Notional Interest Deduction and the Capital Structure of Belgian Banks

An empirical analysis on the notional interest deduction before and during the financial crisis

faculty of economics and business

Thesis submitted to obtain   
the degree of

Master of Business Economics

R0372560 & R0369424

Thibault Dubois & Daan Pelgrims

Major Financial Economics

Promoter: Prof. Dr. Hans Degryse

Assistant: Sanja Jakovljevic

Academic year 2015-2016

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*Abstract*

*In 2006 Belgium introduced the notional interest deduction, or NID, which is a fiscal tool aimed at reducing the tax discrimination between debt financing and equity financing. The prime aim of this study is to assess whether the NID has a significant impact on the capital structure of Banks. In order to capture the effects of the notional interest deduction on leverage levels, this study implements a simulation technique that generates marginal tax rates. This approach is tested on a sample of 32 Belgian banks over the period of 2004 up until 2014. The empirical analysis results in four main findings. First, the NID reduces the optimal debt level of Belgian banks. Second, the NID substitutes short-term funding for equity, making the banking system more stable in the short run. Third, the impact of the NID differs among bank types. Finally, the NID preserves its significant influence on the capital structure of banks during the financial crisis. In conclusion, evidence demonstrates that banks will be more equity-financed as a result of the NID.*

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Thibault Dubois

Daan Pelgrims

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# General Introduction

To this day, certain parts of the world, including Europe, are still run-down by the financial crisis’ aftermath. This causes regulators and politicians to reconsider and rethink bank capital regulation to give the appropriate incentives for a safe and stable banking system. A manageable option would be a subclass of the “allowance for Corporate Equity” system (ACE), the notional interest deduction (NID). Belgium has been an early adopter of such an ACE system and tried to lower the discrimination in fiscal treatment between debt versus equity. The focus of this paper lies in capturing the effects of the NID on the capital structure of Belgian banks.

The trade-off for society between an economic system with or without the NID can be translated as follows: with the introduction of the NID there are less bankruptcy costs and less costs of financial distress, as opposed to less government revenues. Nonetheless, recent occurrences have proved that banks in financial distress have far-reaching consequences on the financial system and the economic system as a whole. As a result, financial stability has become a primary objective in the banking sector.

Specifically, this study seeks to address the following research question: to what extent does the NID affect the capital structure of banks and, consequently, does it make the banking system more stable?

Extensive research has already been conducted concerning the impact of the NID regarding SMEs, but the NID’s impact on banks has been rarely addressed. Indeed, only two papers have investigated the effect of the NID on the capital structures of banks. These studies differ in their methodologies, use different samples, and also have found contradicting results. Milané and Rodrigues (2014) found, by means of a random-effects model that the NID introduction did not have a significant impact on leverage while Schepens (2015) found the opposite, using a fixed-effects approach.

This study contributes to the existing literature by means of a different methodology, suggested by Milané and Rodrigues (2014), and a wider window of observations to include the financial crisis. Previous literature on the effects of the NID on the capital structure of banks has proved to be rather limited. Moreover there is not a clear conclusion on whether or not the NID has a significant impact. Using a different approach will help to ease contradictions in the currently scarce literature. Furthermore, it investigates whether there is a difference in impact on short-term versus long-term funding, it also controls for difference in bank types with respect to tax incentives and it concludes with an analysis on the impact of the financial crisis in 2008.

The approach used to capture the impact of the NID, consists of a simulation technique which will generate marginal tax rates, or MTRs. Shevlin (1990) and Graham (1996) developed this method with the purpose of measuring and observing tax incentives within a company. In the case of this study, the MTR focusses on the potential impact of the NID on banks’ capital structures. Kestens et al. (2011) define MTR as “the change in present value of total tax liabilities caused by one additional unit of interest cost today. Given that this additional interest cost is tax deductible, this will lower taxable income i.e. the MTR.” However, when the NID is involved, the tax shield provided by extra debt is lowered. Hence, we expect banks to calibrate their capital structure in the favor of equity because of the introduction of the NID.

The leverage ratio has been constructed using economically sound control variables supported by capital structure theories. Consequently, an unbiased effect of the NID on the capital structure is guaranteed. The empirical analysis results in four main findings. First, the analysis finds that the NID has a significant negative impact on the leverage ratio of Belgian banks. Second, the NID has a considerable negative impact on short-term funding whereas long-term funding is not affected. This implies that the stability of the banking system has improved on a short-run base. Third, commercial banks are more bound to reduce their optimal level of debt because of the NID introduction compared to savings banks or co-operative banks. The fourth and last finding suggests that the NID remains highly significant even after controlling for the financial crisis.

The remainder of this thesis is organized as follows. Section 2 describes the NID in more detail and how it is implemented in Belgium. Section 3 follows with an overview of existing literature on the topic. Section 3.1 discusses research done for SMEs and section 3.2 focusses in greater detail on research done for banks. Furthermore, section 3 contains an overview of the different existing capital structure theories. Moving on to section 4, we present the different hypotheses used as a basis for the general model and the extensions. This section also contains a description of the variable of interest and the research sample. Furthermore, it also explains the data filtering approach, the construction of the variable of interest and the choice concerning the dependent variable, Ln(Gearing). Lastly, section 4 concludes with a description of the applied models and the control variables. Section 5 presents the results of the general model and the extensions. In section 6, some robustness tests are performed regarding the window of observations and bank recapitalization by the government. Finally, we conclude in section 7 with the main findings and remarks for future research.

# Notional Interest Deduction

In the majority of corporate tax systems, interest costs can be deducted from the taxable income, as opposed to dividends which cannot be deducted. As a response to this discrepancy, an ACE (Allowance for Corporate Equity) system aims to reduce the discrimination between debt and equity through the exoneration of a notional return from the taxable income (Devereux and Freeman (1991)). Since the exonerated notional return is calculated on the firm’s equity base, this will induce firms to hold additional equity to fully benefit from this subsidy. Firms will be less bound to risks such as financial distress and bankruptcy. This is a feature that would also be particularly beneficial for banks and the stability of the financial system. Moreover, it indirectly benefits governments since including more stability causes the probability of government interventions to decline during an economic downturn. However, an important direct disadvantage of this approach is the immediate fall in governments’ revenues. This decline will have to be compensated elsewhere, creating possible distortions in the economy.

In Belgium such an ACE was introduced in 2006 in the form of the Notional Interest Deduction (NID). The NID was introduced as a replacement to the so-called coordination centers measure. The latter allowed multinational firms to direct a large part of their taxable income to Belgium and have it taxed at a low tax rate. However, this measure was prohibited by a European Commission ruling as it was discriminating against Belgian firms. As a response, the Belgian government introduced the NID which was in line with European regulations. One of the NID’s objectives was to lower the effective tax rate so as to keep Belgium attractive for multinationals. Another objective was to tackle the previously mentioned tax discrimination between debt and equity and increase the companies’ equity base, giving them a better protection against bankruptcy. Belgian firms as well as multinational firms with a permanent establishment in Belgium (i.e. all firms subject to Belgian corporate taxation) would benefit from this measure. Belgium was only second in introducing this form of tax regime, the first one being Croatia between 1994 and 2000. Other countries (Italy, Austria and Brazil) have tried similar though slightly different initiatives to adopt an ACE system which makes Belgium one of a kind. (Schepens (2015)).

A fictional interest rate on the (adjusted) equity level of the firm can be deducted from the taxable income. This rate is calculated on the basis of the 10-year Belgian government bond rate with a maximum set at 6.5% (Schepens (2015)) and will be 1.63% for tax-assessment year 2016.  This interest rate is increased with 0.5 percentage points to 2.13% for small and medium-sized enterprises. An important feature of the NID system is that if a company had insufficient earnings to fully benefit from the NID, it was possible to carry forward that unused amount up until 7 years (Kestens, Van Cauwenberge and Christiaens (2011)). However since 2013, the unused amount of NID can no longer be carried forward. Nonetheless, this restriction will not be applied to the carry forwards that a company has built prior to 2013. Another modification is that the interest rate is capped at maximum 3% (+ 0.5 percentage points for SMEs). This paper will not take into account the recent changes in legislation since the window of observation after the implementation is too short.

The NID is currently a noteworthy contemporary topic given that in 2016 Belgium’s Minister of Finance is striving to abolish it altogether. In his vision, the NID should be substituted by a reformed tax system with a lowered corporate tax rate but without tax deductions. Furthermore, Belgium has received warnings about the system from both the EU and the USA. In contrast, Belgium’s Minister of Economy states that the abolishment of the NID would have a severe effect on Belgium’s international reputation, given that a large fraction of multinational companies have made decisions based on the NID measure being in place. Also, a change in tax policy could push multinational companies out of the country, as Belgium would become considerably less attractive from a taxation point of view. Additionally, the costs of the NID system for the government are currently low given the low interest rates. However, we suggest that both views seem to ignore the effect that an abolishment would have on the stability of the Belgian banks.

# Literature Overview

## Literature on small and medium-sized enterprises

Previous studies mainly tackle the effect of the NID on SMEs’ capital structure, leaving the financial sector out of consideration. Within the strand of literature concentrating on SMEs in Belgium, mixed results about the effectiveness of the NID have been found.

The first paper to research the effects of the NID on SMEs, introduced in Belgium, was that of Cornelis and Merckx (2009). They use a technique to simulate the marginal tax rate (MTR) to approximate tax incentives. This simulation was first developed by Shevlin (1990) and perfected by Graham (1996). It has been used on a sample of 1127 Belgian SMEs over the period 2005 to 2007. One of the main findings is that the introduction of the NID has a significant negative effect on SMEs’ leverage ratios.

Kestens et al. (2011) also investigate the effects of the NID on the capital structure of SMEs. Sample-firms over the period 2005 to 2008 are non-randomly selected and also go through an MTR-simulation in order to evaluate the influence of a tax change. Similar results to that of Cornelis and Merckx (2009) are found, i.e. leverage levels were significantly reduced.

Princen (2012) examines the effects of the NID on non-financial firms using a difference-in-difference approach. The sample covers a period which runs from 2001 to 2007 and includes 18,322 Belgian companies. In accordance with previous studies, a negative impact on firm leverage is discovered.

Panier et al. (2013) tackle the effects of the NID using a difference-in-difference approach and expand their sample, when compared to previous studies, to the Belgian firm population as a whole. The sample period covers 2001 up until 2009. One of their four main findings is the significant increase in the share of equity as a result of the NID. They also point out the empirical benefits of analyzing the NID in Belgium. These benefits, which are listed below, can also be assigned to this study as well as the other mentioned studies.

