Essays on Banks' Tax Response

Inauguraldissertation

zur

Erlangung des Doktorgrades

der

Wirtschafts- und Sozialwissenschaftlichen Fakultät

der

Universität zu Köln

2015

vorgelegt

von

Dipl. Kffr. Julia Anna Merz

aus Stuttgart

Referent: Prof. Dr. Michael Overesch
Koreferent: Prof. Dr. Thomas Hartmann-Wendels
Tag der mündl. Prüfung: 02. Juni 2015

Contents

Chapter 1

Motivation and research questions

Contents

1. Motivation

When American investment bank Lehman Brothers filed for bankruptcy in September 2009, common perceptions about the financial sector had to be revaluated. "Too big to fail", a concept taken to be irrevocable for decades, had suddenly become outdated. The following worldwide financial crisis affected not only banks but whole economies and led to fundamental questioning of banks' business practices and their impact on global economies. Many countries were forced to bail out credit institutions and bear the burden of crisis related costs. At the same time tax revenues declined due to shrinking economies.[1] As a result many countries discussed how to influence banks' business practices and refinance crisis related costs. Governments' options can be grouped into either regulatory or tax measures. Keen (2011) provides a theoretical analysis of the interaction between regulation and taxation building on a seminal study by Weitzman (1974). Whereas in theory tax and regulation policies may be considered as perfect substitutes, practical considerations suggest that both policy instruments should be used.

As for regulatory measures, various single country restrictions were imposed. In addition the Basel III package (BCBS 2010) increased both liquidity and capital requirements for its adopters. However, implementing efficient tax measures is not as straight forward and bears the risk of undesired distortions. Promoted by the IMF, bank levies of a Pigouvian rationale have been adopted in a number of countries, in varying forms. First evidence on banks' response, however, is mixed (Devereux et al. 2013).

[1] Germany reported a decrease of tax revenue by 6,6% in 2009.

Another measure seriously considered in the European Union is a financial transaction tax. However, its effect is still controversial. Supporters claim taxing transactions between banks will lead to less short-term speculative trading and more value-oriented investments. In contrast, opponents state that it will disrupt market efficiency and as differentiation is impossible the would not only be levied on "harmful" transactions but also on "normal" transactions. In addition it should be noted that the tax will only affect banks' behavior if a worldwide concept prevents them from using loopholes, such as relocation of business. As a result the proposal was not yet implemented.[2]

Nevertheless, apart from new taxes yet to be installed, the current tax system should give some insight on the status quo of banks' tax response and could help policy makers design the most efficient tax instruments. Current empirical evidence on financial institutions' tax response is scarce (Huizinga et al. 2014; de Mooij and Keen 2012). However, it suggests banks being similarly aggressive to non-financial firms, which have been at the heart of the recent debate on Base Erosion and Profit Shifting (OECD 2013). Hence, publicly available information on banks' multinational structure, profit reporting and location choices enable researchers to evaluate empirically how these choices are influenced by taxation.

This thesis consists of three essays examining banks' tax response. The first essay *Tax vs. Regulation Policy and the Location of Financial Sector FDI* is co-authored with Prof. Dr. Michael Overesch, Chair of Business Taxation at the University of Cologne and Prof. Dr. Georg Wamser, Chair of Public Finance at the University of Tuebingen. It aims to investigate how taxation and

[2] As for the EU, following an agreement of the Finance Ministers a proposal was set out in February 2013. However, a final agreement has been postponed.

regulatory constraints influence German banks' decision to locate branches or subsidiaries in specific countries.

In the second essay *Profit Shifting and Tax Response of Multinational Banks*, co-authored with Prof. Dr. Michael Overesch, Chair of Business Taxation at the University of Cologne, we evaluate if banks engage in profit shifting and estimate the extent. In additional analysis we test different profit components for their tax elasticity. Finally, we test often suspected shifting channels, such as leverage and loan loss provisions, to support our results. The paper is currently in the second round of revision at the *Journal of Banking and Finance.* The paper was presented at the 3rd *EIASM Workshop on Current Research in Taxation 2013*, the *37th European Accounting Association Annual Congress 2014*, the *76. Jahrestagung des Verbands der Hochschullehrer für Betriebswirtschaft (VHB) 2014*, the *IIPF Doctoral School 2014 in Oxford* and the *Annual MaTax Conference 2014*.

The thesis concludes with an essay on recapitalized banks. *Tax Aggressiveness vs. Capital Injections - Can Banks Have It All?* is based on a working paper with MSc. Tanja Herbert, doctoral research assistant at the chair of business taxation at the University of Cologne. Using a hand-collected data set we analyze the change in tax aggressiveness of banks caused by capital injections during the financial crisis. We thereby measure the effect government influence had on banks' tax aggressiveness. The paper was presented at the *PhD Seminar on Taxation 2015* at the Freie Universität Berlin.

2. Tax vs. Regulation Policy and the Location of Financial Sector FDI

2.1 Research question and design

The essay *Tax vs. Regulation Policy and the Location of Financial Sector FDI* analyzes how corporate taxation and regulatory requirements affect the location of financial sector FDI. Previous literature has provided vast evidence of host country determinants for financial sector FDI. Namely, distance (Focarelli and Pozzolo 2005; Buch and Lipponer 2007; Claessens and van Horen 2014), bilateral trade (Brealey and Kaplanis 1996; Yamori 1998; Buch 2000; Berger et al. 2004; Focarelli and Pozzolo 2001, 2005) and host country characteristics such as market size and GDP per capita (Yamori 1998; Buch 2000; Claessens et al. 2001; Cerruti et al. 2007) were identified as drivers. Moreover, since the financial sector is a particularly regulated industry, a high level of regulation is seen as an additional cost and therefore associated with a negative effect on foreign activity (Buch 2003; Buch and Lipponer 2007; Tsai et al. 2011).

A consequence of firms' multinational structure is the increased opportunity to allocate profits in favorable destinations. Firms without international activities are rather limited in their opportunities to optimize their tax burden. Therefore, taxation should be considered as an additional incentive when analyzing FDI. While for some destinations the incentive might be clearly tax driven, others like Ireland or Luxembourg offer a mixed spectrum of incentives for banks. Hence, to distinguish between both incentives should give valuable insights on what attracts banking FDI.

We conduct estimates on own- and cross-elasticities by using a mixed logit estimation approach. Derived elasticities indicate how a change in tax and/or

regulation policy of one country affects not only the probability that this country is chosen as a location, but also how this affects the location probabilities of other countries. We then include a measure for bank secrecy in our analysis to account for banks' incentive to follow customers to specific locations.

We use financial services FDI data provided by Deutsche Bundesbank (the German central bank). This data allows us to identify establishments of German multinationals in 150 countries between 2000 and 2012. Our sample includes 839 MNCs that establish in total 3,790 new financial sector entities in 83 host countries. Tax data and regulatory indices are collected from various sources (Global Tax Handbook, KPMG, World Development Indicator).

2.2 Results and contribution to literature

Our results indicate banks being highly sensitive to tax rates and the regulatory framework when investing in foreign countries. Using a mixed logit estimation approach, we find a significant impact of tax and regulation variables on location probabilities. A higher tax as well as a stricter regulation at the host country level is associated with less financial sector FDI. In addition, the estimation of cross-elasticities gives us insights in how policy changes affect the location probabilities of other countries. Another important finding of our analysis is that own- as well as cross-elasticities are estimated to be highly heterogeneous across firms and countries. Thus, tax and regulation policy may be used to attract financial sector FDI. In an additional analysis we find that banks do not only consider their own tax advantage, but also follow their customers to locations offering favorable conditions for them.

This essay contributes to a small number of studies that have investigated the influence of host country taxes on banking FDI (Claessens et al. 2001; Huizinga et al. 2014)

A second string of literature examines how financial sector FDI is affected by regulation policy (e.g., Buch and Lipponer 2007; Tsai et al. 2011). Yet, we are notably the first study to use a discrete choice model in this context.

3. Profit Shifting and Tax Response of Multinational Banks

3.1 Research question and design

The essay *Profit Shifting and Tax Response of Multinational Banks* explores the impact of taxation on banks' reported profits and attempts to identify possible profit-shifting channels. While profits of a subsidiary are determined by several factors like the size of the economic activities, a systematic impact of tax incentives on reported profits can be interpreted as indirect evidence for profit shifting.

In accordance with international tax principles each subsidiary of a multinational bank is subject to tax in its country of residence. Taxable profits are separately determined for each subsidiary. Therefore, international differences in tax rates provide an incentive to adopt strategies that are associated with profit shifting from high-taxed to low-taxed subsidiaries to minimize the overall tax payments. Previous literature has found striking evidence for profit shifting of non-financial multinationals (Hines and Rice 1994; Huizinga and Laeven 2008). However, evidence on banks' profit shifting is still scarce (Demirgüc-Kunt and Huizinga 2001; Huizinga et al. 2014).

First, we investigate the tax elasticity of subsidiary-level earnings before taxes to statutory tax rates within a multinational bank. In accordance with prior literature our regressions use a set of control variables to single out the tax effect. In addition we test for possible restrictions banks face when shifting their profits such as transfer pricing regulation and capital constraints.

In the second part of the paper we attempt to identify possible profit-shifting channels. Therefore, we trace the tax sensitivity of different profit components such as interest income and trading gains.

We then test for the tax influence on potentially important profit-shifting tools. So far, a number of accounting studies (Greenawalt and Sinkey 1988; Beatty et al. 1995; Collins et al. 1995; Balboa et al. 2013) have analyzed loan loss provisions (LLPs) as a managerial tool in the banking industry. Tax treatment for loan loss provisions varies among countries with some allowing taxable deduction and some prohibiting them. However, all countries have in common that a deduction for tax purposes is possible in case the debt becomes default. Therefore, a strong incentive to place high risk debt in high-tax jurisdictions can be assumed. We use LLPs as a proxy for the allocation of credits with a high default risk and test for their tax sensitivity.

We then focus on debt as a tool to shift profits. Deductibility of interest payments creates a clear incentive to shift profits via intracompany debt. Previous studies document a tax effect on financial decisions of non-financial multinationals (Desai et al. 2004; Huizinga et al. 2008; for a survey Feld et al. 2013). We determine the marginal tax effect on capital structures similar to previous evidence (Keen and de Mooij 2012; de Mooij and Heckemeyer 2013).

Our data covers 2 136 bank groups for the years 2001-2012. The data used is partly from Bureau van Dijk's Bankscope database; tax data is hand-collected from various sources (Global tax handbooks, KPMG, PwC).

3.2 Results and contribution to literature

The results of our study confirm that banks do engage in profit shifting. Interestingly, the estimated coefficients are considerably higher than for non-financial multinationals in similar settings. Investigating heterogeneity among profit components, we find several tax sensitive profit components and that tax elasticity differs across business types.

When analyzing possible shifting channels we find the accrual of loan loss provisions to be significantly higher in high-tax jurisdictions. Our results suggest that discretionary accrual of loan loss provisions is, in fact, driven by tax incentives associated with the deduction of losses from default credits.

Finally, we find a significant positive effect of host country taxes on debt financing of bank subsidiaries. This indicates that banks do adjust their leverage ratio for tax purposes, although this is limited in case of regulatory constraints. Yet, our results suggest that the magnitude of the tax response via capital structures is significantly smaller in the banking sector compared to previous findings for non-financial multinationals.

The essay mainly contributes to two strings of literature. First, we add to previous studies analyzing profit-shifting activities of multinational companies (for a review cf. Heckemeyer and Overesch 2013). Second, we make a distinct contribution to a growing number of studies investigating banks' tax response (Demirgüc-Kunt and Huizinga 2001; Huizinga et al. 2014). We add to this

literature by analyzing the heterogeneity of profit components. Moreover, we present evidence on possible shifting channels and link the importance of transfer-pricing regulation to banks' tax response.

4. Capital Injections and Aggressive Tax Planning - Can Banks Have It All?

4.1 Research question and design

The essay *Capital Injections and Aggressive Tax Planning – Can Banks Have It All?* analyzes the impact of capital injections on banks' tax aggressiveness. During the recent financial crisis a number of financial institutions received public funds. The characteristics varied by country and included guarantees, asset purchases and capital injections. Almost all countries tied conditions to receiving such funds. However, none of these conditions targeted tax aggressiveness. Nevertheless, we hypothesize that banks will reduce their tax aggressiveness when receiving capital by the respective government. We derive this assumption from previous studies reporting changes in tax aggressiveness in cases of state ownership (Desai et al. 2007; Desai and Dharmapala 2008). However, evidence on governments' influence in connection with recapitalization is so far mixed. Whereas changes in lending behavior can be associated with receiving capital injections (Mariathasan and Merrouche 2012; Brei et al., 2013), banks' risk taking seems to have been unaffected (Brei and Gadanecz 2012).

In the first part of the essay we employ propensity score matching (PSM) to create a sufficient control group. Since treatment status is not random, PSM is the best option to obtain a control group as similar to our treated group as possible. We then measure the effect of the recapitalization treatment by

comparing the change in tax aggressiveness of the treatment group between 2007 and 2011 to the counterfactual trend of the control group in absence of the recapitalization. By combining the strength of propensity score matching and difference-in-differences analysis towards causal inference our analysis is robust to selection on observables and unobserved time effects (Heckman et al. 1998)

The essay concludes with a series of robustness tests. To avoid distortion stemming from our event window, we conduct tests using the year 2010 instead of 2011. Moreover, we evaluate effects for subsamples.

Our empirical analysis is based on unique hand-collected data on capital injections in 10 OECD countries. It covers 93 banks, receiving funds in 2008 and/or 2009. Our control group, which did not receive government support, consists of 763 banks in the respective countries. Data on capital injections is hand-collected. Financial statements were derived from Bankscope database, whereas tax data is hand-collected from various sources (Global tax handbooks, KPMG, PwC).

4.2 Results and contribution to literature

The results of our analysis indicate that capital injections had a limiting effect on banks' tax aggressiveness. Difference-in-differences analysis provides significant evidence that recapitalized banks' tax aggressiveness diminished after the crisis. We attribute this finding to governments' underlying influence as shareholders and the increased attention for banks' moral behavior. Our analysis shows that even though banks' tax behavior was not addressed when supporting capital was paid, a voluntary reduction took place. In addition, we

find that banks' receiving public funds had significantly lower ETRs in 2007. Various robustness tests using a different event window and a number of matching methods support our results. A split of our sample suggests that the limiting effect was especially pronounced in Europe. When testing for a solely US sample we do not find a significant effect.

In the light of the recent financial crisis this paper contributes to an increasing number of studies focusing on recapitalized banks and their characteristics. Within this area we especially add to studies analyzing banks' behavior after receiving public funds (Panetta et al. 2009; Mariathasan and Merrouche 2012; Brei et al. 2013). Furthermore, our essay contributes to accounting literature using the effective tax rate as a measure for tax aggressiveness (Hanlon and Heitzman 2010) and to studies investigating governments' influence as shareholders (Desai et al. 2007; Desai and Dharmapala 2008). Notably we are the first to link recapitalizations and banks' tax aggressiveness.

References

Balboa, M., López-Espinosa G. and Rubia, A. (2013). Nonlinear Dynamics in Discretionary Accruals: An Analysis of Bank Loan-Loss Provisions, *Journal of Banking and Finance* **37**, 5186–5207.

Basel Committee on Banking Supervision (2010). The Basel Committee's Response to the Financial Crisis: Report to the G20, Bank for International Settlements.

Beatty, A., Chamberlain, S., Magliolo, J., (1995). Managing Financial Reports of Commercial Banks: the Influence of Taxes, Regulatory Capital, and Earnings, *Journal of Accounting Research* **33**(2), 231–261.

Berger, A.N., Buch, C.M., DeLong, G. and DeYoung, R. (2004). Exporting Financial Institutions Management via Foreign Direct Investment Mergers and Acquisitions, *Journal of International Money and Finance* **23**, 333–366.

Brealey, R.A. and Kaplanis, E.C. (1996). The Determination of Foreign Banking Location, *Journal of International Money and Finance* **15**, 577–597.

Brei, M., Gambacorta, L. and von Peter, G. (2013). Rescue Packages and Bank Lending, *Journal of Banking and Finance* **37**, 490–505.

Brei, M. and Gadanecz, B. (2012). Public Recapitalizations and Bank Risk: Evidence from Loan Spreads and Leverage, BIS Working Papers No. 383.

Buch, C.M. (2000). Information or Regulation: What Is Driving the International Activities of Commercial Banks?, Kiel Working Paper No. 1011.

Buch, C.M. and Lipponer, A. (2007). FDI versus Exports: Evidence from German Banks, *Journal of Banking & Finance* **31,** 805–826.

Cerrutti, E., Dell'Ariccia, G. and Martínez Pería, M.S. (2007). How Banks go Abroad: Branches or Subsidiaries?, *Journal of Banking & Finance* **31**, 1669–1692.

Chen, S., Chen, X., Cheng, Q. and Shevlin, T. (2010). Are Family Firms more Tax Aggressive than Non-Family Firms?, *Journal of Financial Economics* **95**, 41–61.

Claessens, S., Demirgüç-Kunt, A. and Huizinga, H. (2001). How does foreign bank entry affect domestic banking markets?, *Journal of Banking & Finance* **25**, 891–911.

Claessens, S. and Van Horen, N. (2014). Location Decisions of Foreign Banks and Competitor Remoteness, *Journal of Money, Credit and Banking* **46**(1), 145–170.

Collins, J., Shackelford D. and Wahlen J. (1995). Bank Differences in the Coordination of Regulatory Capital, Earnings and Taxes, *Journal of Accounting Research* **33**(2), 263–292.

Demirgüc-Kunt, A. and Huizinga, H.P. (2001). The Taxation of Domestic and Foreign Debt, *Journal of Public Economics* **79**(3), 429-453.

De Mooij, R. and Heckemeyer, J.H. (2013). Taxation and Corporate Debt: Are Banks any Different?, IMF, Working Paper 13/221.

Desai, M.A., Foley, C.F. and Hines, J.R. (2004). A Multinational Perspective on Capital Structure Choice and Internal Capital Markets, *Journal of Finance* **59**(6), 2451–2487.

Desai, M., Dyck, A. and Zingales, L. (2007). Theft and Taxes, *Journal of Financial Economics* **84**, 591–623.

Desai, M. and Dharmapala, D. (2008). Tax and Corporate Governance: An Economic Approach, in W. Schön, (ed.), Tax and Corporate Governance, Springer-Verlag, Berlin, pp. 13–30.

Devereux, M., Johannesen, N. and Vella, J. (2013). Can Taxes Tame the Banks? Evidence from European Bank Levies, Oxford University Center for Business Taxation, Working Paper 13/25.

Feld, L., Heckemeyer, J. and Overesch, M. (2013). Capital Structure Choice and Company Taxation: A Meta-Study, *Journal of Banking and Finance* **37**, 2850–2866.

Finke, K. (2014). What is the Scale of Tax Avoidance? Evidence from a Propensity Score Matching Approach, Working Paper.

Focarelli, D. and Pozzolo, A.F. (2001). The Patterns of Cross-Border Bank Mergers and Shareholdings in OECD Countries, *Journal of Banking & Finance* **25**, 2305–2337.

Focarelli, D. and Pozzolo, A.F. (2005). Where Do Banks Expand Abroad? An Empirical Analysis, *Journal of Business* **78**(6), 2435–2463.

Greenawalt, M.B. and Sinkey, J.F. (1988). Bank Loan-Loss Provisions and the Income-Smoothing Hypothesis: An Empirical Analysis, *Journal of Financial Services Research* **1**, 1976–1984.

Hanlon, M. and Heitzman, S. (2010). A Review of Tax Research, *Journal of Accounting and Economics* **50**, 127–178.

Heckemeyer, J. and Overesch, M. (2013). Multinationals' Profit Response to Tax Differentials: Effect Size and Shifting Channels, University of Cologne, Working Paper.

Heckman, J., Ichimura, H., and Todd, P. (1998). Matching as an Econometric Evaluation Estimator, *Review of Economic Studies* **65**, 261–294.

Hines, R. and Rice, E. (1994). Fiscal Paradise: Foreign Tax Havens and American business, *Quarterly Journal of Economics* **109**(1), 149–182.

Huizinga, H. and Laeven, L. (2008). International Profit Shifting within Multinationals: A Multi-Country Perspective, *Journal of Public Economics* **92**(5-6), 1164–1182.

Huizinga, H., Laeven, L. and Nicodème, G. (2008). Capital Structure and International Debt Shifting in Europe, *Journal of Financial Economics* **88**, 80–118.

Huizinga, H.P., Voget, J. and Wagner, W.B. (2014). International Taxation and Cross-Border Banking, *American Economic Journal: Economic Policy* **6**(2), 94–125.

Keen, M. (2011). The Taxation and Regulation of Banks, IMF Working Paper 11/206.

Keen, M. and de Mooij, R. (2012). Debt, Taxes, and Banks, International Monetary Fund, Working Paper.

Laeven, L. and Majnoni, G. (2003). Loan Loss Provisioning and Economic Slowdowns: Too Much, Too Late?, *Journal of Financial Intermediation* **12**(2), 178–197.

Mariathasan, M. and Merrouche, O. (2012). Recapitalization, Credit and Liquidity, *Economic Policy* **27**(72), 603–646.

OECD (2013). Action Plan on Base Erosion and Profit Shifting, OECD Publishing.

Panetta, F., Faeh, T. and Grande, G. (2009). An Assessment of Financial Sector Rescue Programmes, BIS Working Papers No. 48.

Tsai, H., Chang, Y. and Hsiao, P. (2011). What Drives Foreign Expansion of the Top 100 Multinational Banks? The Role of the Credit Reporting System, *Journal of Banking & Finance* **35**, 588–605.

Weitzman, M. (1974). Prices vs. Quantities, *Review of Economic Studies* **41**, 477–491.

Yamori, N. (1998). A Note on the Location Choice of Multinational Banks: The Case of Japanese Financial Institutions, *Journal of Banking & Finance* **22**: 109–120.

Chapter 2

Tax vs. Regulation Policy and the Location of Financial Sector FDI

Tax vs. Regulation Policy and the Location of Financial Sector FDI

Julia Merz[*]
University of Cologne

Michael Overesch[**]
University of Cologne

Georg Wamser[***]
University of Tübingen

Abstract: This paper analyzes how corporate taxation and regulatory requirements affect the location of financial sector FDI. We use novel information on new financial services entities established by German multinational firms in 83 host countries. We find a negative effect of host country taxes on the probability to choose a particular host location. We can also confirm a significant influence of the regulatory environment. For example, stricter (equity) capital requirements negatively affect location probabilities. Our empirical approach allows us to provide new insights in how a policy measure of a given country affects other countries by estimating cross-country tax and regulation elasticities.

Keywords: Financial Sector Taxation, Multinational Banks, Corporate Taxation, Mixed Logit Model

JEL Classification: F3, G21, G28, H87

* University of Cologne, Albertus-Magnus-Platz, D-50923 Cologne, Germany, merz@wiso.uni-koeln.de, +49 (0)221 470-5605.
** University of Cologne, Albertus-Magnus-Platz, D-50923 Cologne, Germany, overesch@wiso.uni-koeln.de, +49 (0)221 470-5605.
*** University of Tübingen, Mohlstraße 36, D-72074 Tübingen, Germany, georg.wamser@uni-tuebingen.de, +49(0)7071-2975423

1. Introduction

Foreign direct investment (FDI) of the financial sector has substantially increased during the last decades. For example, the share of foreign owned banks jumped from 20% in 1995 to 34% in 2009.[3] The emergence of global banks is closely related to the emergence of multinational companies (MNCs) whose international operations require services like lending, currency or cash management. Particularly after the recent financial crisis many countries have seen a need to restrict banks' international activities. On the other hand, more and more global banks express their concerns about excessive compliance costs associated with stricter regulation. Some of them even reconsider their international strategies as the costs of being global seem to exceed the benefits thereof (see the Economist, Global banks, A world of pain, March 7th, 2015, p. 59-61).

The revelations around the so-called "Luxembourg leaks" drew even more attention to international banking.[4] Several banks were involved in complex cross-border lending structures set up to avoid taxes and benefit from Luxembourg's many tax exemptions. In addition, some banks supported their clients in tax evasion through Luxembourg-based subsidiaries.[5] All this has led legislators of many countries to impose new and stricter regulations. For example, under the US Foreign Account Tax Compliance Act (FATCA) passed in 2010, financial institutions all over the world are supposed to exchange information on American clients vis à vis the US Internal Revenue Service

[3] Data taken from Claessen and Van Horen (2012) based on 137 countries.
[4] Among other reports, Financial Times, November 6th, 2014, http://www.ft.com/intl-/cms/s/0/c8de6734-65d0-11e4-898f-00144feabdc0.html#axzz3UCJyeIKz.
[5] For example, the German Commerzbank AG was raided by tax authorities in February 2015, cf. Financial Times February 24th 2015, http://www.ft.com/intl/cms/s/0/dac3b366-bc5e-11e4-a6d7-00144feab7de.html#axzz3Udg5CrZF.

(IRS) to make it more difficult for tax dodgers to hide money abroad. Another example is the OECD (2013) action plan against base erosion and profit shifting (BEPS) by MNCs.

Although there is broad agreement that policy action is needed, it is not clear which policy measures are the most effective ones or whether they are effective at all. Bank regulation has so far been the dominant approach to tame risky banks. For example, in response to the financial crisis, the "Basel III" agreement of September 2010 tightened capital requirement rules to increase equity buffers and make the banking system more resilient to shocks. The same goal – discouraging low capitalization – may be achieved by designing the tax system such that it does not reward excessive debt financing. Keen (2011) provides a theoretical analysis of the interaction between regulation and taxation building on a seminal study by Weitzman (1974). Whereas in theory, tax and regulation policies may be considered perfect substitutes, practical considerations suggest that both policy instruments should be used.

