Hard facts. Clear stories.

Copenhagen Economics

FINANCIAL TRANSACTION TAX STUDY

Impact on pension savers and the real economy

11 MAY 2021

Copenhagen Economics

AUTHORS

Helge Sigurd Næss-Schmidt
Jonas Bjarke Jensen
Laurids Leo Münier
Astrid Leth Nielsen
Sara Jebbar
Morten Esketveit

PREFACE

Taxes on financial transactions have occasionally been suggested in various forms since Keynes first proposed the idea back in the 1930s.[1] Two arguments for a Financial Transaction Tax (FTT) have typically been asserted:

1) **Raise government revenue** from the financial sector
2) **Deter purported excessive financial trading** to reduce market volatility and prevent the build-up of asset price bubbles

The idea of an FTT regained traction again after the financial crisis as a way of recuperating the fiscal costs of bailing out parts of the financial sector. In the EU, several versions of an FTT were proposed, and a few countries went ahead and adopted an FTT at the national level. However, an EU-wide FTT was never implemented.

Ahead of the German presidency of the European Council, Germany and France once again put an EU-wide FTT on the agenda, and today it continues to be relevant for policymakers throughout Europe. The latest proposal is more limited in scope, and would only cover shares of companies valued above EUR 1 bn in market capitalisation.

Against this backdrop, representatives from the financial sector have asked Copenhagen Economics to revisit the arguments for an FTT. In doing so, we will pay close attention to who eventually will end up paying the bill for an FTT. In other words, we will focus not only on how the financial markets will be affected, but also how end-consumers of the financial markets, i.e. households and companies, will be impacted by the tax.

Thus, this study sets out to answer a number of questions:

- How would an FTT specifically be implemented?
- How effective would an FTT be in raising revenue and preventing excessive financial trading?
- How would an FTT impact the functioning of financial markets and asset values?
- How would an FTT affect the real economy and pension savers?

[1] Keynes, J. M. (1936), The General Theory of Employment, Interest and Money

TABLE OF CONTENTS

LIST OF FIGURES

EXECUTIVE SUMMARY

In the debate around a EU Financial Transaction Tax (FTT), two main arguments have been put forward as reasons for implementing the tax: to *deter purportedly excessive financial trading* and to *raise government revenue*. A first task of this study is to assess these two arguments.

1) Raise government revenue

An FTT's ability to raise significant amounts of tax revenue has been questioned in economic research. The problem is that an FTT will inevitably change the behaviour of financial market participants, leading to fewer trades and thus lower tax revenue than initially forecasted. As a result, achieving a given amount of revenue may require a much higher rate of taxation, and hence even further distortionary effects, than envisaged from the outset.

First of all, the higher cost of a transaction which an FTT entails would reduce the incentive to conduct trades, leading to fewer trades. In particular, the high-frequency trading that has emerged over the past decade will be heavily affected, as these kinds of trades typically operate with very small margins and would thus not be profitable with an FTT.

Furthermore, an FTT will lead market participants to try to avoid the tax, a phenomenon known as leakage. For example, if an FTT is implemented on trades on European soil, European brokers will simply move their trades to foreign exchanges to avoid the tax. This is pronounced for derivative trading, which is less linked to any specific country. Following the implementation of an EU FTT, we expect that 90% of all derivative trading would move abroad.[2]

To put this problem into perspective, we have looked at the revenue impact of an EU FTT of 0.2% on bonds and equities and 0.02% on derivatives. Specifically, we find that the behavioural effects leading to fewer trades will reduce the revenue of an EU FTT by approximately 60%. This means that the FTT would yield tax revenue of some EUR 31 bn, corresponding to 0.5% of total EU-27 public tax revenue.

It should be noted that such revenue estimates come with considerable uncertainties, and greatly depend on how the FTT is specifically designed (we base our estimate on the so-called source principle, i.e., trades carried out on EU marketplaces). In particular, there are uncertainties related to the leakage effect, i.e., to what extent market participants will seek to avoid the tax by trading abroad.

Due to some of the implementational issues and the large leakage effects related to a broad tax base described above, a narrower scope of an FTT, only targeting equities, has more recently been discussed. We find that if such a tax was implemented in the EU, it would lead to revenue of some EUR 5 bn, corresponding to 0.1% of total EU-27 public tax revenue, after accounting for behavioural effects. Here, behavioural effects will have reduced the revenue by some 55%.

[2] As estimated by the European Commission, see European Commission (2011), FTT, Impact Assessment Detailed page 32

2) Deter purported excessive financial trading

Different shapes of this argument have been presented in the debate, often centred around the theory that an FTT will prevent purported excessive financial trading and therefore either reduce short-term market volatility or prevent the build-up of asset price bubbles.

The latter argument has been quite univocally rejected in economic research[3]; an FTT has no impact on the kind of asset bubbles that were among the root causes of the financial market collapse in 2008-2009. Such bubbles are the result of asset prices consistently growing out of sync with fundamentals over a prolonged period. This is due to unrealistic projections of future growth rates and a surplus supply of credit leading to excessive leverage, and has nothing to do with the cost of transactions.

The ability of an FTT to improve short-term market stability is also doubtful. The problem is that an FTT does not distinguish between trades which are stabilising and those which are not.

The second part of the study involves a review of the complexities and distorting effects of an FTT, where we review four issues:

- Challenges in implementation
- Distortions in asset prices and capital allocation
- Impact on household savings
- Impact on investments, productivity and GDP

Key points for the four areas are highlighted below.

Challenges in implementation

The behavioural effects described above, which reduce revenue by some 60%, highlight a more fundamental problem with an FTT; being able to construct a system that can work in practice.

In principle, all financial transactions would be in scope, notably covering trades in all locations and all types of transaction. If not, trading will sweep away from covered trades towards non-covered trades. However, in practice this is hardly possible, as it would require all countries across the globe to support its use and implementation.

Distortions in asset prices and capital allocation

From a financial market perspective, the tax will increase transaction costs, thereby widening bid/ask spreads. Thus, the tax will create a 'no trade zone', where investors will not react to new information by rebalancing their portfolios, because net gains from doing so will be less than the tax itself.

The higher transaction costs from the tax will also lead to a reduction in asset prices. The reason for this is as follows: Investors anticipate eventually selling their assets to rebalance their portfolio, and these sales will now entail additional costs. Therefore, they will be willing to pay less up-front for the asset. The person they sell the asset to will also know that they will have to pay the tax when passing on the asset – and this continues. Thus, once an FTT is implemented, asset prices can be expected to decline by the present value of all future applied FTTs.

---

[3] European Commission (2011), FTT, Impact Assessment Detailed and IMF (2011), Taxing Financial Transactions Issues and Evidence

Exactly how this will impact the value of European stocks will depend on the complex interlinkage of global financial markets.

To simplify matters, we analyse the impact on asset prices for a so-called closed economy, i.e., with the effect isolated to European capital markets. In doing so, we find that the value of traded assets affected by the FTT will decline by some 2.3%, corresponding to approx. EUR 700 bn or 5% of EU GDP.

Having estimated the impact on asset prices allows us to move the analysis to the real-economy side, answering the fundamental question: *Who will pay the bill for a European FTT?*

Impact on household savings

Total equity and bonds owned by households (either directly or indirectly, e.g. through a pension fund) are in the region of EUR 15-20 trillion.[4] Simply transforming the decrease in asset prices to an average per adult EU citizen equates to an impact of approx. EUR 1,000-1,500 per person.

However, the impact is very heterogeneously distributed across European households. Three factors drive this heterogeneity:

- **Age:** The main reason why most people save is to have an income in retirement. Consequently, savings typically peak around retirement age, and people around that age will thus be the most susceptible to the decline in asset prices from an FTT.
- **Composition of savings:** Throughout Europe, the modes of saving are rather different. In some countries, bank deposits are a common way for people to save, and these will not be impacted by an FTT. In others, various investment products such as mutual funds, which involve the trading of financial assets, are used to a greater degree. These will be impacted to a much greater extent by an FTT.
- **Pension system:** Finally, the pension system in a given country is decisive in determining the magnitude of the impact of an FTT. In some countries, public pay-as-you-go pension systems play a big role in providing retirement income, as for example in France. Here, households will be less impacted because pension benefits are not dependent on investment returns. In other countries, private market pension (or semi-private) schemes are predominant, e.g. in Scandinavia and Eastern Europe. Here, future pension benefits depend on the return on assets, so households would be significantly impacted by an FTT.

To illustrate this heterogenous impact, we have constructed two cases of households that will be impacted by an FTT – both close to the retirement age. One couple lives in a country where private market pensions are predominant, and where future benefits depend on the return on assets, e.g. in Scandinavia or Eastern Europe. In this case, we find that this household will experience a capital loss of around EUR 5,900. In the second case, from a country where pay-as-you-go systems play a larger role, e.g. Germany or Austria, but where there is still a private market pension element, the impact will be smaller – in our case around EUR 3,200.

[4] The total value of traded securities in the EU totals EUR 29,500 bn. Part of this is not owned by households, but by e.g. central banks and brokers, and is never fully taken into account by households. Thus, we estimate the securities owned by households to total approx. 17,800 bn.

Impact on investments, productivity and GDP

Over time, the costs of an FTT will gradually shift towards higher funding costs for companies, governments and personal finance (e.g. mortgage loans). When new instruments are issued, investors will price in the cost of future expected FTTs, and thus make the issuer pay for the present value of those future taxes. Furthermore, shareholders can demand that their company price in the higher cost of capital when evaluating a new investment (even though no new debt and equity have been issued).

This shift towards the FTT being paid by issuers also means that future generations of pension savers will be less impacted than in the two cases above, since the bill will fall on companies rather than investors.

The higher funding costs for companies will lead to subdued investments for an extended period. This will reduce productivity and eventually lead to a decline in long-run GDP.

Specifically, we find that an FTT could increase funding costs for companies by 0.6% (0.02%-point),[5] leading to a decline in long-run GDP of 0.2-0.5%.

Concluding remarks: It is hard to see how uncertain tax revenue can justify the implementation challenges and negative costs to the real economy

The FTT is a very complex and potentially costly tax to implement. *First*, it is difficult to ensure that significant tax revenue will be collected as there is high risk that trading volumes simply diminish and that a material volume of remaining activity simply moves away from transactions covered by the tax, either to other countries or to transactions not covered by the FTT. *Second*, there are real-economy costs of implementing the tax – capital losses for households saving up for retirement and a decline in long-run productivity and GDP.

To avoid these repercussions, FTTs that are narrower in their scope of coverage have been suggested. While this would certainly reduce the negative effects, it would also provide the public purse with correspondingly lower tax revenue. Thus, it does not change the fact that an FTT provides an unfavourable trade-off between public revenue and societal costs.

5 Corresponding to an increase in the weighted average cost of capital of 0.05%-points.

CHAPTER 1

DIFFERENT APPROACHES TO DESIGN A FINANCIAL TRANSACTION TAX

Before analysing the effects of a Financial Transactions Tax (FTT), in this chapter we will outline the different ways in which an FTT can be designed, and which implementational challenges this entails. As we will describe, the revenue potential of an FTT as well as the impacts on the financial markets and the real economy depend to a considerable extent on how the tax is designed.

First, we will describe how the design of an FTT will impact the effectiveness of the tax (section 1.1). We will then focus on two key aspects that policy makers have to decide on when considering how to implement an FTT:

- *Scope*: Which assets and market types should be covered by the tax (section 1.2)?
- *Tax principle*: Who should pay the tax? And where in the value chain should it be levied (section 1.3)?

1.1 WHY THE DESIGN OF AN FTT IS RELEVANT

Revenue stemming from an FTT, and any attendant distortions, depends heavily on the design of the tax: Which assets are covered by the FTT?[6] And on whom will the tax be levied – on the exchanges where the trade takes place or on the brokers who carry out the trade? Decisions like this change incentives for the market participants and affect how much they trade – and thus how many trades will eventually become subject to the tax.

Specifically, the impact of the design is determined through three main channels:

1) ***Tax base:*** The more assets that are covered by the FTT, (i.e. a larger tax base), the larger the revenue will be, all else being equal.
2) ***Leakage:*** When a certain jurisdiction implements an FTT, financial market participants are likely to carry out their trades in other jurisdictions in order to avoid the tax. This will lead to fewer transactions being taxed, which will decrease the revenue raised.
3) ***Lock-in:*** An FTT will increase the cost of conducting a trade, and thus induce market participants to carry out fewer trades. This will lead to a decrease in the amount of revenue raised.

These different effects are, of course, heavily co-dependent, and as we will demonstrate, there is a clear trade-off between increasing the tax-base and reducing leakage.

These interlinked effects have been subject to considerable scrutiny by researchers over the years as they investigate whether and how it is possible to design an FTT that raises considerable revenue with minimum leakage and lock-in effects.[7]

---

6 FTTs are usually grouped in four categories: 1) Securities transaction tax (STT), 2) Commodity transaction tax (CTT), 3) Currency transaction tax (CTT), 4) Banking transaction tax (BTT). A STT is the most common type of FTT, and we will therefore use these two synonymously in this study.

