# Exchange Rate Pass-Through and Credit Constraints: Firms Price to Market as Long as They Can

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## Abstract

The macroeconomic evidence on the short-term impact of exchange rates on exports and prices is notoriously weak. In this paper I examine the micro-foundations of this disconnect by looking at firms' export and price setting decisions in response to fluctuations in exchange rates and credit conditions using German firm survey data. Firm-level data on pricing and export expectations enables me to measure the instantaneous response of each firm to changing financial constraints and the EUR/USD exchange rate, which avoids endogeneity issues. I find that primarily large firms cause the exchange rate "puzzles" in aggregate data. The exchange rate disconnect disappears for financially constrained firms. For these firms, the pass-through rate of exchange rate changes to prices is more than twice the rate of unconstrained firms. Similarly, their export volumes are about twice as sensitive to exchange rate fluctuations. Credit therefore affects not only exports via trade finance, but also international relative prices by constraining the scope of feasible pricing policies. The effect of borrowing constraints is particularly strong during the recent financial crisis.

*Keywords:* exchange rate pass-through, exchange rate disconnect, financing constraints, pricing to market, exports, credit crunch, trade collapse, law of one price, trade finance

*JEL classification:* F31, E44, F40, E32, G21

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# 1　Introduction

The response of exports to changes in the nominal exchange rate is notoriously weak. From 1999 to 2010, for example, the exchange value of the U.S. dollar (USD) fell by more than 20 percent: Starting at 0.94 Euro (EUR), it first increased to more than 1.10 EUR, then dropped to less than 0.68 EUR, and recovered recently a bit to about 0.75 EUR. As Figure 1 shows, United States (U.S.) import prices from European Union (E.U.) barely responded to the initial appreciation. Only after a massive depreciation of the USD, import prices started to increase. During 2004–2008, years in which the USD did not appreciate, import prices from the E.U., and Germany in particular, followed the exchange rate closely. But the appreciation of the USD after 2008, again, did not lead to lower import prices, just as in the beginning of the century. Despite the increase in import prices, during 2002–2006 the U.S. goods and services balance did not improve. After a financial crisis and a "great recession", the U.S. current account today is again where it was in 1999, despite the lower EUR/USD exchange rate (Figure 2).

[Figure 1 about here.]

[Figure 2 about here.]

This recent behavior of U.S. imports and import prices reflects a well-known fact in international economics: The aggregate pass-through of exchange rate changes to import prices is incomplete. Accordingly, imports and exports respond to exchange rate fluctuations only weakly and slowly, and in effect, the stabilizing role of freely floating exchange rates on the current account is small.

In this paper I trace this incomplete exchange rate pass-through (ERPT) to decisions and financial constraints at the firm level. It has been noted that firms rely heavily on trade credit for financing their exports, and that bank health directly affects their export activity (Amiti and Weinstein, 2011). But in fact, credit constraints limit choices *throughout* the firm, including pricing decisions. With this paper I aim to answer the following three questions: Firstly, where does the lack of ERPT stem from? Secondly, do financial constraints affect firms' export and pricing behavior, and, if so, how? And lastly, which properties and circumstances make firms contribute to the exchange rate disconnect?

Using a unique dataset of firm surveys I am able to study the determinants of pricing-to-market (PTM) decisions by firms and how these affect the sensitivity of a firm's exports to the EUR/USD exchange rate. My key finding is that firms subject to borrowing constraints

behave much closer to what economic theory predicts than unconstrained firms: They keep PTM to a minimum, and their exports follow exchange rate changes closely.

A key advantage of my approach is that price and export expectations in my dataset are *expected* firm-level changes in response to contemporaneous realized exchange rate changes. Conventional studies attempt to find a relationship between current realized exports or current realized prices with lagged or current exchange rates. But delays in the implementation of price changes, asynchronous sampling, and inconsistent aggregation of exports and prices blur any potential causality and impair the comparability of such aggregated measures.

This paper contributes to the literature in three ways: First, it compares the pricing and export behavior of financially constrained and financially unconstrained firms at the firm level. Second, it provides new micro evidence on PTM; in particular, that firms engage in PTM only as long as their finances allow. Third, it shows that the recent credit crunch affected exports not only by cuts in trade finance, but also by forcing firms to deviate from their long-run (optimal) pricing strategy.

This paper is organized as follows: The following Section 2 puts this paper in the context of recent empirical work. Section 3 introduces the methodology, including model and estimation procedure, and provides a quick overview of the data. Section 4 discusses and compares the determinants of firms' export and pricing decisions. I look at subsamples, e.g. by industry and firm size, in Section 5. After some robustness checks in Section 6, I conclude with a short summary in Section 7.

# 2    Incomplete ERPT and the Disconnect Puzzle

Low ERPT to aggregate import prices is a well-studied phenomenon. The comprehensive study by Vigfusson, Sheets, and Gagnon (2009), for example, confirms a generally low ERPT to U.S. import prices. But German exporters, which I focus on in this paper, show in their sample only very little signs of pricing to (export) market. Recently, ERPT to aggregate U.S. import prices seems to have declined even more. Marazzi and Sheets (2007) find such a trend since the early 1970s, which they attribute to changing patterns in global competition.

Economic theory provides four main explanations for incomplete ERPT:[1] local content, price adjustment costs, market power (i.e. entry costs), and marketing. Local content is

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[1]Economists have observed incomplete ERPT even before the Bretton-Woods system collapsed. See e.g. the study by Dunn (1970) for Canada, or by Steinherr and Morel (1979) for Germany. Closely related is the persistence of violations of the law of one price, see e.g. the recent microdata-based work by Crucini and Shintani (2008).

by construction not exposed to exchange rate fluctuations. Price adjustment costs, often referred to as menu costs, are small and barely affect pass-through, except for delaying adjustment (Nakamura and Zerom, 2010). Similarly, costly export entry and exit can create an exchange rate band of zero ERPT (Dixit, 1989). Taking a less extreme scenario, any profit-maximizing firm with market power chooses in the optimum only a partial pass-through (Sibert, 1992). Finally, for a variety of marketing reasons a firm might permanently price discriminate between domestic and foreign markets, i.e. price to market in order to invest into its future customer base (Drozd and Nosal, 2012) or in order to account for differences in market structure (Alessandria, 2009; Giovanni, 1988; Knetter, 1993).

To understand the origins of the low ERPT found in aggregate price indices, research focuses on more and more disaggregated series.[2] For example, an extremely disaggregated dataset forms the basis of the study by Parsons and Sato (2008). Among quarterly prices of Japanese exports to 13 countries at the 9-digit level they detect the strongest evidence of PTM in exports to the U.S., and essentially no change in ERPT during the past 20 years – quite in contrast to the aggregate studies mentioned at the beginning of this section.

But whereas disaggregation along the industry or product dimension provides valuable insights in the heterogeneity across products, it ignores that the unit of decision making is the firm, or firm business unit, which typically spans several, not necessarily adjoining, product categories. To understand limited ERPT, we must understand pricing decisions at the firm, or product-firm, level. As of today, there are only a handful of empirical studies based on firm panels.

An early, but specific, exception is the work of Gron and Swenson (1996) for the car industry in the late 1980. Their ERPT estimates are higher than the ones in the aggregate studies of that time, because they explicitly take the effect of local production into account. They also find that multinational firms with the ability to quickly shift car production from one country to another adjust their prices even less.

More recently, Martín and Rodriguez (2004) note that Spanish firms during the 1990s passed through most exchange rate fluctuations within the European Monetary System, because exchange rate shifts *within* such a system of politically set exchange rates are likely to be permanent. Basile, de Nardis, and Girardi (2009) use discrete Italian firm-level survey

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[2]Yang (1997), for example, finds incomplete ERPT in industry-level data. It varies across industries and is positively correlated to product differentiation. More recently, Campa and Goldberg (2005) look at five product categories for 23 OECD countries, and find that the partial pass-through in the short run disappears in the long run. Comparing the pass-through estimates at the country level with estimates at the product-category level, they observe that changes in aggregate pass-through over time stem primarily from changing import bundles.

data from the early 2000s to estimate a panel VAR of relative prices, exchange rates, and other competition proxies. They conclude that whereas there is some evidence of PTM for Italian firms, it fades quickly with time.

Given the weak link between the exchange rate and nominal prices, it comes at no surprise that its impact on real economic variables is weak as well. Accordingly, many studies detect a lack of comovement of exchange rates and macroeconomic fundamentals. The volatility of exchange rates appears too high to be justified by macroeconomic fundamentals, and in horizons of less than one year exchange rates seem effectively disconnected from fundamentals. In this paper I look a specific instance of this "exchange rate disconnect puzzle" (Obstfeld and Rogoff, 2001), the disconnect between exchange rates and the current account balance, in particular export volume. As empirically shown by Thursby and Thursby (1987), and more recently by Flood and Rose (1995) and Dekle and Ryoo (2007), exchange rate changes have only small or insignificant effects on exports.[3] Using French firm-level data, Berman, Mayer, and Martin (2012) trace the export disconnect back to PTM by high-productivity firms.

Most studies of ERPT and the disconnect puzzle, however, work with aggregate or product data. They are therefore unable to condition on the situation of firms, which make the underlying decisions. Accordingly, the literature on the importance of financing constraints for ERPT and the exchange rate disconnect is very limited. This is unfortunate, as financing constraints might be a driving factor behind the trade collapse of 2009. Sticking to a PTM strategy in a foreign market requires financial strength to maintain constant prices throughout an exchange rate cycle, even if prices fall below marginal cost in terms of domestic currency. When borrowing becomes difficult as in the recent financial crisis, such a PTM strategy quickly becomes infeasible. This paper shows that the financial strength of a firm is indeed a key determinant of whether it engages in PTM or not.

An early related study is Swamy and Thurman (1994). They show based on quarterly aggregate data for the U.S. of the 1970's and 1980's that pass-through to domestic import prices is stronger during periods of massive depreciation and low profit margins of the importing firm. Whereas they do not explicitly associate profit margins with financing constraints, their results could be interpreted in this way. Other studies analyze the issue at the industry

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[3]Explanations cover a wide spectrum, ranging from incomplete financial markets (Devereux and Engel, 2002), PTM (Betts and Devereux, 2000), adjustment costs paired with temporary exchange rate fluctuations (Kasa, 1992), noise traders or otherwise biased exchange-rate expectations (Frankel and Froot, 1987), to recently more technical explanations such as zero discounting with unit-root fundamentals (Engel and West, 2005), or information asymmetries at the microstructure level and sampling frequency (Evans, 2010).

level. In this vein, Campa and Goldberg (1999) find for four industrialized countries that investment is usually the more responsive to exchange rates the lower the markups (i.e. the tighter the financing constraints) in a (2-digit) industry are.

Recent work has started examining the importance of credit financing for exports. Financial constraints appear to keep French (Bellonne, Musso, Nesta, and Schiavo, 2008; Guillou, 2008) and Italian (Caggese and Cuñat, 2010) manufacturing firms from becoming an exporter. But according to Campa (2004) sunk entry cost hardly affects the sensitivity of aggregate trade volumes of Spanish manufacturing firms to exchange rate changes during 1990–1997. In this paper I focus instead on the intensive margin of exports. With Japanese firm-level data Dekle and Ryoo (2007) show that financing constraints proxied by *keiretsu* membership indeed affect firms' responses to exchange rate fluctuations. They show that the exports of Japanese firms with a close relationship to a bank, i.e. of firms in a *keiretsu* network and thus with easy access to financing, respond less to exchange rates than *non-keiretsu* firms. In contrast, I measure financial constraints directly, without relying on a proxy, based on a large firm-level dataset.

# 3   Methodology

In this section I first define incomplete ERPT and the exchange rate disconnect based on a standard, static model. Then, I describe my firm-level survey dataset and a model-inspired estimation method, which is able to cope with the features of ordinal survey responses.

## 3.1   ERPT and Export Disconnect under Imperfect Competition

Consider an economy of two identical countries, indexed by $i \in \{1, 2\}$. An exporting firm, headquartered in country 1, competes in both countries with a local firm. Each local firm incurs only local costs and serves only its local market. Its profit in local currency is $\pi_i = (P_i - C_i)X_i$, where $P_i$ denotes the price of the good, $C_i$ the per-unit cost – both in terms of local currency – and $X_i$ the quantity sold by each local firm. The exporting firm serves each country with quantity $X_i^*$. Its profit in its home market is $\pi_1^* = \left[ P_1^* - (C_1^* + SC_2^*) \right] X_1^*$, where $C_i^*$ denotes the cost incurred in each country, denominated in the respective local currency. The exchange rate $S$ measures country 1 currency units per one country 2 currency unit. The exporting firm's profit in its foreign market is analogously $\pi_2^* = \left[ SP_2^* - (C_1^* + SC_2^*) \right] X_2^*$.