The efficiency of regulatory measures has been explored in a number of studies, especially in the context of risk taking (Admati et al. 2010; Hart and Zingales 2011). Several European countries followed suggestions by the IMF and implemented bank levies as a reaction to the financial crisis. Devereux et al. (2013) analyze the impact of these levies and find evidence that they indeed did cause an increase in capital stocks of banks. At the same time, however, such a levy could result in an increase of risk in a bank's assets and therefore undermine the benefit of higher capital (Devereux 2014). So far, only little is known how such policies affect the international allocation of financial sector

FDI and particularly how sensitive MNCs' location decisions respond to tax vs. regulation policy.

This paper contributes to the literature on the determinants of financial sector FDI in a number of ways. First, using data on the universe of German outbound financial services FDI, we consider all new location choices of German MNCs over a time span of 13 years. Second, we analyze the effects of tax and regulation policy using new data on more than 150 potential host countries.[6] Third, we provide estimates on own- and cross-elasticities to learn about how a change in tax and regulation policy of one country affects not only the probability that this country is chosen as a location but also how this affects the location probabilities of other countries.

Only very few papers have studied how taxes affect financial services FDI before. A recent contribution by Huizinga et al. (2014) finds that aggregated banking FDI is determined by host country taxes. Moreover, Claessens et al. (2001) find that low host country taxes are associated with additional banking FDI. Evidence on regulation policy and location choices of multinational banks is similarly scarce. While a number of papers examine how financial sector FDI is affected by regulation policy (e.g., Buch and Lipponer 2007; Tsai et al. 2011), none of these papers has analyzed how regulation policy affects the extensive margin of foreign activity in a discrete choice model.

Our analysis is based on financial services FDI data provided by Deutsche Bundesbank (the German central bank). This data allows us to identify the establishment of German multinationals all over the world during the period

[6] Only 83 countries are actually chosen by the firms in our sample.

2000-2012. In an average year during this period, about 250 new entities are established by German MNCs in foreign countries. The most important host countries for financial services FDI are the US, where 760 new entities have been established over the whole time span considered, the UK, where we count 524 new establishments, and the Netherlands with 251 new establishments.

Our preferred specification – using a mixed logit estimation approach – implies a significant impact of tax and regulation variables on location probabilities. We find significant heterogeneity of tax responses. For example, if the tax is cut by 1 percent in Great Britain (Spain), the probability of attracting financial sector FDI increases by about 1.1 (0.3) percent. The estimated regulation responses are heterogeneous, too. For example if regulation in Canada becomes more lenient as the country reduces capital requirements by 1 percent, the probability of attracting new financial sector entities from Germany is increased by almost 8 percent, ceteris paribus. Thus, tax and regulation policy may be used to attract financial sector FDI.

Our estimation approach also allows us to compute cross-elasticities that suggest interesting substitution patterns. For example, if Great Britain cuts its local tax rate by 1 percent, Great Britain will gain (see above) at the expense of other countries like China, whose location probability will be reduced by 0.107 percent. Such findings have policy implications, as uncoordinated policy action of one country imposes an externality on other countries. Hence, particularly regulation policy should be coordinated across countries.

The remainder of the paper is organized as follows. Section 2 briefly introduces a generic theoretical framework, which our empirical analysis is

based on. In Section 3 we discuss the determinants of financial sector FDI. Section 4 explains the empirical approach and describes the data. Empirical results are presented in Section 5. Section 6 concludes.

2. The Extensive Margin of Financial Sector FDI

Our empirical analysis is based on a theoretical concept of comparison of expected profits across alternatives (countries).[7] Let us denote profits of a multinational firm *b* arising at a foreign financial services entity established in country *j* as π_{bj}^*. The asterisk indicates that π_{bj} is a latent variable, which is not observed by the researcher. The actual choice of firm *b* – the location choice or extensive margin of foreign investment activity – is based on the maximum attainable profit when choosing one of $j = 0,1,2,\ldots,J$ potential host countries:

$$\pi_b = argmax(\pi_{b0}^*, \pi_{b1}^*, \pi_{b2}^*, \ldots, \pi_{bJ}^*)$$

The actual choice π_b takes on value one in the respective alternative chosen, $\{0,1,\ldots,J\}$. Thus, above equation suggests that all variables affecting π_{bj}^* will determine in which country *b* is locating its foreign business. We may say that any generic variable x_j that positively affects profits, $\frac{\partial \pi_{bj}^*}{\partial x_j} > 0$, will make it more likely to increase the probability that *b* chooses a particular location. The potential determinants x_j affecting π_{bj}^* will be discussed in the following sections.

[7] This has been introduced by McFadden (1974) who showed that an empirical discrete choice model – as the one we are using in this paper – can be obtained from a theoretical model of utility comparison.

3. Determinants of Financial Sector FDI

Previous literature on the determinants of financial sector FDI has mainly focused on foreign investments of multinational banks. One part of this literature has examined which banks become multinational and found that the size of a bank (Focarelli and Pozollo 2001; Clarke et al. 2003; Buch und Lipponer 2007; Temesvary 2014a), its balance sheet health (Popov and Udell 2012), and its productivity (Buch et al. 2014) are particularly important determinants. This paper is interested in how a financial services firm chooses a location for its foreign activity. The following sections will present an overview on the literature that identified a number of host-country characteristics that seem to be important determinants for location decisions of multinational banks.[8]

3.1 Determinants of Financial Services FDI

Many determinants of goods trade and FDI will be similarly important in context of financial services FDI. First, the distance between host country and home country of a firm is considered to be one major driver of economic integration. While in case of goods trade, distance is associated with transportation costs, distance seems to be important for financial services as it affects the availability and quality of information. The specific business model of banks requires collecting and processing information on customers to provide financial services on competitive terms (Rajan 1992; Petersen and Rajan 2002). Thus, a lower distance between the home country and the host country of an investment should be favorable since this reduces information

[8] In these studies, the role of policy instruments like tax and regulation policies are often neglected, however.

asymmetries between headquarters or parents and foreign entities (Berger et al. 2004; Liberti and Mian 2009). Several studies found empirical evidence for distance as an important determinant of investment locations (Focarelli and Pozzolo 2005; Buch and Lipponer 2007; Claessens and van Horen 2014). As more and more companies started to export to foreign markets and became multinational firms, financial services across borders became more important as well. Several studies demonstrate that foreign activities of banks and bilateral trade volumes between countries are positively correlated (Brealey and Kaplanis 1996; Yamori 1998; Buch 2000; Berger et al. 2004; Focarelli and Pozzolo 2001, 2005). Other determinants of foreign banking relate to cultural characteristics such as common language, which should facilitate the successful market entry in a host country. Evidence suggests that cultural variables are more or less important determinants of international banking, depending on the empirical specification (Buch 2003; Focarelli and Pozzolo 2005). Moreover, a wide range of host-country characteristics that affect the profitability of foreign entities should have an impact on the location choice of financial services firms. For example, previous studies show that market size and GDP per capita are associated with additional bank FDI (Yamori 1998; Buch 2000; Claessens et al. 2001; Cerruti et al. 2007). Focarelli and Pozzolo (2001; 2005) identify expected economic growth in the host country and local bank inefficiencies as additional determinants of location choices.

Finally, very recent literature focuses on the effects of the financial crisis on banking sector FDI. Several studies find a decline in foreign activities associated with the financial crisis (Cetorelli and Goldberg 2009, 2011; Temesvary 2014a, 2014b). Buch et al. (2014) provide evidence that the

changing market conditions triggered by the financial crisis led banks to lower their international assets. In addition, they identify policy interventions and banks' increasing sensitivity towards financial frictions as main drivers behind this reduction.

3.2 Bank Regulation

One argument often used in policy debate is that deregulation policy has been responsible for the rampant expansion of banking across the world (Buch 2003).[9] In line with this view, regulatory requirements are expected to increase market entry costs and deter foreign activity (Lehner 2009; Tsai et al. 2011). In a similar way, if regulators impose high capital (equity) requirements and liquidity rules, this should unambiguously increase a bank's cost of capital and therefore have a negative effect on foreign activity. On the other hand, enhanced transparency through tight government regulation and supervision might reduce aforementioned information asymmetries and could even facilitate foreign activity. Buch (2003) argues that the effect of regulatory requirements might also differ across countries, and finds a limiting effect of tighter regulation on foreign activity, on average.

Buch and Lipponer (2007) confirm a negative relationship between bank FDI and higher capital controls. However, a tight regulatory supervisory system in the host country does not necessarily limit foreign FDI. Buch and DeLong (2004) argue that the effect of information costs on banks' cross-border mergers is far more pronounced than the effect of regulation costs. Temesvary (2014a; 2014b) examines a sample of US banks and the effects of host-country

[9]Moreover, research has been concerned in the relationship between deregulation and excessive risk taking (Keeley 1990; Hovakimian and Kane 2000; Admati et al. 2010; Hart and Zingales 2011).

characteristics on foreign banking activities. Her results indicate that market entry costs, which in her sample are associated with regulatory constraints, have a negative impact on banks' foreign activities. In contrast, Bertus et al. (2008) find no connection between foreign bank ownership and the regulatory framework in a particular country.

3.3 Taxation

Corporate income taxes reduce the return on investment available for the shareholder. In an international context, a foreign affiliate of a multinational firm is subject to tax in its host country. Therefore, a low tax at the host location is associated with higher residual income that can be distributed to the parent firm. The repatriation of income is then usually exempt from home country taxation.[10] A number of studies have analyzed the influence of taxes on FDI (for reviews cf. De Mooij and Ederveen 2003, 2005; Feld and Heckemeyer 2011). Only relatively few papers analyzed how taxes affect the extensive margin of foreign activity by focusing on location decisions of multinational firms. These studies provide evidence that host country taxes exert a negative effect on location probabilities (Devereux and Griffith 1998; Grubert and Mutti 2004; Büttner and Ruf 2005; Büttner and Wamser 2009; Barrios et al. 2012).

While none of the studies mentioned above considers financial sector FDI, the findings in Overesch and Wamser (2009) suggest that financial sector FDI is particularly responsive to taxes. The study distinguishes between FDI from different industries among them financial services. The results show that the

[10] Only the US and a small number of other countries consider all types of foreign income as part of taxable profits of the parent corporation. At the same time, these countries usually provide tax credits on taxes paid abroad. This system is, however, not relevant for our paper, as Germany exempts all foreign income from taxation in the home country.

responses to host country taxes differ significantly across different business activities. Although their data does not include multinational banks, their estimates suggest a particularly strong effect of corporate taxes on location choices of subsidiaries that provide financial services within multinational firms. To the best of our knowledge, only two more studies have analyzed the impact of taxes on FDI of multinational banks. Claessens et al. (2001) find a negative relationship between host country tax rate and banking FDI. Huizinga et al. (2014) find that international double taxation of dividends reduces banking FDI. However, these studies use information about bank assets, while our paper focusses on the question of how taxes affect the choice among alternative locations when setting up a new foreign financial services entity.

4. Empirical Approach and Data

4.1 Mixed Logit

We are interested in the determinants of location choices of multinational banks and particularly how taxes and regulation affect these choices. We base our empirical analysis on a mixed logit model, which is associated with a number of favorable features that are important with respect to the specific research goals we have in this paper. In particular, the two main advantages are (i) that the mixed logit allows us to learn about (realistic) substitution patterns across alternatives and (ii) that it allows for correlation in unobserved factors across alternatives (countries).

A very intuitive interpretation of the mixed logit model is one of error components creating correlations among the profits for different alternatives (see Train 2009). As outlined in Section 2, the underlying model we have in

mind when multinational firm b chooses a foreign location is one where the firm maximizes profits π_{bj}^{*}.

Let us neglect the asterisk we used to denote latent variables and specify profits of multinational bank b relating to alternative (country) j as

$$\pi_{bjt} = \alpha' x_{bjt} + \mu_b' z_{bjt} + \varepsilon_{bjt}. \qquad (1)$$

The vectors x_{bjt} and z_{bjt} denote observed country-j-specific characteristics. While α is a vector of fixed coefficients to be estimated, μ_b is a vector of random terms with zero mean, and ε_{bjt} is an iid extreme value random term. To the extent that x_{bjt} and z_{bjt} are indexed by t, we allow each of these variables to depend on the respective observables in a given year t. We will also consider that one firm may face different choice situations over time, but then treat coefficients μ_b that enter utility as constant for each b. Of course, since μ_b is indexed by multinational b, coefficients vary across firms. One of the key issues in specifying this model is the choice of z_{bjt}. Together with ε_{bjt}, z_{bjt} defines the stochastic portion of profits as $\theta_{bjt} = \mu_b' z_{bjt} + \varepsilon_{bjt}$ (Train 2009). By specifying z_{bjt}, we allow for correlation across alternatives (countries), [11] so that $Cov(\theta_{bit}, \theta_{bjt}) = E(\mu_b' z_{bit} + \varepsilon_{bit})(\mu_b' z_{bjt} + \varepsilon_{bjt}) = z_{bit}' W z_{bjt}$, with W being the covariance of μ_b.

The specific variables included in x_{bjt} and z_{bjt} are discussed in more detail below. While x_{bjt} will capture country characteristics such as the log of a

[11] The conditional logit does not allow for correlation in the unobserved parts of π_{bj}^{*}, which gives rise to the so-called IIA (independence from irrelevant alternatives) assumption. Besides providing consistent estimates on tax and regulation variables, we are particularly interested in substitution patterns across countries. Hence, we need to relax this assumption as it would imply a proportional shifting pattern across alternatives.

country's GDP or the geographical distance to Germany, the specification of z_{bjt} is important as these variables induce correlation over alternatives. Sine we are interested in cross-country elasticities related to tax and bank regulation policy, z_{bjt} includes country j's tax rate and different measures for regulation. In the presence of profit shifting, if MNCs operate internal capital markets or if other intra-firm relations are important, it is highly likely that these variables induce correlation across alternatives' unobserved parts.[12]

4.2 Financial Services FDI Data

Our empirical analysis is based on the micro-level dataset *MiDi* (*Mi*cro Database *Di*rect Investment) provided by Deutsche Bundesbank (the German central bank). *MiDi* is a panel dataset on foreign direct investment positions of German investors. It basically records information about the investment object's balance sheet, some information on the type of investment (e.g., industry), and limited information on the investor. Particularly noteworthy concerning this data is that German law enforces collection of foreign activity of German investors,[13] which enables us to observe virtually all German outbound activity.

While *MiDi* reports foreign investments across all different industries, we will focus on a sub-sample of financial services entities of German multinationals. To be included in our dataset, the latter are required to have a direct participating interest in the foreign entity of more than 50% (majority owners).

[12] Another interpretation of the mixed logit model is one of a random coefficient model. It seems highly likely that firms respond very heterogeneously to taxes, depending on the extent to which firms can avoid taxes, for example.

[13] Section 26 of the Foreign Trade and Payments Act (Aussenwirtschaftsgesetz) in connection with the Foreign Trade and Payment Regulations (Aussenwirtschaftsverordnung).

However, the German headquarters do not necessarily have to operate in the financial sector. These restrictions leave us with 839 MNCs that establish 3,790 new financial sector entities (between 2000 and 2012) in 83 host countries.[14] The vast majority of foreign entities are legally independent subsidiaries (3,546 ones) only few are set up as branches.

For each of the 3,790 newly established subsidiaries, we consider which location is effectively chosen among the 83 potential host countries. As our dependent variable we compute an indicator variable $LOCDEC_{bjt}$ that equals 1 for the location effectively chosen and zero for the 82 alternative host countries not selected. Considering the information of all location choices in the financial sector between 2000 and 2012, our sample includes 309,912 observations.[15]

4.3 Tax and Regulation Data

Regarding tax incentives we consider the statutory corporate tax rate, STR_{jt}, to capture expected tax payments in a host country of foreign entities.[16] This variable is collected by the authors from different sources (International Bureau of Fiscal Documentation, IBFD; tax surveys provided by Ernst&Young, PwC, and KPMG). Another tax variable is DTT_{jt} which measures the total number of double taxation treaties concluded by a host country *j*. This variable is available from the United Nations Conference on Trade and Development (UNCTAD) and is included as a tightly-knit network of DTTs may facilitate

[14] An overview is givien in table 2.7,see appendix.
[15] The total number of observations is not 314,570 (=3,790 · 83) due to missing control variables for some country-year pairs.
[16] Concerning Luxemburg, we assume a statutory tax rate of zero due to Luxembourg's known holding regimes and ruling system. However, alternative regressions in which we excluded Luxemburg confirm our results.

cross-border capital flows of dividends, interest, and royalties, which might be important for the multinational bank.

To account for host countries' regulatory framework we rely on three different variables. First, $RATIO_{jt}$ measures the equity ratio required in the respective host country. This variable was taken from several waves of a survey conducted by Barth et al. (2001).[17] Since increased equity requirements are usually assumed to impose a cost on firms, we expect a negative effect on foreign activities. In our data, $RATIO_{jt}$ varies between 0.05 and 0.19. Many countries impose minimum equity ratios as suggested by Basel II regulation (0.08), some countries like Nigeria or the United Arab Emirates require significantly higher equity ratios (0.19 and 0.12).

The second measure we use to capture the regulatory environment is called REG_{jt}.[18] This variable is also based on an index developed by Barth et al.'s (2001) survey. It consists of four components indicating the strictness of jurisdictions when banks engage in financial activities. To be specific, REG_{jt} is defined as the sum over the four variables $RSEC_{jt}$, $RINS_{jt}$, $RREAL_{jt}$, and $RNONFIN_{jt}$. Each of these variables is increasing in the strictness of how a country j is regulating banks'activities in securities ($RSEC_{jt}$), insurance ($RINS_{jt}$), real estate ($RREAL_{jt}$), or non-financial ($RNONFIN_{jt}$). Strictness is measured by scores ranging from 1 to 4.[19] Our variable REG_{jt} combines all four categories into one measure. Higher values in REG_{jt} are associated with a less

[17] The survey was repeated with the current 4th round being published in 2012.
[18] Cerruti et al. (2007) and Tsai et al. (2011) use the index in a similar context.
[19] A value of 1 for $RSEC_{jt}$, as an example, indicates that a full range of securities activities can be conducted directly by banks. The strictest value which equals 4 indicates that none of these activities can be done in either banks or their subsidiaries in the respective country.

attractive location for banks. In our data, Indonesia exhibits the highest value (16) of REG_{jt}.

Since banks are not only incentivized by their own tax planning opportunities they may also have good reason to establish branches and subsidiaries in locations favored by their clients. Therefore, in additional specifications, we add $BANKSEC_j$ to account for the level of secrecy of the respective location when it comes to tax issues.[20]

It may be interesting to see how regulation policy relates to tax policy. To do this, we have produced Figures 2.1 and 2.2. In both figures, STR_j (averaged over all years in our sample) is displayed on the horizontal axis, while the measures for regulation are displayed on the vertical axes ($RATIO_j$ in Figure 2.1; REG_j in Figure 2.2). Very surprisingly, it seems that regulation policy is only weakly (negatively) related to tax policy in case of $RATIO_j$, although the linear prediction implies a weak negative correlation: higher taxes may allow for laxer regulation. Both figures illustrate that there is a lot of variation across countries across all measures.

[20] We use this variable only in robustness tests. The reason is that due to a poor coverage across countries, we lose about half of the observations compared to our basic specification.

FIGURE 2.1: TAX vs. regulation policy (RATIO)

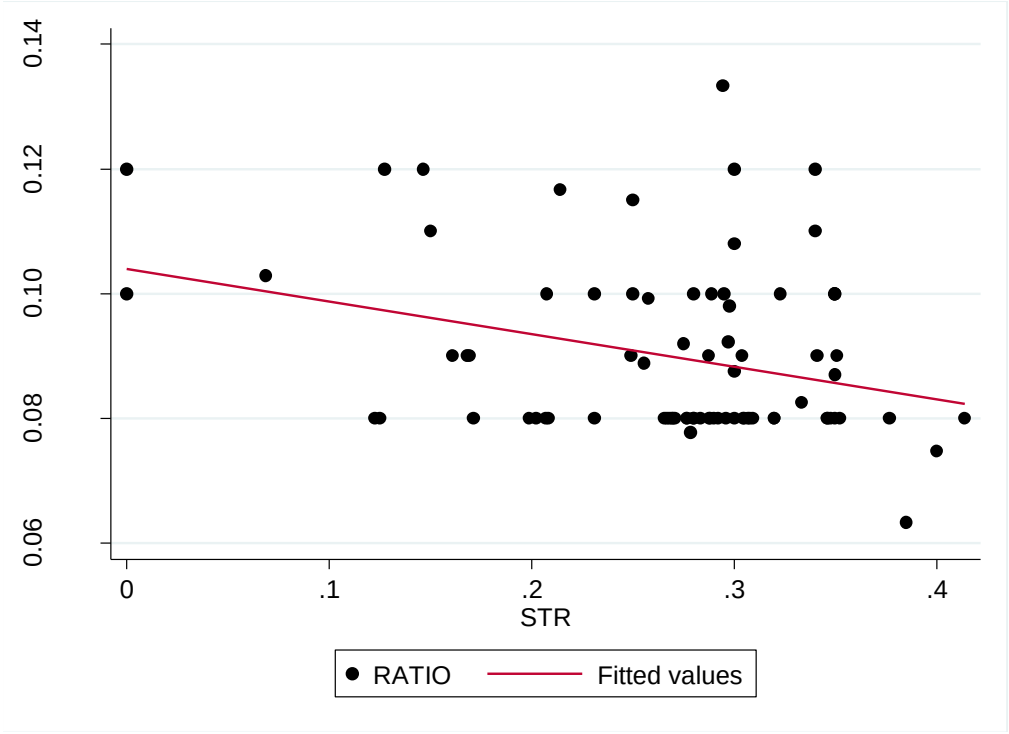
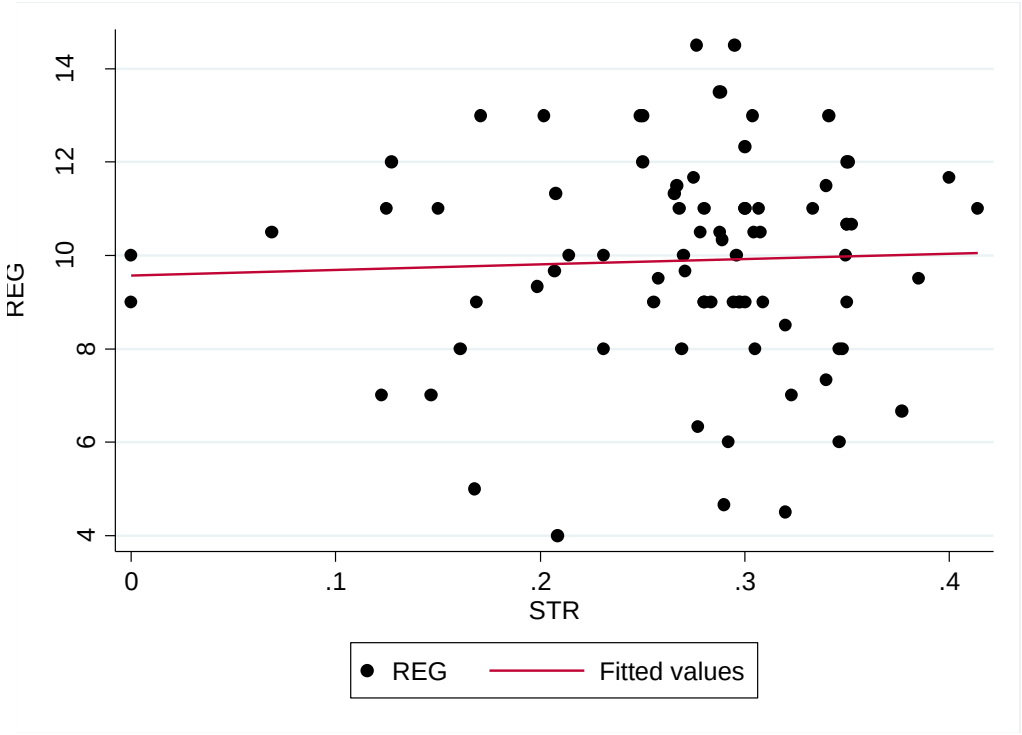


FIGURE 2.2: TAX vs. regulation policy (REG)



4.4 Non-Tax and Non-Regulation Determinants

In line with existing work on the determinants of FDI, we consider the following non-tax and non-regulation variables. First, to capture the size of the local market, we use *(log)GDP*$_{jt}$. Second, the growth of GDP in country *j*, *GDPgrowth*$_{jt}$, is included to capture growth possibilities. Both variables are taken from the World Bank's World Development Indicators. In addition, we use variables to control for cultural and geographical distance between Germany (the country of the investors) and host countries *j*. The geographical distance is denoted by *(log)DIST*$_j$, *CONT*$_j$ and *COMLANG*$_j$ are dummy variables indicating whether host country *j* shares a common border with Germany (*CONT*$_j$) and whether German is an official language in the host country (*COMLANG*$_j$). More distant countries (in geographical distance and cultural distance) are expected to attract less FDI. In particular, as communication and information exchange is important in context of financial services FDI, we expect these variables to be important determinants with a negative expected sign for *(log)DIST*$_j$; *CONT*$_j$ and *COMLANG*$_j$ should positively relate to the probability that country *j* is chosen. All latter three variables are taken from the Centre d'Études prospectives et d'Informations Internatinales (CEPII).

Similar to the DTT variable as introduced above, we use the number of bilateral investment treaties concluded by country *j*, *BIT*$_{jt}$. Bilateral investment treaties have been shown to be an effective policy instrument to attract FDI as they reduce foreign market entry cost (Egger and Merlo 2012). BITs may be less relevant, however, in the context of financial sector FDI. The information on BITs is taken from UNCTAD.

