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Copenhagen Economics

A European Financial Transaction Tax

Revenue and GDP effects for Germany

Bundesministerium für Finanzen
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Preface

Germany and – as of April 2013 - 10 other countries (AUT, BEL, ESP, EST, FRA, GRC, ITA, PRT, SVK, and SVN) aim at introducing a Financial Transaction Tax (FTT). In this context, there are widespread concerns that the limited country participation will give rise to different economic impacts than would have been the case with all 27 EU Member States. In this context, the European Commission has asked the participating countries to submit their initial estimates of the impact of an FTT in this smaller group of participants for their own countries. Copenhagen Economics has been asked by the German ministry of finance to assist in assessing this impact.

The aim of the consulting assignment is to estimate and calculate the economic impact on Germany (GDP, cost of capital in the real economy, revenues from the tax and avoidance reactions). The calculations of the effects (particularly on the real economy) should take into account the fact that most of the financial transactions to be taxed may not be directly linked to underlying real economy activities, and that most of the financial transactions in the real economy, such as raising new capital for corporate companies and insurance companies, and corporate loans are not taxed. However, in implementing the FTT, a substantial impact on the real economy could also emerge stemming from some combination of feedbacks from primary, secondary, and derivatives markets. Results from existing econometric models and other models should be interpreted accordingly.

Executive summary

The key focus of the report is to review the revenue potential as well as GDP effects for Germany of a Financial Transaction Tax (FTT) implemented in co-operation with 10 other EU countries as of April 2013.

We have examined four key issues: 1) establishing the German tax base, 2) estimating German tax revenue, 3) addressing leakage issues, and 4) examining how an FTT affects GDP and the real economy.

Firstly, establishing the German tax base is no trivial matter for at least two reasons: (1) the original Impact Assessment (IA) made by the EU commission contained only EU27 estimates - not country-specific estimates, and (2) the IA's tax base was identified using a source principle - different from the residence principle coupled with an issuance principle now proposed. By identifying a vast amount of new data sources, we estimate that the proposed FTT results in a German tax base of 274,258 billion EUR in the absence of any behavioural effects of the FTT and with a so-called notional value used for the taxation of derivatives cf. Table 1.

Table 1 Overview of tax base and revenue estimates for Germany

	Notional value taxation of derivatives				Market value taxation of derivatives			
	Tax base		Revenue		Tax base		Revenue	
	No flight	Non-FTT flight	No flight	Non-FTT flight	No flight	Non-FTT flight	No flight	Non-FTT flight
Securities Bn. EUR	18,121 (7)	10,877 (6)	22.2 (79)	13.5 (76)	18,121 (62)	10,877 (59)	22.2 (89)	13.5 (87)
Derivatives Bn, EUR	256,137 (93)	177,936 (94)	6.0 (21)	4.2 (24)	11,170 (38)	7,603 (41)	2.8 (11)	1.9 (13)
Total	**274,258**	**188,812**	**28.2**	**17.6**	**29,291**	**18,480**	**25.1**	**15.4**
Revenue as share of GDP, per cent			**1.1**	**0.7**			**0.9**	**0.6**

Note: Brackets indicate the percentage share. When derivatives are taxed on their notional value, each leg is taxed by 0.01 per cent. When derivatives are taxed on their market value, each leg is taxed by 0.1 per cent – like securities.

Source: Copenhagen Economics based on Reuters market share statistics, ECB securities statistics, Asian bonds online, SIFMA, FESE and WFE turnover data, BIS Triennial report, BIS OTC and exchange traded derivatives statistics, Securities holding statistics Bundes Bank, IMF CPIS global portfolio statistic.

We note that in particular with respect to derivatives, the definition of a workable tax base might be a challenge. The EU commission's suggested tax base for a derivatives transaction is the so-called notional value of the underlying security used for calculating the tax base referred to above. This implies that certain types of transactions will be taxed at very high rates relative to their economic value. As an alternative to taxing derivatives on their notional value, market values are discussed. However, this model presents problems of its own, as not even market value truly reflects the underlying economic value of derivative trading: indeed the economic value of a swap when originally initiated is zero.

Secondly, we calculate the German revenue using the Commission's assumptions on dynamic behavioural effects. For benchmark tax rates as put forward by the EU commission – 0,1 per cent for securities and 0,01 per cent for derivatives on each transaction leg – we find that the dynamic revenues applying the Commission's assumptions on dynamics might amount to a total of €28.2 billion: 22 from securities and 6 from derivatives, as shown in Table 1 above.

In addition, we include further behavioural effects which have not been accounted for by the Commission. In particular, there will be a number of transactions where the expected gains from trade will be fully eroded by the tax, and thus will not be conducted. This applies in particular to so-called High Frequency Trading (HFT) which is based on wafer thin gross profit margins likely to be exceeded by tax rates. Rather conservatively, we suggest the revenue to be within a range between €17.6 billion and €28.2 billion. Broadly, this would represent 1.5 to 2.5 per cent of the total German tax revenue, so a non-trivial contribution. However, the truth is; the impact from dynamics is very difficult to predict, calling for very cautious revenue estimates.

Thirdly, we address the particular issue of leakage. This is where the FTT leads market participants to reorganise their trade to avoid (legal) or evade (illegal) the tax. Our focus is on avoidance, and we list three types of FTT leakage risks followed by critical examples listed under each category:

- Product leakage: for example redefining a security spot transaction as a combination of derivatives transactions.
- Market leakage: reorganising the structure of the trade so that it is carried out by non-reporting institutions. This could for example apply to trades between large non-financial firms (only trades with at least one financial institution involved are covered by the proposal).
- Geographical leakage: reorganising the trade so that it legally falls outside the remit of the residence principle and issuance principle.

Our general conclusion on the leakage issue is that there is a fundamental trade-off: The more ambitious the level of leakage prevention, the larger the need for collaboration with countries outside the area with enhanced FTT co-operation. This will ultimately entail collaboration between key financial centres both inside and outside the EU. At the moment, there are existing legal co-operation mechanisms for such purposes. However, it is beyond the scope of this report to evaluate whether they *in practice* are sufficient to enforce ambitious anti-leakage measures.

Fourthly and finally, we examine how an FTT will impact GDP and welfare. The question is how and by how much? The FTT may interfere with three central roles played by financial markets: supply of capital to investments, efficient allocation of savings, and allow market participants to hedge against undesirable outcomes. We find that the most problematic aspects of the FTT might be related to the first and third role. Thus, the FTT may lead to an increase in cost of capital and thereby reduce overall investment. Furthermore, the FTT may reduce productive risk hedging - such as protecting against volatility in currency and commodity markets. With regard to impact on market liquidity, the verdict is a

bit more open: there is some evidence that recent years' dramatic increases in trading of securities, partly through HFT, have led to relatively modest, if any, improvement in the depth and liquidity of markets. Indeed, recent regulatory reform efforts are precisely aimed at addressing some of the problems that have been linked to HFT.

Some very rough estimates of GDP effects have been included in the study. Please note that neither labour market impacts from higher overall taxation nor the effect of recirculating tax revenue is included in the GDP estimates.

With rates for securities of 0.1 per cent and 0.01 per cent, and using earlier studies, the negative GDP effects for Germany might be in the range in between €0.6 - 2.4 billion each year - corresponding to a relative GDP share between 0.02-0.09 per cent. In certain cases, as already discussed, market participants can reorganise financial trading so as to replicate the underlying results of old trading patterns from an economic perspective while avoid paying any taxes. If so, GDP will only be adversely affected to the extent that such reorganised trade patterns might require slightly higher resource use not the least in the financial sector. This might imply that there in certain cases may be a negative relationship between market participant's ability to circumvent the tax and the size of the impact on GDP.

Chapter 1

Establishing the tax base

In this chapter, we will derive the expected German tax base associated with an FTT and calculate static revenue estimates as if there were no behavioural changes. In chapter 2 we derive the tax revenues taking into account these dynamics.

In the Commission's initial Impact Assessment (IA)[1], revenue estimates were constructed for EU27. For at least two reasons, this report takes a different approach than the IA: 1) the IA assumes a tax which is based on a source-principle, while the new proposal from the Commission entails a residence principle coupled with an issuance principle, and 2) we argue that the IA estimates are limited both in use of data and the methodology, which we try to address in this study.

In our derivation of the German tax base, we first use the IA as a starting point, and demonstrate that we can replicate the findings in the IA (Section 1.1). Thereafter we discuss the difference between the source principle and the residence/issuance principles, and how that affects the tax base estimates (Section 1.2). We then construct the German tax base (Section 1.3) and calculate the static tax revenues from this base (Section 1.4). We conclude by evaluating the effects of including/excluding government bonds in the tax base (Section 1.5).

1.1 Commission IA as point of departure

The original EU Impact Assessment suggested that the overall tax revenues for EU-27 were EUR 57.1 bn. with the bulk, 66 per cent stemming from derivatives, cf. Table 2.

Table 2 EU-27 Revenue Estimates

Instrument	Rate	EU-27 revenue EUR. Bn.
Securities	0.1 per cent of market value of turnover	19.4
Derivatives	0,01 per cent of the notional value	37.7
Total tax revenue		**57**
Of which stemming from derivatives		66 per cent

Source: Technical Fiche to IA. Revenue Estimations and Executive Summary of The Impact Assessment

We have been fully able to reconstruct the tax base and tax revenues as in the IA, based on the same data sources and estimation method they used to calculate a tax base for 2010. Since the IA, the figures have been updated, and in 2012 the total tax base has increased from app. €1,200,000 billion to €1,500,000 billion, cf. Table 3, when using the source-principle.

[1] European Commission (2011), Impact Assessment

Table 3 Source-based tax bases

EUR Bn. Total Turnover	EU-27 (2010) (identical to the Commission's Tax base in the IA)	EU-27 (2012)
Securities (market value)	20,670	22,391
Derivatives (notional value)	1,221,988	1,514,415
Total Tax Base	**1,242,657**	**1,536,806**
Derivatives' share of Tax Base	98.3 per cent	98.5 per cent

Source: Copenhagen Economics based on FESE, WSE London Stock Exchange data and Borsa Italia data, Trinneal report 2010, BIS 2012 data

As the Commission's earlier approach is based on a source-principle, we will derive a new approach based on the residence principle coupled with the issuance principle, as entailed in the new proposal from the Commission[2].

In the following section, we will explain the different characteristic of the principles and their impact on our calculation methodology.

1.2 The different principles at stake

In this section we describe the different principles, and how this affects the tax base.

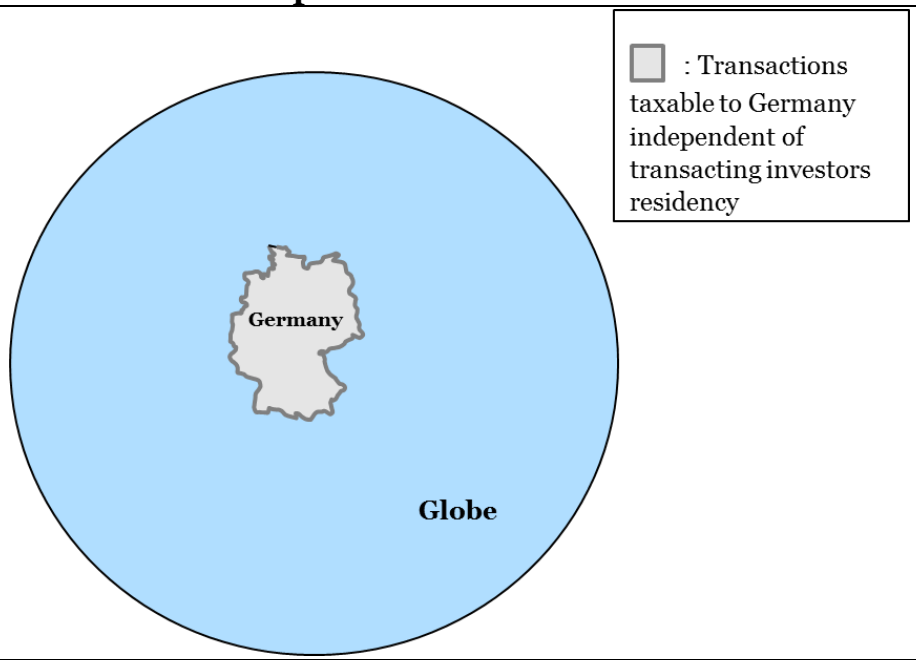
Source principle

Under the source principle, each FTT participating Member State would have the right to tax all the financial transactions that are deemed to have taken place in its jurisdiction, regardless of the tax residence of the parties involved in the transaction. Figure 1 below provides an easy illustration of the principle applied to Germany.

Thus independent of whether Germany with other countries or alone was to implement an FTT based on the source tax principle, only financial transactions taking place on German Territory would be taxable events to Germany. To illustrate: if a German resident were to conduct a trade on the London Stock exchange and afterwards in Paris, no tax would be levied in London, while in Paris, France would "own" the tax event. Similarly, all transactions taking place in Germany would be "owned" by Germany whether it was conducted by French, Chinese or Australian residents.

[2] European Commission (2013) , Proposal for a council directive implementing enhanced cooperation in the area of financial transaction tax

Figure 1 Source Principle Illustration



Source: Copenhagen Economics

The strong feature of this design is its ease of implementation and administration. Transactions can easily be determined taxable, without having first to identify the parties to the transaction and their residency.

The less strong feature of this design is related to avoidance of the tax. As transactions taking place in Germany is taxed, and transactions taking place outside FTT countries, such as the UK, investors would gain from relocating their transactions to the non-taxing jurisdictions. As financial markets in general exert very high degrees of mobility, such behaviours is likely to take place, e.g. as witnessed in Sweden in the early 1990's where more than 50 per cent of all equity trading simply disappeared from the Swedish financial markets.[3]

Residence and issuance principle

In light of especially the issue of relocation, the Commission suggests to base an FTT on a combination of a residence principle and an issuance principle. When applying these principles a taxable event is identified when one of the two is true:

Residence: Turnovers – independent of location – where at least one of the two legs in the trade (the buyer or the seller) involves an investor resident in a FTT country

[3] European Commission (2011), IA vol 9

Issuance: When the asset or the underlying asset to the transaction is issued in one of the FTT countries

Furthermore, the two overall principles stated above are contingent on involvement of financial institutions.

Financial institution involvement: The proposal states that at least one party to the transaction should be a financial institution, acting either for its own account or for the account of another person, or is acting in the name of a party to the transaction.[4] Consequently, financial transactions taking place between non-financial institutions/parties will not be taxed.

The combined result of these three principles is that any financial transaction involving either a party resident in an FTT country or a financial asset (or the underlying asset) issued in an FTT country is taxable, provided there is at least one financial institution involved. The taxing right of the different FTT countries from combinations of different transactions and transaction parties is illustrated in Figure 2.

Figure 2 Tax Principles Illustration

Party/ counterparty	German Resident I	Resident in other FTT Country than Germany II	Non FTT Country Resident III
German Resident A Trading all securities independent of origin	T / T	$T_{foreign}$ / T	T / T
Non-FTT Resident B Trading assets which are issued in Germany or written on German issues	T / T	$T_{foreign}$ / $T_{foreign}$	T / T

Note: The grey area indicates that the tax goes to Germany, the white indicates that the tax goes to a foreign FTT country

Source: Copenhagen Economics

In the *upper row*, we assume that German resident A conducts three identical trades: In the first case, the German resident trades an asset with fellow resident I. The intra-residential transaction generates equal sized tax revenue from both resident A and I totalling 2T. In the second case, German resident A conducts the trade with a resident in a different FTT country. In this case, the German tax authority obtains revenue of size T

[4] Article 1.2 of the Commission's proposal

from the German leg of the trade while the other leg of the trade is taxable to the foreign FTT authority. In the third case, German resident A trades with a non-FTT resident. In this, case both the German leg and the non-FTT led are taxed – implying a total tax of 2T to be collected by German authorities.

In the *bottom row*, we assume that a foreign non-FTT resident conducts three identical trades where the underlying asset is (or is linked to) a German issue. In the first case, the counterparty is German – implying as above that Germany owns the tax levied on both legs. In the second case, the non-FTT resident trades a foreign FTT counterparty. In this case, both legs will be taxable to the foreign FTT country. Finally, in the third case the trade takes another non-FTT resident as counterparty. The issuance principle entails that both legs are taxable to Germany.

As was the case with the source principle, there is also here an inherent trade-off between the risk of relocation and administrative feasibility. With the residence principle, it is avoided that German residents simply move their transactions to non-FTT jurisdictions. And with the issuance principle, it is avoided that transactions of German assets are moved to non-FTT jurisdictions. However, this requires increased efforts from non-FTT countries. One of the challenges is to identify the residency of the transaction parties, and more importantly the underlying investors that such parties may represent. Consider e.g. the case of a transaction taking place in Singapore, by an American financial broker, on behalf of a UK fund manager placing investments on behalf of a German pension fund. Enforcement of the FTT will require involvement from authorities in all the mentioned countries, not only the countries which have adopted the FTT.

Another illustrative example of the administrative challenges and theoretical subtleties is to consider the possibility that trading activities performed by German subsidiaries in foreign countries would be taxable to Germany; but only if they have consolidated accounting with their German parent company.[5] For example, a Siemens subsidiary in Taiwan may instruct a dealer to buy an interest-linked future on Tokyo Stock Exchange from a Japanese resident. This transaction is linked to Asian based subsidiary, and involved no German assets. However, if the Siemens Taiwan-based subsidiary has consolidated accounting with the German parent company, then both legs of the future would be taxable to Germany. However, if the conglomerate does not use consolidated accounting, the transaction is not taxable to Germany.