Both countries are populated by an identical representative agent with a nominal endow-

ment of $Y$ and preferences following the utility function

$$U_i(X_i, X_i^*) = [\alpha X_i^\rho + (1 - \alpha)X_i^{*\rho}]^{1/\rho},$$

where $\alpha$ and $\rho < 1$ measure the preference weights and substitutability of goods, respectively.

The equilibrium market shares of the exporting firm, $\lambda_i^*$, in each country are

$$0 < \lambda_i^* = \frac{P_i^* X_i^*}{Y} < 1. \tag{1}$$

The market share in the foreign country under price competition is given by (see e.g. Bodnar, Dumas, and Marston, 2002)

$$\frac{\lambda_2^*}{1 - \lambda_2^*} \left[ \frac{1 - \rho\lambda_2^*}{1 - \rho(1 - \lambda_2^*)} \right]^\rho = \frac{\alpha}{1 - \alpha} \left[ \frac{SC_2}{C_1^* + SC_2^*} \right]^\rho.$$

Analogously, the market share of the exporting firm in its home country solves

$$\frac{\lambda_1^*}{1 - \lambda_1^*} \left[ \frac{1 - \rho\lambda_1^*}{1 - \rho(1 - \lambda_1^*)} \right]^\rho = \frac{\alpha}{1 - \alpha} \left[ \frac{C_1}{C_1^* + SC_2^*} \right]^\rho.$$

The exporting firm charges in its home market a price of

$$P_1^* = (C_1^* + SC_2^*) \frac{1 - \rho\lambda_1^*}{\rho(1 - \lambda_1^*)}, \tag{2}$$

and in its foreign market

$$P_2^* = \frac{C_1^* + SC_2^*}{S} \frac{1 - \rho\lambda_2^*}{\rho(1 - \lambda_2^*)}. \tag{3}$$

The corresponding quantities follow directly by substituting the respective prices (2) and (3) into Equation (1).

ERPT to export prices is

$$\frac{dlnP_2^*}{dlnS} = -\frac{C_1^*}{C_1^* + SC_2^*} \frac{1 - \rho\lambda_2^*}{1 - \rho^2\lambda_2^*(1 - \lambda_2^*)}. \tag{4}$$

It is incomplete if $\frac{dlnP_2^*}{dlnS} > -1$.

The reverse pass-through to import prices is

$$\frac{dlnP_1^*}{dlnS} = \frac{SC_2^*}{C_1^* + SC_2^*} \frac{1 - \rho\lambda_1^*}{1 - \rho^2\lambda_1^*(1 - \lambda_1^*)}. \tag{5}$$

ERPT to import prices is incomplete if $\frac{dlnP_1^*}{dlnS} < 1$, with the extreme case of no ERPT if (5) equals zero.[4] The ratio (5) is smaller than one, but positive, if either a) $0 < \rho < 1$ and $\lambda \neq 0$, or b) $0 \leq \rho < 1$ and the final good contains local content reflected by local costs $C_1^* > 0$. If local costs are larger than foreign costs $(C_1^* > SC_2^*)$, then the percentage change in import prices is smaller than the percentage change in export prices. Given that many import markets are well characterized by substitute goods under oligopolistic competition, some degree of incompleteness of ERPT is to be expected.

The response of export volume to exchange rate fluctuations is

$$\frac{dlnX_2^*}{dlnS} = \frac{C_1^*}{C_1^* + SC_2^*} \frac{1 - \rho\lambda_2^*}{1 - \rho^2\lambda_2^*(1 - \lambda_2^*)} \frac{1 - \rho\lambda_2^* - \rho^2(1 - \lambda_2^*)^2}{1 - \rho}. \tag{6}$$

Exports are disconnected from exchange rates if this ratio is close to zero. For $\rho \in (-1, 1)$ expression (6) is positive, taking values larger and smaller than unity. It is larger than one, for example, as long as foreign costs are not too small (and thus foreign market share is not too large), i.e. the percentage change of exports frequently exceeds the one of the exchange rate. Thus, unlike the incomplete ERPT, which by (4) is an economic necessity for substitute goods under imperfect competition, the exchange rate disconnect of export volume is less clear-cut. As Equation (6) reveals, at small cost differences between the home and the foreign firm we need considerable complementarity of goods (i.e. $\rho \leq -1$) for a complete disconnect to obtain.[5]

The import price and export quantity responses in (5) and (6) serve as benchmarks, reflecting the optimal response of a myopic firm. Note that under the benchmark model, credit does not affect prices and exports. In practice firms often deviate from (5) and (6) by stabilizing prices and volumes for long-term marketing considerations (e.g. Drozd and Nosal, 2012). Any such a deviation from the (short-term) profit maximum given by (5) and (6) is costly, so that firms have a temporary financing need until the maintained customer relationships pay off again in the future. Whether a firm can bear these marketing costs depends on its financial health, and in particular its ability to borrow after an adverse

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[4]Ruling out the exotic case of a negative ERPT requires assuming $\rho^2 < \frac{1}{\lambda(1-\lambda)}$. This holds for sure if $\rho \in (-2, 1)$. I restrict $\rho \in (-1, 1)$, which also ensures that the export response (6) is always positive. Note that the goods do not have to be substitutes $(\rho > 0)$, but can also be imperfect complements $(\rho \in (-1, 0))$ for the following results to hold.

[5]At the boundary $(\rho \in \{-1, 1\})$ the disconnect exists for perfect substitutability $(\rho \to 1)$ paired with complete foreign market share $(\lambda = 1)$ and at modest complementarity $(\rho = -1)$ paired with no foreign market share $(\lambda = 0)$, both of which can occur under very large cost differences between the home and the foreign firm. For some range of negative $\rho < -1$ the export response is negative, but approaches $1 - \lambda$ for $\rho \to -\infty$.

exchange rate change.

## 3.2 Data Description

The *ifo* (Information und Forschung) Institute for Economic Research conducts monthly business surveys for Germany.[6] Firms are asked to rate the development of key measures such as unfilled orders, prices, and business expectations on a three-level scale. I use business survey data from the *ifo* manufacturing survey, known as the "Konjunkturtest Verarbeiten-des Gewerbe" (KT VG), for the years 2003M01 –2010M08. Each month, more than 2500 German manufacturing firms or major business units respond to the survey.

Since 1980 the *ifo* survey has asked firms to self-assess their export expectations for the upcoming three months on a three-level scale: "The volume of our export trade with XY will likely – taking present transactions and ongoing contract negotiations into account – a) increase, or b) remain approximately the same, or c) decrease, or d) we do not export XY." Likewise, it has asked firms about their planned domestic price changes over the next three months with the question: "Our net domestic prices will – taking changes of conditions into account – a) likely rise, or b) remain approximately the same, or c) drop."

The dataset does not contain foreign prices. The share of imported inputs in the costs of Germany's tradable production is large, however. Goldberg and Campa (2010) estimate it at 27 percent on average, and note that manufacturing industries have a much larger share of imported inputs. I therefore use domestic prices to examine ERPT into home via intermediate goods.

For reasons of confidentiality and efficiency, the survey dataset does not ask firms directly about their specific export markets. However, since 1994 firms have been asked once per quarter whether they export to markets outside of the E.U., and how they assess their competitive situation there. If a firm answered these questions during the most recent year, I consider it as a firm exporting to markets outside the E.U..[7] Based on this definition, about 60 percent of responding firms export to outside the E.U., which corresponds to at least 1500 firms each month.

The question about credit constraints was introduced to the survey in 2003. Its asks firms:

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[6]The survey first and foremost serves the purpose of constructing the monthly *ifo* business climate indicator. See Becker and Wohlrabe (2008) for details of the survey. The microdata are available for researchers at two dedicated computer terminals at the *ifo* Institute Munich after an at least six-month embargo.

[7]This is a very restrictive assumption, because it drops also exporting firms which do not reply to these irregular questions, as well as firms which do not export right now, but would do so if a business opportunity opened up. Appendix B reports the results for all firms in the sample.

"How do you rate currently the willingness of banks to provide credit to firms?" Figure 3 provides a summary of responses by German firms that export to outside the E.U..[8] The share of firms reporting that credit is restrictive is plotted by the dashed line. It declined from more than 50 percent in 2003 to a low of 13 percent in 2007. After September 2008 it jumped abruptly and stayed close to 48 percent through most of the second half of 2009. By August 2010 the share of credit constrained firms is again less than 30 percent. Clearly visible in the figure are the two periods in which credit was tight overall in our sample: before the year 2006, and during 2009.

[Figure 3 about here.]

The upper line in Figure 3 shows the EUR/USD exchange rate, which is the average monthly mid quote provided by oanda.com. Additionally, the share of firms which expect an increase in their domestic prices within the next three months is shown by the widely dotted line. Contrary to what the appreciating EUR would suggest, the share of firms expecting higher domestic prices increased almost monotonically during 2003–2008 from 4 percent to 25 percent. During the financial crisis the share of firms planning a domestic price increase fell back to 4 percent in mid-2009 and partly rebounded to slightly below 20 percent by August 2010. These expected price increases seem at best to be disconnected from, but rather positively correlated with, appreciation episodes of the EUR.

The share of firms which expect a decline of their export volume within the next three months is plotted by the narrowly dotted line. While in 2003 16 percent of firms expected their exports to fall, only 3 percent of German exporters were that pessimistic in the spring of 2007, despite an ever-appreciating EUR. Due to the financial crisis by March of 2009 41 percent of exporters expected declining exports, but by mid-2010 the share of pessimistic firms returned again to a pre-crisis level of about 7 percent. Except for the episode of spreading optimism in 2010, which coincides with a depreciation of the EUR, export expectations appear to be unrelated to changes in the EUR/USD exchange rate.

Overall, an aggregate view onto this firm survey dataset brings up the same exchange rate "puzzles" and "disconnects" as standard macroeconomic time series.

## 3.3 Estimation Approach

The data is a short panel with a large cross-section, and irregularly spaced. The most recent period is oversampled, as the credit information has been collected at a monthly frequency

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[8]Tables 14 and 15 in the appendix provide a more detailed overview of the data.

only since November 2008, and two times per year before that. It consists primarily of naturally ordered discrete observations, $z_{it}$, with usually three options. I therefore use an ordered response model.

Consider a firm $i$ planning its pricing strategy and forming its export expectations at time $t$ for the next period, given its current borrowing constraints, unfilled home and foreign orders, and recent exchange rate and price changes. The firm's expectation conditional on this information set $\Omega_{it} = \{x_t, f_{it}, a_{it}, s_i, y_t, m_t\}$, is

$$E\left(z_{it}^* | x_t, f_{it}, a_{it}, s_i, y_t, m_t\right),$$

where $x_t$ denotes the one-month change of the natural logarithm of the EUR/USD exchange rate and $a_{it}$ represents all other covariates such as business expectations and unfilled orders. $f_{it}$ indicates current financial constraints, i.e. $f_{it} = +1$ for an accommodating, $f_{it} = 0$ for a neutral, and $f_{it} = -1$ for a restrictive credit regime. The remaining variables capture industry fixed effects, $s_i$, and year and month fixed effects, $y_t$ and $m_t$.

The observed firm response, $z_{it}$, to a discrete *ifo* survey question based on this expectation is

$$z_{it} = \begin{cases} +1 & \text{if} \quad z_{it}^* > c_1 \\ 0 & \text{if} \quad c_1 \geq z_{it}^* \geq c_2 \\ -1 & \text{if} \quad z_{it}^* < c_2. \end{cases}$$

In the price regressions the unobserved variable $z_{it}^*$ is the planned change in domestic prices. Analogously, in the export regressions $z_{it}^*$ is the unobserved expected quantity change in exports. Formally, $z_{it}^*$ is the underlying latent variable, which maps into the observed survey responses $z_{it}$ depending on the cutoff points $c_1$ and $c_2$.