5. Results

Table 2.1 presents basic results from mixed logit estimations. As argued above, we specify tax and regulation variables as random (STR_{jt}, $RATIO_{jt}$, REG_{jt}), while all other control variables are defined as fixed. The results show that tax and regulation responses are heterogeneous across firms (see also the highly significant estimates for the standard deviations), but the mean coefficients are estimated with the expected signs: A higher tax at location *j* leads to less financial sector FDI, stricter regulation in form of stricter capital requirements, as well as higher values of the regulation index are associated with less financial sector FDI. The estimated coefficients for the variables entering as fixed are in line with theoretical expectations. Only the negative estimate for $GDPgrowth_{jt}$ may seem unusual. One explanation for this is that more growth allows local and multinational firms to finance locally or out of own earnings. Another explanation may be that financial sector FDI often goes to developed countries which exhibit usually rather low or modest GDP growth rates. Less distant countries in terms of cultural distance ($COMLANG_j$) between Germany and host country *j* as well as geographical distance ($DIST_j$) increase the probability to be chosen as host country, as expected.

Before providing some quantitative interpretations of these results, we may look at predicted base probabilities for a country to be chosen as a host location. Table 2.2 shows that the base probability is predicted to be relatively low (below 1 percent) for countries like Australia (AUS = 0.0061), Hong Kong (HKG = 0.0070) or Singapore (SGP = 0.0046), and relatively high for countries like the United States (USA = 0.0955), Austria (AUT = 0.0368) or Belgium (BEL = 0.0483). However, the country for which we predict the

highest base probability is Great Britain, for which we estimate a base probability that exceeds 10 percent.

TABLE 2.1: Basic Results

	(1)		*(2)*	
Coefficients specified as random:	*Mean*	*SD*	*Mean*	*SD*
STR$_{jt}$	-5.364***	7.642***	-5.081***	8.149***
	(0.461)	(0.482)	(0.470)	(0.804)
RATIO$_{jt}$	-55.27***	42.58***	-58.07***	45.50***
	(5.90)	(4.08)	(5.72)	(4.24)
REG$_{jt}$			-0.107***	0.165***
			(0.015)	(0.016)
Coefficients specified as fixed:				
lnGDP$_{it}$	0.779***		0.784***	
	(0.028)		(0.028)	
GDP growth$_{it}$	-0.050***		-0.052***	
	(0.009)		(0.009)	
lnDIST$_{it}$	-0.529***		-0.376***	
	(0.032)		(0.037)	
COMLANG$_{it}$	0.833***		0.821***	
	(0.074)		(0.074)	
CONTIG$_{jt}$	-0.298***		-0.018	
	(0.066)		(0.070)	
DTT$_{it}$	0.013***		0.013***	
	(0.001)		(0.002)	
BIT$_{it}$	-0.009***		-0.009***	
	(0.001)		(0.001)	
N	309,912		309,912	

Notes: Mixed logit estimates; 3,790 positive location choices. Random variables: STR is the statutory corporate tax rate of the subsidiary's host country. RATIO equals the minimum equity ratio required in the host country. REG is an indicator for restrictions in different activities. Fixed variables: lnGDP is host country GDP in logs, GDP growth indicates yearly growth in host country GDP. lnDIST is the distance between home country and host country in logs. COMLANG is a dummy variable indicating a common official language. CONTIG is a dummy variable for a common boarder. DTT and BIT equal the number of double tax treaties and bilateral investment treaties of the host country respectively. *,**, and *** indicate significance at the 10%, 5%, and 1% level. More information concerning control variables is provided in Table 2.6 in the Appendix.

TABLE 2.2: Estimated Base Probabilities for 12 Selected Countries

Country	*Base Prob.*	*Country*	*Base Prob.*	*Country*	*Base Prob.*
AUS	0.0061	**CHN**	0.0216	**IRL**	0.0357
AUT	0.0368	**ESP**	0.0231	**RUS**	0.0232
BEL	0.0483	**GBR**	0.1241	**SGP**	0.0046
CAN	0.0231	**HKG**	0.0070	**USA**	0.0955

5.1 Own- and Cross-Elasticities for Changes in Tax and Regulation Variables

Our estimation approach not only allows us to find out about how a change in a policy variable of country *j* affects the probability to locate in country *j*, it also allows us to find out about substitution elasticities across alternatives (countries). For example, we may answer questions of the following type: How does a 1 percent change in taxes in the US affect the probability to locate in the US, in Canada, or in the UK. We present estimates on own- and cross elasticities for a number of countries in Tables 2.3 and 2.4. Before discussing the results, let us look at the formal representation of how a change in the *m*th element of the vector of explanatory variables of one country, say *j*, affects the location probability of country *i* (see Train 2009). Expressed as elasticity, the percentage change in the probability is given by

$$E_{bix_{bj}^m} = -\frac{x_{bj}^m}{P_{bi}} \int \beta^m L_{bi}(\beta) L_{bj} f(\beta) d\beta \quad = -x_{bj}^m \int \beta^m L_{bi}(\beta) L_{bj} f(\beta) d\beta$$

Tables 2.3 and 2.4 present own- and cross-elasticities for *STR* and *RATIO* and the same selection of countries as in Table 2.2. The tables are organized such that each cell provides the tax or regulation effect on a country in a row with respect to a 1 percent increase of *STR* (*RATIO*) of the country in a column. For

example, if Singapore reduces its tax rate by 1 percent, all other countries lose in terms of lower location probabilities. However, our estimation approach allows that the reduction in probability mass is heterogeneously distributed across countries, i.e. some countries lose more (e.g., Hong Kong) than others (e.g., Belgium). The bold diagonal elements in the respective table denote own-elasticities. For example, if the tax is cut by 1 percent in Great Britain (GRB), the probability of attracting financial sector FDI increases by about 1.01 percent. Although a tax of a given country usually comes at the cost of other countries (one country attracts FDI at the expense of others), our results suggest interesting complementarities for some country-relations. For example, while we expect a US-tax-cut-policy to attract new financial services entities, there seem to be positive spillovers to other countries. In particular, countries that are associated with a high cultural or geographical proximity to the US (as Australia or Canada) benefit from lower taxes there. Such complementarities are in line with learning arguments that arise within multinational firm networks (Egger et al. 2014a).

Table 2.4 further suggests that the responsiveness of German financial services FDI to regulation at the extensive margin is highly sensitive, expressed in form of elasticities. The estimated own-elasticities range from about 4 (RUS) to 9.2 (SGP). For example, a 1 percent lower capital ratio (a 1 percent lower equity requirement) imposed by Great Britain is estimated to increase the probability to locate there by about 5.3 percent. The estimates confirm that *RATIO* is an extremely important determinant of location choice and that locations with lax capital requirements are particularly attractive for German MNCs. Other than in case of *STR*, the estimated cross-elasticities are negative, irrespective of the

country combination. Given the way how we have specified the vector of random variables, and given significant differences in countries' tax incentives, the finding of (some) positive *tax*-cross-elasticities (and throughout negative *regulation*-cross-elasticities at the same time) is fully consistent with profit-shifting considerations. In fact, the latter explains why tax responses differ in the first place (Egger et al. 2014b).

TABLE 2.3: Own- and Cross-Elasticities of a One-Percent Tax Cut for a Selection of Countries

	AUS	AUT	BEL	CAN	CHN	ESP	GBR	HKG	IRL	RUS	SGP	USA
AUS	**1,148**	-0,463	-0,024	-0,117	-0,318	-0,006	-0,120	-0,081	-0,030	-0,025	-0,007	0,003
AUT	-0,009	**1,418**	-0,048	-0,021	-0,028	-0,018	-0,206	-0,015	-0,045	-0,042	-0,010	-0,027
BEL	-0,003	-0,029	**0,575**	0,006	-0,013	0,015	-0,068	-0,006	-0,021	-0,019	-0,004	0,091
CAN	-0,003	-0,025	0,013	**0,509**	-0,015	0,018	-0,061	-0,006	-0,020	-0,016	-0,005	0,111
CHN	-0,009	-0,044	-0,036	-0,020	**1,357**	-0,014	-0,107	-0,007	-0,031	-0,021	-0,012	-0,056
ESP	-0,013	-0,022	0,029	0,017	-0,010	**0,287**	-0,039	-0,006	-0,018	-0,014	-0,005	0,145
GBR	-0,006	-0,060	-0,033	-0,014	-0,019	-0,010	**1,078**	-0,012	-0,036	-0,037	-0,007	-0,006
HKG	-0,013	-0,132	-0,093	-0,040	-0,037	-0,042	-0,357	**1,626**	-0,091	-0,082	-0,019	-0,081
IRL	-0,015	-0,122	-0,093	-0,044	-0,052	-0,040	-0,336	-0,028	**1,320**	-0,075	-0,019	-0,109
RUS	-0,008	-0,078	-0,057	-0,024	-0,024	-0,021	-2,360	-0,017	-0,051	**1,523**	-0,009	-0,043
SGP	-0,014	-0,109	-0,076	-0,042	-0,079	-0,046	-0,251	-0,023	-0,076	-0,052	**1,826**	-0,109
USA	0,000	-0,008	0,040	0,023	-0,010	0,032	-0,005	-0,002	0,011	-0,006	-0,003	**0,085**

TABLE 2.4: Own- and Cross-Elasticities of a One-Percent Lower Capital Requirement Tax Cut for a Selection of Countries

	AUS	AUT	BEL	CAN	CHN	ESP	GBR	HKG	IRL	RUS	SGP	USA
AUS	**8,218**	-0,318	-0,430	-0,211	-0,207	-0,209	-0,846	-0,058	-0,216	-0,091	-0,050	-0,749
AUT	-0,056	**7,352**	-0,428	-0,198	-0,143	-0,209	-1,015	-0,091	-0,283	-0,128	-0,060	-0,548
BEL	-0,060	-0,336	**6,995**	-0,236	-0,154	-0,250	-0,974	-0,058	-0,180	-0,100	-0,038	-0,760
CAN	-0,058	-0,306	-0,463	**7,716**	-0,171	-0,249	-0,901	-0,048	-0,173	-0,092	-0,039	-0,819
CHN	-0,063	-0,244	-0,335	-0,187	**7,246**	-0,162	-0,589	-0,042	-0,207	-0,064	-0,070	-0,880
ESP	-0,058	-0,325	-0,492	-0,251	-0,150	**7,634**	-0,969	-0,052	-0,160	-0,095	-0,043	-0,797
GBR	-0,052	-0,363	-0,444	-0,206	-0,117	-0,223	**5,396**	-0,079	-0,249	-0,130	-0,043	-0,546
HKG	-0,045	-0,392	-0,326	-1,378	-0,111	-0,148	-0,957	**8,337**	-0,416	-0,152	-0,082	-0,301
IRL	-0,045	-0,335	-0,276	-0,133	-0,144	-0,122	-0,846	-0,115	**7,136**	-0,140	-0,076	-0,326
RUS	-0,019	-0,155	-0,157	-0,072	-0,047	-0,074	-0,454	-0,042	-0,144	**3,875**	-0,017	-0,178
SGP	-0,062	-0,405	-0,338	-0,175	-0,286	-0,194	-0,846	-0,129	-0,434	-0,097	**9,205**	-0,492
USA	-0,061	-0,246	-0,447	-0,248	-0,242	-0,240	-0,707	-0,028	-0,117	-0,061	-0,032	**5,352**

5.2 Robustness

Table 2.5 includes 2 additional robustness specifications. In column (1) we add an indicator variable for a high level of bank secrecy taken from the OECD (2006). Since information about bank secrecy is not available for all countries, we can only consider a slightly smaller set of locations as in Table 2.1. However, almost all important host countries with a significant number of new financial service entities are still included. We find a positive effect of bank secrecy on financial sector location decisions.

The second important finding is that the results for the tax rate and bank regulation variables are hardly affected: Table 2.5 still suggests a significant negative effect of a higher tax rate and higher capital requirement on the probability to set up a new entity in a certain country. Moreover, a high score for the overall level of bank regulation, indicating strict limitations, is again associated with a smaller probability to choose a host country.

In specification (2) of Table 2.5 we analyze if all regulation components affect location choices. Our results suggest that location choices are particularly responsive to restrictions of securities transactions but also to limitations of activities outside the financial sector, while restrictions of insurance activities and real estate transactions do not matter. Once again, our findings concerning taxes and capital requirements remain quite robust.

TABLE 2.5: Robustness Checks

	(1)		*(2)*	
Coefficients specified as random:	*Mean*	*SD*	*Mean*	*SD*
STR_{jt}	-3.34***	7.35***	-2.182***	5.983***
	(0.47)	(0.48)	(0.504)	(0.391)
$RATIO_{jt}$	-42.48***	29.17***	-26.08***	22.93***
	(6.06)	(4.09)	(5.42)	(6.82)
REG_{it}	-0.048***	0.174***		
	(0.014)	(0.014)		
$RSEC_{it}$			0.259***	0.460***
			(0.054)	(0.069)
$RINS_{it}$			-0.026	0.557***
			(0.042)	(0.049)
$RREAL_{it}$			0.030	0.467***
			(0.032)	(0.038)
$RNONFIN_{it}$			-0.321***	0.048
			(0.037)	(0.066)
Coefficients specified as fixed:				
$lnGDP_{it}$	0.865***		0.809***	
	(0.032)		(0.032)	
$GDPgrowth_{it}$	-0.038***		-0.054***	
	(0.011)		(0.012)	
$lnDIST_{it}$	-0.734***		-0.723***	
	(0.050)		(0.050)	
$COMLANG_{it}$	-0.124		-0.061	
	(0.096)		(0.104)	
$CONTIG_{jt}$	-0.335***		-0.397***	
	(0.075)		(0.080)	
DTT_{it}	0.008***		0.010***	
	(0.002)		(0.002)	
BIT_{it}	-0.012***		-0.014***	
	(0.001)		(0.001)	
$BANKSEC_{j}$	1.461***		1.516***	
	(0.101)		(0.110)	
N	150,563		150,563	

Notes: Mixed logit estimates; 3,501 positive location choices. Random variables: STR is the statutory corporate tax rate of the subsidiary's host country. RATIO equals the minimum equity ratio required in the host country. REG is an indicator for restrictions in different activities. RSEC, RINS, RREAL and RNONFIN are components of REG. Fixed variables: lnGDP is host country GDP in logs, GDP growth indicates yearly growth in host country GDP. lnDIST is the distance between home country and host country in logs. COMLANG is a dummy variable indicating a common official language. CONTIG is a dummy variable for a common boarder. DTT and BIT equal the number of double tax treaties and bilateral investment treaties of the host country respectively. BANKSEC is a dummy variable indicating the existence of high bank secrecy in the host country. *,**, and *** indicate significance at the 10%, 5%, and 1% level. More information concerning control variables is provided in Table 2.6 in the Appendix.

6. Conclusion

We have analyzed how the location of financial sector FDI is affected by taxes and the regulatory environment. For the empirical analysis, we have considered novel data, covering the universe of German outbound financial sector FDI over a time span of 13 years. Our results suggest that not only regulation but also tax incentives matter for the location of financial sector FDI.

Our empirical approach also computes cross-elasticities for tax incentives and regulation. We find that a change in tax and regulation policy of one country affects the location probabilities of other countries. Another important finding of our analysis is that own- as well as cross-elasticities are estimated to be highly heterogeneous across firms and countries. For example, expressed in elasticities, we find that US financial sector FDI is less responsive to tax and regulation policy compared to financial sector FDI in countries like Singapore or Hong Kong.

Our findings have interesting policy implications. First, given that recent discussions in the context of financial sector FDI often focus on regulation policy, our results suggest that policy makers may place more emphasis on tax policy. Second, our findings confirm the expectation that the responsiveness to tax and regulation policies varies across host countries. Third, the result of significant externalities arising from uncoordinated policies implies that coordinated action, particularly in regulation policy, is needed.

Appendix

TABLE 2.6: Variable Description

Variable	Definition	Source
LOCDEC	Dependent variable indicating location decision	Deutsche Bundesbank
lnGDP	Gross domestic product of host country (in logs)	World Bank: World Development Indicators (WDI) Database
GDPgrowth	Annual growth rate of gross domestic product of host country	World Bank: World Development Indicators (WDI) Database
COMLANG	0-1 dummy variable for the existence of a common language	Centre d'Études prospecitves et d'Informations Internationales (CEPII)
lnDIST	Log of distance between home country and host country	Centre d'Études prospecitves et d'Informations Internationales (CEPII)
CONT	0-1 dummy variable for the existence of a common boarder	Centre d'Études prospecitves et d'Informations Internationales (CEPII)
DTT	Number of double tax treaties	United Nations Conference on Trade and Development (UNCTAD)
BIT	Number of bilateral investment treaties	United Nations Conference on Trade and Development (UNCTAD)
BANKSEC	0-1 dummy variable for the existence of high bank secrecy	OECD (2006)
STR	Statutory tax rate	International Bureau of Fiscal Documentation, IBFD; tax survey provided by Ernst&Young, PwC and KPMG
RATIO	Minimum equity required in host country	Barth et al. (2001)
RSEC	Indicator on conditions to engage in securities activities	Barth et al. (2001)
RINS	Indicator on conditions to engage in insurance activities	Barth et al. (2001)
RREAL	Indicator on conditions to engage in real estate activities	Barth et al. (2001)
RNONFIN	Indicator on conditions to engage in non-financial activites	Barth et al. (2001)
REG	Combined indicator on conditions to engage in securities, insurance, real estate, non-financials	Barth et al. (2001)

TABLE 2.7: Country Overview of Location Decisions

Country	Number of location decisions
USA	760
GB	524
NL	251
LUX	239
I,F, PL, CH,AT, CAY	>100
Singapore, Canada, RUS, IRL, B, SP	>50
Malta/Hong Kong/Singapore	>40
Cyprus	10

References

Admati, A.R., DeMarzo, P.M., Hellwig, M.F. and Pfleiderer, P. (2010) Fallacies, Irrelevant Facts, and Myths in the Discussion of Capital Regulation: Why Bank Equity is Not Expensive, Stanford Graduate School of Business Research Paper, No. 2065, Stanford University.

Barrios, S., Huizinga, H., Laeven, L. and Nicodème, G. (2012). International Taxation and Multinational Firm Location Decisions, *Journal of Public Economics* **96**, 946–958.

Barth, J.R., Caprio Jr., G. and Levine, R. (2001). The Regulation and Supervision of Banks around the World: A New Database, Policy Research Working Paper 2588.

Berger, A.N., Buch, C.M., DeLong, G. and DeYoung, R. (2004). Exporting Financial Institutions Management via Foreign Direct Investment Mergers and Acquisitions, *Journal of International Money and Finance* **23**, 333–366.

Bertus, M., Jahera Jr., J.S. and Yost, K. (2008). A Note on Foreign Bank Ownership and Monitoring: An International Comparison, *Journal of Banking & Finance* **32**, 338–345.

Buch, C.M. (2000). Information or Regulation: What Is Driving the International Activities of Commercial Banks?, Kiel Working Paper No. 1011.

Buch, C.M. (2003). Information or Regulation: What Drives the International Activities of Commercial Banks?, *Journal of Money, Credit, and Banking* **35**, 851–869.

Buch, C.M. and DeLong, G. (2004). Cross-border Bank Mergers: What Lures the Rare Animal?, *Journal of Banking & Finance* **28**, 2077–2102.

Buch, C.M. and Lipponer, A. (2007). FDI versus Exports: Evidence from German Banks, *Journal of Banking & Finance* **31,** 805–826.

Buch, C.M., Neugebauer, K. and Schröder, C. (2013). Changing Forces of Gravity: How the Crisis Affected International Banking, Deutsche Bundesbank Discussion Paper No 48/2013.

Buch, C.M., Koch, C.T. and Koetter, M. (2014). Should I stay or should I go? Bank Productivity and Internationalization Decisions, *Journal of Banking & Finance* **42**, 266-282.

Buettner, T. and Ruf, M. (2005). Tax Incentives and the Location of FDI: Evidence from a Panel of German Multinationals, Deutsche Bundesbank Discussion Paper No 17/2005.

Buettner, T. and Wamser, G. (2009). The Impact of Non-Profit Taxes on Foreign Direct Investment: Evidence from German Multinationals, *International Tax and Public Finance* **16**, 298-320.

Brealey, R.A. and Kaplanis, E.C. (1996). The determination of foreign banking location, *Journal of International Money and Finance* **15**, 577–597.

Cerrutti, E., Dell'Ariccia, G. and Martínez Pería, M.S. (2007). How Banks Go Abroad: Branches or Subsidiaries?, *Journal of Banking & Finance* **31**, 1669–1692.

Cetorelli, N. and Goldberg, L.S. (2009). Globalized Banks: Lending to Emerging Markets in the Crisis, *Federal Reserve Bank of New York Staff Reports* no. **377**.

Cetorelli, N. and Goldberg, L.S. (2011). Global Banks and International Shock Transmission: Evidence from the Crisis, *IMF Economic Review* **59**(1), 41–76.

Claessens, S., Demirgüç-Kunt, A. and Huizinga, H. (2001). How Does Foreign Bank Entry Affect Domestic Banking Markets?, *Journal of Banking & Finance* **25**, 891–911.

Claessens, S. and Van Horen, N. (2012). Foreign Banks: Trends, Impact and Financial Stability, IMF Working Paper 12/10.

Claessens, S. and Van Horen, N. (2014). Location Decisions of Foreign Banks and Competitor Remoteness, *Journal of Money, Credit and Banking* **46**(1), 145–170.

Clarke, G., Cull, R., Martinez Peria, M.S. and Sánchez, S.M. (2003). Foreign Bank Entry: Experience, Implications for Developing Economies, and

Agenda for Further Research, *The World Bank Research Observer* **18**(1), 25–59.

De Mooij, R. and Everdeen, S. (2003). Taxation and Foreign Direct Investment: A Synthesis of Empirical Research, *International Tax and Public Finance*, **10**(6), 673 – 693.

De Mooij, R. and Everdeen, S. (2006). What a Difference Does it Make? Understanding the Empirical Literature on Taxation and International Capital Flows, European Economy - Economic Papers 261, Directorate General Economic and Financial Affairs (DG ECFIN), European Commission.

Devereux, M.P. and Griffith, R. (1998). Taxes and the Location of Production: Evidence from a Panel of US Multinationals, *Journal of Public Economics* **68**, 335–367.

Devereux, M.P., Johannesen, N. and Vella, J. (2013). Can Taxes Tame the Banks? Evidence from European Bank Levies, Working paper series 13/25.

Devereux, M. (2014). New Bank Taxes: Why and What Will Be the Effect, *in* R. de Mooij and G. Nicodème (eds), Taxation and Regulation of the Financial Sector,25– 54.

Egger, P. and Merlo, V. (2012). BITs Bite: An Anatomy of the Impact of Bilateral Investment Treaties on Multinational Firms, *The Scandinavian Journal of Economics* **114**(4), 1240–1266.

Egger, P., Fahn, M., Merlo, V. and Wamser, G. (2014a). On the Genesis of Multinational Foreign Affiliate Networks, *European Economic Review* **65**, 136–163.

Egger, P., Merlo, V. and Wamser, G. (2014b). Unobserved Tax Avoidance and the Tax Elasticity of FDI, *Journal of Economic Behavior & Organization* **108**, 1–18.

Feld, L. and Heckemeyer, J. (2011). FDI and Taxation: A Meta-Study, *Journal of Economic Surveys* **25**, 233–272.

Focarelli, D. and Pozzolo, A.F. (2001). The Patterns of Cross-Border Bank Mergers and Shareholdings in OECD Countries, *Journal of Banking & Finance* **25**, 2305–2337.

Focarelli, D. and Pozzolo, A.F. (2005). Where Do Banks Expand Abroad? An Empirical Analysis, *Journal of Business* **78**(6), 2435–2463.

Grubert, H. and Mutti, J. (2004). Empirical Asymmetries in Foreign Direct Investment and Taxation, *Journal of International Economics* **62**, 337 – 358.

Harr, T. and Ronde, T. (2005). Branch or Subsidiary? Capital Regulation of Multinational Banks, Working Paper.

Hart, O. and Zingales, L. (2011). A New Capital Regulation for Large Financial Institutions, *American Law and Economics Review* **13**(2), 453–490.

Hovakimian, A. and Kane, E.J. (2000). Effectiveness of Capital Regulation at U.S. Commercial Banks, 1985 to 1994, *The Journal of Finance* **55**, 451–468.

Huizinga, H.P., Voget, J. and Wagner, W.B. (2014). International Taxation and Cross-Border Banking, *American Economic Journal: Economic Policy* **6**(2), 94–125.

Keeley, M.C. (1990). Deposit Insurance, Risk, and Market Power in Banking, *The American Economic Review* **80**(5), 1183–1200.

Keen, M. (2011). The Taxation and Regulation of Banks, IMF Working Paper 11/206.

Lehner, M. (2009). Entry Mode Choice of Multinational Banks, *Journal of Banking & Finance* **33**, 1781–1792.

Liberti, J.M. and Mian, A.R. (2009). Estimating the Effect of Hierarchies on Information Use, *The Review of Financial Studies* **22**(10), 4057–4090.

McFadden, D. (1974). Conditional Logit Analysis of Qualitative Choice Behavior in: P. Zarembka (ed.), *Frontiers in Econometrics*, Academic Press, New York, 105–142.

OECD (2006). Tax Co-operation: Towards a Level Playing Field, OECD Publishing.

OECD (2013). Action Plan on Base Erosion and Profit Shifting, OECD Publishing.

Overesch, M. and Wamser, G. (2009). Who Cares About Corporate Taxation? Asymmetric Tax Effects on Outbound FDI, *The World Economy* **32**, 1657–1684.

Petersen, M.A. and Rajan, R.G. (2002). Does Distance Still Matter? The Information Revolution in Small Business Lending, *The Journal of Finance* **57**(6), 2533–2570.

Popov, A. and Udell, G.F. (2012). Cross-border banking, credit access, and the financial crisis, *Journal of International Economics* **87**, 147–161.

Rajan, R.G. (1992). Insiders and Outsiders: The Choice between Informed and Arm's-length Debt, Journal of Finance **47**, 1367–1400.

Temesvary, J. (2014a). The Determinants of U.S. banks' International Activities, *Journal of Banking & Finance* **44**, 233–247.

