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Abstract
This paper estimates the revenue potential of a financial transaction tax (FTT) for U.S. financial markets. We focus on analyzing the revenue potential of the Inclusive Prosperity Act that was introduced in the U.S. House of Representatives in 2012 and the U.S. Senate in 2015. The tax rates stipulated in this Act include 0.5 percent (50 basis points) for all stock transactions; 0.1 percent (10 basis points) for all bond transactions; and 0.005 percent (0.5 basis points) on the notional value of all derivative trades. We examine three sets of evidence to generate potential revenue estimates: 1) the levels of transaction costs in U.S. financial markets over time and within the range of financial market segments; 2) the extent of trading elasticities under various trading conditions; and 3) the current level of trading activity in U.S. financial markets. Based on this evidence, we conclude that a US FTT operating at the tax rates stated above would generate about $250 billion per year, assuming that a combination of trading volume decline and tax avoidance generates the equivalent of a 50 percent fall in trading revenue. We then consider additional factors whose impact will reduce the net revenue generated by the Act. Adding up these various considerations, we conclude conservatively that the net revenue potential of this U.S. FTT is around $220 billion per year, which equals approximately 1.2 percent of current U.S. GDP. This revenue estimate as a share of GDP is consistent with experiences in other countries that have operated with FTTs with similar tax rates and other design features. It is also consistent with other projections based on tax rates that are comparable to those we are examining. In addition, we examine the 18-fold increase, between the 1970s and the present, in the ratio of stock market trading relative to productive investment spending by U.S. nonfinancial corporations. This sharp rise in stock market trading as a share of productive investments has not been associated with any growth in productive investments themselves. Working from this evidence, we conclude that a U.S. FTT, which should bring a fall in stock market trading relative to productive investment spending, should not, on balance, produce significant negative effects on productive investments.

1. INTRODUCTION

This paper estimates the revenue potential of a financial transaction tax (FTT) for U.S. financial markets. We are specifically focused on analyzing the revenue potential of a bill that was introduced in the U.S. House of Representatives in 2012 by Congressman Keith Ellison and in 2015 in the U.S. Senate by Sen. Bernie Sanders as the "Inclusive Prosperity Act," (Ellison and Sanders 2015). This bill was promoted by Sen. Bernie Sanders as a major component within his overall economic policy program in his 2016 Presidential campaign. Sanders proposed to use the revenues generated by this FTT to finance free public college education for all U.S. citizens seeking higher education.

The tax rates stipulated in the Inclusive Prosperity Act include 0.5 percent (50 basis points) for all stock transactions; 0.1 percent (10 basis points) for all bond transactions; and 0.005 percent (0.5 basis points) on the notional value of all derivative trades. The tax obligations from the tax would therefore be $5 on the trading of a $1,000 stock; $1 on the trading of a $1,000 bond; and 5 cents through trading a derivative instrument, such as a stock option, in which the value of the underlying asset—i.e. the stock itself—is worth $1,000.

If we apply these tax rates to the actual levels of financial market trading in the U.S. in 2015, and if we assume that trading on all markets were to consequently fall by 50 percent relative to its actual 2015 level, we estimate that the overall revenue generated by this version of an FTT would be approximately $220 billion per year. This amounts to about 1.2 percent of current U.S. GDP.

The sources for the overall revenue figure would include about $120 billion in revenue through the stock-based tax; $90 billion for the tax on bond trading; and $40 billion from the tax on the notional values of derivative trades. These figures total to $250 billion. Our estimate then also takes account of a provision of the Inclusive Prosperity Act which exempts taxpayers from this obligation if, as an individual, their income is up to $50,000 and, for joint filers, up to $75,000. We also estimate the potential income and capital gains tax revenue losses that might occur when financial market trading declines. But such revenue losses also need to be weighed against the tax revenue gains that will result when jobs and incomes expand in the sectors of the economy that are recipients of the funds generated by the FTT.

Through the Sanders proposal of providing free college education from revenue generated by the FTT, jobs, incomes and tax revenues will, of course, rise sharply among

people working in higher education.   It is through taking account of all of these factors that we conservatively estimate that a U.S. FTT, with the specific design features incorporated in the Inclusive Prosperity Act, can net approximately $220 billion per year in tax revenues. As we show, generating this total net revenue flow through a comprehensive U.S. FTT—covering stock, bond, and derivative trading in U.S. markets—corresponds with the experiences of other countries that currently operate with FTTs.   It is also similar to other projections for a comprehensive U.S.-based FTT that are derived on the basis of the available evidence on U.S. financial market activity.

This paper follows from a series of previous papers and research reports on this topic.   Pollin, Baker and Schaberg (2003) examined a range of general analytic issues regarding FTTs and the application of an FTT for U.S. financial markets. It also developed a straightforward methodology for estimating revenue potential for FTTs, based on taking account of three sets of observations: 1) trading volume in stock, bond, and derivative markets; 2) transactions costs associated with trading in each of these three financial market segments; and 3) trading elasticities in each of these financial market segments—i.e. how much trading volume is likely to fall when transactions costs rise. The immediate impact of the FTT on financial markets will be to raise transactions costs. It is therefore critical to be able to measure, in percentage terms, *how much* transaction costs will rise due to the tax relative to existing transaction cost levels. This then provides the basis for considering how much trading volume is likely to fall as a result of a given rise in transaction costs.

Subsequent to that paper, Baker, Pollin, McArthur and Sherman (2009) provided an updated estimate of the revenue potential from a U.S. FTT. Pollin and Heintz (2011) then reviewed the more recent literature on transaction costs and trading elasticities, and summarized the major findings in that literature. Based on that review, Pollin and Heintz generated revenue estimates for an FTT on stock trading, allowing that the tax rate be set at alternative tax rates.

Building from this 2011 paper, Pollin and Heintz (2012) wrote an informal but publicly circulated memorandum that estimated the revenue potential from the Inclusive Prosperity Act, which had been recently introduced into the House of Representatives. We assumed in this memo (as we do in this current study) that trading levels would fall by 50 percent in all financial markets once the FTT was implemented at the rates established—i.e. 50 basis points for stocks; 10 basis points for bonds; and 0.5 basis points on the notional values of derivatives.   We emphasized that the revenue estimates in this memo were provisional. This was particularly so, since, at the time, we had not

conducted updated research on transaction cost levels and trading elasticities in all relevant financial markets.

In April 2016, Pollin, Heintz and Herndon presented a preliminary working paper version of this present study. In that working paper, and in this paper, we present extensive data on both transaction costs and trading elasticities. We first show wide variation in transaction costs, both over time within a given financial market segment and at a given point in time between market segments. Because of this, the addition to transaction costs introduced by an FTT at the rates we are considering are well within the range of cost variations at which the markets have been operating for roughly the past two decades. This conclusion on transaction costs is then also consistent with the evidence we present on trading elasticities. We show that elasticities, like transaction costs themselves, vary considerably according to specific market conditions as well as the specific design features of a given FTT. Among other considerations, when an FTT is designed with broad coverage—that is, having it apply across stock, bond, and derivative markets and with minimal tax exemptions—the impact will be to lower the trading elasticity, all else equal. This is because a broadly-based tax offers fewer options for tax avoidance through moving trading to untaxed market platforms. It is through evaluating these considerations that we are able to generate what we believe are reliable, if conservative, estimates of the revenue potential of the Inclusive Prosperity Act.

To consider this set of issues further, Section 2 of this paper examines detailed evidence on transaction costs, while Section 3 reviews the available research on trading elasticities. Based on the findings we review in these two sections, in Section 4, we work with data on trading levels in U.S. stock, bond, and derivative markets to estimate the revenue potential of the Inclusive Prosperity Act. As noted above, our estimate is approximately $220 billion, or 1.2 percent of current U.S. GDP, assuming that trading falls by 50 percent in all market segments. In Section 5, we examine evidence as to whether our revenue estimate is aligned with other recent revenue estimates as well as the evidence in other countries operating with FTTs that include components comparable to the Inclusive Prosperity Act. We conclude, both from experiences in other countries as well as projections focused on the U.S. financial market, that our revenue projection is consistent with the overall weight of evidence. In Section 6, we briefly consider the relationship in the U.S. between levels of stock market trading and productive investments by nonfinancial corporations. This is relevant for our discussion because of the concern that any reduction in financial market trading caused by an FTT may have negative effects on other areas of the economy—in particular on productive investments and economic growth. As we show, there is no evidence showing that the much higher levels of stock market trading in recent years relative to the 1970s and 1980s are

consistent with increased rates of productive investments by nonfinancial corporations. In Section 7, we provide a brief conclusion to this overall study.

2) TRANSACTION COSTS FOR FINANCIAL MARKET TRADING

What are Transaction Costs?

Overall transaction costs include several components. We can divide them into two broad categories, explicit costs and implicit costs. Explicit costs include brokerage commissions, market fees, clearing and settlement costs, and any taxes. A financial transaction tax would be included as one component of explicit costs. These costs are termed "explicit" because they are clearly defined and understood by all parties to a transaction before that transaction occurs. For example, an FTT of 50 basis points will remain unchanged regardless of how market prices may be fluctuating at any given time.

Implicit costs refer to costs that are not explicitly included in the price of a trade. They depend mainly on the characteristics of any given trade relative to prevailing market conditions. The most important such cost is the bid-ask spread. This is compensation provided to the entity or person supplying liquidity in a trade.[1]

Variation in Transaction Costs

Transaction costs vary widely along several dimensions. These include the following:

Conditions in market segments. Trading conditions differ substantially in stock, bond, and the various derivative asset markets. These differences are reflected in differences in transaction costs, as we will review below. Indeed, it is precisely because of the differences in transaction costs according to market segments that we have proposed to scale the tax at different rates for stocks, bonds and derivatives. The differences in tax rates reflect the existing broad differences in transaction costs.

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[1] These forms of compensation to a liquidity provider can be broken down into three main components as described by D'Hondt and Giraud (2008): 1) *The order processing cost:* Compensation to liquidity provider for supplying liquidity to undertake the trade on an immediate basis, as needed; 2) *Inventory control cost:* Compensation to the liquidity provider for the risk of bearing unwanted inventories; and 3) *Adverse selection cost:* Compensation to liquidity providers for the risks of trading with traders who have inside information.

Levels of market trading. Transaction costs will be lower in markets where a higher volume of trading occurs. This is because, in more heavily traded markets, it is, by definition, easier to make a trade in a timely way. For example, the market for U.S. treasury bonds is much larger than that for the bonds of the Greek government. This will mean that the transaction costs for the U.S. sovereign debt market will operate with significantly lower transaction costs than that for Greek treasuries.

Size of trades. Transaction costs vary according to the size of the trade being executed. Larger trades provide opportunities to benefit from economies of scale. This will enable the per unit costs of trading to fall.

Changes in markets over time. Transaction costs have fallen dramatically in the past 30 years due to the growth of new information processing and communications technologies.[2] These transaction cost declines, in other words, are *endogenous* developments within the operations of financial markets. By contrast, a change in transaction costs due to enactment of an FTT would be an *exogenous* source of change in transaction costs. It is useful to keep these distinct sources of transaction cost change in mind in assessing the potential impact of an FTT. For example, a fall in transaction costs due to endogenous changes in market activity creates more capacity for market participants to absorb an exogenous increase in costs due to an FTT.

Differences in defining and measuring transaction costs. Especially with respect to implicit transaction costs, there are large differences among the various sources as to what should be included in the measurement of transaction costs. We do not attempt to adjudicate between the various data sources. We rather, straightforwardly, report the figures produced by different sources and recognize the fact that, between these various sources, differences in their definitions and methodologies can yield large differences in the cost estimates themselves.[3]

One- and Two-Way Transaction Costs. Transaction costs are reported both in terms of one-way costs—i.e. the cost that fall only on either the buyer or seller, but not on both; and as two-way costs, which are the combined costs for both buyer and seller. In the data that follow, we report transaction costs uniformly as two-way costs. But we do

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[2] Angel, Harris and Spatt (2010) provide a good review of these changes in trading practices for U.S. equity markets.

[3] Among other considerations, Teissen and Zehnder (2014) present evidence as to why standard "trade indicator" model estimators of bid-ask spreads consistently underestimate the spreads, by between 20 – 33 percent. Teissen and Zehnder argue that such underestimations occur in the "trade indicator" models because new market information is negatively correlated with the trade indicator variable, and that this negative correlation results in a downward bias in the estimated spread (2014, p. 1).

also note in all cases when the data source we are referencing reports as one-way costs. When figures have been reported as one-way costs, we either multiply the one-way cost figures by 2, to obtain the relevant two-way cost figure; or, when the costs for buyers and sellers are reported as being different, we add up both the buyer and seller costs to give us a two-way cost figure.

Estimating Transaction Costs

We review below a range of estimates for transaction cost levels for U.S. stock, bond, and derivative markets. We focus on figures from U.S. markets, but include, for comparison purposes, estimates for the stock markets in the U.K., China and Japan. As we discussed at the outset, the immediate impact of the FTT on financial markets will be to raise transactions costs. It is therefore critical to be able to measure *how much* transactions costs will rise due to the tax relative to existing transactions cost levels. This then provides the basis for considering how much trading volume is likely to fall as a result of a given rise in transactions costs (i.e. the elasticity of financial market trading with respect to transactions costs).

U.S. Stock Market

We present figures from four recent sources, two of which report only implicit costs—specifically, bid/ask spreads—while the other two report figures on both explicit and implicit costs.

Table 1 reports data from a 2012 study by Corwin and Schultz which estimates bid/ask spreads only for the New York Stock Exchange (NYSE), American Stock Exchange (AMEX) and the NASDAQ Stock Market (NASDAQ). We report their figures for "effective spreads" between 1993 – 2006.[4] As the table shows, their mean estimate of spread is 238 basis points (bps), while the median is 129 bps. This large difference between mean and median figures in their data sample is an indication of wide dispersion for bid/ask spreads on an individual trade-by-trade basis. The high degree of dispersion is also evidenced by the standard deviation of 337 basis points, i.e. 42 percent larger than the mean value. From these figures, we derive two critical points: 1) Considering both mean and medians, the bid/ask spreads range between about 2 – 5 times greater than the proposed 50-basis point FTT on stock trades. This large dispersion in the bid/ask spreads conveys that the U.S. stock market, overall, typically operates with large differences in bid/ask spreads at a given point in time and with significant changes

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[4] Their full study includes seven additional measures of spread. For the most part, these spread figures do not diverge significantly between their eight alternative measures.

over time. As such, a one-time 50 basis point cost increase resulting from the FTT—i.e. an exogenous increase—would not represent an anomalous event relative to typical market behavior.

TABLE 1 BELONGS HERE

Figure 1 presents data from a second source, a 2014 paper by Chung and Zhang. These are also figures on bid-ask spreads only, in this case, between 1993 – 2009.   These figures are useful in that they provide a yearly time series on these data, and they also distinguish between figures from the NYSE/AMEX and NASDAQ. These figures present somewhat different patterns relative to Corwin and Schultz.   First, the overall means and medians reported by Chung and Zhang are higher.   These differences in the means and medians derived from closely equivalent data sets reflect disparities in methodologies between the two studies as to how they are measuring bid/ask spreads.