7 IMF (2011), Taxing Financial Transactions Issues and Evidence, page 12

In the following, we will look at the most common ways in which it has been suggested that an FTT might be implemented. In doing so, we will assess how the different design elements impact the three main effects described above and, in turn, which implementation difficulties might result. For a more technical and thorough outline of the different options, see Copenhagen Economics (2014): *A European Financial Transaction Tax*.

1.2 SCOPE: DETERMINING WHICH ASSETS AND MARKET TYPES SHOULD BE COVERED

To generate the largest possible tax revenue, policy makers are interested in having the largest possible tax base, i.e., having as many transactions included as possible. Specifically, the design choices include which *assets* and which *markets* to include.

Which assets to include?

Financial assets can be divided into three main categories – equities, bonds and derivatives. Equities and bonds are from a tax base perspective fairly straightforward to include, as they have a clear market value registered for all trades.

For derivatives there is no obvious tax base. Two possibilities have typically been suggested:

- **Market value:** One possibility is to tax the price or premium of the derivative. The problem is that for some derivatives these can be very small. One example of this is an interest rate swap, which is an agreement to exchange a series of fixed interest rate payments for a series of variable payments. Such an agreement will have an initial market value of zero (the market expectation is that neither party will be better off), but the swapped interest rate exposure fits the risk profile of both parties better and thus creates value.[8] Furthermore, the market value of derivatives decreases when the implicit gearing is increased. A product with twice the gearing but with the same underlying asset will correspondingly have half the market value. As such, an FTT based on the market value will impose half the tax on the product with twice the gearing and effectively incentivise the increased use of geared products.[9]
- **Notional value of the underlying asset**. This will provide a clear tax base. However, this decouples the size of the tax with the market value of the derivative, meaning the relative size of the tax will vary greatly. One study finds that the market value of derivatives is typically priced anywhere from 0.1-13% of the value of the underlying asset.[10] For some derivatives a large relative tax will make the trade entirely unfeasible. Furthermore, the notional value might be more difficult to define for some derivatives, again for example for interest rate swaps.[11]

In addition, one can expect very large leakage effects from taxing OTC derivatives, as they are not linked to any specific exchange or trading venue. Thus, it will be very easy for market participants to

8 Copenhagen Economics (2014), A European Financial Transaction Tax, page 26 and IMF (2011), Taxing Financial Transactions, Issues and Evidence, page 29

9 European Commission (2011), FTT, Impact Assessment Detailed, Annexe 7, page 9

10 Copenhagen Economics (2014), A European Financial Transaction Tax, page 19

11 For example, the notional value of an interest rate swap could be divided by an arbitrarily large number and then multiply all its payments by the same number. The payments of the swap would be unaffected, but the tax base would shrink. European Commission (2011), FTT, Impact Assessment Detailed, Annexe 7, page 11

contract the derivative outside the FTT jurisdiction. Consequently, the European Commission expected a 90% reduction in derivatives trade in the EU if an FTT was implemented.[12]

Because of the described issues, derivatives are often left out of the scope of proposed FTTs. Nevertheless, this can *also* lead to large leakage effects; market participants will simply start to trade derivatives instead of buying or selling the actual underlying asset. Imagine that an investor is interested in a large pharmaceutical company. Without an FTT, the investor would have bought shares in the company. With an FTT, the investor will instead buy an option, which is linked to the company's market value, thus avoiding an FTT.[13]

Which markets should be included?

Markets for financial products can be categorised in two dimensions:

- **Primary/secondary:** Primary market transactions are the initial issuance of a financial product while the secondary market covers each subsequent transaction. The secondary market is by far the largest tax base with approx. 97-98% of transactions for bonds and equities, and is thus from a revenue perspective the most relevant.[14] Furthermore, due to a concern about large leakage effects, primary markets are often excluded from FTT proposals.
- **Regulated exchanges/Over-The-Counter:** Regulated exchanges, like the London Stock Exchange, Deutsche Börse etc., are from a compliance perspective fairly straightforward to tax as trades are registered centrally. These cover some 62-84% of all transactions in equities.[15] It is also possible to trade outside regulated exchanges, in the so-called Over-The-Counter (OTC) market. Here, trades happen bilaterally between two parties, where one is usually a broker-dealer but in some instances can also be smaller end-users. These markets are generally less transparent and operate under fewer rules than exchanges.[16] As such, it can be difficult to ensure that all OTC trades are capture by an FTT. However, only taxing regulated exchanges could cause significant leakage effects; market participants will simply start trading OTC to avoid an FTT.

The different implementation trade-offs are summarised in Figure 1.

---

12 European Commission (2011), FTT, Impact Assessment Detailed page 32

13 Similar issues arise with Exchange Traded Funds (ETFs), which pool securities. If they are not subject to an FTT, the tax could be avoided by investing in these products rather than the underlying securities. However, including them can lead to double taxation if both the trades of the fund and the trades of shares underlying the fund are taxed. See IMF (2011), Taxing Financial Transactions Issues and Evidence, page 32

14 European Commission (2011), FTT, Impact Assessment Detailed, page 46

15 European Commission (2011), FTT, Impact Assessment Detailed, Annexe 11, page 8

16 IMF (2011), Taxing Financial Transactions - An Assessment of Administrative Feasibility, page 19

Figure 1
Design of the scope affects the size of the tax base and implementation feasibility

Scope	Small tax base/ Implementation feasible → Larger tax base/ Implementation difficult	
Assets	Equities/Bonds	Derivatives
Markets	Secondary	Primary
	Regulated exchanges	OTC

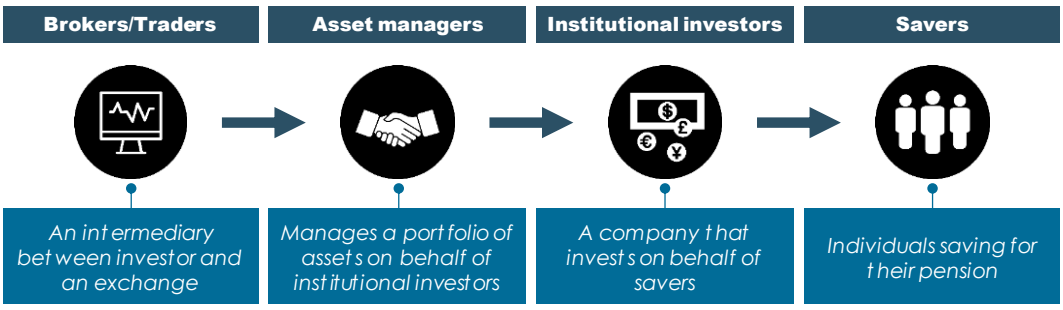
Note: Illustrative framework for the trade-off between tax base and implementation difficulty in design elements.
Source: European Commission (2011), FTT, Impact Assessment Detailed, pages 38-45 and Copenhagen Economics (2014), A European Financial Transaction Tax, pages 12-14

1.3 TAX PRINCIPLE: DETERMINING THE PAYER AND PLACE OF TAX

Once a tax base is decided on, the next step for policy makers is to decide **who** the FTT should be applied to – and **where** it should be applied, i.e., which part of the financial sector's value chain?

Who are the potential candidates to whom the tax could be applied?
In general, if a decision is made to implement an FTT, policy makers face choices in determining how far back in the value chain of asset management the tax should be applied. Ultimate savers (who constitute the tax base) are less mobile and as such less prone to leakage effects. However, from an implementational point of view, these are also the most difficult to tax.

Figure 2
Illustration of a value chain of financial transactions



Source: Illustration by Copenhagen Economics

The first decision policy makers face is which type of entity the tax is levied on:

- **Brokers/traders** operating at the front of the value chain: this will cover about 85% of all transactions. However, European investors and asset managers would be free to choose brokers outside Europe, potentially leading to a risk of considerable tax avoidance since the brokers covered by the tax will incur higher costs and thus need to charge more for their services to be profitable.

- **Underlying asset owners** at the back of the value chain: this might be institutional investors (pension funds, insurance companies) or private individuals managing their own savings. These operators are less mobile (less likely to operate from abroad), which therefore reduces the risk of tax avoidance. However, this will lead to a large number of taxable parties and increase compliance costs when each individual actor is required to report tax payments related to their transactions.

We therefore often end up with a trade-off between leakage and compliance costs; taxing investors at the back of the value chain would minimise leakage, but it is often ruled out in practice due to the large compliance costs.

What part of the value chain could the tax be applied to?

Despite the leakage issues, traders/brokers often end up being the taxable entity due to the significant compliance and implementational issues from taxing further back in the value chain. This leaves the option of how these should be taxed.

In the discussion around an FTT, three options usually emerge:[17]

- **The source principle – 'a tax on exchanges':** Imposes the tax on transactions taking place within the country (or another defined jurisdiction), regardless of the tax residence of the parties involved. This also means that if residents from the taxed country conduct trade in another country, they will not be taxed. This introduces a significant risk of leakage, since brokers will merely trade on exchanges not subject to the FTT. However, it has the advantage that the tax can be collected at central trading or clearing and settlement platforms, and therefore avoids excessive administrative costs resulting from having to identify the parties to a transaction.
- **The residential principle – 'a tax on brokers':** Imposes the tax on transactions on residents of the country (or another jurisdiction), regardless of the country where the financial transaction is deemed to have taken place. This means that if an FTT is implemented in France, and two French brokers trade on an exchange in Brazil, the trade will be subject to the FTT. Obviously, such a principle entails significant implementation issues, as it will de facto require that the country which implements the FTT to collaborate with all the world's exchanges. Therefore, this principle introduces significant administrative and compliance costs. Finally, it does not solve the leakage issue, since domestic asset owners/managers can use brokers from abroad who are not covered by the tax.
- **The issuance principle – 'a tax on issuers':** Imposes the tax on financial transactions of securities issued within the country (or another jurisdiction). Transactions of products already issued when the tax is introduced will be covered by this principle regardless of where they take place. The risk of leakage for these products is therefore low. However, new issuances are likely be moved abroad to avoid the tax. Derivatives in particular are likely to be moved abroad due to not being 'issued' by companies but rather by the contracting parties.[18] This leakage will gradually reduce the tax base and result in a reduction in the revenue raised. Furthermore, it is difficult to implement and enforce an FTT on, for example, two foreign brokers trading a nationally issued product on a foreign exchange.

---

[17] European Commission (2011), FTT, Impact Assessment Detailed, Annex 7, page 5-9

[18] European Commission (2011), FTT, Impact Assessment Detailed, page 42

Figure 3
Design of the tax principle affects the size of leakage and implementation feasibility

Tax principle	Large leakage/ Implementation feasible → Smaller leakage/ Implementation difficult		
Payer	Brokers/Traders		Underlying asset owner
Place	Residential (Brokers)	Sourcing (Exchanges)	Issuance

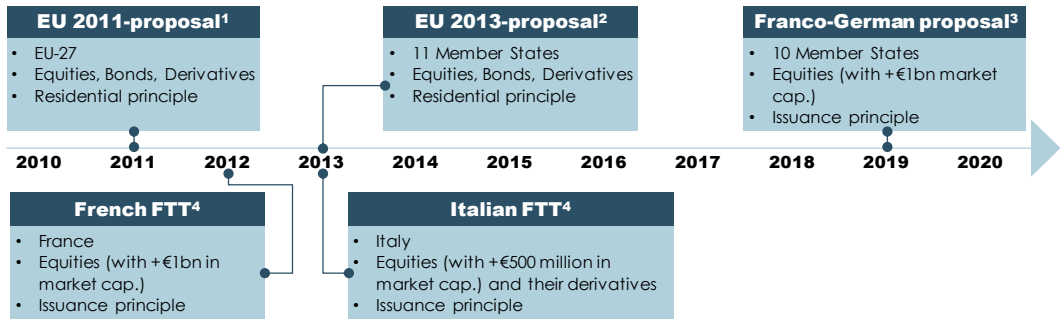
Note: Illustrative framework for the trade-off between leakage and implementation difficulty in design elements.
Source: European Commission (2011), FTT, Impact Assessment Detailed, pages 40-44 and Copenhagen Economics (2014), A European Financial Transaction Tax, pages 12-14

1.4 DIFFERENT OPTIONS IN PRACTICE

Since the financial crisis, there has been considerable debate and negotiation about how to best design an FTT both in the EU and globally. The timeline of the FTT discussion in the EU can be summarised as follows (also cf. Figure 4):

- **2011:** The European Commission proposed an FTT involving all EU countries which would be levied on transactions of equities, bonds and derivatives, based on the residential principle.
- **2012:** Since the proposal did not secure a majority, France and Italy decided to go forward and introduced national FTTs. The taxes were based on a narrower scope of just equities above a fixed market capitalisation, based on the issuance principle.
- **2013:** An enhanced cooperation consisting of 11 member states was investigated, based on a new commission proposal, but was finally abandoned due to a lack of a breakthrough in the negotiations over a number of years.
- **2019:** A Franco-German proposal was presented based on the design of the French national tax. It still involved the 11 member states of the 2013 proposal, but the scope was reduced to only cover equities from companies with more than EUR 1 bn in market capitalisation.