Temesvary, J. (2014b). Foreign activities of U.S. Banks since 1997: The Roles of Regulation and Market Conditions in Crises and Normal Times, *Journal of International Money and Finance*, 1–24.

Train, K.E. (2009). Discrete Choice Methods with Simulation, Second Edition, Cambridge University Press, New York.

Tsai, H., Chang, Y. and Hsiao, P. (2011). What Drives Foreign Expansion of the Top 100 Multinational Banks? The Role of the Credit Reporting System, *Journal of Banking & Finance* **35**, 588–605.

Weitzman, M. (1974). Prices vs. Quantities, Review of Economic Studies 41, 477–491.

Yamori, N. (1998). A Note on the Location Choice of Multinational Banks: The Case of Japanese Financial Institutions, *Journal of Banking & Finance* **22**, 109–120.

Chapter 3

Profit Shifting and Tax Response of Multinational Banks

Profit Shifting and Tax Response of Multinational Banks

Julia Merz[*]
University of Cologne

Michael Overesch[**]
University of Cologne

Abstract: This paper analyzes multinational banks' response to taxation. For the empirical analysis we use firm-level bank data from the Bankscope database. We find significant tax effects on reported profits of bank subsidiaries. The magnitude for the tax response of reported profits doubles the effects found in previous studies for non-financial MNCs. The response to tax incentives is significantly smaller in the aftermath of the financial crisis in 2008. Additional analysis reveals that in particular trading gains are highly tax responsive. Results also reveal significant tax effects on loan loss provisions and debt financing.

Keywords: Financial Sector Taxation, Multinational Bank, Corporate Taxation, Empirical Analysis

JEL Classification: G21, G28, H25

* University of Cologne, Albertus-Magnus-Platz, D-50923 Cologne, Germany, merz@wiso.uni-koeln.de, +49 (0)221 470-5605.
** University of Cologne, Albertus-Magnus-Platz, D-50923 Cologne, Germany, overesch@wiso.uni-koeln.de, +49 (0)221 470-5605.

1. Introduction

When G20 leaders met in Pittsburgh in 2009 to discuss the still ongoing financial crisis they requested the IMF to investigate "…how the financial sector could make a fair and substantial contribution toward paying for any burden associated with government interventions to repair the banking system" (IMF 2010). Thereafter, various tax measures to improve regulation of capital structure as well as possibilities to shift part of the crisis related costs from taxpayers to the financial sector have been discussed.

Very recently, a public debate on what the OECD (2013) denotes "base erosion and profit shifting" (BEPS) has been stirred up by aggressive tax planning of some very prominent companies mainly from the IT and retail sector. Interestingly, the financial sector is not at the heart of this recent discussion. One reason might be the scarce empirical evidence on banks' tax response. We therefore aim at evaluating the status quo of banks' response to international taxation.

Profit shifting activities of multinational corporations (MNCs) have long been subject to extensive research. The literature provides striking evidence for profit shifting (cf. Hines and Rice 1994; Huizinga and Laeven 2008) and tax effects on capital structures (cf. Desai et al. 2004; Huizinga et al. 2008). However the financial sector has been left out in all of these studies. To the best of our knowledge we have only limited evidence for profit shifting within banks so far. Demirgüc-Kunt and Huizinga (2001) conclude that foreign banks pay lower taxes in several developed countries and therefore suspect them to engage in profit shifting. Huizinga et al. (2014) consider tax rates of host and parent countries. While they also find some evidence for profit shifting, their

focus is on the pricing and quantity effects of international double taxation as reflected in interest margins and FDI of banks.

Our analysis of profit shifting by multinational banks contributes to this literature. We investigate the profit response of multinational banks to taxes. In particular, we analyze differences in shifting opportunities across banks due to different business models and certain shifting channels like allocation of risky assets. Moreover, we consider the impact of tax avoidance legislation, bank regulation and the impact associated with the financial crisis.

For our empirical analysis we use subsidiary-level bank data from the international bank database Bankscope in 131 countries over 11 years. Identification of multinational profit-shifting activities is a challenging task. In accordance with previous literature that has analyzed non-financial firms we analyze banks' tax elasticity of subsidiary profits. While profits of a subsidiary are determined by several factors, a systematic impact of tax incentives on reported profits can be interpreted as indirect evidence for profit shifting.

Our results suggest that reported earnings of multinational bank subsidiaries significantly respond to host country tax incentives. The magnitude of the tax sensitivity of reported profits is almost twice compared with effects found in previous studies for MNCs outside the financial sector. Therefore, our results suggest that banks have enhanced tax planning opportunities. However, our results also show that the tax response of profits is significantly restricted by anti-tax avoidance legislation and the financial crisis in 2008 – 2011.

In a second step we try to identify possible shifting channels. First, we consider the tax response of revenues from certain profit components of banks. Our

analysis reveals that, in fact, the tax elasticity of profits differs across business types. The tax elasticity of revenues generated by interest-bearing activities is less responsive compared to other activities. In particular, trading gains are highly tax sensitive.

Second, we focus on the tax influence on potentially important shifting tools. Considerable studies have analyzed the discretionary component of loan loss provisions (LLPs) used for income smoothing (Greenawalt and Sinkey 1988; Beatty et al. 1995; Collins et al. 1995). Nevertheless LLPs value as an indicator for future deduction from taxable base has not been at the center of attention yet. Making loan loss provisions can reduce taxable income in some countries; other jurisdictions do not allow deductions for tax purposes. However, even in the case where loan loss provisions are not deductible at the moment, they serve as a proxy for the allocation of bad debt in high tax countries. Therefore, we expect that LLPs are also tax sensitive. Our results, in fact, suggest significant positive effects of host country taxes on the level of loan loss provisions.

Previous tax research has also analyzed capital structure choices in order to investigate tax effects on financial decisions (for a survey cf. Feld et al. 2013). However, evidence for banks is again scarce. Keen and de Mooij (2012) and de Mooij and Heckemeyer (2013) analyze in detail the tax incentives for capital structures of banks. They find similar effects compared to the non-financial sector. Our analysis of tax influence of capital structure choices confirms previous findings of a significant marginal tax effect on capital structures. Yet, our results suggest that the magnitude of the tax response via capital structures is smaller for multinational banks compared to non-financial firms.

We particularly consider how bank regulation and the financial crisis affect the response of banks to international tax incentives. We find convincing evidence for banks reducing their tax planning during the crisis. Moreover, our results suggest that debt financing and loan loss provisioning are affected by banks' capitalization requirements.

The remainder of the paper is organized as follows. In Section 2, a discussion of the tax incentives to shift profits is provided. Section 3 explains the empirical approach and describes the data. Empirical results are presented in Section 4. Section 5 concludes.

2. Profit-Shifting Activities

In accordance with international tax principles each subsidiary of a multinational bank is subject to tax in its country of residence. Taxable profits are separately determined for each subsidiary. Therefore, international differences in tax rates provide an incentive to adopt strategies that are associated with profit shifting from high-taxed to low-taxed subsidiaries. Shifting taxable profits into low-tax jurisdictions minimizes the overall bank tax payments.

2.1 Profit Shifting

Many studies have used an indirect approach to identify profit shifting by analyzing a relationship between reported earnings and tax incentives (for a review cf. Heckemeyer and Overesch 2013). The scarce existing evidence suspects that banks are also engaged in profit shifting (Demirgüc-Kunt and Huizinga 2001; Huizinga et al. 2014).

We test whether higher host country taxes are associated with less reported earnings of bank subsidiaries and attempt to identify shifting channels. While profit-shifting activities are often associated with intangible assets and manipulation of transfer prices for firm-specific goods, profit-shifting activities of banks rely on additional strategies due to their special business model. Interest margins, allocation of services and hedging instruments as well as disclosure of loan loss provisions are potential candidates. Moreover, interest deduction from internal debt financing might be a means to shift profits, although capital structure is also a key element of bank regulation.

Profit-shifting techniques are associated with significant costs of restructuring organizational and financial structures. Furthermore, tax legislation also restricts the extensive use of shifting techniques by implementing anti-avoidance regulations. Therefore, shifting aggressive firms suffer the risk that transfer prices are adjusted in the course of tax audits. Financial institutions have so far not been at the center of transfer-pricing discussions. However the OECD Report on the Attribution of Profits to Permanent Establishments (2010) dedicating a special section to banks' profit allocation emphasizes the importance of this topic for banks.

Particularly, tax authorities scrutinize intra-group transactions by means of transfer-pricing rules. Transfer prices are assessed and adjusted if they do not correspond to the arm's length principle. The key practical issue with applying the arm's length principle is the comparability of intra-group transfer prices with prices of transactions between unrelated parties. Identification of comparable transactions, however, requires data that is often hard to collect or insufficient (see e.g. Durst and Culbertson 2003). Tax authorities have

implemented transfer-pricing regulations, but tightness, enforcement and documentation obligations of these rules vary across countries. Lohse and Riedel (2013) find for MNCs outside the banking sector that additional documentation obligations related to transfer pricing can effectively restrict the tax response of reported profits. We test whether the tightness of regulation affects banks' transactions accordingly.

2.2 Effects of Capital Regulation and the Financials Crisis

An additional constraint banks face is capital regulation. According to the Basel III principle, as enforced in most countries, banks must provide certain amounts of equity. Therefore capital-tight banks might have differing decision incentives. Taking into account banks' capitalization we are able to test effects of regulatory constraints on profit-shifting activities. We expect less tax response of capital-tight banks, especially in terms of additional debt financing or loan loss provisioning.

Moreover, our sample period provides insights into banks' behavioral adjustments during the financial crisis. With refinancing becoming increasingly difficult we expect banks to face different priorities concerning their earnings. Rather than shifting their profits to minimize taxes, we expect a focus on maintaining liquidity, fulfilling capital requirements and adjusting their business model to changing economic environments. In addition, the public debate on aggressive profit maximization and bank bailouts might have prevented bank managers from aggressive tax minimization in the aftermath of the Lehman shock in 2008. Profit during the crisis should therefore show less sensitivity to tax incentives.

2.3 Tax Responsiveness of Income from Different Business Models

Whereas banks may or may not face similar conditions than MNCs concerning transfer-pricing strategies, additional tax planning instruments might be available. We therefore suspect banks to be able to adjust in various business models for tax reasons. Nevertheless, opportunities to allocate taxable revenues are likely to differ across banks' business models. Some business models allow transactions being carried out regardless of the distance between banks and customers. Moreover, some business models might be more flexible in reorganizing their business structures due to the business not requesting plants or infrastructure. Most likely we assume to find different tax responses in lending activities, trading business as well as net fees and commissions accrual.

As for interest bearing business, adjusting interest margins in order to accrue revenues in low tax jurisdictions is only possible within a certain range. Another possibility lies in reallocating lending activity to entities in favorable destinations. However, we expect enhanced flexibility for earnings generated by consulting and investment banking. Since transactions are much more firm-specific, the arm's length principle to assess transfer prices is difficult to apply. Within transfer-pricing restrictions, contract design should be able to channel some revenue to preferred destinations. We therefore expect pronounced tax elasticity for fees and commissions.

Business activities in multiple countries offer multinational banks possibilities to allocate their trading business in tax favorable locations. Previous studies focused on the introduction of a securities transaction tax in Sweden. Studies find shifts between products and a significant migration of trading volume to the UK (Campbell and Froot 1993; Umlauf 1993). More recently Chou and

Wang (2006) find similar evidence for trading volume shifted from Singapore to Taiwan. In addition there might be some discretion where to realize certain gains. We therefore expect trading gains to be rather sensitive to tax considerations. So far we only measure the tax effect on profits, well aware that the reallocation of business would trigger additional negative effects on countries' tax revenue.

2.4 Tax Effects on Loan Loss Provisions

So far, a number of accounting studies have analyzed loan loss provisions (LLPs) as a managerial tool in the banking industry. Management incentives influencing the discretionary component of LLPs can be grouped in two categories. Some studies find evidence that LLPs are used to smooth earnings over time. Incentives to smooth income can differ with managers' strategies. Well known examples include so called "big bath" strategies, showing less volatility towards investors and managerial self-interest such as earnings based compensation packages (Fonseca and González 2008; Balboa et al. 2013). A second group of studies finds capital management to be a driver of loan loss provisioning, as LLPs can be partly used to fulfill capital requirements (Beatty et al. 1995; Ahmed et al. 1999; Laeven and Majnoni 2003).

Huizinga et al. (2014) suspect some profit shifting to be done via loan loss provisioning. However, the potential tax response of LLPs has not been analyzed empirically. Tax treatment for loan loss provisions varies among countries. Whereas some jurisdictions, such as the United States do not allow taxable deduction, other jurisdictions, for example Japan, France and Germany

allow deduction under specific conditions.[21] Covering 138 countries, we are unable to account for every specific regulation in our analysis.[22] However, all countries have in common, that a deduction for tax purposes is possible in case the debt becomes default. Therefore, we assume a strong incentive to place high risk debt in high-tax jurisdictions. We take the amount of loan loss provisions as proxy for banks' attempt to allocate loans with a high default risk in locations with a high statutory tax rate.

Given the existence of suitable subsidiaries, we will test whether banks disclose additional loan loss provisions in high tax jurisdictions to benefit from tax deductibility.

2.5 Tax Effects in Capital Structures

Whether and to what extent taxes affect financing decisions of firms has been subject to extensive discussion in the literature. Theoretical models suggest that firms optimize their capital structures by considering a trade-off between costs and benefits of debt financing. The costs may be related to financial distress (see Kraus and Litzenberger 1973), or in case of banks to regulatory requirements (Merton 1978; Marcus 1984). Moreover costs may arise from agency conflicts between equity and debt claimants on the one hand (see Jensen and Meckling 1976; Myers 1977), or between managers and shareholders on the other hand (Jensen 1986; Lundstrum 2003). Leland (1994)

[21] LLPs are regulated by IAS No. 39 and therefore subject to the incurred loss model. This requires that a loss event occurs before a provision can be made and was introduced to avoid so-called 'big bath' general provisions that distorted the accurate reporting of financial performance to investors. Bankscope's data item "Loan loss provisions" includes general and specific provisions for bad debt. In the case of Germany, this equals general and specific deductions made under § 253 III HGB (German local GAAP), which are mostly tax deductible. Additional reserves under §340f HGB are reported under a different item and are not tax deductible

[22] For an overview of loan loss provisions see World Bank (2003).

and Harding et al. (2013) add to the discussion by differentiating between protected and unprotected debt to explain banks' behavior in a realistic framework.

The major tax benefit of debt financing is that interest expenses are deductible from corporate profits, while dividend payments to equity holders are not. Hence, debt can act as a tax shield since taxable profits are reduced. The value of this tax shield obviously depends on several conditions: the corporate tax rate of the borrowing entity and the tax treatment of interest income (Modigliani and Miller 1963).The higher the corporate tax rate, the higher the value of the debt tax shield. However a high tax rate on interest income for the investors could limit or even rule out the effect (Miller 1977).

Regarding international tax incentives within multinational firms, a large body of literature provides striking evidence of profit shifting by intercompany debt for MNCs (Desai et al. 2004; Huizinga et al. 2008; for a survey Feld et al. 2013).Yet, evidence on the tax impact on capital structures of banks is still scarce.

Previous research identifies unexpected similarities between capital structures of financial institutions and non-financial multinationals (Gropp and Heider 2010), but at the same time identifies bank specific factors in capital structure choice (Miles et al. 2012). Accordingly we expect similar tax planning activities as observed for non-financial multinationals, but also expect unique results due to banks' specific regulatory framework.

Taking a closer look at banks' capital structure we face ambiguous argumentation on banks responsiveness to tax. While the same tax incentives

apply to banks than to MNCs, banks are subject to regulation in most countries. Common argumentation stresses that regulation alone determines banks' capital structure and therefore little responsiveness to taxation is to be expected. Merton (1978) and Marcus (1984) provide theoretical support for this argument. Both argue that a higher level of regulation results in higher equity ratios for banks. Keen and de Mooij (2012), Gropp and Heider (2010) and Harding et al. (2009) find large variation in banks' capital ratios, and in contrast to common textbook prediction, that banks on average hold more equity than required by regulation.

We therefore expect banks in general to be tax sensitive but control in our regression for capital constraint banks to eliminate banks unable to adjust their capital structure. Moreover the availability of tax planning through 'hybrid' instruments that are categorized differently for tax and regulatory purposes might help to be sensitive to tax considerations, too. We expect a positive sign for the marginal tax effect because additional debt financing is associated with deductible interest payments and thus, less taxable profits of the respective subsidiary.

3. Methodology and Data

3.1 Empirical Approach

In our empirical analysis of profit-shifting behavior in the banking industry, we analyze subsidiary-level data of multinational banks. Although previous studies have investigated profit-shifting activities of non-financial MNCs only, we can refer to these well-known empirical identification strategies.

Regarding the general profit-shifting evidence, previous studies have analyzed a response of reported profitability of a subsidiary to tax incentive. The idea is that reported pre-tax profits P_i^r of subsidiary i are equal to the sum of unobserved true pre-tax profits and those profits shifted into or out of this country.

Unobserved true profits generated at a certain location can be described by some production function. Therefore, the common specification in previous literature considers a vector X including several factors influencing true economic profits like capital employed, wages or host country characteristics. The scale of profit shifting should depend on the level of host country taxes. Then, the most common estimation equation in literature is obtained:

$$\ln P_i^r = \alpha_1 + \alpha_2 X_i + \gamma \tau_i + \delta_i + v_i \qquad (1)$$

A negative sign for γ is expected if profits are shifted into other locations when the local tax rate is rising. Due to the log-level specification, the coefficient γ is a tax semi-elasticity of reported profits. Moreover, we control for heterogeneity across banks by a bank-specific effect δ_i. v_i is a random term.

In an additional analysis we will consider different profit measures including only revenues from certain business models of banks. This additional analysis can detect potential asymmetries in the response to taxes between business models. Moreover, we follow up on loan loss provisioning and debt allocation as potentially important profit-shifting techniques. Since both measures are associated with less taxable profits, we expect positive effects of host country taxes.

3.2 Bank Data

We obtain comprehensive bank data from all over the world from Bankscope Database compiled by Bureau Van Dijk. The database provides balance sheets and income statements for banks based on annual reports, as well as information on their worldwide affiliates.

For our study, we use a dataset on multinational banks from 2001 to 2012. Accordingly, we consider only bank groups with at least one subsidiary in a foreign country. We consider a subsidiary if at least 50 percent of its shares are owned by the respective parent bank. Moreover, we eliminate Central Banks, Specialized Governmental Credit Institution and Micro-Finance Institutions from our sample, as their incentives might differ largely from other banks. Banks with a negative equity value are also eliminated. The sample selection limits our sample to 2,136 multinational bank groups located in 131 countries across the world. Table 3.1 depicts the sample selection.

TABLE 3.1: Sample Selection

Bank groups listed in Bankscope database 2001-2012	3,221
Exclusion of Central banks, Specialized Governmental Credit Institution and Micro-Finance Institutions	- 35
Exclusion of banks with no sufficient tax information	- 91
Exclusion of banks with negative equity	- 4
Exclusion of banks with no sufficient balance sheet information	- 959
Final sample of bank groups	2,136

Since each subsidiary is subject to tax in the respective host country, the empirical analysis considers unconsolidated accounts of both parent firms and

subsidiaries; consolidated accounts are removed.[23] Accordingly, the data reflect responsiveness on national tax rates and country-specific regulations. Unfortunately financial data of subsidiaries are only available if the subsidiary is also a bank. This leaves us with a sample of 18,929 bank-year observations.

3.3 Bank-Level Variables

In our basic set of estimations, we use earnings before taxes (EBT, in logs) of each subsidiary as our dependent variable.[24] To test differences in the tax response across different business models, we also use *Net interest revenue* and *Non-interest operating income* as well as *Trading gains* and revenue from *Net fees and commissions* as additional dependent variables. In additional analyses we also refer to loan loss provisions (LLPs)[25] and the total debt-to-total assets ratio (LEVERAGE).

We control for several bank characteristics. First of all, we consider proxies for the size of economic activities as determinants of subsidiaries' 'true' economic profit in the absence of profit-shifting incentives. We include banks' total assets (TA) and capture banks' activities that are not included in the balance sheet by off-balance sheet items (OBS). The ratio of earning assets to total assets (EA) captures the bank's share of assets that generate interest or dividend income. Moreover, we use total personnel expenses (PAYROLL) as an additional proxy for the scale of affiliate production. Furthermore, we

[23] Banks are known to use permanent establishments (PE) due to various non-tax reasons such as bank licensing. Unfortunately, balance sheet data does not allow detecting profits allocated to a foreign PE. We therefore must assume that our analysis captures not the full extent of banks´ tax planning activities and can therefore be seen as the lower bound of banks´ profit shifting.
[24] Tests with EBT divided by total assets produced similar results.
[25] The variable LLP measures the total amount of loan loss provisions accrued at the respective subsidiary and year.

consider subsidiary growth (GROWTH) measured as the annual change in total assets.

Our definition of COLLATERAL follows Gropp and Heider (2010) and includes total securities, treasury bills, other bills, bonds, CDs, cash and due from banks, land and buildings and other tangible assets divided by the book value of assets to allow for banks' specific asset structure. Profitability is captured by adjusting net income with interest expenses/total assets (ADJROA). We expect a negative sign because high profits could lead banks to retain earnings and lower their leverage ratio. Additionally we use pre-impairment operating profits (PIOP) to control for profitability before loan loss provisioning.

3.4 Tax Variables and Additional Controls

Regarding tax incentives to shift taxable profits within the multinational bank, we consider the statutory corporate tax rate (*STR*) of the subsidiary's host country. The statutory corporate tax rate includes state taxes as well as local surcharges. This can be challenging for federal countries like the US, where states apply different tax regimes. For this reason we use an average tax rate for countries with a federal structure. In our sample: Canada, Germany, Switzerland and the US. To support our results we conduct additional analyses for all our specifications using the corporate tax rate of the respective financial centers, e.g. Toronto, Frankfurt, Zurich and New York City.

While studies typically focus on tax incentives arising from host country tax rates, they neglect that the shifted profit amount is subject to tax at the level of the receiving entity within the same firm. The relevant tax incentive is

determined by the tax-rate differential between the two subsidiaries. As a notable exception Huizinga and Laeven (2008) analyze profit shifting of MNCs and consider weighted tax rates with weights depending on the observed assets of the other foreign affiliates belonging to the same firm to account for tax incentives arising within the multinational firm.[26]

Therefore, we consider several tax measures to approximate the international profit-shifting incentive of multinational banks. *WATR* is the average tax rate within the multinational banking group, excluding the tax rate of the affiliate in question. Please note that we consider the total universe of bank subsidiaries documented in Bankscope. That means for the construction of the mean tax rate we also consider subsidiaries without full financial data. By adding the *WATR* we expand our analysis from banks own tax incentives to incentives within the group structure. We expect positive coefficients since banks would be encouraged to keep profits domestic or even shift profits away from higher taxed jurisdictions.

To further explore the components of the tax incentive we use *MINSTR*, the minimum tax rate found within the group. Here again we expect a positive coefficient, since a higher minimum tax rate indicates a lower incentive to shift profits.

The indicator (*TP*) considers a country's strictness and enforcement of transfer-pricing rules. The data is provided by Lohse et al. (2012). In practice difficulties in compliance with transfer-pricing regulation might differ among industries. While manufacturing firms aim to allocate their personnel most

[26] See also Buettner and Wamser (2012) using the tax rate differential between the local tax rate and the minimum tax rate observed within the company to investigate internal borrowing.

efficiently to exploit transfer prices, banks' focus is set on risk allocation. However, as our index is based on general conditions such as documentation, enforcement and disclosure requirements, we are confident it can be applied to the financial industry. We use a dummy variable which equals one for strict and zero for rather loose transfer-pricing regulation.[27]

Regarding capital regulation of banks, we control for capital-tight banks. *CAP* is a dummy variable equaling one for firms with limited capitalization and zero otherwise. Since BANKSCOPE does not provide sufficient information to compute precise risk-adjusted capital thresholds, we therefore define the 25%-percentile of banks with the lowest capitalization ratio as capital tight. In our sample the threshold equals banks with a capitalization of 12.4 % and less.

We expect banks to be less responsive to tax effects after 2008 due to ongoing recapitalization difficulties throughout the industry. We include a *Crisis* dummy to separate effects before and after the Lehman shock. Our dummy equals 1 for the years 2008-2011. Due to our international sample we control for inflation *(INF)* as the annual percentage change in Consumer Price index of the subsidiary's host country. Dyreng at al. (2012) emphasize the influence of the level of rule of law (*RULEOFLAW*) on subsidiaries' earnings management. Our control variable *RULEOFLAW* is taken from the World Bank Development Indicators dataset. Scores are reported between -2,5 and +2,5 on a country-year level. The score measures the perception of the extent to which rules of society are respected, particularly the quality of contract enforcement. A high score indicates a strong rule of law.

[27] We classify transfer pricing rules as strict if the original score according to Lohse and Riedel (2013) is four or five. Transfer pricing rules are considered as loose if original scores range between zero and three.

TABLE 3.2: Summary Statistics

	No. of obs.	Mean	Std. dev	Min	Max
EBT	18929	35,009.03	46,34529.1	.001	1.87e+07
Net interest revenue	20944	55,216.98	749,227.3	.002	3.39e+07
Non-interest operating income	20355	24,718.21	343,451.6	.001	1.53e+07
Net fees and commissions	18929	12,227.1	147,617.1	.001	4,972,000
Net Gains on Trading	5907	8,499.542	67,784.94	.001	2,123,000
LLPs	16208	13,917.28	186,555.4	.001	7,879,000
LEVERAGE	18929	.896	.10	0	.99
TA	18929	1,775,897	1.97e+07	.021	7.01e+08
EA	18929	1,517,333	1.65e+07	0	5.67e+08
OBS	18929	381,334.6	5,533019	.001	3.35e+08
PAYROLL	18929	19,518.27	254,386.3	.001	1.02e+07
ADJROA	18810	.038	.036	-0.0816	.854
PIOP	16208	50,763.04	62,9126.8	-53.0000	2.34e+07
GROWTH	18929	.0115	.030	-.31	.799
COLLATERAL	18929	.261	.171	0	1
STR	18929	.32	.083	0	.55
STRFIN	18929	.34	.097	0	.55
MIN STR	18929	.25	.13	0	.55
WATR	18929	.314	.063	0	.55
RULEOFLAW	18929	1.09	.86	-1.68	1.99
INF	18929	3.13	3.55	.037	152.56
TP	15270	.31	.46	0	1
CAP	18929	.12	.336	0	1

Sources: Bank variables are derived from Bankscope provided by Bureau van Dijk. The tax variables are derived from information taken from the IBFD Tax Handbooks and the Worldwide Corporate Tax Guides by Ernst & Young. The Transfer pricing indicator is taken from Lohse et al. (2012). Inflation Rate and RULEOFLAW stem from the World Bank's Development Indicators, edition 2012.

