The Role of the Corporate Income Tax
as an Automatic Stabilizer

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Abstract:

This paper analyses the effectiveness of the corporate income tax as an automatic stabilizer. It employs a unique firm-level dataset of German manufacturers combining financial statements with firm-specific information about credit market restrictions. The results show that approximately 20 per cent of all firms report both positive taxable income and capital market restrictions. Taking account of the income tax rates and the size differences of the firms, we find that demand stabilization through the corporate income tax amounts to about 8 per cent of an initial shock to gross revenues. This stabilization effect varies over the business cycle and tends to increase during cyclical downturns.

Keywords:

Corporate income tax; Stabilization; Capital market restrictions; Loss offset; Firm-level data

JEL codes:

H25; H32; E63

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1 Introduction

The current economic crisis has given rise to a debate on the role of fiscal policy as a factor stabilizing demand and, ultimately, employment and output. There are essentially two ways in which fiscal policy can contribute to demand stabilization: firstly, governments may cut taxes or increase expenditure; secondly, governments may rely on automatic stabilizers. Auerbach and Feenberg (2000) define automatic stabilizers as 'those elements of fiscal policy that tend to mitigate output fluctuations without any explicit government action' (ibid., p.37).

How do automatic stabilizers work? To make things simple, consider an economy with a proportional income tax with a rate of 30 per cent. The effectiveness of the income tax as an automatic stabilizer depends on two factors. The first factor is how a given shock on gross income affects after tax income. In our example, a decline in income by 100 Euros leads to a decline in net income by 70 Euros. This implies that the income tax has absorbed 30 per cent of the initial shock to gross income. The second factor is the link between current disposable income and demand. In the case of private households, current expenditure on consumption goods usually diverges from current disposable income as households try to smooth consumption over time. But if households have no financial wealth and cannot borrow, their current expenditures will largely be determined by their disposable income. In the case of firms, decisions on current expenditures for investment goods and other inputs will be determined by capital costs and expectations about the profitability of investment, rather than current cash flow, which depends on the results of past investment. But firms may also lack financial reserves and face borrowing constraints. As a result, a cushioning of shocks to current cash flow may stabilize their demand, too.

This paper analyses the effectiveness of the corporate income tax as an automatic stabilizer. Usually, the debate about automatic stabilizers focuses on the personal income tax. This is because the income tax is more important in terms of the tax revenue it generates and because it is progressive. We focus on the corporate income tax for a number of reasons. Firstly, the base of the corporate income tax is smaller than that of the personal income tax, but its volatility over the business cycle is much higher. Its potential contribution to

overall automatic stabilization may therefore be more significant than its share in tax revenue suggests. Secondly, the automatic stabilization properties of the business tax raise some policy issues, in particular the role of intertemporal loss offset, which are less pressing in the context of the personal income tax. Thirdly, the role of the corporate income tax has been largely neglected in the literature.

With few exceptions, the literature on automatic stabilizers focuses either on the personal income tax, social insurance contributions and benefits (see e.g. Auerbach and Feenberg (2000), Auerbach (2009), Mabbett and Schelkle (2007), Dolls et al. (2009)), or on the tax system as an aggregate (Sachs and Sala-i-Martin (2002), Bayoumi and Masson (1995)), so that the specific issue of corporate taxation plays no role. The role of the corporate income tax as an automatic stabilizer is discussed in Devereux and Fuest (2009).[1] They suggest a simple method to measure the automatic stabilization effect of the corporate income tax, building on the concept of normalized tax change introduced by Pechman (1973). The normalized tax change relates the cushioning effect of the tax system to the size of the initial shock to gross income. In the simple example used above, the normalized tax change is equal to 30 per cent. Essentially, Devereux and Fuest (2009) start from the fact that the corporate income tax is largely proportional in most countries, so that the normalized tax change would be equal to the tax rate. But if taxable income falls below zero, any cushioning of shocks to gross income disappears unless losses can be carried back to earlier periods. In most corporate tax systems, this is either impossible or highly restricted. Firms may be able to use loss carryforwards in future periods, but this does not stabilize current cash flow. Given this, a stabilizing effect of the corporate income tax can only emerge in firms which have two characteristics: they must be credit constrained and their current taxable income must be positive. Applying this approach to data for UK firms, Devereux and Fuest (2009) find that the corporate tax is largely ineffective as an automatic stabilizer. On average, the demand stabilization through the corporate income tax in the UK is equal to only 1 per cent of the initial shock to gross income. In the presence of full loss offset, the stabilization effect would have been equal to 8.5 per cent.

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[1]Auerbach and feenberg (2000) also discuss the role of the corporate tax as an automatic stabilizer but do not produce any estimates. Their focus is on the U.S. federal income tax.

The present paper extends the literature as follows. It is an important limitation of the analysis in Devereux and Fuest (2009) that firm specific information on credit constraints and profit or loss positions comes from two separate data sources. The share of firms with both credit constraints and positive taxable income is, therefore, approximated by assuming that all firms with losses also face credit constraints. As a consequence, stabilization effects could only emerge if the number of credit constrained firms exceeds that of loss making firms. This approach underestimates the stabilization effects of the corporate tax as soon as there are firms which run tax losses but do not face credit constraints. In addition, size differences across firms cannot be taken into account. Our analysis is based on a dataset which combines firm specific information on capital market restrictions with financial information about the firms. This allows us to provide a much more detailed picture of the prevalence of tax losses and financing constraints among different types of firms. Thus, we are able to provide more precise estimates on the effectiveness of the corporate tax to act as an automatic stabilizer.

