacted in 1694, is one of the earliest instances of financial transaction taxation (Table 2). The tax is paid on stock transfers, which are made legally enforceable only with an official stamp (Campbell and Froot, 1994). The tax is currently 0.50 percent and applies to the transfer of securities issued by UK companies, regardless of whether the parties to the transaction reside in the United Kingdom. Original issuance is exempt, as are intermediaries such as “market makers.” In addition, the United Kingdom does not attempt to tax derivatives, which creates an incentive to substitute trading of derivatives for the trading of other securities. In response, derivatives trading appears to have grown dramatically in the UK. Matheson (2012) estimates that contracts for difference — derivatives similar to total return swaps in the United States — accounted for about 40 percent of UK securities trading. The tax raises about £3 billion per year, or 0.6 percent of total UK revenues.⁷ Administrative costs are very low — less than 0.05 percent of revenue — according to the UK Revenue Service (Baker, 2008).

⁶ Since their repeal of previous FTTs, both Italy and Portugal have instituted new ones.

⁷ This figure was calculated from “Tax and NICs Receipts: Statistics Table.” <https://www.gov.uk/government/statistics/hmrc-tax-and-nics-receipts-for-the-uk>.

Table 1
Status of Financial Transaction Taxes in G-20 Major Economies

Country	FTT Type
Argentina	0.60 percent on stocks, corporate/government bonds, and futures
Australia ¹	N/A at a federal level, states may levy transaction taxes
Brazil ²	0.38 percent on foreign exchange, 6 percent on short-term foreign loans and bonds (180 days or less)
Canada	N/A
China ¹	0.1 percent on stocks
EU ³	0.1 percent on stocks and bonds assessed on buyer and seller (total 0.2 percent), 0.01 percent on derivatives (total 0.02 percent) (forthcoming)
France ⁴	0.2 percent on stocks, 0.01 percent on the value of stock orders modified by high-frequency traders
Germany	N/A
India ⁵	0.1 percent on stocks assessed on buyer and seller (total 0.2 percent), 0.017 to 0.025 percent on sale of options, 0.01 percent on sale of futures
Indonesia ⁶	0.1 percent on stocks
Italy ⁷	0.1 percent on stocks, 0.2 percent for OTC transactions and stock derivatives, 0.02 percent on the value of stock orders modified by high-frequency traders
Japan	N/A
Mexico	N/A
Russia	0.2 percent on value of new share and bond issues
Saudi Arabia ⁸	N/A
South Africa	0.25 percent on stocks
South Korea	0.3 percent on stocks and corporate bonds
Turkey	0.2 percent stock issuance fee, 0.6 to 0.75 percent bond issuance fee
United Kingdom	0.5 percent on stocks
United States ⁹	0.00184 percent on stocks, \$0.0042 per futures transaction

Notes: N/A = not applicable; OTC = over the counter.

¹Matheson (2011)

²PricewaterhouseCoopers (2014)

³European Commission (2011)

⁴European Commission (2013)

⁵National Stock Exchange of India (2014)

⁶Pomeranets (2012)

⁷Fidessa (2013)

⁸HSBC (2013)

⁹U.S. Securities and Exchange Commission (2015)

Source: Hillman and Ashford (2012) unless otherwise noted

Table 2
Major Features of Selected Financial Transaction Taxes and Proposals

	United Kingdom (Current)	France (Current)	Sweden (Repealed)	Proposed Taxes	
				European Union	Harkin-DeFazio Baker
Tax determined by					
Residence of issuer	Yes	Yes	No	Yes	No
Residence of buyer/seller	No	No	No	Yes	Yes
Location of transaction	No	No	Yes (brokerage)	No	Yes
Tax rate (%) ¹					
Equities	0.5	0.2	1.0 ²	0.2	0.03
Debt	N/A	N/A	0.002–0.03 ³	0.2	0.03
Currency	N/A	N/A	N/A	N/A	N/A
Derivatives	N/A ⁴	N/A	2.0 ⁵	0.02	0.03
Value	N/A	N/A	Premium price	Notional value	Payments
Tax on original issuance?	No	No	No	No	No
Tax on secondary markets?	Yes	Yes	Yes	Yes	Yes
Market makers included?	No	No	Unknown	Yes	Yes
Government debt included?	No	No	Yes	Yes	Yes
International coordination?	No	No	No	Yes	No

Note: N/A = not applicable

¹ The rates listed reflect the total combined rate on both buyers and sellers.

² This rate was increased from 1 to 2 percent in 1986.

³ This rate was introduced in 1989.

⁴ The UK stamp duty taxes derivatives at 0.5 percent only for stock options that are exercised and physically settled.

⁵ This tax only applies to stock options.

⁶ 0.01 percent per year on swaps, 0.02 percentage points on futures, 0.5 percent on options. Notional value used for swaps and futures, premium price used for options.

Sources: HM Revenue & Customs (2010); French Tax Code (2012), Article 235 ter ZD; Campbell and Froot (1994); European Commission (2011); DeFazio and Harkin (2013); Baker et al. (2009).

In contrast, Sweden's FTT was short-lived and created numerous problems (Table 2). Beginning in January 1984, Sweden levied a tax of 0.50 percent on both the purchases and sale of equities (for a total of 1.0 percent). The tax rate and other details changed over time, but the key design element remained in place, namely that the tax was imposed only on transactions administered through registered Swedish brokerage houses. The tax was easy to avoid and base erosion was a serious problem, as discussed below. In 1989, the peak year for revenues from the tax, the Swedish FTT raised just 5 percent of its original estimated annual revenue (Campbell and Froot, 1994). In the face of substantially declining trade volume and revenue far below projected levels, Swedish authorities repealed the tax in 1991, but the tax did lasting harm to the Swedish stock market (Campbell and Froot, 1994; Umlauf, 1993).

In 2012, France introduced a 0.20 percent tax on stock purchases of French publicly traded companies with a market value over €1 billion (Table 2), as well as taxes of 0.01 percent on cancelled high-frequency trading orders⁸ and of 0.01 percent of the nominal value on some sovereign credit default swaps.⁹ The equity transfer tax was seen as a way to raise revenue, and the high-frequency trading and credit default swap taxes were seen as ways to reduce rent seeking and speculation. The French government was sensitive to the possibility of transaction flight to other EU states. As a result, the French FTT exempts market makers and excludes corporate bonds, sovereign bonds, and derivatives. Despite these efforts, evidence suggests that the FTT reduced trading volume significantly, as discussed below.

D. Proposed FTTs

In January 2017, 10 EU states will adopt a FTT. The parties include Austria, Belgium, France, Germany, Greece, Italy, Portugal, Slovakia, Slovenia, and Spain (European Commission, 2013).¹⁰ Details are still being negotiated, and significant issues remain unresolved. Some observers believe delays in implementation are likely.¹¹

Major features of the EU FTT are listed in Table 2. While the rates are set to be determined by mid-2016, an earlier European Commission proposal set forth taxes of 0.1 percent on both the purchase and sale of securities and 0.01 percent of the notional value of transactions involving derivatives, for total rates of 0.2 and 0.02 percent respectively (European Commission, 2011).¹² Participating member states will drop existing FTTs but are permitted to have taxes on financial instruments not covered by the EU

⁸ The tax code defines high-frequency trading as "the habitual addressing of orders for own account using an automated mechanism" (French Tax Code, article 235 ter ZD, title 2, chapter 1, section 2).

⁹ The French Tax Code, article 235 ter ZD, title 3, chapter 3, section 3.

¹⁰ Estonia had previously agreed to adopt the EU FTT but did not sign the most recent statement in December 2015. For further reference, consult Strupczewski (2015).

¹¹ According to Reuters, member countries disagree about how to tax derivatives, among other issues (Macdonald, 2015).

¹² Notional value is the total value of a leveraged position's assets. For example, an option to sell 1,000 shares of XYZ stock at \$100 per share in six months has a notional value of \$100,000, but the price of the option might be only a fraction of that amount if the current stock price is above \$100 per share.

FTT. The tax is intended to be very broad, with a so-called “R plus I” (residence plus issuance) base. The tax applies to all financial institutions established in a member state and any institutions conducting transactions or serving clients in that state. The tax is coordinated across countries to prevent the double-taxation of transactions. The EU FTT proposal exempts original issuance but not secondary trading; thus, liquidity on secondary markets could be reduced. Nevertheless, the EU believes these provisions will result in a “high degree of tax neutrality across instruments, market places, and actors within the financial sector” (European Commission, 2013, p. 16). The EU further argues that the tax will reduce systemic risk and rent seeking, provide a fair way for the financial sector to pay for bailouts from which it directly or indirectly benefited, and generate annual revenue of about 0.13 to 0.35 percent of GDP in the participating countries (European Commission, 2011).

Numerous proposals have been made for new FTTs in the United States over the past several decades and in particular since the recent financial crisis. Support for FTTs has come from a variety of groups. In 2010, a coalition of 50 charities and civil society groups launched a campaign for a “Robin Hood Tax” on global financial transactions that would finance global development.¹³

In 2013, Sen. Tom Harkin (D-IA) and Congressman Peter DeFazio (D-OR) introduced the “Wall Street Trading and Speculators Tax Act” (H.R. 880 or S. 410), having introduced similar bills in 2009 and 2011 (Table 2). Their proposal would impose a 0.03 percent tax on all trades including stocks, bonds, other debt obligations, and derivatives based on these assets. For a derivative transaction, the base would be any payment made under the terms of the contract.¹⁴ The tax would exempt initial issuance, trading in debt instruments with fixed maturities of 100 days or less, and currency transactions (although transactions involving currency derivatives would be subject to tax). The Harkin-DeFazio tax would not exempt market makers. The tax would be imposed on trading within the United States and on any transaction outside the country if any party to the transaction is a U.S. business or individual. The Congressional Joint Committee on Taxation (JCT) estimates the proposal would raise \$352 billion (about 0.2 percent of GDP) from 2013 to 2021.

Congressman Keith Ellison (D-MN) reintroduced a related proposal, the “Inclusive Prosperity Act,” in 2015 (H.R. 1464) following an earlier version in 2013. Sen. Bernie Sanders (I-VT) introduced a companion bill in the Senate (S.1371). The bill would impose much higher tax rates than Harkin-DeFazio: it would tax stock sales at 0.50 percent, bond sales at 0.10 percent, and payments with respect to derivatives at 0.005 percent.¹⁵ Sanders also included this FTT in his “College for All Act” in 2015

¹³ For more information, refer to ROBINHOODTAX, www.robinhoodtax.org.

¹⁴ For example, for a “put” option to sell 1,000 shares at \$100, the price of the option (i.e., the premium) would be taxable when purchased. If the option were sold, then the amount received (say, \$5) would be subject to a transaction tax. If the option were exercised (that is, the taxpayer sold the stock for \$100), then the proceeds from the sale would be subject to the transaction tax.

¹⁵ The base of the derivatives tax is unclear in the draft legislative language. The low rate — 1/100 of the rate on securities — would be consistent with taxing the notional value of the underlying securities, but the draft statute suggests that the base is the value of the derivative itself, which is typically only a fraction of the value of the securities (and often negative). See Text of the Inclusive Property Act of 2015, H.R. 1464, 114th Congress (2015), <https://www.congress.gov/bill/114th-congress/house-bill/1464/text>.

(S.1373), which would earmark the revenue to finance free college tuition. Sanders (2015) claims the tax has the potential to raise \$300 billion in revenue annually (about 1.7 percent of GDP in 2015), or approximately nine times as much as the JCT estimates of the Harkin-DeFazio proposal.

Baker et al. (2009) propose a tax of 0.50 percent on stock sales, 0.01 percent times the years-to-maturity on bond sales, 0.01 percent on currency transactions, 0.50 percent of the premium price for options, 0.02 percent of the value of futures and forward contracts, and 0.01 percent per year on the notional amount of swaps (Table 2). The tax would be split between the buyer and the seller (e.g., each would pay 0.25 percent on a stock sale). Based on 2008 data, when trading volumes and asset values were depressed by the Great Recession, Baker et al. estimate the tax would have raised \$177 billion (about 1.2 percent of GDP) in that year, despite assuming the tax would halve trading volume.

E. Other Taxes on the Financial Sector

FTTs in general, and STTs in particular, tax the gross value of transactions, rather than the net value of economic activity. By contrast, a financial activity tax (FAT), such as a value-added tax (VAT) on financial services firms, aims to tax the net value of economic activity in the financial sector (International Monetary Fund, 2010). Typically, VATs are not imposed on financial services because of the difficulty of measuring value added in financial transactions. According to Merrill (1997, p. 1), “in the more than one hundred countries with value-added (VAT) systems, ‘core’ financial-intermediation services are almost universally exempt from taxation. The exemption method is used not because it is thought to be the theoretically correct method of taxation, but because it has proven difficult to measure the value of many financial services for which separately-stated fees are not charged.” Despite this exemption, however, a VAT indirectly taxes a significant share of financial sector sales because most inputs are taxable and generally not creditable (Merrill, 1997).

The VAT taxes net proceeds and hence does not cascade, whereas a FTT would tax gross financial transactions and would cascade, creating distortions biased against industries or sectors that are more transaction-intensive. A financial-sector VAT could generate revenues to help pay for the burden of public bailouts of the financial sector, but it would not target the rent-seeking behavior, the excessive leverage, or the implicit public guarantees on large financial institutions (deemed “too big to fail”) that contributed to the excessive risk taking that necessitated the bailouts in the first place.