4. Results

In this section, we present the regression results for the tax impact on reported profits of subsidiaries in the banking sector.

4.1 Tax Effects on Reported Profits

We start with an analysis of reported profits with results shown in Table 3.3. The dependent variable is (log) EBT. Regressions follow Equation (1) as described in Section 3. Some of the tax variables which are important for our

identification only vary within country-year cells. Moulton (1990) and Bertrand et al. (2004) show that the presence of a common random effect at the country-year level has to be taken into account. Thus, we use a variance-covariance matrix allowing for random group effects by clustering in country-year cells. We consider parent-specific effects to control for the heterogeneity among bank groups. Moreover, we consider a full set of year effects and bank type effects which capture differences in the financial conditions among 15 different bank types shown in our sample.

All specifications consider a basic set of control variables to explain true economic profits generated by subsidiaries in the absence of any profit shifting. In particular, we can confirm that the stock of invested capital and payroll exert significant positive effects on the profit amount. Furthermore, we also find a positive influence of the off-balance sheet items. Moreover, higher inflation in a host country is associated with significantly higher reported profit.

Regarding the tax incentive, we find a negative and highly significant effect of the host country tax rate on reported profits. Subsidiaries with higher host country tax levels have significantly smaller pre-tax profits. This finding confirms the expectation that reported profits of multinational banks respond to host country taxes. Considering Column (1) of Table 3.3, the coefficient of -2.378 suggests that a one percentage point higher host country tax rate is associated with about 2.4 percent less reported profits of a bank subsidiary.

Compared with results from studies that consider data from non-financial MNCs, the semi-elasticity of -2.378 is large in absolute terms. A recent meta-study of 25 previous studies by Heckemeyer and Overesch (2013) suggests as a consensus estimate a tax semi-elasticity of subsidiary profits of about -0.8 for

non-financial MNCs. Banks seem to be more flexible in terms of shifting their profits compared to the non-banking sector.

In Column (2) we add the subsidiary's leverage as control variable. By doing so, we control for debt shifting as one potentially important shifting mechanism. As expected, the estimated tax effect is smaller in the presence of a control for differences in debt share. However, the remaining tax effect is still significant and of a noticeable magnitude. We conclude that debt financing might not be the most important profit-shifting mechanism within multinational banks. We will come back to this issue in an additional analysis in Section 4.4.

The host country tax rate might not reflect the complete tax incentive to use profit-shifting opportunities. In Column (3) and (4) we include an average tax rate of all other locations of the multinational banking group and the minimum tax rate available within the group. Since the average tax rate and the available minimum tax rate proxy for the tax effectively imposed if profits are shifted within the multinational group, an adverse effect on the remaining profits of a subsidiary is expected. A higher tax level at other locations of the multinational bank diminishes the incentive to shift profits. As expected both control variables show are significantly positive effect, indicating less profit shifting if the tax level in other jurisdiction increases.

Following Dyreng et al. (2012)'s evidence for non-financial MNCs we expect less profit shifting in countries with a high level of *RULEOFLAW*. However, even though our coefficient is small, it implicates more profit shifting in countries with a high score.

Regarding restrictions of profit shifting, we account for the level of transfer-pricing regulation and enforcement in host countries. The positive effect of the interaction term between the tax rate and the transfer-pricing indicator in Column (6) provides evidence that stricter transfer-pricing regulation is associated with an adverse effect on the profit response to taxes. Taking into account the point estimates for the plain tax rate and the interaction term with the transfer-pricing indicator, our findings suggest that the tax response of bank profits is completely eliminated by strict transfer-pricing regulation.

TABLE 3.3: Banks' Profit Shifting

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
STR	-2.378***	-2.064***	-2.999***	-2.753***	-2.008***	-3.200***	-2.432***	-2.539***
	(0.249)	(0.243)	(0.285)	(0.247)	(0.241)	(0.263)	(0.249)	(0.249)
TA(ln)	0.680***	0.783***	0.680***	0.680***	0.694***	0.694***	0.681***	0.683***
	(0.022)	(0.020)	(0.021)	(0.021)	(0.022)	(0.025)	(0.022)	(0.022)
EA	0.341**	0.410***	0.393***	0.381***	0.417***	0.251	0.359**	0.316**
	(0.144)	(0.132)	(0.145)	(0.145)	(0.143)	(0.174)	(0.144)	(0.144)
OBS (ln)	0.027***	0.031***	0.028***	0.027***	0.031***	0.028***	0.028***	0.026***
	(0.009)	(0.008)	(0.009)	(0.009)	(0.009)	(0.010)	(0.009)	(0.009)
PAYROLL (ln)	0.252***	0.190***	0.252***	0.252***	0.214***	0.223***	0.250***	0.250***
	(0.020)	(0.018)	(0.020)	(0.020)	(0.021)	(0.022)	(0.020)	(0.020)
GROWTH	-0.832***	-0.371	-0.831***	-0.818***	-0.997***	-1.106***	-0.824***	-0.892***
	(0.262)	(0.268)	(0.263)	(0.261)	(0.255)	(0.284)	(0.261)	(0.261)
COLLATERAL	0.439***	0.193***	0.440***	0.440***	0.405***	0.216**	0.434***	0.443***
	(0.084)	(0.074)	(0.084)	(0.083)	(0.081)	(0.098)	(0.084)	(0.084)
INF (ln)	0.095***	0.077***	0.094***	0.095***	0.038*	0.067**	0.095***	0.102***
	(0.022)	(0.019)	(0.022)	(0.022)	(0.020)	(0.026)	(0.022)	(0.021)
LEVERAGE		-3.514***						
		(0.145)						
WATR			2.321***					
			(0.815)					
MINSTR				1.307***				
				(0.494)				
RULEOFLAW					-0.276***			
					(0.030)			
TP						-0.729***		
						(0.200)		
TP x STR						3.729***		
						(0.687)		
CAP							-0.176	
							(0.129)	
CAP x STR							0.379	
							(0.426)	
CRISIS x STR								0.941***
								(0.345)
R^2	0.95	0.96	0.95	0.95	0.95	0.95	0.95	0.95
N	18,929	18,929	18,929	18,929	18,929	15,270	18,929	18,929

Notes: The dependent variable is earnings before taxes EBT (ln). Explanatory variables: STR is the statutory corporate tax rate of the subsidiary's host country. TA (ln) are total assets and OBS (ln) measures off-balance sheet items. EA are earning assets over total assets. PAYROLL (ln) is total personnel expense. GROWTH is the change of total assets. COLLATERAL is a tangibility measure following Gropp and Heider (2010) including total securities, treasury bills, other bills, bonds, CDs, cash and due from banks, land and buildings and other tangible assets divided by the book value of assets to allow for banks' specific asset structure. WATR is the worldwide average tax rate within the group. Inflation as the annual percentage in Consumer Price index of the subsidiary's host country as reported by the World Bank Database. LEVERAGE is the total debt-to-total assets ratio. RULEOFLAW is an indicator for the host country's level of rule of law, scores are taken from the World Bank Development Indicators dataset. TP is a dummy variable for the strictness of transfer pricing regulation. CAP is a dummy variable for banks' limited capitalization. CRISIS is an indicator for years before and after the financial crisis. Year dummies, bank-type effects and parent-firm effects are included but not reported. Robust standard errors, clustered on a country-year level, are shown in parentheses. *, ** and *** indicate significance at the level of 10%, 5% and 1% respectively.

4.2 Effects of Bank Regulation and the Financial Crisis

In additional regressions in Columns (7) and (8) of Table 3.3, we test whether bank regulation and the financial crisis affect profit-shifting behavior of multinational banks. In Column (7) we consider an indicator for banks' actual capitalization. A value of one indicates that the respective bank is in the lower 25%-percentile concerning total capital ratio. Although our coefficient is negative, indicating capital-tight banks being unable to shift profits, our results are statistically insignificant. We cannot conclude that bank regulation does affect the responsiveness of total profit to tax incentives.

Considering that our panel includes the financial crisis as a period with exceptional challenges for banks, we included a dummy for years between 2008 and 2011 in Column (8). Our results suggest that banks did less profit shifting during the financial crisis. This coincides with the general assumption that banks had other preferences in their behavior during the crisis. Buch et al. 2013 state that the crisis lowered banks' engagement in international assets. Withdrawal from foreign markets can be associated with less tax planning possibilities. Nevertheless, the strong impact of the financial crisis on balance sheets calls for follow-up research on this topic.

An additional set of regressions using the statutory tax rate of the respective financial centers supports our results (see Appendix, table 3.7).

4.3 Income from different business models

In our first analysis in Table 3.3, we referred to *EBT* as our profit measure. By choosing this rather broad measure, we capture the overall response to taxes. In order to corroborate our main results we conduct a series of additional tests. Regressions in Table 3.4 focus on potential differences in the tax response of profits generated by different business models of multinational banks.

We take specification (1) from Table 3.3 as a starting point but choose different profit measures as dependent variables. Column (1) of Table 3.4 considers *Net interest revenue* as dependent variable. In Column (2) of Table 3.4 we focus on the non-interest revenues. The significant negative coefficients in both specifications support our assumption that revenues are allocated to low tax subsidiaries. However, comparing the point estimates for the tax response, revenues from interest bearing business are less flexible with regard to profit shifting. Our results suggest that revenues from other types of business are particularly mobile.

Columns (3) and (4) provide additional insights into this tax response and take into account certain types of non-interest income. We consider *Trading gains* as well as *Net fees and commissions* as dependent variables. The results again support the view that different business types are asymmetrically responsive to tax incentives. Comparing our results we find a rather large semi-elasticity for *Trading gains* compared to *Net fees and commissions* or *Net interest revenue.*[28] The findings suggest that *Trading gains* are particularly mobile and shifting to low tax

[28] To consider potential sample biases we also tested all specifications with the smaller sample used in the *Trading gains* regression and gained similar results.

subsidiaries seems to be rather easy. However taking into account the absolute size of business models, *Net interest revenue* proofs to be still an important channel. Due to banks' unique business model *Net interest revenue* has a high volume and contains a variety of transactions. Although the measured tax semi-elasticity is rather small, the absolute amount of shifted income is still larger for interest bearing business than the shifting amount due to tax-optimal allocation of trading gains.

Coefficients for our control variable support the validity of our results. More earning assets can be associated with an increase in *Net interest revenue*. A contrasting relationship can be reported for on *Non-interest operating income* and *Net fees and commissions*. This is expected because a higher share in earning assets indicates a banks focus on interest-generating activities as opposed to fee-generating activities.

TABLE 3.4: Income from Different Business Models

	(1) Net interest revenue	(2) Non-interest operating income	(3) Trading gains	(4) Net fees and commissions
STR	-0.551***	-0.820***	-3.401***	-0.719***
	(0.139)	(0.190)	(0.463)	(0.173)
TA (ln)	0.631***	0.260***	0.592***	0.175***
	(0.017)	(0.020)	(0.051)	(0.019)
EA	0.408***	-0.603***	0.018	-0.278***
	(0.105)	(0.100)	(0.324)	(0.107)
OBS (ln)	0.005	0.024***	-0.025	0.036***
	(0.006)	(0.007)	(0.023)	(0.008)
PAYROLL (ln)	0.366***	0.708***	0.379***	0.751***
	(0.016)	(0.018)	(0.049)	(0.017)
GROWTH	-1.072***	-0.500***	0.109	-0.182
	(0.169)	(0.162)	(0.633)	(0.177)
COLLATERAL	0.047	-0.067	1.023***	-0.450***
	(0.055)	(0.062)	(0.218)	(0.052)
INF (ln)	0.103***	0.030	0.154***	-0.016
	(0.015)	(0.020)	(0.043)	(0.014)
R^2	0.98	0.97	0.93	0.97
N	20,944	20,355	5,907	18,929

Notes: Dependent variables: (1) Net interest revenue (ln); (2) Non-interest operating income (ln); (3) Trading gains (ln); (4) Net fees and commissions (ln). Explanatory variables: STR is the statutory corporate tax rate of the subsidiary's host country. TA is total assets TA and OBS (ln) measures off-balance sheet items. EA are earning assets over total assets. PAYROLL (ln) is total personnel expense. PAYROLL (ln) is total personnel expense. GROWTH is the change of total assets. COLLATERAL is a tangibility measure following Gropp and Heider (2010) including total securities, treasury bills, other bills, bonds, CDs, cash and due from banks, land and buildings and other tangible assets divided by the book value of assets to allow for banks' specific asset structure. INF is inflation as the annual percentage in Consumer Price index of the subsidiary's host country as reported by the World Bank Database. Year dummies, bank type effects and parent-firm effects are included but not reported. Robust standard errors, clustered on a country-year level, are shown in parentheses. *, ** and *** indicate significance at the level of 10%, 5% and 1% respectively.

4.4 Loan Loss Provisions

The literature suggests that loan loss provisioning is an item with a discretionary component depending to some extent on decision makers' strategies. We therefore investigate the relationship between LLPs and the statutory tax rate within the

multinational bank. We expect a positive correlation between STR and the amount of LLPs, equaling less taxable income in high-tax jurisdictions. [29]

TABLE 3.5: Loan Loss Provisions

	(1)	(2)	(3)	(4)
STR	2.330***	2.834***	2.922***	3.242***
	(0.434)	(0.436)	(0.425)	(0.414)
TA (ln)	0.497***	0.287***	0.290***	0.279***
	(0.034)	(0.039)	(0.039)	(0.039)
EA	-0.683***	-0.754***	-0.778***	-0.717***
	(0.205)	(0.215)	(0.216)	(0.216)
OBS (ln)	0.006	-0.005	-0.007	-0.002
	(0.015)	(0.015)	(0.015)	(0.015)
PAYROLL (ln)	0.444***	0.329***	0.328***	0.332***
	(0.030)	(0.031)	(0.031)	(0.031)
GROWTH	-2.758***	-2.308***	-2.306***	-2.082***
	(0.446)	(0.462)	(0.463)	(0.454)
COLLATERAL	-0.769***	-0.832***	-0.832***	-0.842***
	(0.115)	(0.117)	(0.118)	(0.117)
INF (ln)	0.142***	0.096***	0.094***	0.080***
	(0.033)	(0.030)	(0.029)	(0.028)
PIOP (ln)		0.350***	0.350***	0.351***
		(0.026)	(0.026)	(0.026)
CAP			0.664***	
			(0.175)	
CAP x STR			-2.118***	
			(0.566)	
CRISIS x STR				-1.931***
				(0.582)
R^2	0.92	0.93	0.93	0.93
N	16,208	15,592	15,592	15,592

Notes: Dependent variable is loan loss provisions LLP (ln). Explanatory variables: STR is the statutory corporate tax rate of the subsidiary's host country. TA (ln) are total assets and OBS (ln) measures off-balance sheet items. EA are earning assets over total assets. PAYROLL (ln) is total personnel expense. PAYROLL (ln) is total personnel expense. GROWTH is the change of total assets. COLLATERAL is a tangibility measure following Gropp and Heider (2010) including total securities, treasury bills, other bills, bonds, CDs, cash and due from banks, land and buildings and other tangible assets divided by the book value of assets to allow for banks' specific asset structure. INF is inflation as the annual percentage in Consumer Price index of the subsidiary's host country as reported by the World Bank Database. PIOP (ln) is pre-impairment operating profit. CAP is a dummy variable for banks' limited capitalization. CRISIS is an indicator for years before and after the financial crisis. Year dummies, bank-type effects and parent-firm effects are included but not reported. Robust standard errors, clustered on a country-year level, are shown in parentheses. *, ** and *** indicate significance at the level of 10%, 5% and 1% respectively.

We find a significant positive tax effect on LLPs for all specifications in Table 3.5.[30] Column (1) indicates an increase in LLPs of 2.3 percent for a one percentage

[29] For an overview cf. World Bank (2002).

point higher host-country tax rate. To isolate the tax effect we consider controls for banks' profitability and capitalization. In accordance with findings in the accounting literature we find a positive impact of pre-impairment operating profits (PIOP) with loan loss provisioning. Banks with a higher PIOP might buildup LLPs for future losses as well as a means to reduce their tax base.

As accounting literature is suggesting we expect capital-tight banks to be less interested in income smoothing. Additional LLPs might not contribute to regulatory (Tier I) capital but decrease the possibility to retain earnings. Since high leverage and capital tightness come usually as a result of low earnings or losses in previous periods, it can be argued that banks in a tough financial situation would rather increase their earnings than engage in aggressive tax planning. Column (3) supports our prediction. The interaction term between the indicator variable for capital-tight banks and the tax rate is negative and statistically significant.

In column (4), we again investigate the effect of the financial crisis. As expected, we find evidence that LLPs are buildup during the crisis years. Considering the two coefficients of the plain tax variable and the interaction term, our finding suggests almost no tax effect on LLPs during the financial crisis. The economic situation during the crisis seems to mitigate the discretionary component of LLPs.

Interestingly earning assets (*EA*) show significantly negative coefficients throughout all our specifications. This could be attributed to banks with a high share in earning assets are on average less risky.

[30] To test for robustness we conduct additional regressions using the difference between PIOP and Operating Profit. The results support our findings and are available upon request.

In additional tests we are able to support our results. The United States are particularly known for not allowing a tax deduction of LLPs. Therefore we simulate a zero incentive by replacing the statutory tax rate with zero for the United States (see Appendix, Table 3.11). In addition we test for a subsample, excluding the United States (see Appendix, Table 3.12). Both analyses are in accordance with our previous result and find a significant positive effect.

4.5 Capital Structure

In additional analyses we trace refinancing through internal and external capital markets as an additional shifting mechanism. More precisely, we analyze tax effects on capital structures of bank subsidiaries. We employ *LEVERAGE* as our dependent variable in our regression analysis. The additional regression results are depicted in Table 3.6.

Our selection of control variables follows seminal studies providing capital structure regressions (Frank and Goyal 2009; Gropp and Heider 2010; Keen and de Mooij 2012). Frank and Goyal (2009) identify a core set of six capital structure determinants including controls for firm size, tangibility, profit, inflation, firm-specific growth options, and industry median leverage.[31]

Estimated effects for the non-tax determinants are in accordance with previous research. *TA* and *OBS* allow us to control for size effects. As expected our data confirms that larger banks measured by total assets have higher leverage ratios, possibly due to their lower default risk and therefore easier borrowing access

[31] Note that we control for the industry median by including fixed effects for bank types.

(Rajan and Zingales 1995; Graham and Harvey 2001). *EA* allow us to control for banks' share of interest generating activities. A higher share indicates less risky activities and can therefore be associated with borrowing conditions.

More profitable subsidiaries use less debt. Profitability is captured by adjusting net income with interest expenses/total assets (ADJROA). Profitability is negatively related to debt financing suggesting that profitable firms demand less external funds to finance new investment projects (Titman and Wessels 1988; Rajan and Zingales 1995). Moreover, high profits could lead banks to retain earnings and lower their leverage ratio.

Additionally, we consider firm growth. Expectations depend on how subsidiaries finance new investments: if firms can finance investments by retained earnings, the effect of growth on total debt may be negative; if new investments are financed with debt, the effect might be positive. Across all specifications we find an insignificant effect.

Interestingly, additional COLLATERAL leads to smaller leverage. Collateral reduces the cost of external lending. In addition, banks with high tangibility are expected to have easier access and lower costs of borrowing since they can use these assets as collateral when borrowing from central banks. However, studies analyzing capital-structure choices of multinational subsidiaries suggest that MNCs use internal capital markets (cf. Desai et al. 2004; de Haas and van Lelyveld 2010). If internal borrowing is a substitute for external debt, the effect of collateral on the total leverage might also be negative.

Across all specifications in Table 3.6, we find a significant positive effect of the host country tax rate on leverage. Accordingly, our results confirm the expectation of additional debt financing if interest deductibility avoids higher taxes. The coefficient for the tax rate of 0.073 in column (1) of Table 3.6 means that the debt-to-asset ratio of a subsidiary falls by about 0.1 percentage point if the local tax rate increases by one percentage point.

The magnitude of our marginal tax effect is however small in comparison with marginal tax effects on capital structures found for non-financial MNCs. In a meta-analysis covering 48 studies on the relationship between corporate capital structure and taxation, Feld et al. (2013) predict the debt-to-assets ratio to increase by 0.27 percentage points if the applicable corporate tax rate increases by one percentage point. We conclude that capital structures of multinational banks are less sensitive to tax incentives. Our overall results are smaller but nevertheless qualitatively consistent with previous results by Keen and de Mooij (2012) and de Mooij and Heckemeyer (2013). Moreover, de Mooij and Heckemeyer (2013) also find that the tax elasticity of banks' capital structures falls with increasing bank size. For obvious reasons, multinational banks belong to the biggest banks.

One potential reason for the small marginal tax effect on banks' capital structures might be the fact that banks are in general already highly leveraged, in our sample 89% on average. Therefore, capital structure adjustments might be smaller in absolute terms. As a second restriction almost all countries impose regulatory measures on banks and therefore limit responsiveness. To take this expectation into account, in column (2) we again add the dummy variable indicating capital-

tight banks. Our results support the expectation that banks close to their regulatory minimum capital requirement do respond less to tax incentives.

TABLE 3.6: Taxes and Bank Capital Structure

	(1)	(2)	(3)
STR	0.073***	0.084***	0.079***
	(0.017)	(0.017)	(0.019)
TA(ln)	0.017***	0.017***	0.017***
	(0.001)	(0.001)	(0.001)
EA	0.057***	0.053***	0.058***
	(0.016)	(0.016)	(0.016)
OBS (ln)	-0.002*	-0.002**	-0.002*
	(0.001)	(0.001)	(0.001)
ADJROA	-0.069*	-0.065*	-0.069*
	(0.037)	(0.037)	(0.037)
GROWTH	0.088	0.088	0.089
	(0.058)	(0.058)	(0.058)
COLLATERAL	-0.088***	-0.087***	-0.088***
	(0.012)	(0.012)	(0.012)
INF (ln)	-0.005***	-0.005***	-0.005***
	(0.002)	(0.002)	(0.002)
CAP		0.032***	
		(0.009)	
CAP x STR		-0.040	
		(0.026)	
CRISIS x STR			-0.034
			(0.022)
R^2	0.71	0.71	0.71
N	22,273	22,273	22,273

Notes: Dependent variable is the total debt-to-total asset ratio. Explanatory variables: STR is the statutory corporate tax rate of the subsidiary's host country. TA (ln) are total assets and OBS (ln) measures off-balance sheet items. EA are earning assets over total assets. PAYROLL (ln) is total personnel expense.. ADJROA is a profitability measure captured by net income and interest expenses over total assets. GROWTH is the change of total assets. COLLATERAL is a tangibility measure following Gropp and Heider (2010) including total securities, treasury bills, other bills, bonds, CDs, cash and due from banks, land and buildings and other tangible assets divided by the book value of assets to allow for banks' specific asset structure. INF is inflation as the annual percentage in Consumer Price index of the subsidiary's host country as reported by the World Bank Database. CAP is a dummy variable for banks' limited capitalization. CRISIS is an indicator for years before and after the financial crisis. Year dummies, bank type effects and parent-firm effects are included but not reported. Robust standard errors, clustered on a country-year level, are shown in parentheses. *, ** and *** indicate significance at the level of 10%, 5% and 1% respectively.

In specification (3) we take into account that in the aftermath of the bankruptcy of Lehman Brothers in September 2008, financial markets struggled and financing of banks became an extremely difficult task. We test whether during the crisis the focus was no longer on tax planning. The negative effect of the interaction term

between CRISIS and STR suggests that banks' response to tax incentives decreased due to the financial crisis. However the effect is not significant and therefore we are not able to interpret the effect the crises had on banks' leverage.

5. Conclusion

We have analyzed multinational banks' response to taxation. For the empirical analysis we have employed the international bank dataset Bankscope. First, we find that reported earnings of multinational banks' subsidiaries significantly respond to host country tax incentives. The magnitude of the tax sensitivity of reported profits is significantly larger compared to effects found in previous studies for non-financial MNCs. Thus, our findings suggest that banks have enhanced tax planning opportunities similar to firms from the IT industry or the retailing sector. With regard to anti-tax avoidance legislations, our findings suggest that strict enforcement of transfer-pricing rules is associated with less profit-shifting activities.

In additional analyses, we have analyzed whether the tax response differs across different business models in the banking sector. We find that the tax elasticity of revenues generated by interest-bearing activities is less tax responsive compared to other activities. In particular trading gains are highly tax sensitive. Moreover, we have considered potential shifting channels. First, we follow up on evidence in accounting literature and consider loan loss provisioning. Our results suggest that discretionary accrual of loan loss provisions is, in fact, driven by tax incentives. Second, we have analyzed the tax influence on banks' capital structure choices.

Our results confirm a significant positive effect of host country taxes on debt financing of bank subsidiaries. Yet, our results suggest that the magnitude of the tax response via capital structures is significantly smaller in the banking sector compared to previous findings for non-financial MNCs. This finding supports the view that bank regulation in terms of capital requirements is associated with less tax planning flexibility. We also find that bank regulation tends to limit tax planning via loan loss provisions.