Our analysis leads to the following results. Most importantly, we find that, in the period from 2003-2007, where detailed data is available, biannually, approximately 20 per cent of all firms report both positive taxable income and credit constraints. Given the German corporate income tax rate of approximately 38 per cent, and taking account of the size differences of the firms, we find that demand stabilization through the corporate income tax amounts to about 8 per cent of the initial shock to gross revenues.Yet a binary regression analysis reveals that the firms reporting credit constraints and positive profits are different. Besides size differences, we find that firms with a bad business situation are overrepresented among these firms. This casts doubt on the view that these firms would indeed use all available funds for additional investment. Therefore, the estimate of 8 per cent is probably an upper bound for the average stabilization effect.

Another important result of our analysis is that the stabilization effect changes systematically over the business cycle. Since the share of firms with positive taxable income is procyclical whereas the share of firms with credit constraints is anticyclical, it is unclear, *a priori*, whether the stabilization effect is pro- or anticyclical. In our dataset, it turns out that the change in credit constraints over the cycle dominates: Our sample starts in 2003, when Germany was in the middle of a severe economic downturn. For April 2003, our stabilization measure is equal

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to approximately 13 per cent. In the following periods, Germany experienced an upswing, and the stabilization measure declines continuously to reach a value below 3 per cent in August 2007. ~~Of course, due to the rather short time period considered, more research is needed to substantiate the finding that the effectiveness of the corporate tax as an automatic stabilizer is potentially increasing during cyclical downturns.~~

The rest of the paper is set up as follows. In section 2, we discuss the key factors which determine the automatic stabilization effect of the corporate income tax and we derive the measure of automatic stabilization we use for the empirical analysis. Section 3 includes the empirical analysis. Section 4 summarizes the results and concludes.

2 Firms and Automatic Stabilization Effects of the Corporate Income Tax

Consider a firm without capital market restrictions. Ignoring risk, this firm would invest in the capital stock if the expected return on capital investment exceeds that of an alternative investment say government bonds. Under standard assumptions, this decision is not affected by the return on past investment. Hence, a shock to the firm's revenues would not affect the investment of the firm. A firm, however, that is facing capital market restrictions, is likely to respond to a revenue shock. As this firm would use internal funds to finance its investment, partly or fully, a shock to current revenues translates into changes in the investment decision. For this firm, a cushioning of revenue shocks due to the corporate income tax is important and will help to smooth investment spending.

If the firm that experiences an adverse revenue shock still makes profits, it benefits from a decline of tax payments in a proportion corresponding to the statutory tax rate. However, if the firm makes losses, the degree to which revenue shocks to firms are cushioned through corporate income taxation depends on the treatment of losses (Auerbach and Feenberg, 2000, Devereux and Fuest, 2009). In an ideal case, where all losses can be carried back to some previous periods with positive profits, cushioning of revenues is symmetric. A firm facing a

loss would benefit from a reimbursement of previous tax payments in the same proportion as a firm with positive profits. However, in the more realistic case, where loss carry backs are restricted, the corporate income tax does not exert much, perhaps no cushioning of revenue shocks to a firm that incurs tax losses. This suggests that the existence of positive taxable profits constitutes a second qualification to a stabilizing role of the corporation tax.

How can the cushioning effect of the tax system be measured? In this paper, we use a simple measure of the cushioning effect, building on Auerbach and Feenberg (2000) and Devereux and Fuest (2009). Consider an economy with n firms. The cash flow of firm i in period t is given by

$$CF_{it} = R_{it} - C_t^f - T_t(R_{it}, D_{it}, .) \qquad (1)$$

where R_{it} denotes the firm´s revenue net of marginal costs in period t, C_t^f denotes fixed costs, D_{it} denotes deductions from the tax base related to fixed costs like $e.g.$ interest on debt or depreciation of capital goods, and $T_t(.)$ is the firm´s current corporate income tax payment. Note that the firm's income tax payment may depend on a number of variables, including taxable profits of past periods. Assume that there is a shock on R_i , denoted by dR_i. The effect on the firm´s cash flow is given by

$$dCF_{it} = dR_{it}(1 - \frac{\partial T_t(R_{it}, D_{it}, .)}{\partial R_{it}}) \qquad (2)$$

Equation (2) shows that the impact of an exogenous revenue shock dR_{ti} on the firm's cash flow is mitigated by the tax system if current tax payments change as a result of the decline in revenue and, hence, taxable profits. Of course, current tax payments of firms not only depend on current revenues but usually also depend on past taxable profits and other predictors of current profits, depending on the rules for tax prepayments. However, as a first approximation, the analysis below assumes that $\frac{\partial T_t(R_{it}, D_{it}, .)}{\partial R_{it}}$ is equal to the statutory corporate income tax rate, denoted by τ_t, if taxable profits are positive and equal to zero for loss making firms. The stabilizing effect of the corporate income tax system on the cash flow of all firms in the economy in period t (A_t^{CF}) can be defined as the difference between the cash flow effect which would occur in the absence of taxes and the cash flow effect in the presence

of taxes, divided by the overall revenue shock:

$$A_t^{CF} \equiv \frac{\sum_{i=1}^{n_t} dR_{it} - \sum_{i=1}^{n_t} dCF_{it}}{\sum_{i=1}^{n_t} dR_{it}} \tag{3}$$

