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# Clearinghouse-Five: determinants of voluntary clearing in European derivatives markets

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**Abstract**

Central clearing is a major part of the policy response to the financial crisis of 2008, aiming to reign in counterparty credit risk in derivatives markets. I perform an empirical study of the incentives for voluntary central clearing of OTC derivative contracts in Europe. Central clearing acts as insurance against counterparty credit risk related to derivative contracts, and is legally mandated for a specific subset of standardized derivative contracts, with a significant portion of the other contracts eligible for voluntary clearing. I show that there exist significant economies of scale in central clearing, in terms of both the size of each contract, and the scale of total clearing activity. I also show that maturity of the contract and international frictions affect voluntary clearing of different types of derivative contracts in different ways, linked to the conventional maturity and payout structures of various types of contracts. Finally, I show that significant amount of clearing happens only for credit and interest rate derivatives, while equity, foreign exchange, and commodity derivatives are rarely centrally cleared. The results validate theoretical literature, and guide future modeling of derivative markets.

*JEL classification*: C58, G28, G32.

*Keywords*: derivatives, central counterparties, incentives, central clearing.

# 1. Introduction

"Derivatives are financial weapons of mass destruction," wrote Warren Buffett in Berkshire Hathaways 2002 annual letter to investors. At the time it was far from a universal view. In fact, both across academic literature and in the industry, common view was that derivative contracts are an innocuous tools to optimize returns. The 2008 crisis has shown that the complexity of derivatives, both in terms of the contracts and market structure, can create systemic risk (Haldane and May, 2011). It is an important problem, as Bank for International Settlements estimates the outstanding notional in derivative contracts to be over half a quadrillion dollars in 2016. Derivative markets are also a source of significant interconnectedness in the financial system. In this paper, I study a particular issue within the derivatives market, namely the incentives to centrally clear such contracts.

2008 provided an educational example of problems derivatives that can bring. As the Lehman Brother's default wreaked havoc on the financial system, in a large part due to Lehman's poorly understood derivative book, something had to change with respect to these markets following the crisis. An opportunity for G20 leaders presented itself as LCH SwapClear, a central counterparty (CCP), successfully managed Lehman's $9 trillion (66,000 trades) interest rate swap default within three weeks. In principle, a CCP steps into bilateral trades through novation, becomes the buyer to every seller, and the seller to every buyer. By taking on and managing counterparty credit risk (CCR) appropriately, CCPs help their clearing members insure against default losses stemming from their derivative exposures, mutualizing their CCR. G20 leaders, at the summit in Pittsburgh in 2009, pledged to make central clearing mandatory for standard derivative contracts. Central clearing requirements have been implemented in the Dodd-Frank legislation in the US and in the European Market Infrastructure Regulation (EMIR) in Europe. Currently only certain index credit default swaps and interest rate derivatives are subject to obligatory clearing in the European Union (EU). As the implementation and review of these policies are ongoing, this study is of significant policy relevance.

Theoretical literature largely agreed with the benefits of central clearing, but noted that the specifics depend on the market structure (Duffie and Zhu, 2011). While the potential benefits of central clearing are widely accepted, there are unanswered questions on the incentives around central clearing of various economic agents, the calibration of the regulatory regime for derivative exposures, and the extent to which central clearing may be extended to help safeguarding financial stability without having an adverse effect on the derivative markets and the ability of firms to hedge their exposures effectively.

In this paper, I study the incentives to centrally clear derivative contracts in the absence of a legal obligation. Uncovering these has many useful applications. Such incentives matter in validating and guiding theoretical models of central clearing and wider financial system in which derivatives play a significant role. Central clearing affects the wider financial system through various means, e.g. a recent study shows that rather than eliminating counterparty risk, central clearing transforms it into liquidity risk (Cont, 2017). Such incentives also matter for both creating and evaluating policies related to clearing obligation, e.g. in understanding which types of organizations would be the most affected by further legal obligation to centrally clear.

As incentives are not directly observable, I study the determinants of voluntary clearing of over-the-counter (OTC) derivative contracts in the EU. To uncover these, I test a number of hypotheses grounded in the literature and further guided by policy considerations. I look at all five broad asset classes of derivatives (commodity, credit, equity, foreign exchange, and interest rates), but as substantial voluntary clearing only exist in credit and interest rate derivative markets, I concentrate on the results related to these two important market segments. I also concentrate on a sample of contracts excluding intragroup trades, which are unlikely to be centrally cleared.

I show that length of maturity of the contract has a significant effect on the probability of the contract being voluntarily cleared. For credit derivatives the effect is positive. As credit derivative contracts are standardized only for short maturities, the effect stemming from the difficulties in reaping the benefits of central clearing in the context of OTC trading of heterogeneous contracts seems to dominate (Koeppl and Monnet, 2010; Biais, Heider, and Hoerova, 2012). But the effect for interest rate derivative contracts is negative. As these contracts can be standardized even for long maturities, the effect of upward-sloping credit risk term structure dominates (Helwege and Turner, 1999).

I show significant economies of scale are present in central clearing for all asset classes. These exist on two levels. First, on the level of a specific contract where larger notional value of the contract increases the chance of it being centrally cleared, in line with the expectation that losses from a counterparty default would be increasing in the average expected exposure (Duffie and Zhu, 2011). Second, on the level of the counterparty to the contract, a larger share of contracts previously novated to a CCP increases the likelihood new trades of that firm would be centrally cleared on a voluntary basis. This confirms recent studies on central clearing arguing the collateral optimization benefits of central clearing kick in only when a significant share of notional traded is novated to a central counterparty (Duffie and Zhu, 2011; Duffie, Scheicher, and Vuillemey, 2015; Ghamami and Glasserman, 2017).

I also show that international frictions matter to voluntary clearing of derivatives. Credit derivatives with a counterparty from outside the European Economic Area (EEA) are more likely to be voluntarily cleared, perhaps due to central counterparties having developed protections against differences in creditor protection regimes (France and Kahn, 2016). For interest rate derivatives the effect is the opposite, hinting at the creditor protection for these contracts being less important, and instead difficulties in cost optimization within a European CCP for firms from outside the EEA dominate.

Further, financial sophistication also matters to the voluntary clearing of derivative contracts. Financial firms are significantly more likely to centrally clear their derivative contracts, which is in line with the expectation that their expertise in financial markets creates economies of scope in managing central clearing of their derivative books. Interestingly, insurance companies and pension funds are among the types of financial firms most likely to voluntary clear their derivative contracts, in contrast with market intelligence findings of the Bank for International Settlements (2014).

Finally, I also empirically show the structure of the central clearing of derivatives in Europe. In particular, I present clearing rates for each of broad asset classes of derivatives, showing that only interest rate and credit derivatives are cleared to a significant degree.

The remainder of the paper is structured as follows. The relevant literature is briefly discussed in Section 2. The data used and summary statistics are then described in Section 3. The empirical results are described in Section 4. Finally, Section 5 concludes. Several tables are relegated to appendices.

## 2. Literature review

Since the crisis a large body of both theoretical and empirical studies concerning central clearing has been produced. Initially studies concentrated on the question of collateral demand, with Duffie and Zhu (2011) showing that the introduction of clearing for a single asset class could increase collateral demand and counterparty exposures, and Cont and Kokholm (2014) showing that with multiple asset classes central clearing can reduce interdealer exposures. Further, some authors show that central clearing limits the excess risk-taking (Acharya and Bisin, 2014; Biais, Heider, and Hoerova, 2016; Koeppl, Monnet, and Temzelides, 2012).

Studies of central clearing generally agree that the mutualization of credit risk is important when exposures are large (Duffie and Zhu, 2011; Bellia, Panzica, Pelizzon, and Peltonen, 2017). This may be especially true for contracts with long maturity, as credit risk term structure is shown to be upward-sloping (Helwege and Turner, 1999). On the other hand, Hull (2012) notes that costs of clearing of large derivative contracts may grow supralinearly in the size of the contract. Some studies look at mutualization of risk through central clearing and conclude that the benefits of such mutualization are difficult to obtain in the case of trading with heterogeneous contracts, due to informational frictions and moral hazard (Koeppl and Monnet, 2010; Biais et al., 2012).

France and Kahn (2016) discuss how protections within a CCP in the context of defaults have grown out of differences in insolvency laws of the members of CCPs. This implies that CCPs can ameliorate problems with investor protection frictions and contribute to the growth of capital markets (Porta, Lopez-De-Silanes, Shleifer, and Vishny, 1997). CCPs may be particularly effective in managing counterparty credit risk across jurisdictions, although benefits of engaging in central clearing in another part of the world, especially for just the part of the firm's portfolio facing that part of the world, may be limited (Duffie and Zhu, 2011).

Multiple studies suggest that incentives for central clearing depend not only on the wish to mutualize credit risk, but also potential benefits from central clearing in terms of cost. These benefits are most often associated with netting possibilities within central clearing, allowing firms to reduce their exposures and consequently capital and collateral requirements. Duffie and Zhu (2011) show that the percentage of cleared exposures for dealers increases netting possibilities. Duffie et al. (2015) show that mandatory central clearing lowers system-wide collateral demand provided there is no significant proliferation of CCPs. They also show that central clearing does have significant distributional consequences for collateral requirements across market participants. This means that incentives may differ between market participants. The authors note that central clearing can either improve or reduce netting opportunities, depending on how much is cleared, how many CCPs are used, and the degree to which the same swaps are cleared in different CCPs. Ghamami and Glasserman (2017) gauge whether the higher capital and margin requirements adopted for bilateral contracts create an incentive in favour of central clearing. They note that despite the clearing mandate for certain derivatives, as it involves the criterion of the contract being sufficiently standard to require central clearing, the actual decision to clear retains discretion of the counterparties as they can customise these easily. This underlines the importance of empirical work on the determinants of which trades are actually voluntarily cleared to both inform the theoretical work and help regulators align the incentives around the clearing mandate appropriately.

Stephens and Thompson (2017) show that central clearing may provide transparency of counterparty risk, thus suggesting that benefits from central clearing may depend on the informational capabilities of the firm in question, leading to higher demand for central clearing from firms which do not have a good grasp on their counterparty credit risk. Bank for International Settlements (2014) conclude that clearing member banks have incentives to clear centrally. Such incentives for market participants that clear indirectly are reported to be less obvious. The report stresses that the entities clearing derivatives indirectly are far from homogeneous, thus incentives for clearing will differ across various types of institutions. In particular, a distinction is made between "risk-takers" (e.g. hedge funds) who would benefit from central clearing and "hedgers" (e.g. corporates, insurance companies, and pension funds) who would not.

The work closest to this study is the paper of Bellia et al. (2017) who gauge the incentives for central clearing of single-name sovereign credit default swaps (CDS) of three countries. They show that diverse factors explain clearing members decision to clear different CDS contracts: for Italian CDS, counterparty credit risk exposures matter most for the decision to clear, while for French and German CDS, margin costs are the most important factor for the decision. Moreover, clearing members use clearing to reduce their exposures to the CCP and largely clear contracts when at least one of the traders has a high counterparty credit risk. The study concentrate on a very small and specific subset of the market which allows a very detailed empirical setup, whereas this study looks at the system-wide picture, necessarily with less detail. As such, the two studies complement each other very well.

## 3. The EU derivatives data

This section outlines the data used in this study and provides some descriptive statistics concerning derivative contracts in the European Union.

I use the regulatory reporting framework established under the European Market Infrastructure Regulation, which compels all counterparties to derivative contracts located within the European

Union (EU) to report the details of their contracts to one of the Trade Repositories (TRs) registered by the European Securities and Markets Authority (ESMA). The EU-wide dataset is available uniquely to the European Systemic Risk Board (ESRB) and the ESMA. I use data from one of these repositories which contains a large majority of the transactions and is thus representative for the whole market, in line with earlier studies (Abad, Aldasoro, Aymanns, D'Errico, Rousova, Hoffmann, Langfield, Neychev, and Roukny, 2016; Cielinska, Joseph, Shreyas, Tanner, and Vasios, 2017; D'Errico, Battiston, Peltonen, and Scheicher, 2016).

Specifically, I use all trade activity reports (which contain all new trades, and their subsequent modifications, valuation adjustments, and cancellations) for all asset classes (commodity, credit, equity, foreign exchange, and interest rate) between the beginning of March 2016 and the end of June 2017. The dataset covers various characteristics of the contracts, including whether they are under clearing obligation and whether they have been centrally cleared, as well as information about the parties to the contracts. The final dataset does not contain any exchange traded derivatives, thus the sample contains almost exclusively OTC derivatives. Thus, in this paper derivatives refers to OTC derivatives, unless specified otherwise.

The description of how the original dataset was processed in order to arrive at the final sample used in the study can be found in Appendix A. The description of the variables used in the study is provided in Appendix B.

The final clean sample used to study the determinants of voluntary clearing of derivatives contains around 85 millions of trades, as presented in Table 1. For each asset class I present the sample size for the whole dataset, for intragroup and extragroup trades, and trades with and without non-EEA counterparties (I run regressions on these subsamples). Some of the sample sizes are not shown for reasons of confidentiality, although rough estimates are presented in the notes below the table. The goal of the above-mentioned cleaning procedure was to keep as much data as possible, given the constraints of data quality and the empirical setup. Thus, the sample is representative for the whole European derivatives market. However, the large sample size has a drawback, in that it is trivial to obtain statistically significant results. I discuss how I fix this in Section 4.

In Annex C, the readers can find summary statistics for binary (Table 8) and non-binary (Table 9) dependent variables (for independent variables this can be observed in Table 1), as well as correlation tables for these variables across all asset classes (Tables 10-14).

The first contribution of this paper is to present a picture of the central clearing of derivatives in Europe. To calculate clearing rates (% of notional traded which has been novated to a CCP) I use the internationally agreed upon methodology, as described in Annex D. In Figure 1 readers can observe that commodity, equity, and foreign exchange derivatives are rarely centrally cleared. On the order of 20% of the notional of credit derivatives is being centrally cleared, while interest rate derivatives are the most commonly cleared, with about 40% of their notional being centrally cleared. There is no clear trend, presumably due to a relatively short period of the study. The average monthly values presented above come from a set of daily clearing rates characterized by

Table 1: Sample size by asset classes and their subgroups, as used in the forthcoming regressions, together with the number of cleared trades within these groups.

| Asset class | Subset | Sample size | Cleared | % Cleared |
|---|---|---|---|---|
| Commodity | Full sample | 4,296,374 | 29,348 | 0.68 |
| Commodity | Intragroup | 526,013 | * | * |
| Commodity | Extragroup | 3,770,361 | * | * |
| Commodity | Within EEA | 2,563,671 | 14,051 | 0.55 |
| Commodity | With non-EEA | 1,732,703 | 15,297 | 0.88 |
| Credit | Full sample | 1,814,047 | 247,714 | 13.66 |
| Credit | Intragroup | † | † | † |
| Credit | Extragroup | † | † | † |
| Credit | Within EEA | 560,595 | *** | *** |
| Credit | With non-EEA | 1,253,452 | *** | *** |
| Equity | Full sample | 12,320,166 | 56,749 | 0.46 |
| Equity | Intragroup | 2,849,898 | 0 | 0.00 |
| Equity | Extragroup | 9,470,268 | 56,749 | 0.60 |
| Equity | Within EEA | 4,381,137 | 55,661 | 1.27 |
| Equity | With non-EEA | 7,939,029 | 1,088 | 0.01 |
| Foreign Exchange | Full sample | 60,627,185 | 659,848 | 1.09 |
| Foreign Exchange | Intragroup | 6,644,383 | 4,138 | 0.06 |
| Foreign Exchange | Extragroup | 53,982,802 | 655,710 | 1.21 |
| Foreign Exchange | Within EEA | 28,128,714 | ** | ** |
| Foreign Exchange | With non-EEA | 32,498,471 | * | * |
| Interest Rate | Full sample | 4,231,413 | 2,010,329 | 47.51 |
| Interest Rate | Intragroup | 685,089 | 9,317 | 1.36 |
| Interest Rate | Extragroup | 3,546,324 | 2,001,012 | 56.42 |
| Interest Rate | Within EEA | 2,338,383 | **** | **** |
| Interest Rate | With non-EEA | 1,893,030 | *** | *** |

*Notes:* Items not shown due to reasons of confidentiality:
†Split in line with other asset classes.
*Less than 1%.
**Between 2-5%.
***Between 10-20%.
****Over 50%.

a wide dispersion of results, and an interesting market microstructure (e.g. clearing rates are significantly higher on Fridays than on any other day).

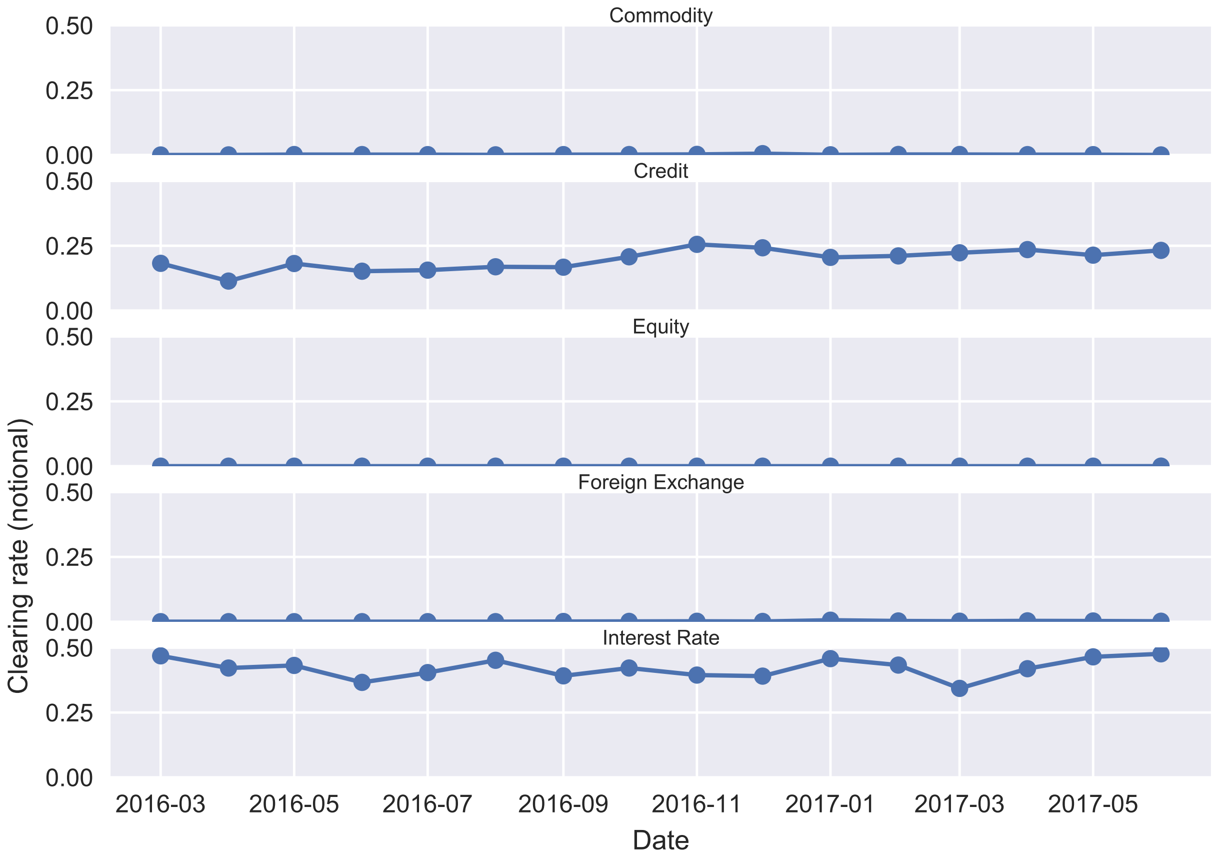


Fig. 1. Monthly clearing rates (percentage of gross notional cleared through a central counterparty in total gross notional of trades reported in a given month) across five major asset classes in the European derivatives market (March 2016 - June 2017).

The presented clearing rates compare the contracts which have been cleared with all contracts in the market. It may be more useful to compare the contracts which have been cleared with all contracts in the market which could in principle be cleared. Both due to difficulties in defining what is clearable, and due to the complex nature, heterogeneity, and the size of the sample used in this study, it would be difficult to reliably estimate the clearable part of the market. To put the above results in perspective it is useful to mention estimates of the percentage of trades that can in principle be centrally cleared as provided in the FSB Twelfth Progress Report on Implementation of the OTC Derivatives Market Reforms. For interest rate derivatives four jurisdictions estimated that between 80% and 100% of new transactions could be centrally cleared, six jurisdictions estimated it to be between 60% and 80%, two jurisdictions estimated it to be between 40% and 60%, and one jurisdiction estimated it to be below 20%. For credit derivatives, two jurisdictions estimated that between 40% and 60% of new transactions could be centrally cleared, two jurisdictions estimated it to be between 20% and 40%, and two jurisdictions estimated it to be below 20% (Financial Stability Board, 2017).

To put these results in perspective, in Figure 2 I present the size of the market (adjusted total gross notional, as defined in Annex D) for the five asset classes across the studied period. It can be seen that foreign exchange, interest rate, and equity derivatives have a total gross notional on the order of $10^{14}$ EUR (hundreds of trillions of euros) per month. Credit and commodity derivatives are closer to $10^{12}$ EUR (trillions of euros).

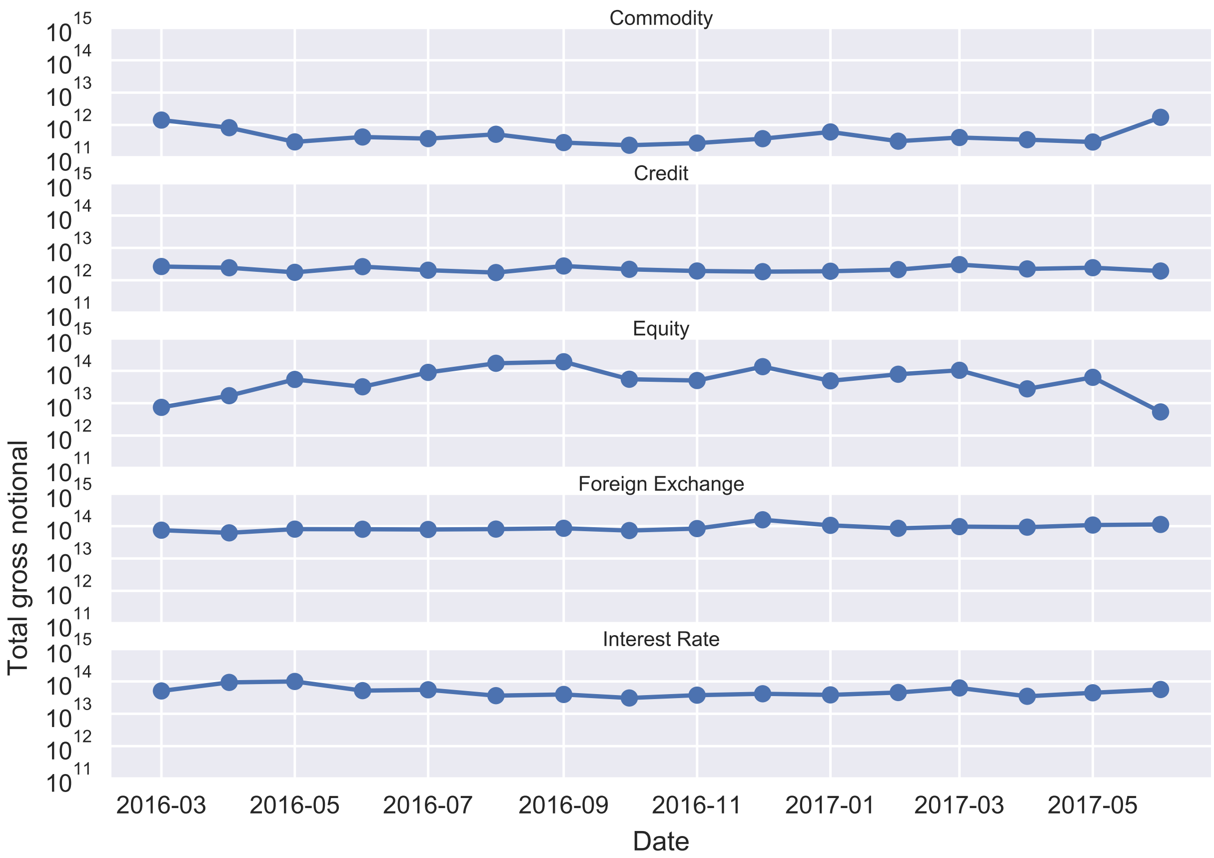


Fig. 2. Total gross notional (in EUR) of trades reported in a given month across five major asset classes in the European derivatives market (March 2016 - June 2017).

Since credit and interest rate derivatives are the only classes with significant share of central clearing, I will concentrate on these asset classes in the analysis of the determinants of voluntary clearing, but the results will be presented for all asset classes for the sake of completeness.

## 4. Voluntary clearing

The study of the determinants of voluntary clearing is divided into six distinct hypotheses. These are discussed in turn within this section. Some of them are based on the questions raised in theoretical literature as described in Section 2, and some of them are driven by the availability of empirical data, or the questions raised in the discussions among regulators and policy makers.

Let me start with general remarks applicable to all models. The EU has introduced the mandatory clearing gradually, phasing-in the obligation for different groups of counterparties and different contracts over several years. For this reason, the clearing obligation is not fully stable across the studied period. Thus, I employ time (month) fixed effects in every model, as to catch such heterogeneity across the studied period. In some of the models I also employ counterparty type fixed effects, where appropriate. Full robustness checks against various fixed effects can be found in Annex H.

Further, this study aims to provide insights into general market forces behind central clearing within the overall derivatives market in the European Union. Thus, I ignore some of the specifics that may be interesting but are left for more detailed studies. For instance, having such a large and heterogeneous sample, it is difficult to gather reliable matching market data. Further, it would be insightful but also very difficult to comprehensively establish if all the trades across many types of instruments would satisfy the CCP eligibility for clearing criteria. This question is being answered in a detailed study of sovereign credit default swaps (Bellia et al., 2017). I have also left certain distinctions, such as between OTC and exchange-traded derivatives (the latter are not included in this study) or between specific instruments within the broad asset classes for future studies. Similarly, the data used does not allow for meaningful consideration of valuation adjustment (XVA), a topic of some relevance to both theory and policy.

The sample period does not contain the time since the mandatory exchange of variation margins for bilateral trades has entered into force. Market intelligence suggests that this has increased the appetite for central clearing. It is unlikely to alter the general conclusions of this paper significantly, nonetheless it would be useful to study this event in future research. More generally, the empirical setup of this study does not allow to directly include the costs of bilateral clearing into the empirical setup, hence I proxy for it as described below.