FIGURE 1 BELONGS HERE

Focusing on the Chung/Zhang data on its own, we see that mean bid/ask spreads rise in the NYSE/AMEX between 1993 – 2000, from 281 to 492 basis points, before falling sharply, as of 2006, to 45 basis points. The spreads rise again after the 2008-09 crisis, reaching 115 basis points in 2009.   By contrast, with Chung/Zhang's NASDAQ figures, bid/ask spreads fall steadily and sharply between 1993 and 2007, prior to the financial crisis. Focusing on the means, the bid/ask spreads are at 728 basis points as of 1993, but by 2007, they have fallen to 88 basis points, before rising sharply post-crisis to 291 basis points.

For our purposes, an important result emerges from Chung and Zhang's NASDAQ data series. It is that, even starting from the high 2009 bid/ask spread figure of 291 basis points, if we were to establish the FTT on stock trading at 50 basis points as an additional exogenous cost, the overall level of bid/ask spread of implicit transaction costs CThis would still be less than half the bid/ask spread level of 1993.   These figures, moreover, do not include additional explicit costs such as brokerage commissions, market fees, and clearing and settlement costs.

Our third source on U.S. stock market transaction costs is the industry database Elkins/McSherry.   Elkins/McSherry reports figures on both explicit as well as implicit costs—i.e. total transaction costs. Their figures that we report are averages for the NYSE and NASDAQ.   We present their results from 1997 to 2014 in Figure 2. First, as we see in Figure 2, the Elkins/McSherry range for total transaction costs, between a high of 67

basis points in 1998 and a low of 20 in 2011, are much lower than either the Corwin/Schultz or Chung/Zhang figures on bid/ask spreads only. Again, these disparities reflect differences in definitions, methodologies and the specific data sets used by various sources. With respect to Elkins/McSherry in particular, data are collected from trades made by institutional investors only. Therefore the transaction costs for these trades are likely lower, at least in part, because the trades are made by professional investors in market settings that are more liquid than average.

FIGURE 2 BELONGS HERE

Focusing on the Elkins/McSherry series itself, we again see a sharp decline in transaction costs through most of the years in their data sample. Thus, as of 1997, Elkins/McSherry report transaction costs at 67 basis points. This figure then falls to a low of 20 basis points as of 2011, before rising to 30 basis points as of 2014. Considering then a 50 basis point increase in total transaction costs that would result through the stock market FTT, the increase in costs relative to the low level of 2011 would be a substantial 150 percent. But considering this 50 basis point cost increase from another perspective, it would mean, relative to the low figure of 2011, that transaction costs would rise to 70 basis points. Overall transaction costs at 70 basis points would only return total transaction costs to basically the level of 1998.

The fourth source that we review on U.S. stock market transaction costs is the industry data source ITG Peer Analysis. ITG publishes quarterly figures on transaction costs for the U.S. stock market as well as for other countries and regions throughout the world. These reports also provide transaction cost data broken out according to the market capitalization level of the firms being traded. The figures include four market capitalization categories for traded firms—micro, small, mid-sized, and large cap firms. From their figures, we are therefore able to observe that transaction costs decline significantly as the market capitalization of the firms being traded increases.

In Figure 3, we show the ITG figures for both micro- and large-cap firms. The figures shown are for fourth quarters between 2009 and 2015. It is clear, first, from this figure that transaction costs are consistently much lower for large-cap firms relative to the micro-cap firms. For the six year period reported, transaction costs for micro-cap firms are about four times higher than those for large cap firms. We also note that with even the large cap firm transaction costs, the range of costs shown are significantly higher than those reported by Elkins/McSherry for total transaction costs. Thus, with the ITG figures, the large cap transaction costs average more than twice those from

Elkins/McSherry, and the ITG micro-cap transaction costs are about seven times higher than those for Elkins/McSherry.`1

FIGURE 3 BELONGS HERE

Focusing on the 2015 ITG data, transaction costs for large cap firms are 83 basis points, which is close to their 2009 figure of 89 basis points. Considering the enactment of a 50-basis point FTT within the context of these overall transaction cost figures, its impact would mean raising total transaction costs by about 60 percent relative to this 2015 transaction cost level for large cap firms. At the same time, if total transaction costs as of 2015 were set at 133 basis points for large-cap firms—that is, the figure we obtain by adding the ITG's reported total market-based transaction costs plus a 50-basis point FTT—the total would still be less than half the 2015 transaction cost figure for micro-cap firms.

Considering all four sets of U.S. stock market transaction cost data we have reported here, our overall conclusion is that a 50-basis point FTT for the U.S. stock market would entail a cost increase that is well within the overall range of transaction cost in which the U.S. stock market has operated in recent years.

Stock Markets in the UK, Japan and China

To further assess how a 50 basis point FTT would affect the operations of the U.S. stock market, it is useful to consider transaction cost figures in other major stock markets. In Table 2, we present average values for transaction costs in the UK, Japanese and Chinese stock markets, and in Figure 4, we consider the UK data in further detail. The comparison between the US and UK stock markets is especially relevant, since the UK stock market has operated since 1986 with a 50-basis point FTT, the rate we are considering for the U.S. stock market.

TABLE 2 AND FIGURE 4 BELONG HERE

In Table 2, we report figures both from the Elkins/McSherry database and the ITG *Global Cost Review*, for the years that these figures are available. The U.K. is the only case in which we have data from both Elkins/McSherry and ITG. We see in Table 2, as with the U.S. figures, that the ITG figures are consistently higher than those from Elkins/McSherry. The range for the mean values from these two sources is between 82 – 159.7 basis points. These figures are significantly above those for the U.S., in which, as we see in Figure 4, the full sample means are 41.4 basis points with Elkins/McSherry and

93.3 with ITG.   We can also see in Figure 4 that, with both the Elkins/McSherry and ITG data sets, the US figures are substantially below those for the UK in all the sample years.

Broadly speaking, the higher costs in the UK stock market reflect the difference in costs established by the UK's 50-basis point FTT.   Thus, considering the Elkins/McSherry data, the mean value for the full sample is 41 basis points higher in the UK relative to the US, at 82.4 relative to 41.4 basis points. Using the ITG data, the difference between the full sample means is 66.4 basis points—159.7 versus 93.3 basis points.   In short, these data convey that the UK stock market operates at a level of transaction costs roughly equivalent to those in the US after subtracting the 50 basis points FTT from overall UK transaction costs.

Considering now the Japanese market, we see in Table 2 that average transaction costs for 2009 – 2015 based on the ITG data, at about 121 basis points, are 30 basis points higher than the U.S. average of 93.3 basis points. Thus, if the U.S. were to impose a 50 basis point FTT, its average transaction costs over this time period would increase to an average of about 18 percent higher than existing costs in Japan.

Finally, for the case of China, the average transaction cost figure for 2007 – 14, based on the Elkins/McSherry data, is 77.3 basis points, i.e. nearly double the Elkins/McSherry average figure for the U.S. of 41.4 basis points.   The Chinese figures incorporate that country's existing10 basis point FTT.   Thus, if the U.S. were to impose a 50-basis point FTT, that would, on average for our data sample, raise U.S. transaction costs to being about 18 percent above the Chinese market—almost the same impact that the tax would have with respect to Japan.

Considering the varied data we have gathered for the UK, Japan and China, what emerges overall is that instituting a 50-basis point FTT for the U.S. market would not create major deviations in transaction costs relative to those in other countries.   Average transaction costs would remain basically in line with those presently prevailing in the UK market.   It is worth emphasizing again that the UK stock market is very large and trades actively, while operating since 1986 with its own 50-basis point transaction tax on stocks. The U.S. market costs would likely rise above the average transaction costs in Japan and China, perhaps in the range of about 20 percent.   Cost increases of this extent are not likely to dramatically alter the performance of the U.S. market relative to these other major stock markets. This is especially true since, as we have seen in considering the U.S. market in detail, the range in transaction cost values around these average figures is

very large, much larger than the mean values themselves. This large degree of variation reflects conditions in the stock market that range widely over time and between firms.

U.S. Bond Market

We provide data from two sources on transaction costs in U.S. bond markets, the market research firms MarketAxess and Elkins/McSherry. The MarketAxess data are for bid/ask spreads only, while those from Elkins/McSherry include both explicit and all implicit costs.

In Figure 5, we report the Elkins/McSherry average quarterly data on total transaction costs in U.S. bond markets between 2008.1 and 2014.2. What is clear from these figures is that average transaction costs in the U.S. bond market range widely. Over the six-year period we are observing in Figure 5, the high figure was reached in 2009.1 at 24.7 basis points, while the low was 1.6 basis points in 2012.1. After falling to this 2012 low point, and remaining there for roughly a year, transaction costs rose sharply, to 16.2 basis points by 2014.2.

FIGURE 5 BELONGS HERE

We report the MarketAxess data in Figure 6. As Figure 6 shows, their estimate of the bid/ask spread is at 34.4 basis points during the financial crisis in 2009, then begins falling through 2010. It then rises to 15.8 basis points by the middle of 2011, then declines again, before beginning another upward movement in 2015. By the end of 2015, the MarketAxess estimate for bid/ask spreads is 8.6 basis points. Overall, during the full 2009 – 2015 period, as we see in the figure, the mean is 12.2 basis points and the median is 10.2. Roughly speaking then, a 10 basis point FTT on bonds would entail a doubling of costs relative to these bid/ask spread implicit cost figures. At the same time, after incorporating a 10-basis point FTT cost increase, overall costs would remain within the recent transaction cost range under which the market has been operating. For example, if the 10-basis point FTT were added onto the mean costs of 12.2 basis points, overall costs would rise to about 22 basis points, i.e. to roughly the market cost levels prevailing in 2009 – 2010.

FIGURE 6 BELONGS HERE

U.S. Credit Default Swaps

Figure 7 presents two data series from the financial market research firm Markit. These are mean and median values with the annual data series on transaction costs for the U.S. credit default swap (CDS) market between 2001-14.   The data sample on which we focus is for instruments maturing in one year.   The transaction cost figures are expressed relative to the notional value of assets. That is, if traders agree to swap a $100 U.S. government bond in one year, we measure transaction costs on this CDS in basis points relative to the $100 bond.   As such, the 0.5 basis point transaction tax on this CDS would amount to 0.5 cents.[5]

FIGURE 7 BELONGS HERE

As with the stock and bond market data that we have reviewed above, we see again with the CDS market that there are large differences in costs at the level of individual trades, both at a point in time and over time.   This is clear, first, in comparing the series on mean versus median values. The average transaction cost for the series of mean values is 4.2 basis points, while the average figure for the median series is less than one-third this, at 1.3 basis points.   This large difference between the mean and medians, again, reflects large transaction cost differences among individual trades at any given point in time.   Considering only the mean values over the full time period, the figures on basis points range between a peak of 14.1 basis points in 2009 and a low of 1.1 in 2006.

Within this range of values for CDS market transaction costs, the establishment of a 0.5 basis point FTT relative to notional values is clearly within the range of existing market-based transaction costs. The tax would represent a cost increase of roughly 12 percent relative to the mean data series, and a 40 percent increase relative to the median series.   Especially given the wide range of individual cost observations, absorbing cost increases due to the FTT should not require significant departures from current market practices.

3) TRADING ELASTICITIES

Our review of the evidence on transaction costs provides the basis for our discussion on trading elasticities—i.e. how much financial market trading is likely to fall when transactions costs are increased due to the FTT.

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[5] We have converted the raw figures reported by Markit, which are expressed relative to the value of the CDS instruments themselves rather than to the notional value of these instruments. We make this conversion by assuming that the market values of derivatives, including CDS assets, will average three percent of the notional value of the underlying assets. See Bank of International Settlements (http://www.bis.org/statistics/about_derivatives_stats.htm) for details on estimating market values of assets relative to notional values of underlying assets.

Until recently, relatively little serious research had been conducted on estimating trading elasticities in financial markets. Moreover, a high proportion of the available research that is most frequently cited is dated. Nevertheless, a new series of substantial papers has emerged over the past three years. This work is primarily focused on examining the impacts of the FTTs established in France in April 2012 and Italy in March 2013. We review here the results of both these newly emerging studies as well as the earlier research.

The earlier research has been surveyed carefully by three studies published in 2011 and 2012. Two were conducted by Thornton Matheson, a staff member at the International Monetary Fund (Matheson 2011, 2012) and the other by economists at the Institute of Development Studies (IDS) at the University of Sussex (McCulloch and Pacillo 2011).[6] In Tables 3 and 4 below, we reproduce the relevant summary tables from these surveys. As can be seen from the tables, these surveys have gathered figures from a range of countries—China, Taiwan, Sweden—as well as multinational figures, in addition to those for the U.S. and UK. They also report figures on various markets, including stocks, bonds, foreign exchange and a range of derivative instruments, including index funds, Treasury futures markets and different commodity futures markets. The Matheson papers report findings from studies ranging between 1985 and 2010. The IDS survey by McCulloch and Pacillo reports findings from studies between 1985 and 2006. With Matheson's papers in particular, the author notes that the measurement of transactions costs used for establishing elasticities vary widely across the studies reviewed and include total transaction costs, bid/ask spreads only, and those based only on the imposition of a transaction tax.

The Matheson papers do not attempt to generate summary statistics for the full set figures they report. But we can see from the table that their low figure, reported in 1998 by Hu, is zero for the Hong Kong stock market operating with a transaction tax. The high figure is -2.7 for the U.S. futures market in Deutschmarks, reported in 1997 by Wang et al.[7]

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[6] In addition to these empirically focused studies, Arestis and Sawyer (2013) is an outstanding analytic overview of the major issues involved in designing an effective financial transaction tax framework.

[7] One of the most interesting results reported in Table 3 is from the 2010 study by Auten and Matheson for all U.S. stock exchanges. Auten and Matheson report a short-run elasticity for the U.S. stock market of -0.04—i.e. effectively a zero elasticity—and a long-run elasticity of -0.3. Matheson derives this low elasticity figure for U.S. stock markets based on her study with Auten on the impact of the U.S. Securities and Exchange Commission's trading levy during 2002 – 2010. She explains that "this result is likely due to the highly liquid state of the US equity market as well as the very small magnitude of the SEC levy, which varied between 0.05 and 0.46 basis points over the test period," (2012, p. 898; see also Matheson 2014). She also provides further detail on the other low elasticity estimates that she reports in her table. In

TABLE 3 BELONGS HERE

Matheson raises an important point with respect to elasticities relative to transaction taxes specifically. It is that elasticities in response to the establishment of transaction costs will vary according to whether there are other financial instruments that are close substitutes to the taxed instruments that are not also subject to the transaction tax. For example, if there is a tax on stock trading, but no tax on stock option trades, then market participants could migrate out of the stock market and into the stock option market, and thereby avoid paying the transaction tax. This effect would increase the elasticity of trading in the stock market relative to the transaction tax. If the stock option market were also taxed, the effect of a transaction tax on both the stock and stock options markets would be relatively weaker. As such, a more broadly designed transaction tax will likely produce smaller trading elasticities than one that is narrowly targeted to a small number or even one market segment.[8]

The McCulloch/Pacillo study reports on findings from the Chinese, UK, Swedish stock markets and the broader US security market. They summarize the full results of these equity and security markets in terms of two median figures: an overall median of -0.8 and a median without long-run effects of -0.58.