As pointed out above, the stabilization of cash flows does not necessarily lead to a stabilization of investment demand. This can only be expected from liquidity constrained firms. Among these firms, only firms with positive taxable profits will be affected by automatic stabilizers. Denote ~~Assume~~ the number of firms with both credit constraints and positive profits in period t ~~is given by~~ with $m_t < n_t$, and order firms such that these firms have lower index values j. The aggregate effect of automatic stabilizers on investment demand can then be written as

$$A_t^D \equiv \frac{\tau_t \sum_{j=1}^{m_t} dR_{jt}}{\sum_{i=1}^{n_t} dR_{it}}. \tag{4}$$

If the shocks which hit profitable credit constrained firms and other firms are, on average, of equal size, ie. if

$$\frac{1}{m_t} \sum_{j=1}^{m_t} dR_{jt} = \frac{1}{n_t} \sum_{i=1}^{n_t} dR_{it}, \tag{5}$$

the demand cushioning effect can be written as

$$A_t^D = \tau_t \frac{m_t}{n_t}. \tag{6}$$

In the following, we will use data for German firms to measure the stabilizing effect of the corporate income tax for the case of Germany.

3 Empirical Application

What arises from the considerations in the preceding section is that the potentially stabilizing role of the corporation tax varies with the share of firms that are subject to capital market restrictions and, at the same time, profitable in the sense that their taxable income is positive.

Figure 1: Credit Constraint Indicator vs. Business Climate
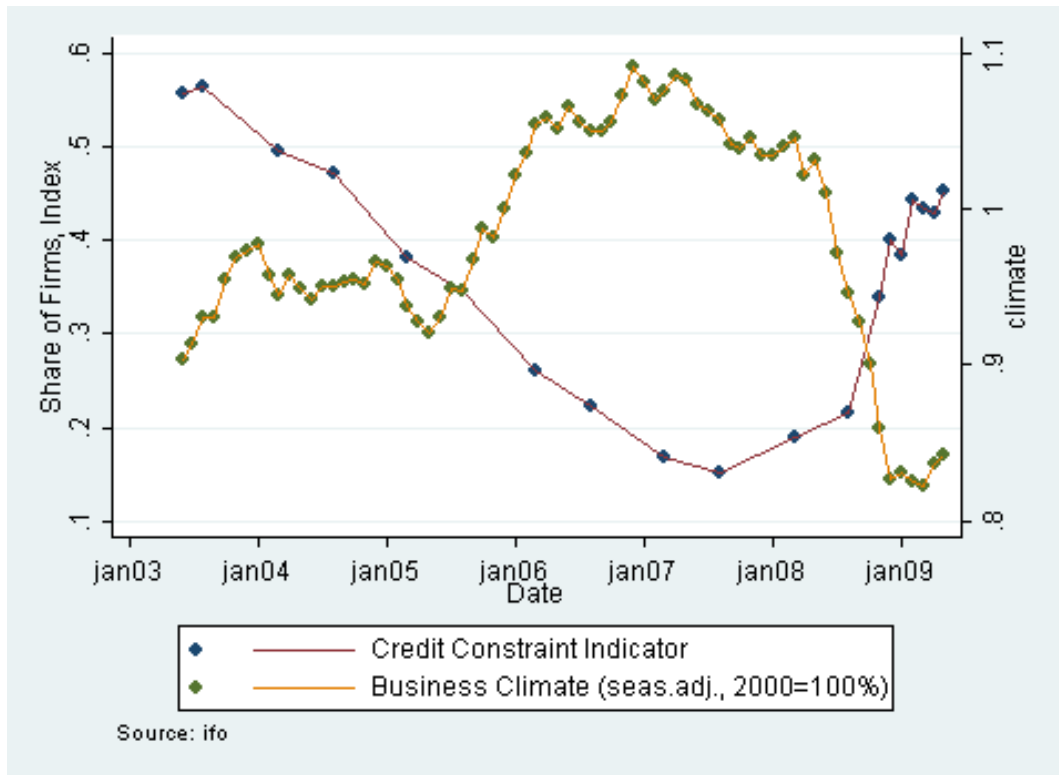
Now, this share is likely to change over the business cycle. Actually, it proves anticyclical. This can be seen from Figure 1 which plots a credit constraint indicator for the German economy[2] against a business climate indicator (both taken from the ifo Business Survey).

To provide empirical evidence we take resort to a unique dataset for German firms that combines firm-specific information about business situation, capacity utilization, and capital market restrictions with financial information about these firms – including profit and loss statements. The data are supplied by the Economics and Business Data Center (EBDC) in Munich. For the purpose of the current analysis we focus on ten waves of the data where information about capital market restrictions is provided, starting with June 2003 until August 2007.

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[2]Until 2007 twice a year, the Ifo Business Survey asks firms about their assessments of bank lending policies. The firms are asked to respond to the following question: "How would you assess the current willingness of banks to extend credit to business"? The credit constraint indicator is calculated from the percentage of the responses in the category "restrictive" (alternative categories are "accommodating" and "normal").