To address these issues a FAT could be targeted at profits and compensation in excess of a certain amount (International Monetary Fund, 2010; Shaviro, 2012). Alternatively, a financial stability contribution (FSC) could apply to debt of financial institutions with the aim of reducing leverage in the financial sector, as recommended by the International Monetary Fund (2010). For example, since 2010 the Obama administration has proposed a new levy originally dubbed the financial crisis responsibility fee (Office of the Press Secretary, 2010). The fee would apply to firms with assets over \$50 billion at a rate of 0.17 percent of covered liabilities. The levy was originally intended to recoup the

cost of the Troubled Asset Relief Program and discourage excessive risk taking (U.S. Department of the Treasury, 2015).¹⁶ Former Ways and Means Committee Chairman Dave Camp's tax reform plan included a somewhat similar bank tax, which applied to only very large financial institutions (Camp, 2014).

If the primary objective of the tax is to deter a future financial crisis, a financial sector tax should be related to the systemic risk imposed by each financial institution and would be a function of size, leverage, and riskiness of portfolio. However, Shackelford, Shaviro, and Slemrod (2010) point out that measuring multidimensional risk is extremely challenging in theory, and even more daunting in practice.

III. DESIGN ISSUES

The vastly different experiences of Sweden and the United Kingdom with FTTs illustrate the importance of careful design. A broader base permits the same revenue to be raised at lower tax rates and reduces the opportunities for tax avoidance and evasion. A broad base and a lower tax rate likely reduce the efficiency costs of the tax. But the issue is complicated both because a FTT with uniform rates may still impose different effective tax rates on different assets since the tax burden depends on how frequently an asset is traded, and because the FTT is a noncreditable tax on an input.

The first design question is the geographic reach of the tax. Should the application of the tax turn on the residence of the issuer of the security, the residence of the buyer, seller, or intermediary, or the location of the trade? The UK stamp duty applies (with some exceptions) to stock issued by a UK corporation. Similarly, the French FTT applies to stock issued by large French companies (a market capitalization of more than €1 billion). And both the United Kingdom and France purport to apply their tax to stock traded on exchanges both inside and outside their borders. As a result, the UK and French taxes avoid the giant loophole in the now-repealed Swedish tax, which applied only to transactions made using Swedish brokerages, a very narrow tax base that investors easily avoided by trading on foreign exchanges.

The draft EU FTT would apply to the purchase of a security issued by a firm in the country that enacts the tax and to other purchases when either party to the transaction is a resident of the taxing country. Thus, either issuance or residence would trigger the tax.

The proposed Harkin-DeFazio FTT applies to a securities transaction when either the purchaser or the seller is a U.S. person (a residence test). It also applies to any purchase that occurs or is cleared in the United States and thus applies to nonresidents who trade on U.S. exchanges. But nonresidents can avoid the Harkin-DeFazio FTT by trading securities on a foreign exchange (even when trading depository receipts of U.S. companies, as the issuer of the security is irrelevant). The Harkin-DeFazio proposal could be amended to attempt to deter this kind of avoidance by adopting the rule under the UK stamp duty that applies a 1.5 percent tax to the transfer of UK equities to a

¹⁶ The rationale for the new tax has evolved over time. Now called simply a "financial fee," recouping the costs of the Troubled Asset Relief Program has been removed from Treasury's list of "reasons for change."

depository receipt facility, as the trading of the receipts would otherwise be free of the UK 0.5 percent stamp duty.

The second design question is which securities are covered by the tax: stocks, bonds, and/or derivatives? All the FTTs described above apply to stock. The French FTT exempts most debt instruments including convertible bonds.¹⁷ However, the conversion of bonds into shares is a taxable event under the French FTT. The EU FTT applies to a wider range of bonds and loans, excluding noncommercial instruments such as home mortgages and insurance contracts. The Harkin-DeFazio FTT also covers most debt, but excludes bonds with a maturity of up to 100 days. The draft EU FTT and the Harkin-DeFazio FTT apply to derivatives.

Shaviro (2012) points out that swaps can be created that are economically equivalent to an asset purchase.¹⁸ Thus derivatives must be taxed to deter tax avoidance, but it is not obvious how to define the tax base in the case of derivatives. The base for a stock or debt transaction is typically the sales price of the asset. With a derivative, there typically is no payment at the time the transaction is commenced, nor is there necessarily a payment at the end (as the total contract payments might happen to net to zero). The draft EU FTT would use the notional value of a derivative as the base.¹⁹ But the notional value of a derivative can be manipulated without changing its underlying economic characteristics. For example, the parties to a swap could halve the notional amount of their derivative and double the payoff formula (i.e., to twice the appreciation and dividends of the underlying stock). Thus, the use of notional value as a base introduces fundamental difficulties. But Matheson (2012) also notes that using a tax base other than the notional value for all derivatives, such as collateral or margin, could encourage excess leverage.

The draft EU FTT acknowledges the challenge of using a notional value and responds by reducing the tax rate for derivatives by an order of magnitude (from 0.2 percent to 0.02 percent). But the rate differential reintroduces a distortion between economically equivalent transactions (e.g., between a total return swap and an outright stock

¹⁷ Convertible debt is debt that a bondholder may elect to convert into a specified number of shares of stock of the issuer.

¹⁸ For example, an investor might enter a total return swap on the value of 100,000 shares of company XYZ stock ($100,000 \times$ the XYZ stock price). The investor is owed payments equal to the dividends paid on the stock quarterly and the rise in value of the stock on the settlement date. If the stock falls in value, the investor must make a payment equal to the decline in value as of the settlement date. In addition, the investor typically owes periodic interest on the notional value of the stock. In most cases, a net settlement is made at the end of the contract. Before tax, the investor's position is identical to that of an investor who borrowed money at the swap interest rate to purchase 100,000 shares of stock, held the shares for the term of the contract, and then sold the shares and paid off the loan. The difference is that the total return swap involves no upfront payments and technically no change in ownership of the underlying security. If a FTT applied to purchases and sales of financial securities but not derivatives, such as swaps, the latter arrangement would be an ideal tax shelter. (This feature, in part, fueled the growth of "contracts for differences" in the United Kingdom, which are a form of total return swap.)

¹⁹ In the total return swap discussed in note 18, the notional value would be the market value of the 100,000 shares.

purchase). As a result, in some cases, it encourages the substitution of derivatives for stocks and bonds.

The draft EU FTT treats all derivatives in the same manner. For example, it taxes the notional value for a put or a call on 100,000 shares of stock the same as a total return swap on 100,000 shares (described in footnote 18). But puts and calls often are used to hedge remote or residual risks (both portfolio and business operational risks). Overtaxing these risk-managing transactions could discourage their use — and result in too much risk taking. In theory, the tax for a derivative that transfers only some of the risk and return of owning an asset should be less than the tax for a derivative that transfers all the return. But how could the amount of risk that is transferred be measured? Would the tax vary, for example, based on the likelihood that the derivative would be exercised? If so, how would that probability be measured?

The Harkin-DeFazio FTT takes a different approach to derivatives, but it still leaves major issues unresolved. The Harkin-DeFazio FTT uses the same 0.03 percent tax rate for derivatives as it uses for stocks and bonds. But the 0.03 percent tax rate applies only to actual cash flows for derivatives (e.g., upfront payments such as premiums, periodic payments, settlement payments, and so forth), not to notional values. Using the same 0.03 percent rate for derivatives and for stocks and bonds is, perhaps, less arbitrary than reducing the tax by a factor of 10, and the size of the tax varies with the value of derivatives. However, under the Harkin-DeFazio FTT, the total tax on a derivative could still be much lower than the tax on an economically equivalent stock or bond, which could lead to substitution of the derivative for the stock or bond.

Another possibility, which has not been tried, is a combination of these two approaches. That is, a FTT could tax some derivatives on their notional value and others on their cash flow, depending on whether the derivative is substantially equivalent to owning the underlying security. For example, a derivative with a delta of 0.8 or higher with respect to a security, could be taxed the same as the security. (A delta measures how the fair market value of a derivative contract changes with respect to a unit change in the fair market value of the underlying security.) The tax on a derivative with a delta of less than 0.8 would be based on the cash flow of the derivative (i.e., the premiums, periodic payments, settlement payments, etc.).

This combination approach is similar to the Treasury's final regulations for withholding on dividend equivalent payments on derivatives. The Treasury requires investors to pay withholding tax on dividend equivalent payments that arise from a derivative if the delta at the time the derivative is issued exceeds a certain threshold. The Treasury also requires any broker, dealer, or intermediary that enters a swap to report the delta to their swap counterparty. A two-tier approach to taxing derivatives would discourage the development of derivatives that are economically equivalent to stock in order to avoid the tax on the stock.

Another aspect of taxing stocks versus bonds or other assets is that the total tax burden for stocks, bonds, and derivatives depends on how often the assets are exchanged. If the FTT rate is constant, short-term bonds could be overtaxed compared with longer-term bonds, which would distort portfolio and issuance decisions. For example, a FTT

might discourage the trading of highly liquid short-term government securities, which are traded frequently as financial institutions use short-term assets to manage cash reserves. The Harkin-DeFazio FTT addresses this problem by exempting short-term debt (e.g., some T-Bills, commercial paper, and credit card issuances). An alternative approach would be to multiply the FTT on bonds by years to maturity, as proposed by Pollin, Baker, and Schaberg (2003). The basic idea is that a 10-year bond that pays annual interest, for example, is economically equivalent to a series of 10 one-year bonds. Under this proposal, the equivalent financial instruments would face the same total tax in present value if all bonds were held until maturity.²⁰

A third issue is which financial markets are subject to the FTT. Does the tax apply only to exchange-based transactions or also to over-the-counter transactions? One of the great advantages of a FTT is that collecting levies on exchange-based transactions would be easy and inexpensive. Over-the-counter transactions, in contrast, are private contracts between any two parties and there is no centralized exchange. If over-the-counter transactions are not taxed, however, investors have an obvious way to avoid the tax and the resulting exodus of trades could make markets less transparent. Taxing over-the-counter transactions would be difficult, but Brondolo (2011) argues it is possible to do. In the United States, the recent Dodd-Frank legislation and other regulatory changes could aid collection of a FTT because there are new clearing and reporting requirements for many derivatives. Most FTT proposals include over-the-counter sales.

A fourth issue is whether the tax excludes market makers. Although the goal of the tax is to reduce speculative activity, some financial institutions serve as market makers, buying and selling in the market to provide liquidity and hence presumably to reduce volatility. Taxing these agents could raise the burdens imposed by the FTT significantly in some cases, and to the extent it reduced purchases by market makers, the tax could reduce liquidity and increase asset price volatility. The UK stamp duty excludes transactions between financial institutions; it only applies to retail customers. Distinguishing productive from unproductive activities is a fundamental tension in designing FTTs. However, exempting market makers could create a significant loophole. Most recent proposals choose to tax market makers.

A fifth issue is whether to exempt government debt. The direct effect of a tax on transactions involving public debt would be to raise government borrowing costs. Government securities tend to be among the most frequently traded because they are used as a substitute for cash (and because regulations require financial institutions to hold cash reserves in the form of Treasury securities). But failure to tax public debt could

²⁰ Assuming the bonds earn simple interest at rate r , which is equal to the discount rate, then the stream of tax payments for the one-year bond with purchase price V (and proceeds reinvested in new bonds each year) and tax rate τ would equal $\tau V(1+r)/10$, $\tau V(1+r)^2/10$, $\tau V(1+r)^3/10$, . . . , $\tau V(1+r)^{10}/10$. The present discounted value of each year's tax liability would be $\tau V/10$, so the entire stream has a present discounted value of $10\tau V/10 = \tau V$. The 10-year bond would have a tax liability of $\tau V(1+r)^{10}$ in year 10, which has the same present value, τV . Thus, the present discounted value of tax liabilities is identical in the two cases.

lead to a shift out of private-sector securities. Many recent proposals tax both corporate and government debt, although, as noted above, the Harkin-DeFazio proposal would exempt debt instruments with a maturity less than 100 days, which would exempt many government securities from the tax.

All the issues above concern the tax base. Turning to the tax rates, there are further questions. Is the tax ad valorem or a flat fee per share traded? Most existing taxes and proposals employ an ad valorem rate. Ad valorem and flat fee taxation have different relative effects on transactions of different sizes. For example, some sophisticated algorithms submit a large number of small orders (“order shredding”) in an extremely short amount of time to profit from miniscule differences between bids and asks. A very small flat fee would be sufficient to discourage such behavior (Matheson, 2012). But a flat fee would implicitly favor assets with relatively high face values — because the tax would be a smaller fraction of the value — and thus might discourage stock splits and dividend payments (which, all else equal, reduce asset prices) and encourage stock buy-backs (which have the opposite effect).

A final issue is whether the tax is coordinated internationally. Because capital is highly mobile across national borders, international coordination could significantly reduce the scope for avoidance. The early Swedish experiment with FTTs was doomed in part by the ability of investors to trade Swedish shares on other countries’ stock exchanges where FTTs were small or nonexistent. The pending EU tax is an example of countries trying to coordinate their FTTs.

