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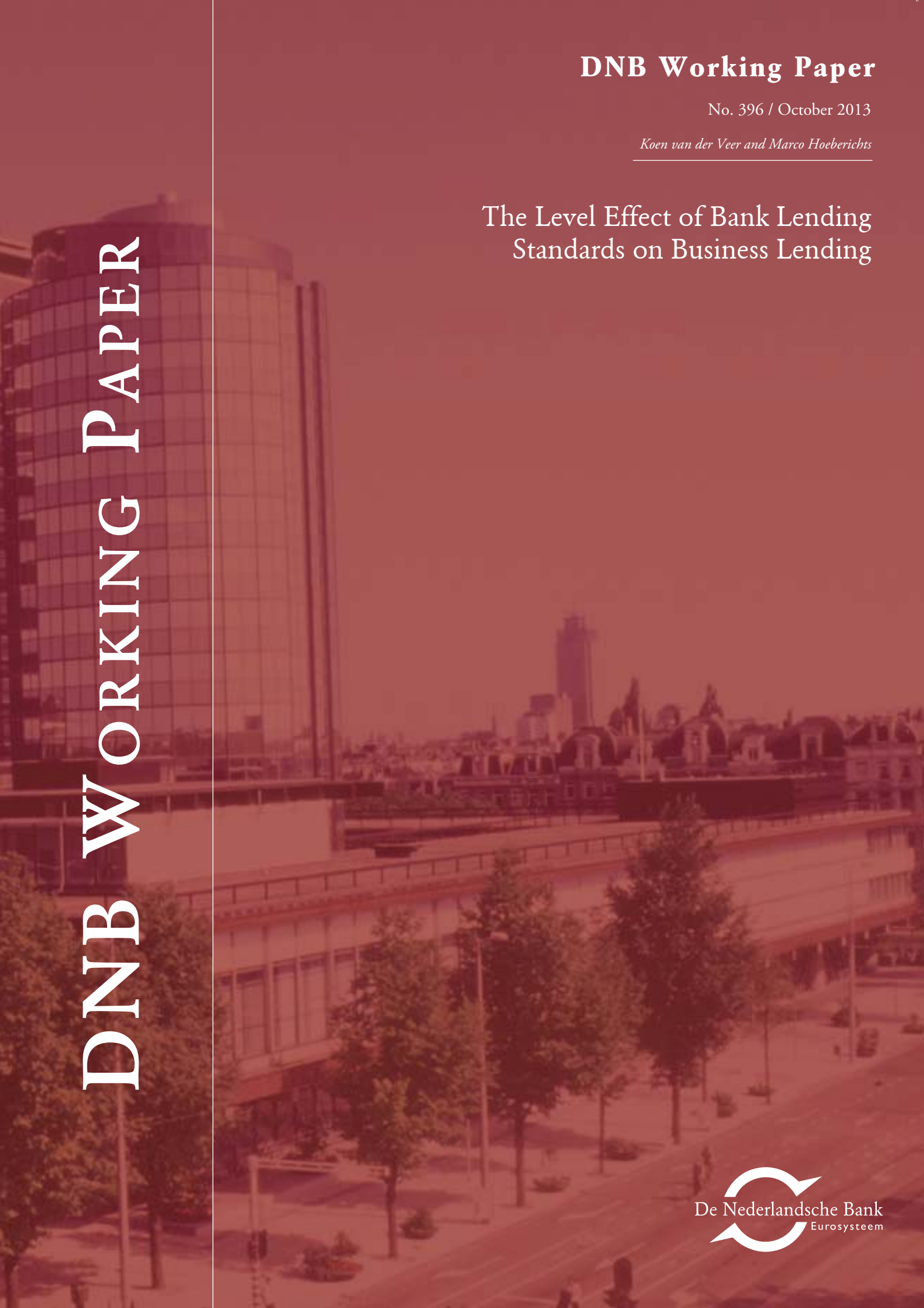

De Nederlandsche Bank
Eurosysteem

The Level Effect of Bank Lending Standards on Business Lending

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* Views expressed are those of the authors and do not necessarily reflect official positions of De Nederlandsche Bank.

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The Level Effect of Bank Lending Standards on Business Lending

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Abstract

Do tightenings of bank lending standards permanently reduce bank lending? We construct a measure of a bank's level of lending standards using micro-data from the sample of banks participating in the Eurosystem Bank Lending Survey in The Netherlands and show that this level measure affects business lending. The level effect is statistically robust and economically relevant; a one point tightening reduces a bank's quarterly growth rate of business lending by about half a percentage point until bank lending standards are eased. This level effect of bank lending standards helps to explain low bank lending growth after a period of prolonged tightening as well as high bank lending growth in a period of prolonged easing. As such, the analysis provides another potential indicator for macroprudential policy.

JEL codes: E44, E51, G01, G21

Keywords: bank lending standards, bank lending survey, bank lending, level effect, macroprudential policy

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1 Motivation

The Eurosystem Bank Lending Survey is an important source of information for monetary policy-makers in the euro area to understand changes in credit conditions and gain better insight into future economic developments. It is a quarterly survey among a representative sample of around 90 banks from all euro area countries, and the European equivalent of the quarterly Senior Loan Officer Opinion Survey that the Federal Reserve conducts in the United States. The survey asks senior loan officers about bank-specific developments in lending standards and credit demand.

A key observation from the Eurosystem Bank Lending Survey is the prolonged period of tightening of lending standards on business lending by banks across Europe during the 2007-09 financial crisis (Figure 1). In that period, every quarter, a considerable share of European banks tightened their lending standards. Since then, on balance, banks have not eased lending standards. From this observation it seems natural to conclude that bank lending standards in Europe are still tight, limiting business lending for a given level of loan demand.

In academic and policy circles, however, it is often questioned whether the survey questions and reported quarterly changes in bank lending standards should be taken literally. For example, Del Giovane et al. (2011) argue that banks provide answers that are inconsistent with the formulation of the question they are asked; instead of reporting a change in lending standards over the past three months, banks report the "degree of tightness" compared to some benchmark. The European Central Bank (ECB) seems to interpret the survey responses in a similar way, concluding from the 2013Q1 survey results (see final point in Figure 1) that bank lending standards in Europe are, in fact, *not* particularly tight:

> "The level of net tightening of credit standards for loans to enterprises in the first quarter of 2013 currently stands below its historical average calculated over the period since the start of the survey in 2003"(ECB, 2013).

Thus, depending on the interpretation of the survey results, a different, even opposite, conclusion on the strictness of bank lending standards in Europe can be reached.

This paper advocates a literal reading of bank lending surveys such as those conducted in the euro area, United States and Japan. In particular, we propose an intuitive approach of constructing a bank-specific measure for the (cumulated) level of bank lending standards from the survey answers, and examine whether this level measure affects business lending. The basic assumption underlying

our measure for the level of a bank's lending standards is that a reported tightening is (only) offset by a reported easing of standards, and vice versa. Using micro-data on the sample of banks that participate in the Eurosystem Bank Lending Survey in The Netherlands, the results show that a one point increase in the level of a bank's lending standards – i.e. a bank reports a tightening – reduces the bank's quarterly growth rate of business lending in the range of .5 percentage points; equivalent to about 2 percentage points in annualized terms. Importantly, this result should be interpreted as a permanent effect – until bank lending standards are eased – and comes on top of the one-off effect of a tightening of standards found by Del Giovane et al. (2011).