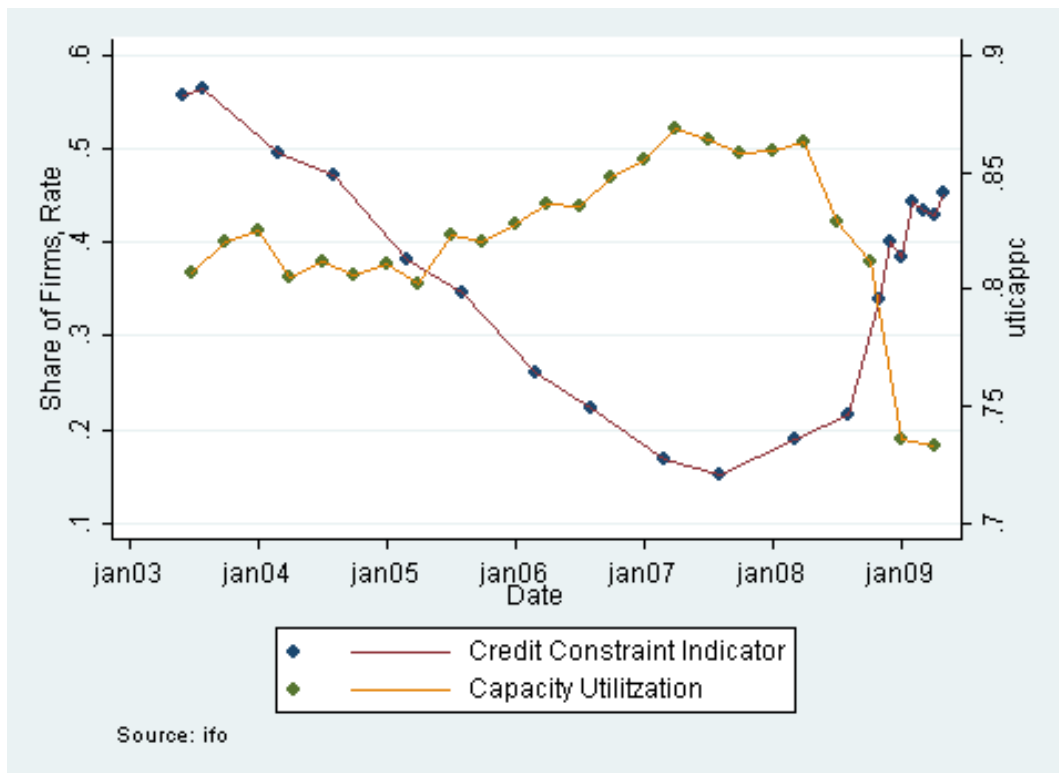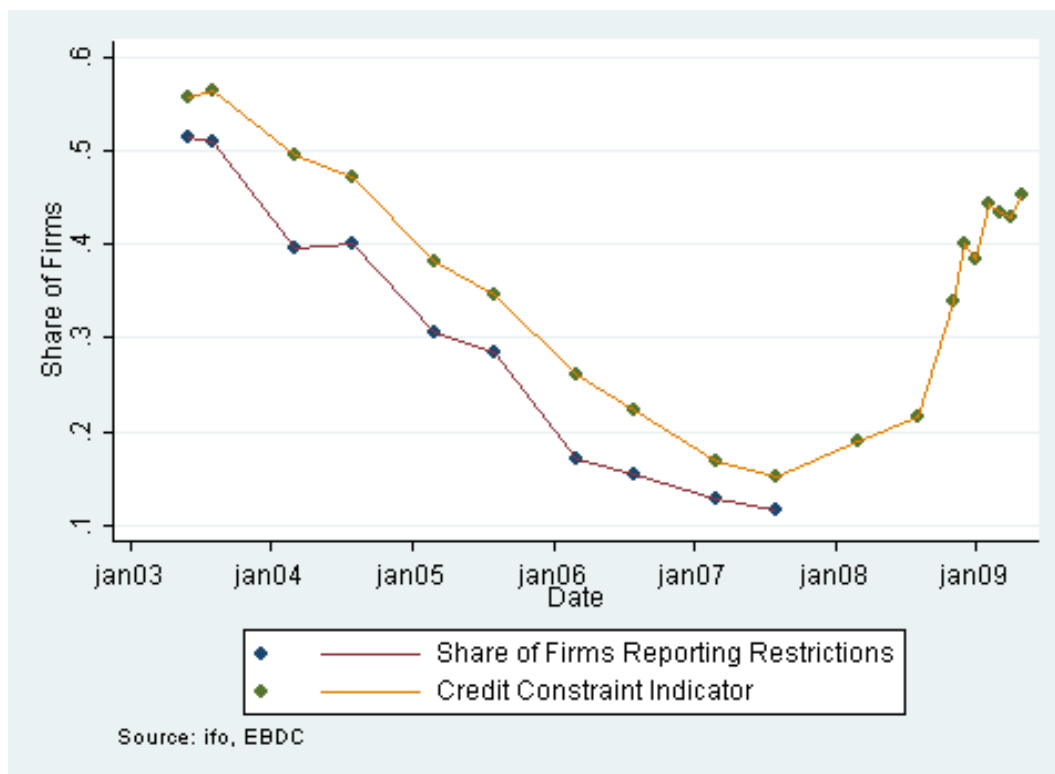Figure 2: Credit Constraint Indicator vs. Capacity Utilization

Figure 3: Credit Constraint Indicator vs. Share of Restricted Firms in EBDC Database

Since the EBDC data used in the study is a subset of the ifo Business Survey where financial information from the Amadeus database has been merged we might be worried about whether this subsample is representative of the ifo Business Survey used in Figures 1 and 2. Figure 3 plots the ifo Credit Constraint Indicator for the manufacturing industry against the share of the firms in our data that consider bank lending policies as restrictive.[3] The figure shows that the EBDC data on credit constraints provides a reasonably good approximation of the general trend in the ifo Business Survey.[4]

Empirical evidence on the importance of losses is provided by Figure 4. It includes not only the share of firms reporting capital market restrictions but also the share of firms that

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[3]Following the practice of the ifo Credit Constraint Indicator a firm is considered credit constrained in our analysis if the appraisal of bank lending policies is "restrictive" rather than "accommodating" and "normal".