International cooperation and coordination of tax bases and rates could greatly reduce the scope for tax avoidance. The problem presents a type of “prisoner’s dilemma” in which every country can reap higher revenues with minimal effects on economically productive financial-sector activity if they all cooperate, but each country has an incentive to break from an agreement and reap the potential economic rewards associated with being a FTT tax haven, boosting its financial sector. In practice, this problem could be addressed by having all countries in the EU, the United States, and a few other major countries agree to a coordinated tax.

IV. THE FINANCIAL SECTOR AND MARKET FAILURE

The financial sector serves several key roles (Philippon, 2011). It facilitates the flow of funds from savers to borrowers. It provides a safe and efficient payment mechanism, which facilitates the exchange of goods and services. It provides insurance, both in the form of diversification and risk management.

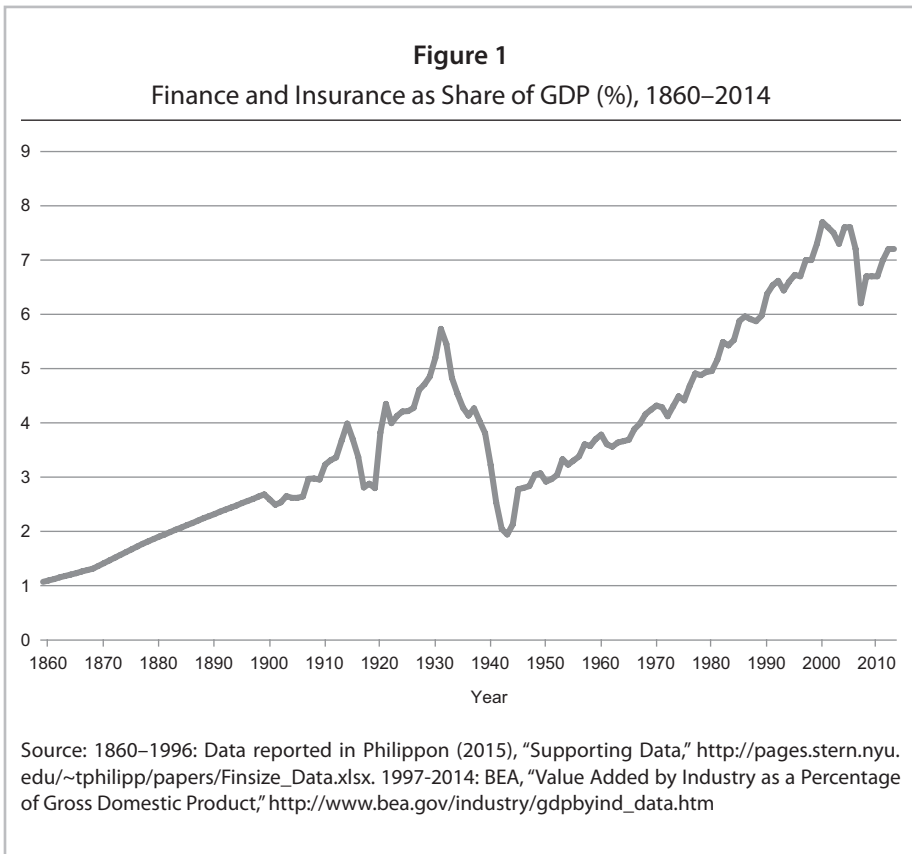
Despite the important contributions of the financial sector, there is growing concern that the sector uses too many resources and suffers from structural problems, with the result being a misallocation of resources and undue risk imposed on the economy. The financial market collapse of 2007 illustrated painfully how dependent we are on a well-functioning financial sector and the dire consequences of failure in that market. This section provides a brief overview of some of these concerns.

A. Size of the Financial Sector

The financial services sector accounted for 7.2 percent of U.S. GDP in 2014, near the all-time high of 7.7 percent in 2001 and up from just 2.5 percent of GDP in 1947 (Bureau of Economic Analysis, 2015; Philippon, 2008) (Figure 1). Similar trends are evident in other industrial economies (Philippon and Reshef, 2013).

Many commentators believe the financial sector has grown inefficiently large (Cœuré, 2014; Zingales, 2015). Some financial institutions have grown so large their failure would produce ripple effects throughout the entire economy, as evidenced by the shock waves created when Lehman Brothers was allowed to fail (Wessel, 2010).

Recent research has found that financial-sector growth leads to increased efficiency up to a point, but institutions larger than that optimal scale increase the risks of a crisis (Cœuré, 2014). Philippon (2015) estimates the financial sector's unit costs have not fallen even while information technology has produced cost savings in other similar



industries. Adjusting for quality improvements, he finds that “the unit cost of intermediation is about as high today as it was at the turn of the twentieth century. Improvements in information technologies do not appear to have led to a significant decrease in the unit cost of intermediation” (Philippon, 2015, p. 1413).

Arcand, Berkes, and Panizza (2012) reexamined a longstanding body of research that has found a robustly positive relationship between finance and economic growth. The authors posit that previous research found that a bigger financial sector always led to more growth because the empirical models did not allow for the possibility of a peak beyond which more finance might entail economic costs. Using a more flexible functional form, Arcand, Berkes, and Panizza (2012, p. 6) find that “the marginal effect of financial depth on output growth becomes negative when credit to the private sector reaches 80–100 percent of GDP.” They note this threshold is roughly the same threshold at which Easterly, Islam, and Stiglitz (2000) found that financial depth begins to increase volatility. The findings of Arcand, Berkes, and Panizza appear in panel data across countries and industries as well as in cross-sectional data, and the results are robust with respect to estimation method.

Greenwood and Scharfstein (2013) argue that whether the financial sector is too large depends on the main sources of its growth. On the positive side, the professionalization of asset management helps businesses by lowering the cost of capital, a reduction that is especially significant for young firms because they are most reliant on external financing. Similarly, expanded access to household credit helps families smooth consumption, but the expanded liquidity also brings risks from too much leverage, as evidenced by the recent financial crisis.

Baily and Elliott (2013, p. 22) express sympathy for the view that the financial sector is too large, but they caution that “it is extremely hard to determine the right size of the financial system based on well-grounded economic theories.” They are concerned that an overreaction in the wake of the financial crisis could harm the economy.

Zingales (2015) notes that, while a modern economy needs a developed financial sector and while there is evidence that a larger banking sector is correlated with stronger growth, there is little evidence that other areas of financial sector deepening — including equity markets, junk bond markets, and futures markets — have any impact on growth.

Clearly, if the financial sector is too big, taxes that reduce the size of the financial sector have the potential to raise economic welfare. Whether taxes that reduce the size of the financial sector in the manner that a FTT would be efficiency enhancing is an open question. It is certainly true that a FAT targeted at financial market inefficiencies would be superior, at least in theory. However, if such a tax is infeasible, a FTT may be a second-best option, as it would surely result in a smaller financial sector because trading volume would decline significantly (see the next section for a discussion of the effects of a FTT). Although the FTT has ambiguous effects on market volatility, it would deter some forms of inefficient rent seeking by making many high-frequency trading strategies unprofitable.

B. Systemic Risk

Federal policies, both explicit and implicit, may have led some participants in the financial sector to take excessive risks. The standard example is deposit insurance, which played a role in the savings and loan crisis in the 1980s. Of greater significance today, however, is the implicit insurance provided to major institutions in the financial sector based on the notion that they are “too big to fail.” By essentially socializing downside risk, implicit insurance for large financial institutions raises their private expected returns, encourages excessive risk taking, and likely causes the allocation of too much in the way of human and physical capital to be devoted to the financial sector. It also causes smaller firms to grow faster than they otherwise would have in order to place themselves under the implicit protective umbrella (Bernanke, 2009).

Depositors acting under the same belief disregard their qualms of an institution’s risky behavior, and both depositors and the institution shirk responsibility for assessing risk (International Association of Deposit Insurers, 2013). Risk breeds more risk. Without some form of regulation that would motivate institutions to be more accountable for their decisions or tax that penalizes institutions for size and riskiness, these implicit and explicit guarantees pose the threat of precipitating future crises.

C. High-Frequency Trading and Flash Trading

High-frequency traders use computer algorithms to choose and execute trades in mere fractions of a second. Traders often use these algorithms to arbitrage and eliminate differences in prices of identical or similar assets across different markets. Budish, Cramton, and Shim (2015) report that between 2005 and 2011 the median length of an arbitrage opportunity on the Chicago Mercantile Exchange and the New York Stock Exchange declined from 97 milliseconds to 7 milliseconds. High-frequency trading plays a major role in current financial markets, accounting for over half of trading volume in equity markets (Jones, 2013; SEC, 2014).

High-frequency trading is the means by which the trade happens, distinct from the various trading strategies that employ it. Passive high-frequency trading strategies have a positive impact on markets by reducing price spreads and volatility (SEC, 2014). More aggressive strategies can aid in price discovery, but they also create costs for fellow market participants and may only provide “phantom liquidity” (Shorter and Miller, 2014). High-frequency trading can create disadvantages for other investors and thus can result in adverse selection, with resulting declines in market quality (Jones, 2013).

Some forms of high-frequency trading involve rent-seeking behavior, which can produce large windfalls for individuals, but no social benefit. For example, highly sophisticated traders sometimes use extremely fast computer algorithms and high tech equipment to get between buyers and sellers to extract rents at the expense of unsuspecting market participants — a practice that has been dubbed “flash trading.” It is a modern variant of the illegal practice of front-running, where a broker enters its own order in front of a client’s to profit at the client’s expense. Flash trading, however, has

not been challenged by the SEC (Lewis, 2014). Enormously talented individuals and real physical capital are invested in flash trading.²¹ The rents extracted by flash traders also reduce returns on capital for other market participants, which might reduce the supply of investment below optimal levels. Adding even a small FTT could make these trades unprofitable and stop such behavior.^{22, 23}

D. Noise Trading

A noise trader bases trades on something other than valid information. Black (1986) believes noise traders are a central feature of financial markets, giving fundamental traders an opportunity to profit and affecting price volatility. He identifies two different types of noise traders: those trading on noise they mistakenly believe is information and those trading frequently just for fun. A FTT may not have much influence on the latter, but for the former a FTT would make all trades look a little less profitable and thus discourage them.

Noise traders' speculation raises market volatility, which harms rational market participants by increasing the risk of holding financial assets. DeLong et al. (1989) conclude that the welfare loss from the higher variance of asset returns and the resulting decline in the size of both the capital stock and consumption more than offset the financial gains to rational investors from exploiting noise traders' ignorance. Imposing a FTT would curb noise trading, but it would reduce informed trading, too, so the net effect on volatility is unclear (Kupiec, 1996). Dávila (2013) finds a nonzero FTT rate is optimal any time investors' nonfundamental belief systems cause excess trading; his optimal tax rate would strike a balance between the gains from reduced noise trading and the losses from cutting informed trading levels. Subrahmanyam (1998) also finds a trade-off arising from a FTT: less activity by informed traders would result in less liquidity, but traders would have an incentive to invest in collecting more information about the long-term prospects of businesses (because average holding periods are longer). Stiglitz (1989) suggests a FTT is an appropriate instrument to reduce noise trading. DeLong et al. (1989, p. 692) propose a short-term capital gains tax, which, in

²¹ Lewis (2014) describes the tremendous expense of laying fiber optic cable between Chicago and New York to gain a time advantage of several microseconds to intercept trades.

²² Arnold (2015) points out that a "spoofers" may also deploy high-frequency trading to combat modern front runners by making their trades unprofitable. "Spoofers" deliberately send false price signals to trick front runners into making money-losing trades. The spoofers outmaneuvers the front runner by proffering a small order, which he will profit from, in conjunction with an offsetting larger order, which he will cancel once the front runner jumps ahead of it. Because spoofing makes front running unprofitable, it could limit the scope of this inefficient high-frequency trading. However, unlike flash-trading, the SEC considers spoofing to be an illegal deceptive practice because spoofers offer trades they never intend to execute (Arnold, 2015).

²³ Budish, Cramton, and Shim (2015) propose a regulatory solution to the problem of rent extraction via increasingly high-speed trading. They propose that orders be collected over time and be executed in batch at frequent intervals, rather than being implemented on a continuous-time, first-come, first-served basis.

their simplified model of behavior, “would eliminate noise traders’ incentive to speculate on their misperceptions.”

V. EFFECTS OF A FTT

This section examines many of the effects of a FTT on the financial sector as well as issues related to compliance and administration.

A. Trading Volume and Speculation

A FTT would reduce the volume of trades by raising transaction costs. Some trades that would have been profitable with lower transactions costs would become unprofitable with the addition of a FTT and hence would not be undertaken. Likewise, market participants would look to substitute nontaxable transactions for taxable transactions. Both effects would reduce trading volume for trades subject to a FTT. Coelho (2015) finds substantial trading responses to a FTT along several dimensions – substitution away from taxed assets and substitution across financial instruments and trading platforms.

Auten and Matheson (2010) find that increases in the very small SEC fee reduced trading volume in the largest, most liquid U.S. securities. Transaction costs on liquid assets tend to be a very small fraction of the price, meaning that such assets can be traded frequently at very low cumulative cost. Even a miniscule FTT can represent a significant proportional increase in transaction costs on liquid assets, which is why their trading volume is most sensitive to the imposition of the tax.