The finding of a level effect of bank lending standards helps to explain high bank lending growth in a period of prolonged easing and low bank lending growth after a period of prolonged tightening of standards. To illustrate this, we perform counterfactual analyses for business lending in The Netherlands – holding the level of bank lending standards constant – in the period before and since the 2007-09 financial crisis. The results suggest that due to looser bank lending standards, business lending growth was about 4 percentage points higher in the years prior to the crisis. In turn, due to tighter bank lending standards since 2009, the current annual growth rate of business lending in The Netherlands is subdued by about 3 percentage points.

The counterfactual scenarios illustrate that our survey-based estimate for the level effect of bank lending standards is relevant at the macro-level. As such, they provide analysis for another potential indicator for macroprudential policy. Several authors (i.e. Borio and Lowe, 2002; Borio and Drehmann, 2009) have identified strong credit growth, and in particular a large credit-to-GDP gap, as an early warning indicator of financial crises.[1] Also, Maddaloni and Peydró (2011) show evidence indicating that countries with softer bank lending standards due to low monetary policy rates prior to the 2007-09 financial crisis, experienced a worse economic performance afterwards. Moreover, the IMF (2013) identifies "erosion of lending standards" as one of the factors that can contribute to credit booms and too much risk taking by financial institutions, thereby increasing the vulnerability of the system. Our survey-based measure of the level of bank lending standards can be of use to track these developments, although it is subject to the Lucas critique; the relationship between bank lending and lending standards might change once policymakers base their actions on it.

We estimate a standard panel data model with bank-specific and time fixed effects to identify the level effect of bank lending standards. Our approach builds on the model by Del Giovane et al. (2011)

which uses micro-level survey results on changes in bank lending standards and credit demand to disentangle supply and demand effects on credit developments. Importantly, we extend their model in two ways. First, we add two novel bank-specific level variables; one measuring the level of bank lending standards, and one for the level of credit demand. Second, we include bank-specific interest rates on new loans. As such, our finding of a "level effect" relates to the influence of non-price bank lending standards (i.e. collateral requirements, non-interest rate charges, covenants etc.) on business lending, and confirms the idea that banks rely more heavily on non-price rationing of loans (Stiglitz and Weiss, 1981).

Our micro-data covers the survey responses, loan quantities and prices, for the eight banks that participated in the Eurosystem Bank Lending Survey in The Netherlands in the period from 2003Q1 to 2013Q2. Although we use information on a relatively small and unbalanced sample, the level effect is robust within a large variety of even smaller subsamples, an alternative weighing scheme for "somewhat" and "considerable" changes when constructing the level variables, and other specification changes. Also, we find no evidence that the level effect is statistically different during the 2007-09 crisis, pre- or post-crisis period, or asymmetric between tightenings and easings of standards.

So far, there has been little attempt in the literature to identify the level effect of bank lending standards on bank lending. Del Giovane et al. (2011), using micro-data on the sample of banks participating in the Eurosystem Bank Lending Survey in Italy, examine a specification with a measure for the cumulated level of bank lending standards that differs from ours but find no statistically significant effect on business lending when including bank-specific and time fixed effects. Lown and Morgan (2006) and Basset et al. (2012) show that a shock in standards in the United States is followed by a decline in the *aggregate volume* of loans until banks start to ease standards again. Our finding of a level effect of bank lending standards is related, but is identified at the *micro-level* and shows that a bank's level of standards has a persistent impact on its *growth rate* of lending. Finally, a number of authors study the link between the level of bank lending standards and consumption (Muellbauer, 2007; Aron et al., 2012; Duca, Muellbauer, and Murphy, 2012; Duca and Muellbauer, 2013). These studies construct a level index of unsecured consumer credit conditions from the Federal Reserve's Senior Loan Officer Opinion Survey aggregate diffusion index and find a strong relationship between credit conditions and consumption.

More generally, our study contributes to the literature that examines the information content of bank lending surveys. Responses of bank lending surveys have been shown to be good predictors of aggregate bank lending and real GDP growth in the United States (Lown and Morgan, 2006; Ciccarelli et al., 2010; Bassett et al., 2012) and the euro area (De Bondt et al., 2010; Cappiello et al. 2010; Ciccarelli et al., 2010). Moreover, there is evidence that reported changes in bank-specific lending standards are associated with one-off effects on bank lending in Italy (Del Giovane et al., 2011), Germany (Blaes, 2011) and Denmark (Kuchler, 2012). Our results show that, in addition to forecasting credit growth and monitoring real-time changes in credit supply, the (historical) content of bank lending surveys can be used to infer the persistent impact of the level of bank lending standards on bank lending.

In what follows, we discuss the empirical methodology, data, and our measure of the level of bank lending standards (Section 2). In Section 3, we present the benchmark results, followed by a discussion and robustness analysis in Section 4. Section 5 provides two counterfactual analyses for business lending in The Netherlands and discusses implications of the prolonged period of easing of bank lending standards before, and tightening since, the 2007-09 financial crisis. Section 6 concludes.

2 Empirical Methodology and Data

2.1 Model Specification

We examine if the level of bank lending standards has an effect on the growth rate of the stock of loans to businesses. This "level effect" is a separate factor that influences credit growth aside from changes in bank lending standards. The intuition behind this link between the level of a bank's lending standards and the growth in the bank's loan portfolio runs as follows.

Let the stock of outstanding loans by bank i at time t be given by S_{it}. Newly extended loans to businesses by bank i in period t are given by L_{it}. The cohort-structure of the loans implies that a fraction $\rho_i < 1$ of S_{it} survives until next period. The survival rate ρ_i is determined by redemptions and defaults on outstanding loans. The dynamics of the stock of outstanding loans S is given by:

$$S_{it} = \rho_i S_{i,t-1} + L_{it} \tag{1}$$

From equation (1), it follows that the growth rate of outstanding loans is equal to:

$$\frac{\Delta S_{it}}{S_{i,t-1}} = \rho_i - 1 + \frac{L_{it}}{S_{i,t-1}} \tag{2}$$

According to equation (2), the growth rate of outstanding loans of an individual bank depends on the bank-specific survival rate ρ_i of the loans in the portfolio and on the amount of newly extended loans as a fraction of the total loan portfolio in the previous period. We argue that the fraction of newly extended loans depends on the change in *and* "level" of bank lending standards. For example, higher (more strict) bank lending standards result in a higher rejection rate of loan applications for a given level of loan demand. So, not only the most recent adjustment of bank lending standards determine the growth rate of the loan portfolio, but also all previous changes that make up the current level of standards. This is formalized in equation (3):

$$\frac{L_{it}}{S_{i,t-1}} = f(BLS\_S_{i,t-1}, BLS\_S\_level_{i,t-2}) \tag{3}$$

where BLS_S represents changes in bank lending standards, and BLS_S_level is the level of bank lending standards. Since we are interested in the level effect of bank lending standards for a given level of credit demand, we include in our econometric specification two level indicators: one for bank lending standards and one for credit demand. Aside from these novel level variables, we follow the approach taken by Del Giovane et al. (2011) and add a set of dummy variables measuring specific changes in bank lending standards and credit demand. We include the level variables with a two-quarter lag in order to prevent double counting of the effect of a change in bank lending standards or credit demand; once by the one-quarter lagged dummy variable for the respective change and once by the level variable. In addition, we include bank-specific interest rates on new loans such that the "level effect" of bank lending standards relates to the influence on business lending of non-price conditions. Combining equations (2) and (3) then implies that the growth rate l_{it} of loans by bank i in quarter t can be written as:

$$l_{it} = D_i + D_t + \alpha_1 X_{it-1} + \alpha_2 IR_{it} + \beta_1 BLS\_S\_level_{i,t-2} + \beta_2 BLS\_D\_level_{i,t-2} + \epsilon_{it} \tag{4}$$

where D_i captures bank fixed effects and D_t are time fixed effects. 'X' is a vector of variables

that includes dummy variables for specific changes in a bank's lending standards (i.e. "eased considerably", "eased somewhat", "tightened somewhat", and "tightened considerably") and changes in bank-specific credit demand (i.e. "decreased considerably", "decreased somewhat", "increased somewhat", and "increased considerably"). IR is the bank-specific interest rates on new loans. β_2 captures the level effect of credit demand.

The parameter of interest is β_1. This represents the level effect of bank lending standards on the quarterly growth rate of bank lending. It is identified within bank variation over time and should be interpreted as a permanent effect. We include bank-specific fixed effects to account for bank-specific factors that may affect the growth rate of bank loans, such as the maturity structure and the credit quality of the loan portfolio. Moreover, our benchmark specification includes time-specific fixed effects to capture the macroeconomic situation and other effects that change over time and affect all banks equally. Demand for credit, to the extent that it is driven by macroeconomic factors, is included in the time-specific effect. The time fixed effects also absorb the influence of supply factors that affect bank loans equally across banks, e.g. if a macroeconomic downturn increases economy-wide credit risk and banks are more reluctant to lend, this effect will be captured by the time dummy.

2.2 Bank-Specific Data on Business Lending and Bank Lending Standards

We examine the level effect of bank lending standards on the quarterly growth rate of lending to non-financial firms in The Netherlands. The individual bank data are confidential, but were kindly provided by the Statistics and Information Division of the Dutch central bank for the purpose of this research project. The sample consists of an unbalanced panel of 8 banks that participated in the Eurosystem Bank Lending Survey in The Netherlands in the period from 2003Q1 to 2013Q2.

The outstanding volume of business loans by the panel of banks represented about 65% of the total volume of business lending in The Netherlands in 2012.[2] The growth rates of lending to firms by the banks in the sample and by the whole Dutch banking sector follow a similar pattern and are highly correlated; the correlation coefficient equals .97.

The data on bank lending standards are taken from the Eurosystem Bank Lending Survey, which was introduced in 2003.[3] Every quarter, banks in the euro area are asked about changes in their lending standards and credit demand. Our benchmark model includes the information from the two

general questions in the survey on developments in lending standards and credit demand for loans to enterprises, which allow us to examine whether there is a level effect of bank lending standards.[4] These "standards" refer to both price and non-price lending terms, such as collateral requirements, non-interest rate charges, loan limits, covenants and maturity. Since we include bank-specific interest rates in the benchmark model, the "level effect" relates to non-price bank lending terms.

Banks answer the question on the change in lending standards by choosing from a scale of five answers: "tightened considerably", "tightened somewhat", "basically unchanged", "eased somewhat" or "eased considerably". Likewise, the question on the change in credit demand involves five answering categories: "decreased considerably", "decreased somewhat", "basically unchanged", "increased somewhat" or "increased considerably". Figure 2 reports the frequency of the various answers given by the panel of banks in The Netherlands, differentiating between the pre-crisis (2002Q4-2007Q2), crisis (2007Q3-2009Q4) and post-crisis period (2009Q4-2013Q1). Figure 3 shows the aggregate bank-weighted changes in bank lending standards on business lending in The Netherlands over time. A few remarks can be made. First, in the majority of responses (about 60-70%), banks report basically unchanged lending standards and credit demand. Second, lending standards are more often reported to have been tightened than eased, which is largely due to the crisis period. Similarly, since the crisis the balance has shifted towards more reporting of credit demand decreases than increases. Finally, banks seldom report a considerable change in either lending standards or credit demand; they never reported a considerable easing of lending standards.

2.3 A Survey-Based Measure of the Level of Bank Lending Standards

The novel part of the data set is our measure of a bank's level of lending standards and credit demand. We use the individual responses of the banks participating in the Eurosystem Bank Lending Survey in The Netherlands to construct these level variables. The idea is straightforward: since banks are asked to report changes in lending standards *over the past three months*, the quarterly reported changes cumulate over time. For example, if a bank reports a tightening at $t+1$ and again at $t+2$, the level of the bank's lending standards at $t+2 > t+1 > t$.

We construct the variable for the level of a bank's lending standards by coding the qualitative answers given in the Bank Lending Survey as follows:

$$BLS\_S\_level_{it} = \begin{cases} 0 \text{ if } t = 2002Q3 \\ BLS\_S\_level_{i,t-1} + 1 \text{ if } t > 2002Q3 \text{ \& lending standards at } t \text{ are "tightened"} \\ BLS\_S\_level_{i,t-1} + 0 \text{ if } t > 2002Q3 \text{ \& lending standards at } t \text{ are "unchanged"} \\ BLS\_S\_level_{i,t-1} - 1 \text{ if } t > 2002Q3 \text{ \& lending standards at } t \text{ are "eased"} \end{cases}$$

Thus we start with a zero level of bank lending standards at the beginning of our sample, and add a value of "+1" when lending standards are tightened, "-1" if lending standards are eased, and "0" if a bank reports no change. Notice that since the level effect is identified within bank variation over time, it is not influenced by the starting point (absolute value) chosen to construct the level of a bank's lending standards. The variable measuring a bank's level of credit demand is constructed similarly; it starts with a value of zero in 2002Q3 after which increases are coded as "+1", decreases as "-1", and a "0" is given when credit demand did not change.

Our benchmark measure for a bank's level of lending standards (or credit demand) makes no distinction in the degree of tightening or easing; the categories "considerably" and "somewhat" are treated equally. Admittedly, this approach is arbitrary, but it is in line with the main measure used by the ECB to describe developments of survey replies over time, i.e. the "net percentage" of changes in aggregate bank lending standards (see for more details Berg et al. 2005). The ECB also reports a "diffusion index" where the response option "considerably" is given a weight twice as high as the response option "somewhat" (see i.e. ECB, 2013). We show below that our main finding of a level effect of bank lending standards is robust to such an alternative weighing scheme. We also examine whether the level effect differs between tightenings and easings of bank lending standards.

3 Benchmark Results

The results of estimating the baseline specification are presented in the first column of Table 1. We also show an alternative specification with constraints on the one-off effects of different changes in standards and credit demand. Both specifications are estimated with bank and quarter fixed effects.