[4]While rather new, the ifo Business Survey's information on credit constraints is widely used to assess capital market restrictions in Germany (*e.g.*, Bundesbank, 2008). A recent micro-level study exploiting the ifo Business Survey's question on credit constraints (vonKalckreuth, 2008) finds a significant association with firm-level investment policies similar to results based on the Industrial Trends Survey by the Confederation of British Industry (vonKalckreuth, 2006).

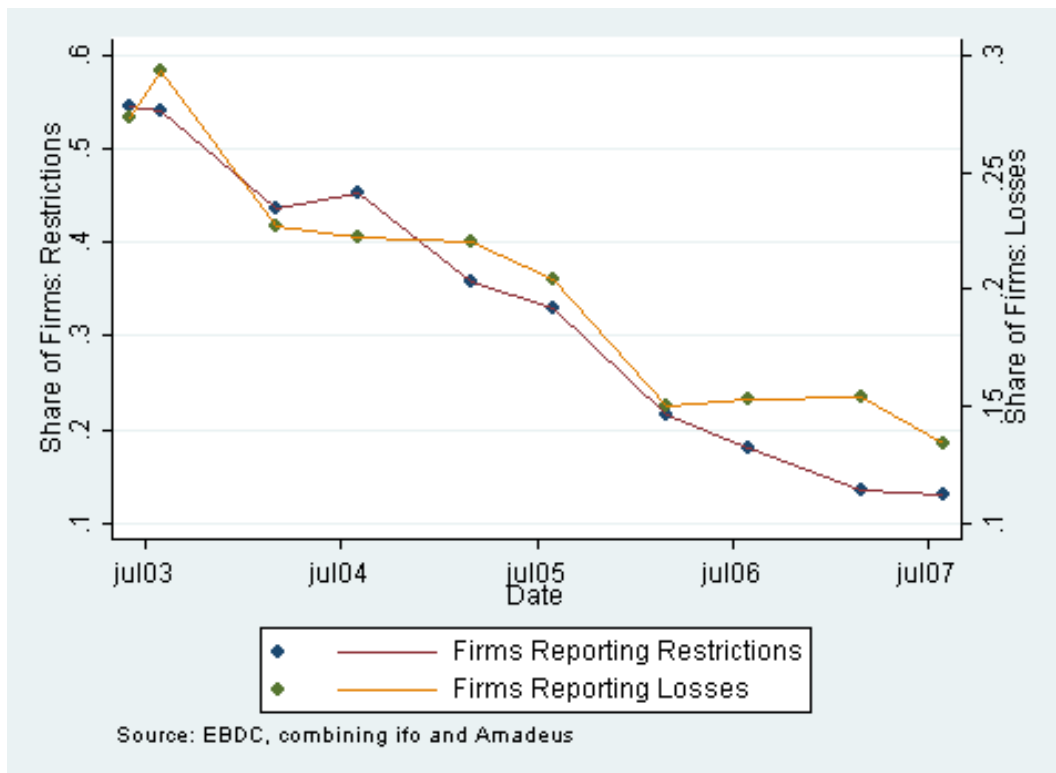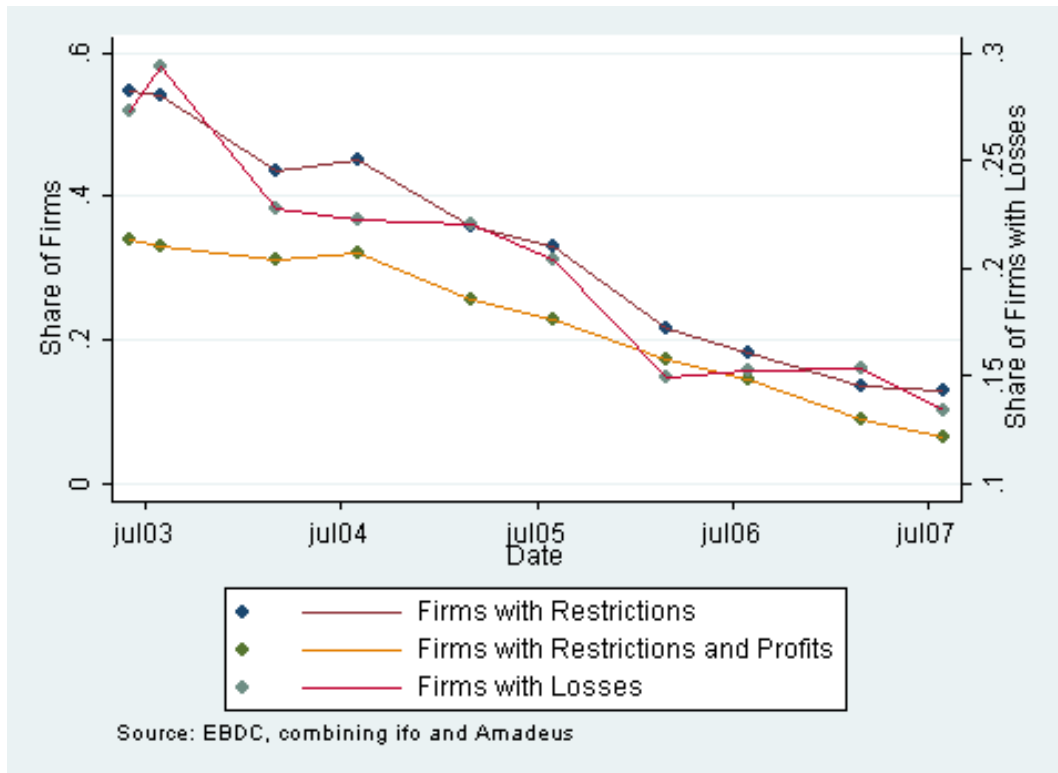Figure 4: Share of Restricted Firms vs. Share of Firms with Losses

