

Hanslin Grossmann, Sandra; Scheufele, Rolf

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Foreign PMIs: A reliable indicator for Swiss exports

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Foreign PMIs: A reliable indicator for Swiss and German exports?

August, 2015

Abstract

Foreign economic activity is a major determinant of export development. This paper presents an indicator for now- and forecasting exports, which is based on survey data that captures foreign economic performance. We construct an indicator by weighting foreign PMIs of Switzerland's and Germany's main trading partners with their export shares and compare its forecasting performance with alternative indicators. The paper shows that the indicator based on foreign PMIs is strongly correlated with exports (total as well as goods exports). In an out-of-sample forecast comparison we employ MIDAS models to forecast different definitions of exports. We document that our export indicator outperforms many other previously used indicators for forecasting exports and an univariate benchmark. As manufacturing is an important pillar of the Swiss and German economy and is highly export intensive, improving export forecasts is also beneficial for forecasting Swiss and German GDP.

JEL classification: F14, F17, C53

Keywords: Business tendency surveys, mixed frequencies, nowcasting, forecasting, MIDAS, exports

1 Introduction

Switzerland and Germany are similar in the sense that manufacturing is an important pillar of their economies. Moreover, manufacturing is highly export intensive. Both countries have a relatively high share of total exports to GDP of around 51 and 52%.¹ As a consequence, these economies depend highly on foreign activity and global trade. As such, the global trade collapse in 2008/2009 had a direct and huge impact on GDP. Thus, early information on foreign activity is extremely valuable for getting a reliable view on the state of the Swiss and German economy. Especially, foreign sentiment and industry conditions may provide important information for exports.

An early available indicator based on survey data is the Purchasing Manager's Index (PMI) which provides timely indication of the current and near-term industry conditions. In addition to the timeliness, further advantages of the PMIs are their broad availability and comparability across countries and that they are not subject to major revisions.

In this paper, we construct an indicator based on export-weighted foreign manufacturing PMIs of Switzerland and Germany's main trading partners and show that it provides important information for export development of these two countries. Moreover, we assess the in- and out-of-sample performance of export equations based on different survey based indicators. We present evidence that our export indicator is superior to other available indicator measures. In an out-of-sample forecasting setup, we show that there are substantial benefits in terms of predictability for Swiss and German exports using our aggregate PMI-based export indicator.

Survey based indicators such as the PMI are widely used by economic analysts for tracking the real economy as they provide early signals for the economic performance. Koenig (2002) and Lahiri and Monokroussos (2013) provide evidence for the usefulness of the PMI as an indicator for growth in the manufacturing sector and the economy as a whole. However, the performance of foreign PMI's for domestic exports has not been investigated in the literature.² Other survey based indicators for German exports are recently discussed in Jannsen and Richter (2012), Elstner et al. (2013) and Grimme and Wohlrabe (2014). The former presents an updated version of the ifo export climate indicator which captures firms and consumer sentiments of the most important destination countries for Germany. The authors find that the export climate indicator is highly cor-

¹The EU average of total exports to GDP is around 45%.

²A similar indicator is used by Credit Suisse (CS) and called CS export barometer.

related with the year-on-year quarterly changes of exports. They also point out that it is a valuable indicator for forecasting German exports. Jannsen and Richter (2012) focus on exports of capital goods only. They provide an indicator for capacity utilization in Germany's export destination countries and show that it is a good indicator for forecasting Germany's exports of capital goods. In contrast to these studies we are able to construct a monthly indicator. This indicator is rapidly available, follows the same definition for all countries and is only marginally revised. Baghestani (1994) find that survey-based forecasts of US net exports from professional forecasters improve the predictions of net exports. Esteves and Rua (2012) find that survey data improve the forecasts for Portuguese exports. Lehmann (2015) analyzes the forecast performance of soft indicators for exports looking at 20 European countries. The author finds that survey-based indicators outperform the benchmark model and hard indicators for most countries.

We show that the PMI-based export indicator is highly correlated with the current and future development of Swiss and German exports on a quarterly basis (both for total and for goods exports). Using MIDAS models, we provide evidence that the export indicator has valuable information for Swiss and German exports. In particular, in nowcasting situations where some month(s) of PMI information is already available, the forecasting accuracy relative to univariate models substantially improves. We also show the performance of the PMI-based export indicator relative to other leading indicators for exports and find that in almost all situations it outperforms other benchmark models.

The remainder of the paper is organized as follows. In the next section, we discuss our data set and the construction of the export indicator. In section 3 we investigate the empirical performance of the export indicator and section 4 concludes.