More generally, a FTT is a much bigger burden on frequently traded assets than on assets that are held longer. For example, suppose an investor purchases an asset for \$10,000 that produces a 5 percent annual rate of return. If the asset is held for a year and sold, the pretax return is \$500 (Table 3). If a 0.1 percent FTT is assessed upon sale, the tax bill is \$10.50 (0.1 percent of \$10,500). The 0.1 percent FTT actually represents more than 2 percent of the income generated. The effective tax rate on transactions falls with the holding period. If the owner sells the asset after owning it for a month, the sale price would be about \$10,042 and the tax would be \$10.42, or almost 25 percent of the return from the asset. If the asset is held for 20 years, the resulting FTT would be only about 0.2 percent of the increase in asset value. Not surprisingly, the effective tax rate rises as the statutory FTT rate rises or the pretax rate of return falls.

Empirical evidence strongly confirms that higher transactions costs in general, and a higher FTT in particular, reduce trading volume (Matheson, 2012). Trading in Sweden fell significantly after imposition of its FTT (Campbell and Froot, 1994; Umlauf, 1993). The French FTT enacted in 2012 was also followed by significant declines in trading (Colliard and Hoffmann, 2013; Haferkorn and Zimmermann, 2013; Buchanan, 2012; Meyer, Wagener, and Weinhardt, 2013). Both countries saw trades move to other parts of Europe. In France, trading also migrated to smaller firms, which were exempt from the tax. A negative correlation between FTT rates and trading volume was also found in China (Baltagi, Li, and Li, 2006), Taiwan (Chou and Wang, 2006), Japan (Liu, 2007), the United Kingdom (Jackson and O’Donnell, 1985), and in cross-national studies

Table 3
The Effective Tax Rate Under a FTT, by FTT Rate and Holding Period

Holding Period	Increase in Value Before Tax (\$)	FTT Rate 0.10 Percent			FTT Rate 0.50 Percent		
		After-Tax Rate of Return (%)	Tax / Increase in Value (%)	ETR (%)	After-Tax Rate of Return (%)	Tax / Increase in Value (%)	ETR (%)
No time	0	N/A	∞	∞	N/A	∞	∞
1 day	1	-27.12	748.2	642.5	-83.15	3,740.8	1,763.0
1 month	41	3.75	24.6	25.1	-1.13	123.2	122.6
1 year	500	4.90	2.1	2.1	4.48	10.5	10.5
2 years	1,025	4.95	1.1	1.1	4.74	5.4	5.3
5 years	2,763	4.98	0.5	0.4	4.89	2.3	2.1
10 years	6,289	4.99	0.3	0.2	4.95	1.3	1.1
20 years	16,533	4.99	0.2	0.1	4.97	0.8	0.5

Notes: Calculations assume that the tax is levied on sellers. The before-tax rate of return is 5 percent, and the initial investment is \$10,000. ETR = effective tax rate.

(Ericsson and Lindgren, 1992; Hu, 1998). Pomeranets and Weaver (2013) show that higher tax rates caused by the New York state FTT reduced trading volume on the New York Stock Exchange and induced shifts of trading to other exchanges. Lepone and Sacco (2013) find that a financial trading fee in Canada led to a significant decline in algorithmic, high-frequency trading.

Whether the reduction in trading volume is a good thing or bad thing is more difficult to say. Under most circumstances, more trade leads to better economic outcomes. Consistent with that thinking, FTT opponents point to lower trading volume as a problem, noting that a FTT would discourage trades that provide liquidity, aid price discovery, and fund productive investment. But a FTT is supposed to work by reducing speculative trading and rent seeking. So the key questions become: What proportion of the reduced trading is unproductive, and what are the costs of discouraging productive financial activity?

One piece of evidence is that a large percentage of financial market transactions involve short-term, high-frequency trading. Matheson (2012, 2014) reports that algorithmic, computer-driven trading that relies on high-speed transactions accounted for 60 percent of U.S. equity trading volume in 2009, up from 30 percent in 2006. Because the margins involved in such trades are often quite small, a tiny FTT would be sufficient to shut down most high-frequency trading, but it would also raise very little revenue.

A FTT at the rates being adopted and proposed, however, would make many short-term investments unprofitable (as illustrated in Table 3) without discriminating between rent-seeking or noise-based trading activities and those with positive economic value. Combined with existing taxes on capital gains (and other forms of capital income), the FTT could make many short-term trades unprofitable and substantially raise the bar for others. Dávila (2013) argues that in a market where some agents trade based on fundamentals and some trade based on other factors, if there is more than a first-best level of trading, then a small financial transaction tax will be optimal. The reduction in trading by non-fundamental traders will have a first-order effect on welfare. In contrast, the reduction in trading by fundamental traders will have only a second-order effect, since they were previously trading at the first-best level. A full assessment of the costs and benefits of a FTT thus would have to balance the gains against the cost to society of suppressing many otherwise productive short- and medium-term trades.

B. Liquidity

Market liquidity is not a precise term. Intuitively, a liquid market is one in which it is easy to sell or buy an asset at a reasonable price. Liquidity is sometimes defined as the inverse of the price effect of a trade; in a liquid market, particular transactions have small impacts on price. That is, sellers can dispose of substantial holdings without driving down prices much, and buyers can acquire significant amounts of an asset without driving up the price very much. Liquidity can also be assessed by the bid-ask spread, the difference between the highest price buyers are willing to pay and the lowest price sellers are willing to accept. Liquid markets have low bid-ask spreads. Alternatively,

liquidity can be defined in terms of market depth, which takes into account not only the bid-ask spread but also the volume of transactions that can be bought or sold at prevailing prices. Typically, liquid markets are also high volume, but volume and liquidity are distinct concepts.

A FTT increases transaction costs and hence would be expected to make markets less liquid. As one example, a FTT would drive a wedge between bids and asks, because tax would have to be paid on the asset sale, and hence it would raise bid-ask spreads. A FTT also may increase the bid-ask spread if it substantially cuts market volume. Empirical evidence generally supports this notion. Pomeranets and Weaver (2013) show that increases in the New York state FTT raised bid-ask spreads. Lepone and Sacco (2013) show that the financial trading fee in Canada led to a significant increase in bid-ask spreads for stocks with larger market capitalization.²⁴

A key question is the size of the economic effects of less liquidity. Bid-ask spreads on the New York Stock Exchange averaged 1.3 percent in the mid-1980s and fell to 0.1 percent by 2009 (Matheson, 2011).²⁵ A FTT of 0.1 to 0.5 percent would widen the bid-ask spread, but it is unclear by how much. Baker (2008) asserts the new bid-ask spread would be narrower than the levels experienced in the mid-1980s and concludes that the economic costs of a FTT, operating through changes in the bid-ask spread, would be minimal.²⁶

C. Price Discovery

Price discovery is the name given to the process by which asset values are determined via trading. Efficient price discovery implies that asset values are not correlated over time; that is, any errors are short lived as markets align price with fundamental values as all information available at the time is incorporated into each trade. Markets with less efficient price discovery mechanisms are slower to incorporate new information into asset prices.

As a theoretical matter, Matheson (2012) finds that FTTs have the potential to slow price discovery in financial markets, primarily by reducing liquidity. She links this slower price discovery with an informational distortion in which assets are priced on old or outdated information because the transaction costs imposed by the FTT make it unprofitable for market participants to act on small price disequilibria. Habermeier and Kirilenko (2001, p. 178) similarly conclude that “the presence of even very small transaction costs makes continuous rebalancing infinitely expensive. Therefore, valuable

²⁴ Dupont and Lee (2007) argue that the impact on liquidity (market depth in their analysis) can also depend on the presence of asymmetric information, and in certain cases the FTT can increase liquidity.

²⁵ Pollin, Baker, and Schaberg (2003) summarize the substantial declines in transaction costs in various financial markets through 2000.

²⁶ Baker and Jorgenson (2012) find a positive and statistically significant correlation between transaction costs in the early 2000s and economic growth from 1990 to 2007 across 33 countries. However, the regression analysis omits a number of factors that may be correlated with transaction costs and growth, so it is impossible to infer a causal link.

information can be held back from being incorporated into prices. As a result, prices can deviate from their full information values.²⁷

Empirical work supports the notion that higher FTTs lead to autocorrelation in stock returns — that is, stocks can remain persistently too high or too low — and hence to less efficient price discovery. Baltagi, Li, and Li (2006) estimate that increases in the STT in China raised the autocorrelation of returns on Chinese stocks. Liu (2007) found that after the reduction in the Japanese STT during the late 1980s, the first-order autocorrelation for Japanese stocks subject to the tax fell until it was in line with untaxed Japanese depository receipts. However, the actual magnitude of the economic costs connected with inefficient price discovery is uncertain.

D. Asset Price Volatility

Although price discovery refers to the first-order autocorrelation of stock returns, volatility typically refers to the variance of returns. At first glance, the relationship between FTTs and volatility appears to be straightforward. As noted above, FTTs create higher transaction costs and thus reduce trading volume. The expectation that a FTT would reduce unproductive trading and thus volatility is a key motivation for the FTT proposals by Keynes (1936), Tobin (1978), Stiglitz (1989), and Summers and Summers (1989). However, the theoretical sign of the relationship is unclear, because FTTs can delay market participants' reaction to new information, as discussed above. This delay means prices may swing substantially before it becomes worthwhile for traders to react and realign prices with fundamentals.

In fact, several studies have found that higher transactions costs and FTTs actually raise volatility. Umlauf (1993) found that the introduction of, and increases in, the Swedish FTT led to increases in daily market volatility. Jones and Seguin (1997) found that deregulation of commissions on the New York Stock Exchange and American Stock Exchange in 1975, which led to lower transaction costs, reduced the volatility of stock prices. Similar findings were reported by Hau (2006) for transaction costs and stock price volatility in France, by Lanne and Vesala (2010) for the effects of a FTT on volatility in the currency trading market, and by Liu and Zhu (2009) for commission deregulation in the Japanese stock market. Pomeranets and Weaver (2013) found that increases in the New York state FTT raised the volatility of individual stocks.²⁸

²⁷ To illustrate this effect, suppose a trader knows the correct price for an asset — that is, the value consistent with all information currently available — is P^* , but the market price is P . The trader will only engage in a transaction if $|P - P^*| \geq TC$ where TC is total transaction costs, including the FTT. With a substantial FTT (or other transaction costs), significant differences between the market price and true value could persist.

²⁸ Of the eight events when the New York STT was changed, six had a statistically significant positive correlation with volatility in daily returns (Pomeranets and Weaver, 2013). Pomeranets and Weaver also examined portfolio volatility by using a methodology similar to Jones and Seguin (1997). Jones and Seguin argue that portfolio volatility is a better measure of the effects of an STT on investor risk because most investors hold portfolios rather than single stocks. Pomeranets and Weaver looked at the volatility of New York Stock Exchange and American Stock Exchange stock indexes and rejected the hypothesis of a negative correlation with the STT. In other words, they did not find evidence that an STT, at the levels adopted in New York, would reduce overall market volatility, but they found evidence it could increase the volatility of individual stock returns.

In contrast, Matheson (2014) found increases in the SEC fee over the 2001 to 2010 period reduced volatility, with the effect being larger (in absolute value) in the second half of the period. As she notes, algorithmic high-frequency trading rose dramatically over this time period, so the results could be interpreted as showing that transaction taxes reduce volatility when applied to a market with a substantial amount of high-frequency trading.

More generally, the effect of FTTs could raise or reduce volatility depending on how they affect noise traders versus fundamental traders. As one example, at the theoretical level, suppose that fundamental traders drive an asset's price toward its fundamental value, while noise traders introduce random variation. Having more fundamental traders will reduce volatility, and having more noise traders will raise volatility. If a FTT primarily reduces speculative behavior and hence removes disproportionately more noise traders than fundamental traders, then it could reduce volatility. Deng, Liu, and Wei (2014) report evidence consistent with this hypothesis. They estimate that in less mature markets, which might have more noise trading because information is less readily available, higher FTTs reduce market volatility, but in more mature markets, presumably with more fundamental traders and better information, FTTs increase volatility.

E. Asset Prices and the Cost of Capital

Introduction of a FTT is almost certain to reduce asset prices. Matheson (2012) presents a simple model in which the asset price impact of a FTT depends on the tax rate, the turnover rate, and the dividend growth rate. She finds that for assets held for 10 years, even a very large FTT (0.5 percent) has only a modest effect (1.4 percent) on initial asset value. For assets held for one year, a 0.5 percent FTT would reduce the initial asset value by 14 percent. For assets with high turnover rates, even a small tax would reduce value significantly. For assets held 0.10 years, for example, a 0.05 percent FTT would reduce value by 14 percent, and a 0.50 percent FTT would reduce value by 62 percent.

Empirical evidence and other estimates are consistent with a negative impact of a FTT on asset prices. A Congressional Research Service study estimated in the 1980s that the creation of a 0.5 percent tax on stock sales would reduce stock market values by between 9.3 and 14.6 percent (Kiefer, 1987). Umlauf (1993) shows that Swedish stocks fell significantly in the month before the tax took effect. Hu (1998) examined numerous STT changes in Asian countries from 1975 to 1994 and found that increases in transactions costs consistently reduced daily returns. Bond, Hawkins, and Klemm (2004) estimate that the cuts in the stamp duty raised share prices, with larger increases for shares with high turnover rates. Amihud and Mendelson (1992) find similar results for high-turnover stocks relative to other stocks.

Matheson (2012) also estimates the impact of a FTT on the cost of capital, with the effects again varying dramatically by holding period and tax rate. A 0.5 percent FTT will raise the cost of capital by 5 percentage points for an asset held for just 0.1 years, by 0.5 percentage points for an asset held for a year, and by 0.05 percentage points for an asset held 10 years.