Source: EBDC, combining ifo and Amadeus

Figure 5: Share of Restricted Firms with Positive Profits

Source: EBDC, combining ifo and Amadeus

experience losses. The share of firms reporting capital market restrictions is generally twice as large as the share of firms with tax losses (note that the share of firms with losses is reported on the vertical axis at the right-hand side). Remarkably, this relationship proves rather robust across the different time periods.

The descriptive statistics presented so far suggest that the stabilizing effect is subject to different cyclical effects. On the one hand, the share of firms where (net-) revenues are exerting an impact on investment due to capital market restrictions is anticyclical. On the other hand, the share of firms where net-revenues could potentially be smoothed by the corporate income tax due to positive taxable profits is procyclical. Thus, the question arises whether, due to the lack of loss offset, the stabilizing effect of the corporation tax is rather weak in downturns when it would be most important. However, whether this is the case depends on the cyclicality of the joint distribution of losses and credit constraints.

Evidence is provided by Figure 5 which shows the share of firms that are reporting capital market restrictions but still report positive profits (in the above notation, the figure depicts $\frac{m_t}{n_t}$). This group of firms will not only adjust their investment expenditures to the availability of internal funds. They are also in the position to benefit from a stabilization of revenues due to the corporation tax. As it turns out, this group of firms on average makes up a fifth of all firms (axis is on the left hand side), indicating that the stabilizing role of the corporation tax is much smaller than indicated by the share of restricted firms.

To sum up, with regard to the role of taxes as automatic stabilizers, our results suggest that over the ten waves of the ifo Business Survey that provide information about capital market restrictions the corporate income tax acted as a stabilizer of investment in a fifth of the German firms, on average. This share, however, is higher in the beginning of the time period, when the economy suffered from a low degree of capacity utilization and when the business conditions were rather weak. Later, when the business situation improved, the share is much lower. A closer inspection of the cyclical pattern reveals two countervailing effects: the share of firms that face capital market restrictions, which, therefore, tend to adjust investment spending to net revenues, is increasing in cyclical downturns. At the same time, the higher likelihood of losses during downturns tends to offset a possibly stabilizing role of the tax system. Yet the net effect points at a stronger role of the corporate income tax as a stabilizer during downturns.

The role of the corporate income tax needs to be further qualified, however, since it seems likely that the firms where a smoothing of investment might take place are firms that are small or are struggling from bad business perspectives. In the former case, demand effects might be unimportant, in the latter case, firms might have reason to cut down on investment spending, anyway.

Figure 6 depicts results for a simple binary regression testing whether specific firm characteristics have significant effects on the probability to jointly report capital market restrictions and positive profits. Figure 7 provides descriptive statistics. While the dummies for the waves depict the time pattern noticed above, the size-range (szrg) and the age of the firm show significant inverse effects. This is in accordance with standard results in the literature

Figure 6: Characteristics of Restricted Firms with Positive Profits

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Linear regression                                          Number of obs =   3291
                                                           F( 14,  3276) =   23.27
                                                           Prob > F      =  0.0000
                                                           R-squared     =  0.0685
                                                           Root MSE      =  .41335