1.3 Calculating the tax base based on residence/issuance

As mentioned earlier, the Commissions' prior attempts to estimate the tax based was based on the geographical location of the transactions, which is fairly simply to construct, as data from different trading venues, including stock exchanges, are readily available. However as the new proposal is based on the residence/issuance principle, we also need to establish the residence of the parties to the different transactions.

[5] This is a concrete example mentioned in the technical fiche from Commission: The residence principle and the territoriality of the tax

One might suggest that, as there is likely to be a bias towards trading domestically, the geographic location of transactions might also be a good proxy of the underlying residency. We suspect, however, that this is likely not to be the case. Consider e.g. the turnover taking place in UK and DE respectively. Turnover in Germany constitutes 5 per cent of EU27 turnover of securities, and 15 per cent of derivatives, cf. Table 4. However, as Germany amounts for app. 20 per cent of EU27 GDP, we would expect German residents to engage in many more transactions than the 5 per cent of securities transactions taking place in Germany. Conversely, turnover in UK is 28 per cent of total EU27 turnover, even though its GDP only amounts to app. 13 per cent of EU27 GDP. In other words, a lot of German residents are most likely taking part in financial transactions in the UK. These taxable events, would not be captured by only looking at the geographical location of the transactions

Table 4 German and UK share of source-principle tax base

EUR Bn. Total Turnover	EU-27	Percentage of which traded in:	
		DE	UK
Securities (market value)	22,391	5.1	28.4
Derivatives (notional value)	1,514,415	0.3	68.2
Total Tax Base	1,536,806	2.3	67.6
Derivatives' share of Tax Base	**98.5 per cent**	**96.8 per cent**	**99.4 per cent**

Source: Copenhagen Economics based on FESE, WSE London Stock Exchange data and Borsa Italia data, Trinneal report 2010, BIS 2012 data

In our calculations we also use both a different methodology from what the Commission applied in its IA, and we use additional data. The reasons are outlined below:

Taxing two legs vs. one leg
In the IA, it is implicitly assumed that the tax is only levied on one leg of the transaction. That is, one transaction giving rise to a net turnover value, is only taxed one time. However, both legs in any transaction are in principle taxable, meaning that both parties to the transaction will be taxed according to the net turnover. For our calculations, this implies that the actual tax base should be the gross turnover (2 times the net turnover, as there are always two parties to the transaction) instead of the turnover amounts typically stated in statistics, including the ones provided in Table 3.

This may seem trivial, but implies that the tax base is actually twice the size of the result if one were simply to multiply the tax rate with the turnover amount. Consequently, this also makes total tax revenue twice as high.

Completeness of data
We have collected more turnover data than the Commission.

- The Commission does not include OTC security trading. Estimates for this share of turnovers range – depending on viewing net or gross turnovers – in between 16

per cent and 38 per cent of total securities trading[6]. We solve this by using Reuter's data for shares which include OTC traded shares. For bonds, there is no available data on OTC trading. Thus for this part, we use the suggested estimate of 16 per cent to scale turnovers for exchange traded bond. That is, we know that exchange traded bonds form 84 per cent of the market. Hence, to include all bonds trading in our turnover data, we divide exchange traded bond turnovers by 84 per cent.

- The Commission double counted some OTC derivatives in their tax base. In particular, the source principle applied in the IA meant that the division between intra-residential and cross-border trades for country distributed FX- and interest-linked OTC derivatives was not used. In this report, the application of the residence principle implies that we fully exploit this data availability. Furthermore, in respect to the IA, it should be noted that a summation of cross-border OTC trades for EU-27 countries was made. Since cross-border trades does not include identification of the trading partner's country of residency, this procedure may potentially imply that double counting of some trades since foreign traders may be other Eu-27 residents. Ultimately, this entails that the turnover estimate for OTC derivatives may have been too large.
- The Commission does not include OTC turnovers for CDS, commodity-linked, and equity-linked derivatives. This is caused by lack of data availability. In this report, we circumvent this issue by estimating annual turnovers for these residual instruments. This is done by first identifying that in terms of outstanding OTC instruments, these residual instruments form roughly 9 per cent. Then assuming that their turnover velocities equal the average turnover velocity for the known 91 per cent – the relevant instrument specific turnover estimates can be derived.
- The Commission did not include trades outside Eu-27. In particular, the source principle approach implied that turnovers on foreign market where EU-27 residents potentially participate were ignored. In this report, application of the residence and issuance principles implies that turnovers in principle on all financial markets may be taxable. Thus, here we have broadened the potential tax base to include North America, Asia, and the Pacific.

The turnover data collected does not include direct identification of traders' tax residency. This information shortage creates substantial challenges when determining the tax base. In Appendix A, we provide the full derivation of the tax base by a three step procedure, which importantly handles the information gap related to traders' residency.

Applying the three step procedure mentioned above, we have constructed the tax base for Germany for an FTT based on a residence and issuance principle. We find that the tax base is EUR 274,258 billion, cf. Table 5. Whenever both legs of a transaction are "owned" Germany we have counted the turnover amount one time, while if only one leg is "owned" by Germany, the net turnover has been halved. It turns out that derivative trading constitute roughly 93 per cent of the total German tax base.

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6 European Commission (2011), IA vol 12. Notice, the range is mentioned in the text but not included in their assessment.

Table 5 Static Tax Base in Net terms

	Notional Values
Securities Bn. EUR	18,121
Exchange-traded derivatives Bn. EUR	226,341
OTC-traded derivatives	29,796
Total tax base Bn. EUR	**274,796**
Derivatives' Share, per cent	93

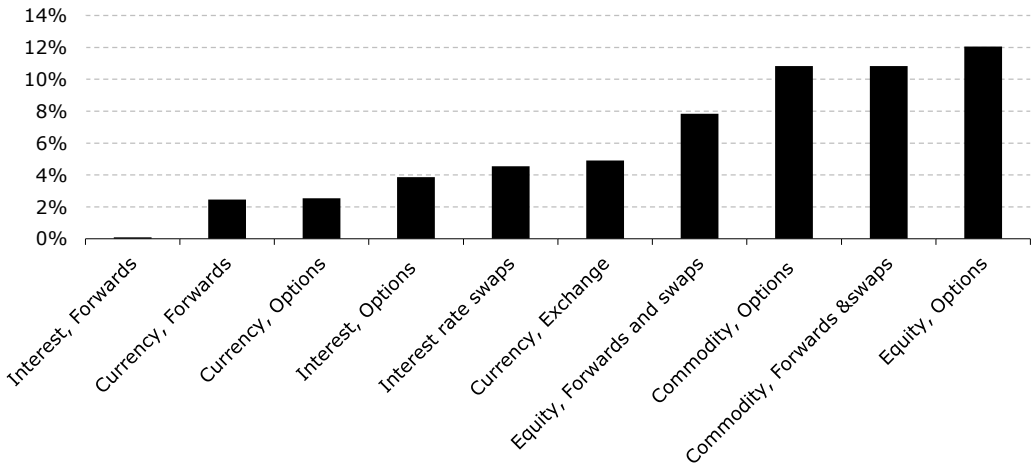
Note: For a more comprehensible distribution between asset types see appendix A. The base is provided in net terms which implies that e.g. if each leg is taxed by 0.1 per cent, then the base should be multiplied by 2 times 0.1 per cent in order to capture that both legs are taxable.

Source: Copenhagen Economics based on Reuters market share statistics, ECB securities statistics, Asian bonds online, SIFMA, FESE and WFE turnover data, BIS Triennial report, BIS OTC and exchange traded derivatives statistics, Securities holding statistics Bundes Bank, IMF CPIS global portfolio statistic.

Taxing derivatives on notional value

The Commissions' proposal entails that the taxable amount of a derivative transaction is the notional value of the underlying asset. That is; if an interest rate swap is written over a government bond worth €10,000, the taxable amount is €10,000. The value of conducting the swap is in terms of hedging against risk and constructing a suitable risk/maturity profile, and the value is likely to be much lower than the value of the underlying government bond (the notional value). Instead of using notional value, another measure could be the *market value* of the transactions. This illustrates that the market value can in fact also be very different for different types of derivative instruments, but also between transactions within the same instrument type. Depending on type of instrument, the market value of derivatives relative to notional value ranges on average between 0.1 per cent and 13 per cent, cf. Figure 5. Thus, if one has the aim of taxing the actual economic value of financial instruments across asset class similarly, differentiated tax rates would be needed.

Figure 3 Market value to notional value ratio - derivatives



Source: Copenhagen Economics based on BIS' Exchange derivatives database

If one were to base the tax on the market value of the instruments, the total tax base would be reduced to app. €29,291 billion, cf. Table 6. This is app. 6 times smaller than when using notional value.

Table 6 Static Tax Base –taxed on market value

	Market value
Securities Bn. EUR	18,121
Exchange-traded derivatives Bn. EUR	9,960
OTC-traded derivatives	1,209
Total tax base Bn. EUR	29,291
Derivatives' Share, per cent	**38**

Note: For a more comprehensible distribution between asset types see appendix A.

Source: Copenhagen Economics based on Reuters market share statistics, ECB securities statistics, Asian bonds online, SIFMA, FESE and WFE turnover data, BIS Triennial report, BIS OTC and exchange traded derivatives statistics, Securities holding statistics Bundes Bank, IMF CPIS global portfolio statistic.

Whether it is preferable to tax derivatives on their notional or market value at turnover is not clear. In section 0 we will conduct an analysis of relocation risks which amongst all addresses this subject. In its current proposal, the Commission suggests that securities should be taxed by 0.1 per cent on their market value at turnover while derivatives should be taxed by 0.01 per cent of their notional value at turnover, however as derivatives are also different this only goes some of the way.

1.4 Revenue calculations - static

In this section, we estimate the German static tax revenue effects from implementing the FTT where regular securities are taxed on their turnover notional value with a rate of **0.1 per cent** and derivatives on their turnover notional value with a rate of **0.01 per cent.**

In the static case, we neglect all potential market reactions initiated by implementing an FTT. These calculations, when not controlling for behavioural effects, provide a very upper bound to the revenues that can be anticipated from implementing the FTT.

We find that the static revenue potential of the Commissions' proposal is €87.5 bn., constituting 3.3 per cent of German GDP, cf. Table 7. We also calculate the case if derivatives were instead taxed by 0.1 per cent on the market value instead of 0.01 per cent of notional value. Here we find that the revenue effect is €58.6 bn. constituting 2.2 per cent of GDP.

Table 7 Revenue estimates - static

	Derivatives' turnovers based on notional value		Derivatives' turnovers based on market values	
	Tax base	Revenue effect	Tax base	Revenue effect
Securities Bn. EUR	18,121	36.2	18,121	36.2
Exchange derivatives Bn. EUR	226,341	45.3	9,960	19.9
OTC-traded securities EUR bn.	29,796	6.0	1,209	2.4
Total EUR bn.	**274,796**	**87.5**	29,291	**58.6**
Revenue relative to GDP, per cent		3.3		2.2

Source: Copenhagen Economics based on Reuters market share statistics, ECB securities statistics, Asian bonds online, SIFMA, FESE and WFE turnover data, BIS Triennial report, BIS OTC and exchange traded derivatives statistics, Securities holding statistics Bundes Bank, IMF CPIS global portfolio statistic. Tax rates are obtained from the commission's proposal

Chapter 2

Dynamics and behavioural effects

In chapter 1, we presented the data and methods for assessing the size of the tax base and the potential tax revenue from a static point of view. As with most taxes, an FTT will give rise to behavioural effects which will affect the size of the tax base, and consequently the potential revenue. The Commission attempts to capture these effects by using tax elasticities based on an extensive literature review. We present these elasticities in Section 2.1 where we also emphasize a number of areas that warrant special consideration with regards to the size of the proposed elasticities. In section 2.2 and 2.3, we calculate the revised revenue estimates taking into account our suggested elasticities. In section 2.4, we review the case, where the FTT is to be implemented gradually. In section 2.5, we analyse taxation of government bonds. In section 2.6, we discuss leakage risks and scope of mitigating actions. Finally, in section 2.7 we provide some concluding remarks.

2.1 Expected reductions in transaction volume – Commission's estimates

In the dynamic case, we proceed by introducing elasticity effects. For the purpose of this note, we use the commission's dynamic effects as point of reference. In the Commission's IA, the baseline scenario employs a tax elasticity of 1 for turnovers of regular securities, for non-FX-linked derivatives, it is 1.5 while for FX-linked derivatives it is 2. Furthermore, the Commission suggests, that the FTT will initially reduce 10 per cent of securities trading and 80 per cent of derivatives trading.

To perform this dynamic revenue calculation, we use the tax revenue formula provided in the IA.

Box 1 Formulas to calculate tax revenue taking dynamics into account

The Commission suggests that the tax revenue should be calculated using the following formula:

(1) $$\text{Tax Revenue} = (1 - \text{E}\%)\text{t}\% \cdot \text{taxable amount} \cdot \left(1 + \frac{\text{t}\%}{\text{c}\%}\right)^{-\epsilon}$$

The formula states that the tax revenue obtained from a taxable amount (net turnovers in market value for securities and notional value for securities) equals the static revenue times a factor less than 1 where t is the tax rate, c is the shared transaction cost, ϵ is the tax elasticity, and E is the evasion factor.

In the Impact Assessment, only one leg is taxed. Thus the formula in (1) is not appropriate – since all taxable events will be double taxed.

To handle this, we suggest using the following formula on the tax bases in net terms:

(2) $$\text{Tax Revenue} = 2\text{t}\% \cdot (1 - \text{E}\%) \cdot \text{taxable amount} \left(1 + \frac{2\text{t}\%}{\text{c}\%}\right)^{-\epsilon}$$

For each netted taxable amount (2) provides the revenue contribution.

Source: European Commission (2011), Impact Assessment

For the transaction cost, we have used the instrument dependent transaction cost provided in the IA. For each instrument class, these costs are provided in Table 8 below.

Table 8 Average transactions costs

Transaction costs	Percentage if notional value taxation	Percentage if market value taxation
Securities	0,6	0.6
Exchange traded Derivatives	0,3	3.8
OTC currency linked derivatives	0,024	0.6
OTC interest-, equity- and commodity-linked derivatives and CDS	0,7	13.7

Note: When derivatives are taxed on their market values by 0.1 per cent, the applied transaction cost needs to be adjusted securing that the total transaction cost of turnover remains unchanged.

Source: European Commission (2011), Impact Assessment and BIS' derivatives database

Thus, for the dynamic cases parallel to the ones suggested in the IA, using (2) in combination with the transaction costs provided in Table 8 above, we are able to calculate initial dynamic tax revenue effects for the cases where derivatives are taxed on their notional and market values.

Applying the dynamic effects suggested by the EU Commission on the notional tax base presented in chapter 1, the German tax revenue to be collected is EUR 33.4 bn. – which is 1.3 per cent of German GDP. Exchanging the notion of taxing derivatives on their notional turnover by 0.01 per cent on each leg to 0.1 per cent on their market value of turnover, the revenue is decreased to EUR 28.6 bn. forming 1.1 per cent of German GDP.

Table 9 Revenues based on Commission's dynamics

Instruments	Elasticity	Evasion	Revenue – taxation of notional EUR Bn.	Revenue – taxation of market value EUR Bn.
Securities	1	10%	24.5	24.5
Exchange derivatives	1.5 (2 for FX)	80%	8.2	3.8
OTC derivatives	1.5 (2 for FX)	80%	0.7	0.4
Total Revenue			**33.4**	**28.6**
Revenue relative to GDP, per cent			**1.3**	**1.1**

Source: Copenhagen Economics based on Reuters market share statistics, ECB securities statistics, Asian bonds online, SIFMA, FESE and WFE turnover data, BIS Triennial report, BIS OTC and exchange traded derivatives statistics, Securities holding statistics Bundes Bank, IMF CPIS global portfolio statistic. Tax rates are obtained from the commission's proposal

To illustrate the derivation based on (2), we look at the revenue stemming from securities. From Table 7, it follows that the netted tax base was EUR 18,121 bn. Multiplying this number by the tax total tax (i.e. both legs) of 0.2 per cent, we get EUR 36.2 Bn. Next, we need to adjust for the evasion term, hence we multiply EUR 36.2 Bn. by 90 per cent (100 per cent minus 10 per cent) and get EUR 32.6 Bn.

Finally, we need to adjust for the elasticity term in (2). The fraction equals the double tax rate, 0.2 per cent, divided by the shared transaction cost, 0.6 per cent, from Table 8. This equals 1/3. Then adding 1, we get 4/3 which lifted to the power of -1 (the elasticity) equals 3/4.

Multiplying EUR 32.6 Bn. by ¾, we get the revenue contribution from securities equal to EUR 24.5 Bn.

2.2 Our assessment of transaction volume reductions

It is a difficult exercise to assess the magnitude of the reduction in transaction volumes from a financial transaction tax. Based on an extensive literature survey, the Commission has suggested a range of elasticities which determine the expected reduction in transaction volumes. However, we suggest that there are some areas of the proposed elasticities which might be subject of further analysis. We propose the following areas: 1) High frequency trading, 2) Varying effective taxes on derivatives, and 3) Flight of non-FTT investors.