With the assumption that the errors in forming these expectations are *iid* normal, the ordered probit model (Aitchison and Silvey, 1957) becomes a natural empirical setup.[9] I model the latent variable by

$$z_{it}^* = \alpha_1 x_t + \alpha_2 f_{it} + \alpha_3 x f_{it} + \gamma a_{it} + \beta_1 s_i + \beta_2 y_t + \beta_3 m_t + \varepsilon_{it},$$

where the variable $x f_{it}$ interacts the exchange rate with financial constraints, i.e. $x f_{it} = x_t$ if

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[9]I use the normalization $\sigma^2 = 1$ and set the intercept to zero by setting the coefficient on the first of each set of fixed effects (industry, year, month) to zero. Because the number of fixed effects is both small and fixed relative to the number of firms, the small-sample downward bias in limited dependent variable models with fixed effects (Greene, 2004) does not apply here.

in period $t$ the firm $i$ is credit constrained, and zero otherwise. The covariates, $a_{it}$, control for the effect of the firm's current business situation and its current business outlook.

Albeit commonly used (e.g. Bricongne, Fontagne, Gaulier, Taglioni, and Vicard, 2010; Chor and Manova, 2010; Iacovone and Zavacka, 2009), balance sheet and cash flow statement items, such as accounts receivables or net cash flow, are unfit as measures of dependence on external financing. They are not only, as Ahn, Amiti, and Weinstein (2011, p.299) correctly note, uncorrelated to trade finance. They are not even a useful indicator for financial constraints in general, unless viewed in context with each firm's actual financing needs. Unfortunately, financing need information is not readily available, because projects deferred due to financing difficulties are mentioned neither in quarterly nor annual reports. It would require a one-by-one examination of each firm's history and projections, which is what good financial analysts do, but none of the papers on the recent trade collapse.

Take as an example a firm with high accounts receivable (relative to total assets). Accounts receivable fluctuate over time. A high value might indicate booming sales or low payment moral. High accounts receivable indicate also that the firm does not sell its accounts receivable to a factor. Maybe it does not sell them because it cannot find a factor. But just as likely is that it (optimally) chose to avoid the factoring discount, and collect its accounts receivable itself. In this sense, firms with high accounts receivable are often among the least credit constrained, because they can afford to keep the accounts receivable on their books. A similar argument can be made for ratios of capital expenditure and cash flow related measures.

For these reasons, I refrain from using balance sheet or cash flow statement items as a measure of dependence on external financing in my empirical setup. The case of dependence on external financing can only be made, when the firm's decisions actually change in response to changes in credit availability. This is what the regressions in the next section explore.

# 4    Empirical Results

In this section I turn to the empirical results, based on the subsample of firms which report exports to outside the E.U.. The exports of these firms are therefore directly affected by the EUR/USD exchange rate. All results are based on ordered probit regressions with 14 one-digit industry dummies, as well as calendar year and calendar month dummies, estimated by maximum likelihood.

## 4.1 Exchange Rate Effect on Exports

To put the following results about expected exports into context, I first verify that current exchange rate changes have no effect on past orders. Table 1 shows the impact of exchange rates on the current backlog of foreign orders. As expected, exchange rate changes during the most recent month have almost no effect on past and contemporaneous foreign orders. Current order backlog accumulates over several months, and because exchange rates are hard to forecast, orders from months ago do not anticipate exchange rate changes during the most recent month.[10]

The picture changes dramatically when we look at export expectations in Table 2. The second row of this table reveals that easy borrowing makes all firms unconditionally more optimistic about future export volume. This effect works fully through the intensive margin, because all firms in this sample are exporters already ex-ante. It confirms that credit financing is an important variable cost component for exports, as recently emphasized by Paravisini, Rappoport, Schnabl, and Wolfenzon (2011) for Peruvian firms. Furthermore, the first row shows that a depreciating home currency improves export expectations somewhat, just as Equation (6) predicts. But for financially constrained firms, represented by row 3, the effect of exchange rate changes is significantly larger. Across all specifications, an exchange rate change has at least twice the impact on a financially constrained firm than on an unconstrained firm. This means that the exchange rate disconnect is much weaker for financially constrained firms. If exchange rates move in favor of the financially constrained firm, it leads to a massive export boost.

[Table 1 about here.]

[Table 2 about here.]

Including firm-level control variables, such as business expectations (specifications 2, 3, 4, and 5), unfilled orders (specifications 3 and 5), or the backlog of foreign orders (specifications 4 and 5) does not change the results.

[Table 3 about here.]

The marginal effect of an exchange rate change on the probability of each of the three export expectation categories is shown in Table 3, where I evaluate all variables at zero. In

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[10]Unlike the "expectation regressions" in Tables 2 and 5, endogeneity potentially biases the results of the "backward looking-regressions" in Tables 1 and 4. Whereas following an instrumental variable approach would mitigate this bias, it would destroy direct comparability with the main results in Tables 2 and 5.

this extreme scenario the EUR trades at par with the USD, and a hypothetical appreciation of the log EUR/USD by one induces at the margin only 26 percent of firms to revise their export expectation upwards within a month. 13 percent improve their expectation from "decreasing exports" to "unchanged exports", and another 13 percent improve their expectation to "increasing exports". This modest reaction of firm expectations is another instance of the "exchange rate disconnect puzzle": Despite a drop of the value of the EUR, say, export volume of German firms does not increase, not even in expectation. Thus the exports of almost three quarters of the firms do not follow the standard profit maximization problem reflected in Equation (6). If a firm is financially constrained, however, the exchange rate change has more than twice that impact, because it improves competitiveness in USD markets without requiring additional financial resources. More than half (56 percent) of these firms expect a higher export volume thereafter, in line with Equation (6): 28 percent improve their expectation from "decreasing exports" to "unchanged exports", and another 28 percent improve their expectation to "increasing exports". Overall, a depreciation of the USD as the one during 2001–2008 induces financially constrained German exporters to scale down their export expectations at the margin by almost half as much as after a simultaneous drop of business expectations, unfilled orders, and backlog of foreign orders from the "normal" to the "bad" state.

The strong impact of financing constraints on exports confirms the importance of trade finance that Ahn et al. (2011) emphasize with their study on U.S. import and export prices.

## 4.2   Exchange Rate Effect on Domestic Prices

The most obvious reason for the differential export effects of exchange rates between financially unconstrained and financially constrained firms are the prices they charge in the destination market. Unfortunately, data on foreign prices is not available in the *ifo* panel. Therefore I examine instead for the same set of firms ERPT in the reverse direction: How does an exchange rate move affect domestic prices? Comparing Equation (5) with Equation (4) reveals that the two ERPT rates are in fact closely related – parameters and costs enter both expressions in the same way.

Table 4 reports the impact of exchange rate changes on domestic price changes in the previous month, and Table 5 reports the impact on the domestic price expectations. As the first rows reveal, there is always a positive pass-through, even for the average firm, just as Equation (5) predicts for substitute goods. Analogous to my findings on exports, the effect of exchange rate changes on contemporaneous price changes in Table 4 is weaker than the

effect on price expectations in Table 5.

The key results about pricing are reported in Table 5. Striking is again the strong impact of financial constraints on ERPT. Row 3 shows that for financially constrained firms the effective pass-through rate is more than twice the rate of unconstrained firms. The coefficients on the control variables indicate strong demand and supply side pricing effects, without affecting the exchange rate result.[11]

[Table 4 about here.]

[Table 5 about here.]

Overall, Table 5 reveals that financially unconstrained firms price to market, and are the main origin of incomplete ERPT. This PTM goes beyond a static export price discrimination by destination country income (Alessandria and Kaboski, 2011); it involves additionally a smoothing of prices over time, absorbing a large part of the exchange rate fluctuations. Absent any constraints, PTM appears to be the optimal choice for firms, e.g. due to the marketing reason that stable prices strengthen customer loyalty.

Financially constrained firms cannot price to market that easily. Accordingly, they display more than twice the ERPT rate of unconstrained firms. The marginal effect of an exchange rate change on the probability of each of the three domestic price expectation categories is shown in Table 6, where I again evaluate all variables at zero. Accordingly, the marginal effect of an exchange rate change is twice as large for financially constrained firms than for unconstrained firms. In this scenario, after a hypothetical appreciation of the log EUR/USD by one, at the margin only 20 percent of firms expect to charge higher prices within three months. Nine percent revise their expectation from "decreasing prices" to "unchanged prices", and eleven percent revise their expectation from "unchanged prices" to "increasing prices". This modest reaction of firms' expectations reflects the incomplete ERPT visible in aggregate data. Following a drop of the value of the USD, say, import prices in Germany drop less than proportionally. The *ifo* micro data reveals that a proportional drop is not even expected by firms. If a European firm is financially constrained, however, the exchange rate change has more than twice the impact, because a financially constrained firm does not have the financial resources to continue its PTM strategy. Almost one-half (46 percent) of these firms revise their price expectation upwards: 21 percent change their price

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[11]Interestingly, absent any exchange rate effect, easy access to borrowing encourages price increases beyond what is warranted by (good) business expectations. Cheap credit appears to be an economy-wide phenomenon, rendering domestic demand less price sensitive.

expectation from "decreasing" to "unchanged", and 25 percent change their expectation from "unchanged" to "increasing".

[Table 6 about here.]

The macro-micro disconnect puzzle (Bergin, Glick, and Wu, 2009), according to which microeconomic relative prices adjust to macro shocks just as slowly as aggregate real exchange rates, therefore stems especially from financially unconstrained firms. These are firms which intentionally deviate from macroeconomic theorists' wisdom. Firms which cannot afford such a pricing strategy follow macroeconomic fundamentals closely, thus aggregate data displays more ERPT during financial crises and less during times of laissez-faire credit.

The cheaper credit is, the less cost-driven economic reasoning is relevant, and the more other, harder-to-formalize considerations dominate the decisions of firms. Or, to put it in a nutshell: Economic theory bites within firms only in times of crisis, whereas in good times marketing rules.

The important role of financing constraints brings the supply-side effects back into the picture. Berman et al. (2012) trace incomplete pass-through back to better performing firms that face less elastic *demand*. My results, in contrast, suggest that the *supply* of less financially constrained firms is more elastic and thus these firms pass through less.

The results also shed light on the finding of Vigfusson et al. (2009) and Dong (2010), "that both U.S. imports and exports have become much less responsive to exchange rate movements [in recent years], mainly due to changes in firms pricing behavior and larger distribution margins" (Dong, 2010, p.18). In the second half of his sample (1992-2008) less firms were financially constrained than during the first half (1974-1991). More firms were therefore able to stick to a PTM strategy in the late 1990s and early 2000s than before. Also the effect of the low-inflation environment abetted by monetary policy on ERPT (Bouakez and Rebei, 2008) might in fact operate through stable interest rates which reduce uncertainty and thus borrowing constraints for firms.

# 5    Subsamples

The heterogeneous response of firms to exchange rates uncovered in the previous section suggests a more detailed look at the impact of firm properties and changes in the business environment. In this section I examine the exchange rate response of firms for various subsamples. I start with splitting the sample by firm size, then by industry, and finally in a pre- and a post-crisis dataset.

## 5.1 Small vs. Large Firms

This subsection examines the effect of the size of a firm on its exchange rate response. Because average firm size differs considerably between industries I define a large firm conditional on the industry. According to my definition, a firm is large if it has more employees than the arithmetic mean employment per firm in its industry. The cutoff between "small" and "large" ranges from 70 employees (*other/uncategorized*) to almost 6000 (*transport equipment*). The average large firm has about 1630 employees, the average small firm about 115. About 80 percent of large firms, and 64 percent of small firms in the survey export to outside of the E.U.. Large firms tend to be slightly more optimistic about future exports than small firms. Other than that, the averages of the two groups is very similar. In particular, the average assessment of the credit situation is the same in both groups. That is, small and large firms are on average equally credit constrained.

The left two columns of Table 7 reveal that among the financially unconstrained firms, large firms price to market, whereas the prices of small firms show large and significant ERPT. Under binding credit constraints, both small and large firms pass through significantly more exchange rate fluctuations, but even then small firms maintain a higher pass-through rate. Overall, PTM appears to be a predominantly large-firm strategy.

The right two columns of Table 7 compare the response of export expectations of small firms with large firms. The export expectations of smaller firms with borrowing constraints are more sensitive to exchange rate movements than the exports of their unconstrained counterparts. This contradicts the conclusion by Arndt, Buch, and Mattes (2009), that small firms' self-reported financial constraints have no impact on exports. In contrast, the export expectations of larger firms do not differ significantly between constrained and unconstrained firms. The estimated export response of large firms is somewhat larger than the one of small firms, but insignificant. This might reflect the lower demand elasticity that the model of Atkeson and Burstein (2008) predicts for firms with large market share.

[Table 7 about here.]