Figure 4
Timeline for proposed and introduced FTTs in the EU since 2010



Source: 1) Press release on 2011 Financial Transaction Tax proposal from European Commission. / 2) Press release on 2013 FTT proposal from the European Commission / 3) Proposal of FTT in 2019 by German delegation in the Council of the European Union. 4) Coelho M. (2014), Dodging Robin Hood - Responses to France and Italy's FTTs

CHAPTER 2

ASSESSING THE TWO MAIN ARGUMENTS FOR AN FTT

Now that we have outlined the different options for how an FTT can be designed, we will turn our attention to investigating the impact of the tax. In this chapter, we will analyse the two arguments which have repeatedly been put forward for introducing an FTT:

1) **Raise government revenue** from the financial sector. In recent years, with the additional argument to cover costs incurred by the financial crisis.
2) **Deter purported excessive financial trading** to reduce market volatility and to prevent the build-up of asset price bubbles.

Based on academic research and the recognised methodology of the European Commission and the IMF, we will assess whether an FTT would deliver the promised benefits.

In section 2.1, we will estimate the revenue impact of the most likely design of an FTT and describe how the potential revenue is diminished by behavioural effects. In section 2.2, we will argue why an FTT is an imprecise instrument for preventing the kind of asset bubbles that led to the financial crisis.

2.1 REVENUE IMPACT

The first argument to assess is the extent to which an FTT is able to generate meaningful tax revenue. As outlined in the previous chapter, the revenue impact depends greatly on the tax design chosen for the FTT.

In our case, we analyse an EU-wide FTT covering all member states, based on the source principle ('a tax on exchanges') which we assess could be feasible to implement in practice, while having a number of associated compliance issues linked to the issues discussed in Chapter 1.

We consider an FTT on equities, bonds and derivatives. For equities and bonds, we use a tax rate of 0.2%, which is also the rate that was proposed in the Franco-German FTT proposal.[20] For derivatives, we use a tax rate of 0.02%.[22]

2.1.1 Revenue estimate

A simple way of calculating tax revenues would be to multiply the taxable amount by the tax rate. Doing so would yield some EUR 75 bn based on a total tax base of EUR 164,000 bn. This is called a static revenue estimate, as it does not include the dynamic effects on the transaction volumes.

However, the revenue estimate is not as simple as this. Implementing the FTT in the EU will result in several behavioural effects as previously described, which will diminish the tax revenue.

---

[20] See https://www.reuters.com/article/eu-tax-germany/germany-sees-15-bln-euro-annual-take-from-new-financial-transaction-tax-idUSL8N28K2BY

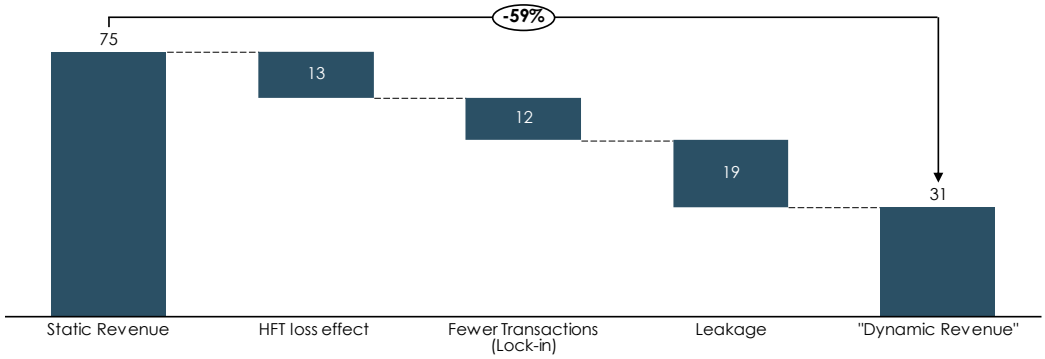
[22] Which is based on the proportionality in tax rates between equities/bonds and derivatives used European Commission Impact Assessment (which used a tax rate of 0.1% for equities and bonds and 0.01% for derivatives). See European Commission (2011), FTT, Impact Assessment Detailed, page 44

Specifically, we need to adjust the revenue estimate for three effects (see description below):

1) Trades on very small margins, including High Frequency Trading (HFT), will evaporate
2) Leakage effects: Market participants start trading abroad
3) Lock-in effects: Fewer trades

These three behavioural effects will have the effect of reducing the tax revenue by approx. 59%, amounting to some EUR 31 bn, or approx. 0.5% of total EU public tax revenue, see Figure 5.

Figure 5
Static and dynamic revenue of an FTT on equities, bonds and derivatives
EUR billion



Note: HFT share of transactions at 33% for equities and derivatives but 0% for bonds. Lock-in elasticity of -1. For equities and bonds: Leakage rate of 10%, transaction cost of 0.6%, tax rate of 0.2%. For derivatives: Leakage rate of 90%, transaction cost of 0.3%, tax rate of 0.02%.
Source: ECB Statistical Data Warehouse (Securities Exchange – Trading Statistics), FESE (European Exchange report) and BIS

1) Trades on very small margins, including HFT, will evaporate

An FTT will increase transaction costs, thereby reducing the number of trades that will be profitable. This implies that trades with very small margins will be unprofitable, and they will therefore completely evaporate from the market. The overall transaction volume in the market will therefore decrease, so we need to adjust for this.

Data for the number of trades conducted on very small margins are not publicly available. Instead, we base our estimates on the share of trades consisting of HFT.[23] HFTs typically conduct a high-volume of transactions as part of market-making or arbitrage strategies with very small per trade margins, with average gross profits of below 0.01% of the value of the transaction.[24] We use HFT as a proxy for trades on very small margins. Such transactions will not be profitable with an FTT of 0.2% (or even with the 0.02% on derivatives). Thus, we expect that such trades – accounting for

[23] In economic research, the study of HFT is still young with no canonical definition. ESMA (2020) reviews some of the methods used to identify HFT firms and states "HFT strategies are often characterised by a very short order lifetime, a high order-to-trade ratio, and an inventory management policy that leads to traders carrying no significant positions overnight".
[24] Menkvald et Boyan (2011), Middlemen in Limit- Order Markets

33%[25] of total value traded in the EU (except bonds[26]) – will be eradicated.[27] This will lead to a reduction in tax revenue of about EUR 13 bn.

2) Lock-in

As for HFT, the FTT will also reduce the volume of ordinary transactions, as it will be more costly to conduct transactions. Specifically, we find that an FTT will increase transaction costs[28] by approx. 33%, which we expect could lead to a reduction in the number of trades of around 25%.[29] This will result in a reduction in the tax revenue of about EUR 19 bn.

3) Leakage

As described, applying an FTT within the EU will lead to trades relocating to regions outside the FTT jurisdiction. This effect is highly uncertain and depends on the design of the FTT.

In the case of an FTT following the issuance principle (as used in France), the geographic leakage effect should, to begin with, be minimal. Investors will be taxed, no matter where they trade. However, this might lead to product leakage, i.e., a shift to options and derivatives (contracted outside EU), whose value is linked to the taxed stocks.

In the case of an FTT following the source principle, the geographic leakage effect may be stronger. When Sweden implemented an FTT, 60% of the trading volume of the 11 most actively traded Swedish shares migrated to London to avoid the 2% tax on equity transactions.[30] The leakage effect in our case will also depend on the final Brexit deal with the EU, i.e., whether the UK will apply the FTT, and the extent to which the Brexit deal allows a shift of trades to the London Stock Exchange.

According to our estimates, we assume leakage effects of 10% for equities and bonds and 90% for derivatives, based on what was used in the European Commission study. As such, the tax revenue is reduced by about EUR 12 bn. In reality, this can vary significantly depending on the scenarios mentioned above.

---

25 Using the average of HFT flag (lower bound) and lifetime of orders (upper bound) approaches. ESMA (2014), High-frequency trading activity in EU equity markets. More recent estimates from the US indicate that the share of HFT trading has been stable between 2010 and 2017 (see https://www.ft.com/content/d81f96ea-d43c-11e7-a303-9060cb1e5f44). Further, we assume that HFT derivative transactions are reduced by 33% and no HFT bond transactions are taking place. (see Haldane, A. (2010), Patience and Finance)

26 Most HFT requires listings in multiple exchanges which is not the case for bonds.

27 A study by the ECB has analysed the impact of the 0.2% transaction tax in France[27]. Even though the French tax effectively exempts intraday trading activities, the HFT activities still decreased by 35% due to the indirect liquidity effect. So, even if a similar exemption is implemented in the future FTT proposal, it is highly likely that HFT will see a decrease as in the French case.

28 Generally, there is uncertainty and regional differences in the actual transaction costs from trading in financial markets. In the study by the European Commission, the transaction cost (prior to the FTT) is assumed to be 0.6% of the traded value for equities and bonds, and 0.3% for derivatives. Two factors have impacted transaction costs since 2011: 1) Technological development leading to lower transaction costs, and 2) New regulations (e.g. PRIIPs and MIFID II) which have increased transaction costs.

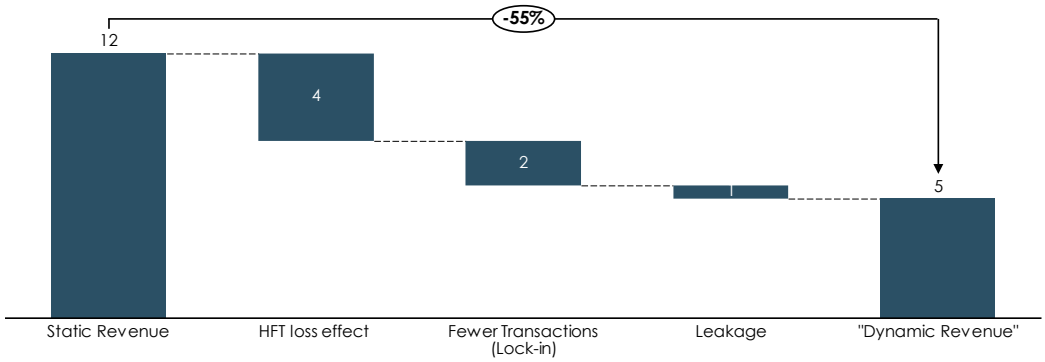
29 This lock-in effect is estimated using an elasticity of -1 for ordinary transactions not including HFT that were accounted for before. An elasticity of -1 means that an increase in transaction costs of 33% (from 0.6% to 0.8% due to the 0.2% FTT) will lead to a decrease in transaction value of 25%.

30 Umlauf (1993), Transaction taxes and the behaviour of the Swedish stock market

2.1.2 Impact on equities

As mentioned, due to the implementation issues relating to a broad tax base, a narrower approach has been discussed in previous years. Therefore, we have also estimated the impact of only implementing an FTT of 0.2% on equity trades in the EU (which gives a tax base of about EUR 6,000 bn). Here, we find a dynamic revenue of some EUR 5 bn, which represents just below 0.1% of total EU-27 public tax revenue.[31] This is about 55% lower compared to the estimated static revenue of EUR 12 bn, and thus a similar dynamic reduction as with the broad tax base, see Figure 6.

Figure 6
Static and dynamic revenue of an FTT on equities
EUR billion



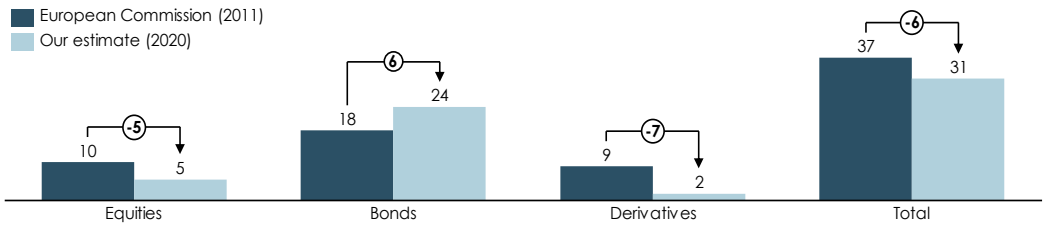
Note: HFT share of transactions at 33%, lock-in elasticity of -1, leakage rate of 10%, transaction costs of 0.6%, tax rate of 0.2%.
Source: ECB Statistical Data Warehouse (Securities Exchange – Trading Statistics)

2.1.3 Comparison with previous FTT revenue estimates

Our estimate of total revenue of EUR 31 bn from an FTT is slightly lower than previous estimates, such as the European Commission Impact Assessment from 2011, which estimated revenue of EUR 37 bn, see Figure 7.[32]

[31] Eurostat (Gov_10a_main)
[32] See Appendix B for a detailed decomposition of the differences between our estimate and the EU impact assessment estimate.