Generally, our results suggest a smaller tax responsiveness of reported profits in the aftermath of the financial crisis in 2008. In particular, our results suggest that the financial crisis seems to diminish incentives to use debt financing and provision making as a means to allocate taxable profits.

Our results provide insights in the status quo of bank taxation. Interestingly, we find that the general tax response of reported profitability seems to be more pronounced than found for MNCs from other industries. It seems to be a challenging task for future research to provide more evidence whether only the location of reported profits or also the location of certain bank activities is affected by taxation.

References

Ahmed, A.S., Takeda, D. and Thomas, S. (1999). Bank LLP: A Re-Examination of Capital Management, Earnings Management and Signalling Effects, *Journal of Accounting and Economics* **28**, 1–25.

Balboa, M., López-Espinosa G. and Rubia, A. (2013). Nonlinear Dynamics in Discretionary Accruals: An Analysis of Bank Loan-Loss Provisions, *Journal of Banking and Finance* **37**, 5186–5207.

Beatty, A., Chamberlain, S., Magliolo, J., (1995). Managing Financial Reports of Commercial Banks: the Influence of Taxes, Regulatory Capital, and Earnings, *Journal of Accounting Research* **33**(2), 231–261.

Bertrand, M., Duflo, E. and Mullainathan, S. (2004). How Much Should We Trust Differences-in-Differences Estimates?, *The Quarterly Journal of Economics* **119**(1), 249–275.

Buettner, T. and Wamser, G. (2012). Internal Debt and Multinationals' Profit Shifting - Empirical Evidence from Panel Data, *National Tax Journal* **66**, 63–95.

Campbell, J. and Froot, K. (1993). International Experience with Securities Transaction Taxes, NBER Working Paper 4587.

Chou, R. and Wang, G. (2006). Transaction Tax and Market Quality of the Taiwan Stock Index Futures, *Journal of Futures Markets* **26**(12), 1195–1216.

Collins J., Shackelford D. and Wahlen J. (1995). Bank Differences in the Coordination of Regulatory Capital, Earnings and Taxes, *Journal of Accounting Research* **33**(2), 263–292.

Demirgüc-Kunt, A. and Huizinga, H.P. (1999). Determinants of Commercial Bank Interest Margins and Profitability: Some International Evidence, *World Bank Economic Review* **13**(2), 379–408.

Demirgüc-Kunt, A. and Huizinga, H.P. (2001). The Taxation of Domestic and Foreign Debt, *Journal of Public Economics* **79**(3), 429-453.

De Haas, R. and De Lelyveld, I. (2010). Internal Capital Markets and Lending by Multinational Bank Subsidiaries, *Journal of Financial Intermediation* **19**(1), 1–25.

De Mooij, R. and Heckemeyer, J.H. (2013). Taxation and Corporate Debt: Are Banks any Different?, IMF, Working Paper 13/221.

Desai, M.A., Foley, C.F. and Hines, J.R. (2004). A Multinational Perspective on Capital Structure Choice and Internal Capital Markets, *Journal of Finance* **59**(6), 2451–2487.

Durst, M.C. and Culbertson, R.E. (2003). Clearing Away the Sand: Retrospective Methods and Prospective Documentation in Transfer Pricing Today, *Tax Law Review* **57**, 37–134.

Dyreng, S. D., Hanlon, M. and Maydew, E.L. (2012). Where Do Firms Manage Earnings?, *Review of Accounting Studies* **17**(3), 649– 687.

Feld, L., Heckemeyer, J. and Overesch, M. (2013). Capital Structure Choice and Company Taxation: A Meta-Study, *Journal of Banking and Finance* **37**, 2850–2866.

Fonseca, A.R. and González, F. (2008). Cross-country Determinants of Bank Income Smoothing by Managing Loan-Loss Provisions, *Journal of Banking and Finance* **32**, 217-228.

Frank, M. and Goyal, V. (2009). Capital Structure Decisions: Which Factors are Reliably Important?, *Financial Management* **38**(1), 1–37.

Graham, J., and Harvey, C. (2001). The Theory and Practice of Corporate Finance: Evidence from the Field, *Journal of Financial Economics* **60**, 187–243.

Greenawalt, M.B. and Sinkey, J.F. (1988). Bank Loan-Loss Provisions and the Income-Smoothing Hypothesis: An Empirical Analysis, *Journal of Financial Services Research* **1**, 1976–1984.

Gropp, R. and Heider, F. (2010). The Determinants of Bank Capital Structure, *Review of Finance* **14**(4), 587–622.

Harding, J., Liang, X. and Ross, S. (2009). The Optimal Capital Structure of Banks: Balancing Deposit Insurance, Capital Requirements, and Tax-advantaged Debt, University of Connecticut, Working Paper.

Harding, J., Liang, X. and Ross, S. (2013). Bank Capital Requirements, Capital Structure and Regulation, *Journal of Finance and Services Research* **43**, 127 – 148.

Heckemeyer, J. and Overesch, M. (2013). Multinationals' Profit Response to Tax Differentials: Effect Size and Shifting Channels, University of Cologne, Working Paper.

Hines, R. and Rice, E. (1994). Fiscal Paradise: Foreign Tax Havens and American business, *Quarterly Journal of Economics* **109**(1), 149–182.

Huizinga, H. and Laeven, L. (2008). International Profit Shifting within Multinationals: A Multi-Country Perspective, *Journal of Public Economics* **92**(5-6), 1164–1182.

Huizinga, H., Laeven, L. and Nicodème, G. (2008). Capital Structure and International Debt Shifting in Europe, *Journal of Financial Economics* **88**, 80–118.

Huizinga, H.P., Voget, J. and Wagner, W.B. (2014). International Taxation and Cross-Border Banking, *American Economic Journal: Economic Policy* **6**(2), 94–125.

IMF (2010). Financial Sector Taxation: The IMF's Report to the G-20 and Background Material 2010.

Jensen, M. and Meckling, W. (1976). Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure, *Journal of Financial Economics* **3**(4), 305–360.

Jensen, M. (1986). Agency Cost of Free Cash Flow, Corporate Finance, and Takeovers, *American Economic Review* **76**(2), 323–329.

Keen, M. and de Mooij, R. (2012). Debt, Taxes, and Banks, International Monetary Fund, Working Paper.

Kraus A. and Litzenberger, R.H. (1973). A State-preference Model of Optimal Financial Leverage, The *Journal of Finance* **28**(4), 911–922.

Laeven L. and Majnoni, G. (2003). Loan Loss Provisioning and Economic Slowdowns: Too Much, Too Late?, *Journal of Financial Intermediation* **12**(2), 178–197.

Leland, H.E. (1994). Corporate Debt Value, Bond Covenants, and Optimal Capital Structure, *Journal of Finance* **49**(4), 1213–1252.

Lohse, T., Riedel, N. and Spengel, C. (2012). The Increasing Importance of Transfer Pricing Regulations – a Worldwide Overview, Working Paper.

Lohse, T. and Riedel, N. (2013). Do Transfer Pricing Laws Limit International Income Shifting? Evidence from European Multinationals, CESifo Working Paper 4404, Munich.

Lundstrum, L. (2003). Firm Value, Information Problems and the Internal Capital Market, *Review of Quantitative Finance and Accounting* **21**(2), 141–156.

Marcus, A.J. (1984). Deregulation and Financial Policy, *Journal of Banking and Finance* **8**, 557–565.

Merton, R.C. (1978). On the Cost of Deposit Insurance when there are Surveillance Costs, *The Journal of Business* **51**(3), 439–452:

Miles, D., Yang, J. and Marcheggiano, G. (2012). Optimal Bank Capital, *The Economic Journal* **123**(567), 1–37.

Miller, M.H. (1977). Debt and Taxes, *Journal of Finance* **32**(2), 261–275.

Modigliani, F. and Miller, M. (1963). Corporate Income Taxes and the Cost of Capital: A Correction, *American Economic Review* **53**(3), 433–443.

Moulton, B. (1990). An Illustration of a Pitfall in Estimating the Effects of Aggregate Variables on Micro Unit, *Review of Economics & Statistics* **72**(2), 334–338.

Myers, S.C. (1977). Determinants of Corporate Borrowing, *Journal of Financial Economics* **5**(2), 147–175.

OECD (2010). Report on the Attribution of Profits to Permanent Establishments, OECD Publishing.

OECD (2013). Action Plan on Base Erosion and Profit Shifting, OECD Publishing.

Rajan, R.G. and Zingales, L. (1995). What Do We Know about Capital Structure?: Some Evidence from International Data, *Journal of Finance* **50**(5), 1421–1460.

Titman, S. and Wessels, R. (1988). The Determinants of Capital Structure Choice, *The Journal of Finance* **43**(1), 1–19.

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

World Bank (2002). Bank Loan Classification and Provisioning Practices in Selected Developed and Emerging Countries, Finance Forum 2002.

APPENDIX

TABLE 3.7: Robustness of statutory tax rates - Banks' Profit Shifting

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
STRFIN	-2.239***	-1.967***	-2.828***	-2.594***	-1.893***	-2.970***	-2.290***	-2.348***
	(0.218)	(0.210)	(0.246)	(0.213)	(0.213)	(0.234)	(0.217)	(0.219)
TA(ln)	0.679***	0.782***	0.678***	0.679***	0.693***	0.692***	0.680***	0.681***
	(0.021)	(0.020)	(0.021)	(0.021)	(0.022)	(0.025)	(0.021)	(0.021)
EA	0.330**	0.401***	0.383***	0.371**	0.406***	0.240	0.349**	0.308**
	(0.144)	(0.132)	(0.144)	(0.145)	(0.142)	(0.173)	(0.144)	(0.143)
OBS (ln)	0.026***	0.030***	0.027***	0.026***	0.030***	0.027***	0.027***	0.025***
	(0.009)	(0.008)	(0.009)	(0.009)	(0.009)	(0.010)	(0.009)	(0.009)
PAYROLL (ln)	0.253***	0.191***	0.254***	0.254***	0.216***	0.225***	0.252***	0.252***
	(0.020)	(0.018)	(0.020)	(0.020)	(0.021)	(0.022)	(0.020)	(0.020)
GROWTH	-0.845***	-0.385	-0.843***	-0.829***	-1.004***	-1.119***	-0.836***	-0.895***
	(0.262)	(0.268)	(0.262)	(0.261)	(0.255)	(0.283)	(0.261)	(0.260)
COLLATERAL	0.440***	0.193***	0.441***	0.442***	0.407***	0.218**	0.435***	0.444***
	(0.083)	(0.074)	(0.083)	(0.083)	(0.081)	(0.098)	(0.083)	(0.083)
INF (ln)	0.093***	0.075***	0.091***	0.092***	0.036*	0.062**	0.093***	0.098***
	(0.022)	(0.019)	(0.022)	(0.022)	(0.020)	(0.025)	(0.022)	(0.021)
LEVERAGE		-3.514***						
		(0.145)						
WATR			2.447***					
			(0.822)					
MINSTR				1.378***				
				(0.496)				
RULEOFLAW					-0.271***			
					(0.030)			
TP						-0.740***		
						(0.194)		
TP x STR						3.782***		
						(0.658)		
CAP							-0.172	
							(0.128)	
CAP x STR							0.357	
							(0.420)	
CRISIS x STR								0.823**
								(0.335)
R^2	0.95	0.96	0.95	0.95	0.95	0.95	0.95	0.95
N	18,929	18,929	18,929	18,929	18,929	15,270	18,929	18,929

Notes: The dependent variable is earnings before taxes EBT (ln). Explanatory variables: STRFIN is the statutory corporate tax rate of the subsidiary's host country. For countries with a federal structure STR equals the STR of the respective financial center. TA (ln) are total assets and OBS (ln) measures off-balance sheet items. EA are earning assets over total assets. PAYROLL (ln) is total personnel expense. GROWTH is the change of total assets. COLLATERAL is a tangibility measure following Gropp and Heider (2010) including total securities, treasury bills, other bills, bonds, CDs, cash and due from banks, land and buildings and other tangible assets divided by the book value of assets to allow for banks' specific asset structure. WATR is the worldwide average tax rate within the group. Inflation as the annual percentage in Consumer Price index of the subsidiary's host country as reported by the World Bank Database. LEVERAGE is the total debt-to-total assets ratio. RULEOFLAW is an indicator for the host country's level of rule of law, scores are taken from the World Bank Development Indicators dataset. TP is a dummy variable for the strictness of transfer pricing regulation. CAP is a dummy variable for banks' limited capitalization. CRISIS is an indicator for years before and after the financial crisis. Year dummies, bank-type effects and parent-firm effects are included but not reported. Robust standard errors, clustered on a country-year level, are shown in parentheses. *, ** and *** indicate significance at the level of 10%, 5% and 1% respectively.

TABLE 3.8: Robustness of statutory tax rates - Income from Different Business Models

	(1) Net interest revenue	(2) Non-interest operating income	(3) Trading gains	(4) Net fees and commissions
STRFIN	-0.459***	-0.826***	-3.332***	-0.739***
	(0.128)	(0.169)	(0.448)	(0.172)
TA (ln)	0.631***	0.260***	0.597***	0.175***
	(0.017)	(0.020)	(0.050)	(0.019)
EA	0.404***	-0.606***	0.002	-0.282***
	(0.105)	(0.100)	(0.325)	(0.106)
OBS (ln)	0.004	0.023***	-0.027	0.036***
	(0.006)	(0.007)	(0.023)	(0.008)
PAYROLL (ln)	0.366***	0.709***	0.376***	0.751***
	(0.016)	(0.018)	(0.049)	(0.017)
GROWTH	-1.068***	-0.508***	0.069	-0.194
	(0.169)	(0.162)	(0.632)	(0.177)
COLLATERAL	0.048	-0.068	1.026***	-0.454***
	(0.055)	(0.062)	(0.218)	(0.052)
INF (ln)	0.102***	0.030	0.150***	-0.017
	(0.015)	(0.020)	(0.044)	(0.014)
R^2	0.98	0.97	0.93	0.97
N	20,944	20,355	5,907	18,929

Notes: Dependent variables: (1) Net interest revenue (ln); (2) Non-interest operating income (ln); (3) Trading gains (ln); (4) Net fees and commissions (ln). Explanatory variables: STRFIN is the statutory corporate tax rate of the subsidiary's host country. For countries with a federal structure STR equals the STR of the respective financial center. TA is total assets TA and OBS (ln) measures off-balance sheet items. EA are earning assets over total assets. PAYROLL (ln) is total personnel expense. PAYROLL (ln) is total personnel expense. GROWTH is the change of total assets. COLLATERAL is a tangibility measure following Gropp and Heider (2010) including total securities, treasury bills, other bills, bonds, CDs, cash and due from banks, land and buildings and other tangible assets divided by the book value of assets to allow for banks' specific asset structure. INF is inflation as the annual percentage in Consumer Price index of the subsidiary's host country as reported by the World Bank Database. Year dummies, bank type effects and parent-firm effects are included but not reported. Robust standard errors, clustered on a country-year level, are shown in parentheses. *, ** and *** indicate significance at the level of 10%, 5% and 1% respectively.

TABLE 3.9: Robustness of statutory tax rates - Loan Loss Provisions

	(1)	(2)	(3)	(4)
STRFIN	2.169***	2.622***	2.697***	2.924***
	(0.383)	(0.386)	(0.376)	(0.370)
TA (ln)	0.496***	0.286***	0.289***	0.279***
	(0.034)	(0.039)	(0.039)	(0.039)
EA	-0.667***	-0.732***	-0.757***	-0.696***
	(0.204)	(0.214)	(0.215)	(0.214)
OBS (ln)	0.007	-0.004	-0.007	-0.001
	(0.015)	(0.015)	(0.015)	(0.015)
PAYROLL (ln)	0.444***	0.329***	0.329***	0.332***
	(0.030)	(0.031)	(0.031)	(0.031)
GROWTH	-2.752***	-2.293***	-2.293***	-2.092***
	(0.445)	(0.462)	(0.463)	(0.455)
COLLATERAL	-0.766***	-0.831***	-0.831***	-0.841***
	(0.115)	(0.117)	(0.118)	(0.117)
INF (ln)	0.144***	0.098***	0.096***	0.083***
	(0.033)	(0.030)	(0.030)	(0.029)
PIOP (ln)		0.351***	0.351***	0.352***
		(0.026)	(0.026)	(0.026)
CAP			0.657***	
			(0.175)	
CAP x STR			-2.085***	
			(0.568)	
CRISIS				0.498***
				(0.189)
CRISIS x STR				-1.778***
				(0.573)
R^2	0.92	0.93	0.93	0.93
N	16,208	15,592	15,592	15,592

Notes: Dependent variable is loan loss provisions LLP (ln). Explanatory variables: STRFIN is the statutory corporate tax rate of the subsidiary's host country. For countries with a federal structure STR equals the STR of the respective financial center. TA (ln) are total assets and OBS (ln) measures off-balance sheet items. EA are earning assets over total assets. PAYROLL (ln) is total personnel expense. PAYROLL (ln) is total personnel expense. GROWTH is the change of total assets. COLLATERAL is a tangibility measure following Gropp and Heider (2010) including total securities, treasury bills, other bills, bonds, CDs, cash and due from banks, land and buildings and other tangible assets divided by the book value of assets to allow for banks' specific asset structure. INF is inflation as the annual percentage in Consumer Price index of the subsidiary's host country as reported by the World Bank Database. PIOP (ln) is pre-impairment operating profit. CAP is a dummy variable for banks' limited capitalization. CRISIS is an indicator for years before and after the financial crisis. Year dummies, bank-type effects and parent-firm effects are included but not reported. Robust standard errors, clustered on a country-year level, are shown in parentheses. *, ** and *** indicate significance at the level of 10%, 5% and 1% respectively.

TABLE 3.10: Robustness of statutory tax rates - Taxes and Bank Capital Structure

	(1)	(2)	(3)
STRFIN	0.065***	0.076***	0.070***
	(0.015)	(0.015)	(0.017)
TA(ln)	0.017***	0.017***	0.017***
	(0.001)	(0.001)	(0.001)
EA	0.058***	0.054***	0.058***
	(0.016)	(0.016)	(0.016)
OBS (ln)	-0.002*	-0.002**	-0.002*
	(0.001)	(0.001)	(0.001)
ADJROA	-0.069*	-0.065*	-0.068*
	(0.037)	(0.037)	(0.037)
GROWTH	0.088	0.088	0.089
	(0.058)	(0.058)	(0.058)
COLLATERAL	-0.088***	-0.087***	-0.088***
	(0.012)	(0.012)	(0.012)
INF (ln)	-0.005***	-0.005***	-0.005***
	(0.002)	(0.002)	(0.002)
CAP		0.032***	
		(0.009)	
CAP x STR		-0.038	
		(0.026)	
CRISIS x STR			-0.028
			(0.021)
R^2	0.71	0.71	0.71
N	22,273	22,273	22,273

Notes: Dependent variable is the total debt-to-total asset ratio. Explanatory variables: STRFIN is the statutory corporate tax rate of the subsidiary's host country. For countries with a federal structure STR equals the STR of the respective financial center. TA (ln) are total assets and OBS (ln) measures off-balance sheet items. EA are earning assets over total assets. PAYROLL (ln) is total personnel expense.. ADJROA is a profitability measure captured by net income and interest expenses over total assets. GROWTH is the change of total assets. COLLATERAL is a tangibility measure following Gropp and Heider (2010) including total securities, treasury bills, other bills, bonds, CDs, cash and due from banks, land and buildings and other tangible assets divided by the book value of assets to allow for banks' specific asset structure. INF is inflation as the annual percentage in Consumer Price index of the subsidiary's host country as reported by the World Bank Database. CAP is a dummy variable for banks' limited capitalization. CRISIS is an indicator for years before and after the financial crisis. Year dummies, bank type effects and parent-firm effects are included but not reported. Robust standard errors, clustered on a country-year level, are shown in parentheses. *, ** and *** indicate significance at the level of 10%, 5% and 1% respectively.

TABLE 3.11: Loan Loss Provisions – assumed nontaxation in the US

	(1)	(2)	(3)	(4)
STR	2.178***	2.532***	2.553***	2.736***
	(0.351)	(0.358)	(0.354)	(0.367)
TA (ln)	0.491***	0.283***	0.286***	0.278***
	(0.034)	(0.039)	(0.039)	(0.040)
EA	-0.728***	-0.806***	-0.826***	-0.782***
	(0.208)	(0.218)	(0.218)	(0.219)
OBS (ln)	0.010	-0.000	-0.002	0.003
	(0.015)	(0.015)	(0.015)	(0.015)
PAYROLL (ln)	0.437***	0.323***	0.323***	0.326***
	(0.031)	(0.031)	(0.031)	(0.031)
GROWTH	-2.799***	-2.365***	-2.371***	-2.206***
	(0.446)	(0.464)	(0.465)	(0.465)
COLLATERAL	-0.744***	-0.802***	-0.803***	-0.809***
	(0.118)	(0.119)	(0.120)	(0.119)
INF (ln)	0.137***	0.091***	0.089***	0.078***
	(0.033)	(0.030)	(0.030)	(0.029)
PIOP (ln)		0.345***	0.345***	0.345***
		(0.027)	(0.027)	(0.027)
CAP			0.546***	
			(0.169)	
CAP x STR			-1.751***	
			(0.554)	
CRISIS x STR				-1.513**
				(0.683)
R^2	0.92	0.93	0.93	0.93
N	16,208	15,592	15,592	15,592

Notes: Dependent variable is loan loss provisions LLP (ln). Explanatory variables: STR is the statutory corporate tax rate of the subsidiary's host country, here the US statutory corporate tax rate equals zero. TA (ln) are total assets and OBS (ln) measures off-balance sheet items. EA are earning assets over total assets. PAYROLL (ln) is total personnel expense. PAYROLL (ln) is total personnel expense. GROWTH is the change of total assets. COLLATERAL is a tangibility measure following Gropp and Heider (2010) including total securities, treasury bills, other bills, bonds, CDs, cash and due from banks, land and buildings and other tangible assets divided by the book value of assets to allow for banks' specific asset structure. INF is inflation as the annual percentage in Consumer Price index of the subsidiary's host country as reported by the World Bank Database. PIOP (ln) is pre-impairment operating profit. CAP is a dummy variable for banks' limited capitalization. CRISIS is an indicator for years before and after the financial crisis. Year dummies, bank-type effects and parent-firm effects are included but not reported. Robust standard errors, clustered on a country-year level, are shown in parentheses. *, ** and *** indicate significance at the level of 10%, 5% and 1% respectively.

Table 3.12: Loan Loss Provisions – Sample excluding US banks

	(1)	(2)	(3)	(4)
STR	2.086***	2.585***	2.676***	3.091***
	(0.414)	(0.413)	(0.412)	(0.382)
TA (ln)	0.468***	0.272***	0.272***	0.262***
	(0.035)	(0.040)	(0.040)	(0.040)
EA	-0.678***	-0.770***	-0.801***	-0.693***
	(0.212)	(0.220)	(0.222)	(0.217)
OBS (ln)	0.015	-0.002	-0.004	0.003
	(0.015)	(0.016)	(0.016)	(0.016)
PAYROLL (ln)	0.461***	0.332***	0.333***	0.338***
	(0.032)	(0.033)	(0.033)	(0.033)
GROWTH	-2.808***	-2.262***	-2.262***	-1.930***
	(0.483)	(0.475)	(0.475)	(0.455)
COLLATERAL	-0.747***	-0.776***	-0.771***	-0.794***
	(0.121)	(0.124)	(0.123)	(0.124)
INF (ln)	0.148***	0.104***	0.102***	0.081***
	(0.033)	(0.030)	(0.030)	(0.029)
PIOP (ln)		0.354***	0.355***	0.355***
		(0.027)	(0.027)	(0.027)
CAP			0.402**	
			(0.164)	
CAP x STR			-1.171**	
			(0.522)	
CRISIS x STR				-2.795***
				(0.474)
R^2	-2.985***	-2.355***	-2.348***	-2.517***
N	(0.376)	(0.389)	(0.389)	(0.386)

Notes: Dependent variable is loan loss provisions LLP (ln). Explanatory variables: STR is the statutory corporate tax rate of the subsidiary's host country. TA (ln) are total assets and OBS (ln) measures off-balance sheet items. EA are earning assets over total assets. PAYROLL (ln) is total personnel expense. PAYROLL (ln) is total personnel expense. GROWTH is the change of total assets. COLLATERAL is a tangibility measure following Gropp and Heider (2010) including total securities, treasury bills, other bills, bonds, CDs, cash and due from banks, land and buildings and other tangible assets divided by the book value of assets to allow for banks' specific asset structure. INF is inflation as the annual percentage in Consumer Price index of the subsidiary's host country as reported by the World Bank Database. PIOP (ln) is pre-impairment operating profit. CAP is a dummy variable for banks' limited capitalization. CRISIS is an indicator for years before and after the financial crisis. Year dummies, bank-type effects and parent-firm effects are included but not reported. Robust standard errors, clustered on a country-year level, are shown in parentheses. *, ** and *** indicate significance at the level of 10%, 5% and 1% respectively.

Chapter 3

Capital Injections and Aggressive Tax Planning – Can Banks Have It All?

Capital Injections and Aggressive Tax Planning - Can Banks Have It All?

Julia Merz[*]
University of Cologne

Tanja Herbert[**]
University of Cologne

Abstract: This paper analyses the impact of recapitalizations on banks' tax planning activities. Our empirical analysis uses a unique hand-collected firm-level data set of 93 banks located in 10 OECD countries which received public funds in form of capital injections. Tax aggressiveness is measured based on banks' effective tax rates (ETRs). Since treatment status is not random, we obtain a control group as similar to our treated group as possible by employing propensity score matching. Using a difference-in-differences approach we compare changes of banks' tax planning behavior before and after receiving government support. The main finding indicates a positive impact of recapitalizations on banks' ETRs. Before banks received capital injections we measure lower ETRs and thus, more tax aggressiveness for receiving banks. In 2011, however, the ETRs of the treated and control group converge. Our findings are robust against time-invariant unobserved heterogeneity.