2 Data

2.1 Exports and its determinants

We use seasonally adjusted real goods and total (goods and services) quarterly exports from the national accounts for the period 1998Q1 to 2014Q4.³ The data is provided by the Federal Statistical Offices of Switzerland and Germany respectively and are based on the European System of Accounts 2010. Although the common standard should make

³The time period is restricted by the availability of PMIs. Up to 1997 only five countries in our sample provide PMIs. Between 1997 and 1999 nine additional countries start to provide a PMI. That is why we restrict our analysis on the period from 1998 on.

the data comparable to each other, Switzerland’s goods trade is special in the sense that merchanting trade makes up for roughly 10% and can be extremely volatile. Hence, concerning goods trade for Switzerland we exclude merchanting trade. For total trade, however, we include merchanting.

The main determinants of exports are usually foreign demand and competitiveness. Commonly used measures for demand are world GDP, export weighted GDP, foreign IPs, foreign soft indicators. Our measure for foreign demand will be based on foreign PMIs as described in the following subsection (2.2). The advantage of this soft indicator is its early availability for a wide range of countries. As a measure for competitiveness we use the real effective exchange rate across 40 (38) main trading partners for Switzerland (Germany).⁴ There is also a long debate about exchange rate uncertainty. As we found no evidence that volatility of the exchange rate affects neither Swiss nor German exports significantly, we focus on the two main drivers that are foreign demand and competitiveness.

2.2 PMI-based export indicator

Our indicator reflecting foreign economic activity is based on monthly manufacturing headline PMI numbers of the most important destination countries for Switzerland’s and German exports. We have picked the following 27 countries that cover 85% of Switzerland’s exports: Australia, Austria, Brazil, Canada, China, Czech Republic, Denmark, France, Germany, Greece, Hongkong, India, Italy, Ireland, Japan, Korea, Netherlands, Poland, Russia, Saudi Arabia, Singapore, Spain, Sweden, Turkey, United Arabian Emirates, United Kingdom and United States.⁵ For the German case we replaced the PMI for Germany by the one for Switzerland.⁶ Figure 1 shows the set of PMIs we use for short-run forecasting Swiss exports. Due to the heterogenous economic activity of Switzerland’s main trading partners, it is hard in some periods to see a clear pattern among the 27 PMIs where foreign activity goes. An export indicator which nicely summarizes the heterogeneity may provide a clear signal. The export indicator is obtained by summing up the weighted PMI of country i

$$EI_t = \sum_{i=1}^{27} w_{it} PMI_{it} \quad (1)$$

where the weights w_{it} are the country i ’s share of the exporting country’s goods exports

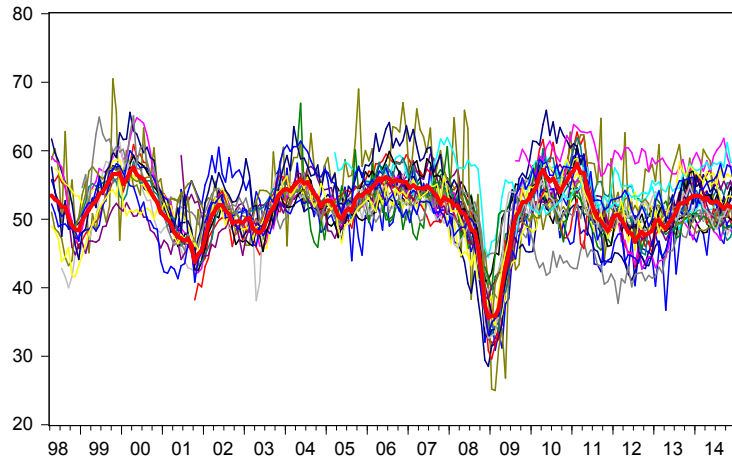
⁴Ca’ Zorzi and Schnatz (2007) analyze different price competitiveness measures explaining export of the Euro area and find little evidence that there is one indicator outperforming the other.

⁵For Saudi Arabia and United Arabian Emirates we use the PMI of the non-oil private sector.

⁶For Germany the selected set of countries cover roughly 80% of German exports.

relative to the sample such that $\sum_{i=1}^{27} w_{it} = 1$.⁷ The weights are a moving average over nine months (past four months, current and coming four months) in order to smooth outliers. For Switzerland, a graphical illustration of the weights over the period 1996 and 2014 is provided in figure 3. The largest weight of 23% during the last year is attributed to Germany, second (with a share of around 14%) is the US. Due to the moving average of export shares we would lose weights for the current four months. We address this by extending the exports for the coming four months with its last observation.