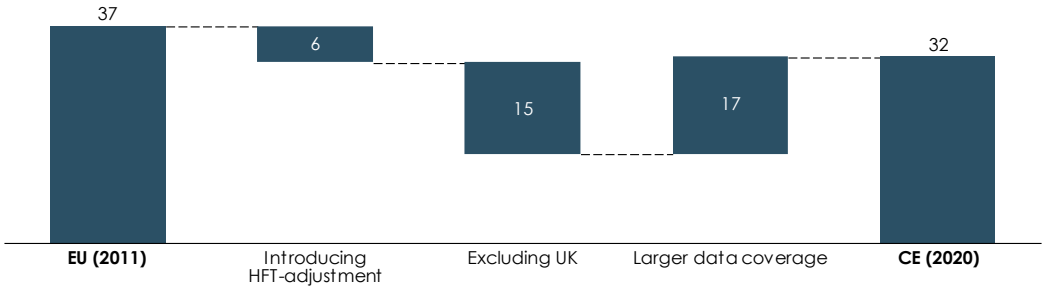
Figure 7
Comparison of revenue estimate to the European Commission Impact Assessment
EUR billion



Note: Leakage rate of 10%, Lock-in elasticity of -1. We have recalculated the European Commission (2011) estimates using the same tax rate as for our estimates. That is 0.2% for equities and bonds and 0.02% for derivatives. The original European Commission estimates were EUR 6 bn for equities, EUR 10 bn for bonds and EUR 5 bn for derivatives.
Source: ECB Statistical Data Warehouse (Securities Exchange – Trading Statistics), FESE (European Exchange report) BIS and European Commission (2011), FTT, Impact Assessment Detailed, Annexe 11, page 17-25

The lower estimate can primarily be attributed to UK leaving EU, which reduces the potential revenue by some EUR 15 bn.[33] We also have estimates available that allows us to adjust for the share of high-frequency trading, that was not available when the European Commission did its study. On the other hand, we have increased the data coverage by including additional exchanges available. This increases the potential revenue by EUR 17 bn.

Figure 8
Decomposition of the revenue estimate difference to the European Commission
EUR billion



Note: Leakage rate of 10%, Lock-in elasticity of -1. We have recalculated the European Commission (2011) estimates using the same tax rate as for our estimates. That is 0.2% for equities and bonds and 0.02% for derivatives. The original European Commission estimate was EUR 21 bn.
Source: ECB Statistical Data Warehouse (Securities Exchange – Trading Statistics), FESE (European Exchange report) BIS and European Commission (2011), FTT, Impact Assessment Detailed, Annexe 11, page 17-25

In Appendix B, we decompose the drivers of difference to the European Commission's study for the three asset classes.

[33] Especially a large share of derivative turnover in EU-28 takes place in UK. However, these have limited impact on the total revenue estimate due to the lower tax rate on derivatives, see Appendix B for further elaboration.

2.2 IMPACT ON FINANCIAL MARKET STABILITY

In the debate about an FTT, one argument which is often put forward in different forms is that an FTT would deter purported excessive financial trading and thus improve market stability. In examining the debate and economic research around an FTT, we have found that this narrative can refer to three rather different aspects of financial market functioning:

- **Asset bubbles:** When asset prices over a longer period become increasingly out of sync with the fundamental value of the asset. From a societal perspective, it is desirable to prevent this, as bursting bubbles can have immense social and economic costs.
- **Short-term price volatility:** Volatility in the price of an asset over a short period of time, typically a day. This type of volatility does not entail major societal costs like asset bubbles. However, it can still be beneficial to mitigate this volatility from a financial market efficiency perspective.
- **Risk-taking:** Providing risk capital to businesses and households, which therefore run a risk, e.g. the company defaulting. This type of risk-taking is typically considered beneficial to society as it provides companies with risk capital to invest, thereby enabling future productivity growth.

We will address each of the three aspects below.

Impact on asset bubbles

An asset bubble is when asset prices over a longer period grow out of sync with the fundamental value of the assets. When this becomes apparent to market participants, the bubble bursts, prices drop and often undershoot the fundamental value.[34]

A very recent example of this is the financial market crash of 2008-2009, with the resulting prolonged recovery period. The crash was preceded by a strong growth in asset prices which – as became crystal clear later – was out of sync with fundamental values.[35]

Such crises have enormous economic and social costs, and it is thus desirable to prevent them from occurring. Consequently, it has been a key aim of financial regulation in recent years to both 1) prevent such bubbles from building up in the first place, and 2) to make the financial system sufficiently robust to withstand such bubbles bursting if they were to occur. Basel III, MiFID II and AIFMD are examples of regulatory packages aimed at preventing such bubbles.

However, an FTT has nothing to do with preventing asset bubbles, as it targets a completely different aspect of the financial market. Asset bubbles build up over longer periods of time – often years – and are based on beliefs about expected growth rates, and often result from a surplus supply of credit leading to excessive leverage. An FTT will make market participants hold on to their assets for longer, but this will not influence the misguided beliefs regarding future growth in asset prices or the surplus of credit which are the root cause of the bubble.[36]

---

34 See e.g. Kiyotaki N. and Moore J. (1997), Credit Cycles, page 212, and Bernanke, B. and Gertler, M (1989), Net Worth and Business Fluctuations, page 28

35 See e.g. Geanakoplos (2010), The Leverage Cycle, page 3

36 IMF (2015), Asset bubbles – Rethinking policy for the age of asset management, page 35

> There is no convincing evidence that security transaction taxes lower short-term price volatility, and high transaction costs are likely to increase it. Current economic thought attributes asset bubbles to excessive leverage, not excessive transactions

Source: IMF (2011), Taxing Financial Transactions: Issues and Evidence, page 37

Impact on short-term price volatility

It is unlikely that an FTT will be beneficial for short-term price volatility. The problem is that the tax will widen the bid/ask-spreads, and thus increase the distance prices need to increase/decrease to make a trade happen. This could lead to bigger jumps in prices when trades occur, i.e. larger volatility in prices.

Furthermore, an FTT is a highly untargeted way to discourage trading activities seen as not being beneficial for the functioning of the market. An FTT has for example been raised as an option to reduce trading driven by short term herding and speculation. The problem is that there is no effective and objective way to make a distinction between productive and potentially unproductive trading.[37]

> Many studies show that an FTT could aggravate volatility (because of a reduction in the number of transactions), creating more room for speculators. An extensive review of the economic literature overall concludes that the effects of the FTT on volatility is largely inconclusive and depends on market structure.

Source: European Commission (2011), FTT, Impact Assessment Detailed, page 52

Impact on risk-taking

The final aspect regarding the impact of an FTT is whether the tax would reduce the incentive for financial market participants to take on risk. The short answer is yes.

An FTT would be a tax on financing companies, which is inherently risky. Changes in the consumer market or business cycle fluctuations can make or break a business, which poses significant risk for investors of losing their invested amount. This is riskier than depositing your funds with a bank.

[37] See for exmaple IMF (2015), Asset bubbles – Rethinking policy for the age of asset management, page 35. The working paper examines the usefulness of using Security Transaction Taxes (STT) to discourage speculative investment. While acknowledging that unproductive trading activity can occur it also concludes that "all STT will impede price discovery to some extent from being incorporated into prices thus reducing the informational efficiency of markets and raising the cost of capital for users" and that "a blanket STT is a crude instrument to mitigate the threat of asset bubbles".

However, this is the very point of capital markets, to finance investments of companies with business risks but also with a potential large upside for both the company and its investor. And, as we will describe in Chapter 3, it is this tax on financing corporate investment that will result in costs to the real economy.

CHAPTER 3

IMPACT ON ASSET PRICES AND FINANCIAL MARKET EFFICIENCY

As described in the previous chapter, an FTT tax will – as with all other taxes – change the behaviour of those it affects. In this chapter, we analyse how these behavioural changes will impact the functioning of the financial markets, and how this in turn will impact asset prices.

In section 3.1, we assess the impact of an FTT of 0.2% on financial market efficiency, and argue that it reduces efficiency. In section 3.2, we estimate the impact on asset values following the implementation of an FTT; we include both equities and bonds. Finally, in section 3.3 we touch upon how derivatives will be affected.

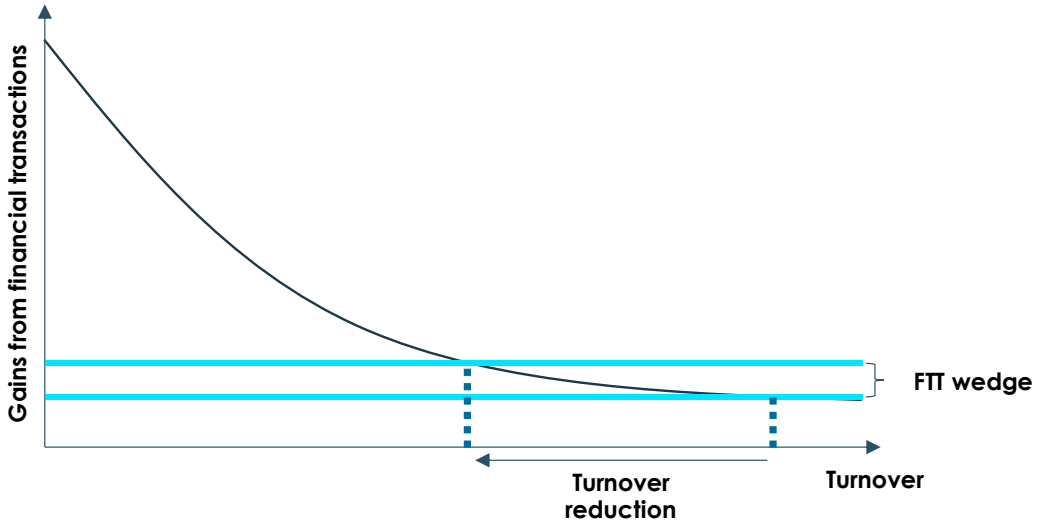
3.1 IMPACT ON FINANCIAL MARKET EFFICIENCY

To understand how an FTT will impact the financial markets, the tax can be seen as a fairly straightforward increase in transaction costs. Based on the European Commission study, we assume that average transactions costs are in the region of 0.6%.[39] With an FTT of 0.2%, transaction costs will increase to 0.8%.

As such, the FTT will act like a wedge, reducing the number of profitable trades, see Figure 9. Thus, the FTT will create a 'no trade zone', where investors will not react to new information by rebalancing their portfolio, because the net gains of doing so will be less than the tax itself.[40]

[39] European Commission (2012), FTT, Impact Assessment Detailed
[40] IMF (2011), Taxing Financial Transactions Issues and Evidence, page 13

Figure 9
Illustration of the effect of an FTT on financial market turnover
Gains from financial market transactions



Source: *Copenhagen Economics (2011), Tax Elasticities of Financial Instruments, Profits and Remuneration, page 24*

3.2 IMPACT ON ASSET VALUES

As discussed in Chapter 1, in its most likely form, the FTT will be collected from financial intermediaries, i.e., brokers – but that does not imply that it is they who will pay the final bill. Instead, the cost burden will move down the value chain (as depicted in section 4.1) to the direct and indirect owners of the traded financial instruments. This could be households which hold shares or bonds as part of their personal savings, or pension funds and banks which are saving on behalf of their customers.

In the EU, the average holding period for a security is around 1.2 years.[41] Excluding behavioural effects, this means that the average asset owners will pay an FTT of 0.2%[42] every 1.2 years.

However, as described in Chapter 2, we expect the FTT to change the behaviour of financial market participants towards conducting fewer trades (via evaporating trades that occur on small margins e.g., HFT, leakage and the lock-in effect). This means that once an FTT is implemented, we expect the average holding period for securities to increase to 2 years.[43]

41 The average holding period is calculated as market capitalisation divided by the annual value of stocks traded on EU stock exchanges, based on 2018 data. Here, we calculate equities and bonds under one.
42 With the same assumptions as in the revenue estimation in Chapter 1.
43 This covers a holding period for equities increasing to 3.1 years, and a holding period for bonds increasing to 1.6 years.

Including behavioural effects, we thus see an increase in annual transaction costs of (0.2%/2=) 0.1%.[44] The annual decline in return on equities on their own will amount to 0.05%, whereas the annual decline in the return on bonds will amount to 0.13%.

Financial markets are forward-looking. This implies that asset prices will react rather strongly up-front to the FTT. In theory, all future expected FTT payments will be priced in the moment the new legislation is approved.[45] The reason is as follows: Investors know that they will eventually have to sell their assets to rebalance their portfolio, and this sale will entail costs. Thus, they will be willing to pay less up front for the asset. The person they sell the asset to will also know that they will have to pay the tax when passing on the asset – and so on.

Taking the net present value of all future FTTs yields a total capital loss of EUR 700 bn, corresponding to 2.3% of total security market capitalisation or approx. 5% of total EU GDP. Looking at individual asset classes, the reduction in value for equities will be 1.1% and 3% for bonds.

44 We follow the formula for the cost of capital presented in the IMF (2011) annexe. As we are looking at the increase in the cost of capital and not at the general cost of capital, the formula collapses to a simpler one which is roughly equivalent to an increase in the firm's discount rate by T/N, where T is the tax rate and N is the holding period.