Before we discuss the level effect of bank lending standards, we briefly go into the impact on business lending of the conditioning variables. The results indicate that when banks tighten their lending standards "considerably", the quarterly growth rate of business lending decreases by as much as 3.9 percentage points (relative to "basically unchanged"); about 1.5 percentage points more

than found by Del Giovane et al. (2011) in their sample of Italian banks. The coefficients for the tightened and eased somewhat dummies are not statistically significant. Considering the effects of specific changes in credit demand, we find a marginally significant negative (positive) effect of a somewhat decrease (increase) in demand of 1.6 (1.1) percentage points; the size of the coefficient for the somewhat increase in demand is equal to the effect found by Del Giovane et al. (2011). We do not find a statistically significant effect of "considerable" changes in credit demand, neither of the level of credit demand or the interest rate on new loans.

Turning to our main variable of interest: the level of banking lending standards appears to influence the growth rate of business lending. The estimate for the level effect of bank lending standards is negative and different from zero at any reasonable significance level. Further, the size of the "level effect" is economically relevant. It shows that a one point increase in the level of a bank's lending standards – i.e. a bank reports to have tightened its lending standards "somewhat" or "considerably" – permanently reduces its quarterly growth rate of business lending by about .5 percentage points (equivalent to about 2 percentage points in annualized terms).

The specification in the second column of Table 1 provides a first sensitivity check by using an alternative approach to account for the one-off effects of changes in bank lending standards and credit demand. Instead of using dummy variables for the various answering categories, we construct one bank lending standards indicator and one credit demand indicator, following the approach by Del Giovane et al. (2011). The bank lending standards indicator has a value of 1 to 5, corresponding to answers ranging from eased "considerably" (1) to tightened "considerably" (5). Likewise, the credit demand indicator ranges from decreased "considerably" (1) to increased "considerably" (5). This approach thus implicitly assumes that a linear relationship holds between the various possible answers to each question. The results show a statistically significant and negative one-off effect of tighter bank lending standards of .9 (Table 1, Column 2); somewhat smaller than the 1.4 found by Del Giovane et al. (2011).[5] Also, we find a positive but marginally significant effect of an increase in credit demand of .6, similar to the effect of .7 in Del Giovane et al. (2011). Importantly, the level effect of bank lending standards remains highly significant and negative with a size of .5.

Succinctly, banks with a higher level of bank lending standards seem to have lending growth that is both economically and statistically significant lower, holding other things constant. The level effect of (a one point) tighter standards reduces the quarterly growth rate of business lending by about half

a percentage point, persists until standards are eased again, and comes on top of any one-off effect of a change in standards. Notably, this level effect relates to the influence on business lending of non-price bank lending standards, such as collateral requirements, non-interest rate charges, covenants etc. In the remainder of this paper, we extensively check the sensitivity of this result and assess the implications for business lending at the macro-level before and after the 2007-09 financial crisis.

4 Discussion and Robustness Analysis

4.1 Response Bias

One question comes up immediately when using survey results to construct a measure of the level of bank lending standards and credit demand. If banks are biased towards reporting tightening (or easing) of standards, how would this influence the level effect of bank lending standards? We attempt to address this point below by testing the robustness of the level effect to a large number of sample and specification changes. Still, we now make several points.

First, any common bias in the answers given in our sample of banks is picked up by the quarterly fixed effects which are included in all specifications throughout the regression analysis.

Second, the distribution of reported tightenings and easings in our sample of survey results seems to be plausible. While lending standards are more often reported to have tightened than eased, there are also periods during which the number of banks tightening outweigh the number of banks easing in our sample (i.e. 2003Q3, 2004Q2-2005Q2, 2006Q1-Q2, 2010Q4-2011Q2; see Figure 3). Moreover, since the sample includes the period of the recent global financial crisis, it is not surprising that banks have reported a tightening of lending standards more frequently.

Third, the direction of a bias in the survey responses, if any, is not clear upfront. Whereas Schreft and Owens (1991) suggested a bias towards tightenings in fear of closer scrutiny from supervisors, Del Giovane et al. (2011) argue that banks might also have an incentive *against* reporting tighthenings in fear of public scrutiny. The aggregate results of the bank lending survey in The Netherlands are often discussed in Dutch media, especially since the 2007-09 crisis. Thus, an incentive to report tightenings for supervisory reasons might well balance out against the incentive to limit public discontent.

Fourth, our empirical strategy to identify a level effect of bank lending standards relies on *changes* over time in the bank-specific level variable. So, any bias against reporting a change in lending

standards (whether this bias is against tightening or easing) works against finding a level effect of bank lending standards on business lending.

4.2 Robustness of Level Effect

Is the finding of a level effect of bank lending standards on business lending fragile? Do small changes to the sample or specification strongly influence the level effect? We provide a battery of robustness checks in Table 2 to show that our main finding is basically insensitive to reasonable changes to the sample and adjustments to the specification. Each of the rows in Table 2 corresponds to a different sensitivity check. We only report the estimate for the level effect; all specifications include the controls, bank and quarter fixed effects, as in our benchmark model.

The Dutch banking system is highly concentrated. As a result, the number of banks participating in the Bank Lending Survey in The Netherlands (8 during the sample period) is relatively small. At the same time, there are large differences in balance sheet size and market shares in overall business lending. To show that our main result is not caused by a particular bank, we successively exclude every bank from the sample. The results in rows 1 to 8 of Table 2 show that the finding of a level effect of bank lending standards is not due to a particular bank. The size of the level effect slightly varies over these subsamples, ranging between .4 and .6.

We continue with the sample sensitivity analysis by dropping groups of banks with a common characteristic. We consider three tests. First, since the 2007-09 financial crisis there is growing evidence that foreign banks reduced lending more compared to domestic banks (see i.e. Claessens and Van Horen, 2013). To examine whether our finding of a level effect of bank lending standards is due to foreign banks, we drop the two foreign banks from our sample. The results show that the level effect remains resilient (Table 2, Row 9). Second, we examine if our finding is caused by banks with a relatively small share in aggregate business lending in The Netherlands. If so, the level effect would lose economic relevance. The results in row 10 of Table 2 show that dropping banks with a share of business lending below 10% does not undermine the main result. Third, we create a more balanced sample by excluding banks that did not participate in the survey from the start to end of our sample period. Once more, the level effect is robust (Table 2, Row 11).

Next, we examine the sensitivity to specification changes. First, we test the sensitivity of the level effect to an alternative weighing scheme for reported changes in bank lending standards. Instead of

treating the response categories "considerably" and "somewhat" equally, we now give "considerable" changes (tightenings and easings) twice as high a weight as "somewhat" changes. The level variable for credit demand is adjusted in the same way. Table 2 row 12 shows that the level effect of bank lending standards is resilient to this alternative weighing scheme for the level variables.

Further, we examine whether our finding holds when we apply a weighted panel regression, where every bank is weighted according to its share in the aggregate volume of business lending. The results in row 13 of Table 2 again confirm the level effect of bank lending standards. The size of the effect is somewhat larger than our benchmark estimate, but not statistically different.

Continuing, our benchmark model includes the level variables with a two-quarter lag. This approach was taken to prevent counting the effect of a change in bank lending standards or credit demand twice; once by the one-quarter lagged dummy variable for the respective change, and once by the level variable. Table 2 row 14 shows the result when the level variables are included with a one-quarter lag; the level effect of bank lending standards is basically unchanged.

Following, we investigate whether our result holds when including bank-specific deposit rates in our estimation. Deposit rates on new deposits can be seen as a measure for a bank's funding costs and higher funding costs could reduce the growth rate of loan supply. We do not find a statistically significant effect of the deposit rate on new deposits. Our main result on the level effect of bank lending standards remains unaffected (Table 2, Row 15).