F. Cascading and Intersectoral Distortions

The FTT is a tax on an intermediate input in the production process and (unlike a VAT) it is not creditable against other taxes. As a result, it will cascade: the more often an asset is traded, the higher the effective tax rate. Diamond and Mirrlees (1971) show that under certain conditions such taxes are always less efficient than taxes on final outputs or input taxes that are creditable, such as a VAT.

Other alternatives like a FAT, which only taxes the value added, could reduce the level of cascading compared with that of a FTT, although a FAT would require a higher rate to raise comparable revenues (Matheson, 2012). There are attempts to counter cascading under a FTT itself through the exemption of transactions by “market makers,” intermediaries who provide market liquidity. The UK stamp duty takes that approach. However, as noted above, this practice may facilitate tax avoidance.

A City of London study on the economic impact of an EU FTT notes that with a typical 10 transactions in the chain of settlement for bonds, cascading could convert the 0.1 percent draft EU rate on bond transactions into an effective tax rate of 1.0 percent (London Economics, 2013). Gauging the impact of cascading in the production chain can be difficult for policymakers, but Keen (2013) concludes that cascading could cause significant welfare losses, by creating price distortions among different types of assets.

One of the rationales for a FTT is to encourage investors to take a longer-term perspective — that is, to create patient capital. If certain investors are overly swayed by rumors and extraneous information, some trades might entail economic costs with little or no gain in individual welfare. Moreover, a short-term perspective by investors may cause corporate managers to pass up profitable long-term investments in favor of less productive strategies that improve the balance sheet in the short run. Thus, discouraging some trades might make some markets work better. However, the capital gains tax already discourages short-term trading. Indeed, many observers have bemoaned the “lock-in effect” whereby capital gains tax discourages investors from making otherwise welfare-improving trades. A FTT would compound the lock-in effect.

Another potential rationale for a FTT would be to reduce excess trading caused by principal-agent problems. Money managers who are compensated on a per-trade basis will have a personal interest in trading more than would otherwise be optimal for their clients. Research, however, shows that the best strategy for most investors is often to buy and hold a diversified portfolio of assets (Barber and Odean, 2000).

By raising trading costs, a FTT would discourage fund managers and brokers from trading and hence offer a counterweight to overtrading. Pension funds, which turn over a great deal, might be especially affected (Schäfer, 2011). Absent a change in fund manager behavior, a FTT would impose a substantial tax increase on many pension funds. A study by a UK consulting firm commissioned by critics of the EU plan (Oxera Consulting, 2011) estimated that a 0.2 percent FTT could reduce pension fund values by more than 5 percent and reduce annual returns by 0.2 percent. However, these estimates assume the trades undertaken by pension fund managers are productive — that they

raise returns. If a significant amount of trading within funds is unproductive, then part of the burden of the tax might be offset by reductions in trades.

Advocates of a FTT argue that pension churning simply adds costs and actually reduces retirement security. Woolley (2010) argues that pension and charitable fund managers do not behave in the best interest of their beneficiaries, but instead maximize rents for fund managers. Gray, Griffith-Jones, and Sandberg (2012, p. 2) claim that “the [proposed EU] FTT will help secure pensioners’ investments through reducing short-term speculative activity and encouraging their funds to invest over longer horizons. It will benefit both European pensioners and the pension fund industry.” In sum, although pension funds might appear to be most vulnerable to reduced returns due to a FTT, the tax might discourage inefficient and unproductive trading behavior by fund managers and indirectly benefit fund participants.

G. Administrative and Compliance Costs

The administrative costs of existing FTTs tend to be relatively small. The UK tax in particular appears to have extremely low administrative costs (Baker, 2008). Gains and losses accrued by individuals and businesses are already taxed according to the type of financial instrument and characteristics of the person or business. It is not unreasonable to imagine the taxation of the transactions themselves carrying relatively small additional administrative costs. The revenue can be raised from a relatively small number of sophisticated entities, making the tax easy to collect and audit.

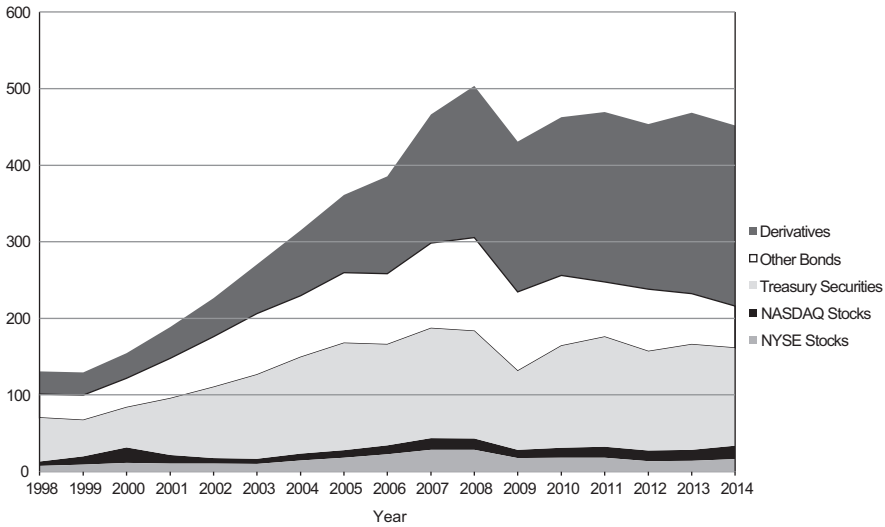
Still, compliance costs may not be negligible. For example, about 1.6 billion trades occurred on the New York Stock Exchange in 2014. Assuming a 50 percent reduction in volume due to a FTT, it would still require businesses and individuals to report, and the IRS to process, information on 800 million trades per year. Moreover, the administrative costs will depend on the design of the tax. A tax on exchange-based transactions would be relatively easy to administer, but it would be ripe for avoidance or evasion by moving trades off exchanges. In comparison, as noted above, a tax that included over-the-counter transactions and derivatives would cost more to administer but would be likely to induce less avoidance and evasion.

VI. ESTIMATES OF THE REVENUE AND DISTRIBUTIONAL EFFECTS OF A U.S. FTT

The revenue potential of a FTT stems from the enormous volume of financial transactions, which have a value many times GDP (Figure 2), which was about \$17 trillion in 2014. As a result, even a low tax rate could generate substantial revenue. The actual relation between a given tax rate and the revenue generated, however, would depend on design features discussed in Section III. A broad-based tax will raise more revenue than a narrow one. Coordination among countries can reduce the scope for tax avoidance and thus boost revenue in each country.

Revenues from FTTs vary widely across countries and are procyclical, meaning they rise more when the economy is booming and fall when the economy falters. The UK

Figure 2
Securities Trading Volume (\$Trillions), 1998–2014



Sources: Bank for International Settlements, "Derivatives statistics," <http://www.bis.org/statistics/derstats.htm?m=6%7C32>; NASDAQ, "Nasdaq Monthly Market Summary," <http://www.nasdaqtrader.com/Trader.aspx?id=MonthlyMarketSummary>; NYSE, "NYSE Market Data Factbook," <http://www.nyxdata.com/nyse/data/asp/factbook/main.asp>; Securities Industry and Financial Markets Association, "Statistics," <http://www.sifma.org/research/statistics.aspx>.

stamp duty raised revenue equal to 0.45 percent of British GDP in 2000. From 2001 to 2008, it raised between 0.2 and 0.3 percent of GDP, which would be the equivalent of about \$44 billion to \$65 billion annually in the United States today assuming a similar revenue yield from the tax. As of 2006, before the financial crisis, FTTs raised 0.8 percent of GDP in Taiwan, 0.6 percent in South Africa, and just under 0.5 percent of GDP in Switzerland (Matheson, 2012).

Estimates of the impact of proposed FTTs vary widely. The Joint Committee on Taxation estimates the Harkin-DeFazio proposal would raise about 0.2 percent of GDP (DeFazio, 2011). Baker et al. (2009) estimate their proposed FTT would raise about 1.2 percent of GDP as of 2008, even if the tax reduced the number of transactions by half. Schulmeister, Schratzenstaller, and Picek (2008) find that a very small (0.01 percent) tax on worldwide stocks, bonds, and derivatives could raise roughly 0.3 percent of world GDP even if trading volume fell by 40 percent. The JCT estimates take into account offsets in income and payroll tax revenues, but the other two estimates do not appear to account for these offsets.

In this section, we present new estimates of the revenue and distributional effects of a U.S. FTT. In order to illustrate the potential range of revenue effects of a FTT, we consider alternative bases and rates for the tax, as well as alternative behavioral responses by traders. We also explore alternative assumptions about the incidence of a FTT and its effects on household welfare.

A. FTT Bases and Rates

We examine two possible FTT bases, one that covers equities (including equity derivatives) and option premiums, and a second base that also includes bonds (including interest rate derivatives) and foreign exchange (spot and derivatives).²⁹ Our broader FTT base is substantially the same as the Harkin-DeFazio (and Sanders) FTT base, except that Harkin-DeFazio and Sanders both exempt short-term debt. Trades by market makers and over-the-counter trades are included in both bases. Futures and swaps in both bases are valued at the underlying notional value of the securities. The first base is estimated to cover \$49 trillion of transactions in 2017, whereas the second base is more than 13 times as broad, covering an estimated \$659 trillion of transactions in 2017.

We examine three possible rate structures: base rates of 0.01, 0.1, and 0.5 percent on stock trades and option premiums (for both tax bases) and bond trades (for the second tax base), and rates on futures and swaps (for both tax bases) and foreign exchange (for the second tax base) that are one-tenth of the base rates. In addition, we compute the base tax rate that would maximize revenues over 10 years for each tax base under alternative assumptions about the behavioral responses of traders.³⁰

The second (broader) base includes trades in both government and private bonds. Assuming the average years to maturity of traded bonds is two years, the rate set for a one-year bond is one-half the base rate, and rates for longer-term bonds would be taxed at a multiple of that rate based on the number of years to maturity. For example, with a 0.01 percent base tax rate, the rate on bonds averages out to the same 0.01 percent that applies to stock. A similar adjustment is made to swaps (assuming an average maturity of 1.5 years), so that the rate across maturities would average out to 0.001 percent.

B. Estimating Issues

Our revenue estimates account for the behavioral responses of traders. We believe the best evidence supports a relatively high price elasticity, and we use -1.25 as our

²⁹ Neither base includes commodity futures contracts because they are not financial instruments; including them would not measurably affect the estimates because they are very small relative to equity, bond, and derivative transactions. The second (broader) base is similar to the base considered by Baker et al. (2009) and Pollin, Baker, and Schaberg (2003).

³⁰ As with the other rate options, the revenue maximizing rates on futures, swaps, and foreign exchange are taxed at one-tenth the base rate.

“standard” elasticity. To illustrate the effect of alternative behavioral assumptions that are consistent with the range of empirical elasticities reported in Matheson (2012), we also report revenue estimates assuming elasticities of -1.5 and -1.0 . Following the JCT,³¹ we also estimate the resulting reductions in payments to owners of capital and labor that would result from a FTT, which would reduce individual and corporate income taxes and payroll taxes. In addition, our estimates take into account the reduction in capital gains revenues due to lower realizations in response to the FTT. We do not, however, take into account the potential effects on U.S. revenues of changes in FTTs in other countries.

Including government bonds in the base would also affect federal borrowing costs, as noted above. We provide estimates of those increased borrowing costs for the broader base that includes bonds.

We assume that baseline transactions costs, before a FTT, will continue their historical downward trajectory, falling to half their 2010 levels by 2035.³² Thus, a FTT at a fixed rate will be a rising share of gross transactions costs — that is, inclusive of the tax — over time.

C. Revenue Effects

Table 4 displays our revenue estimates by year through 2026 for the U.S. FTT base that covers equities (including equity derivatives) and option premiums (base 1) using base tax rates of 0.01 percent, 0.1 percent, and 0.5 percent. The FTT is assumed to become effective January 1, 2017, but revenues are affected in 2016 because some sales would be accelerated to that year to avoid the FTT.

The 0.01 percent rate would raise \$38 billion over fiscal years 2017 to 2026, about 0.02 percent of projected GDP. Raising the base tax rate by a factor of 10 to 0.1 percent would increase the revenue yield to \$208 billion, or 0.09 percent of GDP. This less-than-proportionate increase in revenue arises because trading is expected to be substantially reduced as the rate increases. Indeed, if the rate were increased further to 0.5 percent, revenue would rise only to \$305 billion, or just 0.13 percent of GDP. The reduction in trading as tax rates rise reflects our assumptions of a relatively high (-1.25) elasticity of the volume of transactions with respect to trading costs and that transactions costs will continue to decline.³³ At higher tax rates, the declines in trading volume over time are even steeper.

To illustrate how sensitive revenues are to the breadth of the FTT base as well as the size of the behavioral responses of traders, we estimated revenues for the 10-year budget period (fiscal years 2017–2026) using narrow and broad bases and alternative elasticities of -1.5 and -1.0 as well as -1.25 . We estimate revenues using the three base

³¹ JCT (2011).

³² Matheson (2011) provides evidence of falling transaction costs over time.

³³ As noted, with declining transaction costs over time, a constant FTT represents a rising share of total transaction costs over time, with commensurately larger effects on trading volume. For example, with a 0.01 percent tax rate, volume declines about 7 percent in the first year (2017), but by 9 percent in the 10th year (2026).