First, the sole intended use for the NID is to reduce the discrimination between debt and equity. Second, previous literature was concerned about the endogeneity of macroeconomic or fiscal changes. These intrinsic changes could interfere with tax impact estimates, making them less pure. These concerns are eased in the case of the NID reform, since it was triggered by an exogenous EU-ruling. Third, the NID is an arguably large tax change which induces cleaner variations in equity or debt in comparison to formerly analyzed tax changes.

In contrast to previously mentioned studies, Van Campenhout and Van Caneghem (2013) demonstrate that the NID has no impact on the capital structure of SMEs within a short term’s period. Their sample consists of 614 Belgian SMEs between over the period 1998–2007.

## Literature on banks

Up until now, there are only two studies that have researched the effects of the NID on the capital structure of banks. They use a different methodology and find different, even contradicting, results.

Milané and Rodrigues (2014) were the first to analyze the impact of the NID on the capital structure of financial institutions. Their sample includes 35 Belgian banks and covers a time period ranging from 2001 until 2010. They attempt to answer the question “Can the Belgian government motivate Belgian banks to reduce their leverage by introducing an equity tax shield?” They make an analysis on cross-sectional time-series data with the aid of a random-effects model while making a distinction between commercial and non-commercial banks. A random-effects model is applicable when unobserved individual heterogeneity is uncorrelated with the included regressors. Their study fails to discern a significant effect of the NID on bank leverage and therefore concludes that banks must be less responsive to the NID compared to non-financial firms.

On the grounds of tax shields having a significant impact on corporate capital structure (Stiglitz (1973) and King (1974)), Schepens (2015) investigate the impact of the NID on the Belgian banks’ capital structure, as it reduces the unequal tax treatment of debt and equity. Furthermore, he investigates what the implications of the NID are on banks’ risk taking behavior and on the NID’s contribution to bank capital regulation. His sample consists of 35 Belgian banks over the period 2003-2007. Similarly to Panier et al. (2013), the author relies on a difference-in-difference approach also called a fixed-effects model which assumes the unobserved individual heterogeneity is correlated with the regressors of the model. Note that this difference distinguishes Schepens’ approach from Milané and Rodrigues. The author also compares Belgian banks with European banks. The main findings are explained hereafter. First, tax shields do have a significant impact on banks’ equity ratio. Second, the impact of the NID follows an increase in equity and not a decrease in assets, which is an important result for policy makers and bank regulators. Third, the change in capital structure after the introduction of the NID is relatively similar for low- and high-capitalized banks. Fourth and final finding, there is a difference regarding risk-taking behavior. The author discovers a significant reduction in risk-taking for ex-ante low-capitalized banks, while there is no change for ex-ante high-capitalized banks.

We can conclude that the majority of studies on the NID regarding SME’s tends to support the positive implications of the NID, whereas for banks there is no census yet regarding the effect of the NID

## Contribution to the literature

Our study contributes to the existing literature in three ways. First, it studies the impact of the NID on capital structure of banks using the MTR-approach developed by Shevlin (1990) and Graham (1996a). MTRs are a suitable proxy for corporate tax incentives and have proven their use in prior mentioned studies on SMEs (Cornelis and Merckx (2009), Kestens et al. (2011)). Second, it hypothesizes that banks are inflexible in changing their capital structure in the short-run. Thus extending the research period from 2004 until 2014 can incorporate more of the NID’s effects. Third, there are no studies that take into account the impact of the financial crisis on the effectiveness of the NID.

## Capital structure theories

In this section, the different theories on capital structure will be discussed. Our research is based on the insights provided by the static trade-off theory. Nonetheless, the effects of other capital structure theories are considered as well.

### The irrelevance theorem of the capital structure

Modigliani and Miller (1958) initiated research on this topic by stating that, under the crucial assumptions of there being no transactions costs, no taxes and equal borrowing rates for individuals and firms; the firm leverage level is irrelevant for determining firm value. In other words, the only determinants that can influence firm value are present value of future operating cash flows that are contingent on the profitability of its assets and the future investment opportunities of the firm. As cash flows remain within the company, the capital structure is only manipulating the distribution of cash flows among capital providers.

### Static Trade-Off Theory

Myers and Majluf (1984) were the first to mention the discrepancy between debt and equity and link it to a certain trade-off. This theory assumes that interest expenses are tax-deductible and that bankruptcy costs are present. Firms will always favor debt as a source of funding for the reason that interest expenses are tax-deductible. As a consequence, it would be logical to assume that all projects are financed with debt. However, one must take financial distress and its resulting costs into account. If there exists a probability of default higher than zero, financial distress will automatically arise. Henceforth we can structure the trade-off as follows: the greater the debt ratio, the greater the risks to face costs related to liquidity problems, but also the bigger the tax shield. The static trade-off theory implies that firms will seek to achieve an optimal level of debt since they will balance the value of their tax shield with the costs of bankruptcy, and decide on their debt and equity levels accordingly.

### Agency Cost Framework

The general framework for the agency problem can be defined as follows: a principal expects his agent to serve the principal’s best interests. However, the agent’s decisions are motivated by the agent’s self-interest. Both their interests might differ and this will cause a suboptimal result for the principal.

More specifically, Jensen and Meckling (1976) model a capital structure theory that aims to explain the conflict of interests between the principal, or shareholders, and their agents, or the managers. Their framework relies on the fact that by adding a certain level of debt, the resulting free cash flows are decreased. At the same time, the financial freedom of the managers is lowered, thus decreasing opportunistic behavior. This will to some extent eliminate the possibility of managers pursuing value-destroying investments that would generate private benefits for them, but which are not in line with the interests of the shareholders.

### Pecking Order Theory

Donaldson (1961) with Myers and Majluf (1984) are the founders of the pecking order theory. They argued that the cost of financing increases with asymmetric information, thus creating a distinct hierarchy between financing sources. When sorted in decreasing order of attractiveness, these sources are: internal funds, debt and additional equity. Companies will prefer to finance their investments or pay their dividends with internal funds, if available. If not available, companies will pick debt over equity. The cause of this hierarchy can be explained through the influence of asymmetric information costs. Internal funds are preferred over external funds since there are no information asymmetries in the first place. Consequently, the required return is lower compared to uninformed external fund providers. In the case of external funding, the managers need to account for the signaling effect of their choice of funding. Additional equity is the least preferred source of funding because of its substantial asymmetric information. If managers, who are assumed to know best about the future performance of the firm, choose to raise additional equity, this must mean that the firm is overvalued, hence the new investors will want a higher return on their investment and thus pay a lower price (Myers and Majluf (1984)). On the other hand, issuing debt means that the managers are confident that their stock price is undervalued, which will in turn increase stock prices. In summary, debt is preferred over equity because of the positive signaling effect inherent to debt.

# Method

## Hypothesis

The deductibility of interests influences the capital structure of a company since it reduces its taxable income. Equivalently, banks benefit from this tax implication and will adjust their capital structure in order to reduce overall tax liabilities. As a result, a clear discrimination between equity financing and debt financing is observed. The introduction of the NID aims to reduce this discrimination and its main effect can be translated into a lower leverage ratio of Belgian banks. Prior research shows that the MTR simulation can be a good approximation for the effects of the NID. Cornelis and Merckx (2009) show that the introduction of the NID had a significant negative effect on SMEs’ leverage ratios and Kestens et al. (2011) also find similar results to those of Cornelis and Merckx (2009). Therefore we hypothesize that the NID introduction has a negative effect on Belgian banks’ leverage.

*Hypothesis 1:*

*The introduction of the NID has a negative effect on MTR which in turn lowers the leverage levels in Belgian banks.*

Building on the conclusions of Cornelis and Merckx (2009) and Kestens et al. (2011) this study wants to observe the effects of the NID on the MTR which in turn will have an impact on the level of leverage.

Furthermore, this study will analyze the effectiveness of the NID under three additional extensions of the general model. The first extension will test the impact of the NID on the defining components of debt structure. The second extension controls for bank type and investigates whether there is an interaction between bank type and NID. The final extension analyzes the impact of the NID during the financial crisis.

With the first extension, this paper aims to provide evidence for the NID as an effective tool for increasing stability in the banking sector. Since long-term assets are financed with short-term funding, banks are facing more liquidity risks compared to non-financial firms. If the NID aims to reduce short-term funding, it would reduce liquidity risks in the short run, thus increasing stability in the banking sector. Then again, for the long run, this might not be the case since equity and long-term funding become by principle more interesting substitutes rather than equity and short-term funding. A longer sample period would be able to shed more light on this matter. This is, however, not within the scope of this paper. Besides, we hypothesize that short-term funding is more sensitive to the introduction of NID in comparison with long-term funding. This is a logical argument since long-term funding is invariable in the short run and banks might still be in the process of adapting their long-term funding structure to the NID. Moreover, when assuming both a constant balance sheet total[[1]](#footnote-1) and an invariable long-term funding, the increase in equity due to the NID will cause an automatic decline in short-term funding. This brings us to the second hypothesis.

*Hypothesis 2:*

*The NID introduction reduces liquidity risks by having a larger impact on short-term funding compared to long-term funding.*

With the aid of the third extension, this paper would like to assess the impact of bank types on the level of leverage and investigate whether there exists an interaction between bank type and NID. Bank types involved in riskier projects, such as commercial banks compared to savings banks, need to hold more equity, hence the NID might play a larger role in these types of banks.

*Hypothesis 3:*

*There exists an interactive relationship between bank type and the NID.*

The bank types that will be discussed are commercial banks, savings banks and cooperative banks:

* A handbook of international financial terms defines a commercial bank as: “a bank which undertakes a range of banking services to companies and individuals. Examples of such services are: providing checking facilities; taking deposits; making loans; and supplying and receiving notes and coins. Such banks may offer additional trustee services and a range of securities advisory and transaction facilities. In Continental Europe, they are known as credit banks.”
* A handbook of international financial terms defines a savings bank as:” a type of bank which takes in long-term savings and relends them, often in the form of mortgages.”
* The international co-operative banking association defines a co-operative bank as: “a financial entity which belongs to its members, who are at the same time the owners and the customers of their bank. Co-operative banks are often created by persons belonging to the same local or professional community or sharing a common interest. Co-operative banks generally provide their members with a wide range of banking and financial services (loans, deposits, banking accounts...).”