Overall, it appears that only large firms can tap sufficient financial resources or engage in foreign exchange hedging to implement a full PTM strategy. Some of them might be able to continue PTM even when external borrowing constraints become tight by tapping their internal cash flow. The differential behavior of small versus large firms indicates that absent financial constraints the "market power" explanation can indeed explain some of the

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incomplete ERPT. Accordingly, the limited ERPT and the exchange rate disconnect visible in aggregate data stem primarily from the dominance of large firms in aggregate data.

The effect of large firms on aggregate outcomes is thus more subtle for ERPT than for aggregate output. Whereas idiosyncratic shocks to large firms considerably impact aggregate output (Gabaix, 2011), large firms act as stabilizer with respect to import prices and international trade. Large firms are able to absorb many idiosyncratic shocks within their large balance sheets. If, however, they were hit by extremely large idiosyncratic shocks, their change in pricing and export decisions would have, following the reasoning of Gabaix (2011), considerable effects on aggregate ERPT and international trade just as well. However, shocks so massive that large firms cannot deal with them appear to occur sufficiently rarely, rendering the financial constraint interaction term for large firms in Table 7 close to insignificant.

One might wonder why financially constrained firms do not hedge foreign exchange risk in order to be able to continue their optimal pricing strategy independently of foreign exchange fluctuations. Whereas the direct cost of hedging, such as fees and the bid-ask spread, are negligible, the opportunity costs of the margin capital necessary in case of a maybe temporary, but large adverse exchange rate change can be five percent of the hedged amount or more (Fisher and Kumar, 2010). Considering this, it might be that the costs of hedging for smaller firms exceed its benefit.

## 5.2   Financing Effect by Industry

In this subsection I turn to differences between industries. I report results for the five manufacturing industries in the dataset with the most observations of firms exporting to outside the E.U.. The coefficient on the exchange rate (not shown) is insignificant with only one exception, implying that we cannot reject a pure PTM strategy in any industry. The exception is the industry *machinery and equipment*, where even financially unconstrained firms allow partial ERPT. This could be due to the high degree of specialization of German machinery producers, who might operate in sufficiently monopolistic markets to render costly PTM strategies less essential. In contrast, metal or chemical producers might not enjoy such a niche market and thus have to rely more on PTM to buttress customer loyalty.

[Table 8 about here.]

Table 8 reports the coefficient on the financial constraints interaction variable, $xf_{it}$. All significant coefficients have the expected signs. The effect of borrowing constraints is partic-

ularly strong in the *metal products* industry. When the willingness of banks to provide credit is restrictive, metal product firms significantly increase pass-through and thus increase the exchange rate sensitivity of their exports.

The prices in industries with very differentiated products, such as *machinery and equipment*, do not systematically respond to exchange rates even when credit is tight. In contrast, basic metals and paper products, that is, industries with less scope for product differentiation, feature a massive increase in ERPT in this situation. Albeit less clear-cut than in Gopinath, Itskhoki, and Neiman (2011), this confirms that in differentiated product industries prices are somewhat immune to market conditions, in particular during the recent trade collapse.

## 5.3   Pre-crisis vs. Post-crisis

How did the financial crisis of 2008 affect firm pricing behavior? The pre-crisis column of Table 9 reveals that in the easy credit times before 2008 credit constraints did not matter much. The sign and magnitude of the coefficient on the financial constraints interaction variable are similar to the ones for the entire sample period, but there seem to have been pre-crisis too few firms reporting "restrictive credit" to reach significance. Once the financial crisis hit, pricing behavior of firms abruptly diverged. Whereas before the crisis there was partial ERPT by all firms, during and after the crisis firms with sufficient financial resources refrain from passing through at all. The logic for this might be an investment in customer relationships looking beyond the crisis (Drozd and Nosal, 2012; Froot and Klemperer, 1989). Financially constrained firms, however, pass-through exchange rate changes even during the crisis.

[Table 9 about here.]

# 6   Robustness and Sensitivity Checks

In this section I verify the robustness of my results. I first assess the impact of changing the time horizon, then account for changes in sampling frequency, and finally allow for asymmetric effects in the financial constraints interaction variable.

## 6.1 Exchange Rate Effect over Time

So far I have looked only at the effect of one-month changes in the log exchange rate. In this subsection I investigate if changes over longer horizons have a different effect on prices and exports. Table 10 reports the coefficient on the credit interaction variable, $xf_{it}$, for various horizons. The first row just restates the results for one-month changes from Tables 4, 5, 1, and 2. The following rows give the results for the same regression specifications, using exchange rate changes over a two-, three-, six-, and twelve- months horizon, respectively.

[Table 10 about here.]

It is obvious from Table 10 that the one-month exchange rate changes have the largest impact on expectations. Expectations respond immediately, as rational expectations should. Exchange rate changes over longer horizons matter only for the backward-looking quantities *past domestic price change* and *backlog of foreign orders*. This makes intuitive sense, because if, for example, the current *backlog of foreign orders* had been acquired during the past year, say, then it would be driven more by past exchange rate changes than by changes in the most recent month.

## 6.2 Observations Weighted by Length of Time Interval

In 2008 the census frequency of the credit question increased from twice a year to once a month. This results in an oversampling of the years 2009 and 2010 in the dataset. I deal with this issue by sequentially filling in the missing credit responses from the most recent survey containing the credit question in the earlier part of the sample. This approach fully utilizes the information of the other, monthly survey questions, but introduces via the filled-in credit constraint information some staleness into the dataset.

This approach is nevertheless superior to replicating the observations in the first half of the sample. Replicating early observations, or, equivalently, assigning a weight to early observations six times the weight of later observations, does not use the monthly variation in the other covariates, and would merely artificially increase the sample size.

Following the first approach, the coefficients on the credit variables maintain their sign and remain significant. The absolute value and the significance level drops in some regressions, however, because current survey responses on prices and exports are regressed on credit information that is up to six months old. The staleness of the credit information dampens the estimated coefficients.

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## 6.3  Laissez-faire Credit Dummy

Throughout this paper I used only one credit interaction term, $xf_{it}$, equal to the exchange rate in every period $t$, in which firm $i$ reports restrictive credit, and zero otherwise. The idea is that restrictive credit constrains the firm's scope for decision-making. There is a possibility, of course, that – relative to the neutral credit regime – accommodating credit does the opposite, e.g. it might increase the firm's use of PTM.

[Table 11 about here.]

In Table 11 I therefore include two interaction terms. The first one is equal to the exchange rate at times when banks' credit policies are accommodating, and zero otherwise. The second one is the same as before – equal to the exchange rate at times when banks' credit policies are restrictive, and zero otherwise. The results provide strong evidence of an asymmetric effect of *credit constraints* on both domestic price and export expectations. Financially constrained firms increase ERPT, whereas firms flooded with credit behave not significantly differently from firms in a neutral credit regime. Likewise, whereas the exchange rate sensitivity of exports of a firm moving from the restrictive to the neutral credit regime declines, this sensitivity does not decline any further when a firm moves from the neutral to the accommodating credit regime.[12] Overall, the neutral credit regime seems to suffice for firms to implement their optimal PTM strategies.

# 7  Conclusion

With this paper I identify an important dimension of heterogeneity among firms for explaining exchange rate puzzles. For a financially unconstrained firm, I replicate the standard incomplete ERPT and a disconnect between exports and exchange rates with firm-level survey data. I show that especially large firms stick to a PTM strategy, whereas smaller firms are more responsive to exchange rate changes. But the exchange rate disconnect puzzle does not exist for all firms and at all times. It disappears for firms which cannot afford to do PTM, i.e. for credit constrained firms.

Access to credit appears to be a critical determinant of firms' export and pricing behavior: The pass-through rate of exchange rate changes to the prices charged by financially constrained firms is more than twice the rate of unconstrained firms.

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[12]Including dummies for the discrete responses variables *credit constraints*, *unfilled orders*, and *business expectations* does not change the results.

Likewise, the impact of a favorable exchange rate change on export volume is more than twice as large for a financially constrained than for an unconstrained exporter, because only the financially constrained exporter has to rely on favorable exchange rate moves alone to remain competitive abroad.

Struggling banks reducing their lending to firms therefore affect exporters in two ways. Not only do exporters have trouble financing their working capital and finding a counterparty for factoring their foreign accounts receivable as in Amiti and Weinstein (2011). They also have to deviate from their preferred pricing strategy. The financial sector has thus very real effects: A struggling bank sector virtually affects all parts of the exporting firm: production, marketing, sales, and risk management are all constricted and have to deviate from their optimal (unconstrained) plans.

The effect of credit constraints is particularly strong during the recent financial crisis. My findings show that the importance of access to financing can hardly be emphasized too much: Not only is financing a prerequisite for new firm investment, it is also crucial for an existing firm to operate its business optimally, part of which appear to be PTM strategies.

With this in mind, the smaller current account deficit of the U.S. in the past two years might be temporary. As soon as importing firms' financing possibilities become as abundant as before the crisis, my results suggest that they will engage in PTM again. U.S. importers will again stabilize USD prices even in the face of a depreciating USD, thereby muting the stabilizing role of expenditure switching.

The importance of financing constraints for firms' pricing behavior suggests a more detailed look at their financing structure. It would allow to consider not only borrowing, but also internal financing, and potentially equity financing as determinants of pricing and export decisions.

Table 1: Exchange Rate Effect on Backlog of Foreign Orders

|  | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| dl(EUR/USD) | -0.18 | 0.22 | 0.15 | 0.28 |
|  | (0.26) | (0.31) | (0.28) | (0.31) |
| ease of borrowing | 0.32*** | 0.09*** | 0.11*** | 0.06*** |
|  | (0.01) | (0.01) | (0.01) | (0.01) |
| fin. constrained × dl(EUR/USD) | 0.78** | 0.09 | 0.52 | 0.07 |
|  | (0.37) | (0.46) | (0.40) | (0.46) |
| unfilled orders |  | 2.04*** |  | 1.87*** |
|  |  | (0.01) |  | (0.01) |
| state of business |  |  | -1.14*** | -0.29*** |
|  |  |  | (0.01) | (0.01) |
| obs. | 54483 | 54459 | 54457 | 54433 |
| Pseudo-$R^2$ (McFadden, 1974) | 0.07 | 0.47 | 0.24 | 0.47 |

Ordered Probit regression. Unweighted, only firms exporting outside E.U.. Cutoff points, as well as industry, year, and month dummies not reported. Standard errors in parentheses. Asterisks indicate the level of significance, (*) at the 10%, (**) at the 5%, and (***) at the 1% level.

Table 2: Exchange Rate Effect on Export Expectations

|  | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| dl(EUR/USD) | 0.43* | 0.61** | 0.68** | 0.70** | 0.68** |
|  | (0.26) | (0.27) | (0.28) | (0.01) | (0.28) |
| ease of borrowing | 0.13*** | 0.08*** | 0.03*** | 0.01 | 0.02** |
|  | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| fin. constrained × dl(EUR/USD) | 1.28*** | 0.85** | 0.79** | 0.78** | 0.81** |
|  | (0.37) | (0.39) | (0.39) | (0.39) | (0.39) |
| business exp. |  | 0.99*** | 0.95*** | 0.96*** | 0.96*** |
|  |  | (0.01) | (0.01) | (0.01) | (0.01) |
| unfilled orders |  |  | 0.29*** |  | -0.12*** |
|  |  |  | (0.01) |  | (0.01) |
| backlog of foreign orders |  |  |  | 0.47*** | 0.56*** |
|  |  |  |  | (0.01) | (0.01) |
| obs. | 54709 | 54611 | 54541 | 54387 | 54363 |
| Pseudo-$R^2$ | 0.05 | 0.18 | 0.19 | 0.21 | 0.21 |

Ordered Probit regression. Unweighted, only firms exporting outside E.U.. Cutoff points, as well as industry, year, and month dummies not reported. Standard errors in parentheses. Asterisks indicate the level of significance, (*) at the 10%, (**) at the 5%, and (***) at the 1% level.

Table 3: Marginal Exchange Rate Effect on Export Expectations

| $z_{it}$ | exp. exports decrease -1 | exp. exports unchanged 0 | exp. exports increase 1 |
|---|---|---|---|
| dl(EUR/USD) | -0.13** | 0.00 | 0.13** |
|  | (0.05) | (0.02) | (0.05) |
| ease of borrowing | -0.01** | 0.00 | 0.00** |
|  | (0.00) | (0.00) | (0.00) |
| fin. constrained × dl(EUR/USD) | -0.15** | 0.00 | 0.15** |
|  | (0.08) | (0.02) | (0.08) |
| business exp. | -0.18*** | 0.00 | 0.18*** |
|  | (0.01) | (0.03) | (0.01) |
| unfilled orders | -0.03*** | 0.00 | -0.02*** |
|  | (0.00) | (0.00) | (0.00) |
| backlog of foreign orders | -0.11*** | 0.00 | 0.11*** |
|  | (0.01) | (0.02) | (0.01) |
| $P(z_{it})$ | 0.11 | 0.78 | 0.11 |

Ordered Probit, specification (5) in Table 2. Marginal effect of variables evaluated at zero. Standard errors in parentheses. Asterisks indicate the level of significance, (*) at the 10%, (**) at the 5%, and (***) at the 1% level.