TABLES 4 BELONGS HERE

What emerges from these 2011-2012 surveys is that trading elasticities are highly variable across specific market segments, specific circumstances, as well as the time period. As such, we cannot establish with certainty what the response would be on

addition, she explains some of the difficulties in deriving elasticity estimates, writing that "empirical methodology can also influence elasticity estimates, particularly where the measure of transaction costs is the bid-ask spread. Unlike a change in STT rates, which can be considered exogenous to trading volume, changes in the bid-ask spread are endogenous, since a higher volume of trading is likely to narrow spreads by rendering the market more liquid and reducing dealers' inventory risk. Bid-ask spreads must therefore be instrumented to calculate the direct impact of transaction costs on trading volume, and the method for doing so can significantly influence the estimates," (2012, p. 898).

[8] Matheson (2011) writes: "In choosing the base, the relationship between taxed and untaxed instruments should be considered. For example, taxing equities without taxing bonds could strengthen the debt bias imposed by the deductibility of interest but not of the return to equity under the standard corporate income tax....Taxing securities without taxing their derivatives could result in migration of trade from the spot market to derivative markets, with an accompanying increase in leverage and risk. To limit such distortions, an STT [Securities Transaction Tax] should be applied to transactions in all types of traded securities—equity, debt, and foreign exchange—and their derivatives," (2011, p. 28). Matheson presents a similar argument in (2012), p. 905.

market trading if an FTT were established in the United States. The responses will vary depending on which market segment we are considering, and what other market segments would be covered by the tax.   This conclusion is consistent with the evidence we have presented in the previous section on transaction costs.

A 2016 paper by Hemmelgarn et al. of the European Commission surveys the extensive research and main findings of the more recent literature focusing on the experiences since 2012 in France and 2013 in Italy.

The French tax has three components:

1. ***Large cap stocks.*** A tax on the purchase of shares of French listed companies whose market capitalization exceeds EUR 1 billion. The tax rate was originally set at 0.1 percent (10 basis points) but was increased to 0.2 percent (20 basis points) in August 2012. The tax does include exemptions, including those for primary market issuances and market makers.

2. ***CDS derivatives.*** A tax on "naked"/uncovered CDS bonds issued by governments of EU Member States and purchased on the French market.[9] The tax rate for these derivative instruments is 0.01 percent (1 basis point).

3. ***High-frequency trading.*** A tax on high-frequency trading, also set at 0.01 percent (1 basis point). This tax is in addition to that applied to all large cap transactions.[10]

The Italian tax also applies to stocks, derivatives, and high-frequency trading.   It applies more broadly to stock trading, as opposed to the French tax, which more narrowly targets large cap firms as covered by their transaction tax. The tax rate in Italy on stocks ranges between 0.12 percent (12 basis points) for trades on regulated markets and 0.22 percent (22 basis points) otherwise. The Italian tax on derivatives also has broader scope than the French tax. The tax rate is a fixed amount depending on the type of derivative. The tax rate on high frequency trading is at 0.02 percent (2 basis points).

In describing the current research on the French and Italian experiences with the recently established FTTs, Hemmelgarn et al. write that "these papers apply new natural

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[9] A naked contract means the investor does not have an offsetting position in the underlying asset even though they own protection against a rise or fall in the price of the asset.
[10] "High-frequency trading" is defined as trades that are carried out through high-frequency algorithms, and the ratio of cancelled orders to all orders exceeds 80 percent.

experiment methods, comparing the behavior of French or Italian financial assets affected by the new tax to unaffected foreign financial assets with similar characteristics," (2016, p. 5).

These papers examine different impacts from the French and Italian FTTs, including those on trading volume, bid/ask spreads, and market volatility. We focus on the results for trading volume only. Hemmelgarn et al. summarize the findings on trading in France as follows:

> For France, all papers find a strong and significant decline in trading volume of an order of magnitude of close to 20 percent. Both Meyer, Wagener and Weinhardt (2015) and Colliard and Hoffman (2015) offer indications that the effects were the biggest on large and liquid stocks, as well as on institutional investors or those with high turnover. Coelho (2014) also finds a decrease in turnover, especially for liquid stocks and for the lowest two quintiles of market capitalization. For high frequency trading, her estimated tax elasticity is very high at -9 percent, compared to a general price elasticity of stocks of -3.6 percent. European Commission (2014b) considers, however, the evidence as mixed with trading volumes dropping prior to and after the introduction of the tax and recovering later to a certain extent, (2016, p. 5).

Hemmelgarn et al. then summarize the recent findings on trading volume for Italy as follows:

> Ruhl and Stein (2014)…do not observe changes in trading volumes, although the authors suggest that these changes may have occurred in anticipation of the enactment of the tax at times outside their data range. Coelho (2014) also does not find a significant effect on trading volumes. She suggests this is due to more complex combinations of the FTT design, which would offset much of the otherwise expected decline in exchange trading. Conversely, the decline in trading in Italian over-the-counter (OTC) markets is substantial…probably due to the doubling of the tax compared to …organized platforms, (2016, p. 6).

Overall, these more recent studies suggest that the impacts range widely as a result of the implementation of the French and Italian FTTs. In France, the high-end impact on trading looks to be in the range of a 20 percent decline in the short run, but with trading levels reviving after the initial adjustments are absorbed by market

participants. For Italy, the evidence to date does not point to a reduction in trading that is consistent across market segments.

Similar to Matheson's discussion with respect to the earlier evidence on elasticities, Hemmelgarn et al. conclude their assessments of the recent literature on France and Italy by emphasizing the need to recognize that the specific features of any given financial market structure and tax design are critical for evaluating how any specific FTT will affect trading. As they write:

> It is important to keep in mind that the available studies look at effects of financial transaction taxes for different periods of time, different countries, and different types of markets. It goes beyond the scope of this paper to carry out a meta-analysis, but such an exercise could reveal important influences of tax designs, structures of financial markets, ex-ante liquidity and volatility, products traded, and types of interactions between actors on the markets (2016, p. 6).

4) REVENUE ESTIMATES FOR U.S. FTT

We now present our estimates as to the potential revenue that would be generated by a U.S. FTT in which the tax rates are 50 basis points (0.5%) for stocks; 10 basis points (0.1%) for bonds; and 0.5 basis points (0.005%) on the notional value of derivatives. In order to generate such potential revenue estimates, our starting point needs to be the actual level of trading in U.S. stock, bond, and derivative markets.

As we see in Table 5, total trading on U.S. stock markets was about $48 trillion for 2015. This means that if all trades were taxed and trading levels did not decline, the revenues from the tax on stock trading would amount to $240 billion annually. With respect to the U.S. bond markets, total trading in 2015 was $180 trillion. With a 10 basis point tax, and with no tax avoidance or trading volume decline, the tax on bond trading would generate $180 billion per year.

TABLE 5 BELONGS HERE

Finally, with U.S. derivative markets, the data on trading volume is less complete than that for the stock and bond markets. We have derived our estimate of trading volume for 2015 based on figures from the Bank of International Settlements (BIS), including those for: 1) exchange-traded derivatives for "North American" markets in futures and options in 2015; and 2) over-the-counter (OTC) markets in the U.S. alone in

interest rate and foreign exchange derivative markets for April 2016. These April 2016 data are the closest available figures to those for the year of 2015 for the OTC markets. In Appendix 1, we provide details on our use of these data sources to derive the figures we report in Table 5.

Table 5 reports the results of our estimate for total derivative market trading in U.S. markets for 2016.   As we see there, our estimate is that, for 2015, the notional value of derivative trades in U.S. markets was $1,525 trillion.   If we tax this level of trading at 0.5 basis points, that would generate tax revenues of around $76 billion annually.[11]

If we then add the revenues generated by the stock, bond, and derivative markets, we then generate a total of $496 billion in revenues, as we show in row 4 of Table 5.   Of course, we recognize both that some degree of tax avoidance will occur and that trading volume will decline to some extent once the tax is established.   How large should we expect such responses to be? Following from our review of the evidence on both transaction costs and trading elasticities in previous sections, we can expect that the impact of imposing the tax should vary considerably depending on the specific situations prevailing in each market segment—that is, depending on the means, medians, and ranges of transaction costs in the stock, bond, and derivative markets respectively, the extent of trading activity in these markets, and the specifics of the tax design.

In our discussion on transaction costs, we showed that we have set the three tax rates to be at levels that are consistent with recent transaction cost levels within U.S. stock, bond, and derivative markets. We have also reviewed the literature on elasticities. This review included considering the recent experiences in France and Italy when FTTs were introduced into their financial markets. As we saw, trading volume fell in the range of 20 percent in France over the short term, then began recovering subsequently, while in Italy, no significant changes in trading volume occurred.

For assessing the potential behavioral responses to the introduction of a U.S. FTT, it is also significant that we have designed the U.S. FTT to apply to all financial market

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[11] The figures we report here on derivative market trading levels, and following from that, the revenue potential from an FTT on derivative trading, are both significantly lower than what we presented in the 2016 working paper version of this study.   In that preliminary draft, we reported a level of total derivative trading in U.S. markets at $5,200 trillion in notional values, which then implied $130 billion in revenues with a 0.5 basis point tax and a 50 percent decline in trading volume. We had mistakenly overlooked the available direct data on derivative market trading levels provided by the BIS in that preliminary draft. We therefore generated estimates of derivative market trading through extrapolation.   We described our extrapolation method in detail in Appendix 1 of the preliminary draft. Nunns (2016) and Baker (2016) were both correct in pointing out that our earlier draft of this study was in error for having overlooked the available direct derivative market trading data from the BIS.

segments.   All else equal, this will reduce trading elasticities, since, as we have discussed above, market participants will not be able to avoid the tax by moving their trading from a taxed to an untaxed market segment—such as, for example, moving out of the U.S. stock market that would face the tax and into a stock option market that would be untaxed. As we have designed the tax, trading on stock options would be taxed as well, at the 0.5 basis point rate on the notional value of derivatives.

Of course, financial market participants could still attempt to avoid paying the tax by moving their trading activity off-shore, to non-U.S. jurisdictions.   However, the incentive to do so can be effectively countered by following the UK's FTT model on stock trading, which is termed a "stamp duty." Under this type of arrangement, asset transfers would not be legally effective until they had been officially stamped. We assume that most market participants place a high value on establishing legal status for their asset acquisitions and sales and thereby having access to the U.S. legal system in the event of disputes. The stamp requirement therefore creates a strong disincentive against efforts to circumvent the FTT.

In considering all of these factors, we still assume that a combination of tax avoidance and trading decline will occur.   For the purposes of our discussion, we assume that the combination of tax avoidance and trading decline will amount to 50 percent of the existing level of market trading value. We consider this assumed level of trading decline to be implausibly high, given the evidence we have reviewed on transaction costs and elasticities, and the fact that our tax design structure does not create untaxed market havens within the U.S. financial system.

Still, based on this assumption of a 50 percent fall in trading volume or its equivalent through tax avoidance, we then report in column 4 of Table 5 the revenues that would be generated through the FTT.   As we see, under this set of assumptions, the U.S. FTT would generate a total of $248 billion per year, including $120 billion from stock trading, $90 billion from bond trading and $38 billion from derivative trading.

Revenue Reduction through Tax Credit

The Inclusive Prosperity Act includes a provision that establishes an offsetting tax credit for individual taxpayers whose income levels are up to $50,000 for individuals and $75,000 for those filing joint returns. Taxpayers at these income levels would therefore not have to pay the FTT on their financial market trading. However, trading by institutional investors, such as mutual funds or pension funds, whose members include people at the $50,000 or $75,000 income levels, will not be eligible for this tax credit.

How much could we expect overall revenues from the Inclusive Prosperity Act Tax version of a U.S. FTT to fall as a result of this tax credit? Data are not available on U.S. financial market trading according to income levels. But we can derive a rough approximation of the impact of this tax credit on the basis of financial asset data holdings by income level, which are available from the Federal Reserve Board's periodic *Survey of Consumer Finances*. We focus on data from the September 2014 study by Bricker et al., "Changes in U.S. Family Finances from 2010 to 2013: Evidence from the Survey of Consumer Finances."[12]

In Table 6, we report figures on the level of financial market asset holdings by U.S. households in the lower 80 percent of the U.S. income distribution. As we see in the table, the mean income levels for these households, divided according to income quintiles, is as follows: $15,200 for the lowest quintile; $30,500 for the second quintile; $49,600 for the third quintile; and $80,000 for the fourth quintile (Bricker et al. 2014, p. 9). Roughly speaking then, these would be the households which would receive the tax credit that would offset the FTT tax obligations tied to their market trading activities.

TABLE 6 BELONGS HERE

Table 6 then shows the level of financial asset holdings for these household categories. As we see, relatively small percentages of these households own any stocks or bonds. The range is 4.2 – 14.5 percent for stock ownership and 0 – 1 percent for bond ownership. Of that small percentage that do own financial assets, we see that the average ownership levels range between $55,500 - $98,600 for stocks and $75,900 - $218,200 for bonds. From these sets of figures, we can then calculate average financial asset ownership levels for all households in these income categories, including those who own stocks or bonds as well as those who do not. We see that for this measure, the range of stock ownership is between $2,331 - $14,297 and for bonds, between 0 - $2,030.

Again, no data are available showing how much these households trade on their individual accounts. For the purposes of our discussion, we first assume an implausibly high average trading figure. Specifically, we assume that, on average, these households' annual trading levels are equal to five times their asset holding amounts. This would mean, for example, that for the average household whose income level is $75,000 and whose total stock plus bond holdings amount to $300,000, their total trading over a year

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[12] This survey is only conducted every 3 years. At the time of writing, the latest survey data available were for 2013.

would amount to $1.5 million, divided equally between their stock and bond holdings. Based on this assumption, we estimate that the total amount of lost revenue due to the tax credit provision of the Inclusive Prosperity Act would be roughly $12 billion per year. We provide details on how we derive this result in Appendix 2. If we assume, still more implausibly, that the average trading level for these household equals 10 times their total amount of asset holdings—i.e. that they would conduct trades at an average of $3 million per year on their overall holdings of $300,000—total revenue lost from the FTT tax credit would then amount to $24 billion.

We conclude that a reasonable high-end estimate of revenue lost from this particular tax credit would be much closer to the $12 billion figure. Nevertheless, for the purposes of our discussion, we will assume the level of revenue loss as being closer to $20 billion per year. Based on this assumption, we then estimate that total revenue generated from the Inclusive Prosperity Act version of a U.S. FTT would be roughly $230 billion per year.