Table 4, Revenue from a U.S. Financial Transaction Tax on Equities and Option Premiums (Base 1), 2016–2026 (FTT Assumed to go into Effect January 1, 2017; Elasticity = -1.25; \$Billions), Continued

	Year											
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2016–2026
Static Revenue (CY)	—	243.5	253.9	264.3	275.7	287.5	299.7	312.3	325.5	339.0	359.4	2,960.7
Less: Effect of Behavioral Response	—	-194.3	-203.6	-213.2	-223.5	-234.2	-245.4	-257.0	-269.1	-281.6	-300.0	-2,421.8
Less: Income and Payroll Tax Offsets	—	-12.0	-12.2	-12.5	-12.7	-13.0	-13.3	-13.6	-13.9	-14.2	-14.7	-132.1
Less: Capital Gains Revenue Loss ¹	4.9	-15.8	-11.6	-7.7	-7.8	-8.1	-8.5	-8.9	-9.2	-9.6	-10.4	-92.8
Equals: Revenue Estimate (CY)	4.9	21.4	26.4	31.0	31.6	32.1	32.5	32.8	33.2	33.6	34.4	314.0
Revenue Estimate (FY)	—	21.0	25.2	29.8	31.5	32.0	32.4	32.7	33.1	33.5	34.2	305.4
Addendum:												
Baseline Financial Transactions	N/A	48,697	50,773	52,869	55,131	57,490	59,933	62,464	65,092	67,809	71,890	592,149

Notes: Tax rate applies to all financial transactions except purchases and sales of derivatives, which are taxed at 1/10 of the rate (i.e., 0.001 percent, 0.01 percent or 0.05 percent respectively) as percentage of notional value of the trade. FY = Fiscal Year, CY = Calendar Year.

¹ The revenue gain on capital gains in 2016 is due to shifting of realizations from 2017 in order to avoid the FTT.

Source: Authors' calculations

rates of 0.01 percent, 0.1 percent, and 0.5 percent, but also using the rate that would maximize revenues over the period. The first column in Table 5 repeats the budget period fiscal year estimates from Table 4. Revenues would be maximized over the period at \$316 billion for the base that includes only equities and option premiums (base 1) if the base rate was set at 0.48 percent, assuming the behavioral elasticity (“ e ” in Table 5) is -1.25 . If the behavioral elasticity is -1.5 , revenues would be maximized over the period at \$230 billion if the base rate were set at 0.29 percent; with an elasticity of -1.0 , revenues would be maximized over the period at \$500 billion if the base rate were set at 1.01 percent. If the base were broadened to include bonds and foreign exchange (base 2), revenues would be much higher, rising to \$806 billion over the budget period if the rate were set at 0.5 percent, assuming the behavioral elasticity is -1.25 . Revenues would be higher still if the behavioral elasticity were only -1.0 ; with a 0.5 percent rate

Rate (%)	Base 1: Equities and Option Premiums			Base 2: Base 1 + Bonds and Foreign Exchange		
	$e = -1.25$	$e = -1.5$	$e = -1.0$	$e = -1.25$	$e = -1.5$	$e = -1.0$
0.01	37.8	37.9	39.3	204.8	194.9	215.5
0.1	207.7	185.4	243.0	704.9	556.1	901.7
0.5	305.4	210.2	458.3	805.6	484.2	1,358.7
Addendum 1						
Revenue Maximizing						
Rate (%)	0.48	0.29	1.01	0.34	0.17	1.24
Revenue (\$Billions)	316.4	230.1	499.8	822.7	574.7	1,452.7
Addendum 2						
Increase in Federal Borrowing Costs (\$Billions) for Rate (%)						
0.01	—	—	—	133.8	127.0	140.9
0.1	—	—	—	389.7	289.2	525.1
0.5	—	—	—	369.2	196.6	693.8
Revenue Maximizing	—	—	—	388.3	272.4	728.7

Source: Authors' calculations

they would be \$1,359 billion over the budget period, about \$136 billion per year or nearly 0.6 percent of GDP.

However, the broader base includes federal Treasury and agency bonds, and the FTT would increase borrowing costs for these bonds.³⁴ Thus, the net reduction in the federal deficit from the adoption of a FTT would be much smaller than the increase in revenues. For example, assuming the behavioral elasticity is only -1.0 , the maximum revenue from this base would be \$1,453 billion (at a rate of 1.24 percent), but federal borrowing costs would increase by \$729 billion so the reduction in the federal deficit would be only \$724 billion. Thus, even with a broad base and a low behavioral elasticity, the maximum revenue (net of increased government borrowing costs) of a U.S. FTT would therefore be only about 0.3 percent of GDP (\$60 billion in 2017).

D. Distributional Effects

Whether the FTT really is a Robin Hood Tax, as its proponents claim, depends on its economic incidence, on who would actually bear the burden of the tax.³⁵ Taxes are ultimately borne by people, not by corporations or other businesses. Thus, the notion that the FTT would hit banks or investment houses is misguided. It may well be remitted by the current owners, executives, or leading traders of such institutions, but they may have little relation to the people who were involved in the choices that led to the financial crisis. Indeed, if the premise of the FTT is that too many assets turn over too quickly, imposing a FTT now as a way to punish the financial-sector institutions at the time of the crisis may be particularly ineffective, because the burden would fall on those owners of assets who chose to hold their assets in the intervening period, not necessarily those who traded away their assets.

In the long run, a FTT would raise the cost of capital. The burden falls on owners of capital, who get slightly lower after-tax rates of return, and workers, who earn less because productivity-enhancing capital becomes scarcer (Matheson, 2012). We therefore distribute the FTT in the same manner as a corporate tax rate increase. The Tax Policy Center distributes the corporate income tax as falling 80 percent on owners of capital and 20 percent on labor.³⁶ We include the associated reductions in income and payroll taxes in the distributional analysis, but do not include the reduction in taxes paid on capital gains, because doing so would incorrectly make taxpayers with capital gains appear to have a reduction in tax burden. Following convention, our standard distributional estimates are “static” and do not take behavioral responses into account. However, taxpayers’ ability to avoid tax by changing their behavior (in this case, by reducing trades) means that static estimates overstate the burden of the FTT. For that reason, we also prepared distributional estimates that reflect the full behavioral responses of taxpayers. The actual burden lies somewhere between these estimates and the static estimates.

Table 6 shows our estimates of the long-run distribution of the burden of a FTT with a base rate of 0.1 percent imposed on equities and option premiums (base 1). The tax

³⁴ This base also includes agency mortgage backed securities, but we do not take the FTT on trades in these bonds into account in our estimates of increased federal borrowing costs.

³⁵ Baker and Woo (2015) provide further discussion of the incidence of a FTT.

³⁶ Nunns (2012) provides a complete description of the Tax Policy Center’s distribution methodology.

Table 6
Distribution of Tax Change from Imposition of a U.S. Financial Transaction Tax at Rate of 0.1 Percent
on Equities and Option Premiums in 2017

	Standard (“Static”) Estimates			Dynamic Estimates		
	Share of Total Federal Tax Change	Percent Change in After-tax Income	Change in Average Federal Tax Rate (Percentage points)	Share of Total Federal Tax Change	Percent Change in After-tax Income	Change in Average Federal Tax Rate Percentage Points
Expanded Cash Income Percentile						
Lowest Quintile	1.3	-0.1	0.1	1.3	0.0	0.0
Second Quintile	3.2	-0.1	0.1	3.1	-0.1	0.1
Middle Quintile	6.8	-0.1	0.1	6.8	-0.1	0.1
Fourth Quintile	13.0	-0.2	0.1	13.0	-0.1	0.1
Top Quintile	74.7	-0.4	0.3	74.8	-0.2	0.2
All	100.0	-0.3	0.2	100.0	-0.2	0.1
Addendum						
80–90	10.5	-0.2	0.2	10.5	-0.1	0.1
90–95	9.2	-0.3	0.2	9.2	-0.2	0.1
95–99	15.0	-0.4	0.3	15.0	-0.2	0.2
Top 1 Percent	40.0	-0.8	0.5	40.0	-0.4	0.3
Top 0.1 Percent	23.5	-1.0	0.7	23.5	-0.6	0.4

Notes: Tax rate applies to all financial transaction except purchases and sales of derivatives, which are taxed at 1/10 of the rate (i.e., 0.001 percent or 0.05 percent respectively) as percentage of notional value of the trade.
 Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0515-3A)

is quite progressive; about 75 percent of the burden falls on taxpayers in the highest-income quintile and 40 percent falls on the top 1 percent. This pattern is true for both the static and dynamic estimates.

The tax grows as a share of income. Under the static estimates, the reduction in after-tax income is 0.1 percent for the lowest-income group, rising to 0.4 percent in the highest quintile, and to 1.0 percent for the top 0.1 percent of tax units. The reductions in after-tax income are much smaller, however, in the dynamic estimates; the reduction for the top 0.1 percent of taxpayers is 0.6 percent, 60 percent of the reduction shown for the static estimates.

As noted above, creation of a FTT would lead to a drop in asset values, which would at least initially be borne by existing holders of assets. The distribution of wealth in general is quite skewed in the United States, with distribution of financial assets even more skewed. The top 1 percent of households held almost two-thirds of all financial securities in 2010 (Wolff, 2012). We therefore made alternative distributional estimates in which the burden of the FTT was assumed to be borne entirely by financial assets. These estimates are quite similar to those shown in Table 6.

A more complete modeling would likely show an even more concentrated burden. To the extent the tax thwarts rent seeking in the financial sector, those effects would be highly concentrated among taxpayers at the top of the income distribution. If the tax hits pension funds especially hard, though, it could have a disproportionate effect on retirees and workers with relatively moderate incomes. As noted above, however, discouraging trading within funds could indirectly benefit participants to the extent that such trading is unproductive.

VII. CONCLUSION

FTTs attract interest in part because the base is so large that even a tiny tax rate would raise significant revenue. When combined with the potential to reduce the negative effects of speculation and rent seeking — including both the wasted resources invested in the activity and the potentially negative macroeconomic spillovers — and the potential to have the financial sector pay for some of the benefits it has received and the costs it has imposed on the economy, the case for a FTT is very tempting.

But the key question is whether a FTT is the best option relative to other potential taxes in terms of economic costs and benefits, fairness, and costs of administration and compliance. A FTT at the rates being proposed and adopted elsewhere would discourage all trading, not just speculation and rent seeking. It appears as likely to increase market volatility as to curb it. It would create new distortions among asset classes and across industries. As a tax on gross rather than net activity, and as an input tax that is not creditable and thus cascades, the FTT clearly can most optimistically be considered a second-best solution. Over the long term, it appears poorly targeted at the kinds of financial-sector excesses that led to the Great Recession. If the goal is to have the financial sector pay the costs of its past or future bailouts and compensate the rest of

the country for the costs imposed in the financial crisis, a FAT or VAT might be more effective and less distortionary.

Nevertheless, comparing a FTT (or any real-world tax) against an ideal income or consumption tax would be inappropriate. Most feasible taxes are distortionary. It might well be that the marginal cost of raising revenue via a well-designed FTT is lower than via increases in individual or corporate income taxes.

The ideal tool to measure the efficiency implications of a FTT would be a well-formed general equilibrium model of the economy that included fully specified financial markets with fundamental traders and noise traders, rent seeking behavior, financial institutions with reserve requirements, and firms and households that supply and demand capital. There is thus a great deal of scope for future research.

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REFERENCES

- Amihud, Yakov, and Haim Mendelson, 1992. "Transaction Taxes and Stock Values." In Lehn, Kenneth, and Robert W. Kamphius, Jr. (eds.), *Modernizing US Securities Regulations*, 477–500. Irwin Professional Publishing, Burr Ridge, IL.
- Arbelaez, Maria A., Leonard E. Burman, and Sandra Zuluaga, 2005. "The Bank Debit Tax in Colombia." In Bird, Richard M., James M. Poterba, and Joel Slemrod (eds.), *Fiscal Reform in Colombia*, 29–92. MIT Press, Cambridge, MA.
- Arcand, Jean-Louis, Enrico Berkes, and Ugo Panizza, 2012. "Too Much Finance?" IMF Working Paper 12/161. International Monetary Fund, Washington, DC.
- Arnold, John D., 2015. "Spoofers Keep Markets Honest." *Bloomberg View*, January 23. Bloomberg L.P., New York, NY, <http://www.bloombergview.com/articles/2015-01-23/high-frequency-trading-spoofers-and-front-running>.

Auten, Gerald, and Thornton Matheson, 2010. "The Market Impact and Incidence of a Securities Transaction Tax: The Case of the US SEC Levy." Paper presented at the 103rd Annual Conference of the National Tax Association, November 18–20, Chicago, IL.

Baca-Campodónico, Jorge, Luiz de Mello, and Andrei Kirilenko, 2006. "The Rates and Revenue of Bank Transaction Taxes." Economics Department Working Papers No. 494. Organisation for Economic Co-operation and Development, Paris, France.

Baily, Martin Neil, and Douglas J. Elliott, 2013. "The Role of Finance in the Economy: Implications for Structural Reform of the Financial Sector." Brookings Institution, Washington, DC, <http://www.brookings.edu/~media/research/files/papers/2013/07/11-finance-role-in-economy-baily-elliott/11-finance-role-in-economy-baily-elliott.pdf>.