Finally, we check the sensitivity of the level effect when including the lagged dependent variable. This way, the specification accounts for possible lending dynamics in quarterly business lending. The coefficient of the lagged dependent variable is small (.02) and not statistically significant. Importantly, once more the level effect of bank lending standards is robust; the size being slightly larger than our benchmark estimate (see final row of Table 2).

To sum up, we conclude from the various sensitivity checks that the level effect of bank lending standards is relatively robust to reasonable changes in the sample and specification. Banks with a higher level of bank lending standards seem to have permanently lower growth of business lending. The size of the level effect is somewhat sensitive to the sample or specification chosen, ranging between .4 and .7; overall close to and not statistically different from our benchmark estimate of .5.

4.3 Asymmetry

Did the level effect change since the 2007-09 financial crisis? Is the level effect of tightenings versus easings of bank lending standards different? We now examine both these types of possible asymmetry in the level effect of bank lending standards.

First, we test whether the level effect is different during the crisis, pre- or post-crisis period. We define the crisis as the period from 2007Q3 to 2009Q4.[6] Subsequently, we create a dummy variable for the crisis, pre- and post-crisis period, and interact each dummy variable with the level variables for bank lending standards and credit demand. The results are presented in Table 3 column 1. We find a statistically significant level effect of bank lending standards in all three periods. Moreover, test results reveal that the size of the level effect is not statistically different between periods.

Second, we examine whether the level effect is the same for tightening versus easing of bank lending standards. We add two interaction terms to our benchmark model; one between the level variable of bank lending standards and a dummy for tightenings, and one interacted with a dummy for easings. Likewise, we include two interaction terms between the level of credit demand and a dummy variable for increases and one for decreases in demand. The results in Table 3 column 2 show that neither of the two interaction terms of bank lending standards is statistically different from zero; the level effect appears to be symmetric between tightenings and easings of standards.

Overall, we find no evidence indicative of asymmetry in the level effect of bank lending standards. The level effect is not statistically different before, during and after the financial crisis period, or between tightenings and easings of standards.

5 Counterfactual Analyses

The finding of a level effect of bank lending standards implies that after a prolonged period of tightening, such as during the 2007-09 financial crisis, bank lending growth is subdued. Likewise, the level effect could help to explain high bank lending growth in a period of prolonged easing of standards, such as prior to the crisis. This raises the question of whether our micro-level estimate for the level effect of bank lending standards is economically relevant at the macro-level.

In this Section, we attempt to quantify the level effect of bank lending standards on business lending in The Netherlands both before and since the 2007-09 financial crisis. We do so by performing

two counterfactual analyses. The first scenario demonstrates the impact of the level of bank lending standards on business lending in the period of easing of standards before the crisis. The second scenario focuses on the period of subdued credit growth since the crisis.

In order to generate a prediction in the counterfactual scenarios for business lending at the macro-level, we use the estimated coefficients from the weighted panel regression (see Table 2, Row 13). In this weighted panel regression each bank is weighted according to its share in the total outstanding volume of loans issued by all banks in the sample. The presented annual (rolling four-quarter) growth rate at the macro-level, then, equals the weighted sum of the predicted bank-specific growth rates.

5.1 The Level Effect of Looser Bank Lending Standards Before the Crisis

In the first counterfactual scenario we aim to isolate the level effect of bank lending standards on business lending in The Netherlands in the pre-crisis period. We do so by comparing the actual growth rate of business lending with a prediction based on a counterfactual scenario in which the level of bank lending standards did not change after a certain date. We choose 2004Q1 as the quarter after which we hold the level of bank lending standards constant for each bank. Banks in The Netherlands started easing standards in 2004 and maintained relatively loose standards until the second half of 2007 (see Figure 3).

The results of the counterfactual analysis are presented in the left panel of Figure 4. The black line shows the actual annual growth rate of business lending in The Netherlands. The grey line shows what annual business lending growth would have been if the level of bank lending standards would not have eased after 2004Q1. In that scenario, annual business lending growth would have been about 4 percentage points lower at around 6% in 2006 and 2007. The peak of annual business lending growth in 2008Q2 seems to have been largely attributed to demand factors and is only 2 to 3 percentage points lower in the counterfactual scenario at the still high level of around 13%. Overall, these results suggest that supply factors, as measured by the level of banks' lending standards, were important drivers behind strong business lending growth in The Netherlands before the 2007-09 financial crisis.

5.2 The Level Effect of Stricter Bank Lending Standards Since the Crisis

In this second counterfactual analysis, our aim is to isolate the level effect of bank lending standards in the period since the crisis. Again, we compare the actual growth rate of business lending with a

prediction based on a counterfactual scenario in which the level of bank lending standards did not change after a certain date. We choose 2008Q4 as the quarter after which we hold the level of bank lending standards constant for each bank. By that time, most banks had tightened their standards about five times from the low levels reached in 2006, and the aggregate annual growth rate of business lending was close to its long-term average of 7% (see the dotted line in Figure 4).

A particular issue that comes up in the post-crisis counterfactual scenario is the take over and split-up of one major bank in 2010. As a result, this bank was replaced in the bank lending survey by one large and two smaller banks. In the counterfactual scenario we let the three new banks inherit the major bank's level of bank lending standards and of credit demand as of 2010Q1.

The results of the post-crisis counterfactual analysis are presented in the right panel of Figure 4. The grey line presents the counterfactual prediction in case the level of bank lending standards would not have changed after the final quarter of 2008. In that scenario, current annual business lending growth would have been close to 4%; about 3 percentage points higher than the actual growth rate.

Overall, these results suggest that the persistently low growth rate of business lending in The Netherlands since the 2007-09 financial crisis can for a significant part be attributed to stricter bank lending standards. Due to the prolonged period of tightening, and limited easing so far, bank lending standards in The Netherlands are still relatively tight, restricting business lending growth for a given level of loan demand. This is not to say that depressed demand is not a limiting factor either. Indeed, the long-run average growth rate of business lending is about 7% annually, still well above the prediction in our post-crisis counterfactual scenario.

6 Conclusion

In this paper we examine the link between the level of bank lending standards and business lending using micro-data from the Eurosystem Bank Lending Survey in The Netherlands. In this survey, as in similar surveys conducted in countries around the world, banks are asked to report quarterly changes in standards (i.e. pricing, collateral requirements, non-interest rate charges, covenants etc.) on the approval of business loans. Taken literally, reported tightenings or easings of standards cumulate over time, thus representing changes in the level of a bank's lending standards. Economists, however, are often skeptical of such a cumulative interpretation of these survey results, casting doubt on whether banks interpret the survey questions correctly. This paper follows a literal reading of bank lending

survey results. In doing so, we identify a level effect of bank lending standards on business lending using a simple and intuitive survey-based measure of a bank's level of lending standards.