Revenue Effects from Broader Economic Adjustments

Sectoral Shifts in Economic Activity

In estimating the full revenue potential of a U.S. FTT, one needs to consider not only the taxes generated through financial market trading, but also the broader economic impact of the tax on overall economic activity.[13] Among other considerations, these broader economic impacts will also affect the total revenues generated by the FTT.

For example, establishing an FTT could influence decisions by private investors on how much they may wish to allocate their funds to financial market trading as opposed to investing to create new productive assets. Indeed, as the FTT was first conceptualized by John Maynard Keynes in *The General Theory of Employment, Interest and Money* (1936), his main concern was precisely to discourage excessive speculative trading and encourage productive investment as an alternative. Encouraging productive investment, in turn, would then raise aggregate demand in the short run and productivity growth in the long run. Both effects could expand an economy's capacity to generate tax revenues. However, contrary to Keynes's perspective, other economists, such as Milton Friedman, argue that promoting higher levels of speculative trading will increase the efficiency of financial markets and decisions by investors. This is because, according to Friedman, the dominant effect of speculative financial market trading will be to drive

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[13] More specifically, we are referring here to the general equilibrium as opposed to the partial equilibrium effects of a US FTT.

asset prices toward their fundamental values, thereby clarifying the true productive capacities of private business firms.[14]

These contrasting perspectives between Keynes and Friedman illustrate the difficulties inherent in estimating reliably what the total effects of an FTT are likely to be. Nevertheless, at least conceptually, such effects need to be incorporated into the analysis, including estimates of overall revenue potential.

As a starting point for examining this fuller set of effects from an FTT, it is logical to begin with the most directly relevant, and measurable, impacts. That is, in considering our specific U.S. FTT tax proposal, we are estimating that, due to the FTT, about $230 billion will be transferred out of the U.S. financial securities industry. Some income and activity will also transfer out of related financial services sectors of the U.S. economy, such as insurance and banking, since financial asset trading represents a share of their overall operations. For purposes of illustration, we simplify the discussion here by assuming that all income from trading activity is concentrated in the securities sector itself.

The transfer of funds out of the securities industry (following our simplifying assumption) will generate reductions in incomes and jobs for people employed in this industry. This loss of incomes will in turn bring losses of tax revenues generated through activity within the securities industry. Specifically, there will be losses in both income and capital gains taxes on individual tax returns that result from operating financial markets with the FTT as well as losses in corporate taxes from financial securities industry firms.

Various authors have correctly recognized that this loss of tax revenues will occur, and that such losses need to be factored into a fuller assessment of the revenue potential of a U.S. FTT.[15] However, such assessments typically do not examine this issue beyond the specific confines of the securities industry alone. But there is no justification for confining this type of analysis so narrowly.

To be more specific with respect to the U.S. FTT we are considering, the $230 billion in revenue that we estimate will be generated will not disappear out of the

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[14] Friedman's classic paper on this question is "The Case for Flexible Exchange Rates," (1953).

[15] For example, Burman et al. (2015) write that their initial 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 (like an 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," (2015, p. 41).

economy. Rather, these funds will be spent on other economic activities. The spending in these other activities will in turn produce jobs and incomes. The people and business enterprises receiving these incomes will then pay taxes based on their incomes. These tax revenues thus need to be factored into any fuller accounting for the overall net tax revenues resulting through an FTT, no less than the impact that may result within the financial securities industry narrowly.

As one relevant case in point, we can illustrate these fuller tax effects within the context of the proposal Sen. Sanders made during his 2016 presidential campaign to use the funds generated by the FTT to finance free public college education for all qualified U.S. students. Let us consider, therefore, a simple hypothetical exercise, in which $230 billion is transferred out of the U.S. financial securities industry and into higher education.[16]

Our specific question is: what would be the impact on job creation, incomes and individual tax revenues through such a spending transfer? We focus our discussion with respect to the impact on individual tax returns, which constitute nearly 50 percent of all federal tax revenues.[17]

Table 7 presents the results of such an exercise. To begin with, in row 1 of Table 7, we present the figures on the extent of job creation that occurs through spending $1 billion in the higher education and financial securities industries respectively within the U.S. economy. As we see, spending $1 billion in higher education produces an average

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[16] In fact, it is not necessarily the case that the $230 billion in tax revenue generated by the FTT would be funds that, absent the FTT, would all have been retained and deployed within the financial securities industry to hire employees and produce output within that sector. We assume this to be the case in order to keep our exercise as simple as possible. At the same time, the total level of output in the financial securities industry for our benchmark year of 2007 was about $570 billion (in 2015 dollars). If trading were to fall by 50 percent, that would imply that total output for the industry would also fall by half, i.e. by $285 billion. As such, it is a reasonable approximation to assume that the $230 billion in tax revenue generated by the FTT, assuming a 50 percent decline in trading levels, would be equivalent to a $230 billion fall in output of the financial securities industry.

[17] The shift in economic activity from the financial securities industry and into higher education will also affect federal revenues from the employers' share of payroll taxes, which amount to 16.5 percent of all federal revenues; and corporate income taxes, which supply 11 percent of all federal revenues. We have not attempted to calculate these impacts for this paper. In general, payroll tax revenues will rise with the shift in activity to higher education, since, as we will discuss below, employment levels in education are roughly 8 times higher than those in financial securities per dollar of expenditure, and the payroll tax burden is regressive—i.e. is higher for lower-income employed people. The shift in activity from financial securities and into education should have a relatively modest overall effect on federal tax revenues via corporate taxes. This is because corporate taxes, in total, supply only 11 percent of all federal revenues, and the losses of revenues from the securities industry will be compensated for by gains from all industries associated with higher education.

of about 14,900 jobs within the industry.[18] By contrast, spending $1 billion in the financial securities industry generates an average of 1,800 jobs. In other words, transferring $1 billion out of financial securities and into higher education generates a net expansion of about 13,100 jobs—i.e. 8.3 times more jobs.

TABLE 7 BELONGS HERE

In row 2, we then show this same comparison through spending $230 billion in either the higher education or financial securities industries. As we see there, transferring $230 billion out of financial securities and into higher education will produce a net expansion of 3 million jobs.

The major factor driving the large difference in relative employment levels is the difference in average compensation per employee.   As we see in row 3 of Table 7, average compensation (in 2015 dollars) per employee in higher education is $43,520. By contrast, the average for the financial securities industry is $277,624. In other words, the average employee in financial securities earns 5.4 times more than the average higher education employee. Based on these figures along with those for total employment, we can calculate total compensation levels within both industries. As we see in row 4 of Table 7, spending $230 billion generates a total of $148 billion in total compensation within higher education versus $115 billion in financial securities.

Following from these compensation figures, we can generate an estimate of total federal tax revenues that would result through paying either 3.4 million employees in higher education $43,520 in average compensation versus 414,000 people in financial securities an average of $277,624.[19]   We work from data published by the U.S.

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[18] Our figures on employment levels per $1 billion in spending are the employment/output ratios derived from the Department of Commerce, Bureau of Economic Analysis, Benchmark Input-Output tables, 2007. Our figures on compensation are from the Bureau of Labor Statistics "Current Employment Survey." See Appendix 3 for details. We are considering here only the "direct" job creation through spending in either higher education or the securities industry—i.e. the jobs produced within the industry itself. We are not considering here either the "indirect jobs"—jobs created by entities that provide supplies to these industries—or "induced jobs"—the jobs generated throughout the economy when newly employed workers have additional money to spend.   The levels of both indirect and induced jobs will be similar between the higher education and financial securities industries.

[19] We are not attempting to calculate here the full set of effects on tax revenues that would result through this shift in relative spending between the securities industry versus higher education.   One factor that we are not including is the loss of corporate income tax revenue.   This factor will entail a further loss of revenues than what we are calculating, since higher educational institutions are either public or private non-profit, and therefore tax-exempt, organizations, while the securities firms are private for-profit entities, and therefore responsible for paying corporate income taxes. We take account of this additional loss of revenue through increasing the overall revenue loss through the shift in spending out of securities and into higher education, as we discuss further below.

Congressional Budget Office in estimating average overall federal tax liabilities—
including income, payroll and capital gains taxes—for people earning about $43,000 and
$278,000 (Congressional Budget Office 2014, p. 2).

As we show in row 5 of Table 7, the average U.S. taxpayer earning $43,520 pays
14.9 percent in total federal taxes.   By contrast, the average individual earning $277,624
pays 24.5 percent in total federal taxes. Based on these tax rates, as we show in row 6 of
Table 7, spending $230 billion in the higher education industry will generate about $22.1
billion in overall federal taxes, whereas spending $230 billion in the financial securities
industry will generate $28.2 billion.

In short, if we consider the effects of a U.S. FTT that entails the transfer of $230
billion out of the financial securities industry and into higher education, the impact on
total individual tax revenues will be a revenue decline of about $6.1 billion. This figure
therefore needs to be subtracted from the $230 billion in revenue that, by our estimate,
could be generated through the version of a U.S. FTT on which we have focused in this
paper.   To round down again, after accounting for this loss of tax revenue, we now
estimate that the revenue potential of the U.S.-based FTT on which we have focused
would be around $220 billion.[20]

We could also perform a similar set of calculations working with alternative
assumptions as to where the $230 billion in FTT tax revenues would be spent.   For
example, if we assumed that the $230 billion is simply distributed evenly throughout all
public and private sectors of the U.S. economy, the overall tax revenues generated would
likely be about $13 billion—i.e. nearly $15 billion less than the $28 billion that is
generated through spending $230 billion in the financial securities industry.[21]   Overall
then, we can roughly assume that, however the revenues from the FTT are distributed

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[20] Though it is not the subject on which we are focusing in this paper, it is worth highlighting that this
transfer of funds out of financial securities and into higher education would produce a net expansion of
about 3 million jobs for U.S. workers. On average, these would be middle-class jobs, paying about
$44,000, as opposed to the high-income jobs that would be lost in the financial securities industry.   This is
in addition to how this transfer of funds into higher education could expand opportunities for young people
in the U.S., and, through this channel, strengthen the economy's prospects for long-run productivity
growth.

[21] We derive this rough estimate based on these sets of figures: a) spending $1 billion in the overall U.S.
economy generates, on average, about 4,900 jobs; b) the average compensation level for the economy
overall (in 2015 dollars) is $70,347; and c) The average level of federal tax payments for people earning
$70,337 is about 17 percent.

once they are transferred out of the securities industry, the net revenue generated from the FTT and any revenue losses through such a transfer will be around $220 billion.[22]

5) ALTERNATIVE FTT REVENUE ESTIMATES RELATIVE TO GDP

A U.S. FTT that generates on the order of $220 billion per year as of 2015 would represent a revenue stream of about 1.2 percent of current U.S. GDP. Even though we have derived this revenue estimate based on a series of conservative assumptions, a further valuable robustness check on our results will be to assess from additional perspectives whether it is realistic to expect the U.S. FTT to generate as much as 1.2 percent of GDP in new revenue.

As we have discussed above, probably the most directly relevant comparison case to what we are proposing is the 50-basis point tax on stock trading that has operated in the UK since 1986. This is the identical tax rate that we would apply on U.S. stock trading under the Inclusive Prosperity Act. Yet the UK tax is also distinct from our U.S. proposal in that there is no FTT levy in the UK for either bond or derivative markets. The UK tax also exempts the original issuance of stocks on the primary market as well as secondary market trading by market makers and non-profit organizations.

As reported by Matheson (2012, p. 890), the UK stock trading tax generated an average of 0.27 percent of UK GDP between 2000 – 2008, with a high figure of 0.45 percent of GDP in 2000 and a low of 0.22 percent in 2003, 2004 and 2008. By comparison, as we saw in Table 5, our estimate of revenue from the stock market component of the US FTT, at $120 billion, amounts to about 0.66 percent of U.S. GDP for 2015.

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[22] In critiquing the 2016 working paper version of our discussion in this section relative to that presented in Burman et al. (2016), Nunns (2016) writes that our analysis "fails to take into account the general equilibrium effects of an excise, which would change wages and profits (and the employment of labor and capital) in all industries, not just the taxed industry," (p. 6). Such general equilibrium effects will occur. But it is safe to say that the magnitude of these economy-wide effects will be of a second-order nature relative to the more direct partial equilibrium effects within the securities industry and any industries that are the recipients of the tax revenues generated by the FTT (e.g. higher education in the Sanders proposal). In any case, it is hardly appropriate for Nunns to criticize our paper for not considering such second-order general equilibrium effects. This because the Burman et al. paper, of which he is a co-author, gives *no consideration at all* to even any first-order spending effects when the FTT revenues are distributed into various sectors of the U.S. economy. Nunns also criticizes our earlier discussion because "it does not conform to the standard procedures followed by the JTC [Joint Tax Committee] (and Treasury) in preparing official revenue estimates," (p. 6). Such an appeal to authority is hardly persuasive on its merits, but is especially inappropriate in Nunn's discussion since he also writes in the same paragraph that our approach "has merit in considering the combined effects of revenues and spending on the economy."

It follows from the large number of exemptions provided with the UK stock trading tax that, on average, it generates about half as much, relative to GDP, as our proposed US stock trading set at the same 50 basis point tax rate. Matheson cites the work of Oxera (2007) as concluding that, overall, "only about 20 percent of share trading on the London Stock Exchange is subject to stamp duty," i.e. the 50-basis point stock trading tax (2011, p. 36).

On the basis of Oxera's evidence cited by Matheson, it is reasonable to conclude that, by reducing exemptions, the 50 basis point stock trading tax in the UK is capable of generating a revenue flow that would approximate 0.66 percent of GDP, i.e. our estimate for the stock-trading component of the U.S. FTT. For example, if the taxable share of UK stock market trading were raised from 20 percent to roughly 50 percent, it is reasonable to conclude that revenue from this tax should then rise to about 0.68 percent of UK GDP.[23] To express this in terms of the US financial markets, it is therefore reasonable to expect that a U.S.-based FTT on stock trading set at 0.5 percent, and operating without the large number of exemptions permitted under the UK tax, would also be able to generate revenue in the range of 0.66 percent of US GDP. This in turn supports the conclusion that our estimate of the revenue potential for the stock-trading component of the U.S. FTT is consistent with the longstanding UK experience.