Key Words: International Tax Planning, Recapitalization, Financial Sector, Propensity Score Matching

JEL Classification: H12, H20, G21, G28

* University of Cologne, Albertus-Magnus-Platz, D-50923 Cologne, Germany, merz@wiso.uni-koeln.de, +49 (0)221 470-5605.

** University of Cologne, Albertus-Magnus-Platz, D-50923 Cologne, Germany, herbert@wiso.uni-koeln.de, +49 (0)221 470-5605.

1. Introduction

"Although participation in the program was not necessary from a capital adequacy perspective, as our capital position was strong, it was determined to be financially beneficial and provided U.S. Bancorp with the ongoing capacity for additional loan growth and for funding growth initiatives."

U.S. Bancorp Annual Report, 2008

The financial crisis in 2008/2009 caused intensive liquidity issues for banks in various countries. Fearing an even more severe effect on the overall economy, many governments bailed out banks to stabilize the financial sector. As there was no coordinated approach, the design of these rescue packages varied among countries.[32] Nevertheless, a rough classification can be made between guarantees and capital injections. Guarantees on bank credits were given by several governments in an attempt to calm down markets and increase vanishing liquidity. However in some cases, this was not enough to save institutions from bankruptcy. Therefore, as an additional instrument capital was given to institutions in financial disrupt.

With this being the most extensive and costly form of support and also attracting attention from tax payers, a broad discussion on banks' responsibility for the crisis and the necessity of government rescue packages followed. Public opinion was highly critical suspecting moral hazard among banks being one major trigger. Being considered as too big to fail for a long time, financial institutions were able to profit from a lower risk premium due to assumed government support in case of

[32] A valuable overview is given by Panetta et al. (2009).

bankruptcy.[33] This is suspected to lead banks to engage in high risk transactions to maximize their profits while shifting costs of default towards the tax payer. However, one could also argue that banks do contribute substantially to tax revenue and countries' welfare and therefore deserve to be rescued. Whereas there seems to be some agreement on the necessity of bailouts since the bankruptcy of Lehman Brothers in 2008, the discussion on lessons to be learned from the crisis has targeted various topics.

In this context public debate has focused mainly on (recapitalized) banks' business models and compensation plans; however, banks' role as tax payers was widely ignored. This is surprising, since one major aspect of the discussion was how the crisis related costs could be shifted towards the financial sector. Existing empirical studies have already investigated recapitalized banks concerning bank lending (Mariathasan and Merrouche 2012; Brei et al. 2013) and risk taking behavior (Brei and Gadanecz 2012). However, although there is some evidence of banks' tax aggressiveness in general (Keen and de Mooij 2012; Heckemeyer and de Mooij, 2014; Huizinga et al. 2014), there is so far no research on the link between recapitalized banks and their tax strategy. For this purpose, the recent financial crisis gives us optimal conditions to evaluate a change in tax aggressiveness of troubled banks before and after the crisis.

In contrast to other rescue packages (e.g. guarantees) capital injections give governments shareholder power. Previous literature shows an impact of government ownership on corporations' behavior. Iannotta et al. (2013) find that

[33] O'Hara and Shaw (1990) provide an early study of this effect, more recent Acharya, Anginer, and Warburton (2013).

government-owned banks have a different risk taking behavior than private banks. Other studies report a change in tax aggressiveness due to ownership structure and corporate governance influence (Desai et al. 2007; Desai and Dharmapala 2008; Chen et al. 2010; Chyz et al. 2013). We want to contribute to this discussion by investigating the influence of government support on banks' tax planning behavior. Results of our study can give us some insight into whether capital injections should be tied to additional conditions in the future.

In our empirical analysis we use consolidated balance sheet and income statement information from the Bankscope Database provided by Bureau van Dijk for 856 multinational banks headquartered in 10 OECD countries. We manually identify 93 banks that received government support during the financial crisis. Our study applies propensity score matching in a difference-in-differences framework (DID-PSM approach) and contributes to recent studies applying propensity score matching in the context of taxation (Wamser 2008; Finke 2014).

We investigate the influence of the recapitalization by comparing the change in tax aggressiveness, as measured by the effective tax rate (ETR), of rescued banks between 2007 and 2011 to the counterfactual trend of a control group which consists of non-rescued banks. Our results provide evidence that the recapitalizations caused a significant change in tax aggressiveness for rescued banks. Recapitalized banks had significantly lower ETRs measured one year before the financial crisis. However, the ETRs of the rescued and non-rescued banks converge after the financial crisis. We associate the change in tax

aggressiveness with an increased shareholder power and influence of the government associated with capital injections.

The remainder of the paper is organized as follows. In Section 2, a discussion of the relationship between international tax planning of banks and recapitalization measures in previous literature is provided. Section 3 shows an overview of our dataset. Section 4 describes the methodology, i.e. the matching procedure. Here, we also assess the matching quality which is a prerequisite for drawing valid conclusions. Empirical results are presented in Section 5. Section 6 concludes.

2. Recapitalization and International Tax Planning of Banks

The aim of this study is to link banks' tax aggressiveness with capital injections during the financial crisis. We want to investigate if receiving government support did have any impact on banks' tax planning activities.

As a reaction to the events of the financial crisis many banks announced plans to change their corporate culture. Some of these changes were not merely voluntary, but a reaction to conditions tied to the respective support measure. Most rescue packages entailed specific conditions targeting remuneration and lending policy. To enforce these conditions governments implemented additional monitoring options. As an example, the U.S. Treasury demanded to send an observer if certain conditions were not met.[34] However, none of the recapitalization schemes we analyze had any specific tax conditions attached to receiving capital.

[34] Members of the Capital Purchase Program (CPP) agreed to allow a government appointed observer in their board meetings in case of repayment delays.

We want to emphasize the importance of this point for two reasons. First, most headquarters of multinational banks are located in rather high-tax jurisdictions such as the U.S. and the U.K.; therefore, aggressive tax planning equals a reduction in tax revenue in these countries.[35] In contrast, the majority of rescue packages were issued to the respective headquarters of multinational banks – in high tax jurisdictions. Thus, while tax revenue is shifted to favorable destinations, government support is received from generous governments at home. Second, a meaningful ex-post contribution of banks to the crisis related costs can most likely be collected in form of taxes. Therefore, banks' tax aggressiveness after the crisis should be evaluated. Although previous literature has already investigated banks' tax aggressiveness in general (Keen and de Mooij 2012; Heckemeyer and de Mooij 2014; Huizinga et al. 2014), there is so far no research on the impact of recapitalization on tax planning strategies.

Governments can be considered the largest minority shareholder in almost all corporations due to its tax claim on cash flows (Desai et al. 2007). Capital injections can be assumed to increase governments' influence and supervision as shareholders. Since governments are receivers of tax payments, we expect them to try to limit tax planning of the respective bank. This assumption is supported by evidence on government ownership. Several studies report a change in bank risk (Iannotta et al. 2013) and in tax aggressiveness (Desai et al. 2007; Desai and Dharmapala 2008; Chen et al. 2010; Chyz et al. 2013) due to ownership structure and corporate governance influence. In addition, it can be assumed that banks

[35] The average statutory tax rate in our sample is 27.94 %.

profiting from government support were eager to reinstate their reputation; and, in response to public attention, reduced their tax planning.

However, it is also imaginable that banks do not show any loyalty and continue to engage in aggressive tax planning activities. This would show in smaller or at least unchanged effective tax rates (ETRs). A potential reason could be that governments' possibilities to monitor banks' behavior were limited and not sufficient to influence banks' tax planning. Studies using a similar data set found no evidence for a change in risk taking (Brei and Gadanecz 2012). Aggressive tax planning strategy goes along with increased risk of future payments caused by tax audit detections. Banks staying risk prone in general might also continue their tax planning strategy. In consequence, it might be that tax aggressiveness did at last not decrease.

We contribute to a number of studies investigating the effects of rescue packages on banks' behavior. Panetta et al. (2009) give a valuable overview of governments' rescue measures between 2008 and 2009. Brei et al. (2013) and Mariathasan and Merrouche (2012) document determinants of recapitalization and examine the effect rescue measures had on the supply of bank lending. They find similar results suggesting that only capital injections of a certain amount can be associated with loan growth. Focusing on market reactions to government measures, King (2009) finds that creditors benefited from rescue packages at the expense of shareholders. To the best of our knowledge, there is so far no research on the taxation and tax planning activities of recapitalized banks. As a measure of tax aggressiveness, we use the ETR disclosed in consolidated financial statements

according to SFAS 109 or IAS 12 (depending on the accounting standard) which is defined as the sum of current and deferred taxes divided by profit before tax. This commonly used proxy for tax avoidance is widely available to investors and to the public. It is a well-accepted measure for tax behavior in previous literature (Hanlon and Heitzman 2010).

3. Data

Key asset for the following analysis is the identification of recapitalization measures on individual bank level. This data was hand-collected for large multinational banks headquartered in 10 OECD countries for which public rescue information were available. Our control group consists of all other banks in the respective country. As there is no comprehensible list of capital injections in general, we have to rely on intensive research. In order to identify rescued banks, we use public sources (e.g. news reports, official websites of national authorities) and confirm our findings through banks' annual reports.

In total, we have collected information on 93 banks that received government support in form of capital in 2008 and/or 2009. By hand-collecting this unique dataset we are able to differentiate between rescued and non-rescued banks for all major countries affected by the financial crisis. To be considered recapitalized in our sample, a bank must have received capital injections from a public fund. There have been additional measures, such as guarantees, nevertheless for our study we

focus only on capital injections.[36] We do not include banks receiving guarantee measures in our analysis for two reasons. First, our research question assumes an increasing influence of governments on banks' business decisions. Although there was a variety of measures valuable to banks, we believe that only an increasing shareholder power would give governments sufficient information and possibilities to influence banks' tax avoidance strategies. Second, guarantee measures were often provided to the whole banking sector and therefore would have limited our control group of non-treated banks substantially.

Our group of banks which did not receive government support consists of 763 banks. Table 4.1 provides a detailed overview of the 10 countries in which the rescued and non-rescued banks are located.

[36] Capital injections came in the following forms: Common equity, Preference capital, Hybrid capital, Subordinated notes, Contribution to reserves, Conversion of subordinated debt into equity capital.

TABLE 4.1: Country Overview

Country	Recap = 1	Recap = 0	Total
Germany	6	81	87
France	6	148	154
The Netherlands	3	46	49
U.K.	5	150	155
Ireland	2	23	25
Belgium	3	27	30
Luxembourg	1	19	20
Austria	3	46	49
Switzerland	1	73	74
U.S.	63	150	213
TOTAL	**93**	**763**	**856**

Note: Table 4.1 shows an overview where the rescued and non-rescued banks are located in our sample.

For all 856 banks we collect balance sheet and income statement information from the Bankscope Database provided by Bureau van Dijk for the years 2007 and 2011. [37] We rely on consolidated statements, since they provide relevant information on the internationally active banking groups' tax burden. Moreover, public capital injections were typically given to consolidated entities, rather than subsidiaries or branches.

We conduct several dataset adjustments. To obtain a sufficiently balanced sample, we restrict attention to the 150 largest banks in the U.S. and U.K.[38] Moreover,

[37] For our robustness check we also collect data for the year 2010 [cf. Section 5.2].
[38] In the U.S. more than 700 banks profited from CPP. Since data on smaller banks is limited we restrict our control group to the 150 largest banks, measured by total assets, to avoid a mix-up of both groups. The same was done for the UK.

recapitalizations are only considered if provided in 2008 and/or 2009. This is necessary to define a clear treatment window which enables us to analyze before and after treatment effects.[39] Acquisitions in general pose no risk to our analysis, since tax aggressiveness is expected to be extended to a newly acquired entity. However, we eliminated banks from our sample which were either nationalized, went bankrupt or merged to a new entity during the crisis. In addition, we eliminate loss banks as they have different tax planning strategies. ETRs[40] with a negative component have a different interpretation and are therefore eliminated accordingly (cf. Stickney and McGee 1982; Zimmermann 1983; Gupta and Newberry 1997; Rego 2003).

4. Methodology

4.1 Difference-in-Differences Propensity Score Matching Approach

The optimal setting to investigate the effect of the governmental recapitalizations on banks' tax aggressiveness would require observing each bank in both states (with and without treatment) in each period. However, as it is not possible to observe how the bank would have performed without receiving the treatment, the best alternative is to build an adequate control group that is similar to the treated group with respect to as many criteria as possible.

Therefore, we identify banks which received recapitalization (RECAP=1) as our treatment group and assign banks which are not subject to treatment (RECAP=0)

[39] Rescue packages in Spain, for example, were still ongoing in 2012. Therefore, Spain is not included in our sample. In the case of Japan, the major earthquake of 2011 distorts results and led us to exclude Japanese banks.
[40] To limit the influence of outliers, we winsorize the ETRs at the interval [0; 1].

to our control group. We use propensity score matching which is a popular method to estimate causal effects and obtain a control group as similar to our treatment group as possible. This involves a two-step procedure: In the first step, we predict the probability of being treated by government support (propensity score) using a probit regression with respect to a vector of relevant pre-treatment observables X_i (Rosenbaum and Rubin, 1983). In our binary model the choice of the underlying model is relatively unproblematic (Caliendo and Kopeinig, 2008):

$$p(X_i) = Pr\,(RECAP_i=1|\, X_i) = \phi\,(\beta_0 + \beta_1 X_i) \qquad (1)$$

In the second step, we match each treated bank (RECAP=1) to one or more non-treated banks (RECAP=0), being sufficiently similar with respect to the observables X_i. The matching procedure is based on the propensity score from the first step. In our study, we use different matching algorithms to match the treated and the non-treated group in order to avoid bias due to the chosen matching method [cf. Section 4.3 and Section 5].

Applying propensity score matching requires two assumptions to be fulfilled. First, for the probit regression the propensity score as a probability has to lie between zero and one for both groups, i.e. banks with the same value of observables X_i have the identical positive probability of being both treated and non-treated (Heckman et al., 1999). This Common Support Condition ensures that only banks with suitable control units are considered:

$$0 < Pr\,(RECAP_i =1|\, X_i) <1 \qquad (2)$$

As the aim of applying propensity score matching is to avoid bias due to selection observables, the second main prerequisite for the application of propensity score matching is the Conditional Independence Assumption (CIA). The CIA requires that the selection into the group of recapitalized (RECAP=1) or non-recapitalized (RECAP=0) is only driven by observables (a vector of characteristics X_i). This is to say that there exists a set X_i of observables such that after controlling for these characteristics, potential outcomes, in our case ETRs, are independent of treatment status i.e. recap status. It can then be assumed that this condition is exogenous:

$$(ETR_i(1), ETR_i(0)) \perp RECAP_i | X_i \quad (3)$$

Having obtained two groups only differing in their treatment status, we are able to compare banks' tax aggressiveness. In order to capture a bank's tax avoidance behavior we use ETRs as reported in the financial statements as outcome variable. A change in the outcome variable due to the treatment is usually called ATT (Average Treatment Effect on the Treated). Theoretically, this effect is the difference Δ_i between the tax aggressiveness $ETR_i(1)$ of a bank i which received government support and the tax aggressiveness of the same bank i in the hypothetical case of not receiving government support $ETR_i(0)$:

$$\Delta_i = ETR_i(1) - ETR_i(0) \quad (4)$$

$$ATT = E(ETR_i(1) - ETR_i(0) \mid RECAP=1) \quad (5)$$

However, this effect does not control for the counterfactual trend of both groups. Our study therefore applies a difference-in-differences framework (Heckman et al., 1998). According to the difference-in-differences method the effect of a

recapitalization treatment is identified by comparing the change in tax aggressiveness of the treatment group between two periods (here 2007 and 2011) to the counterfactual trend in tax aggressiveness they would have experienced in the absence of the treatment. The counterfactual trend is approximated by the actual change in tax aggressiveness of the control group between 2007 and 2011.

By forming "statistical twin pairs" before performing the DID estimator, propensity score matching makes the standard difference-in-differences assumption more plausible as the between-comparison removes common period effects that identically affect the treatment and control group. The plausibility of this common trend assumption is based on the similarity in propensity scores of treated and control group. Compared to the alternative of controlling linearly for the X_i observable variables in a DID regression, the DID-PSM approach has two advantages. It guarantees a more appropriate weighting of covariates and does not extrapolate beyond the region of common support avoiding comparison of non-comparable units.

4.2 Selection of Relevant Characteristics

A central issue for propensity score matching is the choice of observable variables driving the self-selection process and thus being relevant for computing the propensity score. Only variables that influence both the treatment decision and the outcome variable should be included.[41] In addition, only variables that are

[41] Explanatory variables can be divided into three sets: (1) Covariates which strongly influence the treatment decision but weakly the outcome variable, (2) Covariates which are relevant to the outcome variable but irrelevant to the treatment decision and (3) Covariates which influence both.

unaffected by the treatment (or the anticipation of it) should be considered to avoid endogeneity problems. Therefore, we use the 2007 values of the covariates, i.e. the values before the financial crisis and government support for our matching procedure (Caliendo and Kopeinig 2008).

In the propensity score matching we take into account banks' characteristics that are expected to differ across the respective treatment and control groups. The DID-PSM approach allows us to balance the treatment and control group with respect to these characteristics making the common trend assumption more plausible. For this purpose, we follow Mariathasan and Merrouche (2012) and Brei et al. (2013) who investigate differences between rescued and non-rescued banks with a sample similar to ours. We can therefore rely on these results when determining relevant characteristics of recapitalized banks that can affect treatment assignment.

We choose the variable *SIZE* which is the sum of total assets and off-balance sheet items (in logs) as it is a potentially important factor in lending decisions. During the crisis, large banks were particularly affected by their lower deposit funding ratio. According to Brei et al. (2013) recapitalized banks were on average twice the size compared to non-rescued banks. Therefore, we can expect a positive relationship between recapitalization status and bank size. We also add the variable *ROA* which is measured by adjusting net income with interest expenses divided by total assets as a proxy for profitability. High profits could lead banks to retain earnings and lower the leverage ratio. As a higher equity ratio could reduce the demand for external lending, we expect a negative correlation. In addition, we

---

The propensity score estimation should at least include set (3) (Augurzky and Schmidt 2001; Caliendo and Kopeinig 2008).

consider the variable *LEVERAGE* which is the quotient between total liabilities and total assets as the leverage ratio should have a positive influence on the recapitalization of a bank. *LIQUIDITY* which is defined as liquid assets (including cash, trading securities and interbank lending with a maturity of less than three months) divided by total assets is also an important characteristic of rescued banks as their reliance on market funding before and during the crisis was generally higher (Brei et al. 2013). Liquidity should have a negative impact on the recapitalization status of a bank. Moreover, we add the variable *COLLATERAL* which is a tangibility measure including total securities, treasury bills, other bills, bonds, CDs, cash and due from banks, land and buildings and other tangible assets divided by the book value of assets (Gropp and Heider 2010) in order to capture for banks' specific asset structure. As a high level of tangibility makes external lending more attractive (easier access and lower costs), we expect a positive correlation with a bank's recapitalization status, since lending conditions changed dramatically during the financial crisis. Finally, we take the variable *LLP* into consideration, which captures a bank's accrual of loan loss provisions (in logs). Since banks with a high level of LLPs can be assumed to have a higher amount of defaulting credits, we expect a positive correlation with recapitalization status.

The computation of the propensity score should also include determinants of the outcome variable ETR in addition to the drivers of the selection decision (Heckmann et al. 1998). In our study, there is some overlap of both groups of determinants. For example, prior studies find a significant influence of size and profitability (Zimmermann 1983; Gupta and Newberry 1997; Plesko 2003; Rego 2003; Chen et al. 2010) on tax planning activities. In addition, leverage is

associated with tax aggressiveness. Banks with a high level of debt can use the deductibility of interest expenses to reduce tax burden. However, the effect of leverage on the ETR is ambiguous since interest payments do not only reduce taxable profits, and thus, tax expenditures, but also pre-tax earnings (Hanlon and Heitzman 2010). Loan loss provisions' tax deductibility varies by country, however the accrual of bad loans in high tax countries can be seen as a proxy for future deductions in case of credit default and therefore as a tax planning tool.

Table 4.2 shows the means of the observable characteristics before matching. The comparison shows with the exception of *ROA* and *COLLATERAL*, both groups of banks are significantly different. These results show the necessity to establish an adequate control group via propensity score matching.

TABLE 4.2: Means of the selected observable characteristics before matching

Characteristics	Recap = 1	Recap = 0	t-stat	p-value
SIZE	11.4112	9.1208	-9.1402	0.0000
ROA	0.0420	0.0804	0.5459	0.5853
LEVERAGE	0.9194	0.8673	-2.9189	0.0036
LIQUIDITY	0.1433	0.2435	3.7466	0.0002
COLLATERAL	0.2890	0.2701	-0.7474	0.4550
LLP	4.8272	3.2204	-6.4369	0.0000

Notes: Table 4.2 compares the mean of selected characteristics between rescued banks (Recap = 1) and non-rescued banks (Recap = 0) before matching in 2007. Except of ROE and COLLATERAL, the differences between both groups are highly significant.

4.3 Estimating the Propensity Score

We use the observable characteristics which we derive in Section 4.2 to calculate the probability of receiving government support (propensity score). In accordance

with Heckman et al. (1998), we estimate the propensity score by taking the determinants of a bank's recapitalization and of the outcome, in our case tax aggressiveness (ETR) as explanatory variables [cf. Equation (1)]. In addition, as Mariathasan and Merrouche (2012) find an influence of different banks' specializations, we ensure that only banks belonging to the same specialty are matched.

$$\Pr(\text{RECAP}) = \beta_0 + \beta_1 \log(\text{SIZE}) + \beta_2 \text{ROA} + \beta_3 \text{LEVERAGE} + \beta_4 \text{LIQUIDITY} + \beta_5 \text{COLLATERAL} + \beta_6 \log(\text{LLP}) + \varepsilon \quad (6)$$

Table 4.3 shows the coefficients of the probit regression. All determinants have the expected sign. The size of the coefficients cannot be directly interpreted as there are no marginal effects of the explaining variables on the dependent variable. However, this is not relevant here as the coefficients are exclusively used to calculate the propensity score.

TABLE 4.3: Estimating the Propensity Score

	Coefficient	**S.E.**	**z**	**P>|z|**
SIZE	0.2106	0.0809	2.60	0.009
ROA	-0.0530	0.6241	-0.08	0.932
LEVERAGE	0.8909	1.6700	0.53	0.594
LIQUIDITY	-2.4570	0.6685	-3.68	0.000
COLLATERAL	0.7076	0.5818	1.22	0.224
LLP	0.0628	0.0616	1.02	0.308
CONSTANT	-4.1394	1.4610	-2.83	0.005

Notes: Table 4.3 shows the coefficients of the probit regression.

As the propensity score is a probability of receiving treatment given observed characteristics X_i, it has to be in the interval [0;1] [cf. Equation (2)]. In our sample, the average probability to participate in the treatment for all banks is 0.14. Based on the propensity score, we use for the matching in our study *five to one nearest neighbor algorithm* (with replacement) which assigns five of the closest non-treated observations to match the treated one. We choose this matching method as especially in small samples of treated units this method is more reliable. It reduces the variability of the nearest neighbor estimator in comparison to a one to one neighbor matching (Blundell and Costa-Dias 2008). To ensure matching quality we set the maximum caliper at 0.01. Due to the caliper, the propensity scores between treated and matched control banks do not deviate in absolute terms by more than 0.01.

However, to show that the results are not driven by the applied matching algorithm, we also apply kernel matching and one to one nearest neighbor matching in Section 5. *One to one nearest neighbor matching* matches to each treated unit the control unit with the closest propensity score. *Kernel matching* uses weighted averages of all controls in order to match treated and control units. The shorter the distance between the treated and the control observation, the greater is the weight. Thus, this method can use more information as it reduces the variance of the estimation.

4.4 Assessing Matching Quality

Before we report the results with respect to our research question, we first provide information on the matching quality concerning the two main assumptions of

propensity score matching - Conditional Independence Assumption and Common Support Condition [cf. Section 4.1.]. The Conditional Independence Assumption cannot be directly tested, but several guidelines for model specification should be considered. Since we do not condition on all covariates but on the propensity score, we have to check if the matching procedure is able to adequately balance the distribution of these characteristics. For the validity of results it is important that the treated and control group are sufficiently similar after the matching. This prerequisite can be assessed in a balancing test by the standardized bias (SB_x) for each variable. The SB_x is calculated by dividing the difference between the mean characteristic of the treatment ($\bar{x}_{tr}$) and matched control group ($\bar{x}_{co}$) by the square root of the mean variance in each group (Rosenbaum and Rubin 1985) and expressed as a percentage:

$$SB_x = 100 * \frac{\bar{x}_{tr} - \bar{x}_{co}}{\sqrt{\frac{\sigma^2_{x_{tr}} + \sigma^2_{x_{co}}}{2}}} \% \quad (7)$$

Table 4.4 compares the means of all relevant characteristics between rescued banks and a control group which was determined via propensity score matching (five to one nearest neighbor caliper matching) before and after matching and displays the standardized bias for all observable variables.

The results show that the propensity score matching succeeds at balancing the covariates and reducing the bias between banks with and without recapitalization. With the exception of *ROA* and *LEVERAGE*, all variables are significant before matching i.e. the unmatched treatment and control group differ substantially. After matching the standardized bias should be about 5 % for the key variables as this

indicates good matching quality. Otherwise the mean difference is considered quite large and may indicate a lack of balancing (Caliendo and Kopeinig 2008). The standardized biases are acceptable for all variables. By the matching, the differences between treatment group and non-treatment group are reduced considerably. An exception is the variable *COLLATERAL*. For this variable, the standardized bias is about 9 %. However, the two columns on the right hand side show that the difference in the variable *COLLATERAL* is not significant after matching which confirms that the variable is no longer an explanation for the recapitalization status of a bank.