Table 4: Exchange Rate Effect on Past Domestic Price Changes

|  | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| dl(EUR/USD) | 0.44 | 0.53* | 0.52* | 0.55* |
|  | (0.29) | (0.29) | (0.29) | (0.30) |
| ease of borrowing | 0.12*** | 0.06*** | 0.04*** | 0.03*** |
|  | (0.01) | (0.01) | (0.01) | (0.01) |
| fin. constrained × dl(EUR/USD) | 0.93** | 0.81** | 0.88** | 0.82** |
|  | (0.41) | (0.42) | (0.42) | (0.42) |
| unfilled orders |  | 0.36*** |  | 0.22*** |
|  |  | (0.01) |  | (0.01) |
| state of business |  |  | -0.34*** | -0.20*** |
|  |  |  | (0.01) | (0.01) |
| obs. | 54605 | 54538 | 54579 | 54512 |
| Pseudo-$R^2$ | 0.04 | 0.06 | 0.06 | 0.06 |

Ordered Probit regression. Unweighted, only firms exporting outside E.U.. Cutoff points, as well as industry, year, and month dummies not reported. Standard errors in parentheses. Asterisks indicate the level of significance, (*) at the 10%, (**) at the 5%, and (***) at the 1% level.

Table 5: Exchange Rate Effect on Domestic Price Expectations

|  | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| dl(EUR/USD) | 0.72** | 0.81*** | 0.88** | 0.73** | 0.77** |
|  | (0.28) | (0.28) | (0.29) | (0.30) | (0.31) |
| ease of borrowing | 0.11*** | 0.08*** | 0.04*** | 0.05*** | 0.02** |
|  | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| fin. constrained × dl(EUR/USD) | 1.42*** | 1.20*** | 1.13*** | 1.04** | 1.01** |
|  | (0.40) | (0.40) | (0.41) | (0.43) | (0.43) |
| business exp. |  | 0.37*** | 0.33*** | 0.31*** | 0.29*** |
|  |  | (0.01) | (0.01) | (0.01) | (0.01) |
| unfilled orders |  |  | 0.26*** |  | 0.15*** |
|  |  |  | (0.01) |  | (0.01) |
| past domestic price changes |  |  |  | 1.42*** | 1.39*** |
|  |  |  |  | (0.01) | (0.01) |
| obs. | 54572 | 54484 | 54417 | 54423 | 54356 |
| Pseudo-$R^2$ | 0.04 | 0.06 | 0.07 | 0.22 | 0.22 |

Ordered Probit regression. Unweighted, only firms exporting outside E.U.. Cutoff points, as well as industry, year, and month dummies not reported. Standard errors in parentheses. Asterisks indicate the level of significance, (*) at the 10%, (**) at the 5%, and (***) at the 1% level.

Table 6: Marginal Exchange Rate Effect on Expected Domestic Prices

| $z_{it}$ | exp. dom. price drop -1 | exp. dom. price unchanged 0 | exp. dom. price increase 1 |
|---|---|---|---|
| dl(EUR/USD) | -0.09** | -0.02 | 0.11** |
| | (0.04) | (0.02) | (0.04) |
| ease of borrowing | -0.00** | 0.00 | 0.00** |
| | (0.00) | (0.00) | (0.00) |
| fin. constrained × dl(EUR/USD) | -0.12** | -0.02 | 0.14** |
| | (0.05) | (0.03) | (0.06) |
| business exp. | -0.03*** | -0.01 | 0.04*** |
| | (0.00) | (0.01) | (0.00) |
| unfilled orders | -0.02*** | 0.00 | 0.02*** |
| | (0.00) | (0.00) | (0.00) |
| past domestic price changes | -0.16*** | -0.03 | 0.19*** |
| | (0.02) | (0.04) | (0.02) |
| $P(z_{it})$ | 0.06 | 0.87 | 0.07 |

Ordered Probit, specification (5) in Table 5. Marginal effect of variables evaluated at zero. Standard errors in parentheses. Asterisks indicate the level of significance, (*) at the 10%, (**) at the 5%, and (***) at the 1% level.

Table 7: Differential Exchange Rate Effect on Small and Large Firms

|  | Domestic Price Expectations | | Export Expectations | |
|  | small firms | large firms | small firms | large firms |
| --- | --- | --- | --- | --- |
| dl(EUR/USD) | 1.01*** | 0.42 | 0.63** | 0.82 |
|  | (0.33) | (0.57) | (0.32) | (0.55) |
| ease of borrowing | 0.03** | 0.09*** | 0.01 | 0.11*** |
|  | (0.01) | (0.02) | (0.01) | (0.02) |
| fin. constrained | 1.08** | 1.43* | 0.76* | 0.95 |
| × dl(EUR/USD) | (0.48) | (0.78) | (0.46) | (0.76) |
| business exp. | 0.34*** | 0.31*** | 0.95*** | 0.97*** |
|  | (0.01) | (0.02) | (0.01) | (0.02) |
| unfilled orders | 0.26*** | 0.29*** | 0.31*** | 0.22*** |
|  | (0.01) | (0.02) | (0.01) | (0.02) |
| obs. | 40014 | 14403 | 40083 | 14458 |
| Pseudo-$R^2$ | 0.08 | 0.07 | 0.19 | 0.19 |

Ordered Probit regression. Unweighted, only firms exporting outside E.U.. Cutoff points, as well as industry, year, and month dummies not reported. Standard errors in parentheses. Asterisks indicate the level of significance, (*) at the 10%, (**) at the 5%, and (***) at the 1% level.

Table 8: Differential Exchange Rate Effect by Industry

| Manufacture of | firms exporting outside E.U. (%) | coefficient on $xf_{it}$ | |
| --- | --- | --- | --- |
| | | expected domestic prices | export expectations |
| Basic metals and fabricated metal products | 66 | 2.09* (1.13) | 2.06** (1.05) |
| Chemicals and chemical products | 84 | 1.56 (1.48) | 1.89 (1.37) |
| Machinery and equipment | 88 | -0.58 (1.02) | 1.15 (0.86) |
| Electrical and optical equipment | 84 | -0.95 (1.21) | 0.59 (1.06) |
| Pulp, paper, paper products; publishing and printing | 41 | 3.17** (1.47) | -1.53 (1.45) |

The right two columns are based on Ordered Probit, specification (5). Unweighted, only firms exporting outside E.U.. Standard errors in parentheses. Industry definitions follow the 2003 German Classification of Economic Activities (WZ 2003) of the Federal Statistical Office of Germany (Statistisches Bundesamt). Asterisks indicate the level of significance, (*) at the 10%, (**) at the 5%, and (***) at the 1% level.

Table 9: Differential Exchange Rate Effect on Domestic Price Expectations before and after September 2008

| | before | after |
|---|---|---|
| | Sept. $1^{st}$, 2008 | |
| dl(EUR/USD) | 1.39*** | 0.29 |
| | (0.53) | (0.39) |
| ease of borrowing | -0.03 | 0.04*** |
| | (0.02) | (0.01) |
| fin. constrained | 0.79 | 1.08** |
| × dl(EUR/USD) | (0.95) | (0.49) |
| business exp. | 0.25*** | 0.30*** |
| | (0.02) | (0.01) |
| unfilled orders | 0.11*** | 0.16*** |
| | (0.02) | (0.01) |
| past domestic | 1.32*** | 1.42*** |
| price changes | (0.02) | (0.02) |
| obs. | 19081 | 35275 |
| Pseudo-$R^2$ | 0.20 | 0.22 |

Ordered Probit regression. Unweighted, only firms exporting outside E.U.. Cutoff points, as well as industry, year, and month dummies not reported. Standard errors in parentheses. Asterisks indicate the level of significance, (*) at the 10%, (**) at the 5%, and (***) at the 1% level.

Table 10: Decay of Exchange Rate Effect at Longer Horizons

| horizon in months | past dom. price ch. spec. (4) | price exp. spec. (5) | backlog fo. ord. spec. (4) | exp. export spec. (5) |
|---|---|---|---|---|
| 1 | 0.82** | 1.01** | 0.07 | 0.81** |
| 2 | 0.43* | 0.36 | 0.18 | 0.03 |
| 3 | 0.50** | -0.07 | 0.36 | -0.06 |
| 6 | 0.30** | -0.21* | 0.36*** | -0.12 |
| 12 | 0.06 | -0.21* | 0.35*** | -0.14 |

The table reports the coefficient on $xf_{it}$, taking exchange rate changes $x_t$ of varying horizons. Ordered Probit; specification (4) for past domestic price changes and backlog of foreign orders; specification (5) for domestic price expectations and export expectations. Unweighted, only firms exporting outside E.U.. Asterisks indicate the level of significance, (*) at the 10%, (**) at the 5%, and (***) at the 1% level.

Table 11: Asymmetric Exchange Rate Effect Dependent on Credit Regime

| | Domestic Price Expectations | Export Expectations |
|---|---|---|
| dl(EUR/USD) | 0.71** | 0.71** |
| | (0.32) | (0.29) |
| ease of borrowing | 0.02** | 0.02** |
| | (0.01) | (0.01) |
| fin. unconstrained × dl(EUR/USD) | 0.54 | -0.25 |
| | (0.81) | (0.75) |
| fin. constrained × dl(EUR/USD) | 1.07** | 0.79** |
| | (0.44) | (0.40) |
| business exp. | 0.29*** | 0.96*** |
| | (0.01) | (0.01) |
| unfilled orders | 0.15*** | -0.12*** |
| | (0.01) | (0.01) |
| past domestic price changes | 1.39*** | |
| | (0.01) | |
| backlog of foreign orders | | 0.56*** |
| | | (0.01) |
| obs. | 54356 | 54363 |
| Pseudo-$R^2$ | 0.22 | 0.21 |

Ordered Probit regression. Unweighted, only firms exporting outside E.U.. Cutoff points, as well as industry, year, and month dummies not reported. Standard errors in parentheses. Asterisks indicate the level of significance, (*) at the 10%, (**) at the 5%, and (***) at the 1% level.

Figure 1: Nominal EUR/USD Exchange Rate and U.S. Import Price Indices, 1999-2011
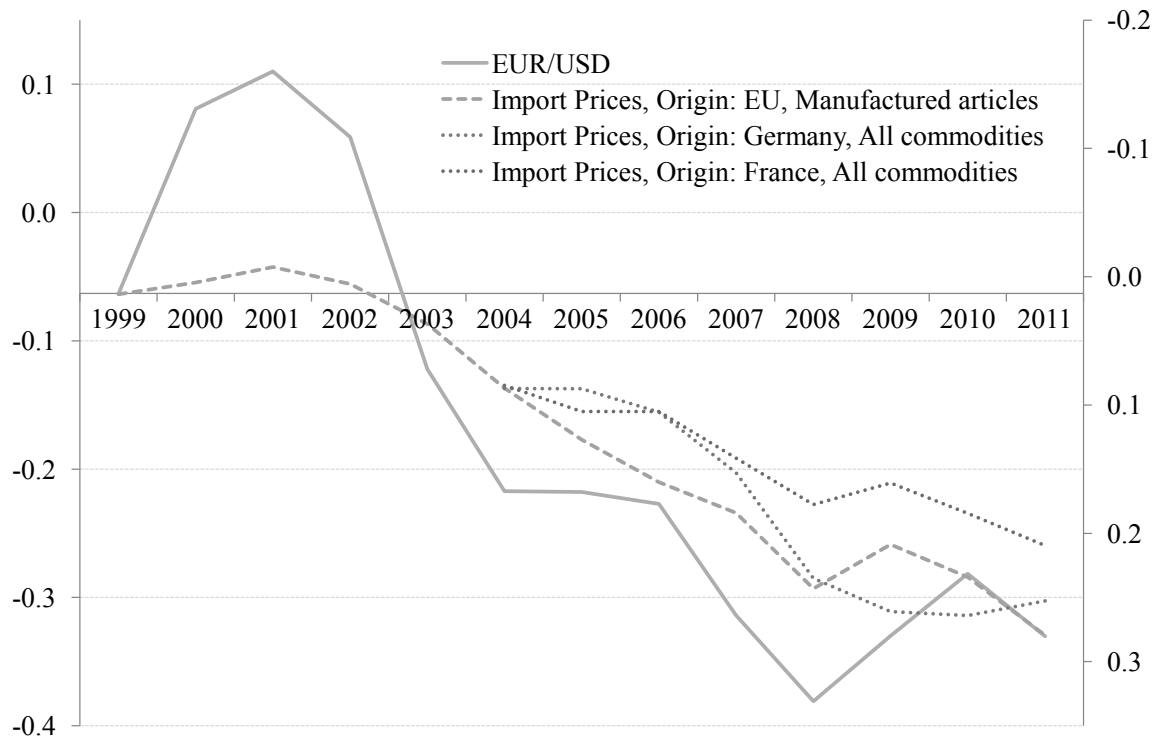


The solid line graphs the natural logarithm of the annual average EUR/USD exchange rate, measured by the left axis. The dashed line graphs U.S. import prices for manufactured articles originating in the European Union. The upper dotted line represents the U.S. import prices for goods from France (all commodities), the lower dotted line for goods from Germany (all commodities). All import prices are plotted against the right axis and are predominantly based on free-on-board prices. They are displayed as the natural logarithm of $1/100$ of the respective import price index from the Bureau of Labor Statistics (access date: February $2^{nd}$, 2012). The series of France and Germany are spliced to the EU series in 2004. The exchange rate data is from oanda.com (access date: February $2^{nd}$, 2012).