Baker, Dean, 2008. *The Benefits of a Financial Transaction Tax*. Center for Economic and Policy Research, Washington, DC.

Baker, Dean, and Helene Jorgensen, 2012. "The Relationship between Financial Transactions Costs and Economic Growth." Issue Paper. Center For Economic and Policy Research. Washington, DC.

Baker, Dean, Robert Pollin, Travis McArthur, and Matt Sherman, 2009. "The Potential Revenue from Financial Transactions Taxes." Joint Working Paper No. 212. Center For Economic and Policy Research, Washington, DC, and Political Economy Research Institute, Amherst, MA.

Baker, Dean, and Nicole Woo, 2015. "The Incidence of Financial Transaction Taxes." Center for Economic and Policy Research, Washington, DC.

Baltagi, Badi H., Dong Li, and Qi Li, 2006. "Transaction Tax and Stock Market Behavior: Evidence from an Emerging Market." *Empirical Economics* 31 (2), 393–408.

Barber, Brad M., and Terrance Odean, 2000. "Trading Is Hazardous to Your Wealth: The Common Stock Investment Performance of Individual Investors." *Journal of Finance* 55 (2), 773–806.

Bernanke, Ben S., 2009. "Financial Reform to Address Systemic Risk." Speech at the Council on Foreign Relations, March 10, Washington, DC, <http://www.federalreserve.gov/newsevents/speech/bernanke20090310a.htm>.

Black, Fischer, 1986. "Noise." *Journal of Finance* 41 (3), 529–543.

Bond, Steve, Mike Hawkins, and Alexander Klemm, 2004. "Stamp Duty on Shares and Its Effect on Share Prices." IFS Working Paper 04/11. Institute for Fiscal Studies, London, UK.

Brondolo, John D., 2011. "Taxing Financial Transactions: An Assessment of Administrative Feasibility." IMF Working Paper 11/185. International Monetary Fund, Washington, DC.

Buchanan, Mark, 2012. "Impact of French Financial Transaction Tax." Market Commentary. Credit Suisse, Zurich, Switzerland, <https://edge.credit-suisse.com/edge/Public/Bulletin/Servefile.aspx?FileID=22949&m=-174672839>.

Budish, Eric, Peter Cramton, and John Shim, 2015. "The High-Frequency Trading Arms Race: Frequent Batch Auctions As a Market Design Response." *Quarterly Journal of Economics* 130 (4), 1547–1621.

- Bureau of Economic Analysis, 2015. *National Income and Product Accounts: Value Added by Industry As a Percentage of Gross Domestic Product*. Bureau of Economic Analysis, Washington, DC.
- Camp, Dave, 2014. *Tax Reform Act of 2014*. Committee on Ways and Means, U.S. House of Representatives, U.S. Congress, Washington, DC, http://waysandmeans.house.gov/UploadedFiles/Statutory_Text_Tax_Reform_Act_of_2014_Discussion_Draft_022614.pdf.
- Campbell, John Y., and Kenneth A. Froot, 1994. "International Experiences with Securities Transaction Taxes." In Frankel, Jeffrey A. (ed.), *The Internationalization of Equity Markets*, 277–303. University of Chicago Press, Chicago, IL.
- Chou, Robin K., and George H. K. Wang, 2006. "Transaction Tax and Market Quality of the Taiwan Stock Index Futures." *Journal of Futures Markets* 26 (12), 1195–1216.
- Cochrane, John H., 2013. "Finance: Function Matters, Not Size." *Journal of Economic Perspectives* 27 (2), 29–50.
- Coelho, Maria, 2015. "Dodging Robin Hood: Responses to France and Italy's Financial Transaction Taxes." Job Market Paper. University of California, Berkeley.
- Cœuré, Benoît, 2014. "The Optimal Size of the Financial Sector." Speech at the European Central Bank Conference, September 2, Frankfurt, Germany, <https://www.ecb.europa.eu/press/key/date/2014/html/sp140902.en.html>.
- Colliard, Jean-Edouard, and Peter Hoffmann, 2013. "Sand in the Chips? Evidence on Taxing Transactions in Modern Markets." Working Paper. European Central Bank, Frankfurt, Germany.
- Congressional Budget Office, 2015. *The Budget and Economic Outlook: 2015–2025*. Congressional Budget Office, Washington, DC.
- Dávila, Eduardo, 2013. "Optimal Financial Transaction Taxes." Job Market Paper. Harvard University, Cambridge, MA.
- DeFazio, Peter, 2011. "Memo: Joint Tax Committee Finds Harkin, DeFazio Wall Street Trading and Speculators Tax Generates More Than \$350 Billion." U.S. House of Representatives, U.S. Congress, Washington, DC, <http://defazio.house.gov/media-center/press-releases/memo-joint-tax-committee-finds-harkin-defazio-wall-street-trading-and>.
- DeFazio, Peter, and Tom Harkin, 2013. *Wall Street Trading and Speculators Tax Act*. H.R. 880/S. 410. U.S. House of Representatives, U.S. Congress, Washington, DC.
- DeLong, J. Bradford, Andrei Shleifer, Lawrence H. Summers, and Robert J. Waldmann, 1989. "The Size and Incidence of the Losses from Noise Trading." *Journal of Finance* 44 (3), 681–696.
- Deng, Yongheng, Xin Liu, and Shang-Jin Wei, 2014. "One Fundamental and Two Taxes: When Does a Tobin Tax Reduce Financial Price Volatility?" NBER Working Paper 19974. National Bureau of Economic Research, Cambridge, MA.
- Diamond, Peter A., and James A. Mirrlees, 1971. "Optimal Taxation and Public Production I: Production Efficiency." *American Economic Association* 61 (1), 8–27.

Dupont, Dominique, and Gabriel Lee, 2007. "Effects of Securities Transaction Taxes on Depth and Bid-Ask Spread." *Economic Theory* 31 (2), 393–400.

Easterly, William, Roumeen Islam, and Joseph E. Stiglitz, 2000. "Shaken and Stirred: Explaining Growth Volatility." In *Annual World Bank Conference on Development Economics*, 191–211. The World Bank, Washington, DC.

Ellison, Keith, and Bernie Sanders, 2015. *Inclusive Prosperity Act of 2015*. H.R.1464/S.1371. U.S. House of Representatives, U.S. Congress, Washington, DC.

Ericsson, J., and R. Lindgren, 1992. "Transaction Taxes and Trading Volume on Stock Exchanges: An International Comparison." Working Paper 39. Stockholm School of Economics, Stockholm, Sweden.

European Commission, 2011. "Impact Assessment: Proposal for a Council Directive on a Common System of Financial Transaction Tax and Amending Directive 2008/7/EC." Working Paper 1102. European Commission, Brussels, Belgium.

European Commission, 2013. "Impact Assessment: Proposal for a Council Directive Implementing Enhanced Cooperation in the Area of Financial Transaction Tax, Analysis of Policy Options and Impacts." Working Document 28. European Commission, Brussels, Belgium.

Fidessa, 2013. "Italian Financial Transaction Tax." Fidessa, London, UK, <http://regulation.fidessa.com/ataglance/italian-financial-transaction-tax-iftt/>.

Gensler, Gary, 2011. *Excessive Speculation and Compliance with the Dodd-Frank Act*. U.S. Senate, U.S. Congress, Washington, DC, <http://www.gpo.gov/fdsys/pkg/CHRG-112shrg72487/pdf/CHRG-112shrg72487.pdf>.

Gray, Jack, Stephany Griffith-Jones, and Joakim Sandberg, 2012. *No Exemption: The Financial Transaction Tax and Pension Funds*. Network for Sustainable Financial Markets, http://www.sustainablefinancialmarkets.net/wp-content/uploads/2012/12/No_Exemption.pdf.

Greenhouse, Steven, and Graham Bowley, 2011. "Tiny Tax on Financial Trades Gains Advocates." *The New York Times*, December 6, http://www.nytimes.com/2011/12/07/business/global/micro-tax-on-financial-trades-gains-advocates.html?_r=0.

Greenwood, Robin, and David Scharfstein, 2013. "The Growth of Finance." *Journal of Economic Perspectives* 27 (2), 3–28.

Habermeier, Karl F., and Andrei Kirilenko, 2001. "Securities Transaction Taxes and Financial Markets." IMF Working Paper 01/51. International Monetary Fund, Washington, DC.

Haferkorn, Martin, and Kai Zimmermann, 2013. "Securities Transaction Tax and Market Quality: The Case of France." Working Paper. Goethe University, Frankfurt, Germany.

Hau, Harald, 2006. "The Role of Transaction Costs for Financial Volatility: Evidence from the Paris Bourse." *Journal of the European Economic Association* 4 (4), 862–890.

Hillman, David, and Christina Ashford, 2012. *Financial Transaction Tax: Myth-Busting*. Stamp Out Poverty, London, UK.

- HM Revenue and Customs, 2010. *Stamp Taxes on Shares Manual*. HM Revenue and Customs London, UK, <http://www.hmrc.gov.uk/manuals/stsmanual/index.htm>.
- HSBC, 2013. "Saudi Arabia." HSBC, Riyadh, Saudia Arabia, https://globalconnections.hsbc.com/downloads/treasury_management_profile-sa.pdf.
- Hu, Shing-Yang, 1998. "The Effects of the Stock Transaction Tax on the Stock Market: Experience from Asian Markets." *Pacific Basin Finance Journal* 6 (3–4), 347–364.
- International Association of Deposit Insurers, 2013. *Enhanced Guidance for Effective Deposit Insurance Systems: Mitigating Moral Hazard*. International Association of Deposit Insurers, Research and Guidance Committee, Basel, Switzerland.
- International Monetary Fund, 2010. *A Fair and Substantial Contribution by the Financial Sector: Final Report for the G-20*. International Monetary Fund, Washington, DC.
- Jackson, P. D., and A. T. O'Donnell, 1985. "The Effects of Stamp Duty on Equity Transactions and Prices in the UK Stock Exchange." Working Paper. Bank of England, London, UK.
- Joint Committee on Taxation, 2011. "The Income and Payroll Tax Offset to Changes in Excise Tax Revenues (JCX-59-11)." Joint Committee on Taxation, Washington, DC, <https://www.jct.gov/publications.html?func=startdown&id=4378>.
- Jones, Charles M., 2013. "What Do We Know about High-Frequency Trading?" Columbia Business School Research Paper No. 13–11. Columbia University, New York, NY.
- Jones, Charles M., and Paul J. Seguin, 1997. "Transaction Costs and Price Volatility: Evidence from Commission Deregulation." *American Economic Review* 87 (4), 728–737.
- Keen, Michael, 2013. "Targeting, Cascading, and Indirect Tax Design." IMF Working Paper 13/57. International Monetary Fund, Washington, DC.
- Keightley, Mark P., 2010. "A Securities Transaction Tax: Financial Markets and Revenue Effects." CRS Report 41192. Congressional Research Service, Washington, DC.
- Keynes, John Maynard, 1936. *The General Theory of Employment, Interest, and Money*, 2007 Edition. Palgrave Macmillan, New York, NY.
- Kiefer, Donald W., 1987. "A Stock Transfer Tax: Preliminary Economic Analysis." Library of Congress, Congressional Research Service, Washington, DC.
- Kupiec, Paul H., 1996. "Noise Traders, Excess Volatility, and a Securities Transactions Tax." *Journal of Financial Services Research* 10 (2), 115–129.
- Lanne, Markku, and Timo Vesala, 2010. "The Effect of a Transaction Tax on Exchange Rate Volatility." *International Journal of Finance & Economics* 15 (2), 123–133.
- Lepone, Andrew, and Alexander Sacco, 2013. "The Impact of Message Traffic Regulatory Restrictions on Market Quality: Evidence from Chi-X Canada." Working Paper. University of Sydney, Sydney, Australia.

- Lewis, Michael, 2014. *Flash Boys*. W. W. Norton & Company, New York, NY.
- Liu, Shinhua, 2007. "Securities Transaction Tax and Market Efficiency: Evidence from the Japanese Experience." *Journal of Financial Services Research* 32 (3), 161–176.
- Liu, Shinhua, and Zhen Zhu, 2009. "Transaction Costs and Price Volatility: New Evidence from the Tokyo Stock Exchange." *Journal of Financial Services Research* 36 (1), 65–83.
- London Economics, 2013. "The Impact of a Financial Transaction Tax on Corporate and Sovereign Debt." Special Interest Paper. International Regulatory Strategy Group, City of London Economic Development, London, UK.
- Macdonald, Alastair, 2015. "Germany Sees Compromise on EU Dealing Tax." *Reuters*, May 12, <http://www.reuters.com/article/2015/05/12/eu-tax-schaeuble-idUSL5N0Y34FT20150512>.
- Matheson, Thornton, 2011. "Taxing Financial Transactions: Issues and Evidence." IMF Working Paper 11/54. International Monetary Fund, Washington, DC.
- Matheson, Thornton, 2012. "Security Transaction Taxes: Issues and Evidence." *International Tax and Public Finance* 19 (6), 884–912.
- Matheson, Thornton, 2014. "The Impact of a Low-Rate Securities Transaction Tax on a Highly Liquid Market." *FinanzArchiv* 70 (4), 487–510.
- Merrill, Peter, 1997. *Taxation of Financial Services under a Consumption Tax*. AEI Press, Washington, DC.
- Meyer, Stephan, Martin Wagener, and Christof Weinhardt, 2013. "Politically Motivated Taxes in Financial Markets: The Case of the French Financial Transaction Tax." *Journal of Financial Services Research* 47 (2), 177–202.
- National Stock Exchange of India, 2014. "Other Levies and Taxes." National Stock Exchange of India, Mumbai, India, http://www.nseindia.com/int_invest/content/tax_other_taxes.htm.
- New York State Department of Taxation and Finance, 2010. "Stock Transfer Tax." New York State Department of Taxation and Finance, Albany, NY, <http://www.tax.ny.gov/bus/stock/stktridx.htm>.
- Nunns, Jim, 2012. "How TPC Distributes the Corporate Income Tax." Urban-Brookings Tax Policy Center, Washington, DC, <http://www.taxpolicycenter.org/UploadedPDF/412651-Tax-Model-Corporate-Tax-Incidence.pdf>.
- Office of the Press Secretary, 2010. "President Obama Proposes Financial Crisis Responsibility Fee to Recoup Every Last Penny for American Taxpayers." Office of the Press Secretary, Washington, DC, <http://www.whitehouse.gov/the-press-office/president-obama-proposes-financial-crisis-responsibility-fee-recoup-every-last-penn>.
- Oxera Consulting, 2011. "What Would Be the Economic Impact of the Proposed Financial Transaction Tax on the EU?" Oxera Consulting Ltd., Oxford, UK.