Finally, the hypotheses below model the choice of the economic agents to centrally clear their contracts. These are guided by economic considerations, i.e. profits. I proxy benefits from central clearing in terms of managing (insuring against through mutualization) the counterparty credit risk. I proxy costs of central clearing in terms of the possibility to optimize collateral costs, in line with the literature (Duffie et al., 2015; Ghamami and Glasserman, 2017). Details follow for specific hypotheses.

*Hypothesis 1: intragroup trades*

There should be few incentives to centrally clear intragroup trades, as these are in principle risk neutral from the point of the group (and should also be neutral with respect to collateral posted within the group, while centrally cleared ones would entail external collateral costs), and are exempt from the clearing obligation in the EU. While over 56% of extragroup interest rate derivative contracts have been centrally cleared, it is only around 1.4% for intragroup trades.

Similar picture appears for other asset classes, as shown in Table 1. This preliminary hypothesis guides modeling choices for the forthcoming hypotheses.

To test the first hypothesis, which conjectures that intragroup trades are less likely to be centrally cleared on a voluntary basis, I estimate the below equation using a conditional probit model, the choice of which is subject to robustness checks as presented in Tables 34-37:

$$Pr(\text{cleared}_i = 1) = \Phi(\alpha + \beta \text{ intragroup}_i + \gamma_t) + \epsilon_i \tag{1}$$

My hypothesis is confirmed if I find a statistically significant and negative coefficient of the intragroup variable $\beta$. I employ time fixed effects, which capture time trends, changes in reporting standards and the clearing obligation. I check for robustness within credit and interest rate derivatives (in Annex H), as they are of the main interest. In Tables 34 & 36 it is apparent that adding other kinds of fixed effects (counterparty type, country, type-month) would not strongly alter the relevant coefficient. In Tables 35 & 37 I present how adding various control variables would affect the relevant coefficient. It can be readily observed that even adding the full set of control variables would not change the coefficient of interest in a meaningful way, thus I opt for the simpler specification. Similar robustness checks are presented for each hypothesis, but in the interest of space I do not discuss them in detail for every hypothesis, and instead mention only the relevant points.

I estimate the above equation for all trades ($i$ stands for the ordinal number of each trade) for each asset class[1]. In Annex G I present results for trades with a non-EEA counterparty and for trades without such counterparty being involved. This is to check whether trades within the same group but with entities in different jurisdictions outside the EEA are more likely to be cleared, which can be conjectured based on more separation between such entities on various grounds: including legally, through the involvement of multiple supervisors, and the lack of equivalent regulation.

In line with the above, I am mostly interested in credit and interest rate derivatives, thus in the rest of the paper I interpret results for these two asset classes, mentioning the other ones only when interesting results appear. This also due to the fact that the results for other asset classes may be less robust given low rates of central clearing. In particular, within this hypothesis the results for equity derivatives are to be ignored, as there are zero intragroup equity derivatives which are centrally cleared. For this reason, the appropriate coefficients for equity derivatives are not statistically significant.

As can be seen in Table 2, I cannot reject the first hypothesis for both credit and interest rate derivatives. Interestingly, for credit derivatives the results are stronger when a non-EEA counterparty is present, but if both counterparties are within the EEA the hypothesis can be rejected. For interest rate derivatives I observe less surprising results, with the appropriate effect stronger for trades with a non-EEA counterparty. The difference could stem from the different composition of intragroup trades in contracts with two EEA counterparties.

Given the sample size I would expect statistical significance to be easy to achieve for most

[1]CO: commodity, CR: credit, EQ: equity, FX: foreign exchange, IR: interest rate.

coefficients, thus effect size can be helpful in analyzing the economic significance of the results. In Annex E I present the effect size for the presented models. As can be seen in Table 15, the dependence between central clearing of a contract and it being intragroup is strongly negative for both credit and interest rate derivatives.

The estimated conditional probit model is non-linear, thus further complicating economic interpretation of the coefficients. For this reason in Figure 3 I plot response rates (predicted clearing rates) based on theoretical characteristics of a contract that would be entered into at the end of the studied period. In particular, I distinguish between various asset classes and trades being intragroup or extragroup. As the model is built for testing the specific hypothesis, these predicted clearing rates should not be interpreted as predictions per se, but rather as an indication of the magnitude of change in the probability of a contract being centrally cleared based on it being within a group or not.

As there is a strong difference between intragroup and extragroup contracts in terms of central clearing, with the former being less of interest both for practical purposes of policy and due to their response functions being flat (as in Figure 3), I concentrate on the results for trades outside of a group for the other hypotheses.

Table 2: Results for hypothesis 1 (full sample), estimated with a conditional probit model (Equation 1). The dependent binary variable denotes whether a contract is centrally cleared. intragroup denotes whether a contract is between entities within the same group. The full sample of all new derivative contracts is from April 2016 until June 2017.

| | cleared (full sample) | | | | |
|---|---|---|---|---|---|
| | (CO) | (CR) | (EQ) | (FX) | (IR) |
| intragroup | −2.030*** | −2.614*** | −3.579 | −0.940*** | −2.382*** |
| | (0.090) | (0.020) | (2.417) | (0.011) | (0.004) |
| Constant | −3.225*** | −1.132*** | −2.678*** | −2.733*** | 0.150*** |
| | (0.017) | (0.005) | (0.006) | (0.007) | (0.002) |
| Monthly FE | Yes | Yes | Yes | Yes | Yes |
| Observations | 4,296,374 | 1,814,047 | 12,320,166 | 60,627,185 | 4,231,413 |
| McFadden's $R^2$ | 0.221 | 0.143 | 0.043 | 0.047 | 0.158 |
| *Notes:* | ***Significant at the 1 percent level. | | | | |
| | **Significant at the 5 percent level. | | | | |
| | *Significant at the 10 percent level. | | | | |

*Hypothesis 2: maturity*

Maturity affects the decision to use central clearing in two distinct ways. On the one hand, on the side of benefits from mutualization of counterparty credit risk, one would expect contracts

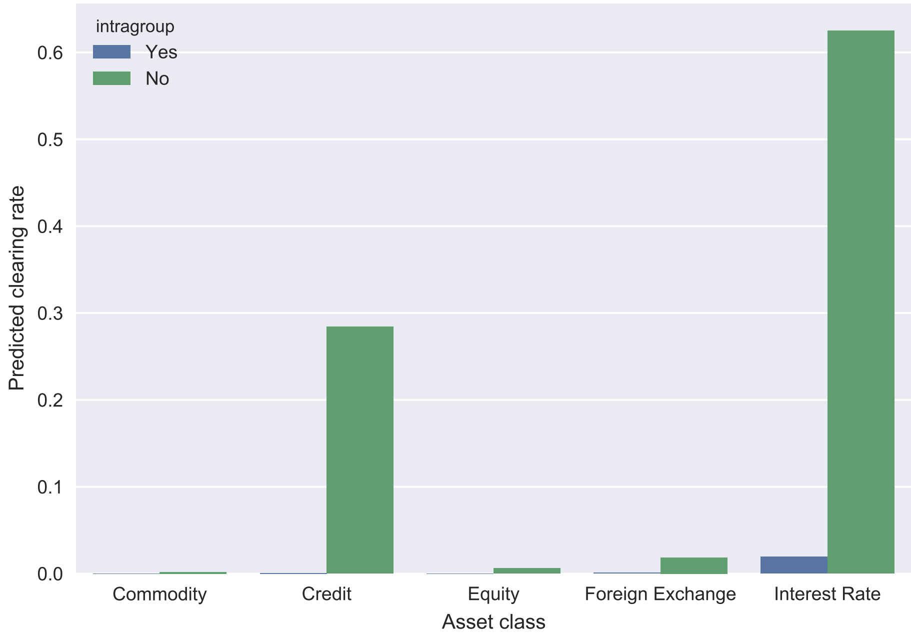


Fig. 3. Predicted clearing rates based on the models reported in Table 2, accounting for whether a trade is within a group or not for trade that would be executed at the end of the studied period (June 2017). Standard errors are not presented as they are $\sim 0$ for all values.

with longer maturity to benefit more from insurance through a CCP. This stems from an upward-sloping risk term structure of credit risk (Helwege and Turner, 1999). On the other hand, long dated contracts can be less standard (more heterogeneous). Koeppl and Monnet (2010) and Biais et al. (2012) show that in the context of OTC trading of heterogeneous contracts, information asymmetries lead to difficulties in reaping the benefits of central clearing. A priori, one would expect the second effect to be stronger for credit derivatives which are standard only for very short maturities, while less strong for interest rate derivatives, as one can find standardized interest rate contracts with maturities of 30 years and more.

To test the second hypothesis, which conjectures that trades with longer maturity are more likely to be centrally cleared on a voluntary basis, I estimate the below equation using a conditional probit model, the choice of which is subject to robustness checks as presented in Tables 38-41:

$$\begin{aligned} Pr(\text{cleared}_i = 1) =& \Phi(\alpha + \beta_1 \text{ maturityyear}_i + \beta_2 \log(\text{eurnotional})_i \\ & + \beta_3 \text{ clearingobligation}_i + \gamma_t) + \epsilon_i \end{aligned} \tag{2}$$

My hypothesis is confirmed if I find a statistically significant and positive coefficient of the year of maturity variable $\beta_1$. I employ only time fixed effects given the results of robustness checks as described in Annex H. There I also present checks for robustness w.r.t. various control variables, which led to the inclusion of the notional of the contract and the clearing obligation status (it proxies for the uncertainty around the clearing obligation), which together with the trades being intragroup are the only variables affecting the results of interest to this hypothesis. I use the notional value in logarithm, in line with the standard practice in financial economics.

In this and forthcoming hypotheses, I estimate the models for all trades for each asset class, and then separately for trades which are not intragroup. I report results for extragroup trades, and relegate results including intragroup trades to Annex G.

As can be seen in Table 3, trades with longer maturity are more likely to be centrally cleared for interest rate and foreign exchange contracts. Conversely, for credit derivatives (together with commodity and equity derivatives) the opposite is the case. This is in line with the expectation that for interest rate derivatives the effect of upward-sloping risk term structure is dominating, whereas for credit derivatives the effect of heterogeneity of long dated contracts dominates the decision to clear voluntarily.

In Figure 4 I plot response rates based on theoretical characteristics of a contract that would be entered into at the end of the studied period. I distinguish between various asset classes and year of maturity for trades not within a group and without a clearing obligation. These predictions are based on a median notional within the asset class (see Table 9 for details). It can be seen that interest rate derivative contracts are more likely to be cleared as the maturity becomes longer, whereas the opposite is the case for credit derivatives. These two increase or decrease in a roughly linear manner. Interestingly, the probability of foreign exchange derivatives being cleared increases with the maturity date, but in a highly non-linear fashion.

*Hypothesis 3: contract size*

Size of the contract (proxied by the notional value) affects the likelihood of it being centrally cleared through benefits of insurance against CCR and collateral costs. On the one hand, literature suggests that given a certain standard of collateralization, losses stemming from a counterparty default are increasing in average expected exposure (Duffie and Zhu, 2011). Size of a specific contract is not perfectly matching an increase in average expected exposure stemming from entering this contract, but it is a good proxy. Thus, one would expect firms to benefit more from mutualizing counterparty credit risk of large contracts. On the other hand, entering into a large contract entails large collateral costs. In fact, Hull (2012) conjectures that a CCP would consider very large contracts to be more difficult to manage in case of a counterparty default and would thus increase collateral costs in more than a linear fashion with respect to the size of the contract. This need not always be the case for trades not cleared centrally. Thus, central clearing of large contracts could in principle be less cost effective. Bellia et al. (2017) show that size of the contract has a positive effect on the likelihood of it being centrally cleared for sovereign credit default swaps of France and Italy, but not those of Germany.

To test the third hypothesis, which conjectures that trades with larger notional values are more likely to be centrally cleared on a voluntary basis, I estimate the below equation using a conditional probit model, the choice of which is subject to robustness checks as presented in Tables 42-45:

Table 3: Results for hypothesis 2 (extragroup), estimated with a conditional probit model (Equation 2). The dependent binary variable denotes whether a contract is centrally cleared. maturityyear denotes whether the year in which a contract matures. I control for log(eurnotional), which denotes the logarithm of the gross notional value of the contract, and clearingobligation, which denotes whether the clearing obligation has been deferred or is not envisioned. The full sample of all new derivative contracts that are not between two entities within the same group is from April 2016 until June 2017.

| | cleared (extragroup) | | | | |
|---|---|---|---|---|---|
| | (CO) | (CR) | (EQ) | (FX) | (IR) |
| maturityyear | −0.119*** | −0.022*** | −0.072*** | 0.056*** | 0.017*** |
| | (0.004) | (0.000) | (0.000) | (0.000) | (0.000) |
| log(eurnotional) | 0.099*** | 0.142*** | −0.041*** | 0.074*** | 0.044*** |
| | (0.001) | (0.001) | (0.001) | (0.000) | (0.000) |
| clearingobligation | −1.482*** | −0.413*** | −3.284*** | 1.482*** | −0.053*** |
| | (0.011) | (0.003) | (0.008) | (0.039) | (0.001) |
| Constant | 236.700*** | 41.744*** | 144.170*** | −117.300*** | −35.770*** |
| | (8.754) | (0.480) | (0.750) | (1.018) | (0.171) |
| Monthly FE | Yes | Yes | Yes | Yes | Yes |
| Observations | 3,770,361 | † | 9,470,268 | 53,982,802 | 3,546,324 |
| McFadden's $R^2$ | 0.296 | 0.085 | 0.555 | 0.150 | 0.016 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.
†Not shown for reasons of confidentiality.

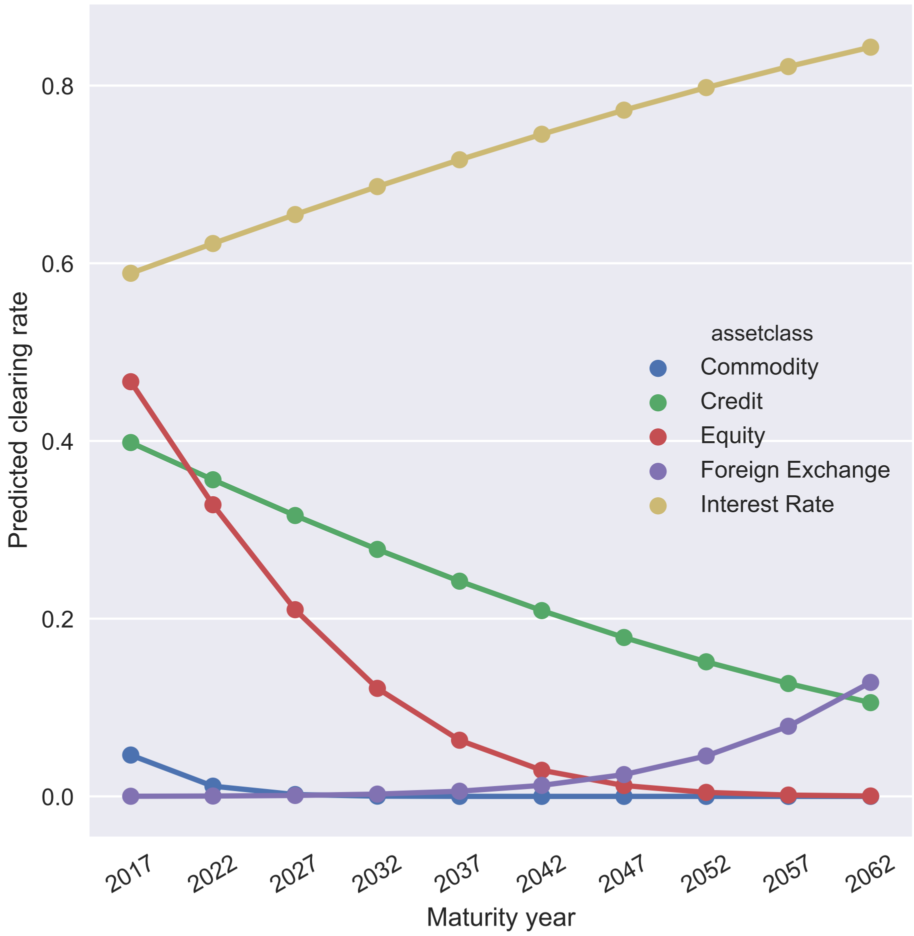


Fig. 4. Predicted clearing rates based on the model reported in Table 3, accounting for the year of maturity, for an extragroup trade without a clearing obligation that would be executed at the end of the studied period (June 2017) of median notional value for each asset class. Standard errors are not presented as they are $\sim 0$ for all values.

$$\begin{aligned} Pr(\text{cleared}_i = 1) =& \Phi(\alpha + \beta_1 \log(\text{eurnotional})_i + \beta_2 \text{ maturityyear}_i \\ & + \beta_3 \text{ Non-EEA cpty}_i + \gamma_t) + \epsilon_i \end{aligned} \tag{3}$$

I use the notional values in logarithm, in line with the standard practice in financial economics. My hypothesis is confirmed if I find a statistically significant and positive coefficient of the log of notional value variable $\beta_1$. I employ time fixed effects given the results of robustness checks as described in Annex H. There I also present checks for robustness w.r.t. various control variables, which led to the inclusion of the maturity of the contract and the involvement of non-EEA counterparty in the contract.

As can be seen in Table 4, trades with larger notional value are more likely to be centrally cleared (except in the case of equity derivatives). There is a positive correlation between central clearing of a contract and its notional value for both credit and interest rate derivatives (Table 17). Thus, it appears that there are statistically significant economies of scale involved in clearing credit and interest rate derivative contracts associated with the size of the contract.

In Figure 5 I plot response rates based on theoretical characteristics of a contract that would be entered into at the end of the studied period. I distinguish between various asset classes and notional value for extragroup trades between two EEA counterparties. It can be seen that for both credit and interest rate derivative contracts the larger the notional value the larger the probability of the contract being cleared. Interestingly, this relationship is much stronger for credit derivatives. This can be explained by two factors. First, credit derivative contracts tend to have smaller notional values than interest rate ones, thus far right side of this figure may be less likely for credit derivatives. Second, changes in valuation of credit derivatives could be more abrupt than in the case of interest rate derivatives, leading to notional scaling these being more important in deciding whether the mutualize the CCR.

*Hypothesis 4: international frictions*

International frictions may conceivably matter for the decision to voluntarily clear derivative contracts. France and Kahn (2016) note that central counterparties have developed protections against differences in creditor protection regimes, as historically members of central counterparties came from jurisdictions with varying protections afforded to creditors (e.g. different state laws in the US). This conjecture fits in within a larger picture of international frictions. Incidentally, central counterparties may in this way enhance capital markets (Porta et al., 1997). Thus, one would think contracts between counterparties from different jurisdictions would benefit more from having their contracts centrally cleared. I proxy for these differences by looking at contracts between firms located in the European Economic Area and ones outside of the EEA. On the other hand, companies from outside of the EEA may only be eligible to clear part of their portfolio within a European CCP, and thus encounter difficulties in cost optimization within a European CCP, through limited economies of scale and limited possibilities of margin optimization.

To test the fourth hypothesis, which conjectures that trades with non-EEA counterparties are more likely to be centrally cleared on a voluntary basis, I estimate the below equation using a conditional probit model, the choice of which is subject to robustness checks as presented in Tables 46-49:

$$Pr(\text{cleared}_i = 1) = \Phi(\alpha + \beta_1 \text{ Non-EEA cpty}_i + \gamma_t) + \epsilon_i \tag{4}$$

My hypothesis is confirmed if I find a statistically significant and positive coefficient of the dummy variable indicating the involvement of a non-EEA counterparty $\beta_1$. I employ time fixed effects given the results of robustness checks as described in Annex H. There I also present checks for robustness w.r.t. various control variables.

As can be seen in Table 5, for credit derivative contracts the benefits of managing counterparty

Table 4: Results for hypothesis 3 (extragroup), estimated with a conditional probit model (Equation 3). The dependent binary variable denotes whether a contract is centrally cleared. log(eurnotional) denotes the logarithm of the gross notional value of the contract. I control for maturityyear, which denotes whether the year in which a contract matures, and Non-EEA cpty, which denotes whether the one of the counterparties to a contract has been established outside of the EEA. The full sample of all new derivative contracts that are not between two entities within the same group is from April 2016 until June 2017.

| | cleared (extragroup) | | | | |
|---|---|---|---|---|---|
| | (CO) | (CR) | (EQ) | (FX) | (IR) |
| log(eurnotional) | 0.109*** | 0.144*** | −0.029*** | 0.081*** | 0.024*** |
| | (0.001) | (0.001) | (0.001) | (0.000) | (0.000) |
| maturityyear | −0.076*** | −0.021*** | −0.000* | 0.041*** | 0.015*** |
| | (0.003) | (0.000) | (0.000) | (0.000) | (0.000) |
| Non-EEA cpty | 0.145*** | 0.132*** | −1.594*** | −1.398*** | −1.216*** |
| | (0.005) | (0.003) | (0.008) | (0.006) | (0.001) |
| Constant | 149.500*** | 38.180*** | −1.295*** | −85.870*** | −29.740*** |
| | (6.592) | (0.475) | (0.386) | (0.261) | (0.182) |
| Monthly FE | Yes | Yes | Yes | Yes | Yes |
| Observations | 3,770,361 | † | 9,470,268 | 53,982,802 | 3,546,324 |
| McFadden's $R^2$ | 0.251 | 0.075 | 0.201 | 0.255 | 0.163 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.
†Not shown for reasons of confidentiality.

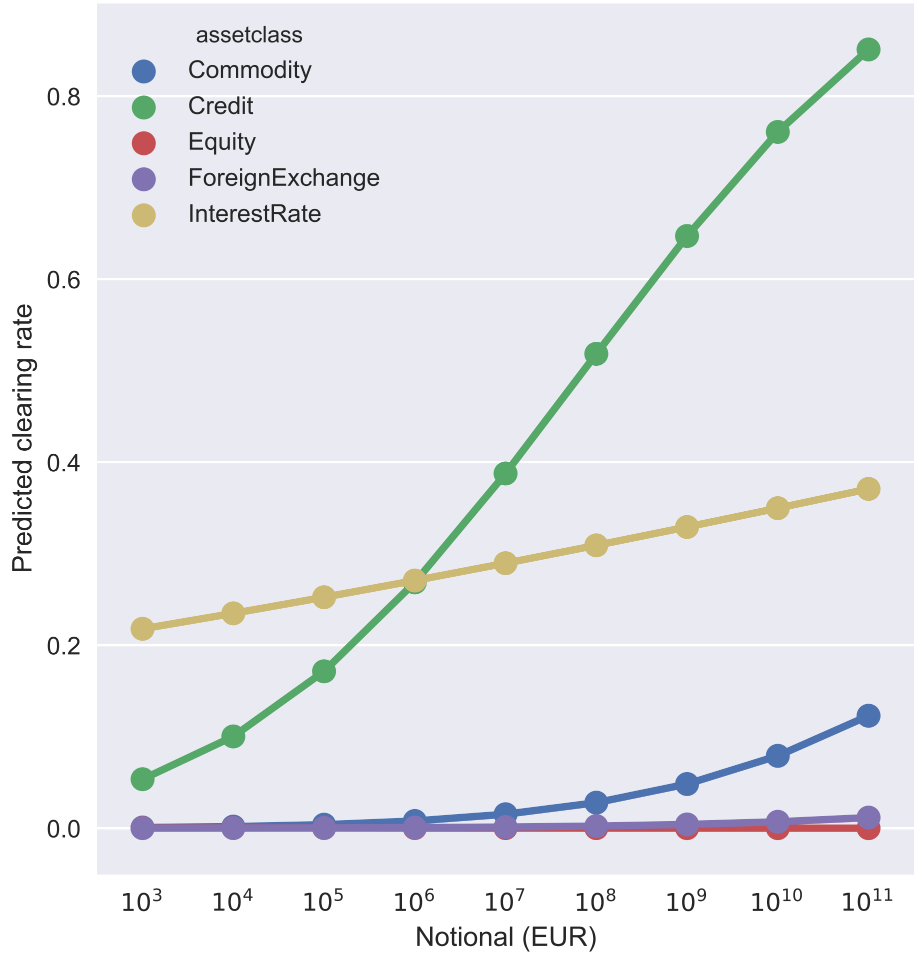


Fig. 5. Predicted clearing rates based on the model reported in Table 4, accounting for the gross notional of the trade (in EUR), for an extragroup trade between two EEA counterparties that would be executed at the end of the studied period (June 2017), with a short-term maturity (representative for most contracts in the market). Standard errors are not presented as they are $\sim 0$ for all values (with a maximum standard error of around 0.001).

risk with entities from outside the EEA seem to outweigh the potential loss of cost optimization. The opposite is the case for interest rate derivatives, where the effect of frictions due to different jurisdictions seem to be weaker than considerations of potential for cost optimization.

In Figure 6 I plot response rates based on theoretical characteristics of a contract that would be entered into at the end of the studied period. In particular, I distinguish between various asset classes and the involvement of non-EEA counterparties. Credit derivatives which are not traded within a group are about five percentage points more likely to be centrally cleared if they involve a non-EEA counterparty. The effect is reverse and much stronger for interest rate derivatives. Interest rate derivative contracts which are not traded within a group are over twice more likely to be centrally cleared if they involve a non-EEA counterparty than if they are between two counterparties established within the EEA.

Table 5: Results for hypothesis 4 (extragroup), estimated with a conditional probit model (Equation 4). The dependent binary variable denotes whether a contract is centrally cleared. Non-EEA cpty denotes whether the one of the counterparties to a contract has been established outside of the EEA. The full sample of all new derivative contracts that are not between two entities within the same group is from April 2016 until June 2017.

| | cleared (extragroup) | | | | |
|---|---|---|---|---|---|
| | (CO) | (CR) | (EQ) | (FX) | (IR) |
| Non-EEA cpty | 0.196*** | 0.100*** | −1.589*** | −1.306*** | −1.228*** |
| | (0.005) | (0.003) | (0.008) | (0.005) | (0.001) |
| Constant | −3.298*** | −1.190*** | −2.295*** | −2.446*** | 0.592*** |
| | (0.017) | (0.005) | (0.007) | (0.008) | (0.003) |
| Monthly FE | Yes | Yes | Yes | Yes | Yes |
| Observations | 3,770,361 | † | 9,470,268 | 53,982,802 | 3,546,324 |
| McFadden's $R^2$ | 0.209 | 0.031 | 0.198 | 0.153 | 0.156 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.
†Not shown for reasons of confidentiality.

*Hypothesis 5: financial sophistication*

Financial sophistication also matters to voluntary clearing of derivative contracts. It affects the decision to clear derivative contracts through information asymmetries, especially in the confidence of a firm in its assessment of counterparty credit risk. When there is uncertainty about the credit risk, counterparties may provide transparency (Stephens and Thompson, 2017). This may be particularly useful for less sophisticated companies. On the other hand, sophisticated financial companies have more expertise and a deeper portfolio of derivative contracts which through economies of scope may compel these firms to clear voluntarily to a greater degree. Interestingly, Bank for International Settlements (2014) conjectures that "risk-takers" such as hedge-funds would benefit more from central clearing, while "hedgers" such as insurance companies and pension funds would hardly benefit and not choose to clear unless legally obliged to do so. I attempt to test this conjecture within this hypothesis.