Figure 2: Nominal EUR/USD Exchange Rate and U.S. Balance on Goods and Services, 1999-2010
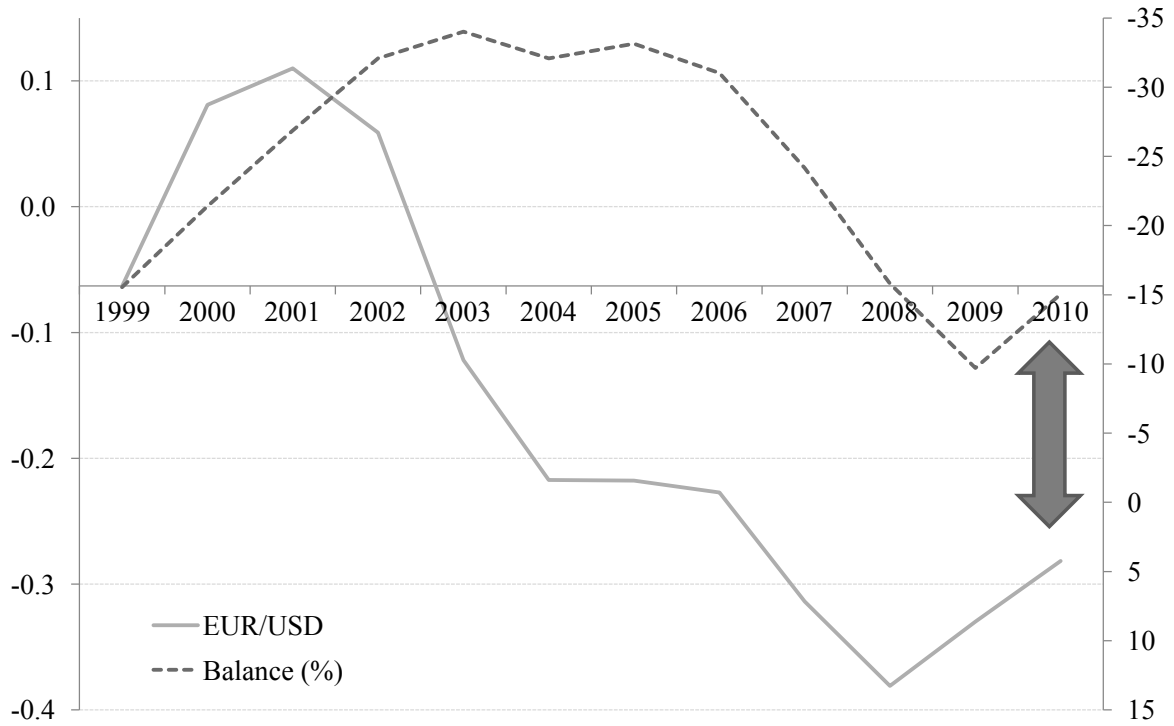


The solid line is natural logarithm of the annual average of the EUR/USD exchange rate, measured by the left axis. The dashed line is the U.S. balance on goods and services with the Euro area, measured in percent of the arithmetic average of exports and imports by the right axis. The exchange rate data is from the website oanda.com (access date: February $2^{nd}$, 2012), the balance data from the Bureau of Economic Analysis (release date: June $16^{th}$, 2011).

Figure 3: Credit Constraints, Domestic Price Expectations, Export Expectations, and the EUR–USD Exchange Rate, 2003-2010
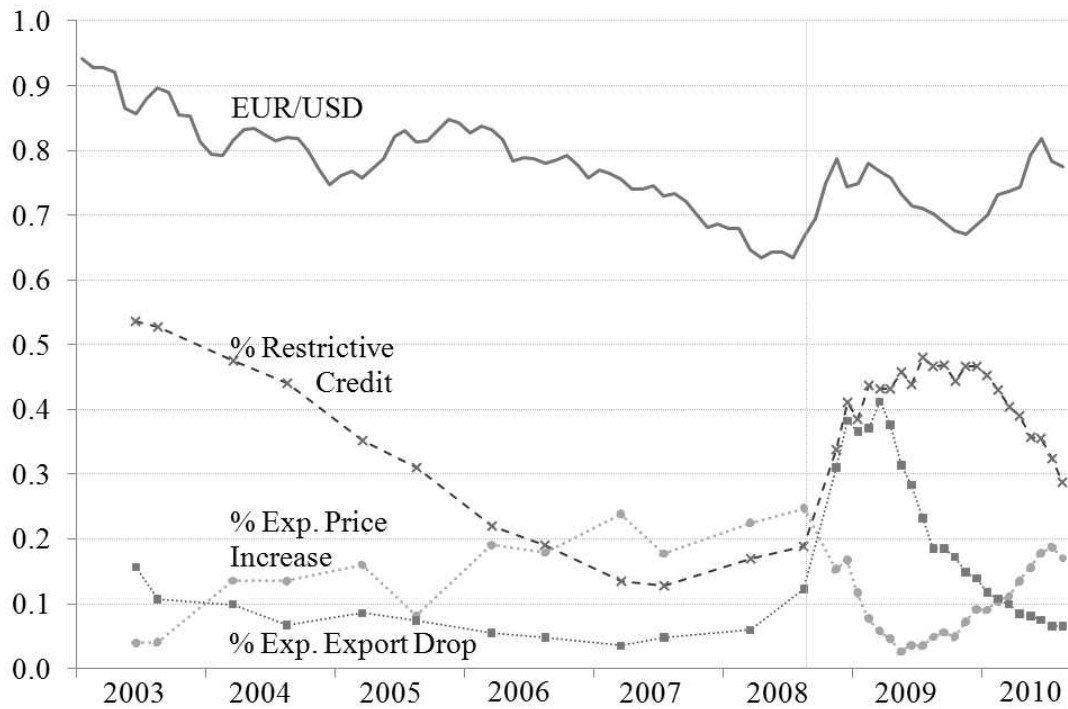


The upper solid line shows the EUR/USD exchange rate from 01/31/2003 until 08/31/2010. The other three lines graph the responses of firms that export to outside the E.U.. The dashed line with cross markers (×) is the percentage of firms reporting that credit is restrictive. The widely dotted line with dot (•) markers represents the percentage of firms which expect to increase their domestic prices within the next three months. The narrowly dotted line with box markers (■) represents the percentage of firms which expect a decline of their exports within the next three months.

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# A  Persistence of Credit Regimes

[Figure 4 about here.]

Figure 4 reveals that at the firm level, the restrictive credit regime is more persistent than the accommodating regime. Almost two-thirds of credit-constrained firms today will still be credit-constrained a year from now. Among the firms who enjoy accommodating credit today, however, only 40 percent will do so as well one year from now.

[Figure 5 about here.]

Figure 5 shows the effect of a change in the availability of credit on firms' export expectations. Credit constraints have a strong impact on firms which initially expected increasing exports. A sudden tightening of credit constraints makes an additional 17 percent of firms lose their optimism. In contrast, firms, which are already expecting only weak export sales, are almost unaffected by changes in credit constraints: They maintain their negative export outlook, even if credit financing becomes more easily available. This asymmetric has its analogue to central bank policy: Worsening credit conditions (or high interest rates) alone can curb economic activity, but improving conditions alone will not restart an ailing economy.

# B  Full-Sample Regression Results

In this appendix I report results for all firms in the sample, including firms that did not answer any export question in the survey. These results confirm the findings for the subsample of firms exporting to outside the E.U. shown in Tables 1 to 6. Because some firms in the full sample most likely do not export into the USD area, the exchange rate impact on export expectations in Table 12 is mostly negligible. This finding mirrors the issue of nontraded goods in macro data: The part of the economy, which does not trade with the currency area of interest, will not (or at best only indirectly) respond to changes in that exchange rate.

The export expectations of financially constrained firms, however, are extremely sensitive to exchange rate changes. A reason for this might be that the full sample response includes not only the intensive, but also the extensive margin of exports. Firms which did not export during the past year were excluded from the regressions in the main part of the paper. But some of these firms might be standing by, waiting to enter the export market. Because financial constraints can act as a barrier to entering the export market (Bellonne et al., 2008;

Guillou, 2008), it is likely that the still strong effect of financing constraints in Table 12 is due to potential export market entrants.

[Table 12 about here.]

A similar picture emerges for domestic price expectations, shown in Table 13. Because some firms in the full sample do not export, they have no way to offset the effect of exchange rates on import prices with their effect on export prices. Therefore, the exchange rate effect on expected domestic prices is even stronger in the full sample, than in the exporting firm subsample of Table 5. The pass-through remains significantly higher for financially constrained firms, but now financially unconstrained firms already pass-through a bit more than half of what financially constrained firms do.

[Table 13 about here.]

Table 12: Exchange Rate Effect on Exports

| | backlog fo. ord. | backlog fo. ord. | exp. export | exp. export | exp. export | exp. export | exp. export |
|---|---|---|---|---|---|---|---|
| dl(EUR/USD) | -0.29 | -0.03 | 0.26 | 0.37 | 0.41* | 0.61** | 0.59** |
| | (0.24) | (0.29) | (0.23) | (0.24) | (0.24) | (0.26) | (0.26) |
| ease of borrowing | 0.31*** | 0.09*** | 0.14*** | 0.07*** | 0.03*** | 0.02* | 0.02*** |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| fin. constrained × dl(EUR/USD) | 0.81** | 0.47 | 1.23*** | 0.99*** | 0.99*** | 0.78** | 0.79** |
| | (0.35) | (0.42) | (0.32) | (0.33) | (0.34) | (0.37) | (0.37) |
| business exp. | | | | 0.87*** | 0.83*** | 0.93*** | 0.93*** |
| | | | | (0.01) | (0.01) | (0.01) | (0.01) |
| unfilled orders | | 1.95*** | | | 0.28*** | | -0.11*** |
| | | (0.01) | | | (0.01) | | (0.01) |
| backlog of foreign orders | | | | | | 0.48*** | 0.56*** |
| | | | | | | (0.01) | (0.01) |
| obs. | 62066 | 62031 | 78798 | 78654 | 78347 | 61964 | 61929 |
| Pseudo-$R^2$ | 0.07 | 0.44 | 0.04 | 0.15 | 0.16 | 0.20 | 0.20 |

Ordered Probit regression. Unweighted, full sample. Cutoff points, as well as industry, year, and month dummies not reported. Standard errors in parentheses. Asterisks indicate the level of significance, (*) at the 10%, (**) at the 5%, and (***) at the 1% level.