The final extension inspects whether previous results on the NID are biased or not by extraordinary behavior exhibited during the financial crisis. A financial crisis can be defined by more than one phenomenon such as stark disruptions in financial intermediation, substantial government support (e.g. recapitalizations) and/or large scale changes in credit volume and asset value. As a result, banks are pressured by fire sales, liquidity shocks and increasing default risk. More precisely, signs of the recent financial crisis in Europe have arisen from the asset side of banks’ balance sheets. Problems in the asset markets such as the real estate loans made many banks undercapitalized (Claessens and Kose (2013)). Therefore, this study will define a financial crisis as a negative growth in total assets. We further hypothesize that the NID has no significant impact on the leverage of banks during a financial crisis since equity fluctuations are influenced by anti-crisis policies rather than tax incentives.

*Hypothesis 4:*

*The NID has no significant impact on gearing in times of financial crisis.*

This is a relevant hypothesis from a policy maker’s point of view since it would be interesting to assess the usefulness of the NID during crises.

## The variable of interest

With the MTR simulation technique this study is able to make an accurate approximation of the NID’s effects on a bank’s tax incentives, thus capturing the changes in the capital structure. A lower MTR can be interpreted as debt becoming less interesting compared to equity.

Shevlin (1990) originally developed the MTR and Graham (1996a) perfected it afterwards. We will use the same definition as stated in Kestens et al. (2011): “The MTR is the decrease in the present value of the sum of present and discounted expected future tax liabilities due to an increase in interest costs of one euro. Accordingly, the MTR can be considered as the decrease in tax liabilities resulting from a change in the level of debt corresponding to an increase in interest costs of one euro.” This paper operates by comparing the MTR over a time series across Belgian banks exclusively. Previous papers took different approaches such as the random-effects model in Milané and Rodrigues (2014) or the fixed-effects model in Schepens (2015).

### The effect of the NID on the MTR

In this section the intuition behind the MTR is illustrated by means of an example:

First, consider state {A,B}. A situation without the NID:

* State A: no fictive marginal increase in cost of debt (state A is closest to reality and is also the starting point in the data.)
* State B: a fictive marginal increase in the cost of debt is added to state A. An increase in the cost of debt causes the taxable base to decrease and hence, tax liabilities decrease as well.
* The MTR is considered to be the difference in tax liabilities between state A and state B (MTR = A – B). Tax liabilities in state A are logically higher than in state B since state A does not benefit from the incremental increase in cost of debt, which reduced tax liabilities. As a result, the larger the difference in tax liabilities between state A and B the larger the resulting MTR. In other words, a large MTR can be translated as a large benefit stemming from an increase in debt or, more MTR makes debt taking more interesting.

Next, consider state {C,D}. A Situation with the NID introduction.

* State C: no fictive increase in cost of debt. The difference between state C and A is the NID. The introduction of the NID already lowers the taxable base before the extra incremental cost of debt. This means that state C’s tax liabilities are lower than state A’s tax liabilities.
* State D: a fictive marginal increase in cost of debt is added to state C. The extra cost of debt reduces taxable income, thus tax liabilities. However state C’s tax liabilities have already been reduced by the NID.
* The reduction in tax liabilities of MTR = C – D will not be as high as MTR = A – B, meaning the MTR will be lower in a situation with NID. The introduction of the NID reduced the MTR making debt taking less interesting. The difference between situations {A,B} and {C,D} is called the MTR difference and encloses the impact of the NID on leverage.

Furthermore a constant balance-sheet total is assumed. This assumption implies that taking on more debt causes equity to automatically decrease, which results in a lower NID impact on MTR. Consequently, the taxable income increases again. The assumption of a constant balance is commonly used in previous studies on NID, however it is not in line with what we can observe in reality. This study finds a strong correlation of 90% between total assets and equity (not reported) which implies that total balance sheets will not remain unchanged when equity changes or vice versa. Note that without this assumption, equity might not decrease as a result of an extra €1 interest cost which would result in a larger and even bigger impact of the NID on MTR. Making this assumption thus provides a conservative image of the true impact of the NID on leverage.

## Sample description

Financial data for all Belgian banks are being obtained from the Bankscope database, which contains financial information such as balance sheets and income statements on more than 30.000 banks worldwide and which is administered by Bureau Van Dijk. The financial data is available for up to 16 years. Reporting statements to the National Bank of Belgium each year is mandatory for Belgian banks. This ensures that we have high quality data available for every bank.

Since tax return data are not available for Belgium, we will be using banks’ financial statements as an input to simulate the marginal tax rate (MTR). Graham and Mills (2008) argue that the strong correlation between financial statements’ data and tax return data causes close to no discrepancies for the simulated MTRs.

Our sample ranges from 2004 to 2014. We are aware that this is a wide period but we use a period this wide because in order to properly account for the effect of NID, one should analyze the periods both before and after its introduction. Using such a wide data period has both its advantages and disadvantages. A likely disadvantage is the interference of global economic events, such as the financial crisis of 2008, which can create an uncontrolled impact on the leverage level of banks. Consequently, regulations have been put into place which in turn also disturb banks’ leverage levels. As opposed to these disadvantages, there is also a non-negligible advantage. It is reasonable to hypothesize that banks are inflexible in changing their capital structure in the short-run. So by extending the research period from 2004 until 2014 we can cover more NID effects. Moreover we can test how NID fares when pressurized by systematic events such as the financial crisis of 2008 and its subsequent measures such as the Basel Norms. In the robustness section, we check for confounding events by taking a shorter time frame ranging from 2004 to 2007.

## Data extraction and adjustments

The initial sample amounts to 147 Belgian financial institutions extracted from Bankscope.  First, observations that have missing values for either profits before taxes or interest expenses are dropped. Second, observations are kept only if there are at least five statements reported for that specific bank, so as to capture the effects of the NID on a long-term basis. Third, following literature conventions, only co-operative, savings, and commercial banks are kept in our sample. Fourth, only independent banks are included in our sample. This is motivated by Rommens, Cuyvers and Deloof (2008), who argue that the parent company’s financial strategy can influence the dependent subsidiary’s capital structure. Not excluding those banks might give a biased behavior in tax incentives when faced with the introduction of the NID. Lastly, banks with no entries either for 2004 or 2005 are dropped in order to make appropriate comparisons on the behavior of banks before and after the NID introduction. Banks that are inactive during the sample period are not excluded in order to reduce the survival bias. The final sample includes 32 banks which are listed in appendix 1.

Before the introduction of the general model, a couple of figures are presented to scout for possible changes in equity levels and to give an intuition of what might be going on. As can be seen in figure 1, the banking sector clearly consists of a few large banks and many smaller banks. Note that observations about larger banks are not included for 2004. Therefore, only observations running from 2005 until 2014 are included, which guarantees an accurate image of the fluctuations in equity. This leads to figure 2, which presents the evolution of the average equity levels in the banking sector and covers a period from 2005 up until 2014. We can observe that the introduction of the NID coincides with a raise in average equity levels in 2006. Nonetheless, the financial crisis or the numerous recapitalizations of large banks most likely distort the impact of the NID. Regardless, equity keeps increasing even after the crisis, but then again stricter Basel norms which have been introduced post crisis might cause disturbances and give a biased image. One of the included extensions assesses the impact of the crisis on the NID.

Next, from figure 3 it becomes clear that the banking sector relies more on short-term funding, than on long-term funding. Short-term funding has been slightly decreasing over the years (from 90% to 83%), whereas long-term funding remained constant around 10%. Hence, equity has grown larger over the sample period. Again, both the effects of the NID and the crisis could have caused this increase. In figure 3 we also notice the simultaneous increase in equity from 4% to 5% and the introduction of the NID. Moreover, equity continuously soared to 8% in 2014. In other words, equity levels have doubled over the course of 8 years following the introduction of the NID. Furthermore, the extension section conducts a more profound analysis on the relationship between the NID and short-term or long-term funding.

## Variable explanations

In order to avoid the inclusion of NID deductions and other tax deductions in Bankscope variables, some of the variables are constructed manually. An example of this is EBIT data, since there exists no official obligation to report this figure:

We diverge from the standard EBIT definition. In our opinion, the EBIT for a bank is excluding interest expenses but including interest income. A bank’s core business consists in granting loans, and thus earning interest income. There can be some flexibility in how the EBIT is calculated since it is not a GAAP measure, nonetheless we follow the industry standard.

Next, a legal adjusted equity base on which the NID deduction will be calculated, is constructed in the following way:

Note that the adjusted equity in this case does not hold all the legal restrictions[[2]](#footnote-3) since there was a lack of information in the database.

Furthermore, this study implements the assumption of constant balance-sheet totals, which is also incorporated in Cornelis and Merckx (2009) and Kestens et al. (2011). We assume a constant cost of interest of 5%. This means that when the interest cost is increased by €1, equity decreases by the exact same amount debt increases being €20 (€1 incremental cost of debt / 5%). Hence the assumption lowers the amount of NID. Further variables have to be generated such as new equity levels and new NIDs which account for the €1 increase in interest costs.

Subsequently this study proceeds by calculating the MTRs in the following way. It starts by generating a fictive tax expense for the marginal tax rate without the NID – the MTR(NoNID) - which is based on the previously mentioned EBIT-measure minus the interest expenses.

Then the sum of the discounted tax liabilities for each bank is being calculated.[[3]](#footnote-4)

The exact same process is repeated for an additional €1 cost of interest. This results in a lower profit before taxes and hence in a lower discounted tax liability. The MTR is calculated as the difference between the two summed up discounted tax liabilities.

Now, we will follow a similar[[4]](#footnote-5) approach in constructing the marginal tax rate with the NID accounted for - the MTR(NID).

The final step is the calculation of the difference between the two MTRs, with and without NID respectively, which then gives a difference in basic percentage points.

Note that MTR(Difference) is zero in 2004 and 2005. This stems from MTR(NID) and MTR(NoNID) being equal since the NID has not yet been introduced.

Cornelis and Merckx (2009) and Kestens et al. (2011) use the inverse and “negative” measure for MTR Difference (MTR Difference = MTR(NID) – MTR(NoNID)). In our opinion the “positive” MTR Difference is more intuitive since it allows for an easier interpretation of the NID impact on MTR difference. For instance, an increase in “positive” MTR Difference means that MTR(NID) has become smaller and thus NID has a larger impact. An increase in a negative MTR Difference is harder to interpret.

The remainder of this section will elaborate on the choice of the dependent variable. For convention’s sake the debt to equity ratio, which from now on will be referred to as the gearing ratio, will be used. This ratio has been commonly used in previous literature to proxy the capital structure of companies (Stiglitz, 1972).