To test the fifth hypothesis, which conjectures that trades with financial counterparties are more likely to be centrally cleared on a voluntary basis, I estimate the below equation using a conditional probit model, the choice of which is subject to robustness checks as presented in Tables 50-53:

$$Pr(\text{cleared}_i = 1) = \Phi(\alpha + \beta_1 \text{ financial nature}_i + \beta_2 \text{ Non-EEA cpty}_i + \gamma_t + \delta_j) + \epsilon_i \quad (5)$$

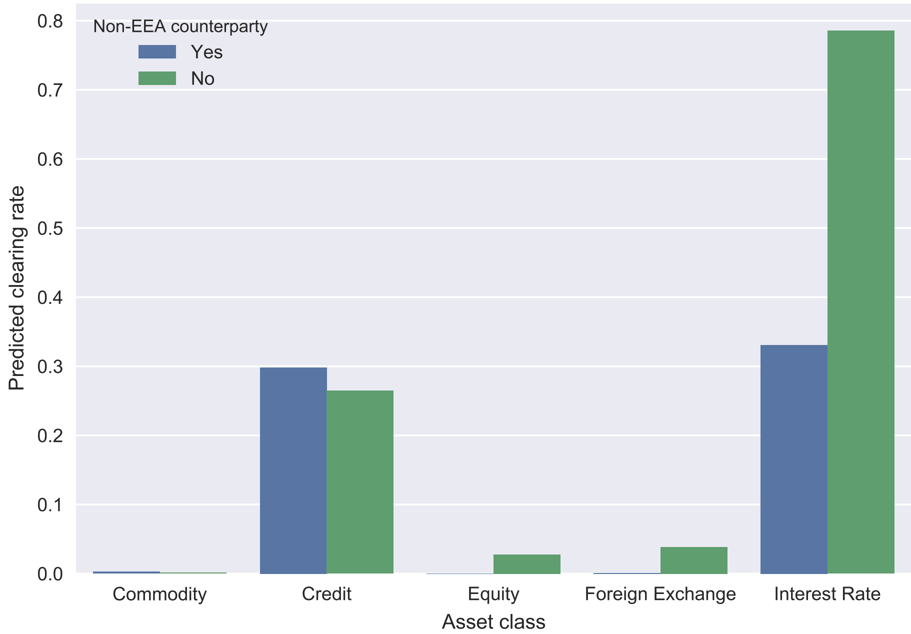


Fig. 6. Predicted clearing rates based on the model reported in Table 5, accounting for whether it is with a counterparty outside of the EEA, for an extragroup trade that would be executed at the end of the studied period (June 2017). Standard errors are not presented as they are $\sim 0$ for all values (with a maximum standard error of around 0.002).

My hypothesis is confirmed if I find a statistically significant and positive coefficient of the dummy variable indicating the involvement of a financial counterparty $\beta_1$. I employ time fixed effects and I saturate the model with counterparty type fixed effects[2] given the results of robustness checks as described in Annex H. In the annex I also present checks for robustness w.r.t. various control variables, based on which only the variable indicating the involvement of a non-EEA counterparty has been included in this model.

As can be seen in Table 6, trades which involve a financial counterparty are more likely to be centrally cleared (with the exception of commodity and equity derivatives).

In Figure 7 I plot response rates based on theoretical characteristics of a contract that would be entered into at the end of the studied period. In particular, I distinguish between various asset classes, the involvement and type of financial counterparties. The order of counterparty types in term of the probability of a trade being cleared given the specific type of counterparty being involved is more or less invariant to the other variables of interest in this model. Within this model, it turns out that trades involving other financial institutions (OFI) are the most likely ones to be cleared. Trades involving G16 dealers, insurance companies & pension funds are below OFIs, with banks lagging behind. Not unsurprisingly, non-financial institutions are the least likely to clear their contracts, which further confirms the findings of this part of the analysis. Importantly, showing that

[2] j index in the model runs across counterparty types: G16 dealers, other banks, insurance undertakings & pension funds, other financial institutions, and non-financial institutions.

the propensity for clearing varies between various kinds of market participants, I confirm theoretical conjecture that incentives may differ between market participants of various kinds (Duffie et al., 2015). There is mixed evidence against the assertion of the Bank for International Settlements (2014) that incentives for clearing will differ across various types of institutions, with a distinction made between "risk-takers" (e.g. hedge funds) and "hedgers" (e.g. corporates, insurers and pension funds). While in the analysed model hedge funds (which are within OFIs) are on the opposite end of the spectrum than corporates, insurers and pension funds are quite close to OFIs (and thus hedge funds). It is noteworthy that this picture may be distorted by the classification not being granular enough, particularly for other financial institutions.

Table 6: Results for hypothesis 5 (extragroup), estimated with a conditional probit model (Equation 5). The dependent binary variable denotes whether a contract is centrally cleared. financial nature denotes whether the reporting counterparty is of financial nature. I control for Non-EEA cpty, which denotes whether the one of the counterparties to a contract has been established outside of the EEA. The full sample of all new derivative contracts that are not between two entities within the same group is from April 2016 until June 2017.

| | cleared (extragroup) | | | | |
|---|---|---|---|---|---|
| | (CO) | (CR) | (EQ) | (FX) | (IR) |
| financial nature | $-0.900^{***}$ | $1.170^{***}$ | $-0.891^{***}$ | $1.038^{***}$ | $0.798^{***}$ |
| | (0.019) | (0.019) | (0.009) | (0.029) | (0.008) |
| Non-EEA cpty | $0.605^{***}$ | $0.113^{***}$ | $-1.977^{***}$ | $-1.411^{***}$ | $-1.266^{***}$ |
| | (0.008) | (0.003) | (0.009) | (0.006) | (0.002) |
| Constant | $-4.479^{***}$ | $-2.967^{***}$ | $-0.014$ | $-3.603^{***}$ | $-0.429^{***}$ |
| | (0.034) | (0.022) | (0.013) | (0.030) | (0.009) |
| Monthly FE | Yes | Yes | Yes | Yes | Yes |
| Type FE | Yes | Yes | Yes | Yes | Yes |
| Observations | 3,770,361 | † | 9,470,268 | 53,982,802 | 3,546,324 |
| McFadden's $R^2$ | 0.515 | 0.041 | 0.544 | 0.201 | 0.171 |
| *Notes:* | ***Significant at the 1 percent level. | | | | |
| | **Significant at the 5 percent level. | | | | |
| | *Significant at the 10 percent level. | | | | |
| | †Not shown for reasons of confidentiality. | | | | |

*Hypothesis 6: economies of scale*

Within the previous hypotheses I have touched upon economies of scale linked with the size of a given contract, and with the type of counterparty involved. Theory suggests another important way in which economies of scale enter into the decision to clear derivative contracts. Duffie and Zhu

Table 7: Results for hypothesis 6 (extragroup), estimated with a conditional probit model (Equation 6). The dependent binary variable denotes whether a contract is centrally cleared. prev.ratio denotes the total gross notional cleared by the reporting counterparty divided by the total gross notional traded by the reporting counterparty within the same asset class in the previous month. The full sample of all new derivative contracts that are not between two entities within the same group is from April 2016 until June 2017.

| | cleared (extragroup) | | | | |
|---|---|---|---|---|---|
| | (CO) | (CR) | (EQ) | (FX) | (IR) |
| prev.ratio | 7.203*** | 2.798*** | 6.810*** | 0.000*** | 1.206*** |
| | (0.048) | (0.008) | (0.050) | (0.000) | (0.003) |
| Constant | −4.265*** | −2.198*** | −4.128*** | −2.802*** | −0.615*** |
| | (0.044) | (0.011) | (0.069) | (0.008) | (0.003) |
| Monthly FE | Yes | Yes | Yes | Yes | Yes |
| Type FE | Yes | Yes | Yes | Yes | Yes |
| Observations | 3,770,361 | † | 9,470,268 | 3,687,931 | 3,546,324 |
| McFadden's $R^2$ | 0.866 | 0.154 | 0.991 | 0.067 | 0.050 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.
†Not shown for reasons of confidentiality.

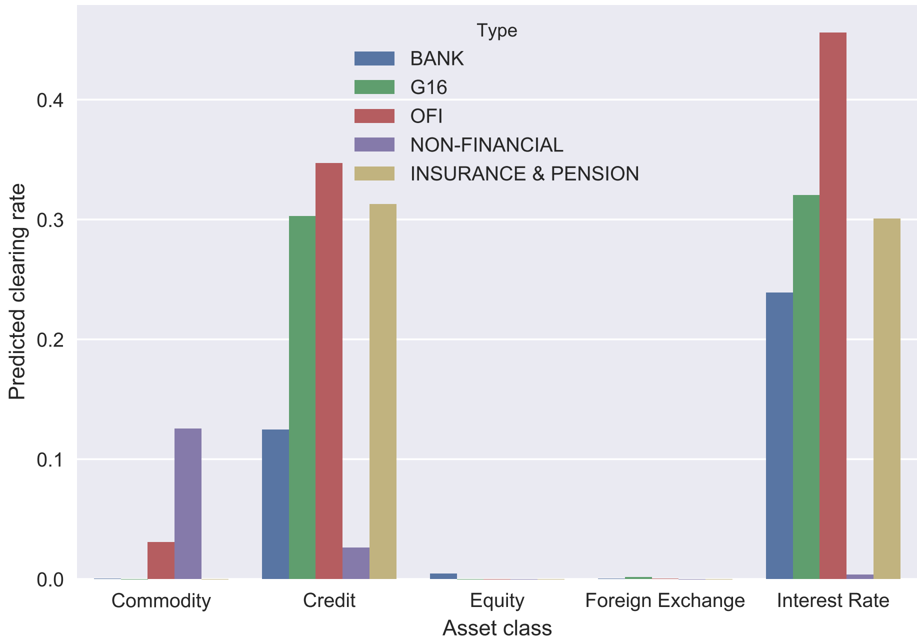


Fig. 7. Predicted clearing rates based on the model reported in Table 6, accounting for type of counterparty, for trade that is not within a group, between two EEA counterparties, and is executed at the end of the studied period (June 2017). Standard errors are not presented as they are $\sim 0$ for all values (with a maximum standard error of around 0.018).

(2011) note that the percentage of cleared exposures for dealers increases netting possibilities, thus giving more incentive to clear further contracts. Similarly, Duffie et al. (2015) note that an increasing degree of novation to CCPs first raises collateral demand, as additional margin requirements and the change in netting sets outweigh the potential cross-counterparty netting and diversification benefits a CCP may provide. Once a sufficiently large share of trades is cleared, however, these benefits prevail and collateral demand decreases relative to the base case. Finally, Ghamami and Glasserman (2017) agree that the degree of netting achieved drives the cost comparison between central and bilateral clearing. I proxy for the percentage of cleared exposures by the ratio of notional cleared to the notional traded in the previous month in the same asset class by the reporting counterpart. Given the nature of the data used, I am not able to create a more detailed measure of netting possibilities. As results driven by a ratio may be difficult to interpret in times, I present a decomposition of the results based on the numerator and the denominator of this ratio in Annex F.

To test the sixth hypothesis, which conjectures that trades with counterparties who have novated larger share of their volumes traded in the preceding month are more likely to be centrally cleared on a voluntary basis, I estimate the below equation using a conditional probit model, the choice of which is subject to robustness checks as presented in Tables 54-61:

$$Pr(\text{cleared}_i = 1) = \Phi(\alpha + \beta_1 \text{ prev.ratio}_i + \gamma_t + \delta_j) + \epsilon_i \tag{6}$$

My hypothesis is confirmed if I find a statistically significant and positive coefficient of the ratio of the notional cleared to the notional traded by the reporting counterparty in the previous month $\beta_1$. I employ time fixed effects and I saturate the model with counterparty type fixed effects given the results of robustness checks as described in Annex H. There I also present checks for robustness w.r.t. various control variables, based on which no control variables have been included in this model. I use the notional value in logarithm, in line with the standard practice in financial economics. I perform a further robustness check for a model with the number of cleared trades being used instead of the volume of cleared trades. As expected, results are more interesting and meaningful when the notional values are used.

As can be seen in Table 7, the picture quite clear. Trades which involve a counterparty that has novated larger portion of their traded volume of derivatives within the same asset class in the previous month to a CCP are more likely to be centrally cleared for all asset classes. The only exception is foreign exchange derivatives, where the relevant coefficient is very close to zero, which is conceivably driven by very few contracts being centrally cleared in this asset class. The effect is exceedingly strong for commodity and equity derivatives (Table 20), but it is a consequence of a very small and concentrated part of these markets that uses central clearing. The results hint at there being significant economies of scale involved in central clearing of derivative contracts.

In Figure 8 I plot response rates based on theoretical characteristics of a contract that would be entered into at the end of the studied period. In particular, I distinguish between various asset classes, the ratio of the volume of derivatives cleared to volume traded in the previous month by the reporting counterparty, and the type of the reporting counterparty. For interest rate derivatives there is a strong, and almost linear relationship between previously cleared notional and the probability of a trade being cleared. The probabilities of trade being cleared varies significantly depending on the type of reporting counterparty. For credit derivatives the picture is the same, except the relationship is further away from being linear.

## 5. Conclusions

I have shown that only credit and interest rate derivatives have a significant involvement of central counterparties in the EU. I have confirmed theoretical predictions that central clearing of derivative contracts involves significant economies of scale. In particular, I have shown economies of scale linked to the size of a given contract and the percent of notional novated to a CCP by a given firm. Results showing the effects of other characteristics of the derivative contracts (such as maturity) or the firms engaging in these contracts (such as the business model or the region of domicile) have a significant effect, which also depends on the type of the contract. This is useful to guide efforts in modeling decision of economic agents with regards to entering into contracts with a central counterparty instead of bilateral contracts. The results are also useful for policy makers as these finding showcase the incentives which need to be taken into account when deciding on the future shape of the clearing obligation. In particular, it seems that broadening the scope of

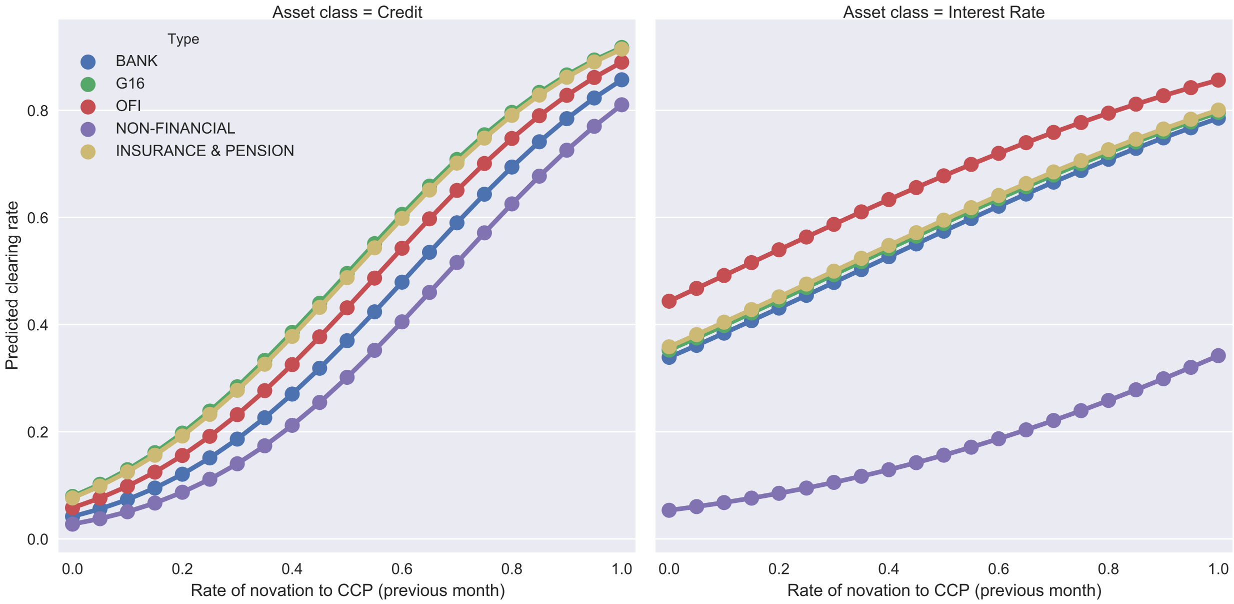


Fig. 8. Predicted clearing rates based on the model reported in Table 24, accounting for the type of the counterparty, asset class of the contract, and the ratio of the total gross notional cleared by the reporting counterparty to the total gross notional traded by the reporting counterparty within the same asset class in the previous month, for an extragroup contract that would be executed at the end of the studied period (June 2017). Standard errors are not presented as they are $\sim 0$ for all values (except for insurers & pension funds for which results should be interpreted with caution).

the clearing obligation could bring additional benefits in terms of the costs, in addition to other benefits such as better financial stability and better market transparency. Detailed deliberations on specific contract types of derivatives, and using matched market and balance sheet data, are relegated to future studies.

## References


Abad, J., Aldasoro, I., Aymanns, C., D'Errico, M., Rousova, L. F., Hoffmann, P., Langfield, S., Neychev, M., Roukny, T., 2016. Shedding light on dark markets: First insights from the new EU-wide OTC derivatives dataset. ESRB Occasional Paper 11.

Acharya, V., Bisin, A., 2014. Counterparty risk externality: Centralized versus over-the-counter markets. Journal of Economic Theory 149, 153–182.

Bank for International Settlements, 2014. Regulatory reform of over-the-counter derivatives: an assessment of incentives to clear centrally. BIS Publication.

Bellia, M., Panzica, R., Pelizzon, L., Peltonen, T., 2017. The demand for central clearing: to clear or not to clear, that is the question. ESRB Working Paper 62.

Biais, B., Heider, F., Hoerova, M., 2012. Clearing, counterparty risk and aggregate risk. European Central Bank Working Paper 1481.

Biais, B., Heider, F., Hoerova, M., 2016. Risk-Sharing or Risk-Taking? Counterparty Risk, Incentives, and Margins. The Journal of Finance 71, 1669–1698.

Cielinska, O., Joseph, A., Shreyas, U., Tanner, J., Vasios, M., 2017. Gauging market dynamics using trade repository data: the case of the Swiss franc de-pegging. Bank of England Financial Stability Paper No. 41.

Cont, R., 2017. Central clearing and risk transformation. Banque de France Financial Stability Review.

Cont, R., Kokholm, T., 2014. Central clearing of OTC derivatives: bilateral vs multilateral netting. Statistics and Risk Modeling 31, 3–22.

D'Errico, M., Battiston, S., Peltonen, T., Scheicher, M., 2016. How does risk flow in the credit default swap market? ESRB Working Paper 33.

Duffie, D., Scheicher, M., Vuillemey, G., 2015. Central Clearing and Collateral Demands. Journal of Financial Economics 116, 237–256.

Duffie, D., Zhu, H., 2011. Does a Central Clearing Counterparty Reduce Counterparty Risk? The Review of Asset Pricing Studies 1, 4–95.

Financial Stability Board, 2017. OTC Derivatives Market Reforms: Twelfth Progress Report on Implementation. FSB Report.

France, V., Kahn, C., 2016. Law as a constraint on bailouts: Emergency support for central counterparties. Journal of Financial Intermediation 28, 22–31.

Ghamami, S., Glasserman, P., 2017. Does OTC derivatives reform incentivize central clearing? Journal of Financial Intermediation 32, 76–87.

Haldane, A., May, R., 2011. Systemic risk in banking ecosystems. Nature 469, 351–355.

Helwege, J., Turner, C. M., 1999. The Slope of the Credit Yield Curve for Speculative-Grade Issuers. The Journal of Finance 54, 1869–1884.

Hull, J., 2012. CCPs: Their Risks, and How They Can Be Reduced. Journal of Derivatives 20, 26–29.

Koeppl, T., Monnet, C., 2010. The Emergence and future of central counterparties. Federal Reserve Board of Philadelphia Working Paper.

Koeppl, T., Monnet, C., Temzelides, T., 2012. Optimal clearing arrangements for financial trades. Journal of Financial Economics 103, 189–203.

Porta, R. L., Lopez-De-Silanes, F., Shleifer, A., Vishny, R. W., 1997. Legal Determinants of External Finance. The Journal of Finance 52, 1131–1150.

Stephens, E., Thompson, J. R., 2017. Information Asymmetry and Risk Transfer Markets. Journal of Financial Intermediation 32, 88–99.

# Appendix A. Data cleaning

The original dataset as reported to the European Systemic Risk Board needs to be cleaned and processed in order to be useful for an analysis. In this paper I perform two such procedures. The first one is to obtain data for the purpose of calculating clearing rates. The second one is more subtle and required for the dataset used in the analysis of the determinants of voluntary clearing of derivative contracts. Below I briefly explain both.

First, I present the method to obtain the dataset used for calculating clearing rates. This method has been agreed upon internationally as the standard method of calculating rates of central clearing in derivatives markets. Starting from the original raw dataset I retain only reports of new trades and cancellations. Then I remove trades which have been cancelled on the same day (and all the reports of cancellations), as these are assumed to be novated to cleared trades, and further remove trades resulting from compression exercises. I deduplicate the resulting dataset based on the trade identifier, and convert the notional values to euros using the ECB exchange rates. In this sample, I am only interested in the following three variables: the trade date, the notional value (in euros), and the binary variable indicating whether the trade has been centrally cleared.

Second, I present the method to obtain the final dataset used in the main part of the analysis, which investigates the determinants of voluntary clearing of derivative contracts. I start in the same way as above, retaining only reports of new trades and cancellations, and subsequently removing trades which have been cancelled on the same day (and all the reports of cancellations), and trades resulting from compression exercises. Further, I also remove trades which are subject to mandatory clearing obligation, as these would be cleared by law and not voluntarily (thus outside of the scope of this paper). To make all the reports comparable, I change all string variables into uppercase and remove all leading and trailing whitespaces. I remove all the reports with misreported variables of interest, in particular notional values (not a non-zero number) and currencies (not a valid ISO 4217 code), financial nature of the reporting counterparty (not 'F' or 'N'), cleared (not 'Y' or 'N'), trading capacity (not 'P' or 'A'), intragroup (not 'Y' or 'N'), contract with non-EEA[3] counterparty (not 'Y' or 'N'), clearing obligation (not 'N' or 'X'), and maturity date (before 2016 or after 2100). I also convert all the variables reported in currencies into euros using the ECB exchange rates. Further, I merge this dataset with other datasets available at the ESRB. In particular, I use Bureau van Dijk Orbis[4] in order to assign reporting counterparties to one of the following six groups: G16 dealers, banks (other than G16 dealers), CCPs, pension funds and insurance companies, other financial institutions (such as mutual and hedge funds), and non-financial institutions. I also use GLEIF data[5], which allows me to obtain the country of domicile of all counterparties.

Some further transformations of variables in the dataset are necessary. First, I bucket maturity date into years, as more granular data is not necessary for the analysis. Further, for each trade I calculate the number and volume of trades the reporting counterparty has traded and cleared in

[3] Established outside the European Economic Area.

[4] `http://www.bvdinfo.com/en-gb/our-products/company-information/international-products/orbis`

[5] `https://www.gleif.org/en/lei-data/global-lei-index`

the previous calendar month to proxy for the involvement of the counterparties in the derivatives markets and central clearing (for this reason the final dataset in this study starts from April 2016 as March 2016 data does not have the previous month aggregates). And, for the sake of consistency I transform all the binary variables into 0s and 1s. For variables with choice between 'Y' (Yes, 1) and 'N' (No, 0) the transformation is obvious. But it is useful to mention how I approach this transformation for the other variables. With regards to the financial nature of the reporting counterparty I assume 1 when the reporting counterparty is of financial nature and 0 otherwise. For the trading capacity variable I assume 1 for principal trades and 0 for agent trades. With regards to clearing obligation, if it is deferred I assume 1 and 0 if it the trade is not envisioned to be subject to clearing obligation.

## Appendix B. Variables

It is useful to describe the variables of interest:

- cleared (1: Yes, 0: No) – identifies whether the contract has been centrally cleared;
- intragroup (1: Yes, 0: No) – identifies whether the contract is between entities within one group.
- maturityyear - the year in which the contract matures;
- eurnotional - gross notional value of the contract (in euros);
- clearingobligation (1: X, 0: No) – identifies whether the contract has no clearing obligation (0) or whether it is entered into before there is a clearing obligation for a given asset class (1);
- Non-EEA cpty (1: with a non-EEA counterparty, 0: without a non-EEA counterparty) – identifies whether an entity residing outside the EEA is a party to the contract;
- financial nature (1: Financial Counterparty, 0: Non-Financial Counterparty) – identifies whether the reporting counterparty of the contract is of financial nature;
- tradingcapacity (1: Principal, 0: Agent) – identifies whether the reporting counterparty of the contract has concluded the contract as principal on own account (on own behalf or behalf of a client) or as agent for the account of and on behalf of a client;
- prev.trades – identifies the number of trades within the asset class to which the reporting entity of the contract has been a counterparty in the previous calendar month;
- prev.trades.cleared – identifies the number of centrally cleared trades within the asset class to which the reporting entity of the contract has been a counterparty in the previous calendar month;
- prev.notional – identifies the total gross notional of trades within the asset class to which the reporting entity of the contract has been a counterparty in the previous calendar month;
- prev.not.cleared – identifies the total gross notional of centrally cleared trades within the asset class to which the reporting entity of the contract has been a counterparty in the previous calendar month;
- prev.ratio – identifies the ratio of prev.not.cleared and prev.notional;
- prev.ratio.trades – identifies the ratio of prev.trades.cleared and prev.trades.

## Appendix C. Summary statistics

Table 8: Summary statistics for binary dependent variables.

| Variable | Value | (CO) | (CR) | (EQ) | (FX) | (IR) |
|---|---|---|---|---|---|---|
| intragroup | 1 | 526,013 | † | 2,849,898 | 6,644,383 | 685,089 |
| | 0 | 3,770,361 | † | 9,470,268 | 53,982,802 | 3,546,324 |
| financial nature | 1 | 3,927,673 | 1,792,267 | 10,925,735 | 56,376,331 | 4,180,527 |
| | 0 | 368,701 | 21,780 | 1,394,431 | 4,250,854 | 50,886 |
| tradingcapacity | 1 | † | 1,810,076 | 12,203,917 | 59,166,656 | 4,222,891 |
| | 0 | † | 3,971 | 116,249 | 1,460,529 | 8,522 |
| Non-EEA cpty | 1 | 1,732,703 | 1,253,452 | 7,939,029 | 32,498,471 | 1,893,030 |
| | 0 | 2,563,671 | 560,595 | 4,381,137 | 28,128,714 | 2,338,383 |
| clearingobligation | 1 | 4,144,755 | 1,507,384 | 11,624,839 | 57,089,343 | 2,657,499 |
| | 0 | 151,619 | 306,663 | 695,327 | 3,537,842 | 1,573,914 |

*Notes:* Items not shown due to reasons of confidentiality:
†Split in line with other asset classes.