45 IMF (2011), Taxing Financial Transactions Issues and Evidence

CHAPTER 4

REAL-ECONOMY IMPACT

In the previous chapter, we analysed how an FTT will impact the functioning of the financial markets and lead to a decline in asset prices. However, this is not where the final bill will end up. From a societal perspective, financial markets are merely a medium for the exchange of financial assets and risks – which are all owned by end-customers. Therefore, an FTT will also eventually impact these end-customers. This chapter looks at who these end-customers will be, and thus answer the fundamental question – who will end up paying the bill for an FTT?

In section 4.1, we will describe who will end up paying the bill if an FTT is introduced, and how this will change over time. In section 4.2, we will assess the impact on household savings under the assumption that the impact will be isolated to the European economy. In section 4.3, we will assess the impact on GDP and investments due to the increased funding costs resulting from an FTT.

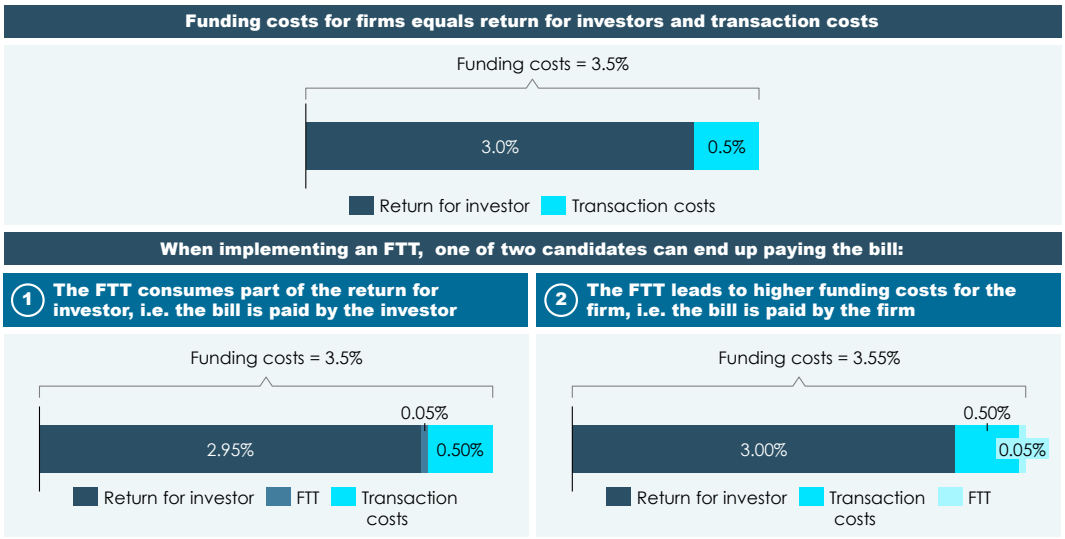
4.1 WHO ENDS UP PAYING THE BILL?

As mentioned, financial markets are a medium of exchange, with the fundamental task of allocating financial resources to agents in need of funding. Thus, it solves the challenge that investors are ready to give up financial resources today against *receiving* a future return. And some other agents want to acquire financial resources today against *paying* a future return.

Investors will often ultimately be households, but will typically not directly be the owner of the assets that are impacted by the FTT: Often a financial institution will administer the savings on behalf of the household, e.g. a pension fund. We will elaborate on this in section 4.2.

Thus, in analysing who will end up paying the bill, we fundamentally have two candidates; those receiving a return, i.e. investors (often households) – and those paying a return (often companies), cf. Figure 10.

Figure 10
Illustration of how the FTT will either impact investors or lead to higher funding costs



In distributing the bill, there will be a clear time dimension; to begin with, we expect primarily investors to be impacted, as described in chapter 3. In time, investors will start to demand a higher return to sustain their 'after-FTT' return, gradually increasing the funding costs for companies.[46] This will, for example, happen when companies issue new debt, or owners will demand that companies include a higher cost of capital when evaluating new investment opportunities.

As we will describe in section 4.3, the higher funding costs for companies will reduce investment for a sustained period, eventually leading to lower productivity and GDP. Also, if the FTT is levied on bonds, governments will start to pay higher funding costs on their debt, and households will pay more for their mortgages.

An important aspect in determining where the bill will end up is which countries will bear the burden. Financial markets are highly interlinked globally. Exactly how the bill will be distributed globally is highly complex, and depends on a range of factors:

- **Through which principle is the FTT being implemented:** For example, if it is being implemented through the issuance principles (i.e. the FTT is levied on companies), European companies are likely to bear the entire burden. If it is implemented through the residential principle however, non-European companies are likely to be affected too, to the extent that European brokers trade non-European companies. As such, the effect of a European FTT can be distributed across companies globally.
- **What are the leakage effects?** With large leakage effects, market participants can circumvent the negative impact of the tax providing a low actual real-economy impact. But then the revenue from the tax will be correspondingly smaller.
- **Is the FTT global or regional?** If the FTT is implemented in all major global financial market hubs, it will be difficult to avoid paying the FTT. This means less leakage, as it will not be possible to avoid the FTT. Finally, the real costs to society will be higher

[46] Standard macroeconomic result

because the impact on funding costs can be reduced by moving the trade to a non-covered transaction (leakage).

As outlined above, it is very difficult to give a precise estimate of how the tax will be distributed globally. In the rest of this chapter, we will analyse the impact of an FTT for a so-called closed economy, i.e., disregarding the highly complex global financial markets' interlinkage. That is, we will assume that the impact of the European FTT is isolated to the European economy and with no leakage.[47]

4.2 IMPACT ON HOUSEHOLDS

As estimated in Chapter 2, the FTT would reduce the value of traded assets by 2.3%. However, a part of this loss will not reach households, since e.g. central banks and brokers own a part of the traded assets as well, which the households never fully account for. This implies that even though households in the end indirectly owns assets possessed by central banks or brokers, most households will not take this complex ownership structure into account. In the following we assume that losses absorbed by e.g., central banks and brokers will not be felt directly by the households.

Total equity and bonds owned by households (either directly or indirectly, e.g. through a pension fund) are in the magnitude EUR 15-20 trillion.[48] Simply transforming the decline in asset prices to an average per adult EU citizen gives an impact of around EUR 1,000-1,500 per person.[49]

However, in reality, the effect will be distributed very heterogeneously across EU households. As we will outline in the following, the impact on each individual will depend on *age*, on the *composition of savings* and on the *pension system* that the household participates in.

4.2.1 Distribution among generations

The most affected groups would typically be households of older generations who have saved up for retirement throughout their working lives.[50] Personal savings typically grow until retirement age, and then fall after retirement, cf. illustration in Figure 11.

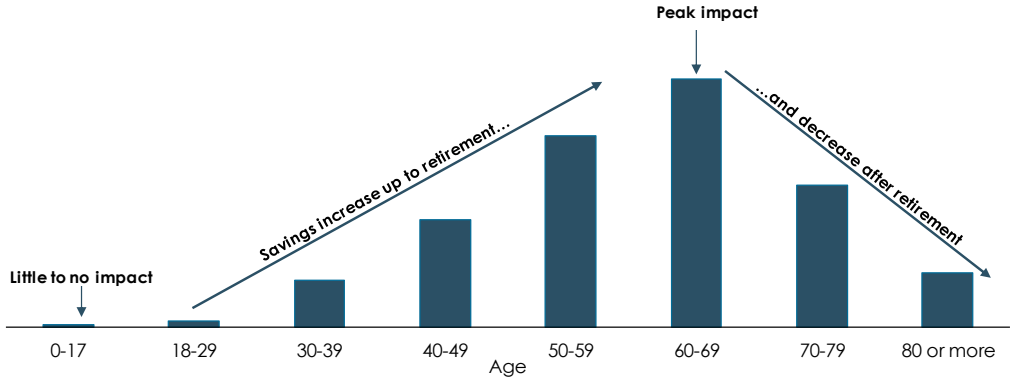
47 Another way of putting it, is that we will analyse the impact of an FTT if it was implemented in all major markets (thus having the same effect in all markets).

48 The total value of traded securities in the EU amounts to EUR 29,500 bn. Part of this is not owned by households, but by e.g. central banks and brokers and is never fully taken into account by households. Thus, we estimate the value of the securities owned by households to be around 17,800 bn.

49 Eurostat, DEMO_PJAN, Population on 1 January by age and sex (accessed 25. November 2020)

50 ECB (2020) New pension fund statistics at: https://www.ecb.europa.eu/pub/economic-bulletin/articles/2020/html/ecb.ebart202007_03~5ead7cb1dc.en.html (accessed 27 November 2020)

Figure 11
Savings increase until retirement age
EUR



Note: Illustrative figure
Source: Copenhagen Economics

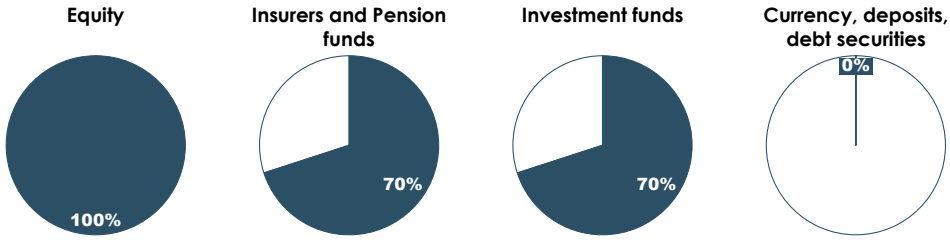
4.2.2 Composition of savings

The extent of the impact of the FTT will further depend on the composition of savings for each household. Households have many savings' channels[51], and those containing an element of traded assets will be impacted:

- **Savings in bank deposits and in real assets (real estate):** Are two very common ways of savings in the majority of EU countries. Obviously, these assets are not traded on the financial markets and will not be impacted by the FTT.
- **Direct investments in traded bonds and shares:** Will on the other hand be affected in full. Again, direct investments are predominant in many countries, particularly in countries such as Estonia, Finland, Spain and Belgium.[52]
- **Savings products and investment funds:** Can include both traded assets as well as non-traded assets, as e.g. private equity. Thus, the impact will depend on the share of traded assets within each fund/product.
- **Pension schemes:** Likewise, they can include both traded and non-traded assets. Furthermore, the impact will depend on the design of the pension schemes as described below.

[51] The European Fund and Asset Management Association (2019), Ownership of investment funds in Europe
[52] Eurostat (2020), Financial balance sheets, online data code NASA_10_F_BS (accessed 14 December 2020)

Figure 12
Indicative security exposures across different modes of saving
Per cent

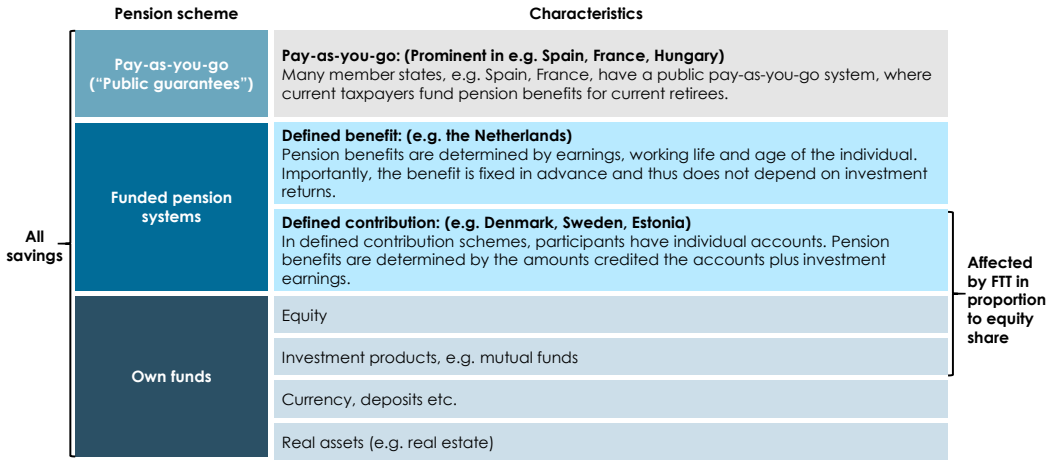


Source: Copenhagen Economics based on OECD, ECB and EFEMA

4.2.3 The relevance of different pension schemes

The impact of an FTT will depend on the terms of the pension scheme that households participate in, cf. Figure 13. Therefore, in the following we will outline the different pensions schemes in place in the EU, and discuss how each will be affected by the FTT.

Figure 13
Illustration of savings



Note: EU member states will typically have a mix of pension schemes in place. Each pension scheme plays an important role in the countries mentioned as examples.
Source: Copenhagen Economics

Broadly speaking, households in private funded pension schemes will be most affected, whereas countries with more generous public pension schemes need to save less for old age and will therefore typically be affected less.

See Appendix E for an outline of the different pension systems in Europe and how each will be impacted by an FTT.

4.2.4 Case studies

As documented above, the impact on EU households is highly heterogenous and depends on various factors. Many will hardly be impacted at all, but some will experience a significant impact. To illustrate this, we have therefore created two different cases for typical EU households, where both comprise 60-year-olds, and are thus close to retirement.