High frequency trading

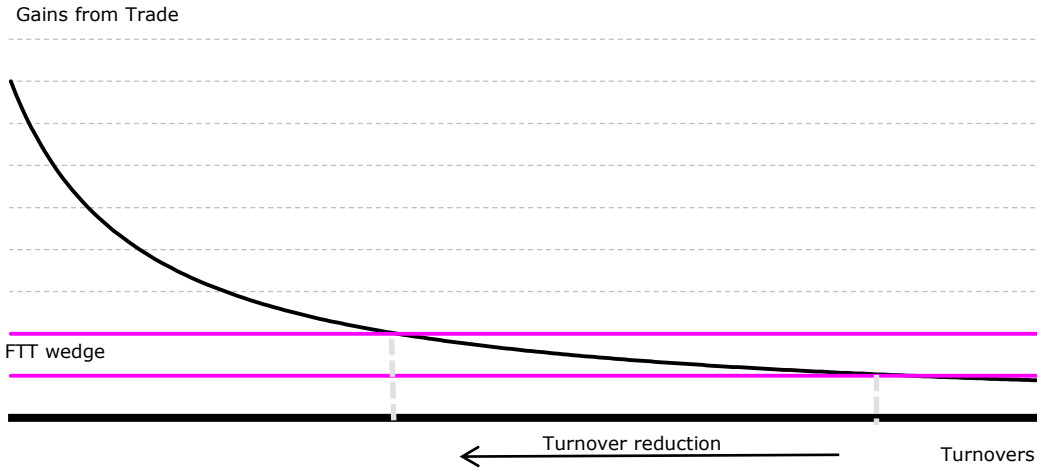
High frequency trading (HFT) was virtually non-existent in Europe before 2007, but has grown rapidly since. Several of the studies that form the basis of the Commission's elasticities are based on time series covering mainly the period before HFT became widespread. This suggests that the prevailing elasticities do not take into account the characteristics of HFT.

HFT does not have one clear definition, but may be several different trading strategies collected under the same hat. HFT can however be characterised by the following:[7]

- Conducted by professional traders for proprietary purposes [8]
- Use of extraordinarily high-speed and sophisticated computer programs
- Very short time frames for establishing and liquidating positions
- Submission of numerous orders that are cancelled shortly after submission
- Ending the trading day in as close to a flat position as possible (in order to avoid overnight clearing and settlement costs)

The business model of HFT is to take advantage of very small margins in the market, and exploit marginal arbitrage possibilities. Estimates suggests that average gross profits of HFT is 0.006[9] in per cent of the amount turned over which is rather low. In contrast, HFT's are estimated to take place every 5th second implying since the gross profit accumulates over the day, profits are high. Because HFT operates with low margins, such trading is likely to be severely affected by an FTT (since the FTT taxing each leg by 0.1 per cent on turnovers erodes the 0.006 per cent in profit per trade), which is illustrated in Figure 4. Equivalently, the European Commission estimates that HFT trading will be rendered unprofitable by the proposed FTT.[10]

Figure 4 Low margin trades will be hit hard by an FTT



Source: Copenhagen Economics

Some estimates suggest that HFT constitutes about 30-40 per cent of all turnovers in exchange-traded equity, futures and bonds in Europe, cf. Table 10. It has not spread to the trading of bonds, and for trading OTC.[11]

7 See e.g. US Securities and Exchange Commission (2010), Concept release on Equity Market Structure
8 Meaning that the trader trades for its own economic benefit, as opposed to serving clients
9 Menkvald et Boyan (2011)
10 European Commission (2011), Proposal for a council directive on a common system of financial transaction tax and amending directive 2008/7/EC, page 5
11 Haldane, A. (2010) "Patience and Finance", Bank of England (Speech)

Table 10 Share of HFT in Europe

Instrument	HFT share of turnover (per cent)
Equity	30-40
Bonds	app. 0
Futures	30-40
Options	30-40

Source: Haldane (2010)

This has three implications for the transaction elasticities – holding everything else equal:

1. The elasticities for exchange traded equity spot and all future and options trading should be higher than previously considered.
2. The elasticities should be higher for equity than for bonds.
3. Elasticities of OTC traded products should be lower than exchange traded products

Effective tax rates on derivatives

The Commission considers that all equity-linked and interest-linked derivatives have a tax elasticity of 1.5. In this section, we argue that the elasticities for different types of derivatives may be very different for at least two reasons: 1) The relative increases in transaction costs are different, and 2) The effective tax rates are different for different instruments.

The transaction costs related to transactions of financial instruments are currently very different. This implies that for the same tax rate, the percentage increase in transaction cost is relatively low for some instruments, and relatively high for other. The most expensive transactions are security-linked derivatives traded OTC and spot traded securities, where the transaction costs are 0.7 and 0.6 per cent respectively of the transaction's notional value, cf. Table 11. Conversely, the transaction costs associated with currency linked derivatives are only 0.02 per cent. This implies that for the specified tax rates, the relative increase in transaction costs will differ greatly. The main outlier is currency linked derivatives, where the transaction costs increase by 83 per cent, cf. Table 11, where the security-linked derivatives only increase by 3 and 7 per cent.

Table 11 Increase in transaction costs after an FTT

	Transaction costs before FTT (per cent)	Tax rate (both legs) (per cent)	Percentage increase in transaction costs
Securities	0.6	0.2	33
Security linked exchange traded derivatives	0.3	0.02	7
Security linked OTC traded derivatives	0.7	0.02	3
Currency linked derivatives	0.02	0.02	83

Source: Copenhagen Economics based on European Commission's estimate of initial transaction costs.

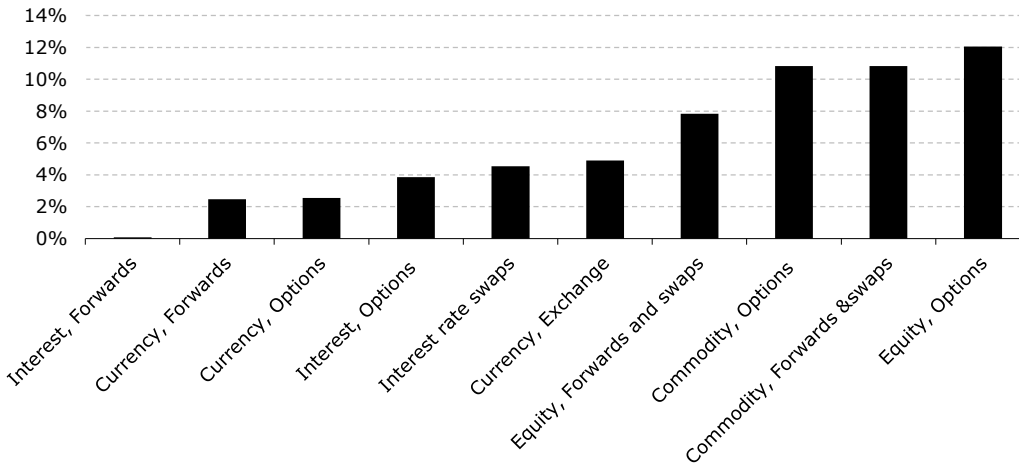
Notice in this connection, that provided exchanges and OTC dealers are competitive we would not expect transaction costs to drop when introducing the FTT. We expect the market is competitive because: there are no large entrance barriers to the financial markets, products for most are comparable, and customers are due to technology mobile on a global market.

In the Commissions' proposal, all derivative contracts are taxed with the same nominal tax rate of 0.01 (0.02 when including both legs of the transaction). This might at first seem like an equal treatment of the different derivative instruments. However, as derivatives are taxed at their notional value, this leaves no consideration of the underlying economic value of the transaction. While a spot transaction per definition has economic value equal to its notional value, a derivative typically has a much smaller economic value. If a derivative contract is used to hedge against risk, which it often is, the economic value is the value of the insurance offered by the contract. As this value differs across different derivative instruments, the effective tax rate measured against its economic value also differs.

In order to capture this, we use data on the market value of derivative transactions. The market value is not a perfect measure for the underlying economic value of a transaction. This can e.g. be illustrated by an option that is never exercised. This option will have a market value of 0, even though the option has served as insurance and thus created value. This value is however significantly less than the value of the underlying asset the option is written over (notional value).

With this caveat, the market / notional value ratio suggests that the effective tax rate of the different derivative instruments varies significantly. While this ratio is 11-12 per cent for equity options, and commodity options, forwards and swaps, it is significantly smaller for currency forwards and options (app 3 per cent), and merely 0.1 per cent for interest-linked forwards, cf. Figure 5. This suggests that the effect of an FTT on transaction volumes will be significantly higher on interest- and forward-linked derivatives than on equity- and commodity-linked derivatives.

Figure 5 Market value to notional value ratio - derivatives



Source: Copenhagen Economics based on BIS' Exchange derivatives database

Flight of non-FTT investors

An important aspect when considering the effect of an FTT on the transaction volumes and thus the tax base is the reaction of investors outside the FTT area. Currently, these investors are indifferent between trading a share with a German investor or with an American investor. However, with an FTT, the investors outside the FTT area will have a strong incentive to avoid trading with FTT-investors as their transaction will now be subject to tax. For German issues, these incentives are further strengthened by the issuance principle – implying that to circumvent the tax, non-FTT investors would have incentives to exit their positions or decrease their trading frequency. This implies, that both FTT and non-FTT investors' trading patterns will be affected by the tax implementation which therefore reduces the tax base and hence the revenue effects.

Currently, 42 per cent of German equity is held by investors outside FTT. As all, say, American investors holding Daimler shares can avoid taxation by replacing their position to e.g. Ford, it is very likely that they will do so. This suggests that 42 per cent of German linked equity transactions as an extreme scenario will be stopped. In addition, this polarisation of trades within two "blocks": The FTT zone and the non-FTT zone will also lead to an increase in the amount of trades where both parties of the transaction are FTT members. This will reduce tax revenue. Consider e.g. a German investor selling shares to an American investor, and another German investor buying shares from American investors. With the introduction of an FTT, both transactions will be taxed on both legs. However, without affecting portfolio positions, the American investors can choose to trade with each other, which implies that this transaction is no longer taxable.

Table 12 Geographical location of equity transactions, per cent

Buyer/Seller	German Residents	Other FTT residents	Non-FTT residents
German Residents	24 (41)	5 (8)	20 (0)
Other FTT residents	5 (8)	1 (2)	4 (0)
Non-FTT Residents	20 (0)	4 (0)	17 (42 in non-FTT instruments)

Note: The shares without brackets form the current probability of traders distributed by nationality selling to different. The shares in brackets capture the extreme case where non-FTT investors stop their trading activities to circumvent the tax.
Source: Copenhagen Economics based on IMF's global CPIS Statistic, Bundes Bank securities holding statistic by residency of issuer

A similar story holds for German bonds transactions. As non-FTT bond ownership is 25 per cent, at least 25 per cent of bond transactions are expected to relocate out of the FTT area, cf. Table 13.

Table 13 Geographical location of bond transactions, per cent

Buyer/Seller	German Residents	Other FTT residents	Non-FTT residents
German Residents	48 (63)	4 (6)	2 (0)
Other FTT residents	4 (6)	0 (0)	4 (0)
Non-FTT Residents	17 (0)	2 (0)	6 (25 in non-FTT instruments)

Note: The shares without brackets form the current probability of traders distributed by nationality selling to different. The shares in brackets capture the extreme case where non-FTT investors stop their trading activities to circumvent the tax.
Source: Copenhagen Economics based on IMF's global CPIS Statistic, Bundes Bank securities holding statistic by residency of issuer

2.3 Implications for revenue estimation

In the following, when determining the dynamic revenue effects we will in order to obtain more refined upper and lower bounds work with the two extreme case – for the upper bound we will assume no flight of non-FTT residents as in Table 5 while for the lower bound, we will assume full flight of non-FTT residents for all asset classes.

This implies that depending on whether derivatives are to be taxed on notional or market value of turnover, for the no flight case, the German tax bases remains as in chapter 1. For the non-FTT flight case the tax base is significantly reduced implying that for the notional value case the tax base is reduced from EUR 274,796 bn. to 188,812 bn. For the market value case, the tax base is reduced from EUR 29,796 to EUR 18,480 bn. For a more detailed distribution of instruments see Appendix A.

Table 14 Tax bases adjusted

	No flight		Non-FTT flight	
	Notional Values	Market Values	Notional Values	Market Values
Securities Bn. EUR	18,121	18,121	10,877	10,877
Exchange-traded derivatives Bn. EUR	226,341	9,960	158,676	6,815
OTC-traded derivatives	29,796	1,209	19,260	788
Total tax base Bn. EUR	**274,796**	**29,291**	**188,812**	**18,480**
Share Derivatives	**93**	**38**	**94**	**41**

Source: Copenhagen Economics based on Reuters market share statistics, ECB securities statistics, Asian bonds online, SIFMA, FESE and WFE turnover data, BIS Triennial report, BIS OTC and exchange traded derivatives statistics, Securities holding statistics Bundes Bank, IMF CPIS global portfolio statistic.

Moving on, we determine the tax revenue when taxing notional turnover for derivatives. We divide the German tax revenue between the two extreme cases (bounds) with respectively no flight and full non-FTT flight.

Initially, for each extreme we report the static revenue provided no elasticity and evasion effects. This provides a revenue effect range in between EUR 57.3 bn. and 87.5 bn.

To narrow this range, we start by implementing the baseline dynamics effects suggested by the commission as described in 2.1. Implementing the German revenue range is narrowed to EUR 20.9 and 33.4 bn.

Finally, we also as described in 2.2 remove all HFT from the German tax base. This implies relative to the commission's dynamic case the 35 per cent of equity and exchange derivatives trading are further removed. This ultimately narrows the range of the revenue effect to EUR 17.6 and 28.2 bn., cf. Table 15.

Table 15 Static and Dynamic Tax Revenue, notional taxation of derivatives

	No flight			Non-FTT flight		
	Static	Dynamic	Dynamic w/o HFT	Static	Dynamic	Dynamic w/o HFT
Securities Bn. EUR	36.2	24.5	22.2	21.8	14.7	13.5
Exchange derivatives Bn. EUR	45.3	8.2	5.3	31.7	5.8	3.7
OTC-traded securities EUR bn.	6.0	0.7	0.7	3.9	0.4	0.4
Total Revenue Bn. EUR	**87.5**	**33.4**	**28.2**	**57.3**	**20.9**	**17.6**
Revenue relative to GDP, per cent	**3.3**	**1.3**	**1.1**	**2.2**	**0.8**	**0.7**

Source: Copenhagen Economics based on Reuters market share statistics, ECB securities statistics, Asian bonds online, SIFMA, FESE and WFE turnover data, BIS Triennial report, BIS OTC and exchange traded derivatives statistics, Securities holding statistics Bundes Bank, IMF CPIS global portfolio statistic. Tax rates are obtained from the commission's proposal

The narrowed range entails a revenue estimation which as percentage of GDP lies in between 0.7 per cent and 1.1 per cent.

Box 2 Comparing with the Commission's Estimates

When we control for the expected dynamics, we estimate that the expected tax revenue for Germany to be EUR 17.6-28.2 Bn., cf. Table 15

The revenue projections made by the Commission in its early Impact Assessment estimated the total EU27 revenue to be EUR 57 Bn. Several factors have driven the difference in the results including:

a. In the IA only one leg of each financial transaction was taxed. Hence, to make the IA estimate comparable to ours, it should be multiplied by two. This implies a total comparable revenue of EUR 114 Bn. Accounting for the fact that German GDP approximately forms 20 per cent of EU-27 GDP, the German share of the EU27 revenue can be roughly estimated to be EUR 22.8 bn. which is comparable to our suggested range.

In the IA, derivative transactions contribute with approximately 2/3 of the total revenue while securities contribute app. 1/3. In our assessment, derivatives only contribute 21-24 per cent of total revenue. This displacement is driven by different factors:

1) The Commission overestimates the tax base contribution from OTC derivatives due to double counting.
2) The Commission did not include OTC traded securities
3) The Commission's use of the source principle implied that derivatives trading conducted in London were fully included in the tax base. This market forms approximately 70 per cent of the European derivatives market, which subtracts from the tax base we establish. We do however attribute some of the transactions in UK to Germany, as they are in fact conducted by German residents.

Source: Copenhagen Economics

In the same fashion as above, where derivatives are instead taxed on their market values by 0.1 per cent, the revenue effects are provided below.

In case of no flight (the cap), the static revenue effect becomes EUR 58.6 bn. while in case of full non-FTT flight (the floor), the static revenue effect becomes EUR 37.0 bn. Narrowing this range by implementing the dynamic effects anticipated by the commission, the German revenue range becomes EUR 17.5 and 28.6 bn. Implementing also the HFT effects as prescribed by 2.2, the range is finally narrowed to EUR 15.4 and 25.1 bn.

Table 16 Static and Dynamic Tax Revenue, market value taxation of derivatives

	No flight			Non-FTT flight		
	Static	Dynamic	Dynamic w/o HFT	Static	Dynamic	Dynamic w/o HFT
Securities Bn. EUR	36.2	24.5	22.2	21.8	14.7	13.5
Exchange derivatives Bn. EUR	19.9	3.8	2.5	13.6	2.6	1.7
OTC-traded securities EUR bn.	2.4	0.4	0.4	1.6	0.2	0.2
Total Revenue Bn. EUR	**58.6**	**28.6**	**25.1**	**37.0**	**17.5**	**15.4**
Revenue relative to GDP, per cent	**2.2**	**1.1**	**0.9**	**1.4**	**0.7**	**0.6**

Source: Copenhagen Economics based on Reuters market share statistics, ECB securities statistics, Asian bonds online, SIFMA, FESE and WFE turnover data, BIS Triennial report, BIS OTC and exchange traded derivatives statistics, Securities holding statistics Bundes Bank, IMF CPIS global portfolio statistic. Tax rates are obtained from the commission's proposal

The narrowed range entails a revenue estimation which as percentage of GDP lies in between 0.6 per cent and 0.9 per cent. Compared with the case in Table 15, the lower estimates stem solely from the change in method of derivatives taxing. However, considering the large change in the derivatives contribution to the tax base from approximately 90 per cent to 30 per cent as depicted in Table 14, the change in revenue effect is rather subtle.