Table 9: Summary statistics for non-binary dependent variables.

| Variable | Asset class | Quantile 10 | 25 | 50 | 75 | 90 |
|---|---|---|---|---|---|---|
| eurnotional | Commodity | 390 | 1,191 | 11,147 | 89,644 | 498,155 |
| | Credit | 240,000 | 1,000,000 | 4,000,000 | 10,000,000 | 26,893,200 |
| | Equity | 814 | 4,744 | 25,381 | 180,793 | 1,212,000 |
| | Foreign Exchange | 6,300 | 58,440 | 460,404 | 3,804,818 | 24,763,500 |
| | Interest Rate | 869,327 | 4,994,410 | 22,000,000 | 71,765,850 | 210,000,000 |
| maturityyear | Commodity | 2016 | 2016 | 2016 | 2017 | 2017 |
| | Credit | 2017 | 2018 | 2021 | 2021 | 2022 |
| | Equity | 2016 | 2017 | 2018 | 2018 | 2026 |
| | Foreign Exchange | 2016 | 2016 | 2016 | 2017 | 2017 |
| | Interest Rate | 2017 | 2018 | 2022 | 2027 | 2037 |
| prev.trades | Commodity | † | 1,861 | 71,563 | 134,606 | 148,053 |
| | Credit | 732 | 5,539 | 11,208 | 21,945 | 40,800 |
| | Equity | 2,140 | 11,254 | 49,503 | 95,719 | 111,244 |
| | Foreign Exchange | 293 | 10,371 | 122,234 | 245,094 | 384,705 |
| | Interest Rate | 428 | 7,087 | 17,895 | 30,391 | 36,176 |
| prev.notional | Commodity | † | 765,990,320 | 26,539,867,766 | 35,097,782,453 | 43,127,571,320 |
| | Credit | 10,653,713,281 | 82,224,345,963 | 175,963,419,834 | 374,107,228,884 | 641,876,287,530 |
| | Equity | 204,185,616 | 2,548,732,854 | 107,694,497,226 | 408,931,765,221 | 2,074,413,637,504 |
| | Foreign Exchange | 464,118,439 | 33,508,919,462 | 2,402,324,084,719 | 5,047,248,185,287 | 7,014,473,051,717 |
| | Interest Rate | 28,105,286,456 | 794,200,504,719 | 2,551,685,906,015 | 4,970,887,422,999 | 7,116,249,271,385 |
| prev.trades.c | Commodity | † | † | † | † | † |
| | Credit | † | 180 | 477 | 1,526 | 4,099 |
| | Equity | † | † | † | † | † |
| | Foreign Exchange | † | † | † | 1,371 | 3,886 |
| | Interest Rate | 244 | 3,888 | 8,128 | 11,566 | 14,916 |
| prev.not.c | Commodity | † | † | † | † | † |
| | Credit | 10,500,000 | 4,403,150,000 | 14,476,832,613 | 36,407,707,591 | 76,187,483,922 |
| | Equity | † | † | † | † | † |
| | Foreign Exchange | † | † | † | 9,687,848,327 | 34,366,603,755 |
| | Interest Rate | 8,581,369,739 | 427,772,030,604 | 1,040,257,258,695 | 1,824,173,176,571 | 2,859,015,655,784 |

*Notes:* Items not shown due to reasons of confidentiality:
†Not shown due to low values.

Table 10: Pearson's correlation coefficients between dependent variables, for Commodity derivatives. Variables are: (1) intragroup, (2) financial nature, (3) tradingcapacity, (4) Non-EEA cpty, (5) clearing obligation, (6) maturityyear, (7) eurnotional, (8) prev.notional, (9) prev.not.cleared.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| (1) | 1.000 | −0.432 | −0.171 | 0.125 | −0.332 | 0.013 | 0.000 | 0.012 | −0.023 |
| (2) | −0.432 | 1.000 | −0.024 | 0.113 | 0.431 | −0.007 | −0.001 | 0.045 | −0.008 |
| (3) | −0.171 | −0.024 | 1.000 | −0.043 | 0.380 | −0.014 | 0.000 | 0.016 | 0.007 |
| (4) | 0.125 | 0.113 | −0.043 | 1.000 | 0.029 | 0.029 | 0.000 | 0.067 | 0.035 |
| (5) | −0.332 | 0.431 | 0.380 | 0.029 | 1.000 | −0.158 | 0.000 | 0.028 | −0.016 |
| (6) | 0.013 | −0.007 | −0.014 | 0.029 | −0.158 | 1.000 | 0.000 | −0.003 | −0.010 |
| (7) | 0.000 | −0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 | 0.005 | 0.000 |
| (8) | 0.012 | 0.045 | 0.016 | 0.067 | 0.028 | −0.003 | 0.005 | 1.000 | −0.009 |
| (9) | −0.023 | −0.008 | 0.007 | 0.035 | −0.016 | −0.010 | 0.000 | −0.009 | 1.000 |

Table 11: Pearson's correlation coefficients between dependent variables, for Credit derivatives. Variables are: (1) intragroup, (2) financial nature, (3) tradingcapacity, (4) Non-EEA cpty, (5) clearing obligation, (6) maturityyear, (7) eurnotional, (8) prev.notional, (9) prev.not.cleared.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| (1) | 1.000 | 0.057 | 0.029 | 0.398 | 0.193 | −0.206 | 0.001 | 0.249 | −0.286 |
| (2) | 0.057 | 1.000 | −0.002 | −0.042 | −0.046 | 0.003 | 0.000 | 0.018 | 0.085 |
| (3) | 0.029 | −0.002 | 1.000 | 0.049 | 0.014 | 0.000 | 0.000 | 0.008 | 0.025 |
| (4) | 0.398 | −0.042 | 0.049 | 1.000 | 0.053 | −0.004 | 0.000 | 0.100 | −0.002 |
| (5) | 0.193 | −0.046 | 0.014 | 0.053 | 1.000 | −0.153 | 0.000 | 0.066 | −0.214 |
| (6) | −0.206 | 0.003 | 0.000 | −0.004 | −0.153 | 1.000 | 0.000 | −0.054 | 0.147 |
| (7) | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 | 0.000 |
| (8) | 0.249 | 0.018 | 0.008 | 0.100 | 0.066 | −0.054 | 0.000 | 1.000 | −0.053 |
| (9) | −0.286 | 0.085 | 0.025 | −0.002 | −0.214 | 0.147 | 0.000 | −0.053 | 1.000 |

Table 12: Pearson's correlation coefficients between dependent variables, for Equity derivatives. Variables are: (1) intragroup, (2) financial nature, (3) tradingcapacity, (4) Non-EEA cpty, (5) clearing obligation, (6) maturityyear, (7) eurnotional, (8) prev.notional, (9) prev.not.cleared.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| (1) | 1.000 | −0.025 | 0.027 | −0.305 | 0.123 | 0.008 | 0.000 | −0.068 | −0.019 |
| (2) | −0.025 | 1.000 | −0.034 | 0.014 | −0.082 | 0.016 | 0.000 | 0.047 | 0.008 |
| (3) | 0.027 | −0.034 | 1.000 | 0.083 | 0.195 | −0.039 | 0.000 | 0.013 | −0.117 |
| (4) | −0.305 | 0.014 | 0.083 | 1.000 | 0.054 | −0.126 | 0.000 | 0.048 | −0.047 |
| (5) | 0.123 | −0.082 | 0.195 | 0.054 | 1.000 | −0.366 | 0.000 | 0.033 | −0.142 |
| (6) | 0.008 | 0.016 | −0.039 | −0.126 | −0.366 | 1.000 | 0.000 | 0.041 | −0.005 |
| (7) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 | 0.000 |
| (8) | −0.068 | 0.047 | 0.013 | 0.048 | 0.033 | 0.041 | 0.000 | 1.000 | −0.005 |
| (9) | −0.019 | 0.008 | −0.117 | −0.047 | −0.142 | −0.005 | 0.000 | −0.005 | 1.000 |

Table 13: Pearson's correlation coefficients between dependent variables, for Foreign Exchange derivatives. Variables are: (1) intragroup, (2) financial nature, (3) tradingcapacity, (4) Non-EEA cpty, (5) clearing obligation, (6) maturityyear, (7) eurnotional, (8) prev.notional, (9) prev.not.cleared.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| (1) | 1.000 | −0.185 | −0.084 | −0.045 | −0.080 | −0.015 | 0.001 | 0.007 | 0.025 |
| (2) | −0.185 | 1.000 | −0.023 | 0.202 | 0.056 | 0.004 | 0.000 | 0.129 | 0.137 |
| (3) | −0.084 | −0.023 | 1.000 | −0.077 | 0.243 | −0.196 | 0.001 | 0.054 | 0.079 |
| (4) | −0.045 | 0.202 | −0.077 | 1.000 | −0.007 | −0.028 | 0.000 | 0.059 | 0.071 |
| (5) | −0.080 | 0.056 | 0.243 | −0.007 | 1.000 | -0.182 | 0.001 | 0.103 | 0.125 |
| (6) | −0.015 | 0.004 | −0.196 | −0.028 | −0.182 | 1.000 | 0.000 | 0.082 | 0.017 |
| (7) | 0.001 | 0.000 | 0.001 | 0.000 | 0.001 | 0.000 | 1.000 | 0.000 | 0.000 |
| (8) | 0.007 | 0.129 | 0.054 | 0.059 | 0.103 | 0.082 | 0.000 | 1.000 | 0.951 |
| (9) | 0.025 | 0.137 | 0.079 | 0.071 | 0.125 | 0.017 | 0.000 | 0.951 | 1.000 |

Table 14: Pearson's correlation coefficients between dependent variables, for Interest Rate derivatives. Variables are: (1) intragroup, (2) financial nature, (3) tradingcapacity, (4) Non-EEA cpty, (5) clearing obligation, (6) maturityyear, (7) eurnotional, (8) prev.notional, (9) prev.not.cleared.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| (1) | 1.000 | −0.049 | 0.020 | 0.302 | 0.092 | 0.050 | 0.004 | 0.098 | −0.162 |
| (2) | −0.049 | 1.000 | 0.037 | 0.058 | −0.035 | −0.008 | 0.000 | 0.009 | 0.129 |
| (3) | 0.020 | 0.037 | 1.000 | 0.024 | 0.004 | 0.009 | 0.000 | 0.004 | 0.052 |
| (4) | 0.302 | 0.058 | 0.024 | 1.000 | 0.094 | −0.004 | 0.002 | 0.036 | 0.086 |
| (5) | 0.092 | −0.035 | 0.004 | 0.094 | 1.000 | −0.044 | 0.001 | 0.051 | −0.130 |
| (6) | 0.050 | −0.008 | 0.009 | −0.004 | −0.044 | 1.000 | 0.000 | 0.027 | −0.001 |
| (7) | 0.004 | 0.000 | 0.000 | 0.002 | 0.001 | 0.000 | 1.000 | 0.000 | 0.000 |
| (8) | 0.098 | 0.009 | 0.004 | 0.036 | 0.051 | 0.027 | 0.000 | 1.000 | −0.007 |
| (9) | −0.162 | 0.129 | 0.052 | 0.086 | −0.130 | −0.001 | 0.000 | −0.007 | 1.000 |

## Appendix D. Methodology to calculate clearing rates

I use the internationally agreed upon methodology for calculating clearing rates (developed by the FSB), which ensures comparability of these numbers with others reported by institutions worldwide. The methodology encompasses the cleaning procedure as described in Annex A. Broadly speaking, to calculate clearing rates I classify trades into cleared and uncleared, and ignore some categories of trades altogether. I classify trades that have never been cleared as uncleared, but ignore uncleared trades that become cleared during the analysed period to avoid double counting. I classify cleared trades where a central counterparty is one of the counterparties as cleared, but I ignore cleared trades where both counterparties are not CCPs, as these are assumed to be client legs of the previously classified cleared trades. I only use the reports of new trades, and do not use old outstanding trades or position reports. Since cleared trades are reported twice (the trade goes from one counterparty to the CCP, and from the CCP to the other counterparty), I only count half the number or volume of cleared trades in the calculations described below to adjust for such double reporting. Of note, uncleared trades as well as both sides of the cleared trades have double reporting in addition to the above, but these are accounted for when removing duplicates according to trade identifiers within the cleaning procedure. Then, to calculate clearing rates (and, as an intermediate step, the adjusted total gross notional), I follow the same calculation that is used by the FSB[6], the Bank of England[7], and the ISDA[8]:

$$\text{Adj. Total Gross Notional} = \frac{\text{Notional of cleared trades}}{2} + \text{Notional of uncleared trades} \tag{7}$$

$$\text{Clearing rate} = \frac{(\text{Notional of cleared trades}/2)}{\text{Adj. Total Gross Notional}} \tag{8}$$

Clearing rates are usually represented as the percent of notional cleared to the total notional traded, but one could also calculate them in terms of the number of trades cleared in the total number of trades entered into.

[6] http://www.fsb.org/wp-content/uploads/OTC-Derivatives-10th-Progress-Report.pdf
[7] http://www.bankofengland.co.uk/publications/Documents/fmi/annualreport2016.pdf
[8] http://www2.isda.org/functional-areas/research/research-notes/

## Appendix E. Effect size

Table 15: Effect size for hypothesis 1 (full sample), with odds ratio of trade not being cleared given it being within a group (OR), Pearson's correlation coefficient between trade being cleared and it being within a group ($\rho(X,Y)$), partial correlation coefficient controlling for whether trade is with a non-EEA counterparty ($\rho(X,Y|Z)$), and mutual information (MI) and partial mutual information $MI(X,Y|Z)$ set up in the same way as the correlation coefficients.

| | (CO) | (CR) | (EQ) | (FX) | (IR) |
|---|---|---|---|---|---|
| OR | 687.607 | 600.860 | N/A* | 19.731 | 93.920 |
| $\rho(X,Y)$ | −0.031 | −0.243 | −0.037 | −0.035 | −0.406 |
| $\rho(X,Y\|Z)$ | −0.034 | −0.236 | −0.068 | −0.040 | −0.310 |
| MI(X,Y) | 0.001 | 0.047 | 0.001 | 0.001 | 0.106 |
| $MI(X,Y\|Z)$ | 0.001 | 0.045 | 0.002 | 0.001 | 0.067 |
| Observations | 4,296,374 | 1,814,047 | 12,320,166 | 60,627,185 | 4,231,413 |

*Notes:* All values significant at the 1 percent level.
*Not defined (0 intragroup cleared trades).

Table 16: Effect size for hypothesis 2 (full sample), with Pearson's correlation coefficient between trade being cleared and its year of maturity ($\rho(X,Y)$), partial correlation coefficient controlling for whether trade is within a group ($\rho(X,Y|Z)$), and mutual information (MI) and partial mutual information $MI(X,Y|Z)$ set up in the same way as the correlation coefficients.

| | (CO) | (CR) | (EQ) | (FX) | (IR) |
|---|---|---|---|---|---|
| $\rho(X,Y)$ | −0.013 | −0.015 | 0.012 | 0.289 | 0.060 |
| $\rho(X,Y\|Z)$ | −0.012 | −0.069 | 0.012 | 0.289 | 0.088 |
| MI(X,Y) | 0.001 | 0.044 | 0.014 | 0.007 | 0.011 |
| $MI(X,Y\|Z)$ | 0.001 | 0.023 | 0.014 | 0.006 | 0.012 |
| Observations | 4,296,374 | 1,814,047 | 12,320,166 | 60,627,185 | 4,231,413 |

*Notes:* All values significant at the 1 percent level.

Table 17: Effect size for hypothesis 3 (full sample), with Pearson's correlation coefficient between trade being cleared and log of its gross notional exposure ($\rho(X, Y)$), and partial correlation coefficient controlling for whether trade is within a group ($\rho(X, Y|Z)$).

| | (CO) | (CR) | (EQ) | (FX) | (IR) |
|---|---|---|---|---|---|
| $\rho(X, Y)$ | 0.034 | 0.152 | −0.011 | 0.036 | 0.076 |
| $\rho(X, Y\|Z)$ | 0.043 | 0.166 | −0.010 | 0.034 | 0.035 |
| Observations | 4,296,374 | 1,814,047 | 12,320,166 | 60,627,185 | 4,231,413 |
| *Notes:* | All values significant at the 1 percent level. | | | | |

Table 18: Effect size for hypothesis 4 (full sample), with odds ratio of trade not being cleared given it is with a counterparty outside of the EEA (OR), Pearson's correlation coefficient between trade being cleared and it being with a counterparty outside of the EEA ($\rho(X, Y)$), partial correlation coefficient controlling for whether trade is within a group ($\rho(X, Y|Z)$), and mutual information (MI) and partial mutual information $MI(X, Y|Z)$ set up in the same way as the correlation coefficients.

| | (CO) | (CR) | (EQ) | (FX) | (IR) |
|---|---|---|---|---|---|
| OR | 0.619 | 1.499 | 93.885 | 41.595 | 9.068 |
| $\rho(X, Y)$ | 0.020 | −0.067 | −0.089 | −0.107 | −0.492 |
| $\rho(X, Y\|Z)$ | 0.024 | 0.033 | −0.105 | −0.109 | −0.424 |
| $MI(X, Y)$ | 0.000 | 0.002 | 0.004 | 0.007 | 0.128 |
| $PMI(X, Y\|Z)$ | 0.000 | 0.000 | 0.005 | 0.007 | 0.088 |
| Observations | 4,296,374 | 1,814,047 | 12,320,166 | 60,627,185 | 4,231,413 |
| *Notes:* | All values significant at the 1 percent level. | | | | |

Table 19: Effect size for hypothesis 5 (full sample), with odds ratio of trade being cleared given it is of financial nature (OR), Pearson's correlation coefficient between trade being cleared and it being of financial nature ($\rho(X, Y)$), partial correlation coefficient controlling for whether trade is within a group ($\rho(X, Y|Z)$), and mutual information (MI) and partial mutual information $MI(X, Y|Z)$ set up in the same way as the correlation coefficients.

| | (CO) | (CR) | (EQ) | (FX) | (IR) |
|---|---|---|---|---|---|
| OR | 0.202 | 6.221 | 1.598 | 27.800 | 3.601 |
| $\rho(X, Y)$ | −0.067 | 0.036 | 0.008 | 0.028 | 0.060 |
| $\rho(X, Y\|Z)$ | −0.089 | 0.051 | 0.007 | 0.022 | 0.044 |
| $MI(X, Y)$ | 0.001 | 0.001 | 0.000 | 0.001 | 0.002 |
| $MI(X, Y\|Z)$ | 0.003 | 0.001 | 0.000 | 0.001 | 0.001 |
| Observations | 4,296,374 | 1,814,047 | 12,320,166 | 60,627,185 | 4,231,413 |

*Notes:* All values significant at the 1 percent level.

Table 20: Effect size for hypothesis 6 (full sample), with Pearson's correlation coefficient between trade being cleared and the ratio of the total gross notional cleared by the reporting counterparty to the total gross notional traded by the reporting counterparty within the same asset class in the previous month ($\rho(X, Y)$), and partial correlation coefficient controlling for whether trade is within a group ($\rho(X, Y|Z)$).

| | (CO) | (CR) | (EQ) | (FX) | (IR) |
|---|---|---|---|---|---|
| $\rho(X, Y)$ | 0.884 | 0.424 | 0.996 | 0.064 | 0.365 |
| $\rho(X, Y\|Z)$ | 0.884 | 0.362 | 0.996 | † | 0.234 |
| Observations | 4,296,374 | 1,814,047 | 12,320,166 | 60,627,185 | 4,231,413 |

*Notes:* All values significant at the 1 percent level.
†N/A due to limited number of cleared intragroup trades.

Table 21: Effect size for hypothesis 7 (full sample), with Pearson's correlation coefficient between trade being cleared and its total gross notional traded by reporting counterparty within the previous month ($\rho(X, Y)$), and partial correlation coefficient controlling for whether trade is within a group ($\rho(X, Y|Z)$).

| | (CO) | (CR) | (EQ) | (FX) | (IR) |
|---|---|---|---|---|---|
| $\rho(X, Y)$ | −0.046 | −0.060 | −0.093 | 0.155 | −0.029 |
| $\rho(X, Y\|Z)$ | −0.048 | 0.035 | −0.090 | 0.155 | 0.024 |
| Observations | 4,296,374 | 1,814,047 | 12,320,166 | 60,627,185 | 4,231,413 |
| *Notes:* | All values significant at the 1 percent level. | | | | |

Table 22: Effect size for hypothesis 8 (full sample), with Pearson's correlation coefficient between trade being cleared and its total gross notional centrally cleared by reporting counterparty within the previous month ($\rho(X, Y)$), and partial correlation coefficient controlling for whether trade is within a group ($\rho(X, Y|Z)$).

| | (CO) | (CR) | (EQ) | (FX) | (IR) |
|---|---|---|---|---|---|
| $\rho(X, Y)$ | 0.862 | 0.141 | 0.994 | 0.128 | 0.127 |
| $\rho(X, Y\|Z)$ | 0.862 | 0.182 | 0.994 | 0.128 | 0.107 |
| Observations | 4,296,374 | 1,814,047 | 12,320,166 | 60,627,185 | 4,231,413 |
| *Notes:* | All values significant at the 1 percent level. | | | | |

## Appendix F. Economies of scale: decomposition

Below I present results of the decomposition of results for testing the economies of scale (hypothesis 6) into separate analysis of the denominator (notional previously traded, hypothesis 7) and the numerator (notional previously cleared, hypothesis 8) of the ratio used in the main text.

*Hypothesis 7: the size of previous trading activity*

To test the seventh hypothesis, which conjectures that trades with counterparties that have traded larger volumes in the preceding month are more likely to be centrally cleared on a voluntary basis, I estimate the below equation using a conditional probit model, the choice of which is subject to robustness checks as presented in Tables 62-69:

$$Pr(\text{cleared}_i = 1) = \Phi(\alpha + \beta_1 \log(\text{prev.notional})_i + \gamma_t + \delta_j) + \epsilon_i \tag{9}$$

My hypothesis is confirmed if I find a statistically significant and positive coefficient of the logarithm of the notional traded by the reporting counterparty in the previous month $\beta_1$. I employ time fixed effects and I saturate the model with counterparty type fixed effects given the results of robustness checks as described in Annex H. There I also present checks for robustness w.r.t. various control variables, based on which no control variables have been included in this model. I use the notional value in logarithm, in line with the standard practice in financial economics. Please note that for this hypothesis I also perform robustness checks for a model with the number of trades instead of the volume of trades entered into by the reporting counterparty in the previous month. As expected, results are more interesting and insightful when I use the notional instead of the number of trades.

As can be seen in Table 23, trades which involve a counterparty that has traded larger volume of derivatives within the same asset class in the previous month are more likely to be centrally cleared for credit, interest rate, and foreign exchange contracts, but less likely to be centrally cleared for commodity and equity contracts. Thus, it appears that there are also economies of scale related to clearing credit and interest rate derivatives stemming from the scale of operations within the derivatives market of the reporting counterparty. This effect is not very strong, although significant (Table 21).

In Figure 9 I plot response rates based on theoretical characteristics of a contract that would be entered into at the end of the studied period. In particular, I distinguish between various asset classes, the volume of derivatives traded in the previous month by the reporting counterparty, and the type of the reporting counterparty. For interest rate derivatives there is a positive linear relationship between previously traded notional and the probability of a trade being cleared. Similar result appears for credit derivatives.

Table 23: Results for hypothesis 7 (extragroup), estimated with a conditional probit model (Equation 9). The dependent binary variable denotes whether a contract is centrally cleared. log(prev.notional) denotes the total gross notional traded by the reporting counterparty within the same asset class in the previous month. The full sample of all new derivative contracts that are not between two entities within the same group is from April 2016 until June 2017.

| | cleared (extragroup) | | | | |
|---|---|---|---|---|---|
| | (CO) | (CR) | (EQ) | (FX) | (IR) |
| log(prev.notional) | $-0.088^{***}$ | $0.041^{***}$ | $-0.123^{***}$ | $0.395^{***}$ | $0.047^{***}$ |
| | (0.001) | (0.001) | (0.001) | (0.002) | (0.000) |
| Constant | $-5.098^{***}$ | $-2.731^{***}$ | $0.609^{***}$ | $-4.985^{***}$ | $-1.046^{***}$ |
| | (0.030) | (0.018) | (0.014) | (0.017) | (0.007) |
| Monthly FE | Yes | Yes | Yes | Yes | Yes |
| Type FE | Yes | Yes | Yes | Yes | Yes |
| Observations | 3,770,361 | $^{\dagger}$ | 9,470,268 | 3,687,931 | 3,546,324 |
| McFadden's $R^2$ | 0.544 | 0.039 | 0.444 | 0.248 | 0.023 |

*Notes:* $^{***}$Significant at the 1 percent level.
$^{**}$Significant at the 5 percent level.
$^{*}$Significant at the 10 percent level.
$^{\dagger}$Not shown for reasons of confidentiality.