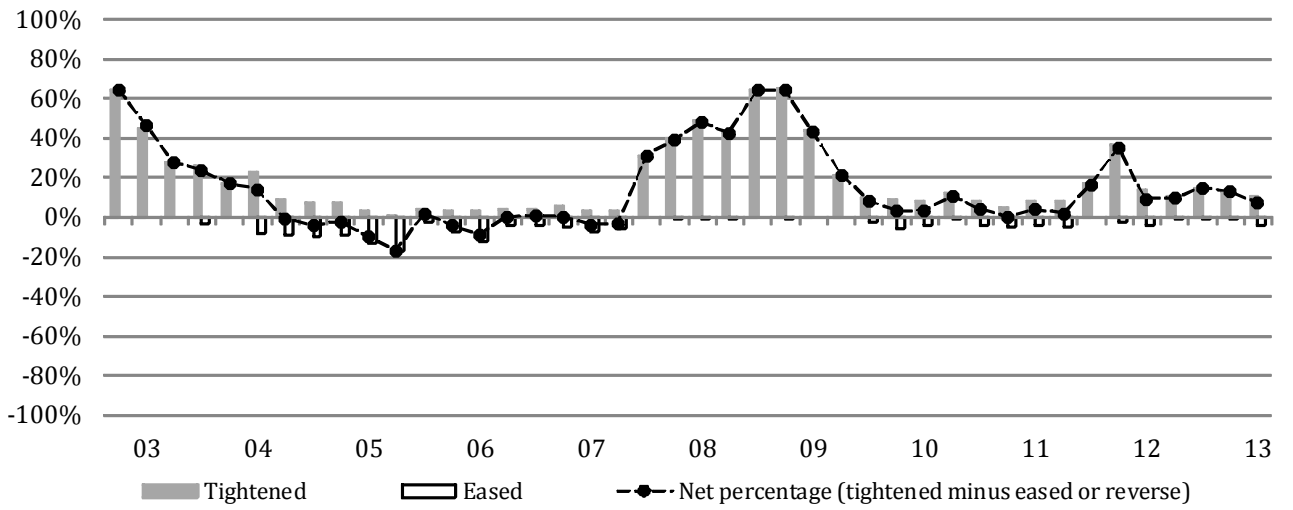
The empirical results show that the "level effect" is robust; a one point increase in the level of a bank's lending standards – i.e. a bank reports a tightening – reduces the bank's quarterly growth rate of business lending in the range of .5 percentage points; or about 2 percentage points in annualized terms. This level effect persists until bank lending standards are eased, comes on top of any one-off effect of a change in standards, and results from the influence on business lending of non-price bank lending standards. Also, we find no evidence of asymmetry in the level effect before, during or after the 2007-09 financial crisis, nor between tightenings and easings.

Our finding of a level effect of bank lending standards helps to explain high bank lending growth when bank lending standards are loose and low bank lending growth when standards are tight. We illustrate the economic relevance of the level effect at the macro-level by performing two counterfactual analyses for business lending in The Netherlands. The first scenario suggests that due to loose bank lending standards, business lending growth was about 4 percentage points higher in the years prior to the 2007-09 financial crisis. As such, our survey-based measure of the level of bank lending standards provides another potential indicator for macroprudential policy, although it is subject to the Lucas critique. The second scenario, in turn, indicates that the current annual growth rate of business lending in The Netherlands is about 3 percentage points lower due to tighter bank lending standards since the crisis.

We close with some general remarks on our survey-based measure for a bank's level of lending standards. First, the level measure does not say anything about the *absolute* level of bank lending standards at a certain point in time. Quantitative information on specific standards, for example on bank loan covenants (Demiroglu and James, 2010), would be needed to do so. Second, although we find this unlikely, the finding of a level effect based on survey data might be peculiar to our sample, which covers the banks that participate in the Eurosystem Bank Lending Survey in The Netherlands. Finally, our goal here is to show that the level effect of bank lending standards on bank lending can be identified using this survey-based measure of overall lending terms. We did not delve into the survey questions on the factors driving changes in standards or the conditions and terms involving a change. Examining the level effect of bank lending standards along these lines could be a promising direction for future research.

Figure 1. Changes in Bank Lending Standards on Business Lending in the Euro Area*

Weighted percentage of banks

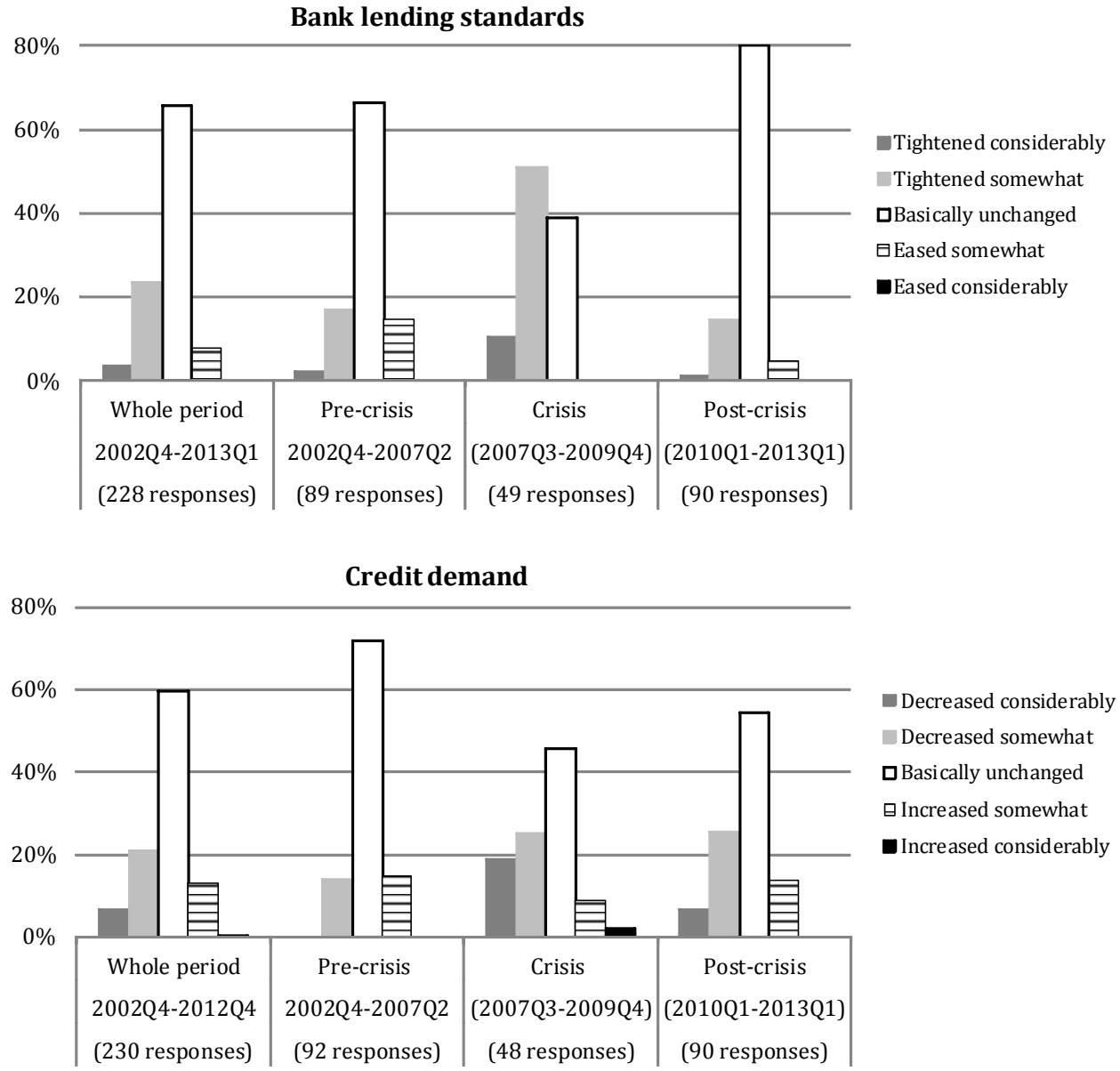


*This figure shows the answers given by banks in the Eurosystem Bank Lending Survey to the question: "Over the past three months, how have your bank's credit standards as applied to the approval of loans or credit lines to enterprises changed?" Grey bars show the percentage of banks in the euro area that tightened lending standards in a particular quarter. White bars show the (negative) percentage of banks that eased lending standards in a particular quarter. Country weights are used to aggregate the national results at the euro area level (see Berg et al. 2005 for details).