Gearing is defined as total debt relative to shareholders’ equity, where total debt includes long-term debt and short-term debt.[[5]](#footnote-6)

In an extension section the regression will be conducted with two other bounded dependent variables, namely the short-term debt to total funding ratio, and long-term debt to total funding ratio. To avoid econometric issues, the natural logarithm is imposed on all the dependent variables.[[6]](#footnote-7)

## Descriptive statistics

Table 1 presents the dependent variables, the variables of interest, the control variables and the capital structure variables for the 32 Belgian Banks over the sample period of 2004 to 2014. Regarding the dependent variables, an average (median) gearing ratio of 18.239 (15.737) can be observed in our sample. This implies that debt is on average 18.239 times higher than equity, which denotes a high but typical leverage level for the institutions that banks are. Also there is a considerable amount of variation between 25th percentile and 75th percentile. The 25% most highly levered banks take on twice as much debt than the 25% least levered banks. Additionally it is important to notice the difference between short-term and long-term funding. The mean (median) long-term funding ratio amounts to only 8.264% (2.763%), which again implies that the banks in our sample are mainly funded by short-term debt. We observe an average (median) short-term funding ratio of 89.266% (96.806%). There is little variation in this trend, given that 75% of our banks have less than 652 million of long-term funding compared to 8,870 million in short-term funding. However a mean almost equal to the 75th percentile is an indication for a small amount of banks holding on to a considerably large amount of long-term funding ratios. Bank type might be the cause of such a discrepancy. The independent variable, MTR(Difference), has a mean of 23.431% and a standard deviation of 4.739%. It is important to note that this is a positive number, which corresponds to our hypothesis that the NID introduction increases the MTR difference between a situation without NID and one with NID. The MTRs inclusive and exclusive of the NID have a mean (median) of 10.558% (12.677%) and 33.99% (33.99%) respectively, the latter being equal to the corporate tax rate. Next, three variables of interest are included to test for the interaction between bank type and MTR(Difference). The table also contains descriptive statistics about the variables that will be used as control variables in our regressions. Given that only one industry is being discussed, the differences in total assets are remarkable. While the mean is €41,192.47 million, the median is only at €2,348 million. 75% of the banks in our sample have less than 10,481 million in total assets, while the largest banks are 7 times bigger. Profitability is on average low within the banking industry. While most banks make small profits there is at least 25% of banks who make losses or small profits. Differences between bank types might be the cause of this result. A correlation check between bank type and profitability reported a significant negative correlation of 16.24% between profitability and commercial banks while there was a significant positive correlation of 20.02% between profitability and cooperative banks. As expected, tangibility of banks is lower compared to other sectors. The mean (median) amounts to only 0.455% (0.193%) which indicates that the majority of assets are not fixed. Funding through collateral is not an option for banks.

The following of this section will discuss the significant correlations between variables which will consist the NID general model. We refer to table 2 for the exact figures. First of all, as expected the MTR(NID) is positively related to Gearing and is significant at the 1% significance level. A positive relation implies that banks with higher MTRs, NID included, are more likely to be highly levered since debt is more attractive. Furthermore there is a strong positive correlation between size and the leverage level. This is a logical result given that size has been labeled as total assets, which are mostly composed of loans. To match total assets it is necessary to have a large amount of leverage given the small equity levels. As a result more leverage is needed to sustain a larger size. We also notice that larger banks on average have higher tax liabilities. Tangibility is negatively related to gearing and MTR(NID). The negative relationship with gearing might be caused by a substitution effect between non-debt tax shields and debt tax shields, or more precisely, depreciations on tangibles and deductible interest payments respectively. In other words, increasing fixed assets will increase the amount of depreciation, thus creating a larger tax shield. As a consequence, there is less need to take on debt to form a high enough tax shield. The same reasoning can be applied to the negative relationship with MTR(NID). Depreciations from tangible assets reduce the taxable base, hence the lower MTR(NID). Moreover table 2 shows a strong significant negative relationship between profitability and gearing. This follows the premise of the pecking order theory. As expected a higher MTR(NID) corresponds to a higher profitability and vice versa. A significant negative correlation between profitability and size can be found. Smaller banks tend to be more profitable compared to larger banks however the correlation is rather small. Profitability is also positively related to tangibility in a significant way. This correlation suggests that a profitable bank might possess for instance better ICT-systems or larger offices etc. Growth has a positive relationship with gearing and a negative relationship with size and tangibility. Finally, the other correlations with inflation rate and dividend payout were insignificant.

## The NID general model and extensions

### The NID general model

**Model 1**

First, model 1 approximates the gearing ratio with control variables supported by economic theory. This will help to examine the foundations of the general regression and create an accurate image for the effect of MTRs later on.

**Size**

Existing literature has different views regarding the impact of firm size on a firm’s leverage. Brierley and Bunn (2005) point out a positive relation between firm size and leverage because bigger firms tend to have more diversified and less volatile incomes which leads to a higher leverage in the static trade-off framework. Research within the pecking order theory has been inconsistent. On the one hand, Frank and Goyal (2003) and Hall et al. (2004) argue for a positive relation, since bigger firms have less asymmetric information and consequently have a lower information cost and therefore hold more debt. On the other hand, Akhtar (2005) finds a negative relationship between the company being a multinational and its level of debt. He relates this effect to multinational companies having better opportunities to generate internal funds through multiple and diversified income sources. As a result, multinational firms will prefer internal funds over debt.

**Tangibility**

Thornhill et al. (2004) point out that firms with more collateral value - for example producing firms versus service companies - will have greater access to debt because of the presence of additional collateral assets. According to the static trade-off theory, this will enable them to hold more debt. A positive relationship between collateral value and leverage is observed. A similar relationship occurs in the agency cost framework. Rajan and Zingales (1995) find that firms with large amounts of tangible assets, which can serve as collateral, will lower the risk of suffering from the agency cost of debt for the lender. As a result, leverage will increase with additional tangible assets. With regards to the pecking order theory, Frank and Goyal (2003) conclude that an increase in collateral assets can be associated with an increase in leverage.

**Growth**

Growth also functions as a variable that influences the leverage of a firm. Changes in the capital structure might be explained by an adjustment to the growth rate of a bank’s volume. Growth has been a widely discussed topic within the agency cost framework literature stream. However, there has not been a conclusive agreement on the precise impact growth holds on leverage as yet. Rajan and Zingales (1995) link high future growth opportunities with increasing equity financing. Furthermore, Frank and Goyal (2003) find evidence that high growth firms kept low levels of debt as to increase their chance to seize investments opportunities when coming across them. Another explanation for this negative relationship can be found within the entrepreneurial finance literature. Growth companies will postpone taking on leverage as long as possible since debt gets cheaper over time. This might also explain why growth companies take on less long-term funding. Then Myers (1977) suggests that the underinvestment problem was more severe for high growth firms. As a result, high growth firms have more difficulties to find creditors since the latter fear the increased information asymmetries. However, the issuance of short-term debt can serve as an alternative for high growth companies. In summary, long-term debt and growth are negatively related while short-term debt and growth are positively related. Bhaduri (2002) and Hall et al. (2004) also find evidence for Myers’ (1977) suggestion. Moreover, Jung et al. (1996) state that firms with scarce investment opportunities emit a bad signal to new shareholders, thus making equity financing more expensive relative to the issuance of debt. As opposed to previous studies, Frühwirth & Kolbialka (2011) hypothesize that a growing entity needs to finance its increasing activities. Debt issuance might be the only solution when capital markets are not working efficiently. They argue for a positive relation between debt and growth. In conclusion, the resulting effect of growth remains unclear.

**Profitability**

The capital structure theories again have contradicting views concerning the impact of profitability on the leverage level of a company. If the static trade-off theory were followed, as is the case in Frank and Goyal (2003), a positive relationship is observed because more profitable firms will want to use more debt to pressure down the increasing tax basis. If the pecking order theory were followed, such as in Hall et al. (2000), a negative relationship is observed since the increase in profitability will allow the firm to generate more internal funds, which are preferred over debt.

**Dividend Payment**

According to Bhaduri (2002) a negative relationship between dividend payment and leverage can be expected. He argues that firms that pay dividends are more transparent and hence face less asymmetric information on the equity market. As a result, equity becomes more attractive than debt. Bhaduri’s conclusions are contradicting the pecking order theory.

**Inflation rate**

Hortlund (2005) provides evidence of a negative relationship between inflation and equity. Hortlund claims that inflation boosts a bank’s total assets, while equity is kept constant due to high corporate taxes. Consequently, liabilities have to increase until leveraged returns suffice to keep capital ratios at constant levels. Therefore, when regressed on Ln(Gearing), a positive inflation-coefficient is to be expected.

**Model 2**

By introducing the variable MTR(NID), model 2 investigates whether the NID lowered tax rates a bank faces has an impact on leverage beyond the effect of the control variables included in the previous model.

**Model 3**

Finally the variable of interest MTR(Difference) is included. This variable captures the impact on leverage of the change in MTRs before and after the introduction of the NID. In other words, with MTR(Difference) the impact of the NID introduction on the capital structure of banks is observed.

**Multicollinearity check**

An important assumption in a multivariate OLS regression is the absence of perfect multicollinearity. Multicollinearity enters the model when regressors are linearly combined with each other. Hence, the coefficient of the independent variable cannot be interpreted correctly since the collinear variable has to remain constant. As a result, multicollinearity makes it impossible to compute the OLS estimator. Imperfect multicollinearity can also disturb the regressors’ coefficients. Imperfect multicollinearity arises when one of the regressors is highly correlated with another regressor. A high correlation is defined as 90% or more in absolute terms. In contrast with perfect multicollinearity, imperfect multicollinearity does not prevent the execution of the OLS regression. Rather, the estimation of one or more regression coefficients will strongly be biased. It increases the variance of the regressors which are highly correlated with each other and this bias cannot be avoided with larger samples. Model 3 will be tested for imperfect multicollinearity as a robustness check. As can be seen in table 2, there is no imperfect multicollinearity that shows up since the correlations do not exceed +90% or -90%. This means that the estimates of the general model are not biased by imperfect multicollinearity.

### Extensions

In this section the three additional hypotheses are tested. First, this study tests if long-term debt and short-term debt have different tax incentives linked to them. Next, the focus lies on the analysis of a possible relationship between bank type and the NID. Lastly, this section inspects the effect of the crisis on the MTR(Difference) model.