Table 13: Exchange Rate Effect on Domestic Prices

| | past dom. price ch. | past dom. price ch. | price exp. | price exp. | price exp. | price exp. | price exp. |
|---|---|---|---|---|---|---|---|
| dl(EUR/USD) | 0.63*** | 0.70*** | 0.81*** | 0.90*** | 0.95*** | 0.70*** | 0.74*** |
| | (0.24) | (0.24) | (0.23) | (0.24) | (0.24) | (0.25) | (0.26) |
| ease of borrowing | 0.13*** | 0.07*** | 0.11*** | 0.08*** | 0.04*** | 0.03*** | 0.02* |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| fin. constrained × dl(EUR/USD) | 0.48 | 0.43 | 0.95*** | 0.80** | 0.76** | 0.77*** | 0.75** |
| | (0.34) | (0.34) | (0.33) | (0.33) | (0.34) | (0.36) | (0.36) |
| business exp. | | | | 0.41*** | 0.37*** | 0.34*** | 0.32*** |
| | | | | (0.01) | (0.01) | (0.01) | (0.01) |
| unfilled orders | | 0.37*** | | | 0.25*** | | 0.13*** |
| | | (0.01) | | | (0.01) | | (0.01) |
| past domestic price changes | | | | | | 1.43*** | 1.41*** |
| | | | | | | (0.01) | (0.01) |
| obs. | 78614 | 78344 | 78577 | 78449 | 78181 | 78360 | 78095 |
| Pseudo-$R^2$ | 0.04 | 0.06 | 0.04 | 0.07 | 0.08 | 0.23 | 0.23 |

Ordered Probit regression. Unweighted, full sample. Cutoff points, as well as industry, year, and month dummies not reported. Standard errors in parentheses. Asterisks indicate the level of significance, (*) at the 10%, (**) at the 5%, and (***) at the 1% level.

Figure 4: Persistence of Credit Regimes at the Firm Level

(a) Initially Restrictive Credit



(b) Initially Accommodating Credit
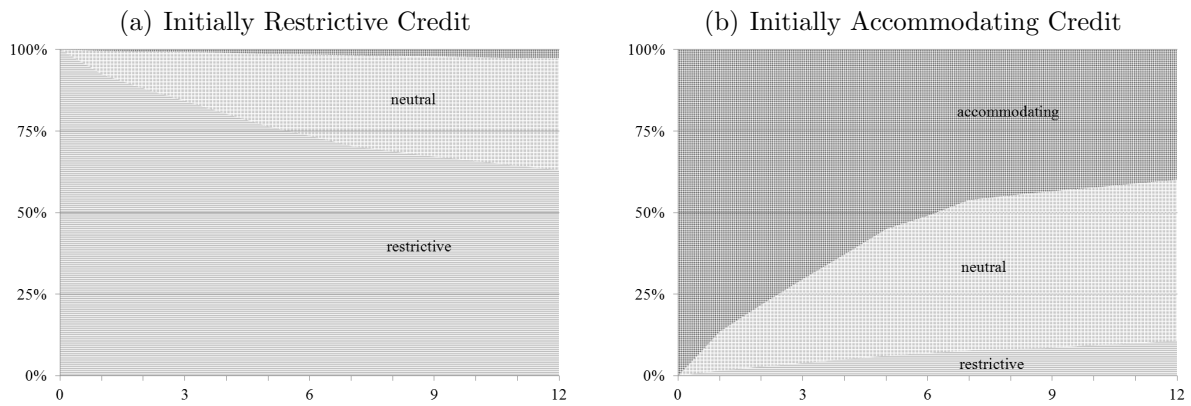


The graphs show the self-reported credit situation of a firm. The graph on the left shows the credit situation of a firm over a 12-month period, which initially reported "restrictive credit". The graph on the right shows the credit situation of a firm over a 12-month period, which initially reported "accommodating credit". Missing survey responses are replaced by the most recently reported credit status within the past six months.

## Figure 5: Export Expectations after a Credit Shock
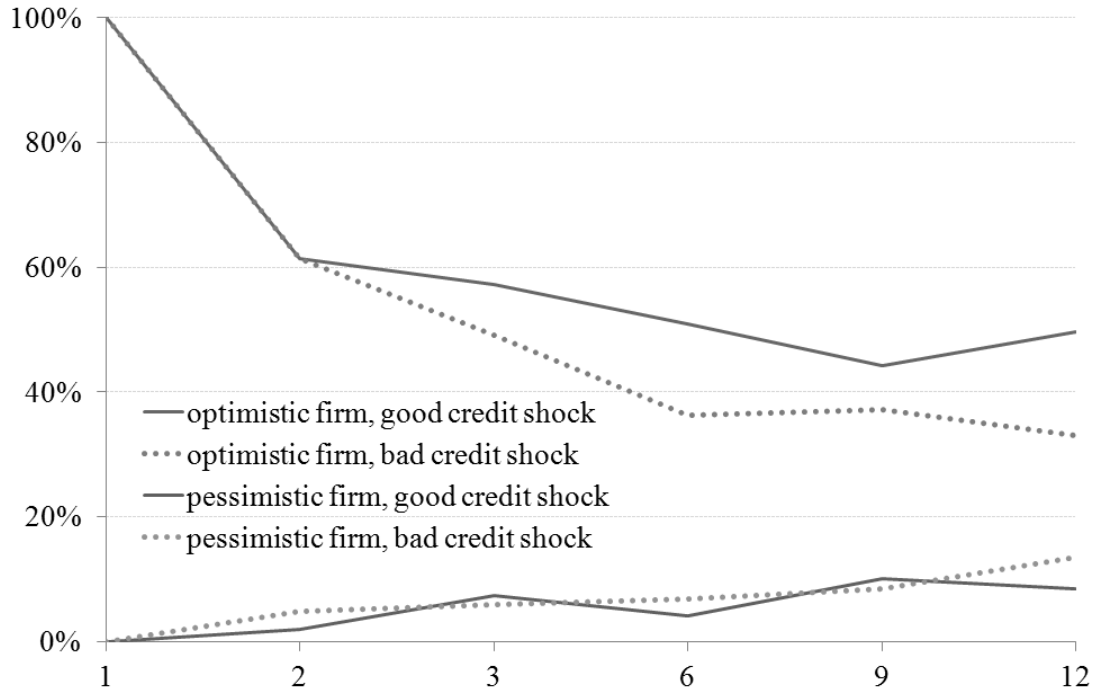


The graph shows the percentage of firms exporting outside the E.U., which expect increasing exports during the following three months, for a period of twelve months after a change in the availability of credit. The solid lines show a "good credit shock" scenario. In this scenario, the availability of credit in the current ($t = 1$) and previous ($t = 0$) month was either neutral or restrictive, followed by at least three months of accommodating credit. The dotted lines show a "bad credit shock" scenario, in which the availability of credit in the current and previous month was either neutral or accommodating, followed by at least three months of restrictive credit. "Optimistic firms" expect increasing exports at $t = 1$ and are therefore shown by the upper two lines. Analogously, "pessimistic firms" expect declining exports at $t = 1$, and are shown by the lower two lines.

# C   Data Overview

Table 14: Overview of Responses to Selected Questions in the *ifo* Business Cycle Survey

| Date | All firms | Credit Constraints re-str. | Credit Constraints neu-tral | Credit Constraints acc. | Exp. Dom. Prices drop | Exp. Dom. Prices no chg. | Exp. Dom. Prices inc. | Exp. Exports drop | Exp. Exports no chg. | Exp. Exports inc. |
|---|---|---|---|---|---|---|---|---|---|---|
| 31/01/03 | 2950 | | | | 347 | 2284 | 311 | 220 | 2369 | 361 |
| 28/02/03 | 2968 | | | | 334 | 2329 | 299 | 260 | 2336 | 372 |
| 31/03/03 | 2963 | | | | 295 | 2337 | 325 | 278 | 2356 | 329 |
| 30/04/03 | 2985 | | | | 309 | 2420 | 249 | 321 | 2364 | 300 |
| 31/05/03 | 3013 | | | | 341 | 2496 | 169 | 330 | 2401 | 282 |
| 30/06/03 | 2934 | 1416 | 1091 | 66 | 340 | 2468 | 118 | 348 | 2334 | 252 |
| 31/07/03 | 2968 | | | | 341 | 2519 | 99 | 330 | 2341 | 297 |
| 31/08/03 | 2916 | 1376 | 1014 | 64 | 258 | 2525 | 124 | 249 | 2339 | 328 |
| 30/09/03 | 2957 | | | | 251 | 2530 | 172 | 238 | 2390 | 329 |
| 31/10/03 | 2966 | | | | 281 | 2518 | 160 | 255 | 2341 | 370 |
| 30/11/03 | 2969 | | | | 281 | 2430 | 249 | 251 | 2344 | 374 |
| 31/12/03 | 2893 | | | | 322 | 2238 | 325 | 245 | 2266 | 382 |
| 31/01/04 | 2966 | | | | 280 | 2330 | 347 | 249 | 2273 | 444 |
| 29/02/04 | 2944 | | | | 273 | 2295 | 368 | 216 | 2239 | 489 |
| 31/03/04 | 2939 | 1294 | 1246 | 69 | 275 | 2290 | 366 | 229 | 2244 | 466 |
| 30/04/04 | 2965 | | | | 287 | 2268 | 402 | 206 | 2297 | 462 |
| 31/05/04 | 2948 | | | | 234 | 2324 | 379 | 188 | 2334 | 426 |
| 30/06/04 | 2949 | | | | 229 | 2337 | 376 | 223 | 2327 | 399 |
| 31/07/04 | 2728 | | | | 224 | 2148 | 348 | 194 | 2114 | 420 |
| 31/08/04 | 2744 | 1099 | 1135 | 106 | 221 | 2160 | 352 | 156 | 2136 | 452 |
| 30/09/04 | 2787 | | | | 212 | 2170 | 396 | 209 | 2132 | 446 |
| 31/10/04 | 2778 | | | | 242 | 2083 | 446 | 225 | 2128 | 425 |
| 30/11/04 | 2869 | | | | 277 | 2036 | 549 | 238 | 2225 | 406 |
| 31/12/04 | 2732 | | | | 258 | 1823 | 640 | 211 | 2101 | 420 |
| 31/01/05 | 2781 | | | | 222 | 1887 | 659 | 176 | 2138 | 467 |
| 28/02/05 | 2731 | | | | 218 | 1994 | 513 | 145 | 2090 | 496 |

Table 14 – continued from previous page

| Date | All | Credit Constraints | | | Exp. Dom. Prices | | | Exp. Exports | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | firms | re-str. | neu-tral | acc. | drop | no chg. | inc. | drop | no chg. | inc. |
| 31/03/05 | 2797 | 964 | 1404 | 143 | 252 | 2134 | 398 | 189 | 2127 | 481 |
| 30/04/05 | 2815 | | | | 270 | 2208 | 327 | 223 | 2112 | 480 |
| 31/05/05 | 2800 | | | | 288 | 2271 | 228 | 236 | 2133 | 431 |
| 30/06/05 | 2832 | | | | 290 | 2345 | 184 | 232 | 2171 | 429 |
| 31/07/05 | 2803 | | | | 284 | 2310 | 194 | 181 | 2197 | 425 |
| 31/08/05 | 2734 | 811 | 1328 | 193 | 246 | 2259 | 216 | 178 | 2136 | 420 |
| 30/09/05 | 2824 | | | | 231 | 2291 | 291 | 173 | 2217 | 434 |
| 31/10/05 | 2782 | | | | 258 | 2180 | 332 | 186 | 2148 | 448 |
| 30/11/05 | 2804 | | | | 262 | 2067 | 467 | 191 | 2190 | 423 |
| 31/12/05 | 2641 | | | | 284 | 1822 | 525 | 170 | 2003 | 468 |
| 31/01/06 | 2711 | | | | 241 | 1891 | 575 | 124 | 2010 | 577 |
| 28/02/06 | 2768 | | | | 216 | 1969 | 577 | 108 | 2074 | 586 |
| 31/03/06 | 2808 | 643 | 1585 | 264 | 219 | 2032 | 545 | 123 | 2083 | 602 |
| 30/04/06 | 2739 | | | | 163 | 2088 | 477 | 110 | 2078 | 551 |
| 31/05/06 | 2729 | | | | 168 | 2081 | 470 | 119 | 2108 | 502 |
| 30/06/06 | 2636 | | | | 150 | 2024 | 455 | 128 | 2010 | 498 |
| 31/07/06 | 2642 | | | | 139 | 2040 | 456 | 123 | 2061 | 458 |
| 31/08/06 | 2558 | 487 | 1433 | 275 | 125 | 1939 | 486 | 108 | 2029 | 421 |
| 30/09/06 | 2667 | | | | 124 | 1968 | 568 | 101 | 2095 | 471 |
| 31/10/06 | 2619 | | | | 126 | 1921 | 560 | 108 | 2070 | 441 |
| 30/11/06 | 2649 | | | | 169 | 1789 | 682 | 128 | 2048 | 473 |
| 31/12/06 | 2616 | | | | 162 | 1662 | 782 | 95 | 2019 | 502 |
| 31/01/07 | 2609 | | | | 108 | 1732 | 757 | 88 | 1979 | 542 |
| 28/02/07 | 2597 | | | | 121 | 1831 | 632 | 99 | 1969 | 529 |
| 31/03/07 | 2653 | 384 | 1591 | 357 | 107 | 1945 | 595 | 90 | 2011 | 552 |
| 30/04/07 | 2579 | | | | 123 | 1963 | 484 | 102 | 1964 | 513 |
| 31/05/07 | 2551 | | | | 111 | 2001 | 426 | 97 | 1927 | 527 |
| 30/06/07 | 2595 | | | | 114 | 2046 | 425 | 104 | 2011 | 480 |
| 31/07/07 | 2535 | | | | 108 | 1986 | 429 | 110 | 1950 | 475 |
| 31/08/07 | 2482 | 312 | 1452 | 323 | 86 | 1962 | 418 | 96 | 1950 | 436 |
| 30/09/07 | 2532 | | | | 101 | 1989 | 424 | 121 | 1946 | 465 |