Table 24: Results for hypothesis 8 (extragroup), estimated with a conditional probit model (Equation 10). The dependent binary variable denotes whether a contract is centrally cleared. log(prev.not.cleared) denotes the total gross notional cleared by the reporting counterparty within the same asset class in the previous month. The full sample of all new derivative contracts that are not between two entities within the same group is from April 2016 until June 2017.

| | cleared (extragroup) | | | | |
|---|---|---|---|---|---|
| | (CO) | (CR) | (EQ) | (FX) | (IR) |
| log(prev.not.cleared) | 0.289*** | 0.110*** | 0.396*** | 0.071*** | 0.072*** |
| | (0.002) | (0.000) | (0.003) | (0.000) | (0.000) |
| Constant | −3.946*** | −3.907*** | −4.652*** | −3.935*** | −1.593*** |
| | (0.035) | (0.015) | (0.076) | (0.011) | (0.006) |
| Monthly FE | Yes | Yes | Yes | Yes | Yes |
| Type FE | Yes | Yes | Yes | Yes | Yes |
| Observations | 3,770,361 | † | 9,470,268 | 3,687,931 | 3,546,324 |
| McFadden's $R^2$ | 0.885 | 0.119 | 0.990 | 0.177 | 0.049 |
| *Notes:* | ***Significant at the 1 percent level. | | | | |
| | **Significant at the 5 percent level. | | | | |
| | *Significant at the 10 percent level. | | | | |
| | †Not shown for reasons of confidentiality. | | | | |

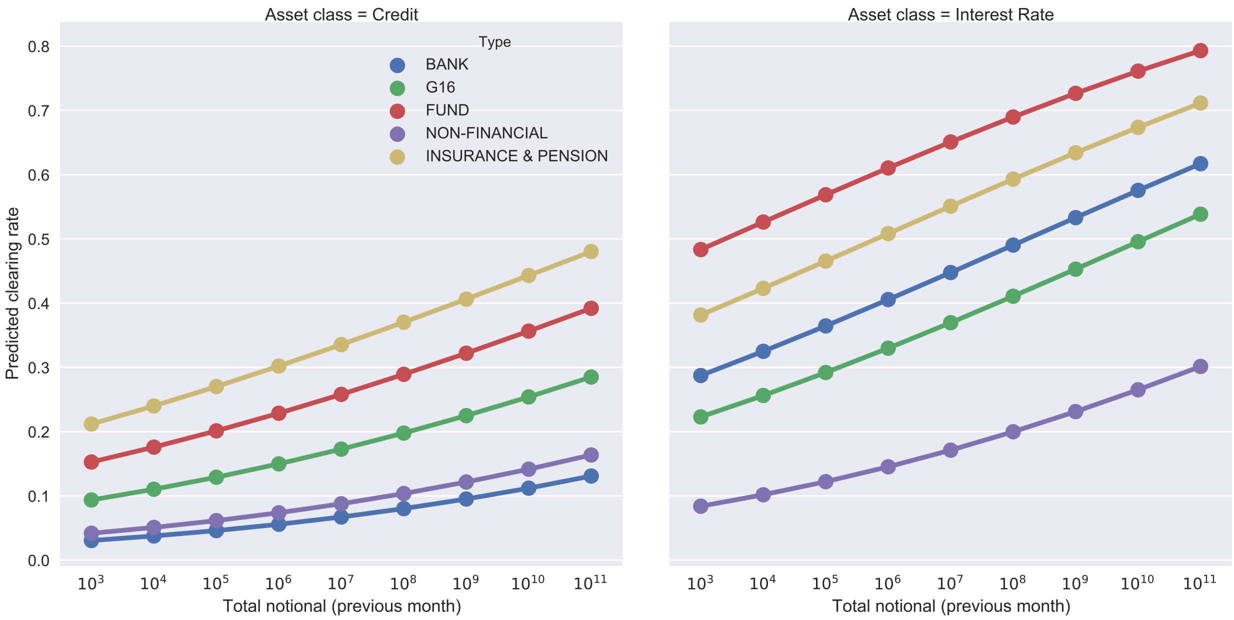


Fig. 9. Predicted clearing rates based on the model reported in Table 23, accounting for the type of the counterparty, asset class of the contract, and the total gross notional traded by the reporting counterparty in the previous month, for an extragroup contract that would be executed at the end of the studied period (June 2017). Standard errors are not presented as they are $\sim 0$ for all values (except for insurers & pension funds for which results should be interpreted with caution).

*Hypothesis 8: the size of previous clearing activity*

To test the eight hypothesis, which conjectures that trades with counterparties who have cleared larger volumes in the preceding month are more likely to be centrally cleared on a voluntary basis, I estimate the below equation using a conditional probit model, the choice of which is subject to robustness checks as presented in Tables 70-77:

$$Pr(\text{cleared}_i = 1) = \Phi(\alpha + \beta_1 \log(\text{prev.not.cleared})_i + \gamma_t + \delta_j) + \epsilon_i \quad (10)$$

My hypothesis is confirmed if I find a statistically significant and positive coefficient of the logarithm of the notional cleared by the reporting counterparty in the previous month $\beta_1$. I employ time fixed effects and I saturate the model with counterparty type fixed effects given the results of robustness checks as described in Annex H. There I also present checks for robustness w.r.t. various control variables. I use the notional value in logarithm, in line with the standard practice in financial economics. Similar to the previous hypothesis, I also perform a robustness check for a model with the number of cleared trades being used instead of the volume of cleared trades.

As can be seen in Table 24, the picture is very clear. Trades which involve a counterparty that has cleared larger volume of derivatives within the same asset class in the previous month are more likely to be centrally cleared for all asset classes. The effect is reasonably strong for both credit and interest rate derivatives (Table 22). It is exceedingly strong for commodity and equity derivatives, but it is a consequence of a very small and concentrated part of these markets that uses central clearing.

In Figure 9 I plot response rates based on theoretical characteristics of a contract that would be entered into at the end of the studied period. In particular, I distinguish between various asset classes, the volume of derivatives cleared in the previous month by the reporting counterparty, and the type of the reporting counterparty. For interest rate derivatives there is a linear relationship between previously cleared notional and the probability of a trade being cleared. The probabilities of trade being cleared varies significantly depending on the type of reporting counterparty. For credit derivatives the picture is the same, except the relationship is further away from being linear. Once again, results for commodity and equity derivatives are not trustworthy in this setup, as they stem from the particular structure of these markets with regards to central clearing.

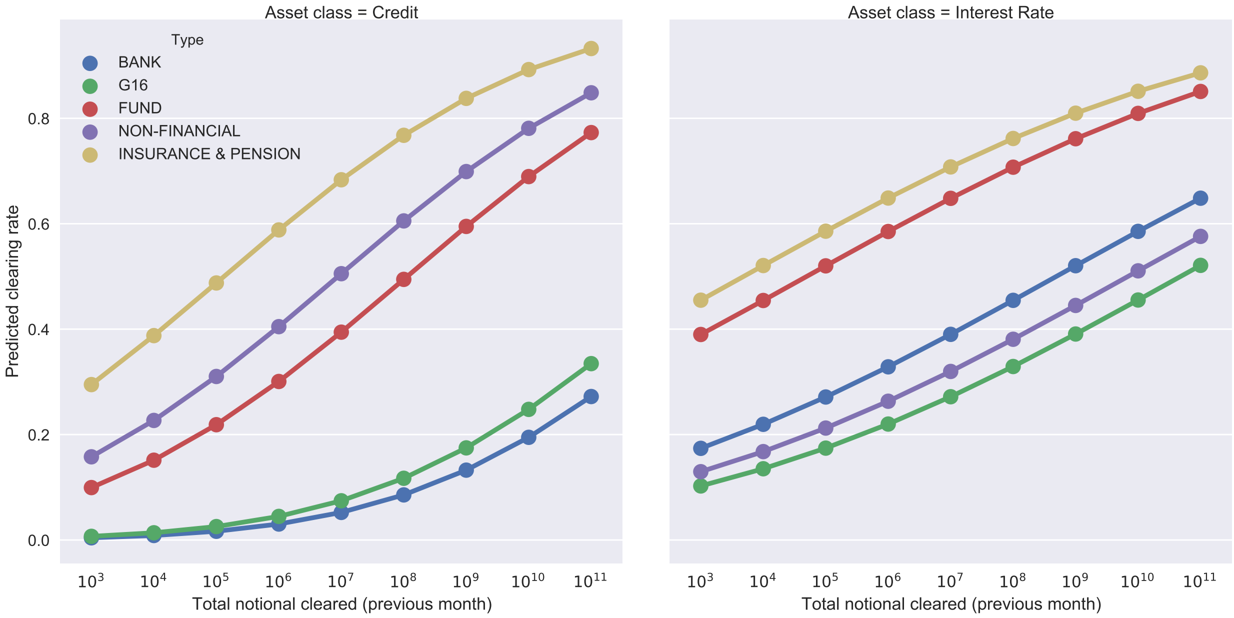


Fig. 10. Predicted clearing rates based on the model reported in Table 24, accounting for the type of the counterparty, the asset class of the contract, and the total gross notional of trades centrally cleared by the reporting counterparty in the previous month, for an extragroup contract that would be executed at the end of the studied period (June 2017). Standard errors are not presented as they are $\sim 0$ for all values (except for insurers & pension funds for which results should be interpreted with caution).

## Appendix G. Alternative specifications

Table 25: Results for hypothesis 1 (with non-EEA counterparty), estimated with a conditional probit model (Equation 1). The dependent binary variable denotes whether a contract is centrally cleared. intragroup denotes whether a contract is between entities within the same group. The full sample of all new derivative contracts where one of the counterparties has been established outside of the EEA is from April 2016 until June 2017.

| | cleared (with non-EEA) | | | | |
|---|---|---|---|---|---|
| | (CO) | (CR) | (EQ) | (FX) | (IR) |
| intragroup | −4.438 | −2.646*** | −3.391 | −0.196*** | −1.722*** |
| | (9.217) | (0.020) | (36.431) | (0.024) | (0.005) |
| Constant | −6.223 | −1.095*** | −3.422*** | −3.235*** | −0.652*** |
| | (16.942) | (0.006) | (0.021) | (0.020) | (0.004) |
| Monthly FE | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,732,703 | 1,253,452 | 7,939,029 | 32,499,985 | 1,893,030 |
| McFadden's $R^2$ | 0.378 | 0.200 | 0.179 | 0.078 | 0.128 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 26: Results for hypothesis 1 (with two EEA counterparties), estimated with a conditional probit model (Equation 1). The dependent binary variable denotes whether a contract is centrally cleared. intragroup denotes whether a contract is between entities within the same group. The full sample of all new derivative contracts between two entities established in the EEA is from April 2016 until June 2017.

| | cleared (within EEA) | | | | |
|---|---|---|---|---|---|
| | (CO) | (CR) | (EQ) | (FX) | (IR) |
| intragroup | −1.660*** | −4.239 | −4.087*** | −1.137*** | −2.631*** |
| | (0.094) | (3.529) | (3.055) | (0.012) | (0.007) |
| Constant | −3.121*** | −1.178*** | −2.322*** | −2.513*** | 0.599*** |
| | (0.018) | (0.007) | (0.007) | (0.008) | (0.003) |
| Monthly FE | Yes | Yes | Yes | Yes | Yes |
| Observations | 2,563,671 | 560,595 | 4,381,137 | 28,127,200 | 2,338,383 |
| McFadden's $R^2$ | 0.125 | 0.034 | 0.104 | 0.063 | 0.120 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 27: Results for hypothesis 2 (full sample), estimated with a conditional probit model (Equation 2). The dependent binary variable denotes whether a contract is centrally cleared. maturityyear denotes whether the year in which a contract matures. I control for log(eurnotional), which denotes the logarithm of the gross notional value of the contract, and clearingobligation, which denotes whether the clearing obligation has been deferred or is not envisioned. The full sample of all new derivative contracts is from April 2016 until June 2017.

| | cleared (full sample) | | | | |
|---|---|---|---|---|---|
| | (CO) | (CR) | (EQ) | (FX) | (IR) |
| maturityyear | −0.078*** | −0.008*** | −0.064*** | 0.055*** | 0.012*** |
| | (0.004) | (0.000) | (0.000) | (0.000) | (0.000) |
| log(eurnotional) | 0.090*** | 0.131*** | −0.019*** | 0.074*** | 0.053*** |
| | (0.000) | (0.001) | (0.001) | (0.000) | (0.000) |
| clearingobligation | −0.540*** | −0.731*** | −3.187*** | 1.431*** | −0.192*** |
| | (0.008) | (0.003) | (0.008) | (0.036) | (0.001) |
| Constant | 153.300*** | 13.406*** | 127.200*** | −116.900*** | −25.340*** |
| | (7.158) | (0.384) | (0.696) | (0.951) | (0.148) |
| Monthly FE | Yes | Yes | Yes | Yes | Yes |
| Observations | 4,296,374 | 1,814,047 | 12,320,166 | 60,627,185 | 4,231,413 |
| McFadden's $R^2$ | 0.245 | 0.080 | 0.550 | 0.151 | 0.016 |
| *Notes:* | ***Significant at the 1 percent level. | | | | |
| | **Significant at the 5 percent level. | | | | |
| | *Significant at the 10 percent level. | | | | |

Table 28: Results for hypothesis 3 (full sample), estimated with a conditional probit model (Equation 3). The dependent binary variable denotes whether a contract is centrally cleared. log(eurnotional) denotes the logarithm of the gross notional value of the contract. I control for maturityyear, which denotes whether the year in which a contract matures, and Non-EEA cpty, which denotes whether the one of the counterparties to a contract has been established outside of the EEA. The full sample of all new derivative contracts is from April 2016 until June 2017.

| | cleared (full sample) | | | | |
|---|---|---|---|---|---|
| | (CO) | (CR) | (EQ) | (FX) | (IR) |
| log(eurnotional) | 0.092*** | 0.137*** | −0.015*** | 0.085*** | 0.036*** |
| | (0.001) | (0.001) | (0.000) | (0.000) | (0.000) |
| maturityyear | −0.069*** | −0.001*** | −0.001*** | 0.041*** | 0.013*** |
| | (0.003) | (0.000) | (0.000) | (0.000) | (0.000) |
| Non-EEA cpty | 0.135*** | −0.240*** | −1.407*** | −1.364*** | −1.340*** |
| | (0.005) | (0.003) | (0.008) | (0.006) | (0.001) |
| Constant | 135.900*** | −1.344*** | −0.837* | 87.180*** | −26.010*** |
| | (6.818) | (0.363) | (0.362) | (0.259) | (0.159) |
| Monthly FE | Yes | Yes | Yes | Yes | Yes |
| Observations | 4,296,374 | 1,814,047 | 12,320,166 | 60,627,185 | 4,231,413 |
| McFadden's $R^2$ | 0.235 | 0.049 | 0.150 | 0.251 | 0.192 |
| *Notes:* | ***Significant at the 1 percent level. | | | | |
| | **Significant at the 5 percent level. | | | | |
| | *Significant at the 10 percent level. | | | | |

Table 29: Results for hypothesis 4 (full sample), estimated with a conditional probit model (Equation 4). The dependent binary variable denotes whether a contract is centrally cleared. Non-EEA cpty denotes whether the one of the counterparties to a contract has been established outside of the EEA. The full sample of all new derivative contracts is from April 2016 until June 2017.

| | cleared (full sample) | | | | |
|---|---|---|---|---|---|
| | (CO) | (CR) | (EQ) | (FX) | (IR) |
| Non-EEA cpty | 0.171*** | −0.239*** | −1.409*** | −1.265*** | −1.347*** |
| | (0.005) | (0.002) | (0.008) | (0.005) | (0.001) |
| Constant | −3.306*** | −1.071*** | −2.418*** | −2.490*** | 0.497*** |
| | (0.017) | (0.005) | (0.006) | (0.008) | (0.002) |
| Monthly FE | Yes | Yes | Yes | Yes | Yes |
| Observations | 4,296,374 | 1,814,047 | 12,320,166 | 60,627,185 | 4,231,413 |
| McFadden's $R^2$ | 0.203 | 0.018 | 0.148 | 0.146 | 0.186 |
| *Notes:* | ***Significant at the 1 percent level. | | | | |
| | **Significant at the 5 percent level. | | | | |
| | *Significant at the 10 percent level. | | | | |

Table 30: Results for hypothesis 5 (full sample), estimated with a conditional probit model (Equation 5). The dependent binary variable denotes whether a contract is centrally cleared. financial nature denotes whether the reporting counterparty is of financial nature. I control for Non-EEA cpty, which denotes whether the one of the counterparties to a contract has been established outside of the EEA. The full sample of all new derivative contracts is from April 2016 until June 2017.

| | cleared (full sample) | | | | |
|---|---|---|---|---|---|
| | (CO) | (CR) | (EQ) | (FX) | (IR) |
| financial nature | −0.422*** | 1.016*** | 0.391*** | 0.942*** | 1.071*** |
| | (0.013) | (0.019) | (0.007) | (0.023) | (0.007) |
| Non-EEA cpty | 0.283*** | −0.212*** | −1.863*** | −1.381*** | −1.421*** |
| | (0.006) | (0.003) | (0.009) | (0.005) | (0.001) |
| Constant | −4.540*** | −2.595*** | −1.416*** | −3.560*** | −0.906*** |
| | (0.031) | (0.021) | (0.010) | (0.025) | (0.007) |
| Monthly FE | Yes | Yes | Yes | Yes | Yes |
| Type FE | Yes | Yes | Yes | Yes | Yes |
| Observations | 4,296,374 | 1,814,047 | 12,320,166 | 60,627,185 | 4,231,413 |
| McFadden's $R^2$ | 0.428 | 0.027 | 0.506 | 0.196 | 0.211 |
| *Notes:* | ***Significant at the 1 percent level. | | | | |
| | **Significant at the 5 percent level. | | | | |
| | *Significant at the 10 percent level. | | | | |

Table 31: Results for hypothesis 6 (full sample), estimated with a conditional probit model (Equation 6). The dependent binary variable denotes whether a contract is centrally cleared. prev.ratio denotes the total gross notional cleared by the reporting counterparty divided by the total gross notional traded by the reporting counterparty within the same asset class in the previous month. The full sample of all new derivative contracts is from April 2016 until June 2017.

| | cleared (full sample) | | | | |
|---|---|---|---|---|---|
| | (CO) | (CR) | (EQ) | (FX) | (IR) |
| prev.ratio | 8.129*** | 3.515*** | 6.858*** | 0.000*** | 1.868*** |
| | (0.052) | (0.007) | (0.051) | (0.000) | (0.003) |
| Constant | −4.261*** | −2.314*** | −4.160*** | −2.844*** | −1.182*** |
| | (0.051) | (0.011) | (0.070) | (0.008) | (0.003) |
| Monthly FE | Yes | Yes | Yes | Yes | Yes |
| Type FE | Yes | Yes | Yes | Yes | Yes |
| Observations | 4,296,374 | 1,814,047 | 12,320,166 | 4,162,367 | 4,231,413 |
| McFadden's $R^2$ | 0.818 | 0.217 | 0.992 | 0.069 | 0.107 |
| *Notes:* | ***Significant at the 1 percent level. | | | | |
| | **Significant at the 5 percent level. | | | | |
| | *Significant at the 10 percent level. | | | | |

Table 32: Results for hypothesis 7 (full sample), estimated with a conditional probit model (Equation 9). The dependent binary variable denotes whether a contract is centrally cleared. log(prev.notional) denotes the total gross notional traded by the reporting counterparty within the same asset class in the previous month. The full sample of all new derivative contracts is from April 2016 until June 2017.

| | cleared (full sample) | | | | |
|---|---|---|---|---|---|
| | (CO) | (CR) | (EQ) | (FX) | (IR) |
| log(prev.notional) | $-0.029^{***}$ | $-0.028^{***}$ | $-0.123^{***}$ | $0.378^{***}$ | $0.015^{***}$ |
| | (0.000) | (0.000) | (0.001) | (0.002) | (0.000) |
| Constant | $-4.824^{***}$ | $-1.033^{***}$ | $0.596^{***}$ | $-4.895^{***}$ | $-0.407^{***}$ |
| | (0.029) | (0.013) | (0.013) | (0.017) | (0.006) |
| Monthly FE | Yes | Yes | Yes | Yes | Yes |
| Type FE | Yes | Yes | Yes | Yes | Yes |
| Observations | 4,296,374 | 1,814,047 | 12,320,166 | 4,162,367 | 4,231,413 |
| McFadden's $R^2$ | 0.431 | 0.022 | 0.453 | 0.239 | 0.020 |
| *Notes:* | $^{***}$Significant at the 1 percent level. | | | | |
| | $^{**}$Significant at the 5 percent level. | | | | |
| | $^{*}$Significant at the 10 percent level. | | | | |

Table 33: Results for hypothesis 8 (full sample), estimated with a conditional probit model (Equation 10). The dependent binary variable denotes whether a contract is centrally cleared. log(prev.not.cleared) denotes the total gross notional cleared by the reporting counterparty within the same asset class in the previous month. The full sample of all new derivative contracts is from April 2016 until June 2017.

| | cleared (full sample) | | | | |
|---|---|---|---|---|---|
| | (CO) | (CR) | (EQ) | (FX) | (IR) |
| log(prev.not.cleared) | 0.292*** | 0.144*** | 0.400*** | 0.071*** | 0.080*** |
| | (0.002) | (0.001) | (0.003) | (0.000) | (0.000) |
| Constant | −3.871*** | −4.515*** | −4.711*** | −3.968*** | −1.923*** |
| | (0.034) | (0.018) | (0.077) | (0.011) | (0.005) |
| Monthly FE | Yes | Yes | Yes | Yes | Yes |
| Type FE | Yes | Yes | Yes | Yes | Yes |
| Observations | 4,296,374 | 1,814,047 | 12,320,166 | 4,162,367 | 4,231,413 |
| McFadden's $R^2$ | 0.873 | 0.110 | 0.990 | 0.173 | 0.060 |
| *Notes:* | ***Significant at the 1 percent level. | | | | |
| | **Significant at the 5 percent level. | | | | |
| | *Significant at the 10 percent level. | | | | |

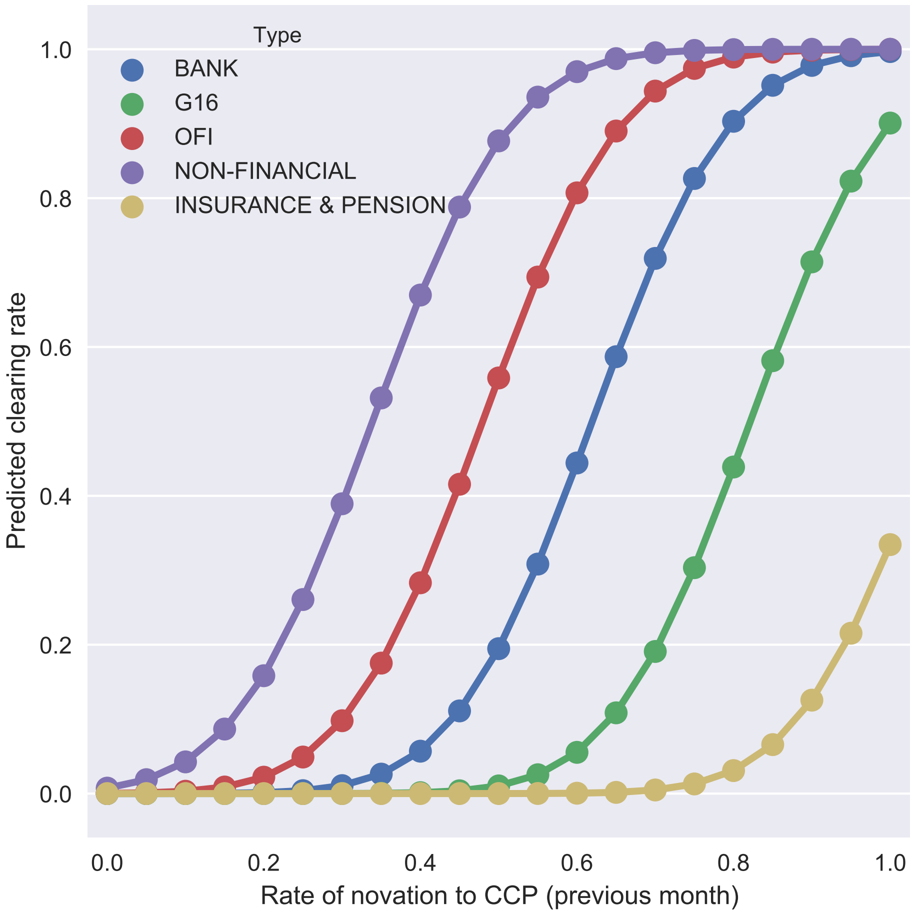


Fig. 11. Predicted clearing rates based on the model reported in Table 7, accounting for the type of the counterparty, and the ratio of the total gross notional cleared by the reporting counterparty to the total gross notional traded by the reporting counterparty within the same asset class in the previous month, for an extragroup commodity derivative contract that would be executed at the end of the studied period (June 2017). Standard errors are not presented as they are $\sim 0$ for all values (except for insurers & pension funds for which results should be interpreted with caution).

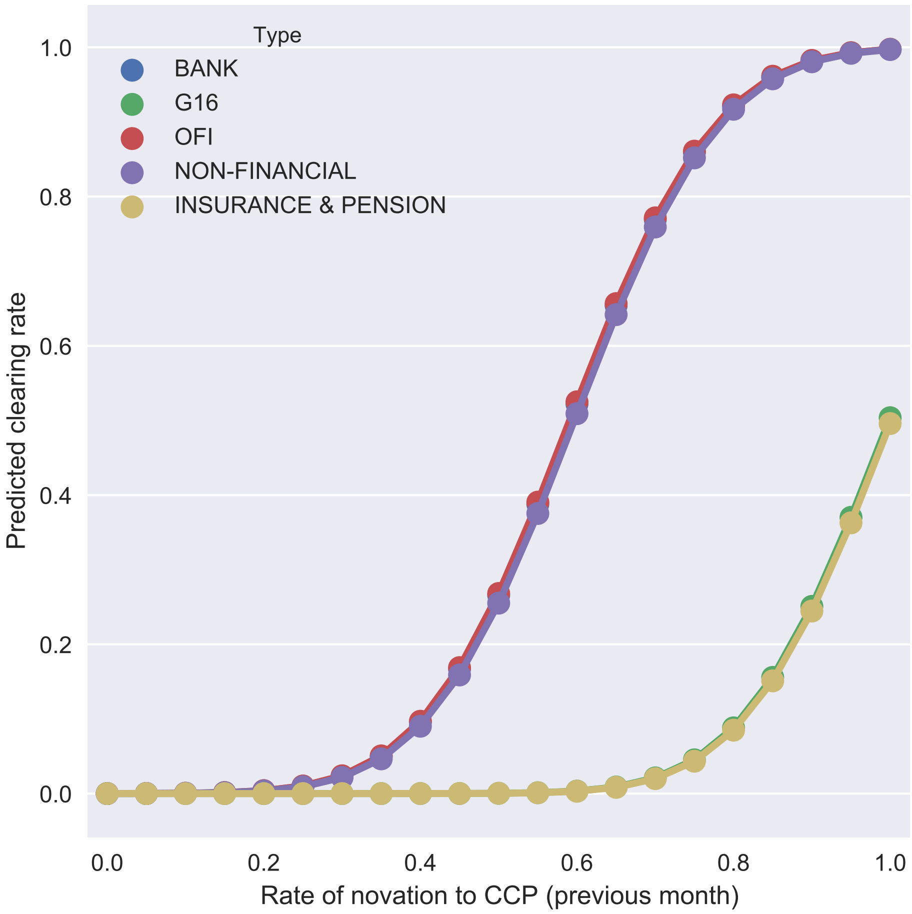


Fig. 12. Predicted clearing rates based on the model reported in Table 7, accounting for the type of the counterparty, and the ratio of the total gross notional cleared by the reporting counterparty to the total gross notional traded by the reporting counterparty within the same asset class in the previous month, for an extragroup equity derivative contract that would be executed at the end of the studied period (June 2017). Standard errors are not presented as they are $\sim 0$ for all values (except for insurers & pension funds for which results should be interpreted with caution).