TABLE 4.4: Assessment of Matching Quality

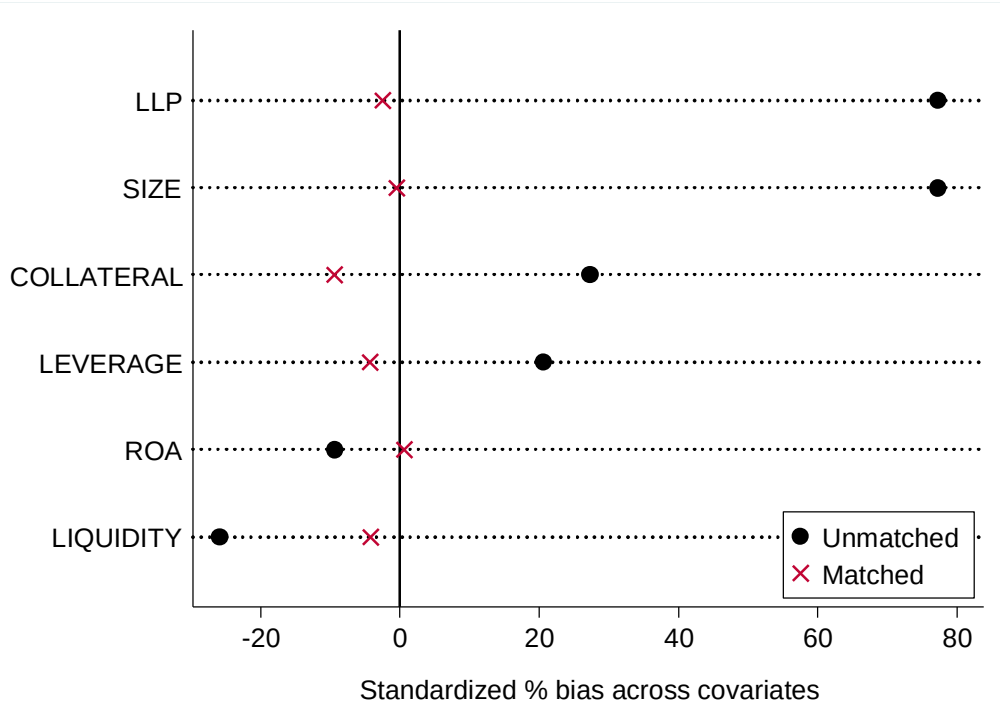
Variable		Mean		%	%		
		Treated	**Control**	**Bias**	**Reduction (Bias)**	**T**	**p>|t|**
SIZE	Unmatched	11.283	9.790	77.3		6.42	0.000
	Matched	11.050	11.059	-0.5	99.4	-0.03	0.977
ROA	Unmatched	0.408	0.094	-9.3		-0.58	0.565
	Matched	0.040	0.037	0.6	93.5	1.67	0.096
LEVERAGE	Unmatched	0.918	0.904	20.7		1.36	0.174
	Matched	0.914	0.917	-4.3	79.2	-0.47	0.643
LIQUIDITY	Unmatched	0.135	0.178	-25.9		-1.97	0.049
	Matched	0.122	0.129	-4.2	83.7	-0.29	0.773
COLLATERAL	Unmatched	0.267	0.227	27.3		2.01	0.045
	Matched	0.253	0.267	-9.4	65.5	-0.63	0.533
LLP	Unmatched	4.827	3.226	77.3		6.42	0.000
	Matched	4.648	4.699	-2.5	96.8	-0.14	0.891

Notes: Table 4.4 compares the means of all relevant characteristics between rescued banks and a control group of non-rescued banks which was determined by propensity score in 2007. The results are based on five to one nearest neighbor caliper matching.

The bias reduction can also be illustrated graphically. Figure 4.1 compares the standardized bias before matching (indicated with points) to the standardized bias

after matching (indicated with small crosses). The figure illustrates again the successful reduction in standardized bias due to the matching procedure.

FIGURE 4.1: Bias Reduction for Characteristics



A further possibility to assess the quality of the matching consists in re-estimating the probit regression based on the matched sample. Table 4.5 illustrates again that the observable characteristics do not longer explain the recapitalization status of a bank. The explanatory power in terms of pseudo-R^2 is reduced from 0.134 to 0.022 and the observables are not only separately insignificant as shown in Table 4.4 but also jointly insignificant ($\rho > x^2 = 0.675$). Moreover, the table shows that in the mean bias between the two groups before and after matching and across all characteristics is reduced from 39.6 % to 3.6 %. As the mean standardized bias over all variables is below 5 %, we can again confirm a good matching quality.

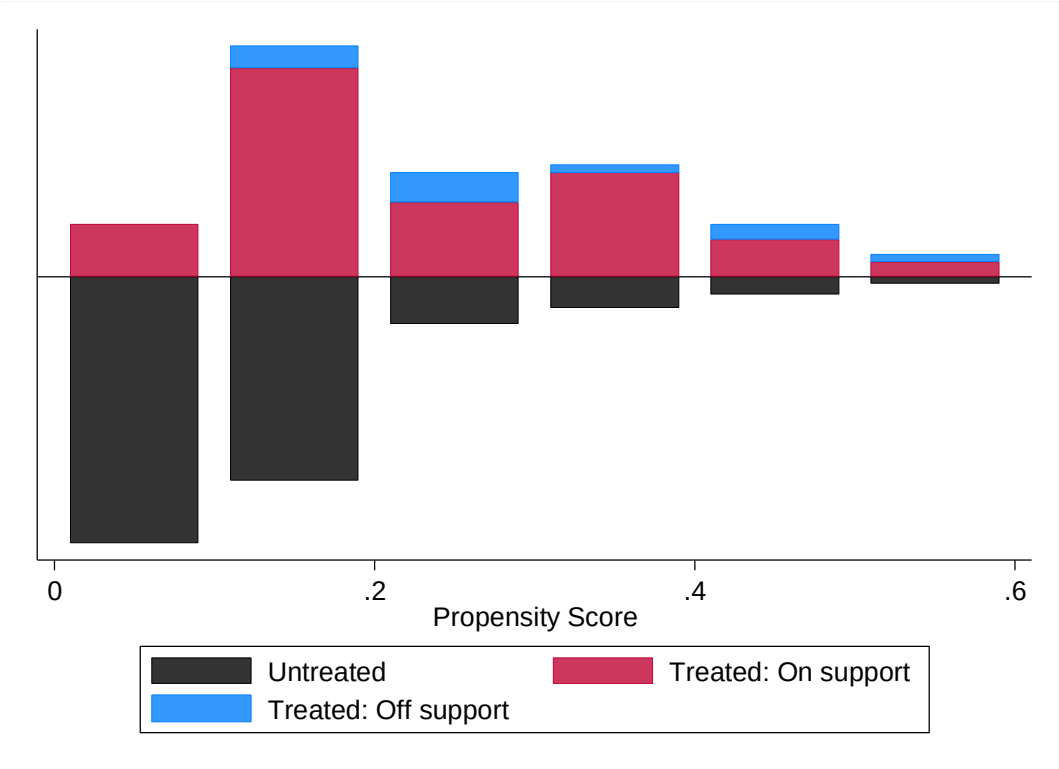
TABLE 4.5: Joint Insignificance of Observables after Matching

	Pseudo-R^2	$p > \chi^2$	Bias	
			Mean	**Median**
Raw	0.134	0.000	39.6	26.6
Matched	0.022	0.675	3.6	3.4

Notes: Table 4.5 shows that after matching observable characteristics do no longer provide joint explanatory power for Recap Status. The results are based on five to one nearest neighbor caliper matching.

In addition, the Common Support Condition should be tested which ensures that there is a sufficient overlap of the propensity scores of the treated and non-treated group in order to find adequate matches. This can be done by visual inspection. Figure 4.2 shows that we can assume that the common support is given as there is a certain number of treated and non-treated banks between the interval [0;1] in each class of the propensity score. In addition, imposing the Common Support Condition only leads to the exclusion of a few treatment observations.

FIGURE 4.2: Common Support Condition



Notes: The figure illustrates that the propensity score as a probability lies between zero and one for both groups (treated and untreated).

To conclude all information on the matching quality, we can show that through the propensity-score five to one nearest neighbor caliper matching, it was possible to generate a control group which is similar enough to the treatment group to be used to calculate the ATT using difference-in-differences method.

5. Empirical Analysis

5.1 Basic Results

As we want to examine if the tax aggressiveness of treated banks has changed in the years after they received governmental support, we use a difference-in-differences propensity score matching (DID-PSM) approach (Heckman et al.

1998) to compare tax aggressiveness of recapitalized banks and banks not receiving government support. We take the outcome variable ETR as measure of banks' tax aggressiveness in 2007 which is the year before the recapitalization occurs and compare it with the ETR in 2011. We choose 2011 instead of 2010 to allow for some time to successfully implement or change existing tax planning strategies after the financial crisis.[42] Moreover, we assume that crisis related balance sheet distortions have faded out until then.

In particular, we calculate not only the ATT on the outcome variable ETR in 2007 and 2011 but also the effect on the change in the outcome variable before and after the treatment. As derived in Section 4.1 the difference-in-differences matching relies on the assumption that the change in the outcome variable ETR between 2007 and 2011 would be the same for the treatment and the control group in the absence of the recapitalization. This allows us to control for the notion that there may be unobserved differences between treated and untreated units. Thus, an advantage of the combination of propensity score matching and difference-in-differences method is not only the potential selection of observables but also the elimination of time constant unobservables.

The main result of the difference-in-differences analysis is presented in the last column of Table 4.6 and significant at 5% level. It indicates a change in rescued banks' tax aggressiveness, namely higher reported ETRs, caused by capital injections in 2008/09. The effect is robust concerning time-invariant unobserved heterogeneity.

[42] An estimation using 2010 instead of 2011 can be found in our robustness tests.

The BASELINE columns contain the mean outcome for each group (control and treated) before recapitalization in 2007 and its difference. The mean ETR of the treated group is smaller (3.1 percentage points) which is an indicator for more tax planning activities. The difference between the means is significant at 10 % level and suggests that banks receiving public funds were on average more tax aggressive in 2007. The FOLLOW UP columns show the same information after the recapitalization. The results indicate that the ETRs of the treated and control group converge in 2011. The difference between the mean outcomes is now positive, but not statistically significant anymore. This supports our assumption that increasing influence and supervision by governments and public attention lead to a reduction in banks' tax aggressiveness.

TABLE 4.6: Difference-in-Differences Method – 5to1 NN-Matching

	BASELINE (2007)			FOLLOW UP (2011)			
Outcome Variable	Control	Treated	Diff(BL)	Control	Treated	Diff(FU)	DIFF-IN-DIFF
ETR	0.282	0.251	-0.031*	0.252	0.274	0.022	0.053**
Std. E	(0.011)	(0.013)	(0.017)	(0.011)	(0.017)	(0.020)	(0.026)

Notes: Table 6 shows the mean outcome for the treated and control group in 2007 and 2011 and its difference. The outcome variable is the ETR. The results are based on five to one nearest neighbor caliper matching. Observations in the control group 219, observations in the treatment group 133. Robust standard errors are shown in parentheses. (***), (**) and (*) indicate significance at (1%), (5%) and (10%) level, respectively.

To show that the results are not driven by the applied matching algorithm, we also test samples matched with *one to one nearest neighbor* and *kernel* matching. The results are shown in Table 4.7 and 4.8 and confirm the results obtained with *five to one nearest neighbor* matching. Again, we find a significant impact of the recapitalization status on the tax aggressiveness in 2007. The treated group has, on average, smaller ETRs. For the year 2011, the difference of the mean ETRs is not

significant. Additionally, we find again a significant effect in the difference-in-differences approach.

TABLE 4.7: Difference-in-Differences Method – 1to1 NN-Matching

	BASELINE (2007)			FOLLOW UP (2011)			
Outcome Variable	Control	Treated	Diff(BL)	Control	Treated	Diff(FU)	DIFF-IN-DIFF
ETR	0.299	0.251	-0.048*	0.252	0.274	0.022	0.070**
Std. E	(0.022)	(0.013)	(0.026)	(0.017)	(0.017)	(0.024)	(0.035)

Notes: Table 4.7 shows the mean outcome for the treated and control group in 2007 and 2011 and its difference. The outcome variable is the ETR. The results are based on one to one nearest neighbor caliper matching. Observations in the control group 90, observations in the treatment group 133. Robust standard errors are shown in parentheses. (***), (**) and (*) indicate significance at (1%), (5%) and (10%) level, respectively.

TABLE 4.8: Difference-in-Differences Method – Kernel Matching

	BASELINE (2007)			FOLLOW UP (2011)			
Outcome Variable	Control	Treated	Diff(BL)	Control	Treated	Diff(FU)	DIFF-IN-DIFF
ETR	0.274	0.251	-0.023*	0.256	0.274	0.018	0.041**
Std. E	(0.010)	(0.010)	(0.013)	(0.012)	(0.011)	(0.016)	(0.021)

Notes: Table 4.8 shows the mean outcome for the treated and control group in 2007 and 2011 and its difference. The outcome variable is the ETR. The results are based on kernel matching. Observations in the control group 435, observations in the treatment group 133. Robust standard errors are shown in parentheses. (***), (**) and (*) indicate significance at (1%), (5%) and (10%) level, respectively.

5.2 Robustness Check

In order to test robustness of our results, we carry out several additional analyses. We examine subsamples with respect to different regions to account for heterogeneity in our sample. Table 4.9 shows a difference-in-differences analysis when only taking recapitalized European banks into account. We obtain highly significant positive effects on 1 % level for the year 2007, i.e. the mean ETR of treated group is 9 percentage points smaller than the ETR of the respective control group. Again, we cannot find a significant effect of the recapitalization status on

the tax aggressiveness in 2011. Our results suggest that for European rescued banks tax aggressiveness was not only more pronounced than for non-rescued banks before the crisis, but that the effect is also time-constant.

TABLE 4.9: European Sample – Difference-in-Differences Method – 5to1 NN-Matching

	BASELINE (2007)			FOLLOW UP (2011)			
Outcome Variable	Control	Treated	Diff(BL)	Control	Treated	Diff(FU)	DIFF-IN-DIFF
ETR	0.282	0.192	-0.090***	0.252	0.296	0.044	0.134**
Std. E	(0.011)	(0.023)	(0.025)	(0.011)	(0.051)	(0.052)	(0.058)

Notes: Table 4.9 considers a subsample of only European banks in the treated group. It shows the mean outcome for the treated and control group in 2007 and 2011 and its difference. The outcome variable is the ETR. The results are based on five to one nearest neighbor caliper matching. Observations in the control group 219, observations in the treatment group 40. Robust standard errors are shown in parentheses. (***), (**) and (*) indicate significance at (1%), (5%) and (10%) level, respectively.

When limiting our sample to U.S. based banks only, we are not able to identify any effect of capital injections on tax aggressiveness. Treatment and control group are very similar in respect to their tax aggressiveness before and after the financial crisis. This can be attributed to a number of causes. First, there was no condition concerning taxation implemented into recapitalization contracts. Second, although public attention and governments' interest in supervision in the U.S. might have been of equal power; the total number of more than 700 capital injections complicated tight supervision and lowered public attention to the single bank. With being one among many banks behavioral incentive might be much lower. Third, whereas in most European countries only few banks with a supposedly risk prone management style were bailed out, in the U.S. the sample includes a bigger variety of business models.

Table 4.10: U.S. Sample – Difference-in-Differences Method – 5to1 NN-Matching

	BASELINE (2007)			FOLLOW UP (2011)			
Outcome Variable	Control	Treated	Diff(BL)	Control	Treated	Diff(FU)	DIFF-IN-DIFF
ETR	0.260	0.283	0.022	0.269	0.267	-0.003	-0.025
Std. E	(0.013)	(0.013)	(0.019)	(0.013)	(0.015)	(0.020)	(0.027)

Notes: Table 4.10 considers a subsample of only U.S. banks in the treated group. It shows the mean outcome for the treated and control group in 2007 and 2011 and its difference. The outcome variable is the ETR. The results are based on five to one nearest neighbor caliper matching. Observations in the control group 171, observations in the treatment group 93. Robust standard errors are shown in parentheses. (***), (**) and (*) indicate significance at (1%), (5%) and (10%) level, respectively.

Choosing our event window has great impact on our analysis. Capital injection programs allowed banks to pay back injected capital when possible on specific terms. Most banks were eager to pay back governments as soon as possible. Not only to avoid government influence on their business decisions but also as a signal to their other shareholders. Therefore, one could argue that 2011 is already too late to measures effects of government influence. To avoid this complication we repeat our analysis choosing 2010 instead of 2011 as our relevant after-crisis year. As shown in Table 4.11 our results are robust and indicate the same behavior of tax aggressiveness as we measured for 2011.

TABLE 4.11: Robustness Test Year 2010 – Difference-in-Differences Method – 5to1 NN-Matching

	BASELINE (2007)			FOLLOW UP (2010)			
Outcome Variable	Control	Treated	Diff(BL)	Control	Treated	Diff(FU)	DIFF-IN-DIFF
ETR	0.282	0.251	-0.031*	0.241	0.274	0.033	0.064*
Std. E	(0.011)	(0.013)	(0.017)	(0.014)	(0.028)	(0.031)	(0.036)

Notes: Table 4.11 shows the mean outcome for the treated and control group in 2007 and 2010 and its difference for the entire sample. The outcome variable is the ETR. The results are based on five to one nearest neighbor caliper matching. Observations in the control group 222, observations in the treatment group 132. Robust standard errors are shown in parentheses. (***), (**) and (*) indicate significance at (1%), (5%) and (10%) level, respectively.

6. Conclusion

Our study investigates tax aggressiveness of banks which received public funds during the recent financial crisis.

For the empirical analysis we use a unique hand-collected data sample of 93 multinational banks headquartered in 10 OECD countries that received support in form of capital from public funds in 2008 and/or 2009. Our control group, which did not receive government support, consists of 763 banks in the respective countries.

Using propensity score matching in a difference-in-differences framework (DID-PSM approach) we are able to compare tax aggressiveness of recapitalized banks with banks that did not receive support. Our main result indicates a significant change in tax aggressiveness caused by capital injections that is robust concerning time-invariant unobserved effects.

In addition we explore the tax aggressiveness of both groups before (2007) and after the capital injections were received (2011). Our results show that banks receiving public funds in 2008 and/or 2009 had significantly lower ETRs measured one year before the financial crisis. However, after the recapitalization we cannot find significant different mean ETRs between the treated and control group anymore. We associate this result with increased government influence after strengthening its shareholder position by capital injections.

Our findings are supported by a series of consistent robustness tests, applying a different event window and additional matching methods. Lastly, a closer look at

our sample suggests that effects differ among countries. Whereas the effect is very pronounced in Europe, we do not find significant results for the U.S. subsample.

Our study contributes to the recent discussions on possible ways to regulate banks' behavior. Interestingly, we find that banks did change their tax aggressiveness even without contractual enforcement. However, this does not hold for the U.S., where the majority of recapitalized banks are located. We attribute this to the enormous size of the recapitalization program, taking attention away from the single bank.

Several policy implications can be taken from our study. First, rescue measures offer an opportunity to address banks' existent tax aggressiveness. Second, negative behavioral patterns such as excessive risk taking and tax avoidance might be highly correlated. Future regulatory approaches could therefore try to address both issues simultaneously.

References

Acharya, V. V., D. Anginer and Warburton A. J. (2013). The End of Market Discipline? Investor Expectations of Implicit State Guarantees, SSRN eLibrary.

Augurzky, B. and Schmidt, C. (2001). The Propensity Score: A Means to an End, IZA Discussion Paper No. 271.

Bundell, R. and Costa-Dias, M. (2008). Alternative Approaches to Evaluation in Empirical Microeconomics, *The Journal of Human Resources* **44**(3), 565–640.

Borio, C., Vale, B. and von Peter, G. (2010). Resolving the Financial Crisis: Are We Heeding the Lessons from the Nordics?, BIS Working Papers No. 311.

Brei, M. and Gadanecz, B. (2012). Public Recapitalizations and Bank Risk: Evidence from Loan Spreads and Leverage, BIS Working Papers No. 383.

Brei, M., Gambacorta, L. and von Peter, G. (2013). Rescue Packages and Bank Lending. *Journal of Banking and Finance* **37**, 490–505.

Caliendo, M. and Kopeinig, S. (2008). Some Practical Guidance for the Implementation of Propensity Score Matching, *Journal for Economic Surveys* **22**(1), 31–72.

Caprio, M., D'Apice, V., Ferri, G. and Puopolo, G.W. (2014). Macro Financial Determinants of the Great Financial Crisis: Implications for Financial Regulation, *Journal of Banking & Finance* **44**, 114–129.

Chen, S., Chen X., Cheng, Q and Shevlin, T. (2010). Are Family Firms more Tax Aggressive than Non-Family Firms?, *Journal of Financial Economics* **95**, 41–61.

Chyz, J.A., Leung, W.S.C, Li O.Z. and Rui O.M. (2013). Labor Union and Tax Aggressiveness, *Journal of Financial Economics* **108**, 675–698.

Desai, M., Dyck, A. and Zingales, L. (2007). Theft and Taxes, *Journal of Financial Economics* **84**, 591–623.

Desai, M. and Dharmapala, D. (2008). Tax and Corporate Governance: An Economic Approach, *in* W. Schön, (ed.), *Tax and Corporate Governance*, Springer-Verlag, Berlin, pp. 13–30.

Finke, Katharina (2014). What is the Scale of Tax Avoidance? Evidence from a Propensity Score Matching Approach, Working Paper.

Gupta, S. and Newberry, K. (1997). Determinants of the Variability in Corporate Effective Tax Rates: Evidence from Longitudinal Data, *Journal of Accounting and Public Policy* **16**, 1–3.

Gropp, R. and Heider, F. (2010). The Determinants of Bank Capital Structure, *Review of Finance* **1**, 587–622.

Hanlon, M., and Heitzman, S. (2010). A review of tax research, *Journal of Accounting and Economics* **50**, 127–178.

Heckman, J., Ichimura, H., and Todd, P. (1998). Matching as an Econometric Evaluation Estimator, *Review of Economic Studies* **65**, 261–294.

Heckman, J., LaLonde, R. and Smith, J. (1999). The Economics and Econometrics of Active Labor Market Programs, *in* O. Ashenfelter and D. Card (eds) *Handbook of Labor Economics*, Vol. III, Elsevier, Amsterdam, pp. 1865–2097.

Huizinga, H.P., Voget, J. and Wagner, W.B. (2014). International Taxation and Cross-Border Banking, *American Economic Journal: Economic Policy* **6**(2), 94–125.

Iannotta, G., Novera, G. and Sironi, A. (2013). The Impact of Government Ownership on Bank Risk. *Journal of Financial Intermediation* **22**, 152–176.

Keen, M. and de Mooij, R. (2012). Debt, Taxes, and Banks, IMF Working Paper 12/48.

King. R. (2012). Time to Buy or Just Buying Time? The Market Reaction to Bank Rescue Packages, BIS Working Papers No. 288.

Mariathasan, M. and Merrouche, O. (2012). Recapitalization, Credit and Liquidity, *Economic Policy* **27**(72), 603–646.

O'Hara, M. and W. Shaw (1990): Deposit Insurance and Wealth Effects: The Value of Being "Too Big to Fail", *The Journal of Finance* **45(**5), 1587–1600.

Panetta, F., Faeh, T. and Grande, G. (2009). An Assessment of Financial Sector Rescue Programmes, BIS Working Papers No. 48.

Plesko, G.A. (2003). An Evaluation of Alternative Measures of Corporate Tax Rates, *Journal of Accounting and Economics* **35**, 201–226.

Rego, S. O. (2003). Tax-Avoidance Activities of U.S. Multinational Corporations, *Contemporary Accounting Research* **20**, 805–833.

Rosenbaum, P.R. and Rubin, D.B. (1983). The Central Role of the Propensity Score in Observational Studies for Causal Effects, *Biometrika* **70**, 41–55.

Stickney, C. P. and McGee, V.E. (1982). Effective Corporate Tax Rates. The Effect of Size, Capital Intensity, Leverage and other Factors, *Journal of Accounting and Public Policy* **1**, 125–152.

Wamser, G. (2008). The Impact of Thin Capitalization Rules on External Debt Usage, A Propensity Score Matching Approach, Ifo Working Paper No. 62

Zimmermann, J. L. (1983). Taxes and Firm Size, *Journal of Accounting and Economics* **5**, 119–149.

Dipl. Kffr. Julia Anna Merz
Hermesweg 6, 60316 Frankfurt
merz.julia@gmx.de
☎ +49 162 230 9713

Curriculum Vitae

Personal Data

Name	Julia Anna Merz
Date of Birth	August 22nd 1985
Place of Birth	Stuttgart, Germany
Citizenship	German

Education

04/2013 – 05/2015	**University of Cologne**
	PhD Student at the Chair of Business Taxation
01/2015 - 03/2015	**University of California, Berkeley, Haas School of Business**
	Visiting Scholar
01/2012 - 03/2013	**Goethe University, Frankfurt**
	PhD Student at the Chair of Business Taxation
04/2006 - 12/2011	**University of Mannheim**
	Diploma in Business Administration with intercultural competence Japanese
09/2007 - 02/2008	**Kyoto University of Foreign Studies**
	Exchange Semester
08/1996 - 07/2005	**St. Meinrad Gymnasium, Rottenburg**
	Allgemeine Hochschulreife

Professional Experience

04/2013 – 05/2015	**University of Cologne, Research Assistant at the Chair of Business Taxation**
01/2012 – 03/2013	**Goethe University, Frankfurt, Research Assistant at the Chair of Business Taxation**
03/2011 - 12/2011	**SAP AG, Walldorf, Working Student**
03/2010 - 12/2010	**BMW Corp. Japan, Tokyo, Internship**
07/2009 - 08/2009	**KPMG AG, Düsseldorf, Internship**
01/2007 - 02/2007	**KPMG AG, Stuttgart/Paris, Internship**

Cologne, April 2015