Figure 1: Export indicator and individual PMIs

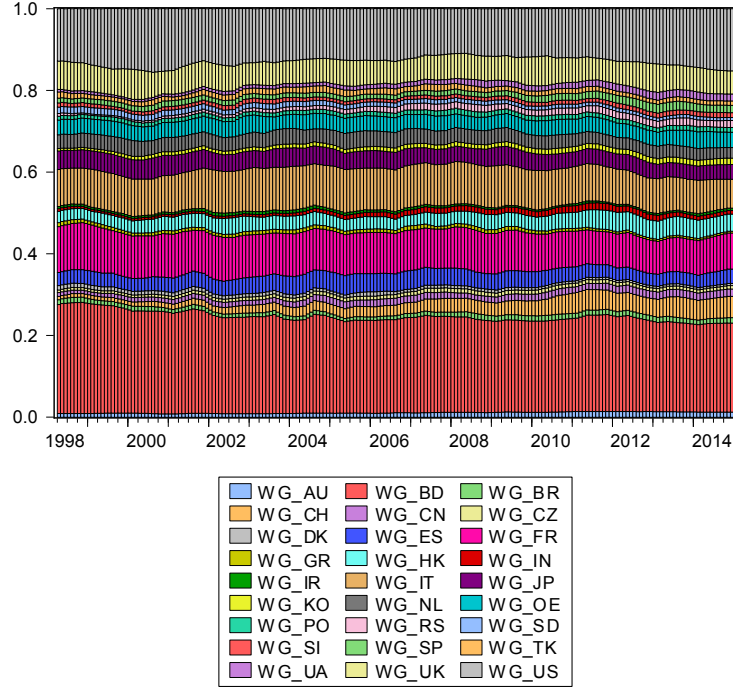


Aggregating country specific indices raises the concern about comparability of the series across countries. As the PMI number is constructed by similar methods across countries, it is a quite standardized measure which allows an international comparison. Thus, the heterogeneity across countries is less of a concern in this case.

For the construction of the PMI indicator we have to address the issue of data availability. As illustrated in figure 1 not all PMIs have the same length. For many countries the sample is quite short. Moreover, not all PMIs are released at the same date; there are basically two waves of PMI releases. There are two potential solutions to this problem. A simple approach would be to set the weight equal to zero for the time where no PMIs are available, i.e. $w_{it} = 0$ if there is no PMI available for country i at time t . This would imply that we give a higher weight to the remaining countries. A more sophisticated solution

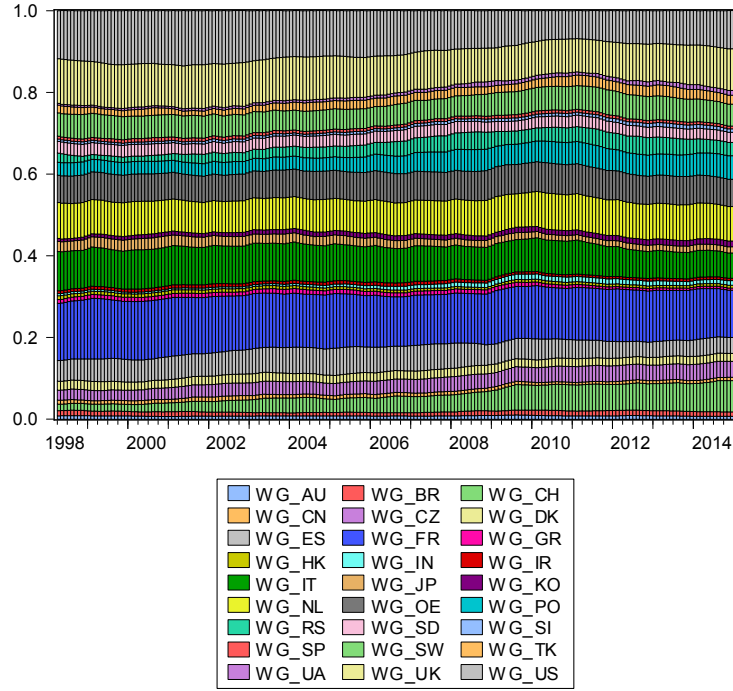
⁷We use the share of goods exports only as we do not have bilateral information on total exports. Exports of services is not available across countries.