Source: European Central Bank, Statistical Data Warehouse.

Figure 2. Bank responses to the survey questions on changes in lending standards and credit demand for loans to enterprises in The Netherlands

Percentage of total number of responses

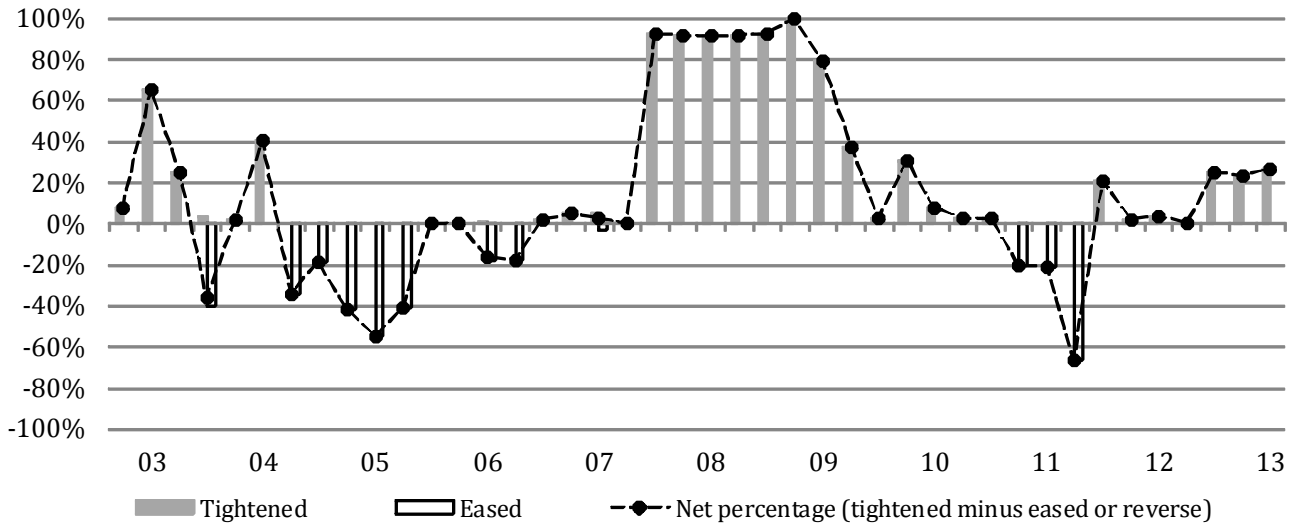


Note: due to missing observations, the total number of responses to the question on changes in bank lending standards is lower than for the question on changes in credit demand.

Source: based on the confidential bank-level data from the sample of banks participating in the Eurosystem Bank Lending Survey in The Netherlands. Aggregate data on the non-weighted net percentage of changes in bank lending standards in The Netherlands are publicly available at the ECB's Statistical Data Warehouse and on the website of the Dutch Central Bank, see Table T5.5 at http://www.statistics.dnb.nl/index.cgi?lang=nl&todo=Bankbedr.

Figure 3. Changes in Bank Lending Standards on Business Lending in The Netherlands*

Weighted percentage of banks

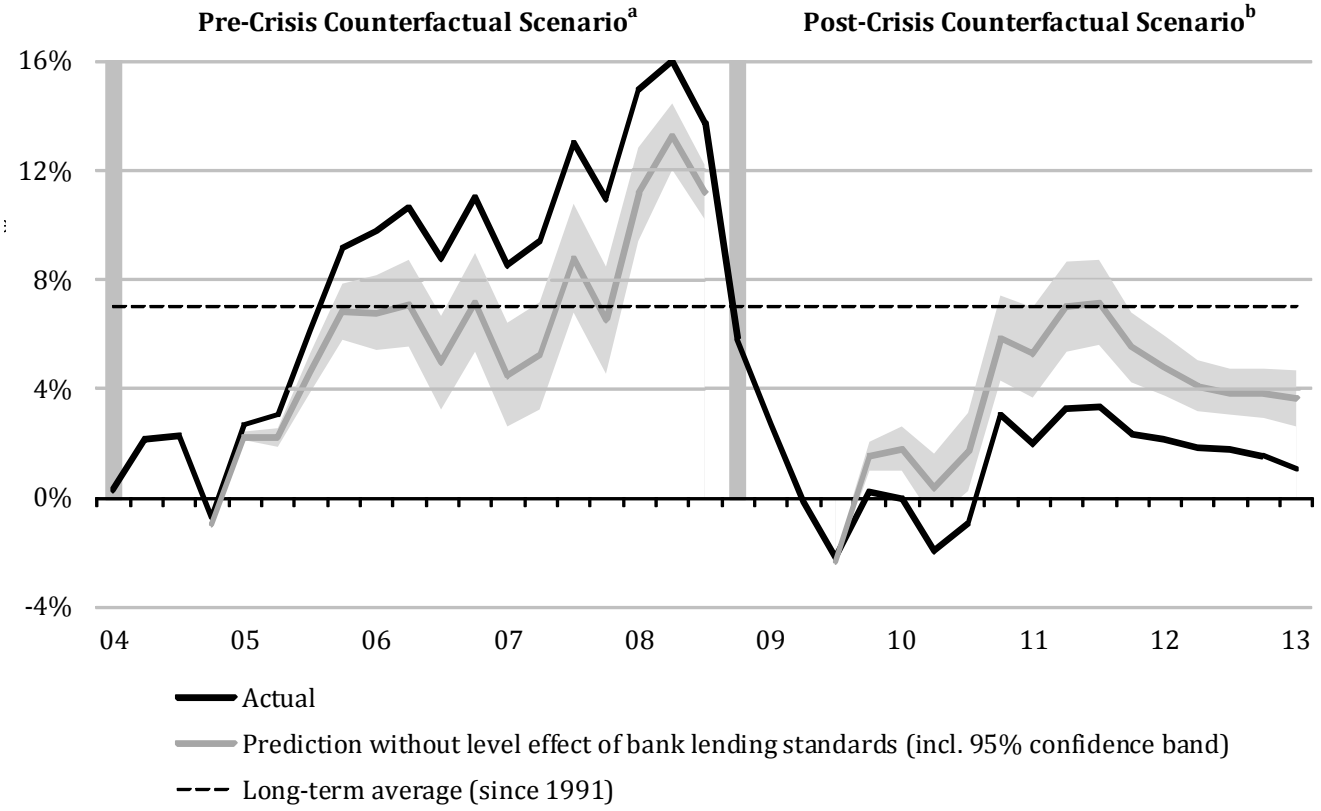


*This figure shows the answers given by the sample of banks participating in the Eurosystem Bank Lending Survey in the Netherlands to the question: "Over the past three months, how have your bank's credit standards as applied to the approval of loans or credit lines to enterprises changed?" Grey bars show the weighted percentage of banks in The Netherlands that tightened lending standards in a particular quarter. White bars show the (negative) weighted percentage of banks that eased lending standards in a particular quarter. Every bank is weighted according to its share in the aggregate volume of business lending of the sample of banks participating in the Eurosystem Bank Lending Survey in The Netherlands.