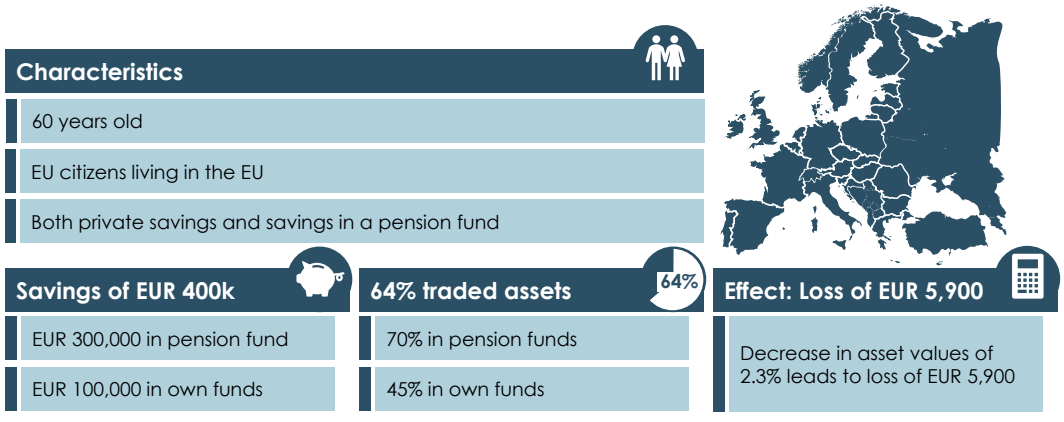
Case study 1: Defined-contribution case

First, we look at a couple living in a country in which a funded defined-contribution pension scheme plays an important role in the pension system. The household could be a typical case in Scandinavia, or in an eastern European country such as Bulgaria or Estonia, where defined contribution schemes are predominant.

The couple has total savings of EUR 400,000, of which EUR 300,000[53] is in their pension fund while the remaining EUR 100,000[54] is in personal savings (excluding real estate). The share of traded assets in the pension fund is around 70%, while they have 45%[55] of their personal savings placed in traded assets.

The decline in the value of traded assets of 2.3% means that the household will experience a loss to their savings of around EUR 5,900.

Figure 14
Illustration of case study 1



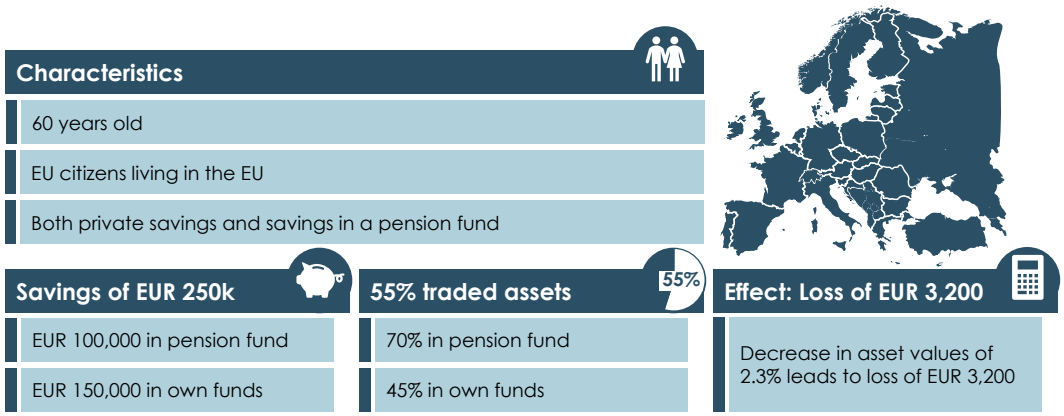
Case study 2: Pay-as-you-go is predominant

In our second case study, we examine how the FTT would affect a couple of the same age, but who live in a country where a public pay-as-you-go pension scheme plays a bigger role in the provision of income in old age. Because of the generous public pension scheme, this couple has saved EUR 100,000 in pension funds. In addition, they have saved EUR 150,000 in their own funds. This could be representative of countries like the Czech Republic and Germany.

53 Based on figures from Insurance and Pension Denmark at https://www.forsikringogpension.dk/statistik/pensionsformuer/ (accessed 17 December 2020)
54 Based on OECD Household financial accounts (indicator) (accessed 30 November 2020)
55 Based on EU27 average of direct and indirect financial holdings of households found in EFEMA (2019) Ownership of investment funds in Europe (page 8)

This means that the FFT will result in the couple seeing a loss of just around EUR 3,200.

Figure 15
Case study 2



Note that the effects are based on an assumption that the entire capital loss falls within the EU. Depending on how the FTT is constructed, it could be that parts of the capital loss would fall outside the EU, i.e., the impact on EU households will be smaller, but households outside the EU would also be affected. As such, this would not change the total societal cost-benefit trade-off.

4.3 IMPACT ON GDP AND INVESTMENTS

As mentioned, in time the costs of the FTT will gradually move from investors to higher funding costs on the issuance side, i.e., governments, companies and individuals (e.g. mortgages customers).

For governments, this will increase the costs of servicing public debt, leaving fewer public funds for public spending, all else being equal. Likewise, mortgage customers will experience an increase in interest expenditures. For companies, the higher funding costs will mean that fewer investments are profitable to undertake. This will lead to a reduction in investments over a prolonged period[56], which will reduce productivity and thus long-run GDP.

Specifically, we find that funding costs for companies will increase by 0.6%, which will reduce long-run GDP by an estimated 0.2-0.5%, corresponding to about EUR 30-60 bn.

See Appendix D for methodology.

[56] Due to diminishing return on capital, the lower investments will gradually increase return on capital, until the long-run level is restored, meaning that investments are back to steady state. On this new steady state path, the capital stock and thus productivity as well as GDP is lower.

REFERENCES

Bernanke, B. and Gertler, M (1989), Net Worth and Business Fluctuations, The American Economic Review, Mar., 1989, Vol. 79, No. 1 (Mar., 1989), pp. 14-31

Copenhagen Economics (2011), Tax Elasticities of Financial Instruments, Profits and Remuneration

Domowitz, I., Glen, J. and Madhavan, A (2001), Liquidity, Volatility and Equity Trading Costs Across Countries and Over Time

ECB (2017), Financial transaction taxes, market compositions, and liquidity

ESMA (2014), High-frequency trading activity in EU equity markets

ESMA (2020), Cross-Venue Liquidity Provision: High Frequency Trading and Ghost Liquidity

European Commission (2011), FTT, Impact Assessment Detailed

Haldane, A. (2010), Patience and Finance, Bank of England (speech)

IMF (2011), Taxing Financial Transactions Issues and Evidence

Keynes, J. M. (1936), The General Theory of Employment, Interest and Money

Kiyotaki N. and Moore J. (1997), Credit Cycles Journal of Political Economy, Vol. 105, No. 2 (April 1997), pp. 211-248

Menkvald et Boyan (2011), Middlemen in Limit- Order Markets

Tobin, J. (1978), A Proposal for International Monetary Reform, Eastern Economic Journal 4(3–4)

Umlauf, S. R. (1993), Transaction taxes and the behaviour of the Swedish stock market

APPENDIX A

REVENUE ESTIMATION METHODOLOGY

In this section, we describe the methodology we used to estimate the revenues expected from implementing an FTT in the EU-27. We based our methodology on the Impact Assessment report made by the European Commission[57] with a couple of adjustments to fit the current market.

First, we calculated the taxable amount for an FTT as the sum of the value of equity, bond and derivatives' transactions across the EU stock exchanges. Then, the static tax revenue is calculated by multiplying the tax base with the tax rate.

However, implementing the FTT rate in the EU will include several behavioural and dynamic changes to the tax base, and will thus reduce the expected revenues through four steps:

1. Static revenue
2. High Frequency Trade Effect
3. Leakage effect
4. Lock-in effect

Having quantified the four steps, we then estimate the total dynamic tax revenue as:

$$\text{Tax revenue} = (1 - \text{E\%})\text{t\%} * \text{taxable amount} * (1 + \frac{t\%}{c\%})^{-\varepsilon}$$

With :

t: financial tax rate

E: Leakage rate that includes fiscal and relocation leakage

c: Transaction cost as a percentage of transaction value

ε: Elasticity that represents the lock-in effect

Step 1: Static revenue

Before calculating the static revenue, we first need the tax base or the taxable amount to apply the FTT to. The tax base is calculated using the transaction values across stock exchanges in the EU-27. The data was gathered from the ECB database from 22 stock exchanges across the EU in 2018 (2017 for bonds).[58] Further, we use data from the Federation of European Securities Exchanges (FESE) to cover derivatives (both options and futures for Stock/Index, Bonds and commodities).

This gives a total value of equity, bonds and derivatives' transactions across the EU-27 of EUR 164,270 bn, which is the taxable amount[59]. We removed the UK from the calculation and assumed that it will not be part of the FTT jurisdiction.

---

57 European Commission (2011), FTT, Impact Assessment Detailed

58 ECB Statistical Data Warehouse, SEE Securities Exchange, Trading Statistics

59 EUR 5,934 bn for equities, EUR 17,815 bn for bonds and EUR 140,521 for derivatives

We based the revenue calculations on the tax rate of 0.2% which was proposed by the German finance minister recently[60] and which was also used for the French FTT in 2012.[61] However, for derivatives we use 0.02% based on a corresponding doubling of the initial proposed FTT by the European Commission in 2011[62].

After multiplying the taxable amount with the tax rate, we get a static revenue of EUR 75.6 bn (see Table 1).

Table 1
Static revenue
EUR billion

	TAXABLE AMOUNT	TAX RATE	STATIC REVENUE
Equities	5,934	0.2%	11.9
Bonds	17,815	0.2%	35.6
Derivatives	140,521	0.02%	28.1
Total	164,270	-	75.6

Source: 1) ECB Statistical Data Warehouse, SEE Securities Exchange, Trading Statistics / 2) FESE, European Exchange report 2018

Step 2: High-frequency trading loss effect

High Frequency Trading has very small margins that are very unlikely to exceed the 0.2% FTT. Estimates suggest that average gross profits from HFT are 0.006%[63]. Therefore, it is to be expected that gains from these trades will be fully eroded by the FTT, and thus they will not take place. Based on this, we remove all high-frequency trades from the taxable base before applying the other effects to the revenue estimation.

This is a new adjustment which was not taken into account in the European Commission study, because the elasticity used there was based on time series covering the period before HFT became widespread in Europe, which was in 2007. ESMA (2014) estimated an average share of HFT in EU equity markets of 43% using the lifetime of orders approach that defines HFT as any order modification that takes less than 100ms. The average share was estimated at 24% using the HFT flag approach, which is based on identifying HFT firms.[64] We assume that the share is 33% as the mid-point of the two approaches.

To estimate the loss of tax revenues from HFT, we multiply the static revenue for equities and bonds by 33% to get an HFT-related revenue loss of EUR 13.2 bn. However, we assume that there is no HFT in bonds since HFT requires listings on multiple exchanges.

60 See https://www.reuters.com/article/eu-tax-germany/germany-sees-15-bln-euro-annual-take-from-new-financial-transaction-tax-idUSL8N28K2BY
61 ECB (2017), Financial transaction taxes, market compositions, and liquidity
62 European Commission (2011), FTT, Impact Assessment Detailed
63 Menkvald et Boyan (2011), Middlemen in Limit Order Markets
64 ESMA (2014), High-frequency trading activity in EU equity markets

Table 2
HFT revenue loss

	STATIC REVENUE	HFT SHARE	HFT REVENUE LOSS
Equities	11.9	33%	3.9
Bonds	35.6	0%	-
Derivatives	28.1	33%	9.3
Total	75.6	-	13.2

Source: 1) ECB Statistical Data Warehouse, SEE Securities Exchange, Trading Statistics / 2) FESE, European Exchange report 2018 / 3) ESMA (2014), High-frequency trading activity in EU equity markets

Having accounted for the HFT, we can continue the estimations based on the assumptions of elasticities and leakage rate that was used by the European Commission study for non-HFT transactions.

Step 3: Fewer transactions – lock-in effect
An FTT will reduce the volume of transactions due to the higher costs of transactions.[65] In the calculation, we used an elasticity of -1 for equities that we estimated in a previous study by Copenhagen Economics[66] and which was also used by the European Commission report in their Annexe 9.

In calculating the lock-in effect, we use an average transaction cost of 0.6% for equities and bonds, and 0.3% for derivatives as used by the European Commission in its 2011 FTT Impact Assessment. This implies an increase in transaction costs from 0.6% to 0.8% for bonds and equities and from 0.3% to 0.32% for derivates due to the FTT. This is a 33% and 7% increase respectively, which will cause the volume of transactions to decrease by 25% and 7% respectively when using an elasticity of -1.

$$\text{Tax revenue} = (1 - \text{E\%})\text{t\%} * \text{taxable amount} * (1 + \frac{t\%}{c\%})^{-\varepsilon}$$

Using the revenue formula with $\varepsilon = 1$, we get a lock-in effect of EUR 12.1 bn.