#### The dependent variable extension

The general model tests whether the NID has a significant negative impact on Ln(Gearing). In order to get a better understanding of what the NID precisely influences, the dependent variable is split into two components, long-term funding and short-term funding.

**Model 4**

Our analysis starts with the regression of short-term funding to total funding. Short-term funding is defined as the sum of customer deposits, bank deposits, other deposits and short-term liabilities. MTR(Difference) is expected to have a strong significant impact on short-term funding since the latter can easily be replaced by additional equity. For the same reason as for gearing, the natural logarithm is taken of the dependent variables so as to avoid econometric problems.

**Model 5**

Next the impact of the NID on long-term funding to total funding is measured. Long-term funding is defined as the sum of senior debt maturing after more than one year, subordinated borrowing and other funding. The NID is expected to have a smaller impact on long-term funding when compared to short-term funding because it is assumed to be less flexible. In accordance, with previous dependent variables, the natural logarithm of long-term funding to total funding is taken in order to avoid econometric problems

#### The specialization extension

Model 6 and model 7 will verify whether hypothesis 3 holds or not by analyzing the relationship between tax incentives and bank type. Also, Adrian and Shin (2010) suggest that commercial banks have less variations in their leverage compared to non-commercial banks. In order to capture and control for these effects, dummy variables are created for commercial, co-operative and savings banks. Afterwards a variable that investigates the effect of bank type on the coefficient of MTR(Difference) is created: {MTR(Difference) x Commercial}, {MTR(Difference) x Saving} and {MTR(Difference) x Cooperative}.

**Model 6**

The control variables for savings banks and commercial banks are included in the model whereas cooperative banks serve as the base case.

**Model 7**

Model 7 investigates whether bank types hold some influence on a bank’s tax incentives.

#### The financial crisis extension

This subsection tackles the impact of the financial crisis on leverage and on the NID while excluding the monetary crisis from 2012 until 2014 and other possible disturbances caused by changes in the NID’s legislation as of 2012. As a result, the sample period only includes years from 2004 up until 2011. Furthermore, a dummy variable will control for financial crisis and bank size. Model 3.1 operates as a benchmark for model 8 and is comparable to model 3. The only difference between model 3 and model 3.1 lies in the sample periods: model 3.1 covers 2004 to 2011 whereas model 3 covers 2004 to 2014.

**Model 8**

Figure 4 relates total assets to years and again we can see a clear distinction between large and small banks. Figure 5 further investigates this distinction and subdivides total asset growth across bank sizes. We observe that large banks, with more than €100,000 million in total assets, have a considerable different growth pattern compared to smaller banks with less than €100,000 million. Large banks have an average growth rate of -2.76% while small banks show a growth rate of 9.26% (not reported). This finding suggests that exposure to the financial crisis might be higher for larger banks, hence it is also important to account for bank size in addition to controlling for the financial crisis.

Note that the higher growth rate for smaller banks might be caused by survivorship bias, since we exclude banks with less than five statements. If a small bank went bankrupt during the financial crisis in 2008, it would have been filtered out if it had less than five statements reported.

The extension model adds a dummy variable which controls for crisis and size. This variable equals 1 if the following conditions are met (zero otherwise):

1. The yearly average growth rate in total assets is below 0%.
2. Total assets have to be larger than €100,000 million.

Note; to avoid multicollinearity, model 8 replaces the regressor Ln(Size) by regressor Crisis since the latter also accounts for size.

# Empirical Results

## The NID general model

Please find the results for the impact of NID on leverage in table 3.

**Model 1**

The control variables mirror the variances in Ln(Gearing) quite well with an R² of 29.46% and show that the F-statistic of the model is highly significant at the 1% significance level. Size is significant at the 1% significance level and has a positive relationship with Ln(Gearing), which is in accordance with the static trade-off theory. As banks grow larger they face less risk, giving them better conditions to take on leverage. Another possible reason for this relationship stems from the asymmetric information signaling framework, where the findings confirm the claims of Frank and Goyal (2003). Contrary to expectations, tangibility is found to be negatively related to Ln(Gearing). However, the variable’s significance is below the 10% significance level. A possible explanation for its insignificance is the negligible fraction of tangible assets present within a bank compared to its actual total liabilities. Profitability is negatively related to Ln(Gearing), which in turn provides evidence for the pecking order theory. The more profitable a bank is the more it can finance itself with less expensive internal funds. The relationship is significant at the 1% significance level. Total asset growth is positively related to leverage, but is not significant. The results provide evidence for Hortlund’s statements, inflation rates are not significant at the 10% significance level however. Consequently, banks’ leverage are not influenced by the change in inflation rates. We conclude the discussion of model 1 with the relation between dividend payout and Ln(Gearing), which turns out to be insignificant.

**Model 2**

A positive causal relationship between MTR(NID) and Ln(Gearing) is found. This result can be translated as follows: a 1% decrease in MTR(NID) reflects a 2.62% decline in Ln(Gearing). It is also possible to interpret these results through a decrease with one standard deviation instead of 1%. This means that a one standard deviation decrease in MTR(NID) would imply a 12.40%[[7]](#footnote-8) decrease in the gearing ratio. In other words, the lower a bank’s MTR(NID), the lower its tax advantage of an incremental cost of extra debt and therefore the lower its optimal level of leverage. In addition, the variable is highly significant at the 1% significance level. Moreover, with regards to the fit of the model, the adjusted R² increases from 29.46% to 31.30%. Including the MTR(NID) gives our model more explanatory power. Concerning the control variables, there are no apparent changes compared to model 1 worth mentioning apart from the increase of the profitability-coefficient, which indicates that profitability has a stronger influence on Ln(Gearing) compared to model 1.

**Model 3**

First of all, the coefficient for MTR(Difference) is significant at the 1% significance level and is negatively related to Ln(Gearing), which is in line with the expectations. Remember that the MTR(Difference) depicts the difference between MTR without NID and MTR with NID. A 1% increase in MTR(Difference), which is in fact an increase of the impact stemming from the NID, results in a 2.61% relative decrease in Ln(Gearing). Another interpretation is that of an increase of one-standard deviation in MTR(Difference), causing leverage to decrease by 12.281%, which means that the mean of gearing ratio would fall from 18.239 to 15.999 [[8]](#footnote-9). More particularly, an increase in the impact of the NID automatically causes MTR(NID) to decline, given a constant MTR(noNID). Therefore, MTR(Difference) grows larger which in turn decreases the optimal level of leverage. Evidence suggests that banks take into account changes in their MTRs when making a decision on capital structure. This concludes the NID general model section with the confirmation of the first hypothesis:

*Hypothesis 1:*

*The introduction of the NID has a negative effect on MTR which in turn lowers the leverage levels in Belgian banks.*

Also note that including MTR(Difference) increased the fit of the model from 30.85% to 32.88%. Concerning the control variables, there are no significant changes when compared to the previous models.

## Extensions

### The dependent variable extension

Please find the results for the dependent variable extension in table 4

**Model 4**

Important to note is the severe decline in adjusted R² from 31.29% to 11.75%. This implies that our model is not a good fit for variances inherent to short-term funding. Nonetheless, the MTR(Difference) remains highly significant at the 1% significance level and has a negative relationship with short-term funding. More precisely, a 1% increase in MTR(Difference) incurs a 2.43% decrease in Ln(Short-term funding ratio). An increase of one-standard deviation in MTR(Difference) leads to an 11.52% relative decrease in Ln(Short-term funding ratio). This drop can be translated to absolute terms as short-term funding falling from €28,386.43 million to €25,116.029[[9]](#footnote-10) million. In other words, banks replace their levels of short-term leverage by an increase in equity in order to benefit from the NID. However, changing the dependent variable from Ln(Gearing) to Ln(Short-term funding ratio) had a considerable impact on the control variables. Ln(Size) and the dependent variable are now negatively related while Ln(Size) remains highly significant at the 99% confidence level. Evidence indicates that smaller banks prefer short-term funding to long-term funding. This result is in accordance with what Myers’ (1977), Bhaduri (2002) and Hall et al. (2004) suggested on high growth companies (cf. agency cost framework). Remember that figure 5 illustrated a higher growth rate for smaller banks compared to larger banks. Next, tangibility has a positive relationship with short-term funding which provides evidence for the static trade-off theory and the agency cost framework. More collateral assets increases the availability of short-term funding. The tangibility coefficient is almost at the 10% significance level. Also notice that profitability has a smaller influence on short-term debt compared to gearing. Its significance decreased to the 5% significance level. Moreover this study finds that Dividend Payout is almost significant at the 10% significance level with a small positive impact on short-term debt funding. This result can be explained with the pecking order theory: the more dividends a bank pays, the more transparent it becomes which in turn reduces costs of asymmetric information for short-term funding. The other control variables remained insignificant.

**Model 5**

Model 5 displays a remarkable surge in adjusted R² from 31.29% to 76.94%, meaning the model better fits the movements of long-term funding variations compared to gearing or short-term funding. However the MTR(Difference) became insignificant. In other words, a bank’s long-term capital structure is not influenced by the introduction of the NID. This finding might be explained by the fact that long-term funding needs more time to adjust, meaning the NID has not been introduced long enough to take effect on the long-term funding structure. Concerning the control variables. Ln(Size) has a larger impact on long-term funding than on gearing or short-term funding and is highly significant. Evidence is consistent with the static trade-off framework (Brierley and Bunn (2005)) and with the pecking order theory (Frank and Goyal (2003)). Next, profitability shows a positive relationship with long-term funding. This finding is in line with the claims of Frank and Goyal (2003) in the static trade-off theory. However its significance is only at the 10% level of significance. Another remarkable result is the close to the 5% significance level negative relationship between Dividend Payout and long-term funding. This result is in line with Bhaduri’s (2002) claim. More transparency through dividends reduces asymmetric information and enables greater access to the equity market making debt less interesting.

These findings are on the complete opposite of short-term funding and contradict the pecking order theory. The constant term also switched signs and remains highly significant. In summary: in model 4, the introduction of the NID causes banks to decrease their short-term funding and replace it with equity, but the model has a lower fit compared to model 3. As opposed to short-term funding, banks do not adapt their long-term funding to the introduction of the NID. Nonetheless, model 5 has a high fit of 76.94%. We conclude that these results are in line with the second hypothesis:

*Hypothesis 2:*

*The NID introduction reduces liquidity risks by having a larger impact on short-term funding compared to long-term funding.*

### The specialization extension

Please find the results for the specialization extension in table 5.