In conclusion, provided that implementing the FTT does not trigger further relocation of trades, the estimate of the German tax revenue obtained through implementing an FTT lies in the region around EUR 17.6 bn. and EUR 28.2 bn. (if as in the proposal derivatives are taxed on their notional value) and forms approximately in between 0.7 and 1.1 per cent of German GDP. As shown in chapter 3, over the last decade, turnover velocities in shares and some exchange trade derivatives have been volatile and very pro cyclical. Our estimates are based on current trading activities and might thus be affected by the current business cycle.

2.4 Gradual implementation of the tax

One potential implementation of the FTT would be to introduce it gradually across different instruments. One concrete option is to first introduce the tax on shares and bonds, and consequently over the years on derivative instruments.

If such an implementation in itself would give rise to no other dynamic behaviour changes, it would simply mean that the revenue accruable to Germany only would be the €13.5-22.2 bn. from securities in the beginning, and €4.2-6.0 bn. from derivatives afterwards, cf. Table 17.

Table 17 Bounds on Revenue Estimates

	Lower bound	Upper bound
Securities Bn. EUR	13.5	22.2
Derivatives Bn. EUR	4.2	6.0
Total Revenue Bn. EUR	**17.6**	**28.2**
Revenue relative to GDP, per cent	**0.7**	**1.1**

Note: The figures are taken from Table 15.

Source: Copenhagen Economics based on Reuters market share statistics, ECB securities statistics, Asian bonds online, SIFMA, FESE and WFE turnover data, BIS Triennial report, BIS OTC and exchange traded derivatives statistics, Securities holding statistics Bundes Bank, IMF CPIS global portfolio statistic. Tax rates are obtained from the commission's proposal

However, we expect such a gradual implementation to affect the dynamic trading behaviour. This will spill over into the estimated elasticities and therefore also affect revenue estimations. In the transition period, securities will be taxed, while derivatives are not, which implies that the relative attractiveness of derivative products will increase. As the derived value from purchasing/selling a security can be replicated to a very large extent by a combination of derivative contracts,[12] we will expect a larger movement of transactions from the security markets to the derivative markets than would have been the case if the FTT was implemented on an equal basis across different instruments.

The implication is that the lower bound of 13.5 will be a more realistic estimate given move towards derivatives products.

Once derivatives are to be taxed, the relative attractiveness of the two products is realigned. This would suggest that the revenue estimates of Table 17 would materialise, however it is very difficult to predict whether gradual implementation would have led to permanent changes in trading behaviour, which might turn out to be difficult to roll back.

2.5 Taxing Government Bonds

In this section, we focus on the net effects from taxing government bonds and derivatives written on those. We argue that the main effects are a tax revenue gain and a cost emerging due to an increase in the liquidity premium on German government debt, cf. Table 18. The liquidity premium defines the additional compensation in terms of yield that investors demand as a compensation for holding more illiquid assets. Hence, when the liquidity premium increases, cost of finance increases.

12 A very simple example is to purchase a future contract stipulating that an asset is delivered in one day. This derivative contract has almost exactly the same features as a security contract, but will not be subject to tax under gradual implementation.

Table 18 Effects of taxing government bonds

	Taxation of Government Bonds	Non-taxation of Government Bonds
Benefits	Tax Revenue from Government Bonds	
Costs	Potential increase in liquidity premium on investors required Government yield	No Tax Revenue from Government Bonds Potential decrease in contribution to tax base from non-government linked assets due to residents substituting from taxed assets towards government-linked assets

Source: Copenhagen Economics

In this paragraph, we focus in a dynamic perspective on the net effects from including German government bonds and related instruments in the FTT.

Compared to the static case we present in Appendix C, we will here determine a range for the revenue and the liquidity premium under the two extremes of no flight and full non-FTT flight.

For both cases the allocation keys to distribute turnovers are provided in Table 19: the case with no flight is provided without brackets while the non-FTT flight case is provided within brackets. The non-FTT flight case reflects that to circumvent the tax, all foreign investors stop actively trading in the market. Since foreign non-FTT investors currently hold 60 per cent of the German government debt, this scenario implies that the active market is reduced to 40 per cent. For other countries debt – similar full flight matrices have been constructed.

Table 19 Government debt allocation key (non-FTT flight)

Sellers\Buyers, per cent	Other FTT residents	German residents	Non-FTT residents
Other FTT residents	2 (5)	4 (9)	9 (0)
German residents	4 (9)	6 (16)	15 (0)
Non-FTT residents	9 (0)	15 (0)	36 (60 per cent relocated)

Source: Copenhagen Economics based on IMF's global CPIS Statistic, Bundes Bank securities holding statistic by residency of issuer

Gains from Government Bonds Taxation

The total gain from taxation ranges in between EUR 11.4 Bn. and EUR 19.1 Bn as shown in Table 20.

Table 20 Gain from taxing Government Bonds

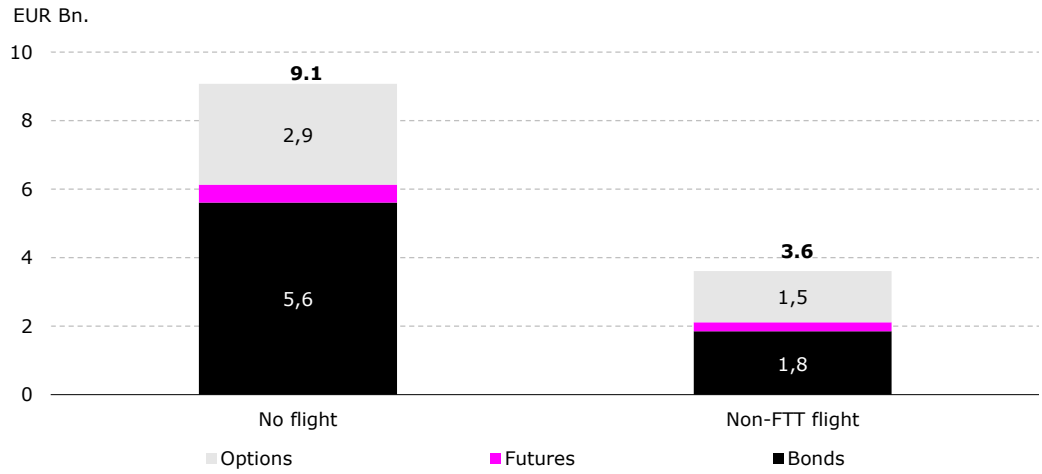
	No flight	non-FTT Flight
Revenue from German Government bonds, EUR Bn.	9.1	3.6
Revenue from foreign Government Bonds, EUR Bn.	8.5	6.9
Non-substitution Gain, EUR Bn.	1.6	1.0
Total Gain from Taxation, EUR Bn.	**19.1**	**11.4**

Source: Copenhagen Economics based on German Finanz Agentur, EUREX, Bundes Bank securities holding statistics, ECB securities statistics, Asian bonds online, SIFMA, FESE and WFE turnover data, Securities holding statistics Bundes Bank, IMF CPIS global portfolio statistic.

The total gain comprises three separate effects: Tax revenue from German government bonds, tax revenue from foreign government bonds, and an opportunity gain from fencing off against product substitutions.

We start by looking at the revenue effects from taxing government debt linked instruments. We do this by implementing the full dynamic effects as introduced in Section 2.1 and 2.2. Thus we account for elasticity, evasion, and HFT effects for the derivatives. Performing these calculations on the upper bound (with no flight) and lower bound (with full non-FTT flight) of the German government debt contribution to the tax base, we establish a German revenue range between EUR 3.6 bn. and EUR 9.1 bn.

Figure 6 Dynamic Tax revenue contribution stemming German government debt linked instruments



Note: The German Finanz Agentur informs that the outstanding German government debt forms EUR 1,105 bn. with an annual turnover velocity of 4.92. Furthermore from EUREX the annual notional turnover of futures written on German government debt is EUR 29,008 bn. while for options written on German government debt, the annual turnover is EUR 163,327 bn.
Source: Copenhagen Economics based on German Finanz Agentur, EUREX, Bundes Bank securities holding statistics, IMF's CPIS statistics for global portfolio holdings, ECB security statistics, SIFMA, WFE, FESE

Next, we also need to account for German tax collection stemming from residents trading in foreign government bonds. Again as above, we perform this calculation using bound terminology. Thus for the upper bound with no flight and the dynamic revenue effect is EUR 8.5 bn. while for the lower bound with full non-FTT flight the dynamic revenue effect is EUR 6.9 bn.

Finally, we should also account for the opportunity cost from not taxing government bonds. If Government bonds are tax exempt, this may create a substitution effect from high rating corporate bonds. We account for this by assuming that non-taxation will increase the elasticity on corporate bonds from 1 to 1.001. For the no flight case this implies that including government bonds in the FTT relative to exclusion provides a gain of EUR 1.6 bn. For the case with full non-FTT flight the gain is reduced to EUR 1.0 bn.

Liquidity Costs

We also need to consider the potential liquidity cost emerging if government bonds are included. To perform this analysis, we start by analysing the upper bound case with no flight. In this case, the dynamic effects implies that for bonds, annual turnover velocity for is reduced to 3.3, for options it is reduced to 17.4, while for futures, it is reduced to 3.1. Since bond trades are taxed by 0.2 per cent while derivatives trades are only taxed by 0.02 per cent, FTT taxation implies that traders in the different market are on an annual basis set to pay 0.7 per cent, 0.3 per cent respective 0.1 per cent on outstanding debt. Assuming that the government were to compensate traders– the liquidity premium that should be added to the current interest rate would lay within the range 0.1 per cent and 0.7 per cent. Multiplying this range on the outstanding government debt of EUR 1105 Bn. the annual liquidity cost range if no flight between EUR 0.7 and 7.3 Bn.

For the case of non-FTT flight turnover velocities are reduced further which ultimately provides a lower bound on the maximum liquidity cost ranging in between EUR 0.3 and 2.9 Bn.

Table 21 Dynamic liquidity premium

	Bonds		Options		Futures	
	No flight	non-FTT Flight	No flight	non-FTT Flight	No flight	non-FTT Flight
Dynamic Turnover velocity	3.3	1.3	17.4	6.9	3.1	1.2
Tax rate, per cent	0.2	0.2	0.02	0.02	0.02	0.02
FTT premium, per cent	0.7	0.3	0.3	0.1	0.1	0.02
Outstanding debt EUR Bn,	1105	1105	1105	1105	1105	1105
Liquidity Cost, EUR Bn.	**7.3**	**2.9**	**3.9**	**1.5**	**0.7**	**0.3**

Source: Copenhagen Economics based on German Finanz Agentur, EUREX, Bundes Bank securities holding statistics, ECB securities statistics, Asian bonds online, SIFMA, FESE and WFE turnover data, Securities holding statistics Bundes Bank, IMF CPIS global portfolio statistic.

Net Gain from Taxation

Comparing the gains and costs related to taxation, the upper bound on net gains ranges in between EUR 11.7 bn. and EUR 18.4 bn. while the lower bound ranges in between EUR 8.5 bn. and 11.2 bn.

Table 22 Net Gains from taxation

	Bonds		Options		Futures	
	No flight	non-FTT Flight	No flight	non-FTT Flight	No flight	non-FTT Flight
Total Gain from Taxation, EUR Bn.	19.1	11.4	19.1	11.4	19.1	11.4
Liquidity Cost, EUR Bn.	7.3	2.9	3.9	1.5	0.7	0.3
Net Gain from Taxation	**11.7**	**8.5**	**15.2**	**9.9**	**18.4**	**11.2**

Source: Copenhagen Economics based on German Finanz Agentur, EUREX, Bundes Bank securities holding statistics, ECB securities statistics, Asian bonds online, SIFMA, FESE and WFE turnover data, Securities holding statistics Bundes Bank, IMF CPIS global portfolio statistic.

For all cases, it should be noted that futures trading is the main provider of the liquidity of German government bonds.[13] This suggests that the lower the liquidity premium is the more realistic – implying that the net gain from taxation ranges in between EUR 11.2 and 18.4 bn.

Finally, it should be noted that since futures bear a lower taxation than bonds i.e. 0.02 per cent versus 0.2 per cent, this difference may imply that in order to circumvent the tax, investors would substitute from bonds to futures. The key in this connection is that when entering a future with delivery e.g. tomorrow, traders would only pay 0.02 per cent of the bond's value, while if they buy the bond today they would pay 0.2 per cent. On one hand, this consideration implies that the liquidity cost on government bonds would be low while on the other hand, it suggests that the average turnover velocity in the bond market may drop. The fact that bonds are only taxed in the secondary market together with the above entail that on top of it the likelihood of substantial increase in the cost of government debt issuance is low. However, it is difficult to project whether a change in business model as sketched above can have other second order effects to the market.

2.6 Leakage risks and scope of mitigating actions

Taxing behaviour will lead to changes in behaviour. This will especially be the case when there are plenty of alternatives to the taxable behaviour. The financial sector is known for its flexibility with respect to the availability of different financial instruments, trading platforms and flexibility of trading strategies. The Commission has attempted to mitigate some of the most serious leakage issues in its current proposal, e.g. by proposing both a "residence principle" and an "issuance principle". These principles attempt to mitigate leakage by extending the scope of the FTT, entailing monitoring and enforcement *requirements on non-FTT countries*.. While these mitigation actions are likely to prevent some sources of leakage, there are still a number of *relocation channels* that potentially may reduce the tax base and thus the collected revenue. We will address these two issues in the following.

13 ECB (2009)

Requirements on non-FTT countries

There is an overarching trade-off between mitigation and leakage risks, and the complexity and proportion of technical and administrative requirements on non-FTT countries. Both the "residence principle" and the "issuance principle" are examples of mitigation actions that require a substantial degree of cooperation both within FTT countries, but more importantly with countries outside the FTT. We highlight a few examples:

Firstly, the issuance principle requires that the trade of a Daimler share between an American and a Chinese investor is taxable also if it is traded in London or Singapore. This implies that stock exchanges in London and Singapore must monitor transactions of FTT-issued shares and more importantly levy, collect and distribute the tax revenue accruing to the FTT countries. This requirement will also apply to transactions that are conducted OTC instead of on-exchange. For derivative products, this essentially moves the reporting requirement from centralised agents such as exchanges and clearing facilities to the investors themselves. It is thus the responsibility of the Singaporean firm trading a Daimler future with another Singaporean firm to report to some tax authority that it has engaged in a taxable transaction.

Secondly, the residence principle requires that a transaction outside the FTT-zone is taxable, if at least one of the parties is an FTT-based investor. This implies that exchanges in e.g. UK and Singapore must keep track of the nationality of their traders, and impose taxes according to the structure of the transaction. The residence principle also implies that e.g. a German investor investing in a UK investment fund should be taxed. Consequently, the underlying ownership of all transactions should be monitored, and reporting requirements should be levied such that non-FTT investors and including investment funds disclose the underlying nationality share of an investment fund's (that may consist of funds from several different investors across the globe) concrete transactions. While this "nationality share" may not even be a theoretically feasible concept, a technical solution in practice will be challenging to construct.

Other relocation channels

The relocation risks can roughly be divided into three categories: Product leakage, market leakage and geographic leakage, cf. Table 23. Several of the possible relocations may fall into more than one of these categories.

Table 23 Possible relocation causes and effects

Relocation cause	Type of relocation
Product leakage	
Derivatives are taxed at a lower rate than spot transactions	Instead of buying a share in the spot market, agents can purchase the same share in the futures market with delivery shortly after, thus reducing the tax rate from 0.1 to 0.01 %.
Derivatives are taxed at notional value	Artificial reduction of the notional value of the derivative through "creative" derivative construction, leaving the value of the derivative intact
FTT issued shares are taxable outside the FTT zone	Non FTT investors can acquire stock indices based on FTT issued stocks instead of the actual stock and avoid taxation
Bonds are taxed, but bank lending is not	This may lead to some substitution of bond financing with bank lending
The effective tax on hedging may be high as many hedging arrangement uses rolling transactions, thus accumulating the effective tax rate on a particular hedging strategy	Reducing hedging through derivatives transactions
Interbank repos are taxed (only 1 leg)	Interbank liquidity is likely to decrease
Options are taxed at a lower rate than spot trades. A given portfolio can be achieved through a mix of put/call options and securities (put/call parity)	Portfolio holdings is likely to be made up by more put/call options than securities
Market leakage	
Cascade effect. Typically several agents involved in one on-exchange transaction, including vendors, brokers and clearing members. This drives up the effective tax rate for any given real transaction.	Migration from exchanges to OTC as the involved "middlemen" are fewer for OTC, or complete overhaul of the functioning of on-exchange trade.
Transactions conducted between non-financial institutions/firms are not taxed	Exchange trade requires the involvement of financial institutions, but OTC trade does not necessarily. Large companies and non-financial institutions may to a larger degree trade OTC to avoid tax
Geographic leakage	
Transactions between non-FTT and FTT investors are taxed on both legs	Non-FTT investors will avoid trading with FTT investors (flight)
FTT issued stocks are taxed outside the FTT-zone, increasing the cost of capital for these firms	Firms that are not essentially dependent on location will move outside the FTT zone Non-FTT investors may seek to construct their portfolio with non-FTT stocks instead of FTT stocks
FTT issued stocks are taxed outside the FTT-zone, but indices based on those stocks are not taxed	Trade will take place in stock indices instead of actual stocks. Trading in stock indices will migrate out of the FTT zone

Source: Copenhagen Economics

Product leakage describes the possibility of achieving the same results with different combinations of financial instruments or transactions. Several types of product leakage can be envisaged, cf. Table 23. One of the main channels comes from the different tax rates levied on security trading and derivative trading. An agent wishing to buy a security can instead enter a future (or forward) obligation or an option to buy the same security say tomorrow. This contract is now a derivative, and the notional value will be taxed by 0.01 per cent instead of 0.1 per cent. A second channel of product leakage is from creative construction of derivative products which is not uncommon practice by e.g. hedge funds. Here, the same value may be derived from a derivative with a lower notional and therefore taxable value. A third channel of product leakage emerges if non-FTT investors can acquire indices based on FTT issued instruments instead of the actual instrument and thereby avoid taxation. Since indices to some degree resemble derivatives, it is unclear

whether the issuance principle will fence off against this risk. A fourth channel emerges in the debt market as bonds are taxed, but bank lending is not. This may lead to some substitution of bond financing with bank lending. In light of the new Basel III regulation, which may increase banks' lending rates,[14] it is difficult to assess how large the net effect will be. Our estimates, however, suggests that there will be a reduction in current bond financing from an FTT. If this amount of financing fully shifts from bond issuing to bank lending, the increase in bank lending will be EUR 1,224-1,620 billion depending on whether there is flight of non-FTT residents, cf. Table 24. This will be an upper bound on what can be expected, as bank lending may not fully absorb the total reduction in bond issuance, and as other regulation such as e.g. Basel may reduce bank lending for other reasons.