- Philippon, Thomas, 2008. "The Evolution of the US Financial Industry from 1860 to 2007: Theory and Evidence." NYU Stern Working Paper. New York University, New York, NY.
- Philippon, Thomas, 2011. "The Size of the US Financial Industry: A Puzzle?" Federal Reserve Bank of New York, New York, NY.
- Philippon, Thomas, 2015. "Has the US Finance Industry Become Less Efficient? On the Theory and Measurement of Financial Intermediation." *American Economic Review* 105 (4), 1408–1438.
- Philippon, Thomas, and Ariell Reshef, 2013. "An International Look at the Growth of Modern Finance." *Journal of Economic Perspectives* 27 (2), 73–96.
- Pollin, Robert, Dean Baker, and Marc Schaberg, 2003. "Security Transactions Taxes for U.S. Financial Markets." *Eastern Economic Review* 29 (4), 527–558.
- Pomeranets, Anna, 2012. "Financial Transaction Taxes: International Experiences, Issues and Feasibility." *Bank of Canada Review* 2, 3–13.
- Pomeranets, Anna, and Daniel G. Weaver, 2013. "Security Transaction Taxes and Market Quality." Working Paper 2011–2026. Bank of Canada, Ottawa, Canada.
- PricewaterhouseCoopers, 2014. "Brazil Expands Zero IOF Tax Rate to Foreign Loans over 180 Days." PricewaterhouseCoopers, New York, NY, <http://www.pwc.com/us/en/tax-services/publications/insights/assets/pwc-brazil-expands-zero-iof-tax-rate-foreign-loans-over-180-days.pdf>.
- Sanders, Bernie, 2015. "Statement by Senator Bernard Sanders on the College for All Act." U.S. Senate, Washington, DC, <http://www.sanders.senate.gov/download/051915-highered/?inline=file>.
- Schulmeister, Stephan, Margit Schratzenstaller, and Oliver Picek, 2008. "A General Financial Transaction Tax: Motives, Revenues, Feasibility and Effects." WIFO: Austrian Institute of Economic Research, Wein, Austria, http://www.oekosozial.at/uploads/pics/FTT_Text_End_15_03.pdf.
- Shackelford, Douglas A., Daniel Shaviro, and Joel B. Slemrod, 2010. "Taxation and the Financial Sector." Public Law and Legal Theory Working Paper 199. New York University, New York, NY.
- Schäfer, Daniel, 2011. "Pension Funds Hide £3.1bn Costs, Says Study." *Financial Times*, November 2, <http://www.ft.com/intl/cms/s/0/7cf72b58-1385-11e1-81dd-00144feabdc0.html#axzz3bY41bXzg>.
- Shaviro, Daniel, 2012. "The Financial Transactions Tax versus the Financial Activities Tax." *Tax Notes* 135 (4), 453–474.
- Shorter, Gary, and Rena S. Miller, 2014. "High-Frequency Trading: Background, Concerns, and Regulatory Developments." CRS Report 43608. Congressional Research Service, Washington, DC.
- Stiglitz, Joseph E., 1989. "Using Tax Policy to Curb Speculative Short-Term Trading." *Journal of Financial Services Research* 3 (2–3), 101–115.

Strupczewsk, Jan, 2015. "Ten EU Countries Agree on Aspects of a Financial Transaction Tax." Reuters, <http://www.reuters.com/article/us-eu-fft-progress-idUSKBN0TR19C20151208>.

Subrahmanyam, Avanidhar, 1998. "Transaction Taxes and Financial Market Equilibrium." *Journal of Business* 71 (1), 81–118.

Summers, Lawrence H., and Victoria P. Summers, 1989. "When Financial Markets Work Too Well: A Cautious Case for a Securities Transactions Tax." *Journal of Financial Services Research* 3 (2), 261–286.

Thorndike, Joseph J., 2008. "Speculation and Taxation: Time for a Transaction Tax?" *Tax Notes* 119 (6), 1367.

Tobin, James, 1978. "A Proposal for International Monetary Reform." *Eastern Economic Journal* 4 (3–4), 153–159.

Umlauf, Steven R., 1993. "Transaction Taxes and the Behavior of the Swedish Stock Market." *Journal of Financial Economics* 33 (2), 227–240.

U.S. Department of the Treasury, 2015. "General Explanations of the Administration's Fiscal Year 2016 Revenue Proposals." U.S. Department of the Treasury, Washington, DC, <http://www.treasury.gov/resource-center/tax-policy/Documents/General-Explanations-FY2016.pdf>.

Urban-Brookings Tax Policy Center, 2013. "Brief Description of the Tax Model." Urban-Brookings Tax Policy Center, Washington, DC, <http://taxpolicycenter.org/taxtopics/Brief-Description-of-the-Model-2013.cfm>.

U.S. Securities and Exchange Commission, 2014. *Equity Market Structure Literature Review Part II: High Frequency Trading*. U.S. Securities and Exchange Commission, Division of Trading and Markets, Washington, DC.

U.S. Securities and Exchange Commission, 2015. "Fee Rate Advisory #2 for Fiscal Year 2016." Press Release. U.S. Securities and Exchange Commission, Washington, DC, <http://www.sec.gov/news/pressrelease/2015-222.html>.

Wessel, David, 2010. *In FED We Trust: Ben Bernanke's War on the Great Panic*. Three Rivers Press, New York, NY.

Wilson, Janette, and Pearson Liddell, 2010. "Sales of Capital Assets Reported on Individual Tax Returns, 2007." *Statistics of Income Bulletin* 23 (1), 75–104.

Wolff, Edward N., 2012. "The Asset Price Meltdown and the Wealth of the Middle Class." NBER Working Paper 18559. National Bureau of Economic Research, Cambridge, MA.

Woolley, Paul, 2010. "Why Are Financial Markets So Inefficient and Exploitative — And a Suggested Remedy." In *The Future of Finance: The LSE Report*, 121–143. London School of Economics and Political Science, London, UK.

Zingales, Luigi, 2015. "Does Finance Benefit Society?" CEPR Discussion Paper No. DP10350. Centre for Economy Policy Research, London, UK.

APPENDIX A. REVENUE ESTIMATING AND DISTRIBUTIONAL METHODOLOGY FOR FINANCIAL TRANSACTION TAXES

The two FTT bases we examine include stock trades (both bases), bond trades times number of years to maturity (base 2), option premiums (both bases), foreign exchange spot transactions (base 2), the underlying notional values of futures (excluding FX futures in base 1), and the underlying notional values of equity and interest rate swaps times number of years to maturity (excluding interest rate and FX swaps in base 1). Rates on foreign exchange spot transactions, futures, and swaps are one-tenth the base rates that apply to stocks and bonds (0.01 percent, 0.1 percent, or 0.5 percent). Assuming the average years to maturity of traded bonds is two years, the rate for a one-year bond is set at one-half the base rate, so the rate on bonds averages out to the same rate that applies to stock. A similar adjustment is made to swaps (assuming an average maturity of 1.5 years), so the rate averages out to one-tenth the base rate.

Values of transactions by instrument in 2014 were obtained from the various sources cited in Baker et al. (2009), with some differences in which source was used for a particular transaction.

Transactions costs for futures were generally taken from Schulmeister, Schratzenstaller, and Picek (2008), and the same values were used for swaps. Foreign currency transactions costs were taken from Matheson (2012). Transactions costs for stock trades were assumed to be higher in smaller markets.

The standard price elasticity applied to all transactions was -1.25 , but we also prepared estimates using elasticities of -1.5 and -1.0 . (The price of a transaction is the estimated transactions cost as a share of the dollar value plus the tax.) All of these elasticities are within the range of empirical elasticity estimates reported in Matheson (2012).

Baseline transactions were forecast from 2014 levels through 2026, assuming they would all grow at the same rate as nominal GDP, rather than at the much higher rate preceding the financial crisis that began in 2008.³⁷ Transactions costs were assumed to decline at a uniform rate to half their 2010 levels by 2035, continuing (at a much slower rate) the decline in transactions costs over the past several decades.

Static FTT revenue estimates for calendar years 2017 through 2026 were estimated for each base and rate by applying the tax rate for each instrument to the forecasted amount of transactions in that instrument. The first step in developing actual revenue estimates was to estimate FTT tax liabilities on a calendar year basis in the same manner as the static estimates, except that the behavioral response was reflected by adding the tax rate to the transactions cost and applying the elasticity formula.³⁸ These calendar-year FTT liability estimates were then adjusted for the offset that applies to all excise taxes. The offset results from the revenue estimating convention that the price level is fixed, so that imposition of a new excise tax (like a FTT) must reduce payments to labor (e.g., wages) and capital (e.g., business profits). The reductions in payments to labor and capital in turn reduce revenues from individual income, corporate income, and payroll taxes. Generally, this offset is equivalent to about 25 percent of pre-offset revenues from an excise tax. Finally, we took into account the reduction in individual income tax revenues from capital gains that would result because the FTT would increase the cost

³⁷ Figure 2 provides the recent history of asset trading levels. The GDP forecast is from the Congressional Budget Office (2015).

³⁸ The standard elasticity formula is $Q^*((P + t)/P)^{-e}$, where Q is quantity (transaction volume), P is price (transaction cost as share of price), t is the tax rate, and e is the elasticity (expressed as a positive number).

of realizing a gain.³⁹ These calendar estimates, net of the income and payroll tax offsets and the reduction in capital gains revenues, were then converted to a federal fiscal year receipts basis.⁴⁰

Distributional Methodology

Because the long-run effect of a FTT is likely to raise the user cost of capital (as explained in the text), we assume its burden is distributed in the same manner as the corporate income tax. The Tax Policy Center distributes 20 percent of the corporate income tax burden to labor, 20 percent to the normal return to all capital, and 60 percent to supernormal returns to corporate equity (shareholders). Labor income includes wages, employee retirement contributions, distributions (excluding rollovers) from defined contribution plans and defined benefit plans, and the employer's share of Social Security and Medicare taxes (i.e., FICA). Labor income also includes the labor component of self-employment and partnership income, assumed to be 80 percent of the Self-Employment Contributions Act (SECA) tax base. The normal return to capital includes all interest income (taxable and nontaxable), the capital income share of the SECA base (the remaining 20 percent of that base), and 40 percent of dividends, all capital gains, and income from pass-through businesses not subject to SECA. Supernormal returns to capital include 60 percent of dividends and 60 percent of capital gains on stocks.

The offset is also distributed by reducing factor incomes, which reduces individual income, corporate income, and payroll tax revenues. These revenue reductions are distributed in the same manner as the underlying taxes (i.e., individual income taxes to the taxpayer, the corporate income tax as described above, and the payroll tax (both the employee and employer shares) to employees and the self-employed). We did not distribute the effect of the FTT on individual income tax revenues from capital gains realizations on stocks, because doing so would incorrectly imply that taxpayers with these capital gains would benefit from this tax reduction.

As indicated in the text, we also made "dynamic" distributional estimates based on actual FTT revenues (excluding the capital gains revenue effects), which reflect the behavioral responses of traders to the tax. And as an alternative methodology, we estimated the distribution of the FTT under the assumption that it is borne entirely by financial wealth.

³⁹ We used 2007 capital gains data from Wilson and Liddell (2010) to compute, by AGI class, the amount of sales of stock per \$1 of gain, taking into account sales that resulted in losses (both short-term and long-term) that reduce net long-term gains in AGI. So, for example, taxpayers with AGI between \$1 million and \$1.5 million (in \$2007) had a "sales factor" (the ratio of sales to gains) of 3.583, meaning they sold \$3,583 of stock (some at a loss) in order to realize a gain of \$1,000. With a FTT tax rate of 0.1 percent, their sales of \$3,583 would have incurred a FTT tax of \$3.583, which is 0.3583 percent of their gain. So in TPC's microsimulation model, we increased the rate on capital gains for all taxpayers in this AGI class by 0.3583 percent and calculated the effect of that rate increase on individual income tax revenues calculated in each year.

⁴⁰ We assume 75 percent of calendar-year liabilities (net of the offset) are received in the same fiscal year, and the remaining 25 percent are received in the following fiscal year.