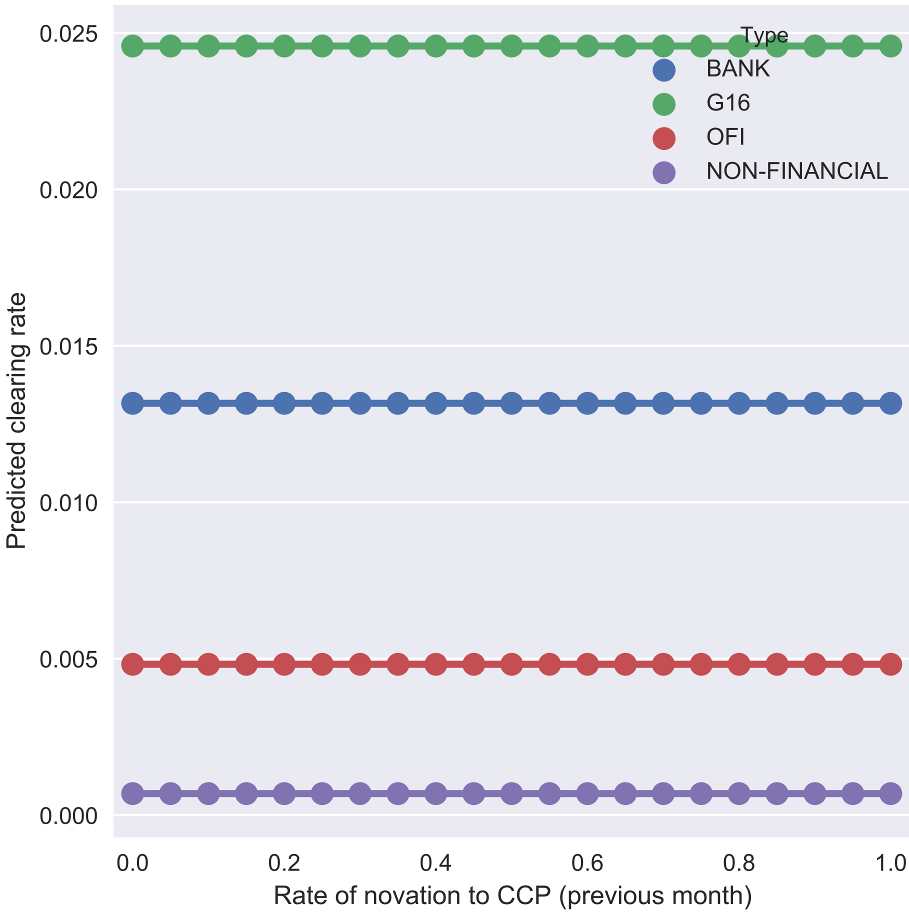


Fig. 13. Predicted clearing rates based on the model reported in Table 7, accounting for the type of the counterparty, and the ratio of the total gross notional cleared by the reporting counterparty to the total gross notional traded by the reporting counterparty within the same asset class in the previous month, for an extragroup foreign exchange derivative contract that would be executed at the end of the studied period (June 2017). Standard errors are not presented as they are $\sim 0$ for all values (except for insurers & pension funds for which results should be interpreted with caution).

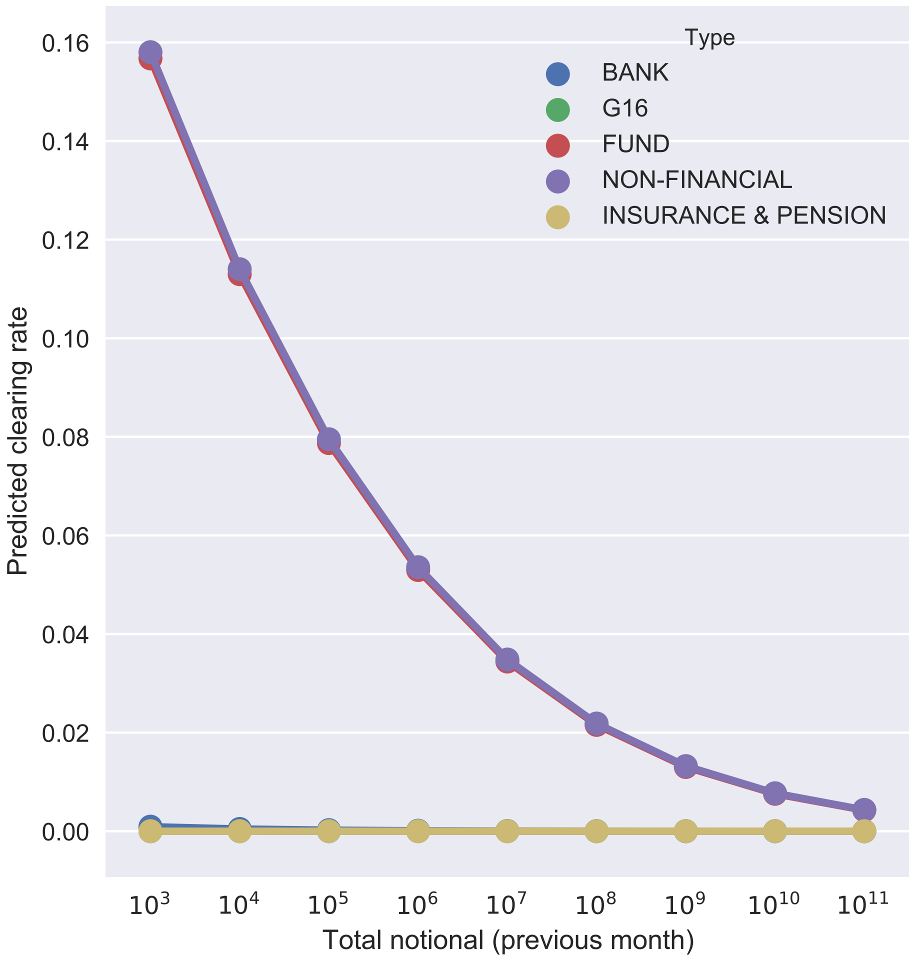


Fig. 14. Predicted clearing rates based on the model reported in Table 23, accounting for the type of the counterparty, and the total gross notional traded by the reporting counterparty in the previous month, for an extragroup commodity derivative contract that would be executed at the end of the studied period (June 2017). Standard errors are not presented as they are $\sim 0$ for all values (except for insurers & pension funds for which results should be interpreted with caution).

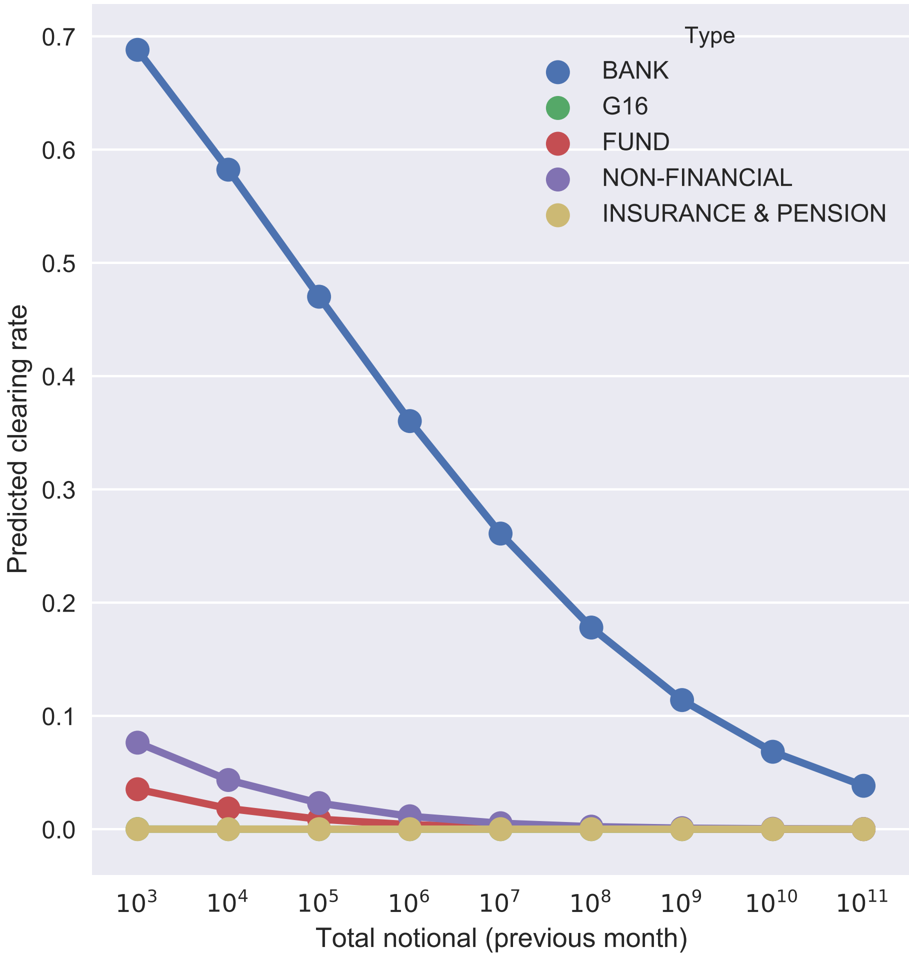


Fig. 15. Predicted clearing rates based on the model reported in Table 23, accounting for the type of the counterparty, and the total gross notional traded by the reporting counterparty in the previous month, for an extragroup equity derivative contract that would be executed at the end of the studied period (June 2017). Standard errors are not presented as they are $\sim 0$ for all values (except for insurers & pension funds for which results should be interpreted with caution).

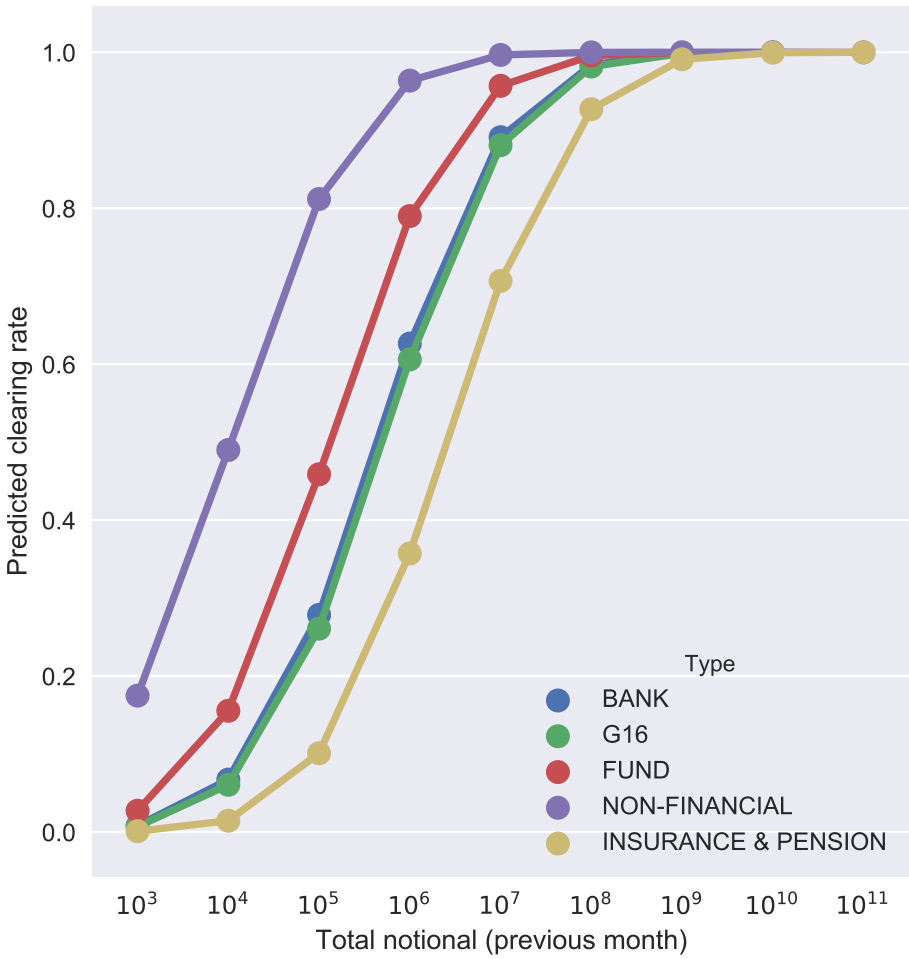


Fig. 16. Predicted clearing rates based on the model reported in Table 23, accounting for the type of the counterparty, and the total gross notional traded by the reporting counterparty in the previous month, for an extragroup foreign exchange derivative contract that would be executed at the end of the studied period (June 2017). Standard errors are not presented as they are $\sim 0$ for all values (except for insurers & pension funds for which results should be interpreted with caution).

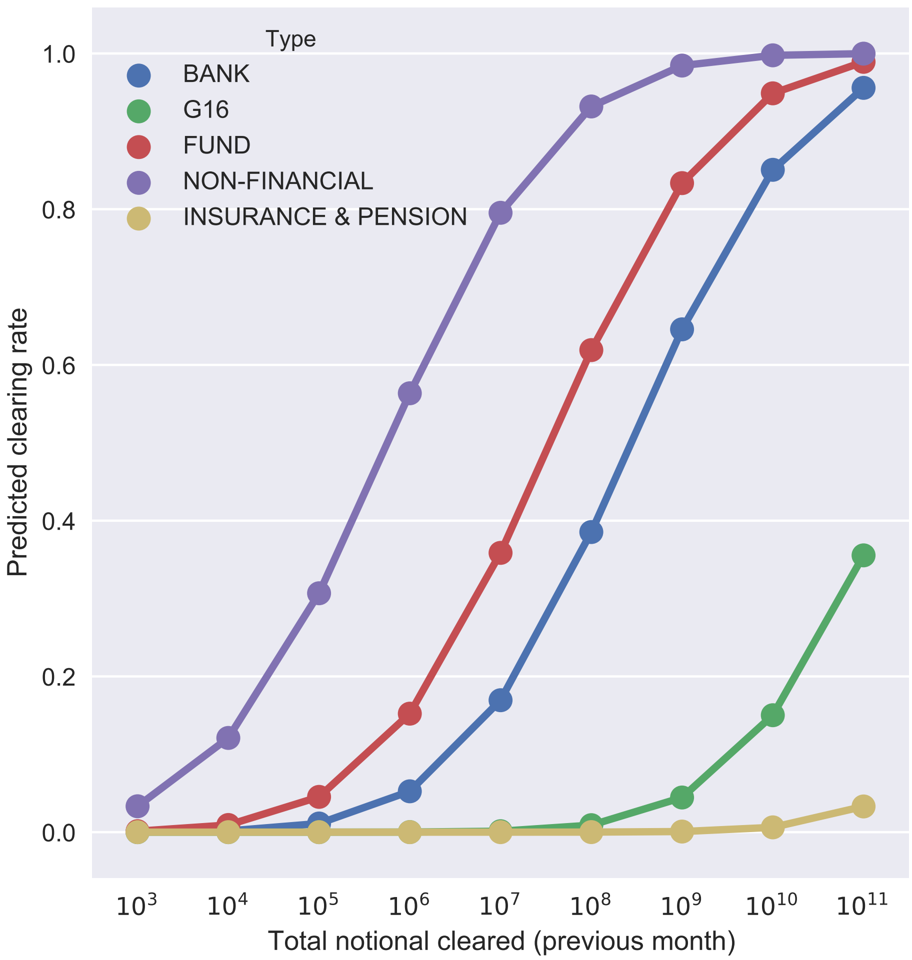


Fig. 17. Predicted clearing rates based on the model reported in Table 24, accounting for the type of the counterparty, and the total gross notional of trades centrally cleared by the reporting counterparty in the previous month, for an extragroup commodity derivative contract that would be executed at the end of the studied period (June 2017). Standard errors are not presented as they are $\sim 0$ for all values (except for insurers & pension funds for which results should be interpreted with caution).

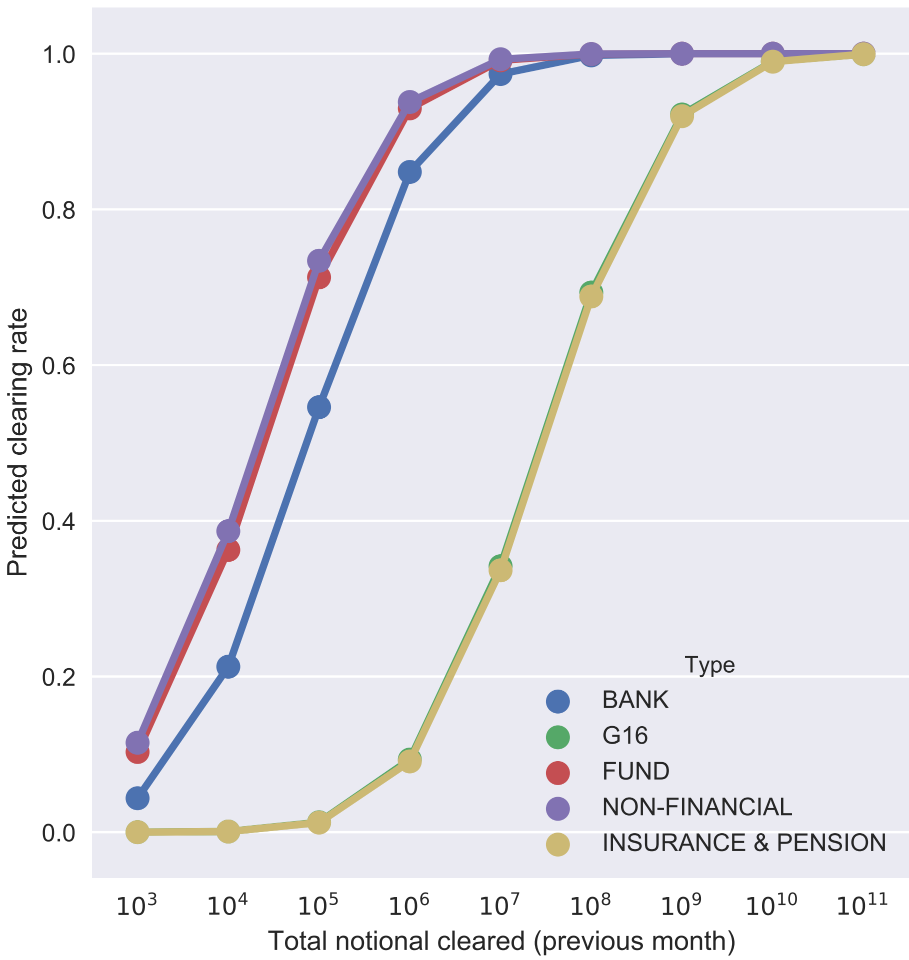


Fig. 18. Predicted clearing rates based on the model reported in Table 24, accounting for the type of the counterparty, and the total gross notional of trades centrally cleared by the reporting counterparty in the previous month, for an extragroup equity derivative contract that would be executed at the end of the studied period (June 2017). Standard errors are not presented as they are $\sim 0$ for all values (except for insurers & pension funds for which results should be interpreted with caution).

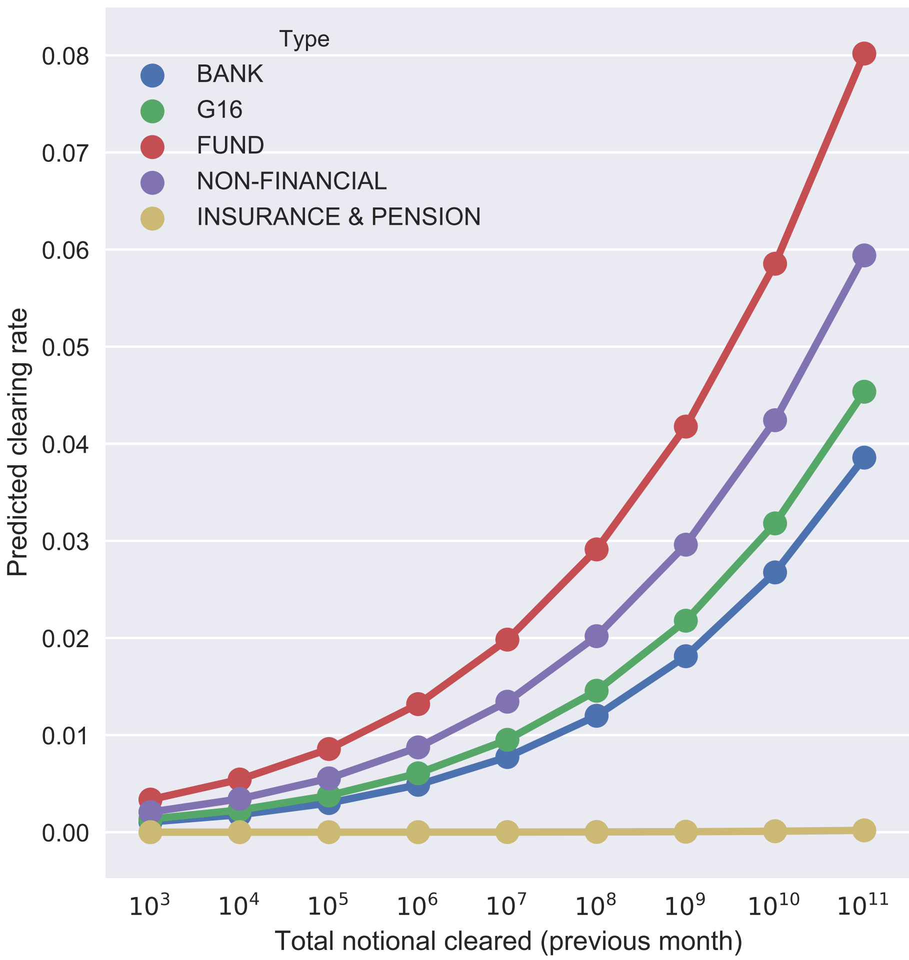


Fig. 19. Predicted clearing rates based on the model reported in Table 24, accounting for the type of the counterparty, and the total gross notional of trades centrally cleared by the reporting counterparty in the previous month, for an extragroup foreign exchange derivative contract that would be executed at the end of the studied period (June 2017). Standard errors are not presented as they are $\sim 0$ for all values (except for insurers & pension funds for which results should be interpreted with caution).

## Appendix H. Robustness checks

Table 34: Robustness checks for fixed effects – Hypothesis 1 (Credit)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| intragroup | −2.477*** | −2.489*** | −2.470*** | −2.614*** | −2.475*** | −2.628*** | −2.618*** | −2.623*** | −2.627*** |
| | (0.020) | (0.020) | (0.020) | (0.020) | (0.020) | (0.020) | (0.019) | (0.019) | (0.020) |
| Constant | −0.887*** | −1.552*** | −4.819 | −1.132*** | −6.107 | −1.772*** | −5.190 | −6.449 | −1.251*** |
| | (0.001) | (0.009) | (14.620) | (0.005) | (23.387) | (0.010) | (14.328) | (22.897) | (0.023) |
| Monthly FE | No | No | No | Yes | No | Yes | Yes | Yes | No |
| Type FE | No | Yes | No | No | Yes | Yes | No | Yes | No |
| Country FE | No | No | Yes | No | Yes | No | Yes | Yes | No |
| Type-month FE | No | No | No | No | No | No | No | No | Yes |
| Observations | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 |
| McFadden's $R^2$ | 0.117 | 0.122 | 0.139 | 0.143 | 0.144 | 0.148 | 0.166 | 0.170 | 0.152 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 35: Robustness checks for controls – Hypothesis 1 (Credit)

| | cleared | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| intragroup | −2.614*** | −2.677*** | −2.696*** | −2.492*** | −2.654*** | −2.613*** | −2.620*** | −2.689*** |
| | (0.020) | (0.020) | (0.020) | (0.020) | (0.020) | (0.020) | (0.020) | (0.020) |
| log(eurnotional) | | 0.151*** | | | | | | 0.141*** |
| | | (0.001) | | | | | | (0.001) |
| maturityyear | | | −0.024*** | | | | | −0.022*** |
| | | | (0.000) | | | | | (0.000) |
| clearingobligation | | | | −0.386*** | | | | −0.399*** |
| | | | | (0.003) | | | | (0.003) |
| Non-EEA cpty | | | | | 0.100*** | | | 0.130*** |
| | | | | | (0.003) | | | (0.003) |
| tradingcapacity | | | | | | −0.156*** | | −0.067** |
| | | | | | | (0.022) | | (0.022) |
| financial nature | | | | | | | 1.025*** | 0.890*** |
| | | | | | | | (0.019) | (0.019) |
| Constant | −1.132*** | −3.375*** | 47.793*** | −0.749*** | −1.188*** | −0.975*** | −2.132*** | 42.171*** |
| | (0.005) | (0.012) | (0.462) | (0.006) | (0.005) | (0.022) | (0.019) | (0.479) |
| Monthly fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 |
| McFadden's $R^2$ | 0.143 | 0.176 | 0.152 | 0.152 | 0.144 | 0.143 | 0.146 | 0.195 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 36: Robustness checks for fixed effects – Hypothesis 1 (Interest Rate)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| intragroup | −2.370*** | −2.348*** | −2.343*** | −2.382*** | −2.333*** | −2.359*** | −2.353*** | −2.344*** | −2.360*** |
| | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) |
| Constant | 0.162*** | 0.145*** | 0.601*** | 0.150*** | 0.769*** | 0.144*** | 0.541*** | 0.706*** | 0.147*** |
| | (0.001) | (0.002) | (0.157) | (0.002) | (0.157) | (0.003) | (0.157) | (0.157) | (0.006) |
| Monthly FE | No | No | No | Yes | No | Yes | Yes | Yes | No |
| Type FE | No | Yes | No | No | Yes | Yes | No | Yes | No |
| Country FE | No | No | Yes | No | Yes | No | Yes | Yes | No |
| Type-month FE | No | No | No | No | No | No | No | No | Yes |
| Observations | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 |
| McFadden's $R^2$ | 0.154 | 0.163 | 0.165 | 0.158 | 0.169 | 0.167 | 0.169 | 0.173 | 0.167 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 37: Robustness checks for controls – Hypothesis 1 (Interest Rate)