                          Robust
   restprof |     Coef.   Std. Err.      t     P>|t|     [95% Conf. Interval]
  statebus  |  .0289721   .0110906     2.61    0.009     .0072268    .0507174
      szrg  | -.0368194   .0061029    -6.03    0.000    -.0487853   -.0248534
     pub_q  | -.0628211   .0249556    -2.52    0.012    -.1117512    -.013891
       age  | -.0005937   .0002057    -2.89    0.004     -.000997   -.0001904
  tangible  | -.0303425   .0374341    -0.81    0.418    -.1037391    .0430542
  _Iwave_2  | -.0096717    .039161    -0.25    0.805    -.0864541    .0671108
  _Iwave_3  |  -.035282   .0359132    -0.98    0.326    -.1056966    .0351326
  _Iwave_4  | -.0211418   .0361548    -0.58    0.559    -.0920301    .0497464
  _Iwave_5  | -.0909626   .0345497    -2.63    0.009    -.1587038   -.0232213
  _Iwave_6  | -.1233893   .0345764    -3.57    0.000    -.1911829   -.0555957
  _Iwave_7  | -.1691588   .0360917    -4.69    0.000    -.2399234   -.0983941
  _Iwave_8  | -.1965932   .0360611    -5.45    0.000    -.2672978   -.1258887
  _Iwave_9  | -.2481623   .0336922    -7.37    0.000    -.3142222   -.1821024
 _Iwave_10  | -.2705421   .0326676    -8.28    0.000    -.3345932   -.2064911
     _cons  |  .4309728   .0444439     9.70    0.000     .3438322    .5181134
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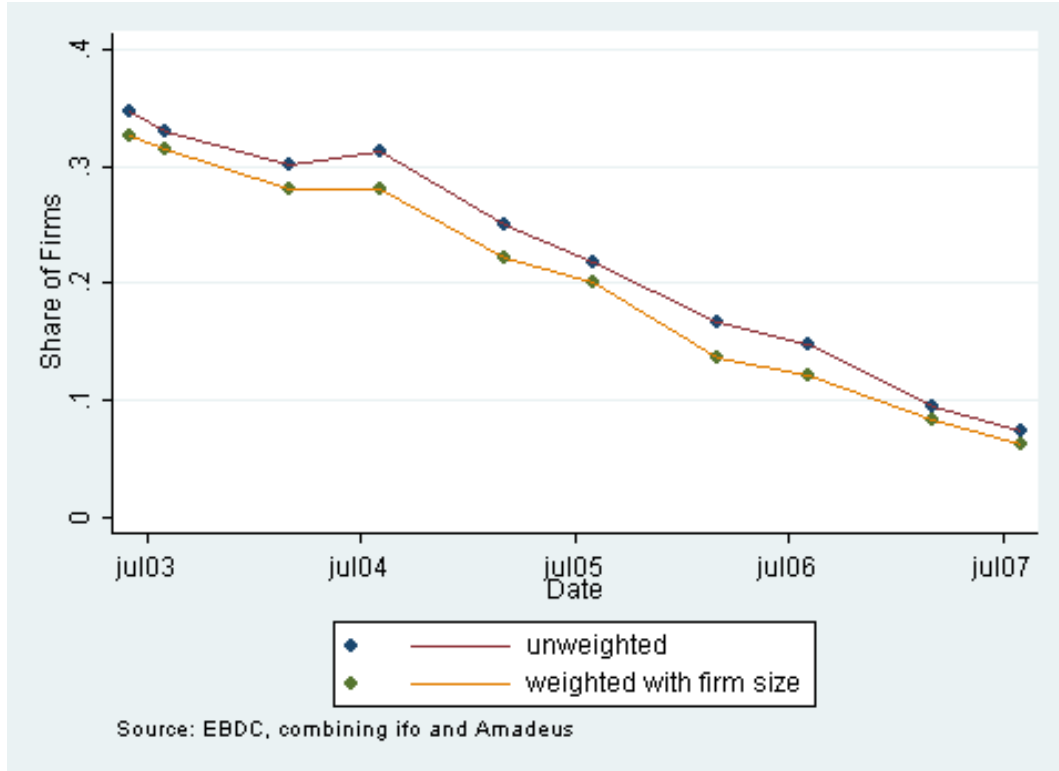
Figure 7: Descriptive Statistics

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   Variable |      Obs        Mean    Std. Dev.      Min        Max
  statebus  |     3291    1.955637     .670599        1          3
      szrg  |     3291    2.815254    1.212357        1          5
     pub_q  |     3291    .0680644    .2518947        0          1
       age  |     3291    43.83197    36.33759        1        107
  tangible  |     3291    .2853577    .1977559        0    .9377039
   restprof |     3291    .2403525    .4273624        0          1
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Figure 8: Weighted Share of Restricted Firms with Positive Profits

on credit rationing. Also publicly quoted firms depict an inverse effect. However, tangibility does not prove significant. The appraisal of the current business situation by the firm (statebus) shows a positive effect. Note that this categorial variable varies between 1 (good) and 3 (bad). Hence, the positive effect shows that firms with a bad business situation are overrepresented among the group of restricted firms with positive profits. However, the firm's size shows a much stronger effect. This suggests that in an assessment of the role of the corporation tax as an automatic stabilizer we should take resort statistics weighted by firm size in order to assess the importance of firms that are restricted in terms of credit but report positive profits. Figure 8 documents that the share of these firms weighted by employment (using the size variable szrg) is somewhat lower indeed.

Based on individual firm data, Figure 9 reports an aggregate measure of stabilization corresponding to Equation 6. ~~in the spirit of Devereux and Fuest (2009).~~ This measure is obtained as a weighted sum of the statutory tax rates for all firms where a positive profit as well as credit