**Model 6**

First of all, note the increase in adjusted R². Including bank-type dummy variables explains an extra 8.3% of the variance in gearing compared to model 3. Bank types and gearing have a strong significant positive relationship. When compared to cooperative banks, a commercial bank holds 56.95[[10]](#footnote-11) percentage points more Ln(Gearing) while for a savings bank Ln(Gearing) even doubles with 108.99[[11]](#footnote-12) percentage points extra.

**Model 7**

When including these variables, we observe an increase in the adjusted R² from 39.60% to 42.86%. This means that including these variables makes sense from an econometric perspective. The coefficient of (MTR(Difference) x Commercial) can be interpreted as follows: when the dummy variable for the commercial bank type equals one, the MTR(Difference) increases its impact on leverage by 5.27 percentage points. In other words, being a commercial bank increases the effect of MTR(Difference), which in turn decreases leverage by 5.85% instead of 0.55%. A one-standard deviation increase in (MTR(Difference) x Commercial) would imply a 25.10%[[12]](#footnote-13) decrease in gearing ratio and as a result the leverage ratio would be contracted to 13.661. Commercial banks are able to benefit more from the introduction of the NID, in contrast to savings banks where there is no interaction with the NID incentives. This might be explained by the fact that commercial banks are by definition involved in riskier activities and thus require a larger equity base[[13]](#footnote-14), although the difference between commercial and savings banks has blurred over time. Note that the effect alone of MTR(Difference) is insignificant.

In conclusion, evidence displays a positive relationship between being a commercial bank and the impact of the NID whereas co-operative and savings banks are not influenced by the NID. As a consequence, the third hypothesis has been confirmed.

*Hypothesis 3:*

*There exists an interactive relationship between bank type and the NID.*

### The financial crisis extension

Please find the results for the financial crisis extension in table 6

**Model 8**

The crisis-variable[[14]](#footnote-15) coefficient has a p-value of 0.128 and is thus rejected at the 10% significance level while MTR(Difference) retained its significance at the 1% significance level from model 3. A remarkable finding is the positive impact of the crisis on Ln(Gearing). In other words, 87.2% of the large banks suffering from an average growth rate of below 0% will experience a rise in gearing of 33.91[[15]](#footnote-16) percentage points compared to small banks without a financial crisis. Figure 6 further investigates this positive influence with the illustration of the yearly average changes in gearing for large banks only. We observe that the financial crisis of 2008 and the monetary crisis of 2011 corresponds to a surge in gearing, however it is not clear which component in gearing causes this increase. Therefore, figure 7 will investigate large banks’ average growth rates of equity and liabilities for the period of 2004 to 2011. As can be seen in figure 7, for both 2008 and 2011 equity growth drops below liability growth and explains the increase in gearing during crisis periods. Consequently, it is safe to state that equity is the first victim of both a financial crisis and a monetary crisis. The surge in equity growth suggests that large banks were quickly recapitalized later on. This quick response might mirror a government intervention. Furthermore, the impact of the NID on MTR(Difference) has increased in absolute terms from -2.74% (model 3.1) to

-4.66% (model 8). Not controlling for the financial crisis gives a downward bias to the NID’s real impact on Ln(Gearing). If MTR(Difference) were to be increased by one standard deviation, it would reduce Ln(Gearing) by 22.07% and cause the size of liabilities to only amount to 14.21 times the size of equity instead of 18.239. In summary, large banks have a higher gearing ratio during a financial crisis because of the steep decline in equity when compared to small banks. Next, MTR(Difference) remains highly significant and the financial crisis reduces tax incentives when not controlled for. Also note that the F-statistics are highly significant and that the adjusted R² dropped to 18.88%, which is the result of a substitution between Ln(Size) and the Crisis variable. We conclude that the effect of the NID on leverage in model 3 is not biased by the financial crisis. This result contradicts our expectations and might hide possible confounding effects stemming from the recapitalization of larger banks. Model 9 in the robustness section will control for these effects. Nonetheless, this is an interesting result for policy makers since the NID incentivizes banks to increase their equity before and during a financial crisis, which in turn gives banks a larger buffer against liquidity shocks. This finding also supports a claim KPMG[[16]](#footnote-17) makes on NID, namely of it being an effective tool during the financial crisis. To conclude, the findings do not confirm the fourth hypothesis.

*Hypothesis 4 (rejected)*

*The NID has no significant impact on gearing in times of financial crisis*

# Robustness

The robustness section will test for possible confounding effects which could influence the equity levels apart from the NID. Please find the results for the robustness tests in table 7.

The first part will discuss a regression that exclusively focusses on the changes in Ln(Gearing) two years prior to the introduction of the NID and three years after the introduction of the NID. The advantage of this smaller window of observations is the filtering of the financial crisis and its recapitalizations and other influences on leverage levels. On the other hand, excluding the financial crisis is at the same time a disadvantage since it represents a relevant stress test to investigate whether the NID also works during an economic downturn with the government interventions. Therefore we will discuss the impact of recapitalization in the second part.

## Shorter window of observations

Model 3.2 is a modification of model 3 in the sense that the sample period runs from 2004 until 2007. Other studies on NID also preferred this window of observations (Schepens 2015). Apart from the mentioned modification, model 3.2 is an exact copy of model 3. By means of a smaller sample period, confounding effects such as the financial crisis, the monetary crisis and changes in NID legislation have been excluded.

MTR(Difference) in model 3.2 has a stronger and highly significant impact on Ln(Gearing) when compared to model 3. More precisely, restricting the window of observations to only include years from 2004 until 2007 has doubled the impact of MTR(Difference) on Ln(Gearing) with 5.59% compared to 2.61% in model 3 and the adjusted R² has soared to 44.38%. A one-standard deviation increase in MTR(Difference) now causes leverage to drop by 26.49%. In absolute terms it means that liabilities are only 13.407 times the size of equity. This result is not biased by a different variability in MTR(Difference) across these two sample periods since figure 8 shows that the variability in standard deviations remained relatively constant. These results are in line with the findings of model 8, which suggests that the financial crisis was marked by a reduced importance of tax incentives when not controlled for. Note that Ln(Gearing) is more sensitive to a change in profitability prior to the crisis compared to a period with crisis. This finding again denotes a possible change in capital-structure-decision behavior due to the financial crisis. Other control variables remained unchanged.

## Recapitalization

Model 9 concludes by investigating the impact of recapitalization on Ln(Gearing). Recapitalization is defined as any kind of capital injection stemming from a legal authority. Legal authorities have intervened and restructured four major Belgian banks: Dexia, KBC, Ethias and Fortis[[17]](#footnote-18). The model controls for recapitalization by including a dummy variable that equals 1 when a bank has been intervened at a specific moment in time and remains 0 when there is no intervention.

A regression shows that capitalization has no significant impact on Ln(Gearing). Therefore, we argue that the coefficient of MTR(Difference) is unbiased and highly significant at the 1% significance level. This finding confirms the results of model 8 which states that MTR(Difference) remains a working ACE system when faced with a financial crisis.

# General conclusion

The Notional Interest Deduction is a fictitious tax deduction that was introduced by the Belgian government in 2006 with the main purpose to lower the tax discrimination between debt and equity. Given that interest payments on debt are tax deductible, this measure allows companies to also deduct a fictitious interest cost on their equity from their taxes, thus lowering the tendency to hold substantial amounts of debt on their balance sheets.

Since the financial crisis of 2008, the banking system and its inherent (in)stability received a great deal of attention from policy makers who want to rectify this instability. Consequently, a relevant research question for these policy makers would be the following one: does the NID incentivizes banks to recalibrate their capital structure in favor of more equity and thus more stability?

This paper investigates the impact of the NID on bank capital structures by using a simulation of the Marginal Tax Rate (MTR) as a proxy for banks’ tax incentives while controlling for other economically sound factors of leverage.

The empirical analysis yields four main findings. First, the analysis finds that the NID has a significant negative impact on the leverage ratio of Belgian banks. A rise in the impact of the NID is mirrored by an increased difference between MTRs before and after the NID introduction, which in turn results in a lower leverage level for banks. Furthermore, the NID especially replaces short-term funding for equity, as opposed to long-term funding which is not affected. This implies that the stability of the banking system has improved on a short-run basis. However, latency in the effects of the NID on long-term funding might play a role since long-term funding needs more time to adjust. Moreover, evidence shows that commercial banks are more prone to reduce their optimal level of debt because of the NID introduction compared to savings banks or co-operative banks. Finally, the results suggest that only large banks are hit by the crisis and that the NID remains highly significant. These conclusions join claims made by previous literature on the significant relation between the NID and leverage (Cornelis and Merckx (2009)), (Kestens et al. (2011)), (Princen (2012)), (Panier et al. (2013)), (Schepens (2015)).

These results confirm our hypotheses that the NID has a negative impact on the leverage level of Belgian banks, that the NID’s introduction reduces liquidity risks by having a larger impact on short-term funding compared to long-term funding and that the impact of the NID on leverage varies for different bank types. The fourth hypothesis, which states that the NID has no significant impact on leverage in times of financial crisis, has been rejected.

This study highlights the importance of the NID as a regulatory policy tool. Evidence suggests that the NID gives banks the right incentives to increase their equity base, making it a potentially excellent measure to improve bank stability. This is currently a highly topical issue in Belgium, given the ongoing discussion regarding the possible abolishment of the NID.

There are however three shortcomings to this paper. The first shortcoming lies in the selection of the data. Limiting the scale of this study to only focus on Belgian banks has for consequence to restrict the amount of observations to 32 bank which is a rather small sample size to run statistical tests on. Note that this quantity is comparable to that of the other papers which focus on NID and Belgian banks. The second shortcoming can be attributed to the underlying assumption that every bank applies the NID. However, this is a reasonable assumption since banks are in general large institutions with, in absolute terms, vast amounts of equity. As a consequence, it is worthwhile to pursue the NID. The last shortcoming is the assumption of a constant balance sheet total. This assumption is different from what is observed in reality yet it is a necessary assumption for our approach.

This study concludes with few suggestions for future research. A possible topic for future investigation might be the impact of the recent changes in NID legislation as of 2013. More recently, in 2015, a number of adjustments have been specifically aimed at banks. Another possibility would be to apply a difference-in-difference approach between Belgian banks and non-European peer groups. Additionally, a more challenging topic would be to measure the trade-off between the benefits and the losses of the NID for the Belgian government. And finally, it would be interesting to investigate on a long-term basis whether banks are more resistant to liquidity shocks as a result of the introduction of the NID.