| | cleared | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| intragroup | −2.382*** | −2.371*** | −2.413*** | −2.371*** | −2.161*** | −2.382*** | −2.381*** | −2.133*** |
| | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) |
| log(eurnotional) | | 0.022*** | | | | | | 0.022*** |
| | | (0.000) | | | | | | (0.000) |
| maturityyear | | | 0.014*** | | | | | 0.015*** |
| | | | (0.000) | | | | | (0.000) |
| clearingobligation | | | | −0.090*** | | | | 0.033*** |
| | | | | (0.002) | | | | (0.002) |
| Non-EEA cpty | | | | | −1.203*** | | | −1.204*** |
| | | | | | (0.001) | | | (0.001) |
| tradingcapacity | | | | | | 0.056*** | | 0.167*** |
| | | | | | | (0.014) | | (0.014) |
| financial nature | | | | | | | 0.687*** | 0.905*** |
| | | | | | | | (0.007) | (0.007) |
| Constant | 0.150*** | −0.231*** | −27.360*** | 0.237*** | 0.582*** | 0.094*** | −0.532*** | −30.310*** |
| | (0.002) | (0.006) | (0.155) | (0.003) | (0.002) | (0.014) | (0.007) | (0.178) |
| Monthly fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 |
| McFadden's $R^2$ | 0.158 | 0.159 | 0.163 | 0.158 | 0.282 | 0.158 | 0.159 | 0.290 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 38: Robustness checks for fixed effects – Hypothesis 2 (Credit)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| maturityyear | −0.004*** | −0.004*** | −0.006*** | −0.005*** | −0.006*** | −0.005*** | −0.007*** | −0.007*** | −0.006*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Constant | 7.003*** | 7.202*** | 6.498 | 9.061*** | 5.619 | 9.249*** | 9.038 | 7.938 | 9.886*** |
| | (0.337) | (0.340) | (14.630) | (0.344) | (14.627) | (0.347) | (14.500) | (23.180) | (0.349) |
| Monthly FE | No | No | No | Yes | No | Yes | Yes | Yes | No |
| Type FE | No | Yes | No | No | Yes | Yes | No | Yes | No |
| Country FE | No | No | Yes | No | Yes | No | Yes | Yes | No |
| Type-month FE | No | No | No | No | No | No | No | No | Yes |
| Observations | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 |
| McFadden's $R^2$ | 0.000 | 0.007 | 0.031 | 0.013 | 0.037 | 0.019 | 0.044 | 0.049 | 0.024 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 39: Robustness checks for controls – Hypothesis 2 (Credit)

| | cleared | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| maturityyear | −0.005*** | −0.000*** | −0.024*** | −0.012*** | −0.005*** | −0.005*** | −0.005*** | −0.023*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| log(eurnotional) | | 0.137*** | | | | | | 0.141*** |
| | | (0.001) | | | | | | (0.001) |
| intragroup | | | −2.696*** | | | | | −2.689*** |
| | | | (0.020) | | | | | (0.020) |
| clearingobligation | | | | −0.755*** | | | | −0.399*** |
| | | | | (0.003) | | | | (0.003) |
| Non-EEA cpty | | | | | −0.239*** | | | 0.130*** |
| | | | | | (0.002) | | | (0.003) |
| tradingcapacity | | | | | | −0.399*** | | −0.067** |
| | | | | | | (0.022) | | (0.022) |
| financial nature | | | | | | | 0.843*** | 0.890*** |
| | | | | | | | (0.018) | (0.019) |
| Constant | 9.061*** | −1.933*** | 47.793*** | 24.385*** | 9.602*** | 9.468*** | 8.253*** | 42.171*** |
| | (0.344) | (0.356) | (0.462) | (0.373) | (0.351) | (0.345) | (0.344) | (0.479) |
| Monthly fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 |
| McFadden's $R^2$ | 0.013 | 0.043 | 0.152 | 0.053 | 0.019 | 0.013 | 0.015 | 0.195 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 40: Robustness checks for fixed effects – Hypothesis 2 (Interest Rate)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| maturityyear | 0.008*** | 0.008*** | 0.008*** | 0.008*** | 0.008*** | 0.008*** | 0.008*** | 0.008*** | 0.008*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Constant | −17.040*** | −16.180*** | −15.100*** | −16.760*** | −15.720*** | −15.900*** | −14.900*** | −15.500*** | −15.940*** |
| | (0.138) | (0.139) | (0.210) | (0.138) | (0.211) | (0.139) | (0.211) | (0.211) | (0.140) |
| Monthly FE | No | No | No | Yes | No | Yes | Yes | Yes | No |
| Type FE | No | Yes | No | No | Yes | Yes | No | Yes | No |
| Country FE | No | No | Yes | No | Yes | No | Yes | Yes | No |
| Type-month FE | No | No | No | No | No | No | No | No | Yes |
| Observations | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 |
| McFadden's $R^2$ | 0.003 | 0.018 | 0.024 | 0.006 | 0.032 | 0.021 | 0.027 | 0.035 | 0.022 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 41: Robustness checks for controls – Hypothesis 2 (Interest Rate)

| | cleared | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| maturityyear | 0.008*** | 0.013*** | 0.014*** | 0.008*** | 0.010*** | 0.008*** | 0.008*** | 0.015*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| log(eurnotional) | | 0.056*** | | | | | | 0.022*** |
| | | (0.000) | | | | | | (0.000) |
| intragroup | | | −2.413*** | | | | | −2.133*** |
| | | | (0.004) | | | | | (0.004) |
| clearingobligation | | | | −0.216*** | | | | 0.033*** |
| | | | | (0.001) | | | | (0.002) |
| Non-EEA cpty | | | | | −1.352*** | | | −1.204*** |
| | | | | | (0.001) | | | (0.001) |
| tradingcapacity | | | | | | −0.188*** | | 0.167*** |
| | | | | | | (0.014) | | (0.014) |
| financial nature | | | | | | | 0.774*** | 0.905*** |
| | | | | | | | (0.006) | (0.007) |
| Constant | −16.760*** | −26.580*** | −27.360*** | −16.040*** | −19.890*** | −16.590*** | −17.720*** | −30.310*** |
| | (0.138) | (0.147) | (0.155) | (0.138) | (0.150) | (0.138) | (0.138) | (0.178) |
| Monthly fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 |
| McFadden's $R^2$ | 0.006 | 0.013 | 0.163 | 0.010 | 0.190 | 0.006 | 0.009 | 0.290 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 42: Robustness checks for fixed effects – Hypothesis 3 (Credit)

| | | | | | cleared | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| log(eurnotional) | 0.137*** | 0.141*** | 0.140*** | 0.137*** | 0.141*** | 0.141*** | 0.140*** | 0.141*** | 0.141*** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Constant | −3.185*** | −3.823*** | −6.896 | −3.261*** | −8.336 | −3.876*** | −7.042 | −8.463 | −3.455*** |
| | (0.010) | (0.014) | (14.570) | (0.011) | (23.300) | (0.015) | (14.430) | (23.060) | (0.026) |
| Monthly FE | No | No | No | Yes | No | Yes | Yes | Yes | No |
| Type FE | No | Yes | No | No | Yes | Yes | No | Yes | No |
| Country FE | No | No | Yes | No | Yes | No | Yes | Yes | No |
| Type-month FE | No | No | No | No | No | No | No | No | Yes |
| Observations | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 |
| McFadden's $R^2$ | 0.031 | 0.040 | 0.062 | 0.043 | 0.068 | 0.051 | 0.073 | 0.079 | 0.055 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 43: Robustness checks for controls – Hypothesis 3 (Credit)

| | cleared | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| log(eurnotional) | 0.137*** | 0.151*** | 0.137*** | 0.134*** | 0.137*** | 0.137*** | 0.136*** | 0.141*** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| intragroup | | −2.677*** | | | | | | −2.689*** |
| | | (0.020) | | | | | | (0.020) |
| maturityyear | | | −0.001*** | | | | | −0.023*** |
| | | | (0.000) | | | | | (0.000) |
| clearingobligation | | | | −0.710*** | | | | −0.399*** |
| | | | | (0.003) | | | | (0.003) |
| Non-EEA cpty | | | | | −0.240*** | | | 0.130*** |
| | | | | | (0.003) | | | (0.003) |
| tradingcapacity | | | | | | −0.275*** | | −0.067** |
| | | | | | | (0.022) | | (0.022) |
| financial nature | | | | | | | 0.744*** | 0.890*** |
| | | | | | | | (0.019) | (0.019) |
| Constant | −3.261*** | −3.375*** | −1.933*** | −2.511*** | −3.121*** | −2.984*** | −3.973*** | 42.171*** |
| | (0.011) | (0.012) | (0.356) | (0.012) | (0.011) | (0.025) | (0.022) | (0.479) |
| Monthly fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 |
| McFadden's $R^2$ | 0.043 | 0.176 | 0.043 | 0.079 | 0.049 | 0.043 | 0.044 | 0.195 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 44: Robustness checks for fixed effects – Hypothesis 3 (Interest Rate)

| | | | | | cleared | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| log(eurnotional) | 0.042*** | 0.048*** | 0.044*** | 0.041*** | 0.045*** | 0.047*** | 0.043*** | 0.044*** | 0.047*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Constant | −0.753*** | −0.871*** | −0.034 | −0.711*** | −0.079 | −0.819*** | −0.023 | −0.076 | −0.819*** |
| | (0.004) | (0.005) | (0.157) | (0.005) | (0.157) | (0.005) | (0.157) | (0.157) | (0.007) |
| Monthly FE | No | No | No | Yes | No | Yes | Yes | Yes | No |
| Type FE | No | Yes | No | No | Yes | Yes | No | Yes | No |
| Country FE | No | No | Yes | No | Yes | No | Yes | Yes | No |
| Type-month FE | No | No | No | No | No | No | No | No | Yes |
| Observations | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 |
| McFadden's $R^2$ | 0.004 | 0.021 | 0.026 | 0.008 | 0.034 | 0.024 | 0.030 | 0.038 | 0.025 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 45: Robustness checks for controls – Hypothesis 3 (Interest Rate)

| | cleared | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| log(eurnotional) | 0.041*** | 0.022*** | 0.056*** | 0.038*** | 0.022*** | 0.041*** | 0.040*** | 0.022*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| intragroup | | −2.371*** | | | | | | −2.133*** |
| | | (0.004) | | | | | | (0.004) |
| maturityyear | | | 0.013*** | | | | | 0.015*** |
| | | | (0.000) | | | | | (0.000) |
| clearingobligation | | | | −0.204*** | | | | 0.033*** |
| | | | | (0.001) | | | | (0.002) |
| Non-EEA cpty | | | | | −1.339*** | | | −1.204*** |
| | | | | | (0.001) | | | (0.001) |
| tradingcapacity | | | | | | −0.256*** | | 0.167*** |
| | | | | | | (0.014) | | (0.014) |
| financial nature | | | | | | | 0.774*** | 0.905*** |
| | | | | | | | (0.006) | (0.007) |
| Constant | −0.710*** | −0.231*** | −26.580*** | −0.464*** | 0.126*** | −0.458*** | −1.436*** | −30.310*** |
| | (0.005) | (0.006) | (0.147) | (0.005) | (0.005) | (0.014) | (0.008) | (0.178) |
| Monthly fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 |
| McFadden's $R^2$ | 0.008 | 0.159 | 0.013 | 0.011 | 0.187 | 0.008 | 0.010 | 0.290 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 46: Robustness checks for fixed effects – Hypothesis 4 (Credit)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Non-EEA cpty | −0.220*** | −0.211*** | −0.203*** | −0.239*** | −0.190*** | −0.229*** | −0.225*** | −0.212*** | −0.224*** |
| | (0.002) | (0.003) | (0.003) | (0.002) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| Constant | −0.950*** | −1.494*** | −4.819 | −1.071*** | −5.950 | −1.595*** | −5.020 | −6.327 | −1.203*** |
| | (0.002) | (0.009) | (14.620) | (0.005) | (14.623) | (0.010) | (14.483) | (23.155) | (0.023) |
| Monthly FE | No | No | No | Yes | No | Yes | Yes | Yes | No |
| Type FE | No | Yes | No | No | Yes | Yes | No | Yes | No |
| Country FE | No | No | Yes | No | Yes | No | Yes | Yes | No |
| Type-month FE | No | No | No | No | No | No | No | No | Yes |
| Observations | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 |
| McFadden's $R^2$ | 0.006 | 0.011 | 0.035 | 0.018 | 0.040 | 0.024 | 0.048 | 0.053 | 0.028 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 47: Robustness checks for controls – Hypothesis 4 (Credit)

| | cleared | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Non-EEA cpty | −0.239*** | −0.240*** | −0.239*** | −0.202*** | 0.100*** | −0.237*** | −0.234*** | 0.130*** |
| | (0.002) | (0.003) | (0.002) | (0.003) | (0.003) | (0.002) | (0.002) | (0.003) |
| log(eurnotional) | | 0.137*** | | | | | | 0.141*** |
| | | (0.001) | | | | | | (0.001) |
| maturityyear | | | −0.005*** | | | | | −0.023*** |
| | | | (0.000) | | | | | (0.000) |
| clearingobligation | | | | −0.704*** | | | | −0.399*** |
| | | | | (0.003) | | | | (0.003) |
| intragroup | | | | | −2.654*** | | | −2.689*** |
| | | | | | (0.020) | | | (0.020) |
| tradingcapacity | | | | | | −0.291*** | | −0.067** |
| | | | | | | (0.022) | | (0.022) |
| financial nature | | | | | | | 0.792*** | 0.890*** |
| | | | | | | | (0.018) | (0.019) |
| Constant | −1.071*** | −3.121*** | 9.602*** | −0.392*** | −1.188*** | −0.782*** | −1.849*** | 42.171*** |
| | (0.005) | (0.011) | (0.351) | (0.006) | (0.005) | (0.022) | (0.019) | (0.479) |
| Monthly fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 |
| McFadden's $R^2$ | 0.018 | 0.049 | 0.019 | 0.054 | 0.144 | 0.018 | 0.020 | 0.195 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 48: Robustness checks for fixed effects – Hypothesis 4 (Interest Rate)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Non-EEA cpty | −1.349*** | −1.418*** | −1.450*** | −1.347*** | −1.465*** | −1.415*** | −1.446*** | −1.461*** | −1.417*** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Constant | 0.514*** | 0.147*** | 0.667*** | 0.497*** | 0.426** | 0.137*** | 0.642*** | 0.395* | 0.124*** |
| | (0.001) | (0.002) | (0.159) | (0.002) | (0.160) | (0.003) | (0.160) | (0.160) | (0.006) |
| Monthly FE | No | No | No | Yes | No | Yes | Yes | Yes | No |
| Type FE | No | Yes | No | No | Yes | Yes | No | Yes | No |
| Country FE | No | No | Yes | No | Yes | No | Yes | Yes | No |
| Type-month FE | No | No | No | No | No | No | No | No | Yes |
| Observations | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 |
| McFadden's $R^2$ | 0.184 | 0.204 | 0.219 | 0.186 | 0.224 | 0.206 | 0.221 | 0.225 | 0.207 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 49: Robustness checks for controls – Hypothesis 4 (Interest Rate)

| | cleared | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Non-EEA cpty | −1.347*** | −1.339*** | −1.352*** | −1.340*** | −1.203*** | −1.347*** | −1.362*** | −1.204*** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| log(eurnotional) | | 0.022*** | | | | | | 0.022*** |
| | | (0.000) | | | | | | (0.000) |
| maturityyear | | | 0.010*** | | | | | 0.015*** |
| | | | (0.000) | | | | | (0.000) |
| clearingobligation | | | | −0.085*** | | | | 0.033*** |
| | | | | (0.002) | | | | (0.002) |
| intragroup | | | | | −2.161*** | | | −2.133*** |
| | | | | | (0.004) | | | (0.004) |
| tradingcapacity | | | | | | 0.155*** | | 0.167*** |
| | | | | | | (0.014) | | (0.014) |
| financial nature | | | | | | | 1.089*** | 0.905*** |
| | | | | | | | (0.006) | (0.007) |
| Constant | 0.497*** | 0.126*** | −19.890*** | 0.577*** | 0.582*** | 0.342*** | −0.574*** | −30.310*** |
| | (0.002) | (0.005) | (0.150) | (0.003) | (0.002) | (0.014) | (0.007) | (0.178) |
| Monthly fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 |
| McFadden's $R^2$ | 0.186 | 0.187 | 0.190 | 0.187 | 0.282 | 0.186 | 0.192 | 0.290 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 50: Robustness checks for fixed effects – Hypothesis 5 (Credit)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| financial nature | 0.869*** | 1.158*** | 1.154*** | 0.842*** | 1.162*** | 1.128*** | 1.116*** | 1.125*** | 1.070*** |
| | (0.018) | (0.019) | (0.021) | (0.018) | (0.021) | (0.019) | (0.021) | (0.021) | (0.020) |
| Constant | −1.959*** | −2.723*** | −5.973 | −2.031*** | −7.021 | −2.768*** | −6.102 | −7.337 | −2.329*** |
| | (0.018) | (0.021) | (14.620) | (0.019) | (14.623) | (0.021) | (14.498) | (23.178) | (0.030) |
| Monthly FE | No | No | No | Yes | No | Yes | Yes | Yes | No |
| Type FE | No | Yes | No | No | Yes | Yes | No | Yes | No |
| Country FE | No | No | Yes | No | Yes | No | Yes | Yes | No |
| Type-month FE | No | No | No | No | No | No | No | No | Yes |
| Observations | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 |
| McFadden's $R^2$ | 0.002 | 0.011 | 0.034 | 0.014 | 0.039 | 0.022 | 0.045 | 0.051 | 0.026 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 51: Robustness checks for controls – Hypothesis 5 (Credit)

| | cleared | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Financial nature | 1.128*** | 1.046*** | 1.131*** | 1.017*** | 1.016*** | 1.125*** | 1.109*** | 1.020*** |
| | (0.019) | (0.019) | (0.019) | (0.019) | (0.019) | (0.019) | (0.019) | (0.020) |
| log(eurnotional) | | 0.140*** | | | | | | 0.146*** |
| | | (0.001) | | | | | | (0.001) |
| maturityyear | | | −0.005*** | | | | | −0.023*** |
| | | | (0.000) | | | | | (0.000) |
| clearingobligation | | | | −0.728*** | | | | −0.420*** |
| | | | | (0.003) | | | | (0.003) |
| Non-EEA cpty | | | | | −0.212*** | | | 0.130*** |
| | | | | | (0.003) | | | (0.003) |
| tradingcapacity | | | | | | −0.169*** | | −0.050* |
| | | | | | | (0.022) | | (0.022) |
| intragroup | | | | | | | −2.626*** | −2.694*** |
| | | | | | | | (0.020) | (0.020) |
| Constant | −2.768*** | −4.882*** | 8.312*** | −2.035*** | −2.594*** | −2.597*** | −2.862*** | 41.515*** |
| | (0.021) | (0.024) | (0.348) | (0.021) | (0.021) | (0.031) | (0.022) | (0.479) |
| Monthly fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Type fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 |
| McFadden's $R^2$ | 0.022 | 0.054 | 0.023 | 0.061 | 0.027 | 0.022 | 0.151 | 0.203 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 52: Robustness checks for fixed effects – Hypothesis 5 (Interest Rate)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| financial nature | 0.777*** | 0.970*** | 0.837*** | 0.764*** | 0.979*** | 0.958*** | 0.826*** | 0.968*** | 0.959*** |
| | (0.006) | (0.007) | (0.007) | (0.006) | (0.007) | (0.007) | (0.007) | (0.007) | (0.007) |
| Constant | −0.831*** | −1.032*** | −0.237 | −0.784*** | −0.388* | −0.975*** | −0.220 | −0.380* | −0.986*** |
| | (0.006) | (0.007) | (0.157) | (0.007) | (0.157) | (0.007) | (0.157) | (0.157) | (0.009) |
| Monthly FE | No | No | No | Yes | No | Yes | Yes | Yes | No |
| Type FE | No | Yes | No | No | Yes | Yes | No | Yes | No |
| Country FE | No | No | Yes | No | Yes | No | Yes | Yes | No |
| Type-month FE | No | No | No | No | No | No | No | No | Yes |
| Observations | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 |
| McFadden's $R^2$ | 0.003 | 0.019 | 0.025 | 0.006 | 0.033 | 0.022 | 0.028 | 0.037 | 0.023 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 53: Robustness checks for controls – Hypothesis 5 (Interest Rate)

| | cleared | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| financial nature | 0.958*** | 0.960*** | 0.969*** | 0.931*** | 1.071*** | 0.957*** | 0.746*** | 0.834*** |
| | (0.007) | (0.007) | (0.007) | (0.007) | (0.007) | (0.007) | (0.008) | (0.008) |
| log(eurnotional) | | 0.047*** | | | | | | 0.025*** |
| | | (0.000) | | | | | | (0.000) |
| maturityyear | | | 0.008*** | | | | | 0.013*** |
| | | | (0.000) | | | | | (0.000) |
| clearingobligation | | | | −0.215*** | | | | 0.042*** |
| | | | | (0.001) | | | | (0.002) |
| Non-EEA cpty | | | | | −1.421*** | | | −1.234*** |
| | | | | | (0.001) | | | (0.001) |
| tradingcapacity | | | | | | 0.026 | | 0.240*** |
| | | | | | | (0.014) | | (0.014) |
| intragroup | | | | | | | −2.353*** | −2.071*** |
| | | | | | | | (0.004) | (0.004) |
| Constant | −0.975*** | −1.759*** | −17.135*** | −0.729*** | −0.906*** | −1.001*** | −0.590*** | −28.090*** |
| | (0.007) | (0.009) | (0.140) | (0.007) | (0.007) | (0.016) | (0.008) | (0.180) |
| Monthly fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Type fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 |
| McFadden's $R^2$ | 0.022 | 0.028 | 0.025 | 0.026 | 0.211 | 0.022 | 0.168 | 0.299 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 54: Robustness checks for fixed effects – Hypothesis 6 (Credit)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| prev.ratio.trades | 4.284*** | 4.319*** | 4.251*** | 4.450*** | 4.253*** | 4.502*** | 4.454*** | 4.468*** | 4.544*** |
| | (0.009) | (0.009) | (0.009) | (0.010) | (0.009) | (0.010) | (0.010) | (0.010) | (0.010) |
| Constant | −1.871*** | −2.063*** | −4.819 | −1.856*** | −5.295 | −2.038*** | −5.080 | −5.543 | −1.962*** |
| | (0.002) | (0.010) | (14.622) | (0.005) | (14.623) | (0.011) | (23.151) | (23.149) | (0.026) |
| Monthly FE | No | No | No | Yes | No | Yes | Yes | Yes | No |
| Type FE | No | Yes | No | No | Yes | Yes | No | Yes | No |
| Country FE | No | No | Yes | No | Yes | No | Yes | Yes | No |
| Type-month FE | No | No | No | No | No | No | No | No | Yes |
| Observations | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 |
| McFadden's $R^2$ | 0.214 | 0.215 | 0.217 | 0.224 | 0.217 | 0.225 | 0.226 | 0.227 | 0.227 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 55: Robustness checks for controls – Hypothesis 6 (Credit)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| prev.ratio.trades | 4.284*** | 4.608*** | 4.758*** | 4.270*** | 4.474*** | 3.601*** | 4.488*** | 4.522*** | 3.708*** |
| | (0.009) | (0.010) | (0.010) | (0.010) | (0.010) | (0.010) | (0.010) | (0.010) | (0.011) |
| log(eurnotional) | | 0.160*** | | | | | | | 0.155*** |
| | | (0.001) | | | | | | | (0.001) |
| maturityyear | | | −0.028*** | | | | | | −0.030*** |
| | | | (0.000) | | | | | | (0.000) |
| clearingobligation | | | | −0.326*** | | | | | −0.293*** |
| | | | | (0.004) | | | | | (0.004) |
| Non-EEA cpty | | | | | −0.172*** | | | | 0.002 |
| | | | | | (0.003) | | | | (0.003) |
| intragroup | | | | | | −1.934*** | | | −2.050*** |
| | | | | | | (0.021) | | | (0.022) |
| financial nature | | | | | | | 0.498*** | | 0.445*** |
| | | | | | | | (0.029) | | (0.027) |
| tradingcapacity | | | | | | | | −0.984*** | −0.600*** |
| | | | | | | | | (0.025) | (0.025) |
| Constant | −1.871*** | −4.581*** | 54.455*** | −1.708*** | −1.981*** | −1.974*** | −2.530*** | −1.056*** | 56.995*** |
| | (0.002) | (0.017) | (0.448) | (0.012) | (0.011) | (0.011) | (0.031) | (0.027) | (0.514) |
| Monthly fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 |
| McFadden's $R^2$ | 0.214 | 0.258 | 0.238 | 0.231 | 0.227 | 0.258 | 0.225 | 0.226 | 0.309 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 56: Robustness checks for fixed effects – Hypothesis 6 (Interest Rate)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| prev.ratio.trades | 2.718*** | 2.679*** | 2.672*** | 2.729*** | 2.673*** | 2.690*** | 2.684*** | 2.685*** | 2.700*** |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.004) | (0.003) | (0.004) | (0.004) | (0.003) |
| Constant | −1.350*** | −1.408*** | −0.869*** | −1.385*** | −1.041*** | −1.437*** | −0.906*** | −1.077*** | −1.387*** |
| | (0.002) | (0.003) | (0.187) | (0.003) | (0.187) | (0.003) | (0.187) | (0.187) | (0.006) |
| Monthly FE | No | No | No | Yes | No | Yes | Yes | Yes | No |
| Type FE | No | Yes | No | No | Yes | Yes | No | Yes | No |
| Country FE | No | No | Yes | No | Yes | No | Yes | Yes | No |
| Type-month FE | No | No | No | No | No | No | No | No | Yes |
| Observations | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 |
| McFadden's $R^2$ | 0.134 | 0.135 | 0.136 | 0.135 | 0.137 | 0.136 | 0.138 | 0.138 | 0.137 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 57: Robustness checks for controls – Hypothesis 6 (Interest Rate)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| prev.ratio.trades | 2.718*** | 2.669*** | 2.705*** | 2.703*** | 2.559*** | 2.054*** | 2.676*** | 2.690*** | 2.174*** |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.004) | (0.004) | (0.003) | (0.003) | (0.004) |
| log(eurnotional) | | 0.039*** | | | | | | | 0.020*** |
| | | (0.000) | | | | | | | (0.000) |
| maturityyear | | | 0.009*** | | | | | | 0.013*** |
| | | | (0.000) | | | | | | (0.000) |
| clearingobligation | | | | −0.250*** | | | | | −0.021*** |
| | | | | (0.002) | | | | | (0.002) |
| Non-EEA cpty | | | | | −1.427*** | | | | −1.301*** |
| | | | | | (0.001) | | | | (0.002) |
| intragroup | | | | | | −2.110*** | | | −1.871*** |
| | | | | | | (0.004) | | | (0.005) |
| financial nature | | | | | | | 0.336*** | | 0.328*** |
| | | | | | | | (0.009) | | (0.009) |
| tradingcapacity | | | | | | | | 0.215*** | 0.306*** |
| | | | | | | | | (0.017) | (0.016) |
| Constant | −1.350*** | −2.072*** | −20.305*** | −1.188*** | −1.162*** | −0.974*** | −1.759*** | −1.651*** | −27.209*** |
| | (0.002) | (0.006) | (0.147) | (0.004) | (0.004) | (0.004) | (0.009) | (0.018) | (0.187) |
| Monthly fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 |
| McFadden's $R^2$ | 0.134 | 0.139 | 0.139 | 0.141 | 0.307 | 0.226 | 0.137 | 0.136 | 0.362 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 58: Robustness checks for fixed effects – Hypothesis 6 (Credit)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| prev.ratio | 3.396*** | 3.428*** | 3.386*** | 3.472*** | 3.376*** | 3.515*** | 3.466*** | 3.460*** | 3.529*** |
| | (0.007) | (0.007) | (0.007) | (0.007) | (0.007) | (0.007) | (0.008) | (0.008) | (0.007) |
| Constant | −1.885*** | −2.101*** | −4.819 | −2.150*** | −5.431 | −2.314*** | −5.366 | −5.909 | −1.997*** |
| | (0.002) | (0.010) | (14.622) | (0.006) | (14.623) | (0.011) | (23.179) | (23.181) | (0.025) |
| Monthly FE | No | No | No | Yes | No | Yes | Yes | Yes | No |
| Type FE | No | Yes | No | No | Yes | Yes | No | Yes | No |
| Country FE | No | No | Yes | No | Yes | No | Yes | Yes | No |
| Type-month FE | No | No | No | No | No | No | No | No | Yes |
| Observations | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 |
| McFadden's $R^2$ | 0.205 | 0.206 | 0.210 | 0.216 | 0.211 | 0.217 | 0.221 | 0.222 | 0.220 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 59: Robustness checks for controls – Hypothesis 6 (Credit)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| prev.ratio | 3.396*** | 3.687*** | 3.710*** | 3.334*** | 3.500*** | 2.801*** | 3.507*** | 3.530*** | 2.981*** |
| | (0.007) | (0.008) | (0.008) | (0.007) | (0.007) | (0.008) | (0.007) | (0.007) | (0.008) |
| log(eurnotional) | | 0.173*** | | | | | | | 0.164*** |
| | | (0.001) | | | | | | | (0.001) |
| maturityyear | | | −0.027*** | | | | | | −0.030*** |
| | | | (0.000) | | | | | | (0.000) |
| clearingobligation | | | | −0.319*** | | | | | −0.265*** |
| | | | | (0.003) | | | | | (0.004) |
| Non-EEA cpty | | | | | −0.198*** | | | | −0.020*** |
| | | | | | (0.003) | | | | (0.003) |
| intragroup | | | | | | −1.963*** | | | −2.049*** |
| | | | | | | (0.020) | | | (0.022) |
| financial nature | | | | | | | 0.248*** | | 0.237*** |
| | | | | | | | (0.025) | | (0.025) |
| tradingcapacity | | | | | | | | −0.966*** | −0.581*** |
| | | | | | | | | (0.025) | (0.024) |
| Constant | −1.885*** | −5.074*** | 52.657*** | −1.974*** | −2.249*** | −2.197*** | −2.558*** | −1.351*** | 56.067*** |
| | (0.002) | (0.017) | (0.437) | (0.012) | (0.011) | (0.011) | (0.027) | (0.027) | (0.509) |
| Monthly fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Type fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 |
| McFadden's $R^2$ | 0.205 | 0.255 | 0.230 | 0.223 | 0.221 | 0.253 | 0.218 | 0.218 | 0.307 |
| *Notes:* | ***Significant at the 1 percent level. | | | | | | | | |
| | **Significant at the 5 percent level. | | | | | | | | |
| | *Significant at the 10 percent level. | | | | | | | | |