In addition to the experience with the UK FTT on stock trades, Matheson also reports revenue figures as a share of GDP for 10 other countries, including France, Germany, Hong Kong, India, Italy, Japan, South Korea, South Africa, Switzerland, and Taiwan. In most cases, the revenues generated by these taxes amounted to low percentages of GDP. This follows from the fact that, in these countries with low revenue levels, the FTTs were narrowly targeted and/or the tax rates were low. But Hong Kong and Taiwan are two exceptions in Matheson's data sample. For 2008-09, Hong Kong operated with a 10 basis point on stock trading only, with no taxes on either bonds or

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[23] That is, as a rough approximation, we can calculate the ratio for the relationship between revenue generation with the UK stock trading tax and the proportion of trades being taxed as follows: 0.27% of GDP/20% of taxable trades = 1.35. We can then apply this 1.35 figure to an assumption that taxable trades rises to 50 percent of the market. That is, 50% of taxable trades x 1.35= 0.68. In other words, raising the proportion of stock trading that is taxed to 50 percent should yield revenue equal to about 0.68 percent of UK GDP, all else equal. It is also worth noting here that, according to Bond et al. (2004), the UK FTT is very inexpensive to administer. As Bond et al. write "One of the outstanding features of stamp duty is that it is the cheapest of all UK taxes to collect, with a collection cost of just 0.11 pence per pound raised. For comparison, the corresponding figure for income tax, the most important revenue raiser, is 1.59 pence (Inland Revenue, 2002). As the figure reported for stamp duty includes the cost of collecting stamp duty from land and property purchases, it is likely that the corresponding figure for stamp duty on share transactions is even lower, given that most transactions on the stock exchange are now electronic and stamp duty can thus be deducted automatically (2004, p. 4)."

derivatives. Nevertheless, this tax raised 2.1 percent GDP in 2008 and 1.32 percent in 2009. Taiwan operated with a tax on stock trading at 30 basis points, corporate bond trading at 10 basis points, and between 0.25 – 60 basis points on options and futures derivatives.   This tax in Taiwan raised between 0.65 – 1.07 percent of GDP between 2001 – 2008. These cases thus also support the idea that a well-designed tax in the U.S. that spans across stock, bond, and derivative markets is capable of generating about 1.2 percent of U.S. GDP.

This result is also supported through the extensive study by Schulmeister, Schratzenstaller, and Picek (2008) on FTTs as applied to different countries and regions of the world as well as a global FTT. Schulmeister et al. present a wide range of evidence on transaction costs, elasticities and trading values. Based on this evidence, they derive a series of estimates on revenue potential for FTTs that would apply globally and in different regions of the world. Their models work with different assumptions as to the FTT tax rates, which then generate a range of estimates as to the tax revenues that would result from their different tax rate scenarios.

Among the large number of estimates that Schulmeister et al. report, the ones that are most directly relevant for our purposes are those for North America.   For example, they report estimates for a North American FTT operating with a uniform 10-basis point tax rate across all stock, bond, and derivative markets (2008, p. 52).   This tax rate is identical to what we have proposed for bond markets.   But it is only 20 percent as high as our proposed 50-basis point rate for stocks, while also being 20 times higher than our 0.5 basis point rate for derivatives.[24] Overall, their tax proposal is comparable to ours, in that our rates on bonds are identical, while their significantly lower rate on stocks is counterbalanced by their much higher rate on derivatives.

Their estimates as to the revenue potential for this tax depend on the extent to which trading volume declines as a result of the tax. They present three alternative scenarios—low, medium, and high—for trading volume reductions. Based on these alternative scenarios, Schulmeister et al. generate revenue estimates for their North America-based FTT as ranging between 1.2 percent of GDP with "high" trading volume declines to 3.1 percent of GDP when trading volume declines are "low." Their midpoint estimate, based on "medium" declines in trading volume, is 2.2 percent of GDP. In short, Schulmeister et al. work from a database that is eight years older than the evidence we have utilized for our estimates, and with an FTT tax design that is distinct from our own,

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[24] However, it is not clear from the presentation by Schulmeister et al. whether their tax rate on derivatives is meant to apply to the notional value of the assets, as we have proposed, or to the value of the derivative instrument itself.

if broadly similar in its overall impact. Despite these distinctions, our revenue estimate, at 1.2 percent of U.S. GDP, is exactly equal to their estimate derived from their assumption of "high" reductions in trading volume resulting from a North American FTT—i.e. their low-end estimate of a North American FTT. Our revenue estimate is also nearly 60 percent below the Schulmeister et al. figure of 3.1 percent of GDP, working from their scenario in which the decline in trading volume is "low."

A recent paper by Burman et al. (2016, see also their 2015 Discussion Draft) also develops estimates of revenue potential from a U.S. FTT. They determine the *maximum revenue potential* to be about 0.3 percent of GDP (2016, p. 204), which, they state, would amount to about $60 billion in 2017.[25] Their revenue estimate is, thus, dramatically below even the 1.2 percent of GDP figure from Schulmeister et al., assuming a "high" reduction in trading volume, much less the Schulmeister et al. 2.2 and 3.1 percent of GDP revenue estimates based on "medium" or "low" trading declines, or our own estimate at around 1.7 percent of U.S. GDP.

This revenue estimate for Burman et al.—as with any such estimates on FTT revenues—must follow from their analysis of the three variables that we have considered above in some detail, i.e. 1) transaction costs; 2) trading elasticities; and 3) the current level of financial market trading. However, they provide limited evidence to substantiate their conclusions with respect to any of these three variables.

With respect to trading levels, i.e. the tax base for any FTT, they are ambiguous as to how much of derivative market trading they are proposing to tax and at what rates.[26] As regards elasticities, they write as follows:

> We believe the best evidence supports a relatively high price elasticity, and we use -1.25 as our "standard" elasticity. To illustrate the effect of alternative behavioral assumptions that are considered within the range of empirical elasticities reported in Matheson (2012), we also report revenue estimates assuming elasticities of -1.5 and -1.0 (2016, p. 2000).

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[25] They write, "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). They do, however, cite a higher revenue figure in the abstract of their paper: "A hypothetical relatively broadly-based FTT in the United States…could raise about 0.4 percent of GDP ($75 billion in 2017) in a highly progressive manner," (p. 171). Though they do not make this clear, it appears that the lower figure incorporates their estimate of higher borrowing costs on U.S. government debt, while the lower figure does not include this effect.

[26] Most critically, in proposing two alternative rates of 10 and 50 basis points respectively to be applied across all markets, it is not clear whether these rates are meant to apply to the notional value of derivatives or their market value.

In fact, however, as we show in Table 3 and our discussion around this evidence, the range of elasticities reported in this Matheson study that they cite is much wider than Burman et al. state. Matheson herself summarizes the elasticity figures she presents, writing "The full range of elasticities found for world equity markets is -1.7 to 0," (2012 p. 897). As we noted above, Matheson also emphasizes that a more comprehensive FTT design will generally lead to lower elasticities, since the market traders will be less able to engage in tax avoidance strategies.

Burman et al. also do not consider the evidence we have reviewed above showing the wide range of figures on transaction costs in U.S. markets. As we saw, transactions costs vary widely according to market segments in a given point in time as well as within given market segments over time. We also observe that estimates of transaction costs even vary substantially according to how these costs are defined as well as the methodologies being used to measure them. One therefore cannot expect that a single elasticity figure, or a narrow range of figures, will apply uniformly across all markets, regardless of circumstances.

In this regard, it is useful to recall that our revenue estimate of a U.S. FTT at 1.2 percent of GDP does incorporate the assumption that trading volume falls by 50 percent relative to the 2015 trading levels we report in Table 5—i.e. stock market trading at $48 trillion; bond market trading at $180 trillion; and derivative markets at $1,525 trillion relative to notional values. This assumption of a 50 percent fall in trading is itself very large. Based on an across-the-board tax rate of between 10 and 50 basis points for all taxed markets, the Burman et al. maximum revenue estimate at around 0.3 percent of GDP would entail a decline in trading levels by between about 80 – 90 percent, depending on the year, tax rate and tax base.[27] However, given the wide divergence we have reported on transaction costs and trading elasticities, it is reasonable to anticipate that financial markets would adapt to the higher levels of transaction costs generated by a U.S. FTT before total trading activity would fall by something on the order of 80 - 90 percent. Certainly anticipating such adaptations by market participants, as opposed to having market trading activity effectively collapse—which is what a 90 percent fall in

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[27] For their more narrow tax base, termed "Base 1" of trading level activity, presented in Table 4 (p. 202) of their study, one can calculate the level of trading decline through the figures they report on "Effect of Behavioral Response." They do not present a full set of estimates of behavioral responses with their broader "Base 2" tax base. But this is the scenario through which the FTT they estimate generates up to 0.3 percent of GDP, or $60 billion. To generate only about 0.3 percent of GDP with a large tax base and a high tax rate, at 50 basis points, would require trading to fall on the order of 90 percent.

trading volume would entail—is consistent with the notion that contemporary financial markets are capable of operating flexibly in response to changing circumstances.[28]

The evidence from the recent literature examining the experiences in France and Italy with establishing FTTs in their financial markets is pertinent here, though it is not examined by Burman et al.   As discussed above, this literature generally finds that trading in France fell initially by around 20 percent, but subsequently began returning to its pre-tax trading levels.   Trading levels in Italy apparently have been unaffected in any significant way by establishing the FTT.

Burman et al. do refer to the revenue projections presented in the Schulmeister et al. (2008) study. [29]   But they do not mention the most directly pertinent finding presented in that study, which we have discussed above—that Schulmeister et al. estimate for North America that a uniform 10-basis point FTT on stock, bond, and derivative trading will generate revenue ranging between 1.2 and 3.1 percent of GDP, with a midpoint of 2.2 percent, depending on how much trading declines in response to the tax.[30]

Two additional recent studies of a U.S. FTT are those by Baker (2016) and Bivens and Blair (2016).   The revenue estimates from these two studies are broadly in line with our own, despite differences in methodology and, in the case of Baker, in the tax rates from which his revenue estimates are derived.

More specifically, Baker's total revenue estimate is between $103 - $145 billion, which is roughly midway between the Burman et al maximum figure of $60 billion and our own figure of $220 billion.   But the critical source of disparity between Baker's estimate and our own is that his estimates are based on lower tax rates for both the stock and derivative markets.   Baker's assumed tax rates are 0.2 percent (20 basis points) on stocks, as opposed to 0.5 percent rate; and 0.002 percent of notional value (0.2 basis

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[28] More precisely, financial markets are capable of adjusting to an exogenous cost increase engendered by the FTT through endogenous changes in market activity.   In particular, the fact that endogenously generated costs have fallen over time creates more capacity for an exogenous cost increase to be absorbed.

[29] Moreover, Burman et al.'s reference on the Schulmeister et al.'s revenue projections is inaccurate. Burman et al. write "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," (p. 198).   In fact, Schulmeister et al. estimate that a 0.01 percent tax will generate 0.418 percent of world GDP, assuming a "high" reduction in trading volume—i.e. nearly 40 percent more revenue than the figure Burman et al. report.   Schulmeister et al. also estimate that the 0.01 percent tax global FTT could generate 0.551 percent of global GDP if the reduction in trading volume were "low."   Their midpoint estimate was 0.485 percent of GDP (2008, p. 52).

[30] Nunns (2016) reviews the differences in the revenue estimates between Burman et al. (2016) and our own 2016 working paper.   As we have noted above, we have made a downward adjustment in our own current revenue estimate for derivative trading relative to our 2016 working paper.

points) on derivatives, as opposed to our own 0.005 percent (0.5 basis points) rate. Our respective rates for both market trading are identical.

If we were to apply Baker's assumed tax rates and our own figures for total trading in each market, a 50 percent decline in trading due to the tax, and our assumptions on revenue losses through the tax, we would end up with a revenue estimate that is approximately the same as Baker's high-end figure of $145 billion. The only remaining significant difference between our two papers is therefore over the question of trading elasticities at higher tax rates. Baker assumes, similar to Burman et al., that the likely range for trading elasticities in these markets to be between -1.0 and -1.5. But as we have discussed above with respect to the Burman et al. paper, the weight of evidence from the literature does not support a conclusion that the trading elasticities should be that high.

Considering therefore full set of evidence and literature, we conclude that it is indeed realistic to expect that the US FTT that we are considering—with tax rates of 50 basis points on stock trading, 10 basis points on bonds, and 0.5 basis points relative to notional values on derivatives—is capable of generating revenues in the range of 1.2 percent of U.S. GDP. That, again, amounts to about $220 billion for the U.S. economy as of 2015.

6) FINANCIAL MARKET TRADING AND PRODUCTIVE INVESTMENTS

As we have discussed above, the impacts of an FTT will certainly extend beyond its effects on transaction costs, trading volumes, and tax revenue generation. As Keynes and Friedman, among many others, both recognized, the tax could also affect the extent of both speculative trading and productive investments in an economy. The more recent literature has also examined its potential impacts on the liquidity of financial markets, and thereby, echoing Friedman, the capacity of market participants to effectively set prices for financial assets (i.e. to engage in "price discovery"). Further, any decline in market liquidity could also produce a rise in the cost of capital which might then, contrary to Keynes, discourage productive investments. An FTT should also support a more progressive distribution of after-tax income, since the burden of paying the FTT is likely to fall disproportionately on upper-income taxpayers. Examining these issues in depth is well beyond the scope of this paper.[31] But it will be useful to highlight some

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[31] See, for example, the discussions in Matheson (2011, 2012), Schulmeister et al. (2008), Baker and Jorgensen (2012), Burman et al. (2015) on this set of issues. But two of us have recently examined at length the broader set of issues concerned with financial market activity and the performance of the overall economy, including through an extensive literature review, in Pollin and Heintz (2013). Pollin, Baker and Schaberg (2003) also discuss these issues and review some of the main contributions to the literature, as specifically relating to the impact of an FTT.

basic evidence on trading volume in the U.S. stock market along with patterns of productive investment spending. Thus, Figure 8 plots directly the level of stock market trading in the U.S. markets as a share of investment spending by nonfinancial corporations. We report figures for the years 1970 – 2014.

FIGURE 8 BELONGS HERE

To begin with, we see that in the decade 1970-79, the overall level of stock market trading was roughly comparable to the level of productive investments by nonfinancial corporations. That is, for every dollar of new productive investments by nonfinancial corporations, about $1.20 in outstanding corporate shares were traded on the exchanges. However, beginning in the early 1980s, the figure begins rising, and accelerates sharply in the mid-1990s. That is the period of the "dot.com" stock market bubble. The ratio of trading to corporate investment reaches a peak of 30—i.e. $30 dollars in trading for every one dollar in investments in 2000. We see that trading as a share of investment does fall to 21 with the bursting of the bubble in 2001, but rises again thereafter. Overall, as we see, for the full decade 1998-2007 prior to the financial crisis, the total value of stocks traded equaled roughly 22 times the amount of money corporations spent on investment. That same ratio then is sustained for the years 2008 – 2014 subsequent to the financial crisis and Great Recession. That is, on average for the period 1998 – 2014, roughly $22 in stocks were traded on the U.S. exchanges for every one dollar corporations spent on purchasing new equipment and plants. This is an 18-fold increase over where this relationship between stock market trading and investment stood in the 1970s. In other words, since the late 1970s, trading in stocks has dramatically outstripped the amount of money that has been channeled into productive investments by nonfinancial corporations.