Table 24 Estimated reduction in bond finance

	No flight	Non-FTT flight
Reduction in bond finance, EUR Bn.	1,620	1,224

Source: Copenhagen Economics based FESE and CPIS

Market leakage describes potential changes in trading between different trading venues. We highlight two potential leakage issues. Firstly, for exchange trade, the number of underlying financial transactions behind an actual economic transaction is far greater than one, as it typically requires the involvement of vendors, brokers, and clearing members. This drives up the effective tax rate. To avoid this layer of middlemen, some transactions may migrate to OTC, or the on-exchange trading model may change completely. Secondly, as a financial transaction is only taxed if at least one of the parties is a financial institution, non-financial institutions may to a much higher degree attempt to trade with other non-financial institutions. Such trading will take place OTC. .However, this avoidance is limited as non-financial firms conducting significant financial activation may transition to be considered a financial institution for the purpose of this tax.

Geographic leakage describes geographic changes in the trading behaviour. At least three channels are identified: Firstly, as non-FTT investors are taxed when the counterparty is within the FTT-zone, non-FTT investors are likely to stop trading investors within the FTT. Secondly, with the issuance principle, stocks issued in an FTT-country are taxable outside the FTT zone. This is likely to incentivise non-FTT investors to construct their portfolios with stocks issued in non-FTT countries. Additionally, as the cost of capital is raised for listed companies within the FTT-zone, these firms are more likely to consider relocating outside the FTT-zone. Thirdly, while FTT issued stocks are taxable, it seems that stock indices based (partly) on FTT issued stocks are not taxable. This is likely to incentivise non-FTT investors to construct their portfolio with stock indices instead of actual stocks. In addition, non-FTT investors are likely to find other non-FTT investors to trade the stock indices with.

[14] OECD (2011)

2.7 Concluding remarks

Based on the above analysis, we suggest that caution should be used in interpreting revenue estimations. Several sources of leakage exist, and the extent of relocation is yet to be seen. Concretely, we use the analysis to revise down the Commission's revenue estimates from €33 bn. to €18-28 bn., cf. Table 15. This revision is driven by taking into account the strong role of HFT in some asset trading, and the potential for non-FTT investor "flight".

The Commission's revenue estimates depend on two factors for transaction volume reductions, namely: tax elasticities, and evasion factors. While the elasticity in theory depends on the size of the tax rate, the evasion factors simply reduce the transaction volume independently of the tax rate. The Commission does not state the reasons for using the chosen evasion factors, which makes it difficult to know what factors is takes into account. We can, however, observe that the Commission does not mention that it takes into account at least four factors, which we argue will affect the reduction in transaction volume (the elasticity). Concretely, we argue that following, cf. Table 25:

1. Taking HFT into account should increase the elasticity of select instruments, including all asset trading on-exchange except bonds.
2. The large relative price increase for currency linked derivatives will make this instrument more elastic.
3. The higher effective tax rate for interest rate and currency-linked derivatives will make these instruments more elastic.
4. The incentive for non-FTT investors to stop trading with FTT investors and only trade with non-FTT (flight), will make all instruments more elastic.

It is possible that these effects are included in the Commission's "evasion factors", e.g. saying that derivative volumes will be reduced by either 70 per cent or 90 per cent, however non are mentioned in the assessment. Unless already accounted for, this suggests that the Commission's revenue estimates may be an upper bound.

Table 25 Adjustments in magnitude of elasticities

			CE assessment			
	Instrument	Elasticity size	HFT	Increase in transaction cost	Effective tax rates	Flight
Exchange traded	Shares	1	↑	↑	↑	↑
	Bonds	1				↑
	Derivatives - equity linked	1.5	↑			↑
	Derivatives - interest linked	1.5	↑		↑	↑
	Derivatives - currency linked	2	↑	↑	↑	↑
OTC	Shares	1				↑
	Bonds	1				↑
	Derivatives - equity linked	1.5				↑
	Derivatives - interest linked	1.5			↑	↑
	Derivatives - currency linked	2		↑	↑	↑

Note: The elasticity size is based on the Commission's assumptions.

Source: Copenhagen Economics

Chapter 3
Effects on the real economy

A financial transaction tax (FTT) will naturally affect financial transactions. As financial transactions typically are conducted with an underlying real economic aim, an FTT is likely to have implications for the real economy. In this chapter, we describe the principle aims of the financial market (Section 3.1), and investigate the link between an FTT and the functioning of the financial market (Section 3.2). Moreover, we establish the link to the real economy (Section 3.3), and make preliminary estimations on the expected impact on Germany's GDP (Section 3.4).

3.1 Principle aims of the financial market

In general, the financial market serves at least three real economic purposes: 1) Supply capital from savers to borrowers, 2) Allocate capital to its most productive use, and 3) Provide hedging facilities against real economic risks.

Supply of capital

The basic aim of the financial market is to supply capital to real economic investments. Equity capital is supplied in the primary market through issuances e.g. in association with stock exchange listings or as unlisted equity in smaller companies. Debt capital is typically supplied by the banking sector, or acquired through issuances of bonds by typically governments and large corporations. By channelling capital from savers to real economic investments, financial markets are contributing to a main factor of GDP, namely the investment stock.

Allocation of capital

Allocating capital to the investment projects with the highest economic value is a main feature of financial markets. Financial market participants spend many resources evaluating the viability and profitability of investment projects and hence contribute to a proper distribution of investments. Allocation of capital is taking place both in the primary market (issuance) and in the secondary market, where financial market participants exchange assets. In more technical terms it can be said that the secondary financial market allows investors to rebalance their portfolios when new information is disclosed.

Hedging against risks

All economic activity is subject to risk. The financial market offers a source of insurance (or hedging) against such risks. As the typical economic agent is risk averse, insurance products will provide economic value to this agent. Hedging against risk can take place via positions in security instruments, derivative instruments or a combination of both. A simple example of hedging via securities can be illustrated by a cigarette producer – wishing to hedge against a change in social norms towards smoking – buys shares in a firm producing nicotine replacement products.

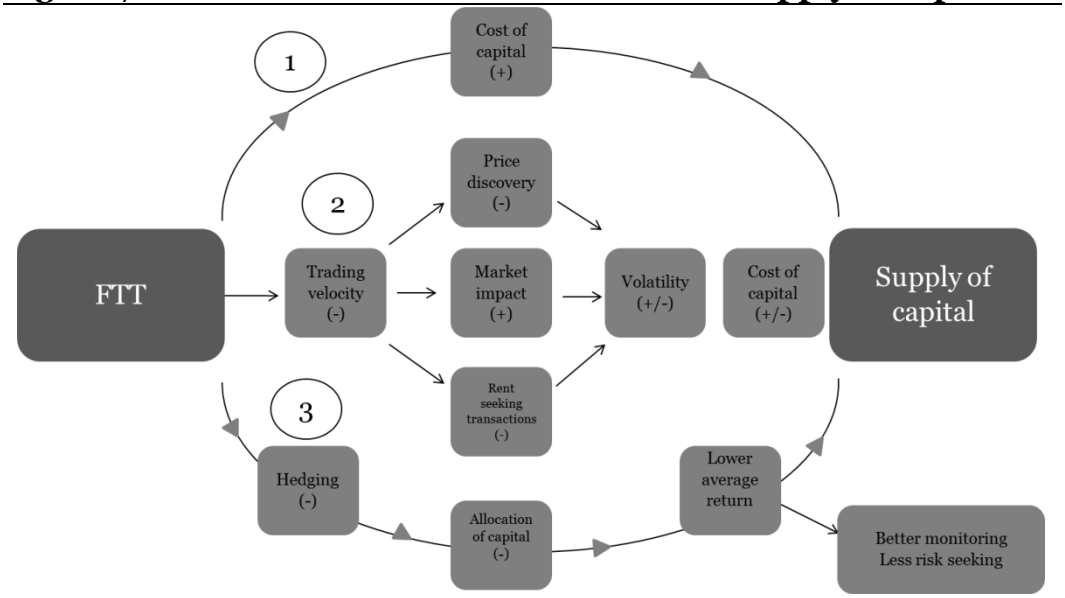
Acquiring securities is often seen as a relatively expensive way to hedge against risks, as one need to buy the actual shares.

It is therefore typically more attractive to hedge via derivative instruments. Here, it is possible to hedge movements in an underlying asset, without having to purchase or sell the underlying asset. A simple example is a European producer receiving a payment of USD100, three months into the future. In the meantime, the European producer is subject to the risk of fluctuating exchange rates. By entering a currency forward agreement now, the European can lock in the amount and alleviate all currency risk.

3.2 Effects of FTT on financial market functioning

An FTT affects financial market functioning through several channels. We illustrate three channels in which the FTT can affect supply of capital, cf. Figure 7.

Figure 7 Transmission channels from FTT to supply of capital



Source: Copenhagen Economics

The *first* and most direct channel is by raising the cost of capital. By increasing the cost of trading assets, the value of holding a security is reduced. This takes place through the direct increase in transaction costs induced by the tax (explicit transaction costs), and through reduced liquidity in the market which is likely to increase the market impact of a transaction and thus make each transaction more expensive (implicit transaction costs). This means that even though the FTT is not directed at the primary market (issuance of capital) it still has an effect on the return on capital investors require via its impact on the secondary market. The impact through this channel is unambiguously negative: an FTT will increase the cost of capital. This will in turn lower the supply of capital to the real economy.

The *second* and more indirect channel is through the impact on trading velocity: the amount of times a particular transaction is traded over a period, which will unambiguously decrease with a tax on transactions. A reduction in trading velocity is likely to affect asset price volatility through at least three channels, which works in opposite direction:[15]

- It impedes price discovery, making it more difficult to discover the equilibrium price. This is likely to increase price volatility.
- It reduces liquidity in the market, consequently increasing the likelihood that a transaction has market impact. This is likely to increase price volatility.
- Pure speculative activities is reduced. This can reduce price volatility

An increase in asset price volatility will increase the perceived risk to investors of holding an asset. This is likely to increase the cost of capital, as the investors will require a higher return to compensate for the increased risk. The opposite holds for reductions in asset price volatility. All three channels are linked to short term asset price volatility. Proponents of an FTT has argued that it may help alleviate long term asset mispricing, which may build up asset bubbles. However, very little evidence has been presented to support this connection.[16]

The empirical results on the effect of an FTT on short term asset price volatility is, similarly to the theoretical foundation, ambiguous. While most studies find that there is no relationship between increased transaction costs and asset price volatility, some find that the relationship is in fact positive: higher transaction costs increase asset price volatility.[17]

The *third* channel, is through the increase in the costs of derivative contracts. As derivative contracts are typically used to hedge against risks, an increase in transaction costs will make it more costly to insure against adverse outcomes. This is likely to result in suboptimal allocation of capital, as optimal allocation of capital may involve taking risky positions and subsequently hedging against extreme outcomes. As a simple example, consider a farmer deciding to invest in either crops or in animal stock. Expected returns from crops is higher than animal stocks, but the price of crops is more volatile; so the project is riskier. A derivative contract can protect the farmer against a fall in the world market crop price, making him choose the project with the highest expected return (socially optimal investment). However, if the derivative contract is too costly, the risk averse farmer may choose the suboptimal investment.

By making riskier projects relatively unattractive compared to less risky projects, society's total investment portfolio will become less risky. This implies in general lower expected returns on investments, and consequently a decrease in the supply of capital. It may also introduce other effects, such as:

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15 See e.g. Commission Impact Assessment (2011), volume 16 and Matheson (2011)

16 On the contrary, bubbles are often seen in e.g. the real estate market where transaction costs are significantly higher, generally in the order of several percentage points. This suggests that long term asset mispricing will not be discouraged by relatively small transaction costs. See e.g. Commission Impact Assessment (2011), volume 16 and Matheson (2011) page 21

17 See Matheson (2011) for a review of the literature.

- Reducing risk seeking, as risk seeking typically requires entering several derivatives contracts
- Better monitoring of projects, as risky projects to a larger extent will be kept by specialist investors
- Reducing innovation, as innovation typically requires risk capital

3.3 Effects on the real economy

An FTT will affect the supply of capital through the three channels highlighted above. As the supply of capital directly translates into real economic investment, we attempt to evaluate the size of this effect.

Channel 1: Increasing cost of capital

By increasing the cost of capital and lowering the amount of capital/investments in the economy, GDP will adversely be affected by an FTT.

The impact on cost of capital from an FTT will depend on the structure of the affected transactions. If an asset – e.g. a Daimler share – is traded numerous times a year, the increase in cost of capital will be higher than if it is traded fewer times, as it is taxed more often. Consequently, if an FTT will spur a large fall in transactions, the effective tax of the underlying assets will be reduced. We know from Chapter 2 that an FTT is in fact likely to reduce the amount of transactions by a significant amount. We use this information here to derive the expected increase in cost of capital.

The maximum increase in cost of capital would be if all current transactions are taxed (the elasticity is zero). Currently, shares are on average traded 1.2 times a year, while bonds are traded 1.1 times a year. This corresponds to an increase cost of capital of 0.25 and 0.21 per cent respectively, cf. Table 26.[18] In Chapter 2 we suggested that HFT constitutes 30-40 per cent of share trading and 0 per cent of bond trading. As this trading is likely to disappear with an FTT, the effective tax of the underlying assets will be reduced. Controlling for HFT, we expect the annual turnover rate for shares to fall to 0.8, implying that a share will traded 0.8 times per year, while bonds are unaffected. This will reduce the effective tax rate for shares to 0.16 per cent. Furthermore, economic business models are likely to change because of an FTT. We estimate that the annual turnover rate for shares and bonds is likely to be reduced even further by 33 per cent. Based on the assessment in Chapter 2, the elasticity of bonds should perhaps even be larger than this. This will reduce the effective tax to 0.11 and 0.14 per cent respectively.

[18] Since both legs of a transaction are taxed, the tax rate will be 2 x 0.1 per cent = 0.2 per cent

Table 26 Effective tax on German securities

	Shares		Bonds	
	Annual turnover rate	Effective tax / Increased cost of capital (per cent)	Annual turnover rate	Effective tax / Increased cost of capital (per cent)
No transaction reduction	1.2	0.25	1.1	0.21
Controlling for HFT	0.8	0.16	1.1	0.21
Controlling for HFT and Commissions elasticities	0.5	0.11	0.7	0.14
Controlling for HFT, Commision's elasticities, and flight	0.3	0.06	0.5	0.11

Source: Copenhagen Economics based on BIS security statistics, turnover data from Reuters' market share report, WFE, and FSE. Haldane (2010) and European Commissions' Impact Assessment.

Currently, a significant share of transactions related to German assets is conducted outside the FTT-area. As these transactions will be taxed under the issuance principle, non-FTT investors can avoid the FTT all together by opting out of FTT-issued assets such as German securities. Currently, 42 per cent of German shares, and 48 per cent of German bonds are held by investors outside the FTT-area.[19] If these investors choose to hold non-FTT issued assets instead of German assets, the turnover rate will be reduced from 0.5 to 0.3, which will reduce the effective tax and the increased cost of capital.

Based on the above reasoning, we depict three different scenarios for the expected increase in cost of capital: 1) No effect on transaction volume which gives the highest possible cost of capital increase. This is a static example, and therefore serves as an extreme upper bound. 2) Transaction volume is reduced by HFT and the elasticities used by the Commission, 3) Non-FTT investors currently holding German issued assets opt out of these assets, instead holding/trading non-FTT issued assets. The impact on cost of capital in the three scenarios is depicted in Table 27.

Table 27 Increased cost of capital – three scenarios

	Scenario no.	Increased cost of capital - Shares (per cent)	Increased cost of capital - Bonds (per cent)	Increased cost of capital - weighted (per cent)
1	No reduction in transaction volume (static)	0.25	0.21	0.23
2	Reduced transaction volume - All transactions included by FTT	0.11	0.14	0.13
3	Reduced transaction volume - Non-FTT transactions - Flight	0.06	0.11	0.09

Note: The weighted cost of capital is based on 40 per cent of capital being equity, and 60 per cent being bonds.

Source: Copenhagen Economics

It should be noted here, that we do not consider the effects on transaction costs from the reduced asset liquidity. Reduced liquidity will typically increase bid-ask spreads in the

19 German Bundes Bank security statistics (2012)

financial market, thus increasing the (implicit) transaction costs of conducting a transaction. This will tend to increase the effective tax rate. Hence, the cost of capital estimates are likely to be lower bounds, as the reduced liquidity will tend to increase the cost of capital.