Figure 9: Measure of Stabilization

Source: Own computations, EBDC. Mean figures weighted with firm size.
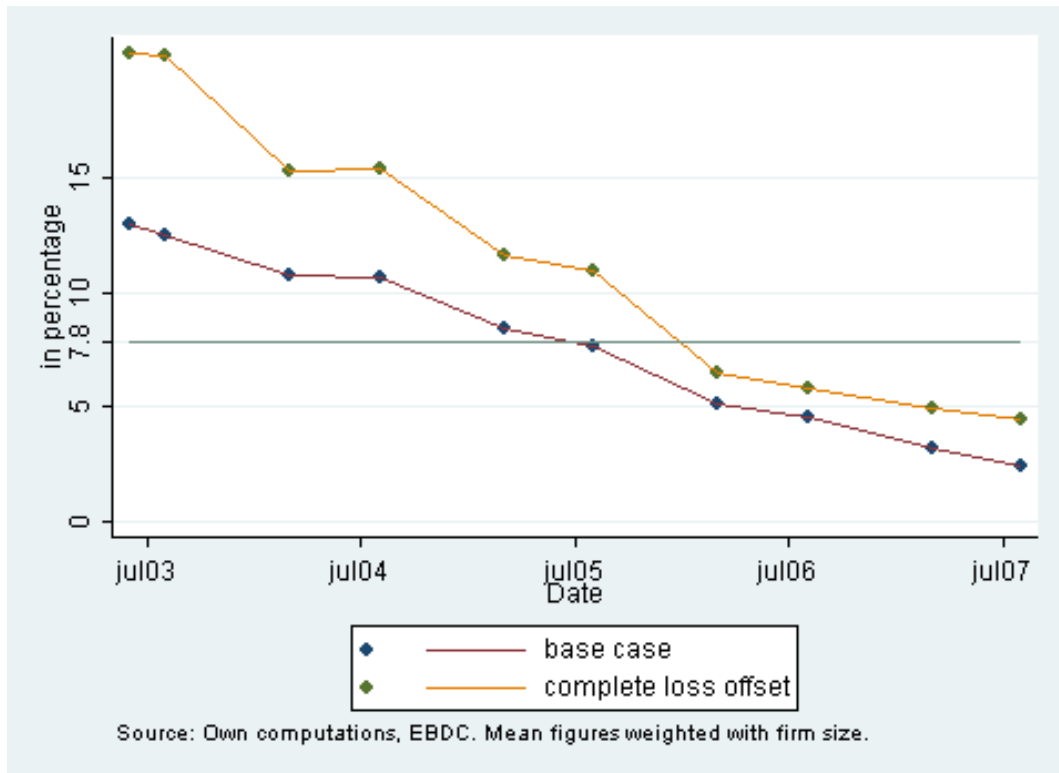
constraints are reported and zero for all other firms.[5] As can be seen from the figure, the average measure of stabilization is about 7.8%. For comparison, in the hypothetical case with complete loss-offset opportunities where all restricted firms benefit from a stabilization of net-revenues, the average measure would be higher: according to our estimates the mean figure would be about 11.5 %.

The figure also shows that the stabilizing effect of corporate income taxation changes systematically over the business cycle. In June 2003, when Germany was in a downturn the stabilization measure is equal to approximately 13 per cent. In the following periods, Germany experienced an upswing, and the stabilization measure declines continuously and reaches a value below 3 per cent for August 2007.

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[5]Note that we compute the firm specific tax rates taking account not only of the corporation tax and the solidarity surcharge but also of the local business tax rate faced by each firm.

4 Conclusions

Using ten waves of a survey of German manufacturing firms, we find that, on average, about 20 per cent of all firms reported both positive taxable income and the existence of credit constraints. Accordingly, at tax rates of approximately 38 per cent, and taking account of the size differences of the firms, demand stabilization through the corporate income tax would amount to about 8 per cent of the initial shock to gross revenues.

While the data used in the above analysis offers a unique combination of firm specific information about credit market restrictions and financial statements, the empirical magnitudes presented are subject to uncertainties. The micro-level evidence rests on financial statement and survey data that captures the conditions faced by the firm only by approximation. The financial statements might differ from the tax accounts and also do not provide information about the existence of tax shields such as loss carry-forwards. Also the survey data on credit constraints should be considered with caution, since the distinction of the different response categories might be somewhat fuzzy. Besides measurement issues, the evidence about the level of stabilization needs to be qualified in a number of ways. First, this estimate is probably providing an upper bound of the stabilizing effect since loss making firms and firms facing credit constraints may constitute a non-representative group of firms. Indeed, our analysis reveals that the firms reporting credit constraints and positive profits are smaller than the average. We, therefore, weight the data with firm-size in order to calculate the above aggregate measure of the stabilization effect. We also find that firms with a bad business situation are overrepresented among these firms. Hence, the willingness of these firms to invest might be low.

Our results also suggest that the stabilizing effect of corporate income taxation changes systematically over the business cycle. While stabilization effects are mainly expected to occur for firms with positive taxable incomes that are also facing credit constraints, our data suggests that the likelihood to report positive taxable income may be procyclical whereas the likelihood of credit constraints is anticyclical. In our dataset, it turns out that the change in credit constraints over the cycle dominates such that the effectiveness of the corporate tax

as an automatic stabilizer tends to increase during cyclical downturns. Of course, due to the rather short time period considered, more research is needed to substantiate this result.

Can we expect our results, which have been derived with German data, to apply to other countries as well? Most European countries have lower statutory corporate tax rates, so that the potential for stabilization effects is lower. But it might be the case that other countries, in particular countries with lower GDP per capita and less developed capital markets, exhibit a larger share of credit constrained firms. This would suggest a stronger effect on demand stabilization.

What are the policy implications of the analysis in this paper? One immediate implication is that our analysis highlights a cost of crowding back loss offset provisions, in particular loss carryback possibilities: restricting loss offset reduces the automatic stabilization effects of the tax system. Of course, extending loss offset would come at a cost in terms of revenue raised, and question is whether the benefits in terms of automatic stabilization properties of the tax system justify this. The benefits of automatic stabilization through the corporate tax system depend on a number of factors. One issue is whether demand stabilization, if it works, also stabilizes domestic output. If firms import investment goods or intermediate inputs, part of the demand stabilization achieved by automatic stabilizers will leak to other countries. The existence of multinational firms may be another reason why the benefits of automatic stabilization may be limited. These firms may well use the cash flow generated in one country to finance investment in another country. These are interesting issues for future research.

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