This transformation in the extent of stock market trading relative to productive investments is not associated with any increase in productive investments itself. We can see this from the data presented in Table 8. Table 8 presents three data series—fixed investments by nonfinancial corporations relative to GDP, GDP growth itself and the same stock market trading/fixed investment ratio that we have reviewed above. The data are grouped according to business cycles, so that we control, simply, for the purely cyclical movements of these series.[32]

TABLE 8 BELONGS HERE

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[32] The fixed investment/GDP ratio and the GDP growth rate are expressed in quarterly data, while the stock market trading/investment ratio uses annual data.

As we see in the first column of Table 8, the dramatic rise in the market trading/investment ratio is not associated with any significant change in the investment/GDP ratio, as shown both in Figure 8 and column 3 of Table 8.   The ratio rises from 8.6 percent over 1970.4 – 1974.4 to 9.8 percent in the 1975.1 – 82.3 cycle. But the ratio falls thereafter, first modestly, then more substantially.   Over 2009.2 and 2015.4, the ratio is at 8.6 percent, the same figure as the low-point the first half of the 1970s.

Similarly, in column 2 of Table 8, we see no positive association between the rise of stock market trading relative to nonfinancial corporate investment and GDP growth. To the contrary, when the trading/investment ratio peaks over the last two business cycles at between around \$21 - \$24 in trading for every dollar of investment, GDP growth reaches its low points, of 1.7 percent over 2001.4 – 2009.1 and 2.1 percent over 2009.2 and 2015.4.

Of course, many factors beyond the level of stock market trading play significant roles in establishing how nonfinancial corporations choose to spend on producing new productive assets.   Nevertheless, analysts frequently argue that the fundamental underlying purpose of financial market activity is to create a supportive environment for expanding an economy's stock of productive assets—that is, investments in physical plants and machinery that can deliver technical innovations and raise overall productivity. It is clear that the 18-fold increase in trading levels relative to investments has not delivered in advancing that underlying purpose.

7) CONCLUSION

The literature examining various aspects of financial transaction taxes has grown substantially in recent years. This includes four major literature surveys examining the full range of issues at play (Schulmeister et al. 2008, McCulloch and Pacillo 2011, Matheson 2011, 2012, and Arestis and Sawyer 2013).   It also includes a new stream of research examining the recent experiences in the European Union with FTTs (surveyed by Hemmelgarn et al. 2016).

This paper is much more narrowly focused.   It addresses the specific question of the revenue potential of a U.S. FTT, in which the tax rates are set at the levels stipulated by the Inclusive Prosperity Act, a bill currently before both the U.S. House of Representatives and U.S. Senate.   The tax rates proposed under the Inclusive Prosperity Act are: 50 basis points (0.5 percent) for trading stocks; 10 basis points (0.1 percent) for

trading bonds; and 0.5 basis points (0.005 percent) relative to the notional value of derivative assets being traded.

To generate reliable estimates of this revenue potential, one needs to examine three sets of evidence: 1) the levels of transaction costs in U.S. financial markets over time and within the range of financial market segments; 2) the extent of trading elasticities under various trading conditions—i.e. how much, due to the FTT, financial market trading is likely to fall in the U.S. when transactions cost rise; and 3) the current level of trading activity in U.S. financial markets. We have reviewed evidence on all three considerations. Based on this evidence, we conclude that a US FTT operating at the tax rates stated above would generate about $500 billion per year, assuming that no decline in trading volume occurs; and $250 billion per year, assuming that a combination of trading volume decline and tax avoidance generates the equivalent of a 50 percent fall in trading revenue.

We then also consider two factors whose impact will be to reduce the net revenue generated by the Inclusive Prosperity Act. The first factor is the tax credit provision of the bill, which applies to individual taxpayers earning up to $50,000 and joint filers earning up to $75,000. Our high-end estimate of revenues foregone from this provision is about $20 billion per year, which would lower the overall revenue generated to $230 billion. The second factor is the net change in tax revenues that results when $230 billion is transferred out of the financial securities industry and into other activities in the economy. We focus on the effects of transferring funds out of the financial securities industry and into higher education, in accordance with the 2016 presidential campaign proposal of Senator Bernie Sanders. But we also consider these same effects on the assumption that the $230 billion is redistributed equally among all sectors of the U.S. economy. Again, our high-end estimate of the net tax revenues foregone through such a transfer is in the range of $10 billion per year.

Thus, adding up these various considerations, we reach a conservative estimate of the revenue potential of a U.S. FTT at the tax rates stipulated by the Inclusive Prosperity Act as being around $220 billion per year. This amounts to about 1.2 percent of current U.S. GDP.

We then review evidence which shows that this revenue estimate as a share of GDP is consistent with experiences in other countries which have operated with FTTs with similar tax rates and other design features. Most notably here is the UK FTT on stock trading, which has operated since 1986 at the same tax rate of 50 basis points that we are considering here for the U.S. We also show that our revenue estimate as a share

of GDP is closely aligned with the estimates generated by Schulmeister et al. (2008) for a North American FTT whose tax rates, overall, are comparable to those we are examining. Our revenue estimate is about 4 times higher than the recent estimates by Burman et al. (2016) for a U.S. FTT. But Burman et al. do not demonstrate how their revenue estimates are consistent with the range of recent empirical evidence on transaction costs, trading elasticities and trading levels in the U.S. financial market.

Enacting an FTT for U.S. financial markets will produce several additional effects on the economy, as many authors have discussed. These include its impact on the liquidity of financial markets, the cost of capital, the incentives to engage in speculative trading, the capacity of the markets to effectively price financial assets (i.e. "price discovery"), the after-tax distribution of income, and the conditions supporting private spending on productive investment. We conclude this paper through briefly considering only one of these effects, though arguably the single most important one—i.e. the relationship between financial market trading levels and the extent of productive investments by nonfinancial corporations.

Examining even this one question on a full scale is itself far beyond the scope of this paper. Rather, we simply examine the trend over time showing the huge increase in U.S. stock market trading levels relative to investments by nonfinancial corporations in new productive plants and equipment. As we show, stock market trading rose from being about 1.2 times greater than productive investments in the 1970s to averaging about 22 times greater than productive investments from the late 1990s until the present. We also show that this 18-fold increase in the ratio of stock market trading to productive investments is not associated with any increase in the share of productive investments relative to GDP or to the rate of GDP growth itself. To the contrary, considered on a business-cycle to cycle basis, the rise in stock market trading relative to productive investments is associated with declines in both the investment/GDP ratio and the GDP growth rate.

Overall then, we conclude that a U.S. FTT established at 50 basis points for stock trading, 10 basis points for bond trading, and 0.5 basis points on the notional values of derivative trades is capable, conservatively, of generating about $220 billion per year in net revenue within the context of the U.S. economy in 2015, roughly equal to about 1.2 percent of U.S. GDP in 2015. In addition, a U.S. FTT set at these rates should not, on balance, produce any significant negative effects on productive investment spending by nonfinancial corporations.

Appendix 1.
Estimate of Financial Transaction Tax Revenue
from Derivative Trading

Figures on derivative trading within U.S. financial markets are based on data from the Bank of International Settlements (BIS) on-line statistical source, *Global Derivative Statistics* (http://www.bis.org/statistics/about_derivatives_stats.htm). We provide full references to the tables we use in the BIS site in Table A1.1 below.

TABLE A1.1 BELONGS HERE

Exchange-traded market. Turnover figures for exchange-traded derivatives, futures and options, are taken from the BIS exchange-traded derivatives statistics.   We report the annual 2015 figures from this source. The most geographically specific market area for which the BIS reports turnover activity is "North America."   These figures therefore include exchange-traded derivative trading activity in Canada and Mexico as well as the United States.   We assume that trading in the U.S. exchange-traded derivative market amounts to 90 percent of all such trading in all North American markets.   This assumption is likely to understate the proportion of trading in the U.S. as a share of all exchange-traded derivative trading in North America overall.

Over-the-counter market. Turnover figures for over-the-counter (OTC) derivative trading in the United States are taken from the BIS triennial OTC derivatives statistics, produced every three years. The BIS does not provide figures for 2015.   The closest to the annual average figures for 2015 are those reported for April 2016. Those are the figures we report in Table A1.1.

The turnover figures for OTC derivatives include interest rate and foreign exchange derivatives only. According to the BIS statistics, these accounted for over 90 percent of the total outstanding notional value of all derivatives globally in April 2016. Including other categories of U.S.-based OTC derivative trading would therefore increase the revenue estimates for a financial transactions tax, but only to a modest extent.

Appendix 2.
Estimating Foregone Revenue due to
Tax Credit Provision of Inclusive Prosperity Act

The tax credit provision of the Inclusive Prosperity Act for taxpayers whose incomes are up to $50,000 for individuals and $75,000 for those filing joint returns will of course entail revenue losses for the overall FTT.   We derive our estimate of the extent of these revenue losses as follows.   There are 16.2 million households in each of the household income quintiles shown in Table 6.   Therefore, for each of the household groupings, we perform the following calculations separately for their average holdings of stocks and bonds (we find that these households do not hold derivative assets):

- (16.2 million households) x
- (average household asset holdings for either stocks or bonds) x
- (assumed annual turnover rate for household assets = 5) x
- (FTT tax rate on trading—either 0.5% for stocks or 0.1% for bonds) =
- **Revenue Lost from Tax Credit on Stock or Bond Market Trading**

As an example of this set of calculations, consider the tax obligation that would be credited for the stock trading of households in the 0 – 20 percent income quintile.   As we see in Table 6, the average stock holdings for the 16.2 million households in this income grouping is $2,331.   Our calculations for the tax credit for this income quintile is therefore as follows:

*(16.2 million) x ($2,331) x (5—average turnover rate) x (0.5 percent tax rate) = **$944 million***

We perform this same set of calculations for all four of the affected income quintiles, for both the stock and bond holdings for these groupings.   The results of these calculations are shown in Table A2.1 below.

TABLE A2.1 BELONGS HERE

Appendix 3. Data Sources for Figures on Employment/Output Ratios and Compensation in Higher Education and Financial Securities Industries

The most recent 2016 data sources on both employment/output ratios and compensation are the US Bureau of Economic Analysis (BEA) and US Bureau of Labor Statistics (BLS). However, the BEA's 2016 figures aggregate higher education industry into a broader category "Educational Services."   To observe the more specific figures on higher education, specifically "Junior Colleges, Colleges, and University," we had to use the BEA's 2007 Benchmark Input-Output tables,[33] which are more disaggregated. We took values for gross output and compensation by industry from these benchmark tables for higher education and converted these figures in 2015 dollars. Data for full-time equivalent employment in higher education in 2007 are drawn from the US Bureau of Labor Statistics "Current Employment Survey."[34] For the sake of comparability, we also include 2007 values for "Securities, Commodity Contracts Intermediation, and Brokerage" industries.   We present the relevant figures in Table A3.1 below.

TABLE A3.1 BELONGS HERE

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[33] http://www.bea.gov/industry/xls/io-annual/IxI_TR_2007_Detail.xlsx
[34] http://www.bls.gov/ces/data.htm

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**Table 1.   Implicit Transaction Cost Estimate
Bid/Ask Spreads for 1993-2006**

Figures are Effective Spreads for NYSE, Amex, and NASDAQ

From Corwin and Schultz (2012, p. 740)

Mean	238 basis points
Median	129 basis points
Standard Deviation	337 basis points

**Table 2. Total Average Stock Market Transaction Costs
for the UK, Japan, and China**

	Basis points	Years	Source
UK	82.4	1997 – 2014	Elkins/McSherry
UK	159.7	2009 – 2015	ITG
China	77.3	2007 - 2014	Elkins/McSherry
Japan	120.6	2009 – 2015	ITG

Sources: Elkins/McSherry database; ITG (2016).

Note: Our reported ITG figure for the UK includes a 50 basis point mark-up to incorporate the UK FTT costs. ITG researchers explained that their published figures do not include the FTT costs (email correspondence 2/21/16).

TABLE 3. ESTIMATED ELASTICITIES OF TRADING VOLUME WITH RESPECT TO TRANSACTION COSTS FROM INTERNATIONAL MONETARY FUND SURVEY

(Matheson 2011, p. 17; 2012, p. 897)

Source	Country	Market	Elasticity	Measure
Stocks				
Auten and Matheson (2010)	US	All exchanges	-0.04 (-0.3)*	STT
Baltagi et al. (2006)	China	Shanghai, Shenzhen	-1	TTC
Ericsson and Lindgren (1992)**	Multinational	23 exchanges Japan, Korea, Taiwan	-1.2 to -1.5	TTC
Hu (1998)	Multinational	Hong Kong	0	STT
Jackson and O'Donnell (1985)**	UK	LSE	-0.5 (-1.7)	TTC
Lindgren and Westlund (1990)**	Sweden	SSE	-0.9 to -1.4	TTC
Foreign exchange				
Schmidt (2007)	Multinational	EUR, USD, GBP, JPY	-0.4	BAS
Futures				
Chou and Wang (2006)	Taiwan	TAIFEX	-1	STT
	Taiwin	TAIFEX	-0.6 to -0.8	BAS
Wang et al. (1997)	US	S&P 500 Index (CME)	-2	BAS
	US	T-bond (CBT)	-1.2	BAS
	US	Deutschmark (CME)	-2.7	BAS
	US	Wheat (CBT)	0	BAS
	US	Soybean (CBT)	-0.2	BAS
	US	Copper (COMEX)	-2.3	BAS
	US	Gold (Comex)	-2.6	BAS
Wang and Yau (2000)	US	S&P 500 Index (CME)	-0.8 (-1.2)	BAS
	US	Deutschmark (CME)	-1.3 (-2.1)	BAS
	US	Silver (CME)	-0.9 (-1.6)	BAS
	US	Gold (CME)	-1.3 (-1.9)	BAS

*Long-run elasticities in parentheses
** Cited in Schwert and Seguin (1993)

TCC = Total Transaction Costs
STT = Security Transaction Costs
BAS = Bid-Ask Spread

TABLE 4.
ESTIMATES OF ELASTICITY OF EQUITY VOLUME WITH RESPECT TO TRANSACTION COSTS FROM INSTITUTE OF DEVELOPMENT STUDIES SURVEY

(McCulloch and Pacillo 2011, p. 68)

Author(s)	Market		Elasticity	Median Values
Schwert and Seguin (1993)	US security market		-0.25-1.35	-0.8
Baitagi, Li and Li (2006)	Equity	Chinese stock exchanges	-1.0	-1.0
Zhang (2001)	Equity	Shanghai stock exchange market	-0.68	-0.58
Zhang (2001)	Equity	Shenzhen stock exchange market	-0.49	-0.49
Jackson and O'Donnell (1985)	Equity	UK	-0.9-1.65	-1.275
Lindgren and Westlund (1990)	Equity	Sweden (1970-88)	-0.85-1.35	-1.1
				-0.8
		Median		
		Median estimations (without long run)		-0.58

TABLE 5. Potential Revenue Estimates of U.S. Financial Transaction Tax under Alternative Scenarios
Based on 2015 trading levels

Financial Instrument	*1. 2015 Trading Volume*	*2. FTT Tax Rate*	*3. FTT Revenues assuming no trading reduction or tax avoidance*	*4. FTT Revenues assuming tax avoidance and/or trading decline equal to 50% fall in trading.*
1. Stocks	$48 trillion	50 basis points	$240 billion	$120 billion
2. Bonds	$180 trillion	10 basis points	$180 billion	$90 billion
3. Derivatives	$1,525 trillion (notional value)	0.5 basis points	$76 billion	$38 billion
TOTALS	**---**	**---**	**$496 billion**	**$248 billion**

Data Sources and Assumptions
Equities. Data on the daily dollar value of trades for all U.S. stock exchanges in 2015 are taken from Securities Industry and Financial Markets Association (SIFMA).
http://www.sifma.org/research/statistics.aspx.
Bonds. Data on the daily dollar value of trades for U.S. bond markets in 2015 are taken from: Securities Industry and Financial Markets Association (SIFMA). http://www.sifma.org/research/statistics.aspx.
Derivatives. Data on daily turnover based on notional amounts of both exchange-traded and over-the-counter derivatives are taken from the Bank for International Settlements (BIS) database of derivative statistics (http://www.bis.org/statistics/derstats.htm). We used these figures to derive estimates on trading in U.S. derivative markets.   We describe the basis for our estimates in Appendix 1.