Channel 2: Volatility

As stated, both the theoretical and the empirical literature is ambiguous on how an increase in financial transaction costs will affect asset price volatility. The relationship between financial market volatility and real economic variables has been studied in several papers.[20] One study shows that long-run asset price volatility is significantly correlated with macroeconomic variables such as industrial production, unemployment.[21] Short-term asset price volatility on the other hand does not seem to be correlated with real economic variables. This suggests that an FTT may have limited effect on the real economy through the volatility channel, as an FTT primarily will affect short term volatility.

One study finds that asset price volatility makes discretionary fiscal policy more volatile.[22] This is driven by changes in fiscal revenue from both capital gains but also through indirect taxes due to changes in consumer behaviour. When discretionary fiscal policy becomes more volatile, it will have negative macroeconomic implications through increased output volatility and economic growth.[23] Consequently, increased asset price volatility may indirectly affect macroeconomic variables negatively through its effect on fiscal decisions.

Channel 3: Reduced risk hedging

Reduced ability to hedge against risk will lead to a suboptimal allocation of capital in the economy, and lead to investments with lower average returns.

When assessing the effects on the real economy from an FTT, it is essential to know how an FTT will actually affect the ability to hedge against risks. As derivatives are the primary instruments to hedge against risks we will primarily focus on such instruments, and ask the question: how does current derivative transactions contribute to risk hedging? This will help us estimate how a reduction in derivative transactions may affect the real economy.

So called high frequency trading is relatively wide spread in derivatives trading, as well as in securities trading as mentioned in Chapter 2. Estimates suggest that 30-40 per cent of the turnover in exchange traded derivative contracts is high frequency trading.[24] As argued above, most (if not all) of such high frequency trades will be discontinued with an FTT, as the trades utilize very small price differentials which will not be profitable with increased transaction costs. As also argued above, the contribution to economic welfare from HFT may be limited. This implies that 30-40 per cent of exchange traded derivative

20 See e.g Ang, Hodrick, Xing, and Zhang (2004), The cross section of volatility and expected return
21 Adrian & Rosenberg (2005), Stock returns and volatility. Pricing the Long-Run and Short-Run Components of Market Risk
22 Tagkalakis (2009), The effect of asset price volatility on fiscal policy outcomes
23 See e.g. Fatas and Mihov (2003), The case for restricting fiscal policy discretion
24 Haldane (2010)

turnover can be removed without significantly affecting the economy's overall risk hedging abilities.

For derivatives traded at OTC markets, there is no high frequency trading. This implies that a reduction in transactions on OTC market is likely to have larger real economic implications than on the exchange market. It also implies that the turnover elasticity is likely to be higher for on-exchange transactions than OTC.

As risk hedging through derivative products becomes more expensive with an FTT, it is likely to have implications for the risk taking in the economy. One example of this might be a shift from investments in equity to investments in bonds. When it gets more expensive to hedge against risks, the marginal investors that are almost indifferent between equity and bonds are likely to choose bonds, as bonds are a less risky investment. This suggests that the tax elasticity of equity should be relatively higher than bonds - everything else equal.

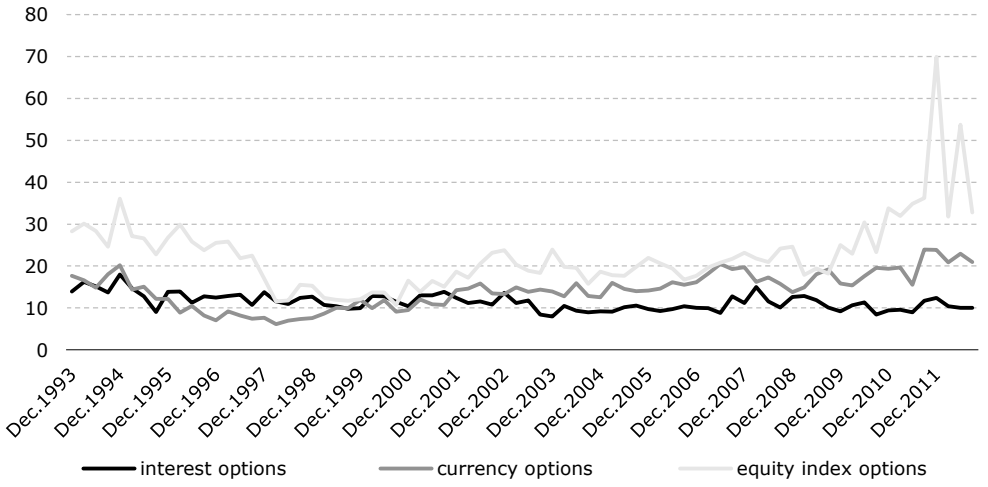
We also argue that there is difference between the different derivative instruments' real economic contribution. We look closer at options and futures respectively.

Options

An option is a financial contract where one party acquires the right – but not the obligation - to purchase or sell an underlying security at a certain price. An option is thus a well suited instrument to hedge against risks affecting the underlying asset, and in particular tail risks. Reducing the use of options is thus likely to be relatively targeted towards reducing risk hedging activities.

Turnover in interest-linked and foreign exchange linked options have been relatively stable over the past 20 years, even during the boom and bust of the end 2000's, cf. Figure 8. While not evidence, this suggests that options have been well linked to real economic activities. Equity-linked options on the other hand have experienced quite significant fluctuations, which may indicate speculative behaviour. On the other hand however, the significant increase in turnover took place in the years after the start of the crisis, indicating that the behaviour may be more linked to hedging against real economic risks related to e.g. government bankruptcies, rather than speculating activities.

Figure 8 Annual turnover velocities, options



Note: We consider exchange traded options

Source: BIS exchange derivatives statistics, WFE, and FESE.

Futures

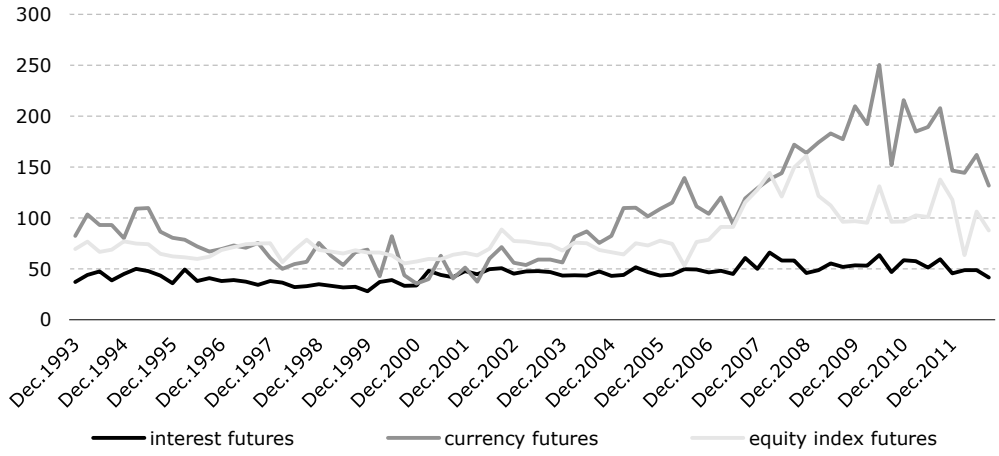
A future[25] is a contract that specifies the price and quantity of a future transaction. A future is typically used to alleviate the risks that may occur until a specific transaction is going to take place, such as e.g. currency fluctuations. Unlike an option contract, a future involves an obligation (not a right) to conduct a transaction in the future. A future therefore combines risk hedging properties with a security trade at a specific point in time. In fact, a future can easily be constructed so it resembles a regular security transaction in the spot market, by e.g. agreeing to conduct the transaction one day after the contract is settled. Such a contract has properties resembling a spot security trade more than a risk hedging derivative product. In fact, by imposing a higher transaction tax on spot transactions is likely to lead to massive relocation to future transactions with very short delay-periods. This characteristic implies that the real effects of future transactions may not be much smaller than for spot transactions, which we evaluated under channel 1. At least, we argue that futures on average have a larger real effect than options, since futures imply real transactions, where an option is a more pure risk hedging instrument that does not necessarily involve a real transaction.

While future contracts are valid risk hedging instruments, they may also be used as speculative instruments. We find indications that the different type of future contracts are used for speculation purposes to a varying extent. While the turnover in foreign exchange futures has fluctuated heavily during the boom and in the crisis, interest-linked futures have showed much more stability during the entire period, cf. Figure 9. While not being evidence, this indicates that currency futures are less anchored in real economic activities, since the demand for risk hedging activities linked to real economic cross border activity hardly can account for the massive increase (and subsequent reduction) in turnover. Eq-

25 The same goes for forwards being traded OTC

uity-linked futures have been less volatile over the boom and bust period than foreign exchange futures, but more volatile than interest-linked futures.

Figure 9 Annual turnover velocities, future contracts



Note: We consider exchange traded futures

Source: BIS exchange derivatives statistics, WFE, and FESE.

High Frequency Trading

HFT are by many participants thought to bring limited net value to the market in terms of e.g. liquidity, and may even hamper the efficiency of the market by posting and cancelling limit orders in order to overload other participants with information.[26] Accordingly, many exchanges apply fines to discourage excessive limit order submission relative to order executions. One study finds that, while HFT has implied a reduction in bid/ask spreads, it has not increased market depth, and consequently not contributed to real economic value.[27] This suggests that removing these transactions with an FTT will have little real effect on the economy.

More recent studies suggest that HFT is not a uniform mass, but is instead divided into "market makers" which provide liquidity, and "opportunistic traders" which do not provide liquidity. While opportunistic traders provide no value, 60-70 per cent of total HFT trading volume is actually conducted by market makers.[28] This conclusion is based on exchange trades of the most liquid shares at NASDAQ OMX Stockholm. If this conclusion is general, it suggests that removing HFT trade through an FTT also will affect the market maker HFTs which is likely to reduce market quality.

26 See e.g. Hagströmer & Nordén (2012), The diversity of high frequency traders

27 See e.g. UK Office for Science (2012) and Menkveld (2012)

28 Hagströmer & Nordén (2012), The diversity of high frequency traders, for an empirical study at Nasdaq OMX Stockholm

Estimated GDP effects

Based on the above considerations we attempt to estimate GDP effects from an FTT. The real effects stemming from channel 2 and channel 3 are described qualitatively, while we attempt to quantify the effects coming through channel 1:

Channel 1

In order to translate the expected increase in cost of capital (channel 1) to an effect on GDP we start out by using the method used in European Commission (2009).[29] This method is based on a supply-side production function, which determines the relationship between GDP, the labour stock and the capital stock. By assuming a Cobb-Douglas specification of the production function, it can be derived that the capital stock's elasticity with respect to cost of capital is -1. This implies that an increase in cost of capital by of 1 per cent will reduce the capital stock by 1 per cent – given that the cost of capital applies to the entire capital stock.

However, the EU commission approach may lead to an overestimation of GDP effects for Germany. Estimates point towards 88 per cent of German equity being held in unlisted companies.[30] This large amount is likely to reflect the large share of family owned businesses in Germany. As debt financing in Germany amounts to app. 52 per cent of total financing (in 2011), equity from non-listed companies is app. 42 per cent of total financing, cf. Table 28.

Table 28 Share of total financing, by instrument

	Per cent
Debt	52
Equity, non-listed companies	42
Equity, listed companies	5

Source: Federal Reserve Bank of St Louis and Dietsch and Weill (2001)

There are at least two reasons to believe that non-listed equity will face much lower effective taxes, and thereby lower cost of capital increases: 1) Equity in non-listed companies is traded significantly less than for listed companies, 2) Equity in non-listed companies may to a large extent be traded between two non-financial institutions, e.g. if ownership is sold to another company or family member. As a lower bound on the cost of capital increase, we assume that 42 per cent of the total capital stock of Germany will not be affected by the FTT. As non-listed shares may in fact be traded by a financial institutions e.g. if a holding company is involved, our assumption is likely to underestimate the impact on cost of capital. By taking the share of non-listed equity into account an increase in cost of capital of 1 per cent will then give rise to a reduction in the capital stock of 0.58 per cent (1-0.42).

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

30 Dietsch and Weill (2001), The assessment of equity of non-listed companies

Using an estimate for capital's share of GDP of 0.4,[31] it follows that for a reduction in the capital stock by 1 per cent, GDP will decrease by 0.24 per cent. We use this framework together with the three scenarios for cost of capital increases depicted in Table 27. In order to highlight that the exclusion of non-listed equity from the tax base is a lower bound, we do not apply the reduction to scenario 1, which is the upper bound for the expected effect. We estimate that the FTT is likely to increase cost of capital on German assets and thereby reduce German GDP by 0.02 - 0.09 per cent, which is equal to €0.6 - 2.4 billion each year, cf. Table 29.

Table 29 GDP effect

	Scenario no.	Cost of capital (per cent)	Cost of capital (excluding non-listed equity) (per cent)	GDP effect (per cent)	GDP (billion EUR)
1	No reduction in transaction volume	0.23	-	0.09	2.4
2	Reduced transaction volume - All transactions included by FTT	0.13	0.07	0.03	0.8
3	Reduced transaction volume - Non-FTT transactions - Flight	0.09	0.05	0.02	0.6

Note: In scenario 1 we do not exclude non-listed equity from the taxable capital stock, in order for it to depict the actual upper bound of our estimate.

Source: Copenhagen Economics

The low estimate of €0.6 bn. should indeed be interpreted as a lower bound. As mentioned above, this estimate includes neither the effects from channel 2 and 3 nor the effects from reduced liquidity of German assets. As the transaction volume of German assets is reduced, this will most likely lead to an increase in the liquidity premium required by investors, and thus higher financing costs for German firms. Furthermore, it assumes that the equity of non-listed firms is not subject to the tax due to very limited trading, and trading typically by non-financial agents. As non-listed equity may indeed be traded by financial institutions, this will tend to underestimate the cost of capital.

Please note also that neither labour market impacts from higher overall taxation nor the effect of recirculating tax revenue is included in the GDP estimates.

The literature on real effects from a financial transaction tax is limited. Four studies related to the European FTT proposal construct a general equilibrium model in order to measure the effect, and find that a tax will reduce GDP between 0.2 and 3.4 per cent, cf. Table 30. The overall transmission channel for this effect is through a lower marginal return on firms' outstanding shares, which leads to lower investments, and in turn lower GDP. In the Impact Assessment from 2013, two additional relations are included: (1) The tax will not affect financing instruments such as bank lending, venture capital and retained earnings. This effect is valid, and also resembles our approach. (2) Secondary adjustments effects in the labour market are included, such as an incentive to work more at lower wages, and importantly recycling of revenue through re-investment in "growth enhancing measures", which increase private productivity. These secondary effects through

[31] See e.g. Ratto et al (2004), quoted in European Commission (2009) The Economic Impact of the Commission Recommendation on Withholding Tax Relief Procedure and the FISCO Proposals

the labour market will dampen the negative GDP effects of the FTT, and may even generate positive GDP effects if optimistic assumptions are made on public measures' effect on private productivity.[32] The other models, including our estimate, excludes such effects and instead assume that revenue is circulated back in a lump sum manner. This approach ensures that the impact assessment focuses on financial market consequences and derived effects on real economy while avoiding somewhat speculative assumptions on the net labour market effects of distorting higher consumption taxes as a result of the FTT that may or may not be fully offset by the way revenues from the FFT can be recycled.

Table 30 Empirical estimates on GDP effects of an FTT

Study	Change in transaction costs	Impact on GDP	Normalised impact on GDP*	Type of model
Commission Impact Assessment (SEC (2011) 1102 final, volume 16)	20 bp (implicit tax rate)	3.4 pct. reduction	3.4 pct. reduction	General equilibrium model
Lendvai et al (2012)	14 bp	0.2 pct. reduction	0.3 pct reduction	General equilibrium model
Commission Impact Assessment, SEC (2013)	20 bp	0.28 pct. reduction to 0.1 increase	0.28 pct. reduction to 0.1 increase	General equilibrium model

Note: The GDP effects are derived as the deviation from a baseline GDP in case of no tax. In some models it is not clear when the steady state is achieved while in others it is achieved in 2040 or 2050. The dynamics in the transition period towards steady state is not given

The implicit tax rate is the tax revenue divided by the tax base.
The normalised impact on GDP recalculates the impact on GDP from a change in transaction cost of 20 bp. This normalisation implicitly assumes that the GDP effect is linear in the change in transaction costs.

Source: The sources mentioned in the table

These estimates are somewhat higher than our assessment of 0.02 - 0.05 per cent of GDP from channel 1. The main reason for this is that all studies assume that the tax on securities will fully translate into cost of capital. In other words, there are no means for avoiding the tax by e.g. reducing the transaction volume, and the nominal tax rate is thus very close to the effective tax rate. In contrast, we find that the effective tax rate from a statutory tax rate of 20 basis points is likely only to be around 6-7 basis points, as the transaction volume will decrease in response to a tax, and due to "flight" of non-FTT investors who can choose to opt out of German issued assets.