Appendices

Appendix 1: List of banks

|  |
| --- |
| ABK Bank |
| Argenta Spaarbank-ASPA |
| Record Bank SA/NV |
| Bank of Baroda |
| ING Belgium SA/NV – ING |
| Byblos Bank Europe SA |
| BKCP SCRL |
| Agricaisse – Caisse Coopérative de Dépots et de Credit Agricole |
| Centrale Kredietverlening NV- CKV |
| CBC Banque S.A. |
| Ethias Bank |
| Record Credit Services SCRL |
| VDK Spaarbank NV |
| Santander Benelux SA/NV |
| Beobank NV/SA |
| GOFFIN Bank NV |
| Onderling Beroepskrediet-OBK Bank C.V.B.A. |
| UBS Belgium SA/NV |
| AXA Bank Europe SA/NV |
| Deutsche Bank SA-Deutsche Bank NV |
| United Taiwan Bank |
| Caisse d’Epargne de la Ville De Tournai |
| Banca Monte Peschi Belgio SA |
| Antwerpse Diamantbank NV-Banque Diamantaire Anversoise SA |
| Bpost Banque SA-Bpost Bank |
| C.V.B.A Lanbokas SPRL |
| Van de Put Effectionbank – Banque de Titres SCA |
| Centea |
| KBC Bank NV |
| Crédit professional s.a. – Beroepskrediet NV |
| Belfius Banque SA/NV-Belfius Bank SA/NV |
| BNP Paribas Fortis SA/NV |

Appendix 2: Definition of variables

Appendix 2 gives a brief definition of the variables used throughout this paper

|  |  |
| --- | --- |
| Variables | Definition |
| Adjusted Equity | The amount of equity that can be used for the NID. Equals Equity minus the amount of repurchased shares minus the investments in associated companies and subsidiaries. |
| Commercial Banks | A bank that offers a broad range of financial products. This is a dummy variable that equals 1 if the bank is a commercial bank. |
| Crisis | A dummy variable that equals 1 if the bank’s yearly growth is below 0%. |
| Dividend Payout | The amount of dividend paid relative to net income. |
| Gearing | A measure of the bank’s leverage, calculated as the bank’s total liabilities relative to total equity. |
| Growth | The change in current year’s total assets relative to previous year’s total assets. |
| Inflation Rate | The yearly inflation rate. |
| Ln(Gearing) | The natural logarithm of total liabilities relative to net income. |
| Ln(Long-term Funding Ratio) | The natural logarithm of long-term funding relative to total funding. |
| Ln(Size) | The natural logarithm of firm size. |
| Ln(Short-term Funding Ratio) | The natural logarithm of short-term funding relative to total funding. |
| Long-term Funding | The sum of senior debt maturing after more than one year, subordinated borrowing and other funding. |
| MTR(Difference) | A measure for the impact of the NID on taxes, calculated as the difference between MTR(NoNID) and MTR(NID) |
| MTR(Difference) x Commercial Banks | Interaction term that influences MTR(Difference) slope when the commercial bank dummy is equal to 1 |
| MTR(Difference) Crisis | Interaction term that influences the MTR(Difference) slope when the crisis dummy is equal to 1 |
| MTR(Difference) x Savings Banks | Interaction term that influences the MTR(Difference) slope when the savings bank dummy is equal to 1 |
| MTR(NID) | The marginal tax rate including NID. |
| MTR(No NID) | The marginal tax rate without NID. |
| Profitability | Operating profit before tax relative to average total assets |
| Recapitalization | A dummy variable that equals 1 when the bank has been recapitalized by government intervention. |
| Savings Banks | A bank that primarily focuses on granting mortgages and savings accounts. This is a dummy variable that equals 1 if the bank is a savings bank. |
| Short-term Funding | The sum of customer deposits, bank deposits, other deposits and short-term liabilities |
| Tangibility | Total fixed assets relative to total assets |
| Total Assets | The total amount of assets on the balance sheet. |

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**Figure 1:** Individual total equity (in millions of euros)

**Figure 2:** Average Equity over the sample period (in millions of euros)

**Figure 3:** Capital structure components

**Figure 4:** Total Assets (in millions of euros)

**Figure 5:** Crisis for small and large banks

**Figure 6:** Average gearing – large banks

**Figure 7:** Average growth rate liabilities and equity – large banks

**Figure 8:** Variability in MTR(Difference)

List of tables

**Table 1:** Descriptive Statistics (in millions of euros)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | N | Mean | Std. Deviation | Minimum | 25th percentile | Median | 75th percentile | Maximum |
| Dependent variables |  |  |  |  |  |  |  |  |
| Gearing ratio | 32 | 18.239 | 12.144 | 693 | 9.833 | 15.737 | 23.983 | 73.913 |
| Short-term Funding ratio | 32 | 89.266% | 16.369% | 3.259% | 81.954% | 96.806% | 100% | 100% |
| Long-term Funding ratio | 32 | 8.264% | 15.079% | 0% | 0% | 2.763% | 8.900% | 96.741% |
| Variables of interest |  |  |  |  |  |  |  |  |
| MTR(NID) | 32 | 10.558% | 4.739% | 0% | 12.671% | 12.677% | 12.677% | 12.695% |
| MTR (noNID) | 32 | 33.999% | 33.999% | 33.999% | 33.999% | 33.999% | 33.999% | 33.999% |
| MTR (Difference) | 32 | 23.431% | 4.739% | 21.289% | 21.312% | 21.313% | 21.313% | 33.99% |
| MTR(Difference) commercial banks | 32 | 13.436% | 11.546% | 0 | 0 | 21.310% | 21.313% | 33.99% |
| MTR(Difference) Savings Banks | 32 | 5.585% | 10.459% | 0 | 0 | 0 | 0 | 33.99% |
| MTR(Difference) Cooperative Banks | 32 | 4.410% | 9.944% | 0 | 0 | 0 | 0 | 33.99% |
| Control variables |  |  |  |  |  |  |  |  |
| Total Assets | 32 | 41,192.47 | 106,898 | 75 | 556 | 2,348 | 10,481 | 767,213 |
| Tangibility | 32 | 0.455% | 0.865% | 0% | 0.039% | 0.193% | 0.605% | 10.160% |
| Profitability | 32 | 0.587% | 1.259% | -4.55% | 0.1% | 0.43% | 0.91% | 5.26% |
| Growth | 32 | 7.687% | 28.548% | -95.46% | -1.92% | 3.56% | 10.76% | 230.28% |
| Inflation | 32 | 2.231% | 1.058% | -0.38% | 1.64% | 2.6% | 3.09% | 3.49% |
| Dividend payout | 32 | 11.181% | 35.993% | -263.87% | 0% | 0% | 0% | 210.53% |
| Capital structure |  |  |  |  |  |  |  |  |
| Equity | 32 | 1,807.082 | 4,634.50 | 7 | 48 | 192 | 544 | 33,866 |
| Liability | 32 | 39,264.72 | 102,469.6 | 64 | 511 | 2,117 | 9,964 | 733,347 |
| Short-term funding | 32 | 28,386.43 | 72,981.46 | 50 | 446 | 1,876 | 8,870 | 554,359 |
| Long-term funding | 32 | 3,371.885 | 10,326.69 | 0 | 0 | 40 | 652 | 106,618 |

Notes: descriptive statistics for sample period 2004 to 2014. N is the number of observed banks. Variable definitions are given in appendix 2.

**Table 2:** Correlations control variables and leverage

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Leverage | MTRNID | Size | Tangibility | Profitability | Growth | Inflation Rate | Dividend Payout |
| Leverage | 1.000 |  |  |  |  |  |  |  |
| MTRNID | 0.187\*\*\* | 1.000 |  |  |  |  |  |  |
| Size | 0.292\*\*\* | 0.167\*\*\* | 1.000 |  |  |  |  |  |
| Tangibility | -0.126\*\* | -0.121\*\* | 0.035 | 1.000 |  |  |  |  |
| Profitability | -0.335\*\*\* | 0.264\*\*\* | -0.096\* | 0.161\*\*\* | 1.000 |  |  |  |
| Growth | 0.095\* | 0.032 | -0.123\*\* | -0.215\*\*\* | 0.021 | 1.000 |  |  |
| Inflation Rate | 0.043 | -0.011 | -0.005 | -0.080 | -0.060 | 0.083 | 1.000 |  |
| Dividend Payout | 0.015 | 0.030 | 0.142\*\* | 0.056 | 0.054 | -0.064 | -0.094 | 1.000 |

Notes: correlation table for sample period 2004 – 2014. N is the number of observations. \*\*\*, \*\*, \* denotes statistical significance of the correlation at the 1%, 5%, 10% level respectively (2-tailed).

Table 3: The NID general model

|  |  |  |  |
| --- | --- | --- | --- |
| Model | 1 | 2 | 3 |
| Dependent Variable | Ln(Gearing) | Ln(Gearing) | Ln(Gearing) |
| MTR(Difference) |  |  | -2.613  *0.003\*\*\** |
| MTR(NID) |  | 2.617  *0.003\*\*\** |  |
| Ln(Size) | 0.148  *0.000\*\*\** | 0.128  *0.000\*\*\** | 0.128  *0.000\*\*\** |
| Tangibility | -5.508  *0.219* | -3.445  *0.441* | -3.448  *0.441* |
| Profitability | -15.279  *0.000\*\*\** | -18.918  *0.000\*\*\** | -18.914  *0.000\*\*\** |
| Growth | 0.191  *0.154* | 0.187  *0.158* | 0.187  *0.158* |
| Inflation Rate | 3.303  *0.353* | 3.025  *0.389* | 3.025  *0.389* |
| Dividend Payout | -0.023  *0.829* | 0.004  *0.969* | 0.004  *0.970* |
| Constant | 1.489  *0.000\*\*\** | 1.395  *0.000\*\*\** | 2.284  *0.000\*\*\** |
|  |  |  |  |
| Number of Observations | 305 | 305 | 305 |
| R² | 0.309 | 0.329 | 0.329 |
| Adjusted R² | 0.295 | 0.313 | 0.313 |
| F-Statistics | 22.16  *0.000\*\*\** | 20.79  *0.000\*\*\** | 20.78  *0.000\*\*\** |

Notes: Model 3 incorporates the explicit effect of the notional interest deduction with the substitution

of MTR(NID) by MTR(Difference). P-values are displayed below Bèta-coefficients,

in italics. \*\*\*, \*\*, \* denotes statistical significance at the 1%, 5%, 10% level respectively.