Source: authors calculations based on confidential bank-level data from the sample of banks participating in the Eurosystem Bank Lending Survey in The Netherlands. Aggregate data on the non-weighted net percentage of changes in bank lending standards in The Netherlands are publicly available in the ECB's Statistical Data Warehouse and on the website of the Dutch Central Bank, see Table T5.5 at http://www.statistics.dnb.nl/index.cgi?lang=nl&todo=Bankbedr.

Figure 4. Counterfactual Prediction of Pre- and Post-Crisis Business Lending in The Netherlands

Annual growth rate of business lending



[a]The pre-crisis counterfactual scenario starts in 2004Q2; the first quarter in which the level of bank lending standards is kept constant. Due to the lag structure in the model (the level variables are included with a two-quarter lag), the counterfactual prediction of business lending starts in 2004Q4.

[b]The post-crisis counterfactual scenario starts in 2009Q1; the first quarter in which the level of bank lending standards is kept constant. Due to the lag structure in the model (the level variables are included with a two-quarter lag), the counterfactual prediction of business lending starts in 2009Q3.

Table 1: Permanent Effect of Level of Bank Lending Standards on Business Lending

Dependent variable: quarterly growth rate of business lending by bank i in quarter t		
	(1)	(2)
Level of bank lending standards (t-2)	−.51***	−.47***
	(.08)	(.12)
Level of credit demand (t-2)	−.01	−.07
	(.11)	(.10)
Changes in bank lending standards		
Tightened considerably (t-1)	−3.89***	
	(1.00)	
Tightened somewhat (t-1)	−1.02	
	(.82)	
Eased somewhat (t-1)	−.46	
	(1.30)	
Bank lending standards indicator (t-1)		−.86**
		(.33)
Changes in credit demand		
Decreased considerably (t-1)	.48	
	(1.38)	
Decreased somewhat (t-1)	−1.61*	
	(.75)	
Increased somewhat (t-1)	1.10*	
	(.58)	
Increased considerably (t-1)	−1.14	
	(1.60)	
Credit demand indicator (t-1)		.55*
		(.25)
Interest rate new loans (t)	.06	.15
	(.35)	(.43)
Bank fixed effects	yes	yes
Quarter fixed effects	yes	yes
Observations	200	200
R-squared	.41	.38

Data set includes quarterly observations covering eight banks, 2002Q4-2013Q1. Robust standard errors (clustered by bank) in parentheses. Significance: ***1%, **5%, *10%. Specification (1) is our benchmark. In specification (2) we use an alternative approach to account for the one-off effects of changes in bank lending standards, and changes in credit demand. Instead of using dummy variables for the various answering categories, specification (2) applies an ordinal scale to the various possible answers to each question. The "bank lending standards indicator" ranges from 1 (eased considerably) to 5 (tightened considerably), and the "credit demand indicator" ranges from 1 (decreased considerably) to 5 (increased considerably).

Table 2: Sensitivity Analysis of Permanent Level Effect of Bank Lending Standards on Business Lending

Dependent variable: quarterly growth rate of business lending by bank i in quarter t		
	Level effect	Observations
Benchmark model	$-.51^{***}$ (.08)	200
Sample Changes		
1. Drop bank 1	$-.50^{***}$ (.09)	193
2. Drop bank 2	$-.51^{***}$ (.10)	190
3. Drop bank 3	$-.54^{***}$ (.07)	189
4. Drop bank 4	$-.49^{***}$ (.12)	176
5. Drop bank 5	$-.53^{***}$ (.08)	165
6. Drop bank 6	$-.63^{***}$ (.10)	163
7. Drop bank 7	$-.56^{***}$ (.11)	163
8. Drop bank 8	$-.38^{*}$ (.18)	161
9. Drop foreign banks	$-.53^{***}$ (.08)	182
10. Drop small banks (share in aggregate business lending $< 10\%$)	$-.69^{***}$ (.09)	110
11. Drop banks not in sample from start to end of the survey	$-.51^{**}$ (.14)	148
Specification Changes		
12. Level variables constructed with alternative weighing scheme	$-.47^{***}$ (.08)	200
13. Weighted regression (bank weight = share in aggregate business lending)	$-.61^{***}$ (.08)	200
14. Level variables with one-quarter instead of two-quarter lags	$-.50^{***}$ (.09)	202
15. Add bank-specific deposit rates	$-.50^{***}$ (.07)	196
16. Add lagged dependent variable	$-.58^{***}$ (.08)	196

Data set includes quarterly observations covering eight banks, 2002Q4-2013Q1. All regressions include the control variables as in the benchmark model (see Table 1, Column 1), bank and quarter fixed effects. Robust standard errors (clustered by bank) in parentheses. Significance: ***1%, **5%, *10%.

Table 3: Asymmetric Level Effect of Bank Lending Standards?

Dependent variable: quarterly growth rate of business lending by bank i in quarter t		
	(1)	(2)
Level of bank lending standards (t-2) * Pre-crisis period (2002Q4-2007Q2)	−.48***	
	(.09)	
Level of bank lending standards (t-2) * Crisis period (2007Q3-2009Q4)	−.42**	
	(.12)	
Level of bank lending standards (t-2) * Post-crisis period (2010Q1-2013Q1)	−.58***	
	(.05)	
Level of bank lending standards (t-2)		−.52***
		(.08)
Level of bank lending standards (t-2) * Tightened		−.01
		(.19)
Level of bank lending standards (t-2) * Eased		−.28
		(.43)
Observations	200	200
R-squared	.42	.42

Data set includes quarterly observations covering eight banks, 2002Q4-2013Q1. All regressions include the control variables as in the benchmark model (see Table 1, Column 1), bank and quarter fixed effects. Additionally, the specification in Column 1 includes interaction terms for the level of credit demand with the pre-crisis, crisis, and post-crisis period. Specification 2 includes interaction terms for the level of credit demand with a dummy variable for decreases, and increases. Robust standard errors (clustered by bank) in parentheses. Significance: ***1%, **5%, *10%.

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Notes

[1]The credit-to-GDP gap is the deviation of the ratio of credit to GDP from its trend.

[2]The data on loans are not adjusted for securitizations, as adjusted data at the bank level are not available in The Netherlands. Over the sample period, an average of 4 percent of the total outstanding volume of business loans was securitized.

[3]See Berg et al. 2005 for a detailed description of the Eurosystem Bank Lending Survey.

[4]The survey contains similar questions related to loans to households.

[5]See Table 6, Column (c) in their article.

[6]The results are qualitatively unchanged when we define the crisis as the period from 2008Q3-2009Q4.

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