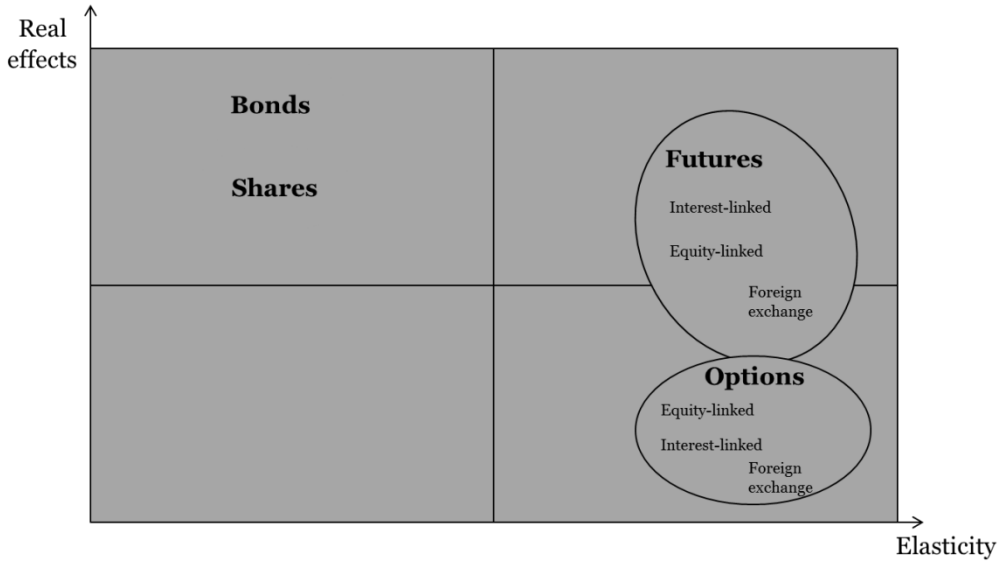
Channel 2 and 3

Based on the above considerations, we argue that the real effects from reducing financial transactions differ according to the targeted instrument. By using the Commissions estimates on the elasticity of the different instruments, these instruments can be grouped according to their expected real effect and their elasticity. Bonds and shares are subject to the lowest elasticity, and are expected to have the largest real effects, cf. Figure 10. This is because a reduction in bond and share transactions will affect cost of capital via the direct channel: channel 1. Since there are very few high frequency trades in the bond market (if

32 DG ECFIN (2012), Quarterly Review of the Euro Area

any), while 30-40 per cent of turnover in the share market, we expect the implications on the real economy to be higher for reductions in bond transactions than for share transactions.

Figure 10 Expected real effects from an FTT



Note: The position of the sub instruments within futures and options should not be evaluated against each other on the real effect scale. That is; we do not intend to speculate that equity-linked options have a larger real effect than foreign exchange futures.

The Commission estimates that the elasticity of foreign exchange derivatives is higher than debt and equity-linked instruments, which again is higher than bonds and shares in the spot market.

Source: Copenhagen Economics

Options, as a group, are expected to imply the lowest real effects. This is because they primarily affect real activity through channel 3; suboptimal allocation of capital due to weakened risk hedging possibilities.

Futures, as a group, are expected to have larger real effects than options as a group, as futures to a larger extent resemble spot transactions and therefore not only affects the real economy through channel 3 but also through channel 1.

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Appendix A
Determining the German Tax base

In order to obtain the tax base, including deriving the residency of the parties to the transactions, we apply three steps:

- Step 1: Obtain data on all turnovers.
- Step 2: Obtain actual data on the underlying residency from statistics
- Step 3:Derive estimates on the underlying residency

We have been able to collect almost all the required data on turnover (step 1), however actual data on the residency of the parties of the transactions have not been available except for in the case of OTC derivatives, cf. Table A.1:.

Table A.1 Data Overview

Avenue of trading		Step 1: Data on turnovers	Step 2: Actual data of residency and origin	Step 3: Derived Data of residency
OTC	Derivatives	91per cent covered, 9 per cent no data	91per cent covered with German residency versus non-German residency	Yes for residual
	Securities	100per cent turnover data for shares and 84 per cent for bonds	No	Yes
Exchange	Securities	100 per cent turnover data	No	Yes
	Derivatives	100 per cent turnover data	No	Yes

Source: Copenhagen Economics based on FESE, WSE, Triennial report 2010, BIS 2012 data, Reuters, ECB, Asian Bonds online, and SIFMA

In step 1, we have first obtained the relevant turnover data:
For OTC derivatives, the 2010 Triennial report[33] published by BIS includes turnover data for FX- and interest-linked derivatives. Using the general BIS on all outstanding OTC derivatives, we find that in terms of outstanding FX- and interest-linked derivatives form 91 per cent of the market. The residual market including derivatives written on commodities and equities and CDS's are not included.

For OTC and exchange traded shares, Reuter's market share report includes all turnover data. For bonds, World Federation of Exchanges (WFE) and Federation of European Stock Exchanges (FESE) provide data for exchange traded part of the market. For the OTC part of the market, there is no data available. Hence, to estimate this market, we use the projection that total bond turnovers consist of 84 per cent exchange trade turnovers and 16 per cent OTC turnovers. Then having complete data, for 84 per cent of the market, the residual OTC turnover data is obtained by dividing all exchange traded turnovers by 84 per cent.

[33] Since this turnover data stems from 2010, we have scaled the turnover data by the market growth in terms of outstanding realized in between 2010 and 2012. Data on outstanding amounts and market data is provided by BIS' detailed derivatives database.

For exchange traded derivatives, all turnovers are covered by the data provided by WFE and FESE.

In step 2, we attempted to find actual data on the residency of the transacting parties: For 91 per cent of OTC traded derivatives, we have an almost clear identification of residents. That is, in terms of German netted turnovers[34], we can fully identify the trades where German residents. Furthermore, for the German turnovers we can divide data in between intra-residential turnovers and cross-border turnovers. For the intra-residential turnovers, both legs are taxable and no further needs to be done. For cross-border turnovers, we know that the German leg is taxable; however, the lack of residence information on the foreign trader provides some issues. Hence if the foreign trader stems from another FTT country, only one leg is taxable to Germany while if the foreign trader stems from outside the FTT zone both legs are taxable to Germany. In step 3, we address this issue of allocating cross-border turnovers to different countries. For the residual 9 per cent of OTC traded derivatives, which we estimated in step 1, we obtain a similar distribution in between intra-residential and cross-border trades by assuming that the average distribution for the 91 per cent of the market we know is representative.

For all other data, we can differentiate in between country of issuance[35] but we cannot identify residency of participating traders.

In step 3, we attempt to bridge the information gap by estimating the underlying residency of the transacting parties. We do this by using the coordinated portfolio of international securities (CPIS) provided by IMF for bonds and shares. Using this data for each country's issues, we are able to identify how much Germans, other FTT residents, and non-FTT residents hold. Having this statistic and assuming that:

1) traders do not hold preferences on the residency of their trading partners and
2) all investors on average trade with equal frequency

For all bonds and shares depending on their country of issuance, we distribute turnovers. Thus, assuming some country where x per cent is held by Germans, y per cent by other FTT member and the residual, z per cent by non FTT residents, we establish an allocation key as in Table A.2.

34 German netted turnovers mean turnovers where at least one leg of the trade is a German resident. These turnovers are divided in between intra-residential trades and cross-border trades. For intra-residential trades the term "netted" entail that only one leg of the trade is reported. For cross-border trades, the German leg is always reported.

35 Reuters provide all share turnover information distributed on the issue's country of origin while FESE and WFE partition bond data between domestic and international issues – where approximately 98 per cent of issues trading originates from the same country where they are traded. For derivatives, the same tendency show, however, for Germany we have kept in mind that all derivatives written on government debt trade on the EUREX in Switzerland.

Table A.2 Allocation Key (German issue/foreign issue)

Buyers/Sellers	German resident	Other FTT resident	Non-FTT resident
German resident	X*X (2/2)	X*Y (1/1)	X*Z (2/2)
Other FTT resident	X*Y (1/1)	Y*Y (0/0)	Y*Z (0/0)
Non-FTT resident	X*Z (2/2)	Y*Z (0/0)	Z*Z (2/0)

Note: Numbers in brackets indicate number of legs to taxable to Germany depending on whether the issue stems from Germany or a foreign country (German issue/foreign issue)

Source: Copenhagen Economics

Thus for each location we have for total bond and share turnovers multiplied by an estimated share where a single (1) leg is taxable to Germany and a share where both legs (2) are taxable to Germany.

Below in Table A.3, we have included the weighted shares of country specific net turnovers which are taxable to Germany. The reporting method implies that cases where only one leg is taxable are summed and divided by two. This means that if there are e.g. share turnovers in Australia worth EUR 20 Bn., then Germany would own 1.2 per cent on net basis. The table includes a division between no flight and non-FTT flight to cover the two extreme cases:

(1) Where global trading patterns remain unchanged - i.e. the tax does not affect non-FTT residents' decision to trade with FTT residents or in issues stemming from FTT countries
(2) Where cross-border trades between FTT and non-FTT residents stop and non-FTT residents exit their positions in issues originating from FTT countries.

Table A.3 Taxable shares in per cent of net turnovers

	No non-FTT flight		Non-FTT flight	
	Equity	Bonds	Equity	Bonds
Australia	1.2	2.2	0.6	1.1
Austria	20.2	19.3	11.0	11.1
Belgium	3.3	8.8	1.7	5.0
Bulgaria	0.2	16.4	0.1	10.2
Canada	1.0	2.6	0.5	1.3
China, P.R.: Hong Kong	0.8	0.5	0.4	0.2
China, P.R.: Mainland	0.6	0.3	0.3	0.1
Czech Republic	2.4	19.4	1.2	11.4
Denmark	2.8	10.7	1.4	5.7
Estonia	1.1	6.6	0.5	3.5
Finland	4.1	11.6	2.1	6.2
France	7.0	92.5	3.7	68.7
Germany	86.7	14.7	48.8	8.6
Greece	2.4	14.2	1.2	8.1
Italy	4.9	14.1	2.6	8.1
Japan	1.1	2.3	0.6	1.2
Luxembourg	19.9	10.1	11.8	5.5
Netherlands	5.7	12.5	3.0	7.1
Norway	3.8	10.2	2.0	5.4
Poland	12.7	15.6	6.7	8.6
Portugal	1.2	14.3	0.6	8.5
Singapore	0.9	0.9	0.5	0.4
Slovak Republic	0.0	26.4	0.0	16.1
Slovenia	1.7	17.2	1.0	10.6
Spain	6.0	17.6	3.2	10.3
Sweden	2.1	8.8	1.1	4.7
Switzerland	5.5	3.6	2.8	1.8
United Kingdom	2.4	7.8	1.2	4.1
United States	2.5	2.3	1.3	1.2

Note: The numbers presented above are netted – implying that they should be multiplied by reported net turnovers

Source: IMF CPIS database, Securities Holding Statistics German Bundes Bank

For exchange traded derivatives, the same procedure is done. However, for this case we have no information on cross-country portfolio holding. To solve this, we exploit that derivatives mostly are used to hedge risks related to the securities portfolio. Thus for all equity-linked derivatives we use the allocation keys derived for shares. For interest-linked, FX-linked, commodity-linked, and securitized derivatives we use the allocation keys obtained for bonds.

Finally, we also need to handle the residency of the cross-border OTC trades. We do this by using foreigners' portfolio holdings on German issues. Thus if other FTT residents hold y per cent of German issues and non FTT residents hold z, we can determine how much of the German foreign portfolio is held by each type. We do this in table A.4 below. Again, for all equity-linked OTC derivatives, we use the distribution of foreigners' German share portfolio while for all other derivative classes; we use the distribution of foreigners' German bond portfolio.

Table A.4 Allocation of cross-border OTC derivatives

	No non-FTT flight		non-FTT flight	
	FTT share, per cent	non-FTT share, per cent	FTT share, per cent	non-FTT share, per cent
Bonds	19	81	100	0
Equity	18	82	100	0

Source: IMF CPIS database, Securities Holding Statistics German Bundes Bank

Applying these three steps we can construct the tax base for Germany for an FTT based on a residence and issuance principle. Whenever both legs of a transaction are "owned" Germany we have counted the turnover amount once, while if only one leg is "owned" by Germany we have halved it.

We find that the tax base is EUR 274,258 billion, cf. Table A.5 in base scenario where derivatives are taxed on their notional and there is no flight. If there is non-FTT flight the tax base is reduced to EUR 188,812 billion. All in all, this entails that if derivatives are taxed on their notional value, we expect the tax base to range in between EUR 188,812 and 274,258 Bn.

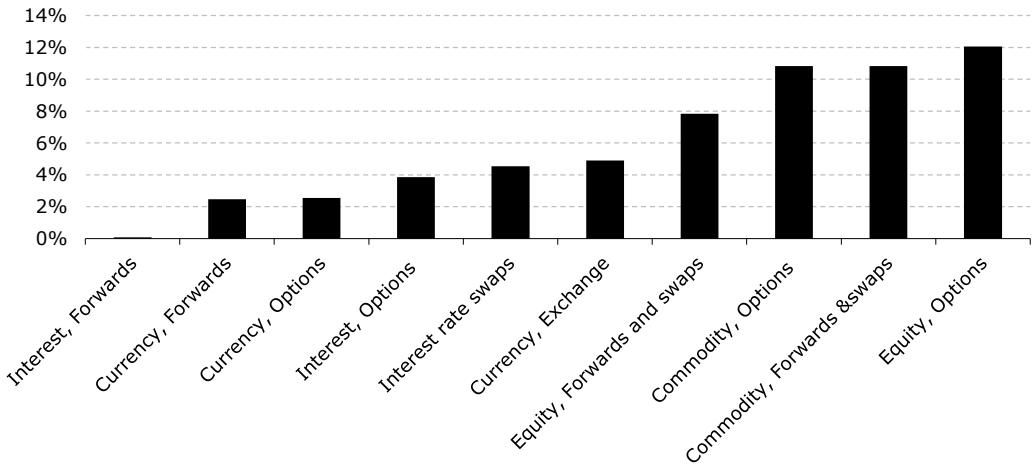
Table A.5 Tax Bases in net terms

Derivative tax base	Notional values		Market values	
	No non FTT flight	Non-FTT flight	No non FTT flight	with non FTT flight
Securities	**18,121**	**10,877**	**18,121**	**10,877**
Shares	4,730	2,576	4,730	2,576
Bonds	13,392	8,301	13,392	8,301
Exchange traded Derivatives	**226,341**	**158,676**	**9,960**	**6,815**
Equity futures	11,027	6,149	1,126	628
Equity options	7,447	4,176	760	426
Interest rate futures	172,159	123,566	6,661	4,781
Interest rate options	35,187	24,440	1,361	946
Securitized derivatives	66	48	3	2
Commodity futures	346	228	45	30
Commodity options	6	4	1	0
Currency futures	98	63	3	2
Currency options	4	2	0	0
OTC derivativatives	**29,796**	**19,260**	**1,209**	**788**
FX				
Outright forward exchange	1,014	700	34	23
Foreign Exchange Swap	14,296	9,141	476	304
Currency Exchange Swap	214	138	7	5
Options	976	670	32	22
Interest				
Forwards	3,083	1,783	119	69
Swaps	5,989	3,906	232	151
Options	334	238	13	9
Other				
CDS	2,070	1,429	91	63
Equity-linked	1,133	780	116	80
Commodity-linked	687	474	90	62
Total	**274,258**	**188,812**	**29,291**	**18,480**

Source: Copenhagen Economics based on Reuters market share statistics, ECB securities statistics, Asian bonds online, SIFMA, FESE and WFE turnover data, BIS Triennial report, BIS OTC and exchange traded derivatives statistics, Securities holding statistics Bundes Bank, IMF CPIS global portfolio statistic.

Above, we have also implemented the case where derivatives are taxed on their market value. For this case, we have multiplied notional derivatives turnovers by the ratios provided in Figure A.1 below. For this case, where derivatives are taxed on their market values, the total tax base ranges in between EUR 18,840 and 29,291 Bn.

Figure A.1 Market value to notional value ratio - derivatives



Source: Copenhagen Economics based on BIS' Exchange derivatives database

Appendix B

Revenue Effects

Using the tax base derived in Appendix A, the revenue effect can be derived. For the static case, this can easily be done by simply multiplying the ranges provided in table A.5. Hence, for the case where derivatives are taxed on their notional value, we simply multiply the tax base contribution from securities by 0.2 per cent and from derivatives by 0.02 per cent. In case where derivatives are tax on their market value, all instruments are taxed by 0.2 per cent.

In the dynamic case, we proceed by introducing elasticity effects. We use the commission's dynamic effects as point of reference. In the Commission's IA, the baseline scenario employs a tax elasticity of 1 for turnovers of regular securities, for non-FX-linked derivatives, it is 1.5 while for FX-linked derivatives it is 2. Furthermore, the Commission suggests, that the FTT will initially reduce 10 per cent of securities trading and 80 per cent of derivatives trading.

To perform this dynamic revenue calculation, we use the tax revenue formula provided in the IA.

Box B.1 Formulas to calculate tax revenue taking dynamics into account

The Commission suggests that the tax revenue should be calculated using the following formula:

(1) $$\text{Tax Revenue} = (1 - \text{E}\%)\text{t}\% \cdot \text{taxable amount} \cdot \left(1 + \frac{\text{t}\%}{\text{c}\%}\right)^{-\epsilon}$$

The formula states that the tax revenue obtained from a taxable amount (net turnovers in market value for securities and notional value for securities) equals the static revenue times a factor less than 1 where t is the tax rate, c is the shared transaction cost, ϵ is the tax elasticity, and E is the evasion factor.

In the Impact Assessment, only one leg is taxed. Thus the formula in (1) is not appropriate – since all taxable events will be double taxed.

To handle this, we suggest using the following formula on the tax bases in net terms:

(2) $$\text{Tax Revenue} = 2\text{t}\% \cdot (1 - \text{E}\%) \cdot \text{taxable amount} \left(1 + \frac{2\text{t}\%}{\text{c}\%}\right)^{-\epsilon}$$

For each netted taxable amount (2) provides the revenue contribution.

Source: European Commission (2011), IMPACT ASSESSMENT

For the transaction cost, we have used the instrument dependent transaction cost provided in the IA. For each instrument class, these costs are provided in Table B.1.below.