Table 6. Financial Asset Holdings for U.S. Households with Average Incomes of $80,000 or Below, 2013

| | Household Income Quintiles | | | |
	0 – 20%	*21 – 40%*	*41-60%*	*61-80%*
Average Household Incomes	$15,200	$30,500	$49,600	$80,000
Percentage Owning Financial Assets				
Stocks	4.2%	5.4%	9.2%	14.5%
Bonds	0.0%	1.0%	1.1%	0.8%
Average holdings for those owning Assets				
Stocks	$55,500	$65,500	$86,000	$98,600
Bonds	0	$203,000	$75,900	$218,200
Total	$55,500	$268,500	$161,900	$316,800
Average holdings for all households, including those without assets				
Stocks	$2,331	$3,537	$7,912	$14,297
Bonds	0	$2,030	$835	$1,746
Total	$2,331	$5,567	$8,747	$16,043

Source: Bricker et al. (2014) http://www.federalreserve.gov/pubs/bulletin/2014/pdf/scf14.pdf

Table 7.
Job Creation, Compensation Levels and Tax Revenues
in the U.S. Economy through Spending on
Higher Education versus the Financial Securities Industry

	(1) **Higher Education**	(2) **Financial Securities**	(3) **Higher Education relative to Financial Securities**
Jobs			
1) Job creation through $1 billion in spending	14,900 jobs	1,800 jobs	+ 13,100 jobs in higher education *(= 8.3 times more jobs)*
2) Job creation through $230 billion in spending *(= row 1 x 230)*	3.4 million jobs	414,000 jobs	+3 million jobs in higher education
Compensation			
3) Average compensation in industry *(in 2015 dollars)*	$43,520	$277,624	+234,104 in financial securities *(= 5.4 times higher average compensation)*
4) Total compensation through $230 billion in spending *(= row 2 x row 3)*	$148 billion	$115 billion	+$33 billion in higher education *(= 29% more compensation)*
Tax Revenues			
5) Tax rate per average employee in sector	14.9%	24.5%	+9.6% in financial securities
6) Total tax revenues from employees through spending $230 billion in sector *(= row 4 x row 5)*	$22.1 billion	$28.2 billion	+$6.1 billion in financial securities *(= 27.6% more revenues)*

Source: See Appendix 3.

Table 8.
Trends in U.S. Nonfinancial Corporate Fixed Investment and GDP Growth

Quarterly Data Grouped by NBER Business Cycles

NBER Business Cycles	Fixed Investment/GDP	Real GDP Growth	Stock Market Trading/Fixed Investment
	(1) *(quarterly data)*	(2) *(quarterly data)*	(3) *(annual data)*
1970.4 – 1974.4	8.6%	2.7%	1.3
1975.1 – 1982.3	9.8%	2.9%	1.3
1982.4 – 1990.4	9.2%	3.6%	3.7
1991.1 – 2001.3	9.4%	3.5%	11.6
2001.4 – 2009.1	8.8%	1.7%	23.8
2009.2 – 2015.4	8.6%	2.1%	20.8

Sources: U.S. National Income and Product Accounts and Flow-of-Funds Accounts
Note: Business cycles are dated according to NBER troughs. The short "double-dip" cycles between 1975.1 and 1982.3 have been combined into one cycle.

Table A1.1
Sources and Calculations for Figures on Derivative Trading
in U.S. Financial Markets

Table		Link to Data Source	Level of Daily Turnover
Exchange-Traded Futures and Options, United States, 2015 (assume = 90% of North American Trading)	Table D1	http://www.bis.org/statistics/d1.pdf	Futures: $2.8 trillion Options: $0.8 trillion
OTC Foreign Exchange Derivatives, USA, April 2016	D 11.2	http://www.bis.org/statistics/d11_2.pdf	$1.3 trillion
OTC Interest Rate Derivatives, USA, April 2016	D12.1	http://www.bis.org/statistics/d12_2.pdf	$1.2 trillion
Daily Turnover TOTALS	----	----	$6.1 trillion
Annual Turnover TOTALS	---	----	$1,525 trillion *($6.6 trillion x 250 trading days)*

Table A2.1
Estimates of Foregone Revenue from Tax Credit
Provision of U.S. FTT

Average asset turnover rate assumption = 5 times asset value

U.S. Income Quintiles	Tax Credit from Stock Trades	Tax Credit from Bond Trades	Total Tax Credits
0 – 20%	$944 million	0	$944 million
21 – 40%	$1.43 billion	$196 million	$1.63 billion
41-60%	$3.20 billion	$68 million	$3.34 billion
61-80%	$5.59 billion	$141 million	$5.73 billion
TOTALS	**$11.2 billion**	**$405 million**	**$11.6 billion**

Table A3.1
Employment/Output Ratios and Employee Compensation Levels for Higher Education and Financial Securities Industries, 2007

	FTE Employees (thousand)	Jobs per $1 billion output	Compensation per FTE
Economic Sectors			
Junior Colleges, Colleges, and University (from 2007 benchmark data and BLS CES)	1.57 Million	14,900	$38,075 *(=$43,520 in 2015 dollars)*
Securities, commodity contracts Intermediation and brokerage (2007)	903,000	1,800	$242,891 *(= $277,624 in 2015 dollars)*

Figure 1. Implicit Transaction Costs:
NYSE/AMEX and NASDAQ Bid-Ask Spreads
From Chung and Zhang (2014)

Figures are Yearly Spreads, 1993 - 2009
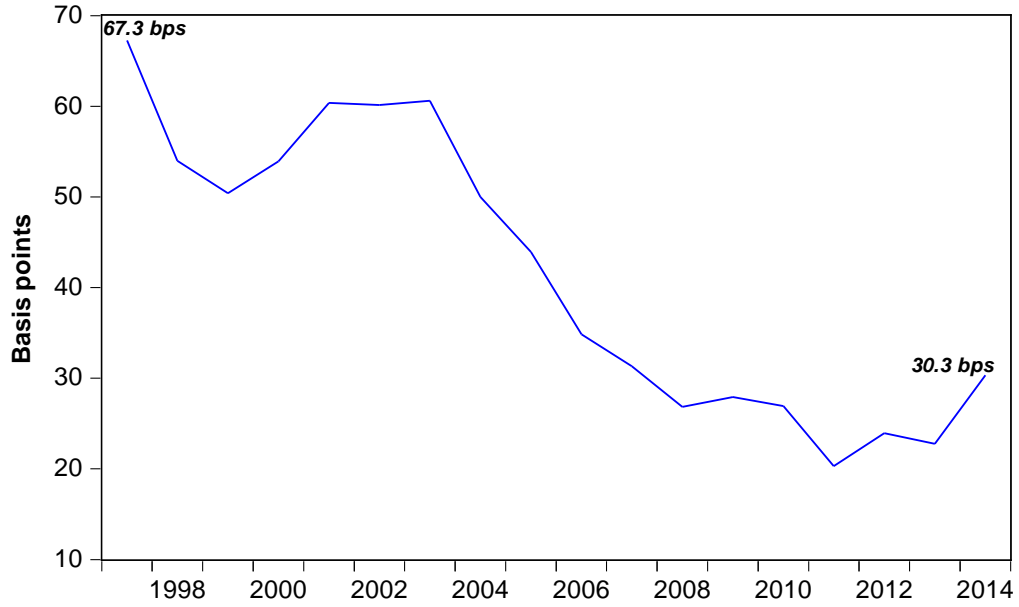*from Center on Research on Security Prices (CRSP)*
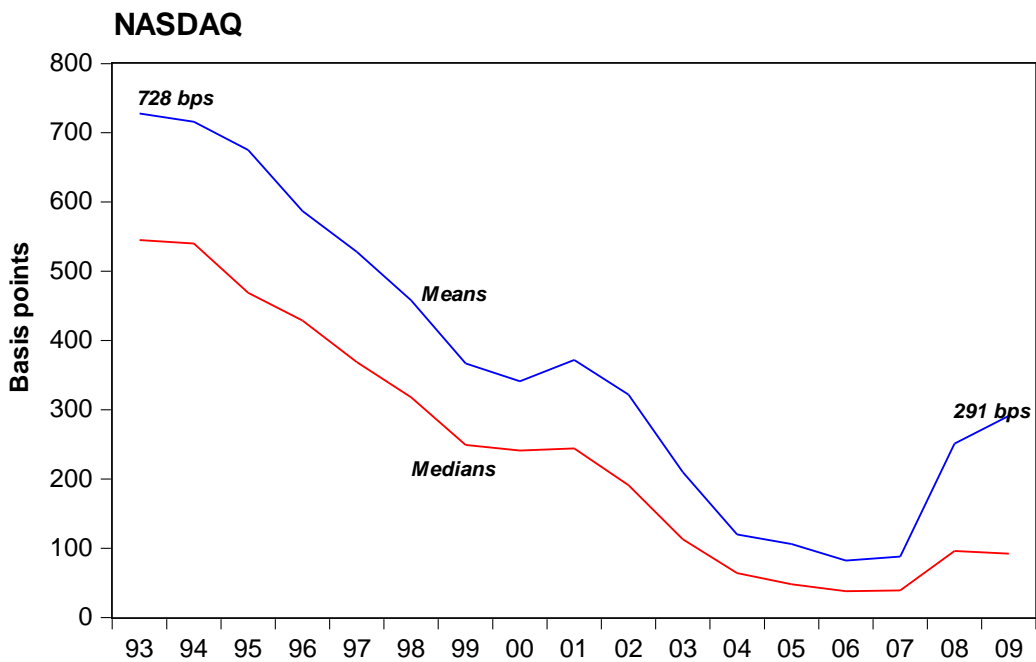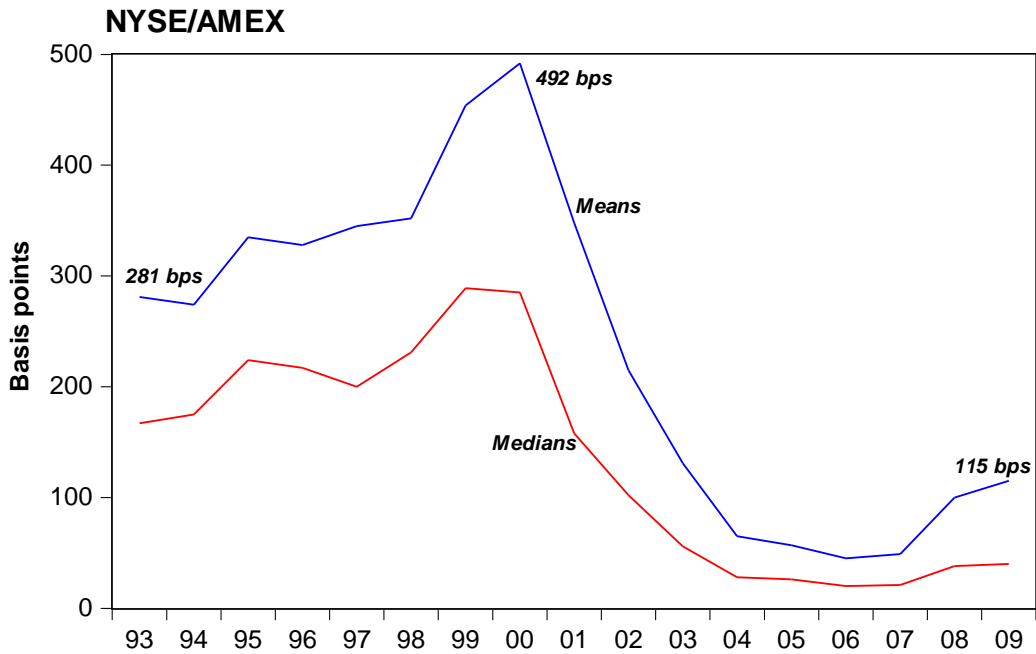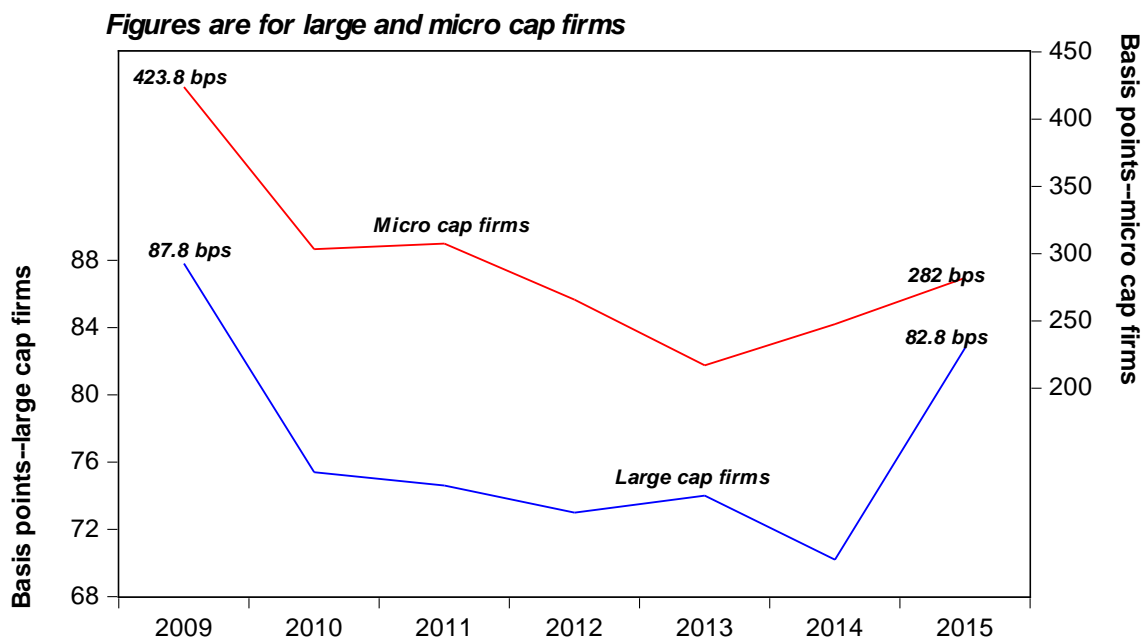