Table 60: Robustness checks for fixed effects – Hypothesis 6 (Interest Rate)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| prev.ratio | 1.907*** | 1.856*** | 1.857*** | 1.919*** | 1.835*** | 1.868*** | 1.866*** | 1.844*** | 1.880*** |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| Constant | −0.991*** | −1.082*** | −0.560*** | −1.101*** | −0.734*** | −1.182*** | −0.684*** | −0.856*** | −1.163*** |
| | (0.001) | (0.002) | (0.174) | (0.003) | (0.174) | (0.003) | (0.175) | (0.175) | (0.006) |
| Monthly FE | No | No | No | Yes | No | Yes | Yes | Yes | No |
| Type FE | No | Yes | No | No | Yes | Yes | No | Yes | No |
| Country FE | No | No | Yes | No | Yes | No | Yes | Yes | No |
| Type-month FE | No | No | No | No | No | No | No | No | Yes |
| Observations | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 |
| McFadden's $R^2$ | 0.102 | 0.105 | 0.112 | 0.104 | 0.112 | 0.107 | 0.113 | 0.114 | 0.108 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 61: Robustness checks for controls – Hypothesis 6 (Interest Rate)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| prev.ratio | 1.907*** | 1.845*** | 1.884*** | 1.847*** | 1.741*** | 1.245*** | 1.851*** | 1.868*** | 1.358*** |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| log(eurnotional) | | 0.034*** | | | | | | | 0.019*** |
| | | (0.000) | | | | | | | (0.000) |
| maturityyear | | | 0.010*** | | | | | | 0.013*** |
| | | | (0.000) | | | | | | (0.000) |
| clearingobligation | | | | −0.104*** | | | | | 0.076*** |
| | | | | (0.002) | | | | | (0.002) |
| Non-EEA cpty | | | | | −1.392*** | | | | −1.284*** |
| | | | | | (0.001) | | | | (0.002) |
| intragroup | | | | | | −2.109*** | | | −1.885*** |
| | | | | | | (0.004) | | | (0.005) |
| financial nature | | | | | | | 0.511*** | | 0.513*** |
| | | | | | | | (0.008) | | (0.008) |
| tradingcapacity | | | | | | | | −0.038** | 0.152*** |
| | | | | | | | | (0.016) | (0.015) |
| Constant | −0.991*** | −1.734*** | −21.397*** | −1.062*** | −0.914*** | −0.647*** | −1.672*** | −1.144*** | −28.069*** |
| | (0.001) | (0.006) | (0.145) | (0.004) | (0.003) | (0.003) | (0.008) | (0.016) | (0.184) |
| Monthly fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Type fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 |
| McFadden's $R^2$ | 0.102 | 0.109 | 0.110 | 0.108 | 0.275 | 0.198 | 0.108 | 0.107 | 0.333 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 62: Robustness checks for fixed effects – Hypothesis 7 (Credit)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| previoustrades | −0.000*** | −0.000*** | −0.000*** | −0.000*** | −0.000*** | −0.000*** | −0.000*** | −0.000*** | −0.000*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Constant | −0.782*** | −1.534*** | −4.819 | −0.877*** | −5.895 | −1.614*** | −5.024 | −6.278 | −1.216*** |
| | (0.002) | (0.009) | (14.622) | (0.005) | (14.623) | (0.010) | (14.359) | (22.934) | (0.023) |
| Monthly FE | No | No | No | Yes | No | Yes | Yes | Yes | No |
| Type FE | No | Yes | No | No | Yes | Yes | No | Yes | No |
| Country FE | No | No | Yes | No | Yes | No | Yes | Yes | No |
| Type-month FE | No | No | No | No | No | No | No | No | Yes |
| Observations | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 |
| McFadden's $R^2$ | 0.042 | 0.050 | 0.065 | 0.063 | 0.071 | 0.072 | 0.086 | 0.092 | 0.077 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 63: Robustness checks for controls – Hypothesis 7 (Credit)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| previoustrades | −0.000*** | −0.000*** | −0.000*** | −0.000*** | −0.000*** | 0.000*** | −0.000*** | −0.000*** | 0.000*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| log(eurnotional) | | 0.136*** | | | | | | | 0.141*** |
| | | (0.001) | | | | | | | (0.001) |
| maturityyear | | | −0.014*** | | | | | | −0.023*** |
| | | | (0.000) | | | | | | (0.000) |
| clearingobligation | | | | −0.537*** | | | | | −0.391*** |
| | | | | (0.003) | | | | | (0.003) |
| Non-EEA cpty | | | | | −0.030*** | | | | 0.115*** |
| | | | | | (0.003) | | | | (0.003) |
| intragroup | | | | | | −2.935*** | | | −2.948*** |
| | | | | | | (0.020) | | | (0.021) |
| financial nature | | | | | | | 1.197*** | | 0.799*** |
| | | | | | | | (0.019) | | (0.019) |
| tradingcapacity | | | | | | | | −0.123*** | −0.114*** |
| | | | | | | | | (0.022) | (0.022) |
| Constant | −0.877*** | −2.916*** | 26.615*** | −0.388*** | −0.863*** | −1.264*** | −2.029*** | −0.755*** | 42.837*** |
| | (0.005) | (0.011) | (0.400) | (0.006) | (0.005) | (0.005) | (0.019) | (0.022) | (0.477) |
| Monthly fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 |
| McFadden's $R^2$ | 0.063 | 0.093 | 0.067 | 0.083 | 0.063 | 0.145 | 0.068 | 0.063 | 0.197 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 64: Robustness checks for fixed effects – Hypothesis 7 (Interest Rate)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| previoustrades | −0.000*** | −0.000*** | −0.000*** | −0.000*** | −0.000*** | −0.000*** | −0.000*** | −0.000*** | −0.000*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Constant | 0.154*** | −0.049*** | 0.601*** | 0.254*** | 0.661*** | 0.056*** | 0.681*** | 0.721*** | −0.006 |
| | (0.001) | (0.002) | (0.157) | (0.002) | (0.157) | (0.003) | (0.157) | (0.157) | (0.006) |
| Monthly FE | No | No | No | Yes | No | Yes | Yes | Yes | No |
| Type FE | No | Yes | No | No | Yes | Yes | No | Yes | No |
| Country FE | No | No | Yes | No | Yes | No | Yes | Yes | No |
| Type-month FE | No | No | No | No | No | No | No | No | Yes |
| Observations | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 |
| McFadden's $R^2$ | 0.011 | 0.020 | 0.030 | 0.014 | 0.034 | 0.024 | 0.034 | 0.037 | 0.025 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 65: Robustness checks for controls – Hypothesis 7 (Interest Rate)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| previoustrades | −0.000*** | −0.000*** | −0.000*** | −0.000*** | 0.000** | −0.000*** | −0.000*** | −0.000*** | −0.000*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| log(eurnotional) | | 0.044*** | | | | | | | 0.023*** |
| | | (0.000) | | | | | | | (0.000) |
| maturityyear | | | 0.009*** | | | | | | 0.015*** |
| | | | (0.000) | | | | | | (0.000) |
| clearingobligation | | | | −0.244*** | | | | | 0.027*** |
| | | | | (0.001) | | | | | (0.002) |
| Non-EEA cpty | | | | | −1.348*** | | | | −1.198*** |
| | | | | | (0.001) | | | | (0.001) |
| intragroup | | | | | | −2.359*** | | | −2.136*** |
| | | | | | | (0.004) | | | (0.004) |
| financial nature | | | | | | | 1.006*** | | 0.926*** |
| | | | | | | | (0.006) | | (0.007) |
| tradingcapacity | | | | | | | | 0.040*** | 0.185*** |
| | | | | | | | | (0.014) | (0.014) |
| Constant | 0.254*** | −0.472*** | −18.719*** | 0.504*** | 0.495*** | 0.312*** | −0.713*** | 0.215*** | −30.501*** |
| | (0.002) | (0.005) | (0.139) | (0.003) | (0.003) | (0.003) | (0.007) | (0.014) | (0.179) |
| Monthly fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 |
| McFadden's $R^2$ | 0.014 | 0.019 | 0.017 | 0.019 | 0.186 | 0.161 | 0.019 | 0.014 | 0.290 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 66: Robustness checks for fixed effects – Hypothesis 7 (Credit)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| log(prev.notional) | −0.025*** | −0.022*** | −0.023*** | −0.028*** | −0.015*** | −0.028*** | −0.028*** | −0.022*** | −0.028*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Constant | −0.463*** | −1.064*** | −4.530 | −0.505*** | −5.595 | −1.033*** | −4.653 | −5.808 | −0.611*** |
| | (0.007) | (0.012) | (14.529) | (0.009) | (14.583) | (0.013) | (14.344) | (23.022) | (0.025) |
| Monthly FE | No | No | No | Yes | No | Yes | Yes | Yes | No |
| Type FE | No | Yes | No | No | Yes | Yes | No | Yes | No |
| Country FE | No | No | Yes | No | Yes | No | Yes | Yes | No |
| Type-month FE | No | No | No | No | No | No | No | No | Yes |
| Observations | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 |
| McFadden's $R^2$ | 0.005 | 0.009 | 0.033 | 0.018 | 0.037 | 0.022 | 0.046 | 0.050 | 0.026 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 67: Robustness checks for controls – Hypothesis 7 (Credit)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| log(prev.notional) | −0.028*** | −0.032*** | −0.029*** | −0.018*** | −0.023*** | 0.040*** | −0.027*** | −0.028*** | 0.027*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.001) | (0.000) | (0.000) | (0.001) |
| log(eurnotional) | | 0.143*** | | | | | | | 0.143*** |
| | | (0.001) | | | | | | | (0.001) |
| maturityyear | | | −0.006*** | | | | | | −0.023*** |
| | | | (0.000) | | | | | | (0.000) |
| clearingobligation | | | | −0.721*** | | | | | −0.414*** |
| | | | | (0.003) | | | | | (0.003) |
| Non-EEA cpty | | | | | −0.208*** | | | | 0.125*** |
| | | | | | (0.003) | | | | (0.003) |
| intragroup | | | | | | −2.744*** | | | −2.755*** |
| | | | | | | (0.020) | | | (0.020) |
| financial nature | | | | | | | 1.117*** | | 1.042*** |
| | | | | | | | (0.019) | | (0.020) |
| tradingcapacity | | | | | | | | −0.194*** | 0.039* |
| | | | | | | | | (0.022) | (0.023) |
| Constant | −1.033*** | −3.190*** | 11.613*** | −0.642*** | −1.083*** | −2.703*** | −2.143*** | −0.840*** | 41.198*** |
| | (0.013) | (0.017) | (0.353) | (0.014) | (0.013) | (0.018) | (0.023) | (0.026) | (0.479) |
| Monthly fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Type fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 |
| McFadden's $R^2$ | 0.022 | 0.055 | 0.022 | 0.059 | 0.026 | 0.151 | 0.025 | 0.022 | 0.205 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 68: Robustness checks for fixed effects – Hypothesis 7 (Interest Rate)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| log(previousnotional) | −0.009*** | 0.015*** | 0.003*** | −0.010*** | 0.021*** | 0.015*** | 0.002*** | 0.021*** | 0.015*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Constant | 0.180*** | −0.457*** | 0.560*** | 0.238*** | 0.203 | −0.407*** | 0.574*** | 0.199 | −0.429*** |
| | (0.004) | (0.005) | (0.157) | (0.005) | (0.158) | (0.006) | (0.157) | (0.158) | (0.008) |
| Monthly FE | No | No | No | Yes | No | Yes | Yes | Yes | No |
| Type FE | No | Yes | No | No | Yes | Yes | No | Yes | No |
| Country FE | No | No | Yes | No | Yes | No | Yes | Yes | No |
| Type-month FE | No | No | No | No | No | No | No | No | Yes |
| Observations | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 |
| McFadden's $R^2$ | 0.001 | 0.016 | 0.022 | 0.004 | 0.031 | 0.020 | 0.025 | 0.035 | 0.021 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 69: Robustness checks for controls – Hypothesis 7 (Interest Rate)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| log(prev.notional) | 0.015*** | 0.012*** | 0.014*** | 0.015*** | 0.028*** | 0.042*** | 0.011*** | 0.015*** | 0.037*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| log(eurnotional) | | 0.046*** | | | | | | | 0.019*** |
| | | (0.000) | | | | | | | (0.000) |
| maturityyear | | | 0.008*** | | | | | | 0.013*** |
| | | | (0.000) | | | | | | (0.000) |
| clearingobligation | | | | −0.220*** | | | | | 0.057*** |
| | | | | (0.001) | | | | | (0.002) |
| Non-EEA cpty | | | | | −1.425*** | | | | −1.236*** |
| | | | | | (0.001) | | | | (0.002) |
| intragroup | | | | | | −2.412*** | | | −2.083*** |
| | | | | | | (0.004) | | | (0.004) |
| financial nature | | | | | | | 0.920*** | | 0.726*** |
| | | | | | | | (0.007) | | (0.008) |
| tradingcapacity | | | | | | | | −0.015 | 0.054*** |
| | | | | | | | | (0.014) | (0.015) |
| Constant | −0.407*** | −1.100*** | −16.140*** | −0.181*** | −0.575*** | −0.922*** | −1.227*** | −0.393*** | −28.180*** |
| | (0.006) | (0.007) | (0.139) | (0.006) | (0.006) | (0.007) | (0.009) | (0.015) | (0.179) |
| Monthly fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Type fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 |
| McFadden's $R^2$ | 0.020 | 0.025 | 0.022 | 0.024 | 0.209 | 0.172 | 0.023 | 0.020 | 0.303 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 70: Robustness checks for fixed effects – Hypothesis 8 (Credit)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| prev.tradescleared | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Constant | −1.406*** | −1.598*** | −4.819 | −1.709*** | −6.185 | −1.886*** | −5.253 | −6.604 | −1.330*** |
| | (0.002) | (0.009) | (14.622) | (0.005) | (23.387) | (0.010) | (14.423) | (23.034) | (0.023) |
| Monthly FE | No | No | No | Yes | No | Yes | Yes | Yes | No |
| Type FE | No | Yes | No | No | Yes | Yes | No | Yes | No |
| Country FE | No | No | Yes | No | Yes | No | Yes | Yes | No |
| Type-month FE | No | No | No | No | No | No | No | No | Yes |
| Observations | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 |
| McFadden's $R^2$ | 0.069 | 0.089 | 0.108 | 0.087 | 0.121 | 0.108 | 0.127 | 0.141 | 0.112 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 71: Robustness checks for controls – Hypothesis 8 (Credit)

| | | | | | cleared | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| prev.tradescleared | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| log(eurnotional) | | 0.157*** | | | | | | | 0.151*** |
| | | (0.001) | | | | | | | (0.001) |
| maturityyear | | | −0.015*** | | | | | | −0.025*** |
| | | | (0.000) | | | | | | (0.000) |
| clearingobligation | | | | −0.490*** | | | | | −0.272*** |
| | | | | (0.003) | | | | | (0.004) |
| Non-EEA cpty | | | | | −0.276*** | | | | 0.038*** |
| | | | | | (0.003) | | | | (0.003) |
| intragroup | | | | | | −2.408*** | | | −2.483*** |
| | | | | | | (0.020) | | | (0.021) |
| financial nature | | | | | | | 0.477*** | | 0.595*** |
| | | | | | | | (0.019) | | (0.019) |
| tradingcapacity | | | | | | | | −0.640*** | −0.230*** |
| | | | | | | | | (0.022) | (0.022) |
| Constant | −1.709*** | −4.115*** | 29.422*** | −1.149*** | −1.558*** | −1.469*** | −2.173*** | −1.071*** | 46.670*** |
| | (0.005) | (0.012) | (0.376) | (0.006) | (0.005) | (0.005) | (0.019) | (0.023) | (0.477) |
| Monthly fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 |
| McFadden's $R^2$ | 0.087 | 0.124 | 0.091 | 0.102 | 0.094 | 0.173 | 0.087 | 0.087 | 0.224 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 72: Robustness checks for fixed effects – Hypothesis 8 (Interest Rate)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| previoustradescleared | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Constant | −0.104*** | −0.146*** | 0.601*** | −0.083*** | 0.553*** | −0.204*** | 0.569*** | 0.445*** | −0.131*** |
| | (0.001) | (0.002) | (0.157) | (0.002) | (0.157) | (0.003) | (0.157) | (0.157) | (0.006) |
| Monthly FE | No | No | No | Yes | No | Yes | Yes | Yes | No |
| Type FE | No | Yes | No | No | Yes | Yes | No | Yes | No |
| Country FE | No | No | Yes | No | Yes | No | Yes | Yes | No |
| Type-month FE | No | No | No | No | No | No | No | No | Yes |
| Observations | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 |
| McFadden's $R^2$ | 0.000 | 0.023 | 0.023 | 0.004 | 0.037 | 0.027 | 0.027 | 0.041 | 0.028 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 73: Robustness checks for controls – Hypothesis 8 (Interest Rate)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| prev.tradescleared | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | −0.000*** | 0.000*** | 0.000*** | 0.000*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| log(eurnotional) | | 0.040*** | | | | | | | 0.020*** |
| | | (0.000) | | | | | | | (0.000) |
| maturityyear | | | 0.008*** | | | | | | 0.014*** |
| | | | (0.000) | | | | | | (0.000) |
| clearingobligation | | | | −0.216*** | | | | | 0.044*** |
| | | | | (0.001) | | | | | (0.002) |
| Non-EEA cpty | | | | | −1.375*** | | | | −1.214*** |
| | | | | | (0.001) | | | | (0.001) |
| intragroup | | | | | | −2.385*** | | | −2.119*** |
| | | | | | | (0.004) | | | (0.004) |
| financial nature | | | | | | | 0.742*** | | 0.859*** |
| | | | | | | | (0.006) | | (0.007) |
| tradingcapacity | | | | | | | | −0.214*** | 0.125*** |
| | | | | | | | | (0.014) | (0.014) |
| Constant | −0.083*** | −0.739*** | −16.711*** | 0.145*** | 0.285*** | 0.183*** | −0.793*** | 0.130*** | −30.078*** |
| | (0.002) | (0.005) | (0.138) | (0.003) | (0.003) | (0.003) | (0.007) | (0.014) | (0.178) |
| Monthly fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 |
| McFadden's $R^2$ | 0.004 | 0.008 | 0.007 | 0.008 | 0.191 | 0.158 | 0.006 | 0.004 | 0.290 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 74: Robustness checks for fixed effects – Hypothesis 8 (Credit)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| log(prev.not.cleared) | 0.066*** | 0.141*** | 0.141*** | 0.067*** | 0.164*** | 0.144*** | 0.142*** | 0.167*** | 0.147*** |
| | (0.000) | (0.001) | (0.001) | (0.000) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Constant | −2.579*** | −4.366*** | −4.819 | −2.712*** | −7.993 | −4.515*** | −5.031 | −8.223 | −4.349*** |
| | (0.010) | (0.017) | (14.622) | (0.011) | (23.387) | (0.018) | (14.503) | (23.186) | (0.030) |
| Monthly FE | No | No | No | Yes | No | Yes | Yes | Yes | No |
| Type FE | No | Yes | No | No | Yes | Yes | No | Yes | No |
| Country FE | No | No | Yes | No | Yes | No | Yes | Yes | No |
| Type-month FE | No | No | No | No | No | No | No | No | Yes |
| Observations | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 |
| McFadden's $R^2$ | 0.038 | 0.099 | 0.104 | 0.050 | 0.127 | 0.110 | 0.114 | 0.138 | 0.114 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 75: Robustness checks for controls – Hypothesis 8 (Credit)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| log(prev.not.cleared) | 0.144*** | 0.140*** | 0.147*** | 0.127*** | 0.141*** | 0.110*** | 0.146*** | 0.147*** | 0.107*** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.000) | (0.001) | (0.001) | (0.000) |
| log(eurnotional) | | 0.133*** | | | | | | | 0.137*** |
| | | (0.001) | | | | | | | (0.001) |
| maturityyear | | | −0.010*** | | | | | | −0.025*** |
| | | | (0.000) | | | | | | (0.000) |
| clearingobligation | | | | −0.641*** | | | | | −0.345*** |
| | | | | (0.003) | | | | | (0.004) |
| Non-EEA cpty | | | | | −0.280*** | | | | 0.053*** |
| | | | | | (0.003) | | | | (0.003) |
| intragroup | | | | | | −2.564*** | | | −2.620*** |
| | | | | | | (0.020) | | | (0.021) |
| financial nature | | | | | | | −0.465*** | | −0.075*** |
| | | | | | | | (0.029) | | (0.026) |
| tradingcapacity | | | | | | | | −1.511*** | −0.847*** |
| | | | | | | | | (0.029) | (0.026) |
| Constant | −4.515*** | −6.538*** | 16.253*** | −3.600*** | −4.353*** | −3.907*** | −4.092*** | −3.073*** | 46.667*** |
| | (0.018) | (0.021) | (0.367) | (0.017) | (0.018) | (0.015) | (0.030) | (0.031) | (0.496) |
| Monthly fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Type fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 | 1,814,047 |
| McFadden's $R^2$ | 0.110 | 0.136 | 0.112 | 0.137 | 0.118 | 0.221 | 0.110 | 0.112 | 0.264 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 76: Robustness checks for fixed effects – Hypothesis 8 (Interest Rate)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| log(prev.not.cleared) | 0.032*** | 0.079*** | 0.062*** | 0.032*** | 0.103*** | 0.080*** | 0.063*** | 0.104*** | 0.080*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Constant | −0.899*** | −1.926*** | −0.137 | −0.884*** | −1.862*** | −1.923*** | −0.161 | −1.930*** | −1.954*** |
| | (0.003) | (0.005) | (0.163) | (0.004) | (0.176) | (0.005) | (0.165) | (0.178) | (0.008) |
| Monthly FE | No | No | No | Yes | No | Yes | Yes | Yes | No |
| Type FE | No | Yes | No | No | Yes | Yes | No | Yes | No |
| Country FE | No | No | Yes | No | Yes | No | Yes | Yes | No |
| Type-month FE | No | No | No | No | No | No | No | No | Yes |
| Observations | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 |
| McFadden's $R^2$ | 0.013 | 0.056 | 0.048 | 0.016 | 0.078 | 0.060 | 0.052 | 0.081 | 0.060 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 77: Robustness checks for controls – Hypothesis 8 (Interest Rate)

| | cleared | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| log(prev.not.cleared) | 0.080*** | 0.078*** | 0.080*** | 0.078*** | 0.088*** | 0.071*** | 0.079*** | 0.081*** | 0.079*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| log(eurnotional) | | 0.035*** | | | | | | | 0.009*** |
| | | (0.000) | | | | | | | (0.000) |
| maturityyear | | | 0.008*** | | | | | | 0.013*** |
| | | | (0.000) | | | | | | (0.000) |
| clearingobligation | | | | −0.158*** | | | | | 0.104*** |
| | | | | (0.001) | | | | | (0.002) |
| Non-EEA cpty | | | | | −1.471*** | | | | −1.285*** |
| | | | | | (0.001) | | | | (0.002) |
| intragroup | | | | | | −2.323*** | | | −1.971*** |
| | | | | | | (0.004) | | | (0.004) |
| financial nature | | | | | | | 0.232*** | | 0.175*** |
| | | | | | | | (0.008) | | (0.009) |
| tradingcapacity | | | | | | | | −0.554*** | −0.320*** |
| | | | | | | | | (0.015) | (0.015) |
| Constant | −1.923*** | −2.448*** | −18.294*** | −1.711*** | −1.914*** | −1.588*** | −2.121*** | −1.389*** | −27.284*** |
| | (0.005) | (0.007) | (0.142) | (0.006) | (0.006) | (0.006) | (0.009) | (0.016) | (0.182) |
| Monthly fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Type fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 | 4,231,413 |
| McFadden's $R^2$ | 0.060 | 0.063 | 0.062 | 0.062 | 0.256 | 0.194 | 0.060 | 0.060 | 0.330 |
| *Notes:* | ***Significant at the 1 percent level.<br>**Significant at the 5 percent level.<br>*Significant at the 10 percent level. | | | | | | | | |

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