Table B.1 Average transactions cost when notional taxation

Transaction costs	Percentage
Securities	0,6
Exchange traded Derivatives	0,3
OTC currency linked derivatives	0,024
OTC interest-, equity- and commodity-linked derivatives and CDS	0,7

Source: European Commission (2011), IMPACT ASSESSMENT

Thus, for the dynamic cases parallel to the ones suggested in the IA, using (2) in combination with the transaction costs provided in Table 8 Table B.1 above, we are able to calculate initial dynamic tax revenue effects for the cases where derivatives are taxed on their notional values.
Finally, in addition to the dynamic effects sketched above, we also in a last step towards obtaining our assessment, remove all high frequency trading (HFT). That is, we argue that the increase in transaction cost imply that HFT becomes non-profitable.- hence all HFT trading dies. On a European level the HFT forms approximately 35 per cent of trading for the instrument types specified in Table B.2 below.

Table B.2 Share of HFT in Europe

Instrument	HFT share of turnover (per cent)
Equity	30-40
Bonds	app. 0
Futures	30-40
Options	30-40

Source: Haldane (2010)

All in all, for the three cases listed above, we get ranges for the revenue effects as shown in Table B.3 below. Thus for the static case, the revenue effect ranges in between EUR 57.3 and 87.5 Bn. For the dynamic case where, we only control for the effects suggested by the commission, the range tightens and decreases to EUR 20.9 and 33.4 Bn. Finally when also removing HFT, we obtain our final assessment of a revenue effect ranging in between EUR 17.6 and 28.2 Bn.

Table B.3 Revenue via Notional Taxation, EUR Bn.

	No non-FTT flight			Non-FTT flight		
	Static	Dynamic Commissi-on	Dynamic adjusted for HFT	Static	Dynamic	Dynamic adjusted for HFT
Securities	**36.2**	**24.5**	**22.2**	**21.8**	**14.7**	**13.5**
Shares	9.5	6.4	4.2	5.2	3.5	2.3
Bonds	26.8	18.1	18.1	16.6	11.2	11.2
Exchange traded Derivati-ves	**45.3**	**8.2**	**5.3**	**31.7**	**5.8**	**3.7**
Equity futures	2.2	0.4	0.3	1.2	0.2	0.1
Equity options	1.5	0.3	0.2	0.8	0.2	0.1
Interest rate futures	34.4	6.3	4.1	24.7	4.5	2.9
Interest rate options	7.0	1.3	0.8	4.9	0.9	0.6
Securitized derivatives	0.0	0.0	0.0	0.0	0.0	0.0
Commodities futures	0.1	0.0	0.0	0.0	0.0	0.0
Commodities options	0.0	0.0	0.0	0.0	0.0	0.0
Currency futures	0.0	0.0	0.0	0.0	0.0	0.0
Currency options	0.0	0.0	0.0	0.0	0.0	0.0
OTC derivatives	**6.0**	**0.7**	**0.7**	**3.9**	**0.4**	**0.4**
FX						
Outright forward exchange	0.2	0.0	0.0	0.1	0.0	0.0
Foreign Exchange Swap	2.9	0.1	0.1	1.8	0.1	0.1
Currency Exchange Swap	0.0	0.0	0.0	0.0	0.0	0.0
Options	0.2	0.0	0.0	0.1	0.0	0.0
Interest						
Forwards	0.6	0.1	0.1	0.4	0.1	0.1
Swaps	1.2	0.2	0.2	0.8	0.1	0.1
Options	0.1	0.0	0.0	0.0	0.0	0.0
Other						
CDS	0.4	0.1	0.1	0.3	0.1	0.1
Equity-linked	0.2	0.0	0.0	0.2	0.0	0.0
Commodity-linked	0.1	0.0	0.0	0.1	0.0	0.0
Total	**87.5**	**33.4**	**28.2**	**57.3**	**20.9**	**17.6**
In per cent of GDP	**3.3**	**1.3**	**1.1**	**2.2**	**0.8**	**0.7**

Source: Copenhagen Economics based on Reuters market share statistics, ECB securities statistics, Asian bonds online, SIFMA, FESE and WFE turnover data, BIS Triennial report, BIS OTC and exchange trad-ed derivatives statistics, Securities holding statistics Bundes Bank, IMF CPIS global portfolio statistic. Tax rates are obtained from the commission's proposal

For the case where derivatives are taxed on their market values, we need to adjust the transaction cost Thus when derivatives are taxed on their market values by 0.1 per cent, the applied transaction cost needs to be adjusted securing that the total transaction cost

of turnover remains unchanged. Revising the transaction costs to align costs when taxing market value of derivatives, the average transaction costs become:

Table B.4 Average transaction cost when market value taxation

Transaction costs	Percentage
Securities	0.60
Exchange traded Derivatives	3.78
OTC currency linked derivatives	0.60
OTC interest-, equity- and commodity-linked derivatives and CDS	13.73

Source: Impact Assessment and BIS derivatives statistics, Copenhagen Economics Calculations

The transaction cost in per cent of market value is noticeably increased when compared to the case where transaction costs are provided in per cent of notional value. This is driven by the fact that most derivatives are designed to have no or a small value upon entrance. However, as most derivatives such as swaps, futures, and forwards yield a later sure transfer of payment streams – the de facto costs are not unreasonable compared to securities' transaction cost.

In Table B.5 below, we provide the revenue effect when taxing on instruments on their market values by 0.2 per cent. For the three cases mentioned earlier, we get ranges for the revenue effects as shown in Table B.5 below. Thus for the static case, the revenue effect ranges in between EUR 37.0 and 58.6 Bn. For the dynamic case where, we only control for the effects suggested by the commission, the range tightens and decreases to EUR 17.5 and 28.6 Bn. Finally when also removing HFT, we obtain our final assessment of a revenue effect ranging in between EUR 15.4 and 25.1 Bn.

Table B.5 Revenue via Market Taxation, EUR Bn.

	No non-FTT flight			Non-FTT flight		
	Static	Dynamic Commissi-on	Dynamic adjusted for HFT	Static	Dynamic	Dynamic adjusted for HFT
Securities	**36.2**	**24.5**	**22.2**	**21.8**	**14.7**	**13.5**
Shares	9.5	6.4	4.2	5.2	3.5	2.3
Bonds	26.8	18.1	18.1	16.6	11.2	11.2
Exchange traded Derivati-ves	**19.9**	**3.8**	**2.5**	**13.6**	**2.6**	**1.7**
Equity futures	2.3	0.4	0.3	1.3	0.2	0.1
Equity options	1.5	0.3	0.2	0.9	0.2	0.1
Interest rate futures	13.3	2.6	1.7	9.6	1.8	1.2
Interest rate options	2.7	0.5	0.3	1.9	0.4	0.2
Securitized derivatives	0.0	0.0	0.0	0.0	0.0	0.0
Commodities futures	0.1	0.0	0.0	0.1	0.0	0.0
Commodities options	0.0	0.0	0.0	0.0	0.0	0.0
Currency futures	0.0	0.0	0.0	0.0	0.0	0.0
Currency options	0.0	0.0	0.0	0.0	0.0	0.0
OTC derivatives	**2.4**	**0.4**	**0.4**	**1.6**	**0.2**	**0.2**
FX						
Outright forward exchange	0.1	0.0	0.0	0.0	0.0	0.0
Foreign Exchange Swap	1.0	0.1	0.1	0.6	0.1	0.1
Currency Exchange Swap	0.0	0.0	0.0	0.0	0.0	0.0
Options	0.1	0.0	0.0	0.0	0.0	0.0
Interest						
Forwards	0.2	0.0	0.0	0.1	0.0	0.0
Swaps	0.5	0.1	0.1	0.3	0.1	0.1
Options	0.0	0.0	0.0	0.0	0.0	0.0
Other						
CDS	0.2	0.0	0.0	0.1	0.0	0.0
Equity-linked	0.2	0.0	0.0	0.2	0.0	0.0
Commodity-linked	0.2	0.0	0.0	0.1	0.0	0.0
Total	**58.6**	**28.6**	**25.1**	**37.0**	**17.5**	**15.4**
In per cent of GDP	**2.2**	**1.1**	**0.9**	**1.4**	**0.7**	**0.6**

Source: Copenhagen Economics based on Reuters market share statistics, ECB securities statistics, Asian bonds online, SIFMA, FESE and WFE turnover data, BIS Triennial report, BIS OTC and exchange traded derivatives statistics, Securities holding statistics Bundes Bank, IMF CPIS global portfolio statistic. Tax rates are obtained from the commission's proposal

Appendix C
Taxing Government Bonds

We focus in this appendix on the net effects from including government bonds and derivatives written on those in the FTT. We only consider static effects, that is; without considering potential behavioural changes spurred by the tax. We argue that the main effects are a tax revenue gain and a cost emerging due to an increase in the liquidity premium on German government debt, cf. Table C.1. The liquidity premium defines the additional compensation in terms of yield that investors demand as a compensation for holding more illiquid assets. Hence, when the liquidity premium increases, cost of finance increases.

Table C.1 Effects of taxing government bonds

	Taxation of Government Bonds	Non-taxation of Government Bonds
Benefits	Tax Revenue from Government Bonds	
Costs	Potential increase in liquidity premium on investors required Government yield	No Tax Revenue from Government Bonds Potential decrease in contribution to tax base from non-government linked assets due to residents substituting from taxed assets towards government-linked assets

Source: Copenhagen Economics

Gains From Taxation

To account first for German government bonds, we apply information provided by the German Finanz Agentur and from EUREX. The German Finanz Agentur informs that the outstanding German government debt forms EUR 1,105 bn. with an annual turnover velocity of 4.92. Furthermore from EUREX the annual notional turnover of futures written on German government debt is EUR 29,008 bn. while for options written on German government debt, the annual turnover is EUR 163,327 bn.

Firstly, to calculate how much of this trade is taxable to Germany, we use an allocation key constructed using IMF's foreign portfolio data in combination with the securities holding statistics provided by the German Bundesbank. Using this data – assuming that trades in between FTT and non-FTT residents are not affected by the FTT implementation – we obtain the following allocation key:

Table C.2 German Government debt allocation key

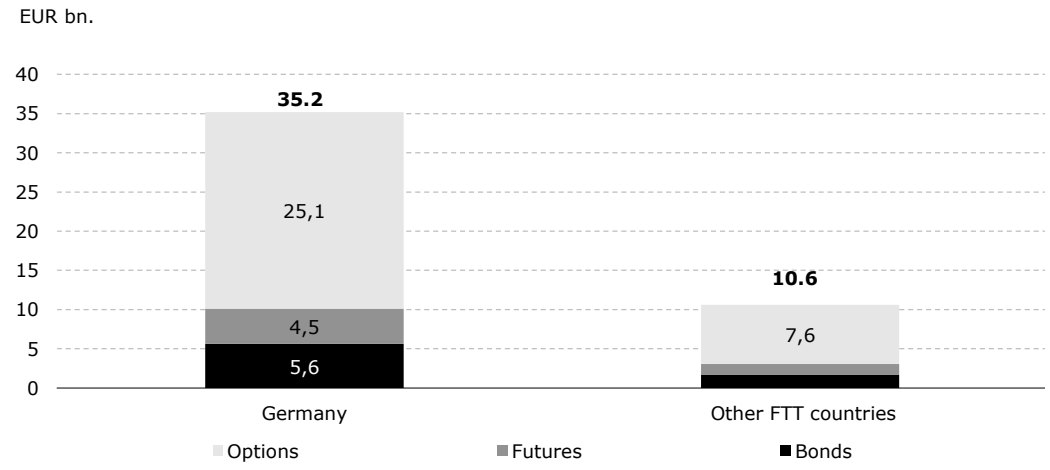
Sellers\Buyers	Other FTT residents	German residents	Non-FTT residents
Other FTT residents	2% (0)	4%(1)	9%(0)
German residents	4% (1)	6%(2)	15%(2)
Non-FTT residents	9%(0)	15%(2)	36%(2)

Note: The bracket refers to number of legs taxable to Germany

Source: Copenhagen Economics based on IMF's global CPIS Statistic, Bundes Bank securities holding statistic by residency of issuer

Thus, assuming German government bonds are to be taxed, all legs will be taxed twice. The German taxable share is in Table C.2 reduced to units followed by brackets either including 1 for 1 leg or 2 for 2 legs. For example, German intra- residential forms 6 per cent of all net turnovers and should be taxed twice. Applying the tax rates on turnover data, the German revenue effect from taxing government debt related instruments is EUR 35.2 bn. while for other FTT countries, the revenues is EUR 10.6 bn.

Figure C.1 Static revenue effect from German government bonds

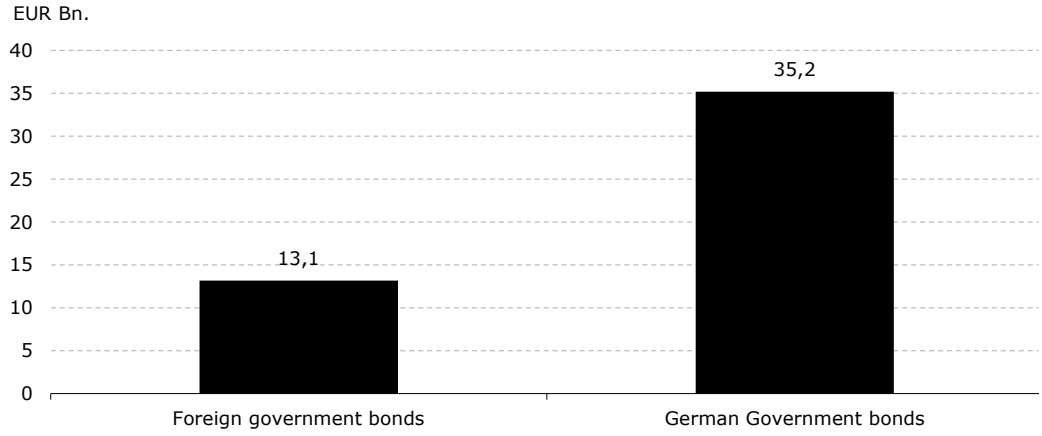


Source: Copenhagen Economics based on German Finanz Agentur, EUREX, Bundes Bank securities holding statistics, IMF's CPIS statistics for global portfolio holdings

Next, to consider the German revenue from taxing foreign government bonds, we apply the estimate that approximate 70 per cent of bond trading is in government bonds[36]. Thus removing German government bonds from the bond tax base and multiplying this number by 70 per cent, we obtain an estimate for the German tax base stemming foreign government debt. Multiplying this number by 0.2 per cent, we estimate the static tax revenue from foreign government bonds to be EUR 13.1 bn. Hence, the total static revenue obtained through taxation equals EUR 48.3 Bn.

36 The CityUK (2012) and Sifma 2012 statistics for the US

Figure C.2 Static German revenue from government bonds



Source: Copenhagen Economics based on German Finanz Agentur, EUREX, Bundes Bank securities holding statistics, IMF's CPIS statistics for global portfolio holdings, ECB security statistics, SIFMA, WFE, FESE

Liquidity Cost

The upper bound on the liquidity cost ranges in between EUR 5.8 and EUR 32.7 Bn. To first analyse the liquidity premium, we have asked how much traders should be compensated in order not to maintain their current trading activity.

Table C.3 Liquidity Costs to be expected

	Annual turnover FTT residents	Tax rate	Annual FTT tax, i.e. maximum annual premium	Outstanding Government debt, EUR Bn.	**Liquidity Cost EUR. Bn.**
Bonds	4.9	0.2 per cent	1.0%	1105	**10.9**
Futures	26.3	0.02 per cent	0.5%	1105	**5.8**
Options	147.8	0.02 per cent	3.0%	1105	**32.7**

Source: Copenhagen Economics based on German Finanz Agentur, EUREX, Bundes Bank securities holding statistics, IMF's CPIS statistics for global portfolio holdings

In Table C.3 above, we start by identifying the turnover velocity in terms of notional for each instrument. For bonds, the annual turnover velocity is 4.92, for futures it is 26.25, and for options it is 147.81. Next, by multiplying the turnover velocities with the instrument specific tax rates (times 2 for both legs), we determine the effective annual tax rates to be paid by traders. For bonds, the effective tax rate becomes 1.0 per cent, for futures it becomes 0.5 per cent and for options, it becomes 3.0 per cent. Thus in order to compensate FTT bondholders and secure their current trading patterns – the liquidity premium would have an upper bound ranging in between 0.5 per cent and 3 per cent. However,

since most options are not exercised[37] and hence no delivery takes place, we assess 1.0 per cent to be the maximum upper bound on the liquidity premium. Next, we multiply the maximum liquidity premium with outstanding government debt of EUR 1105 Bn. to obtain the upper bound for the liquidity cost ranging in between EUR 5.8 and 32.7 Bn.

Net Gains from Taxation

To make a first account of the cost and benefits of taxing Government debt – we compare the additional liquidity cost with the tax revenues obtained from all government bonds. Hence, looking at the net gains from taxation, it ranges in between EUR 15.7 and 42.5 Bn. – implying that in all cases the sign is positive.

Table C.4 Net Gains from Taxation

	Revenue, EUR Bn.	Liquidity Cost EUR. Bn.	Net Gain from Taxation, EUR Bn.	Revenue from German government bonds EUR Bn.
Bonds	48.3	10.9	37.5	37.4
Futures	48.3	5.8	42.5	37.4
Options	48.3	32.7	15.7	37.4

Source: Source: Copenhagen Economics based on German Finanz Agentur, EUREX, Bundes Bank securities holding statistics, IMF's CPIS statistics for global portfolio holdings

37 Using data from BIS derivatives statistics the market value of interest options relative to their notional value lies around 3%. This that on average there is a 3% chance that the options will expire in the money and hence be exercised.