Table 14 – continued from previous page

| Date | All | Credit Constraints | | | Exp. Dom. Prices | | | Exp. Exports | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | firms | re-<br>str. | neu-<br>tral | acc. | drop | no<br>chg. | inc. | drop | no<br>chg. | inc. |
| 31/10/07 | 2538 | | | | 126 | 1969 | 435 | 145 | 1961 | 432 |
| 30/11/07 | 2511 | | | | 137 | 1793 | 575 | 167 | 1925 | 419 |
| 31/12/07 | 2475 | | | | 144 | 1616 | 706 | 161 | 1872 | 442 |
| 31/01/08 | 2491 | | | | 128 | 1618 | 735 | 134 | 1859 | 498 |
| 29/02/08 | 2564 | | | | 113 | 1803 | 637 | 132 | 1930 | 502 |
| 31/03/08 | 2486 | 418 | 1505 | 297 | 95 | 1831 | 555 | 129 | 1881 | 476 |
| 30/04/08 | 2554 | | | | 125 | 1904 | 513 | 172 | 1949 | 433 |
| 31/05/08 | 2505 | | | | 130 | 1921 | 445 | 190 | 1899 | 416 |
| 30/06/08 | 2575 | | | | 141 | 1895 | 531 | 200 | 1991 | 384 |
| 31/07/08 | 2625 | | | | 152 | 1797 | 667 | 237 | 2002 | 386 |
| 31/08/08 | 2597 | 483 | 1536 | 256 | 144 | 1794 | 645 | 265 | 1989 | 343 |
| 30/09/08 | 2598 | | | | 161 | 1897 | 532 | 304 | 1971 | 323 |
| 31/10/08 | 2615 | | | | 243 | 1903 | 461 | 471 | 1881 | 263 |
| 30/11/08 | 2575 | 774 | 1374 | 124 | 348 | 1854 | 364 | 649 | 1725 | 201 |
| 31/12/08 | 2594 | 768 | 1054 | 98 | 495 | 1704 | 385 | 793 | 1621 | 180 |
| 31/01/09 | 2615 | 881 | 1311 | 102 | 492 | 1826 | 282 | 763 | 1679 | 173 |
| 28/02/09 | 2601 | 995 | 1151 | 94 | 507 | 1876 | 205 | 762 | 1669 | 170 |
| 31/03/09 | 2728 | 1049 | 1285 | 88 | 567 | 1994 | 155 | 880 | 1687 | 161 |
| 30/04/09 | 2660 | 1000 | 1213 | 120 | 571 | 1951 | 126 | 803 | 1680 | 177 |
| 31/05/09 | 2672 | 1068 | 1146 | 133 | 517 | 2060 | 83 | 668 | 1825 | 179 |
| 30/06/09 | 2656 | 1060 | 1244 | 111 | 459 | 2073 | 112 | 598 | 1859 | 199 |
| 31/07/09 | 2657 | 1131 | 1159 | 115 | 447 | 2083 | 116 | 486 | 1938 | 233 |
| 31/08/09 | 2568 | 1052 | 1129 | 112 | 326 | 2096 | 134 | 383 | 1895 | 290 |
| 30/09/09 | 2634 | 854 | 901 | 88 | 335 | 2152 | 140 | 382 | 1943 | 309 |
| 31/10/09 | 2708 | 1054 | 1233 | 117 | 352 | 2203 | 144 | 364 | 2028 | 316 |
| 30/11/09 | 2688 | 1053 | 1148 | 118 | 366 | 2116 | 197 | 336 | 2028 | 324 |
| 31/12/09 | 2681 | 933 | 980 | 109 | 378 | 2058 | 228 | 320 | 1994 | 367 |
| 31/01/10 | 2699 | 1067 | 1230 | 118 | 346 | 2098 | 249 | 260 | 1992 | 447 |
| 28/02/10 | 2679 | 976 | 1225 | 125 | 307 | 2093 | 269 | 227 | 1948 | 504 |
| 31/03/10 | 2627 | 945 | 1285 | 119 | 263 | 2041 | 314 | 211 | 1934 | 482 |
| 30/04/10 | 2627 | 902 | 1309 | 152 | 183 | 2068 | 367 | 188 | 1931 | 508 |

Table 14 – continued from previous page

| Date | All firms | Credit Constraints | | | Exp. Dom. Prices | | | Exp. Exports | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | re-str. | neu-tral | acc. | drop | no chg. | inc. | drop | no chg. | inc. |
| 31/05/10 | 2574 | 826 | 1289 | 166 | 166 | 1977 | 421 | 162 | 1932 | 480 |
| 30/06/10 | 2677 | 835 | 1370 | 141 | 172 | 2018 | 475 | 167 | 1996 | 514 |
| 31/07/10 | 2665 | 763 | 1419 | 184 | 139 | 2023 | 488 | 148 | 2008 | 509 |
| 31/08/10 | 2671 | 704 | 1516 | 183 | 112 | 2097 | 458 | 140 | 2011 | 520 |

The table summarizes responses of firms in the *ifo* Business Cycle Survey Manufacturing (KT VG). The column "*All Firms*" lists the total number of firms participating in the survey in the respective month, not all of which replied to all questions. The "*Credit Constraints*" columns report whether a firm considers the willingness of banks to give credit to firms as restrictive (*restr.*), neutral, or accommodating (*acc.*). The "*Exp. Dom. Prices*" columns report whether a firm expects domestic prices to drop, to remain unchanged (*no chg.*), or to increase (*inc.*) during the next three months. The "*Exp. Exports*" columns report whether a firm expects export trade to drop, to remain unchanged (*no chg.*), or to increase (*inc.*) during the next three months.

Table 15: Overview of Responses by Firms Exporting to outside the E.U. to Selected Questions in the *ifo* Business Cycle Survey

| Date | All | Credit Constraints | | | Exp. Dom. Prices | | | Exp. Exports | | |
|------|-----|------|------|------|------|------|------|------|------|------|
| | exp. firms | re-str. | neu-tral | acc. | drop | no chg. | inc. | drop | no chg. | inc. |
| 30/06/03 | 1591 | 854 | 699 | 38 | 150 | 1378 | 63 | 249 | 1154 | 188 |
| 31/08/03 | 1565 | 825 | 699 | 41 | 105 | 1395 | 64 | 168 | 1157 | 240 |
| 31/03/04 | 1716 | 816 | 853 | 47 | 141 | 1342 | 233 | 170 | 1183 | 363 |
| 31/08/04 | 1582 | 697 | 807 | 78 | 117 | 1250 | 213 | 106 | 1128 | 348 |
| 31/03/05 | 1688 | 595 | 990 | 103 | 142 | 1273 | 270 | 144 | 1165 | 379 |
| 31/08/05 | 1589 | 494 | 949 | 146 | 131 | 1322 | 129 | 117 | 1137 | 335 |
| 31/03/06 | 1675 | 368 | 1097 | 210 | 112 | 1239 | 318 | 92 | 1104 | 479 |
| 31/08/06 | 1533 | 292 | 1025 | 216 | 73 | 1184 | 274 | 74 | 1130 | 329 |
| 31/03/07 | 1604 | 216 | 1116 | 272 | 51 | 1169 | 383 | 56 | 1120 | 428 |
| 31/08/07 | 1497 | 192 | 1053 | 252 | 39 | 1188 | 265 | 71 | 1092 | 334 |
| 31/03/08 | 1581 | 269 | 1094 | 218 | 56 | 1168 | 355 | 94 | 1104 | 383 |
| 31/08/08 | 1550 | 293 | 1064 | 193 | 71 | 1092 | 383 | 190 | 1093 | 267 |
| 30/11/08 | 1606 | 543 | 975 | 88 | 189 | 1166 | 246 | 498 | 941 | 167 |
| 31/12/08 | 1396 | 573 | 755 | 68 | 248 | 911 | 233 | 534 | 741 | 121 |
| 31/01/09 | 1665 | 642 | 944 | 79 | 299 | 1163 | 194 | 610 | 907 | 148 |
| 28/02/09 | 1597 | 698 | 832 | 67 | 291 | 1178 | 123 | 592 | 875 | 130 |
| 31/03/09 | 1648 | 713 | 877 | 58 | 301 | 1243 | 95 | 679 | 855 | 114 |
| 30/04/09 | 1671 | 722 | 861 | 88 | 340 | 1250 | 76 | 629 | 895 | 147 |
| 31/05/09 | 1637 | 751 | 788 | 98 | 305 | 1282 | 43 | 513 | 979 | 145 |
| 30/06/09 | 1656 | 726 | 855 | 75 | 266 | 1324 | 59 | 469 | 1022 | 165 |

Table 15 – continued from previous page

| Date | All | Credit Constraints | | | Exp. Dom. Prices | | | Exp. Exports | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | exp. firms | re-str. | neu-tral | acc. | drop | no chg. | inc. | drop | no chg. | inc. |
| 31/07/09 | 1700 | 816 | 802 | 82 | 274 | 1360 | 60 | 395 | 1107 | 198 |
| 31/08/09 | 1596 | 744 | 776 | 76 | 195 | 1318 | 78 | 296 | 1051 | 249 |
| 30/09/09 | 1332 | 624 | 645 | 63 | 172 | 1086 | 74 | 247 | 862 | 223 |
| 31/10/09 | 1691 | 751 | 863 | 77 | 211 | 1395 | 83 | 291 | 1137 | 263 |
| 30/11/09 | 1627 | 758 | 791 | 78 | 212 | 1295 | 117 | 242 | 1125 | 260 |
| 31/12/09 | 1395 | 650 | 675 | 70 | 184 | 1076 | 127 | 194 | 938 | 263 |
| 31/01/10 | 1716 | 777 | 859 | 80 | 206 | 1351 | 155 | 201 | 1138 | 377 |
| 28/02/10 | 1633 | 703 | 847 | 83 | 173 | 1288 | 169 | 176 | 1046 | 411 |
| 31/03/10 | 1636 | 662 | 893 | 81 | 150 | 1301 | 182 | 162 | 1078 | 396 |
| 30/04/10 | 1690 | 660 | 935 | 95 | 115 | 1344 | 228 | 143 | 1112 | 435 |
| 31/05/10 | 1609 | 576 | 924 | 109 | 101 | 1254 | 250 | 131 | 1071 | 407 |
| 30/06/10 | 1641 | 583 | 966 | 92 | 89 | 1258 | 291 | 123 | 1097 | 421 |
| 31/07/10 | 1706 | 554 | 1028 | 124 | 78 | 1302 | 318 | 111 | 1173 | 422 |
| 31/08/10 | 1690 | 485 | 1085 | 120 | 68 | 1333 | 288 | 111 | 1137 | 442 |

The table summarizes responses of firms in the *ifo* Business Cycle Survey Manufacturing (KT VG). Only firms which answer the question about credit access, report current or expected exports, and report exports to outside the E.U. are included. The column "*All exp. firms*" lists the total number of exporting firms in the survey in the respective month, not all of which replied to all questions. The "*Credit Constraints*" columns list whether a firm considers the current willingness of banks to give credit to firms as restrictive (*restr.*), neutral, or accommodating (*acc.*). The "*Exp. Dom. Prices*" columns report whether a firm expects domestic prices to drop, to remain unchanged (*no chg.*), or to increase (*inc.*) during the next three months. The "*Exp. Exports*" columns report whether a firm expects export trade to drop, to remain unchanged (*no chg.*), or to increase (*inc.*) during the next three months.