It is important to note here that we are on the conservative side of the analysis, and we believe that elasticity can be higher than -1. The latest trading cost used in the calculations is estimated to be lower at the moment thanks to technological advancements, with lower entry barriers to equity trading in 2020. In this case, the effect of adding 0.2% to a lower transaction cost will be higher on the volumes of transactions. For example, adding 0.2% to a 0.6% transaction cost represents a 33% increase. However, adding the same FTT to a 0.4% transaction cost is then a 50% increase. And will thus have a stronger effect on the behavioural and dynamic effects of the investors.

[65] IMF (2011), Taxing Financial Transactions Issues and Evidence
[66] Copenhagen Economics (2011), Tax Elasticities of Financial Instruments, Profits and Remuneration

Step 4: Relocation/leakage effect

Several studies found that the FTT leads to the relocation and leakage of several transactions to other markets which are outside the FTT jurisdiction.[67]

The quantification of the leakage rate is highly uncertain since this tax has never been implemented in the EU to empirically analyse it. For this, we use the assumption that the European Commission has used which is a leakage rate of 10% for equities and bonds, and 90% for derivatives. This leakage rate can also be impacted by Brexit, and the ease with which investors can migrate to the London Stock Exchange. It can also vary depending on which principle we use for the FTT implementation policy.

To estimate the marginal leakage effect only, we use the formula for dynamic revenue by setting the leakage rate to E=10% for equities and bonds, and E=90% for derivatives, and use an elasticity of $\varepsilon = 0$.

$$\text{Tax revenue} = (1 - \text{E}\%)\text{t}\% * \text{taxable amount} * (1 + \frac{t\%}{c\%})^{-\varepsilon}$$

We can then isolate a leakage effect of EUR 0.9 bn by subtracting the leakage effect revenue from the revenue that excludes HFT.

Table 3
Leakage effect

	REVENUE EXCL. HFT AND INCL. LOCK-IN	LEAKAGE	REVENUE EXCL. HFT AND INCL. LEAKAGE AND LOCK-IN
Equities	11.9	10%	3.9
Bonds	35.6	10%	-
Derivatives	28.1	90%	9.3
Total	75.6	-	13.2

Source: 1) ECB Statistical Data Warehouse, SEE Securities Exchange, Trading Statistics / 2) FESE, European Exchange report 2018 / 3) European Commission (2011), FTT, Impact Assessment Detailed, Annexe 11, pages 17-25

It is important to note here that the order of the effects will affect their magnitudes. In this case, the leakage effect is marginal to the lock-in effect and will vary based on the order of the calculations.

Step 5: Dynamic revenue

After taking into consideration the dynamic and behavioural effects mentioned above, we estimate the dynamic revenue that the policy makers will collect from the FTT implementation.

$$\text{Tax revenue} = (1 - \text{E}\%)\text{t}\% * \text{taxable amount} * (1 + \frac{t\%}{c\%})^{-\varepsilon}$$

[67] IMF (2011), Taxing Financial Transactions Issues and Evidence

Table 4:
Dynamic revenue parameters
EUR bn

	TAX RATE (t%)	LEAKAGE RATE (E%)	TRANSACTION COSTS (c%)	ELASTICITY (ε)	TAXABLE AMOUNT	DYNAMIC REVENUE
Equities	**0.2%**	10%	0.6%	1	**5,934**	**5.4**
Bonds	**0.2%**	10%	0.6%	1	**17,815**	**24.1**
Derivatives	**0.01%**	90%	0.3%	1	**140,521**	**1.8**

Source: 1) ECB Statistical Data Warehouse, SEE Securities Exchange, Trading Statistics / 2) FESE, European Exchange report 2018 / 3) ESMA (2014), High-frequency trading activity in EU equity markets / 4) European Commission (2011), FTT, Impact Assessment Detailed, Annexe 11, pages 17-25

The dynamic revenue is estimated to be EUR 5.4 bn, which represents 0.038% of EU-27 GDP given that the GDP in 2019 was EUR 13,900 bn.[68]

Table 5:
Dynamic revenue in EUR billion

	STATIC REVENUE	HFT LOSS EFFECT	LOCK-IN EFFECT	LEAKAGE EFFECT	DYNAMIC REVENUE
Equities	**11.9**	3.9	2.0	0.6	**5.4**
Bonds	**35.6**	-	8.9	2.7	**24.1**
Derivatives	**28.1**	9.3	1.2	15.9	**1.8**
Total	**75.6**	13.2	12.1	19.2	**31.2**

Source: 1) ECB Statistical Data Warehouse, SEE Securities Exchange, Trading Statistics / 2) FESE, European Exchange report 2018 / 3) ESMA (2014), High-frequency trading activity in EU equity markets / 4) European Commission (2011), FTT, Impact Assessment Detailed, Annexe 11, pages 17-25

[68] Eurostat, Main GDP Aggregates (t_nama_10_ma)

APPENDIX B

DECOMPOSITION OF REVENUE ESTIMATE

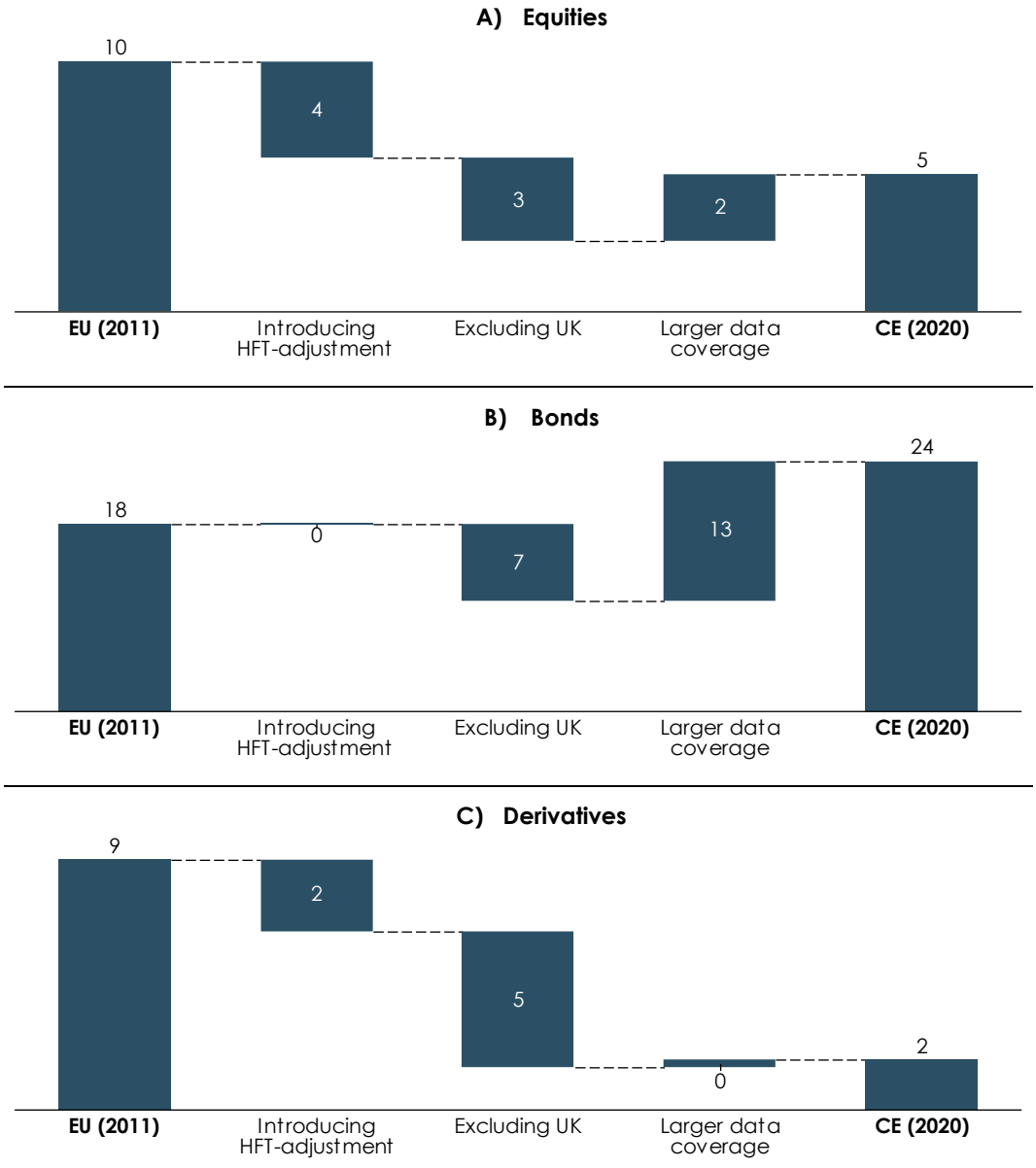
We have compared our revenue estimates to the estimates obtained by the European Commission Impact Assessment of 2011 (abbreviated EU (2011) in the figures below).[69]

We decompose the difference between the estimates into each driving factor. This provides us with three driving factors:

1) Introducing HFT adjustment (not on bonds)
2) Excluding UK
3) Larger data coverage

[69] European Commission (2011), FTT, Impact Assessment Detailed, Annexe 11, page 17-25

Figure 16
Decomposition of CE (2020) and EU (2011) estimates – equities, bonds and derivatives
EUR billion



Note: Leakage rate of 10%, lock-in elasticity of -1. We have recalculated the European Commission (2011) estimates using the same tax rate as for our estimates. That is 0.2% for equities and bonds and 0.02% for derivatives. The original European Commission estimate was EUR 5 bn for equities, EUR 10 bn for bonds and EUR 5 bn for derivatives.

Source: ECB Statistical Data Warehouse (Securities Exchange – Trading Statistics), FESE (European Exchange report) BIS and European Commission (2011), FTT, Impact Assessment Detailed, Annexe 11, pages 17-25

APPENDIX C

ASSET PRICES AND LIQUIDITY PREMIUM ESTIMATION METHODOLOGY

The proposed FTT will lead to market participants charging a premium when trading the taxed assets. Purchasers of assets will pay higher costs to acquire a security and will require a higher return from holding it.

In calculating the liquidity premium/the cost of capital, we follow the IMF (2011) l[70]. Note that what we calculate is the *increase* in the cost of capital, not the general cost of capital which the IMF lays out.

Following the IMF, the increase in the cost of capital is roughly equal to an increase in the firms' discount. The liquidity premium is thus calculated as:

$$\theta = \frac{1}{N} * T$$

With:
θ: liquidity premium/increase in cost of capital
N: holding period
T: tax rate

The price premium will lead to a decline in asset values. The decrease in asset price will not just be the tax percentage the investor will have to pay when selling the asset, but (assuming markets have perfect foresight) the future discounted value of the loss the tax will create.

To estimate this, we use a method proposed by the IMF (2011)[71]:

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

With:
Δ : reduction in a security
R : the gross discount rate. The difference between the discount rate and the growth rate of dividends, i.e. r-g
T: tax rate
N: holding period

Imposing an FTT will lead to changes in the behaviour of investors, thereby affecting the holding period of assets. The holding period of a stock is defined as the market capitalisation divided by the annual value of the stocks traded. To find the new holding period, adjusted for behavioural effects, we go through the following steps:

1) HFT effect
2) Leakage effect

[70] IMF (2011) annexe page 40
[71] IMF (2011) page 14

3) Fewer transactions, lock-in effect

Having quantified the three steps, we get an increase in the holding period for securities from 1.1 years (in the EU in 2018) to 2 years. Assuming R=4% and T=0.2%, we get a reduction in the value of a security of 2.3%. The reduction in the value of equities will amount to 1.1%, whereas the reduction in bonds taken upfront will be 3%.

The price premium when trading securities is 0.1%. The decline in equities separately will amount to 0.05%, whereas the annual decline in the return on bonds will amount to 0.13%.

APPENDIX D

GDP IMPACT

The FTT will lead to an increase in the cost of capital, which in turn will lead to a decrease in GDP. In this section, we will describe our methodology to calculate the impact on:

1) Cost of capital
2) GDP

C.1 IMPACT ON COST OF CAPITAL

In this section, we describe the methodology used to measure the impact on the cost of capital (weighted average cost of capital (WACC)).

To calculate the average EU-27 parameters of the WACC, we retrieved non-financial corporate data from Refinitiv Eikon.[72] The data included 3,057 public and private companies in the EU-27, excluding the UK, with specific parameters per company on cost of debt, cost of equity, debt-to-equity ratio, total equity, total assets and market capitalisation.

Using the formula below, we follow four steps to estimate the impact on cost of capital:

$$\text{WACC} = \frac{\text{D}}{\text{E}+\text{D}}\text{r}_\text{d} + \frac{\text{E}}{\text{E}+\text{D}}\text{r}_\text{e}$$

Step 1: Calculate cost of debt r_d and cost of equity r_e
Step 2: Calculate the share of debt $\frac{\text{D}}{\text{E+D}}$ and share of equity $\frac{\text{E}}{\text{E+D}}$
Step 3: Calculate the weighted average cost of capital (WACC) before FTT
Step 4: Impact on the WACC after FTT

Step 1: Calculate cost of debt and cost of equity

Cost of debt:
According to Refinitiv Eikon, cost of debt r_d is calculated by adding weighted cost of short debt and weighted cost of long-term debt based on the 1-year and 10-year points of an appropriate credit curve. To calculate an average EU-27 cost of debt, we weight the cost of debt of every company *i* from the database by its total debt $\text{r}_\text{d} = \frac{\sum_\text{i}^\text{N}(\text{r}_\text{d}*\text{D})_\text{i}}{\sum_\text{i}^\text{N}\text{D}_\text{i}}$.