Source: Chung and Zhang (2014)

**Figure 2. Total Transaction Costs:
NYSE/NASDAQ Averages**

Elkins/McSherry database

Figures are yearly averages; reported as one-way costs

Figure 3. Total Transaction Costs for U.S. Stock Market Trades
From ITG Global Cost Review (2016)

Figures are for large and micro cap firms

423.8 bps

Micro cap firms
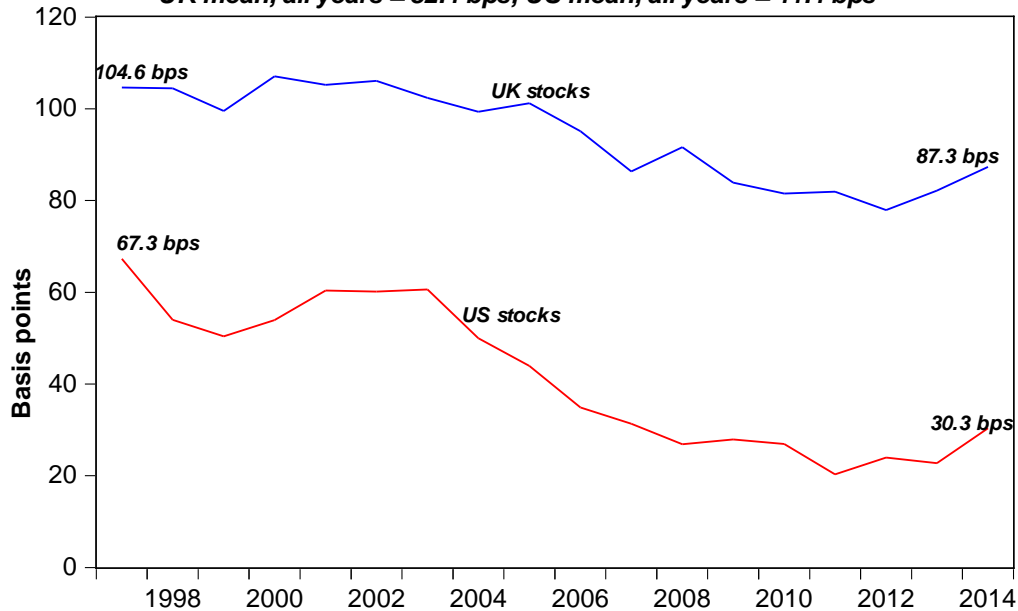
87.8 bps

282 bps

82.8 bps

Large cap firms

Note: Data are for fourth quarter for all reported years, reported as
one-way costs.

Figure 4. UK Stock Market Transaction Costs relative to US Costs
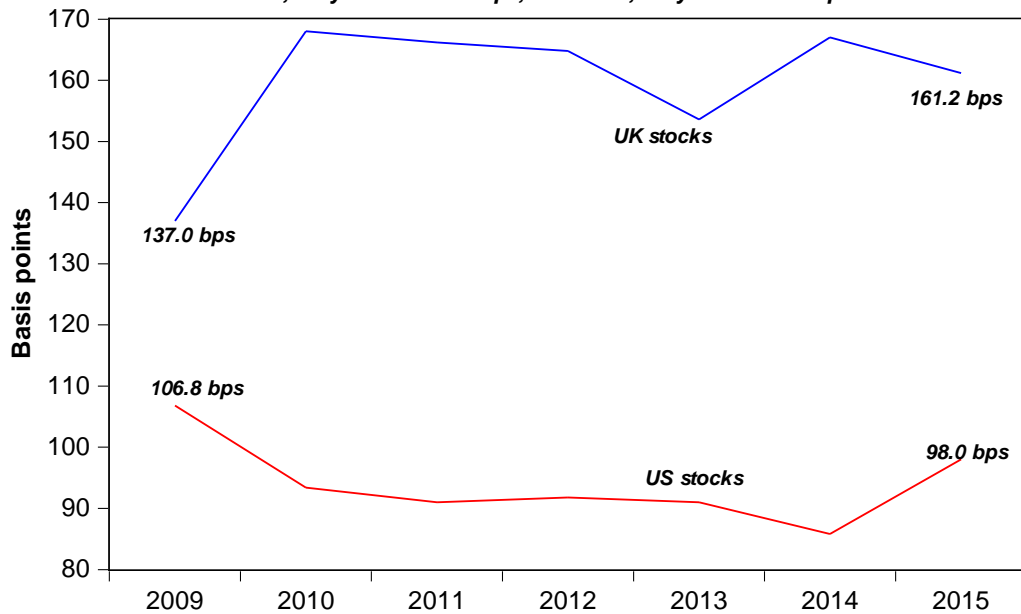
Figures include UK 50-basis point FTT

Elkins/McSherry Total Cost Estimates, 1997 - 2014

UK mean, all years = 82.4 bps; US mean, all years = 41.4 bps

Basis points

104.6 bps

UK stocks

87.3 bps

67.3 bps

US stocks

30.3 bps

1998 2000 2002 2004 2006 2008 2010 2012 2014

ITG Total Cost Estimate, 2009 - 2015

UK mean, all years = 159.7 bps; US mean, all years = 93.3 bps

Basis points

137.0 bps

UK stocks

161.2 bps

106.8 bps

US stocks

98.0 bps
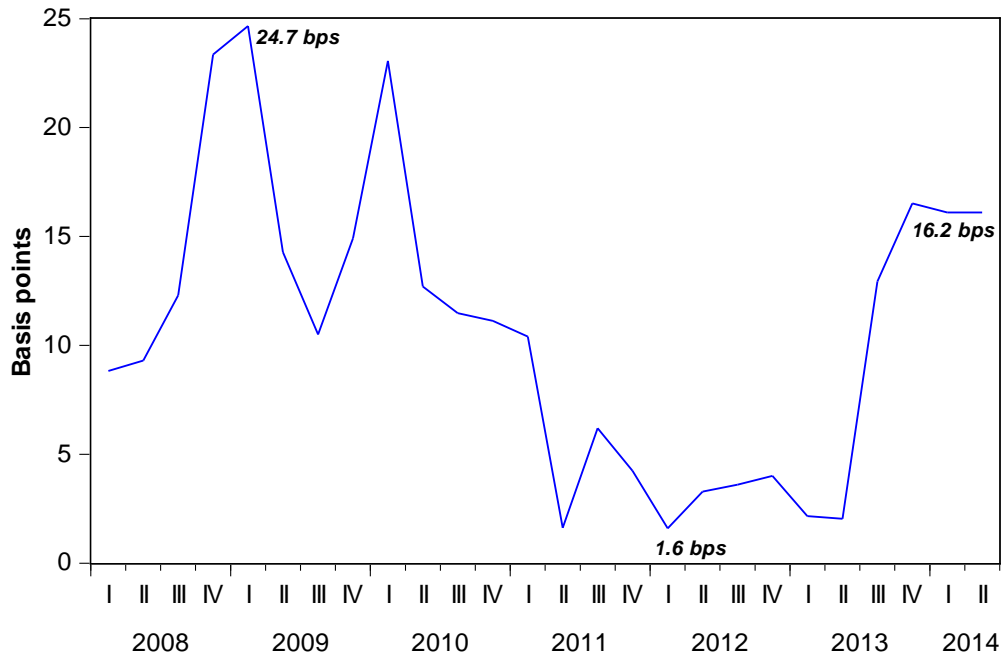
2009 2010 2011 2012 2013 2014 2015

Sources: Elkins/McSherry database; ITG (2016)
Note: Our reported ITG figures for the UK includes a 50 basis point
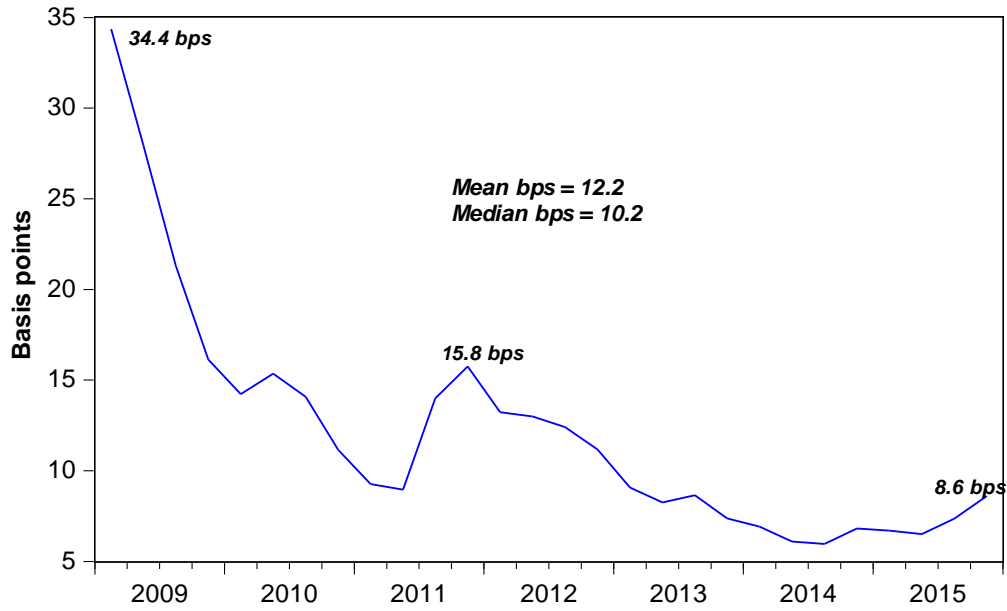mark-up to incorporate the UK FTT costs. See Table 2.

Figure 5. Total Transaction Costs for U.S. Bond Markets
Elkins/McSherry database

Figures are quarterly averages; reported as one-way costs

24.7 bps

16.2 bps

1.6 bps

Basis points

I II III IV I II III IV I II III IV I II III IV I II III IV I II III IV I II
2008   2009   2010   2011   2012   2013   2014

Figure 6. Implicit Transaction Costs for U.S. Bond Markets
MarketAxess Database
**Figures are quarterly averages of bid/ask spreads;
reported as two-way costs**

34.4 bps

Mean bps = 12.2
Median bps = 10.2

15.8 bps

8.6 bps

Basis points

2009   2010   2011   2012   2013   2014   2015

Figure 7. Implicit Transaction Costs for U.S. Credit Default Swap Market

Markit database

Figures are means and medians for one-year maturity instruments; expressed relative to notional values of assets
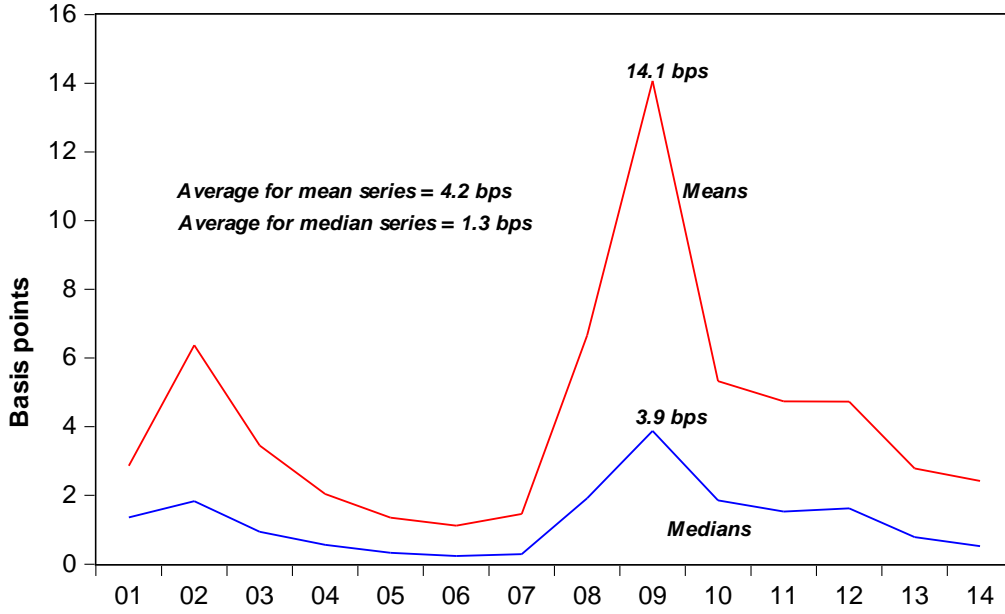
Note: See appendix for details on calculating transaction costs relative to notional values of underlying assets.

Figure 8. U.S. Stock Market Trading relative to Nonfinancial Corporate Fixed Investments in Plant and Equipment, 1970 - 2014
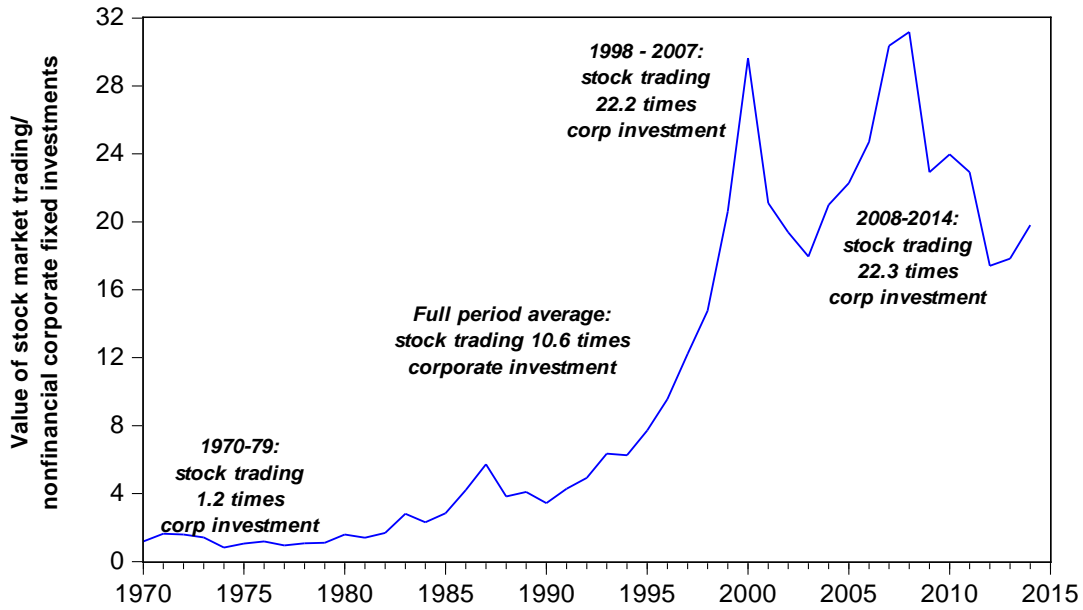
Sources: Securities Industry and Financial Market Association Fact Sheet, 2009 and 2015;
Flow-of-Funds Accounts of U.S. Federal Reserve Board.