Variable definitions are given in Appendix 2.

**Table 4:** Dependent Variable Extension

|  |  |  |
| --- | --- | --- |
| Model | 4 | 5 |
| Dependent Variable | Ln(Short-term funding ratio) | Ln(Long-term funding ratio) |
| MTR(Difference) | -2.431  *0.000\*\*\** | 1.013  *0.639* |
| Ln(Size) | -0.044  *0.000\*\*\** | 1.090  *0.000\*\*\** |
| Tangibility | 3.268  *0.120* | 19.403  *0.420* |
| Profitability | -3.019  *0.050\*\** | 16.323  *0.077\** |
| Growth | 0.007  *0.917* | 0.758  *0.026\*\** |
| Inflation Rate | 1.089  *0.509* | -6.736  *0.423* |
| Dividend Payout | 0.068  *0.176* | -0.421  *0.059\** |
| Constant | 0.752  *0.000\*\*\** | -3.950  *0.000\*\*\** |
|  |  |  |
| Number of Observations | 305 | 206 |
| R² | 0.138 | 0.777 |
| Adjusted R² | 0.118 | 0.769 |
| F-Statistics | 6.78  *0.000\*\*\** | 98.73  *0.000\*\*\** |

Notes: Model 4 and model 5 differ from model 3 by incorporating the dependent variables

Ln(Short-term funding ratio) and Ln(Long-term funding ratio) respectively. P-values

are displayed below Bètacoefficients, in italics. \*\*\*, \*\*, \* denotes statistical significance

at the 1%, 5%, 10% level respectively. Variable definitions are given in Appendix 2.

**Table 5:** Specialization Extension

|  |  |  |
| --- | --- | --- |
| Model | 6 | 7 |
| Dependent Variable | Ln(Gearing) | Ln(Gearing) |
| MTR(Difference) | -2.197  *0.009\*\*\** | -0.552  *0.697* |
| MTR(Difference) x Commercial Banks |  | -5.297  *0.004\*\*\** |
| MTR(Difference) x Savings Banks |  | 1.925  *0.323* |
| Ln(Size) | 0.114  *0.000\*\*\** | 0.105  *0.000\*\*\** |
| Tangibility | -0.380  *0.928* | -0.725  *0.861* |
| Profitability | -16.689  *0.000\*\*\** | -15.891  *0.000\*\*\** |
| Growth | 0.158  *0.204* | 0.143  *0.238* |
| Inflation Rate | 1.985  *0.547)* | 1.133  *0.724* |
| Dividend Payout | -0.023  *0.824* | 0.010  *0.921* |
| Savings Banks | 0.737  *0.000\*\*\** | 0.313  *0.527* |
| Commercial Banks | 0.451  *0.000\*\*\** | 1.714  *0.000\*\*\** |
| Constant | 1.855  *0.000\*\*\** | 1.510  *0.000\*\*\** |
|  |  |  |
| Number of Observations | 305 | 305 |
| R² | 0.414 | 0.449 |
| Adjusted R² | 0.396 | 0.429 |
| F-Statistics | 23.14  *0.000\*\*\** | 21.73  *0.000\*\*\** |

Notes: Model 6 differs from model 3 by incorporating control variables for bank type. Model 7 only

differs from model 6 by including interaction terms between MTR(Difference) and bank type.

P-values are displayed below Bètacoefficients, in italics. \*\*\*, \*\*, \* denotes statistical significance

at the 1%, 5%, 10% level respectively. Variable definitions are given in Appendix 2.

**Table 6:** Crisis extension

|  |  |  |
| --- | --- | --- |
| Model | 3.1 | 8 |
| Dependent Variable | Ln(Gearing) | Ln(Gearing) |
| MTR Difference | -2.740  *0.007\*\*\** | -4.658  *0.000\*\*\** |
| Crisis(Large) |  | 0.292  *0.128* |
| Ln(Size) | 0.135  *0.000\*\*\** |  |
| Tangibility | 10.671  *0.202* | 10.730  *0.236* |
| Profitability | -17.793  *0.000\*\*\** | -23.671  *0.000\*\*\** |
| Growth | 0.123  *0.393* | 0.132  *0.402* |
| Inflation Rate | -8.963  *0.245* | -9.441  *0.256* |
| Dividend Payout | -0.021  *0.898* | 0.283  *0.099\** |
| Constant | 2.552  *0.000\*\*\** | 4.074  *0.000\*\*\** |
|  |  |  |
| Number of Observations | 234 | 234 |
| R² | 0.319 | 0.213 |
| Adjusted R² | 0.298 | 0.189 |
| F-Statistics | 15.15 *0.000\*\*\** | 8.75  *0.000\*\*\** |

Notes: Model 3.1 differs from model 3 by restricting the sample period to 2004 – 2011 as to exclude

confounding effects. Model 8 includes one control variable for both crisis and size. P-values are displayed

below Bètacoefficients, in italics. \*\*\*, \*\*, \* denotes statistical significance at the 1%, 5%, 10% level

respectively. Variable definitions are given in Appendix 2.

**Table 7:** Robustness

|  |  |  |
| --- | --- | --- |
| Model | 3.2 | 9 |
| Dependent Variable | Ln(Gearing) | Ln(Gearing) |
| MTR Difference | -5.590  *0.000\*\*\** | -2.638  *0.003\*\*\** |
| Recapitalization |  | 0.086  *0.722* |
| Ln(Size) | 0.066  *0.044\*\** | 0.126  *0.000\*\*\** |
| Tangibility | 1.645  *0.895* | -3.488  *0.437* |
| Profitability | -43.232  *0.000\*\*\** | -18.815  *0.000\*\*\** |
| Growth | -0.054  *0.732* | 0.191  *0.152* |
| Inflation Rate | -12.002  *0.231* | 2.960  *0.400* |
| Dividend Payout | 0.302  *0.189* | 0.010  *0.924* |
| Constant | 4.108  *0.000\*\*\** | 2.302  *0.000\*\*\** |
|  |  |  |
| Number of Observations | 113 | 305 |
| R² | 0.479 | 0.329 |
| Adjusted R² | 0.444 | 0.311 |
| F-Statistics | 13.77 *0.000\*\*\** | 18.15  *0.000\*\*\** |

Notes: Model 3.2 differs from model 3 by restricting the sample period to 2004 - 2007.

Model 12 adds a control variable for recapitalization. P-values are displayed below

Bètacoefficients, in italics. \*\*\*, \*\*, \* denotes statistical significance at the 1%, 5%, 10% level

respectively. Variable definitions are given in Appendix 2.

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**faculty of business and economics**

Naamsetraat 69 bus 3500

3000 LEUVEN, België  
tel. + 32 16 32 66 12  
fax + 32 16 32 67 91  
info@econ.kuleuven.be  
www.econ.kuleuven.be

1. Cf. 4.2.1 The effect of the NID on the MTR [↑](#footnote-ref-1)
2. The adjusted equity is equal to equity minus the following components as stated in the Federal Public Service Finance:

   The fiscal net value of own shares held on the balance sheet

   The fiscal net value of financial fixed assets qualifying as «participations

   and other shares» (non-portfolio participations)

   The fiscal net value of shares issued by investment companies (income fulfilling the conditions for the Belgian participation exemption)

   The net equity assigned to foreign permanent establishments or real estate property or rights. This only concerns the establishments and real estate situated in a country with which Belgium has concluded a tax treaty

   The net book value of tangible fixed assets, if costs do not unreasonably exceed professional needs

   The book value of tangible fixed assets that are considered as an investment not acquired in order to produce a regular income

   The book value of real estate where its use is granted to directors, their spouses or children

   Tax-free revaluation gains and capital subsidies. [↑](#footnote-ref-3)
3. An average Weighted Average Cost of Capital (WACC) of 4.78% is used, following the results of Waccexpert for the banking sector in Belgium. [↑](#footnote-ref-4)
4. In order to remain consistent with an incremental increase in cost of debt in 2004, we respectively increase with (1 + WACC) and (1 + WACC)² for 2005 and 2006. [↑](#footnote-ref-5)
5. All the terms are derived using the book value from balance sheets. [↑](#footnote-ref-6)
6. Applying simply the gearing ratio as the dependent variable would cause econometrical issues. Gearing only provides values between zero and infinity which does not warrant that all estimates are well represented in a linear regression. Estimates below zero won’t be included in the regression, thus lowering the fit of the regression model. Fortunately, these issues can be solved by means of using the natural logarithm of gearing (Jordan, Lowe and Taylor (1998)). As a result of the logarithmic transformation of gearing we create an unbounded measure. In other words when gearing moves from zero to +infinity, the natural logarithm of gearing ranges from –infinity to +infinity. Consequently the transformation guarantees the inclusion of all possible estimates. This will again increase the fit of the regression model. [↑](#footnote-ref-7)
7. Standard deviation MTR(NID) \* Coefficient MTR(NID) (cf. descriptive statistics)

   12.40% = 0.04739 \* 2.617 [↑](#footnote-ref-8)
8. Mean \* (1 - % footnote 7)

   15.999 = 18.239 \* (1 – 0.12281) [↑](#footnote-ref-9)
9. 89.266% \* (1 – 11.52%) = 78.983%

   €28,386.43 million short-term funding = total funding x 89.266%

   Total funding = €31,799.823 million

   Total funding x decreased proportion of short-term funding = new absolute amount of short-term funding

   €31,799.823 million x 78.983% = €25,116.31 million

   This corresponds to €28,386.43 million x (1 – 11.52%) = €25,116.31 million [↑](#footnote-ref-10)
10. 56.95% = 100 \* [exp(0.450774) – 1] [↑](#footnote-ref-11)
11. 108.99% = 100 \* [exp(0.737099) – 1] [↑](#footnote-ref-12)
12. Only the significant coefficient of (MTR(Difference) x commercial) is being considered:

    -25.10% = -5.297 \* 4.739% [↑](#footnote-ref-13)
13. We observe a positive correlation between commercial banks and equity (not reported) [↑](#footnote-ref-14)
14. There has been a financial crisis for larger banks from 2008 until 2013 for Belfius Bank, PNB Parisbas Fortis, ING Belgium and KBC Bank. [↑](#footnote-ref-15)
15. 33.91% = 100 \* [exp(0.292) – 1] [↑](#footnote-ref-16)
16. KPMG, Notional Interest Deduction: boost for investment in Belgium [↑](#footnote-ref-17)
17. Information on recapitalizations can be retrieved from the IMF. [↑](#footnote-ref-18)