This gives an average EU-27 cost of debt of $\mathbf{r_d = 1.0\%}$

Cost of equity:
According to Refinitiv Eikon, the cost of equity r_e is calculated by multiplying the equity risk premium of the market by the beta of the stock plus an inflation-adjusted risk-free rate.

Equity risk premium is the expected market return minus the inflation-adjusted risk-free rate.

To calculate an average EU-27 cost of equity, we weight the cost of equity of every company *i* from the database by its total equity $\text{r}_\text{e} = \frac{\sum_\text{i}^\text{N}(\text{r}_\text{e}*\text{E})_\text{i}}{\sum_\text{i}^\text{N}\text{E}_\text{i}}$.

[72] Thomson Reuters Eikon. (2020). Screener Company data, Retrieved from https://eikon.thomsonreuters.com/index.html

This gives an average EU-27 cost of equity of $\mathbf{r_e = 6.2\%}$

Step 2: Calculate share of debt and share of equity

The Eikon database provides companies' data on their debt-to-equity ratios. We use this to calculate the debt share and equity share of every company. Then we weight the shares using the sum of total debt and total equity of all companies. This gives an EU-27 average of:

$$\boldsymbol{Share\ of\ debt} = \frac{\boldsymbol{D}}{\boldsymbol{E+D}} = \mathbf{51\%}$$

$$\boldsymbol{Share\ of\ equity} = \frac{\boldsymbol{E}}{\boldsymbol{E+D}} = \mathbf{49\%}$$

Step 3: Calculate WACC before FTT:

We use the parameters calculated above to calculate the average EU-27 WACC for non-financial corporations before the introduction of the FTT using the formula below:

$$\text{WACC} = \frac{\text{D}}{\text{E}+\text{D}}\text{r}_\text{d} + \frac{\text{E}}{\text{E}+\text{D}}\text{r}_\text{e} = 3.6\%$$

Table 6:
WACC parameters calculation for average EU-27 non-financial corporations

COST OF DEBT	COST OF EQUITY	DEBT SHARE	EQUITY SHARE	WACC
$\mathbf{r_d = 1.0\%}$	$\mathbf{r_e = 6.2\%}$	$\frac{\boldsymbol{D}}{\boldsymbol{E+D}} = \mathbf{51\%}$	$\frac{\boldsymbol{E}}{\boldsymbol{E+D}} = \mathbf{49\%}$	**3.6%**

Source: Thomson Reuters Eikon

Step 4: Impact on WACC after FTT

The introduction of the FTT will lead to an increase in the cost of capital through two channels:

- Increase in cost of equity
- Increase in cost of debt

Increase in cost of equity:

As described in the previous chapter, introducing the FTT will lead to an increase in the cost of equity of 0.05%-points for listed equities due to the illiquidity of assets because of the FTT. This is equivalent to a 0.02%-point increase in the cost of equity for all equities in the EU-27 given that the listed equities only represent around 35% of the total. The share of listed equities was calculated by dividing listed equity shares corporations by the total equities of non-financial in EU-27.[73]

Increase in cost of debt:

On top of the increase in the cost of equity, the WACC will also be affected by an increase in the cost of debt. The main driver of this increase is the increase in the cost of issuing bond debt. When levying an FTT, the dynamic effects will increase the holding period of bonds. This will lead to lower liquidity in the bond market and increase the liquidity premium required by investors in bonds. We estimate the increase in the liquidity premium to be 0.13% for bonds in Appendix C. However, the

[73] Eurostat Financial balance sheets [NASA_10_F_BS]

effect on the cost of debt from this increase will be diluted by the share of debt financing from bonds which is estimated at 15%. As such, the increase in the cost of debt will be 0.02%-points.

Further, an increase in the cost of equity of financial institutions will also be passed on to non-financial institutions through an increase in the cost of debt financing through loans. As such, an increase in the cost of equity of 0.05%-points will increase the cost of debt by 0.004%-points.

Increase in WACC:

We have found two channels to increasing the WACC from an FTT: 1) An increase in the cost of equity of 0.02%-points and 2) an increase in the cost of debt of 0.024%-points. Using the formula for calculating the WACC and the shares of debt and equity in financing, we can calculate the WACC after an FTT is introduced to be 3.58%. This corresponds to an increase of 0.6% in the WACC.

Table 2
Increase in WACC from the increases in cost of equity and debt

	AVERAGE EU-27
WACC - Before FTT	3.56%
WACC - After FTT	3.58%
ΔWACC percentage change %	0.6%

Source: Thomson Reuters Eikon and Eurostat Financial balance sheets [NASA_10_F_BS]

C.2 IMPACT ON GDP

The increase in the cost of capital (WACC) shown in the methodology above leads to a decrease in the capital stock, which in itself leads to a decrease in GDP:

We calculate the impact on GDP using two different methodologies:

1. Methodology 1: using our structural macro-economic model [74]
2. Methodology 2: using elasticity from Cobb-Douglas production function from European Commission study[75]

Main approach: using our structural macro-economic model

To estimate the macroeconomic costs, i.e. the impact on GDP and investments, we use a model developed by Meh and Moran (2010). It is a so-called Dynamic Stochastic General Equilibrium (DSGE) model, which is a structural macroeconomic model. The model is calibrated to recent European financial sector data, and we used a DSGE model to measure the impact of the simulated financial friction on capital requirements and thus on GDP. For a more thorough description of the model, see: Copenhagen Economics (2019) '*EU Implementation of The Final Basel III Framework*'.

74 Described in detail in Copenhagen Economics (2019), EU Implementation of the Final Basel III Framework

75 European Commission (2009), The Economic Impact of the Commission Recommendation on Withholding Tax Relief Procedure and the FISCO Proposals

We follow a three-step procedure to calculate the impact on GDP:

Step 1: Calculate the impact on capital stock from an increase in cost of capital:

In the model, we introduce financial frictions on the capital markets to create monetary costs of credit previsions. This experiment somewhat resembles the introduction of a financial tax, making it suitable for our purpose.

Based on this experiment, we can estimate an elasticity on the capital stock from increasing capital costs. Specifically, we find that an increase in funding costs of just over 0.6% leads to a decrease in the capital stock of 1.5%, i.e. an elasticity of around 2.5.

Step 2: Calculate the impact on the capital stock of the FTT:

Using the elasticity above of -2.45, we can calculate the impact on capital due to the FTT.

We have previously calculated that the WACC will increase by just below 0.6% after implementing the FTT. This will lead to a decrease in capital by 1.4%.

Step 4: Calculate the impact on GDP from the lower capital stock:

Using a stylised fact following a long-run production function from Solow and DSGE models, the relation between the capital stock and GDP is constant. Since capital stock is three times the GDP in the EU-27[76], the decline in GDP is 1/3 the decline in capital.

This means the decrease in the capital stock will lead to a decrease in GDP of some 0.5%.

Alternative approach: using elasticity from Cobb-Douglas production function

A European Commission study has derived a Cobb-Douglas production function that gives a direct relationship between the cost of capital and capital K using this derived formula $K^* = (1-\alpha) + Y - cc$.[77]

This shows that the elasticity of capital stock with respect to the cost of capital is -1, which means an increase of 1% in the cost of capital will reduce the capital stock by 1%. This means the increase in the WACC of 0.6% will lead to a decrease in capital of 0.6%. Using the relationship between capital and GDP of 1/3 which we used above, this will lead to a decrease in GDP in the EU-27 of 0.2%.

The above Cobb-Douglas function captures the average relationship between the cost of capital and the capital stock, which is not necessarily reflective of implementing an FTT. We thus expect that the approach using the structural general equilibrium model, based on experiment that resemblance an FTT if more accurate. However, we use the decline in GDP of 0.2-0.5% as our main estimate.

Our main estimate is therefore within the range of the effects found in other studies that measured the impact of the FTT implementation on GDP.

---

[76] European Commission, AMECO, Net capital stock per unit of gross domestic product at constant prices. Retrieved from https://ec.europa.eu/economy_finance/ameco/user/serie/ResultSerie.cfm

[77] European Commission (2009), The Economic Impact of the Commission Recommendation on Withholding Tax Relief Procedure and the FISCO Proposals page 53

Table 10:
Empirical estimates of the impact of FTT on GDP

STUDY	CHANGE IN FTT	IMPACT ON GDP	MODEL
Lendvai et al (2012)	14 bps	0.2% decrease	General equilibrium model
European Commission Impact Assessment SEC (2013)	20 bps	0.28% decrease to 0.1 increase	General equilibrium model
European Commission Impact Assessment (SEC (2011) 1102 final, volume 16)	20 bp (implicit tax rate)	3.4% decrease	General equilibrium model

Source: Sources mentioned in the table

APPENDIX E

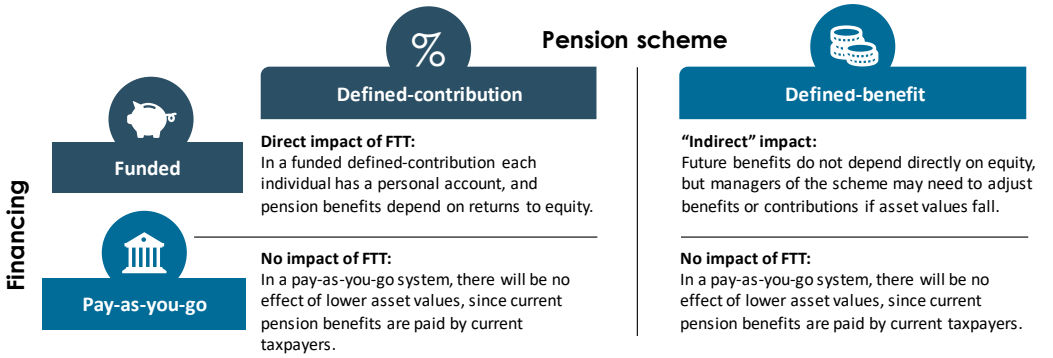
HOW DIFFERENT PENSION SYSTEMS IN THE EU WILL BE AFFECTED BY AN FTT

Privately funded pension schemes play an important role in pension systems in many member states, in particular in the northern and eastern parts of the EU.[78] While privately funded pension schemes vary greatly between countries, pension funds broadly fall into two categories: Defined *benefit* and defined-*contribution*[79] schemes.

Of the two systems, it is only in defined-*contribution* schemes that households will be directly impacted by an FTT. Here, households have individual accounts and their pension benefits are based on the amounts credited to the accounts as well as investment earnings.[80] This means that the loss in asset values will directly lower these households' pension savings. Defined-contribution schemes play an important role in the pension systems in, for example, the Scandinavian countries.

Within the defined-*benefit* scheme, the benefit is fixed in advance and thus does not depend directly on investment returns. Nevertheless, the pension fund administering the funds will be impacted just as much as in the defined-contribution schemes – so the bill must be paid somehow. Exactly how these pension funds go about it is difficult to determine, but they could for example do it through decreasing the defined benefits for future generations to cover the losses of the FTT. Defined-benefit schemes are quite common in the EU, e.g. in the Czech Republic, Finland, the Netherlands and Greece.[81]

Figure 17
Lower asset values only directly affect participants in funded defined-contribution schemes



Source: Copenhagen Economics

In some EU countries, e.g. Spain, France, Lithuania and Hungary, a public pay-as-you-go scheme plays an important role in the pension system[82]. In a pay-as-you-go scheme, current taxpayers pay

78 European Commission (2018), Pension adequacy report vol. 2
79 ECB, Pension funds, at: https://www.ecb.europa.eu/stats/financial_corporations/pension_funds/html/index.en.html (accessed 1 December 2020)
80 OECD (2019), Pensions at a glance, page 132
81 European Commission (2018), Pension adequacy report vol. 2
82 European Commission (2018), Pension adequacy report vol. 2

the pension benefits of current retirees. In a pure pay-as-you-go system, there are no invested funds and therefore no exposure to traded assets and thus no loss due to the FTT.

Finally, in some countries, e.g. France, life insurance also plays a big role as a method of saving for retirement.[83] These life insurance policies offer policy owners a tax-efficient way of investing/withdrawing money. The impact of an FTT on the holders of the life insurance policies will depend on their individual investment decisions. On average however, life insurance in France has a substantial share of bonds as well as some equities.[84] Life insurance reserves accounted for 35% of total household financial assets in France.[85]

[83] https://www.expertsforexpats.com/expat-news-and-opinion/latest-expert-opinion/what-is-assurance-vie/

[84] European Commission (2019), Study on the drivers of investments in equity by insurers and pension funds (Factsheet France page 6)

[85] OECD (2020), Household financial accounts (indicator) (accessed 30 November 2020)