Figure 2: Foreign PMI weights based on export shares, for Switzerland



would be to extend the individual series of PMIs by Stock and Watson's EM algorithm in combination with a factor model (e.g. Stock and Watson, 2002). A big advantage of this second approach is that we obtain a balanced sample of PMIs. As there are countries in the sample which are permanently above others, a balanced sample helps to obtain a time consistent export-weighted PMI indicator. The main idea behind this second approach is that international movements in PMIs are driven by common factors. As such we can make use of the information contained in the set of available PMIs to extend the PMIs which are not available together with the AR structure of individual PMI series. We proceed as follows. (1) We estimate an $AR(p)$ model for each country's PMI in order to take into account its autocorrelated structure. (2) The factors are estimated on the remaining errors but only for those countries with complete data. (3) These factors are used to impute data for the missing observations by means of OLS. (4) The full imputed data set is then used to estimate new factors. (5) The last two steps (step (3) and (4)) are iterated until the factors converge. (6) Finally, we use the factors and the AR structure to compute a balanced data set of all missing PMIs.

Figure 3: Foreign PMI weights based on export shares, for Germany



2.3 Alternative monthly indicators reflecting foreign demand

For both Switzerland and Germany we compare the performance of the export indicator based on foreign PMIs with a number of other publicly available early indicators.⁸ The Institute for Economic Research (Ifo) provides several soft indicators. We employ the following: Ifo business climate index (*IFOCLIMATE*), ifo export climate index (*IFOEXPORTBARO*) and ifo expectations with regard to export business in the next 3 months (*IFOEXPORTEXP*). The first is based on the assessment of the current situation and expectations of about 7000 firms from the manufacturing sector, construction industry, wholesale trade and retail trade. The second consists of firm and consumer sentiment and an indicator for price competitiveness against 37 German trading partners.⁹ The Ifo Export Expectations focuses on the export sector and is based on the Ifo Business Survey (Grimme and Wohlrabe, 2014). Moreover, we use new orders to manufacturing from abroad provided by Deutsche Bundesbank (*ORDERDEF*). For Switzerland we use

⁸Because Germany and Switzerland have a similar export structure we also take the German counterparts into account for forecasting Swiss exports. Indicators for Germany should also be valuable indicators for Switzerland.

⁹For an analysis of the ifo export climate index see Elstner et al. (2013).

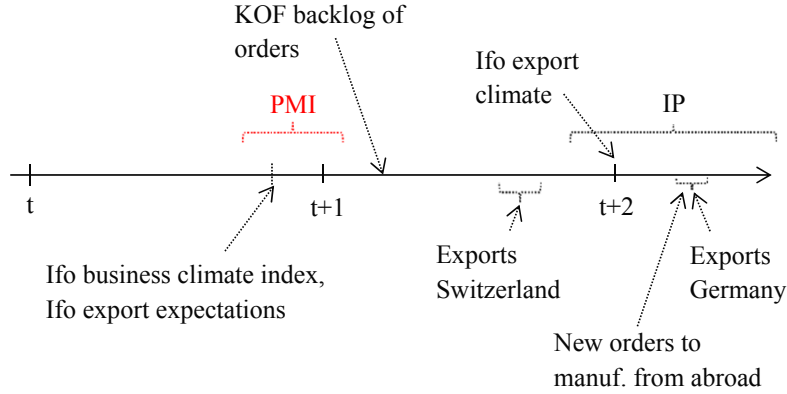
in addition backlog of orders (*BACKLOGSW*) which is provided by the KOF manufacturing survey. We have also looked at other Swiss indicators such as production, expected orders and expected production of the KOF manufacturing survey and PMI Switzerland. Neither of these has beaten our export indicator based on foreign PMIs. Among all these Swiss indicators we picked backlog of orders which performed best.

Beside these soft indicators our evaluation includes an alternative measure of foreign activity built on hard indicators. The indicator we have in mind here is industrial production of the main export destinations of Switzerland and Germany. Based on individual monthly IP growth rates we construct (similarly to the export weighted PMIs) an export weighted foreign IP growth indicator. In our set of 27 countries various IPs become available several months later. We extend these IPs analogue to the PMIs using Stock and Watson’s EM algorithm in combination with a factor model. As information on industrial production is available much later than PMIs, it is not useful as an early indicator. However, comparing its out-of sample performance with our export indicator provides useful information on the information contained in the PMI indicator. Is it worth waiting for the IPs or does the PMI indicator capture already most relevant information on foreign activity?

The advantage of several soft indicators is their early availability. However, monthly goods trade is available also quite early at least for Switzerland (only around two to three weeks after the PMIs). Monthly data on goods trade obviously comprise already some information on the quarterly trade figures. Hence, we also analyze how foreign demand indicators perform compared to monthly goods trade. Our monthly goods trade series are seasonally adjusted.

The publication dates of the indicators described is illustrated in figure 4. The month of which the indicator refers to is denoted by t . The first PMIs are available at the end of the current month and the last ones early at the beginning of the following month. The Ifo business climate index and Ifo export expectations are also available early. The majority of the IPs is available roughly one month later.

Figure 4: Publication dates of indicators

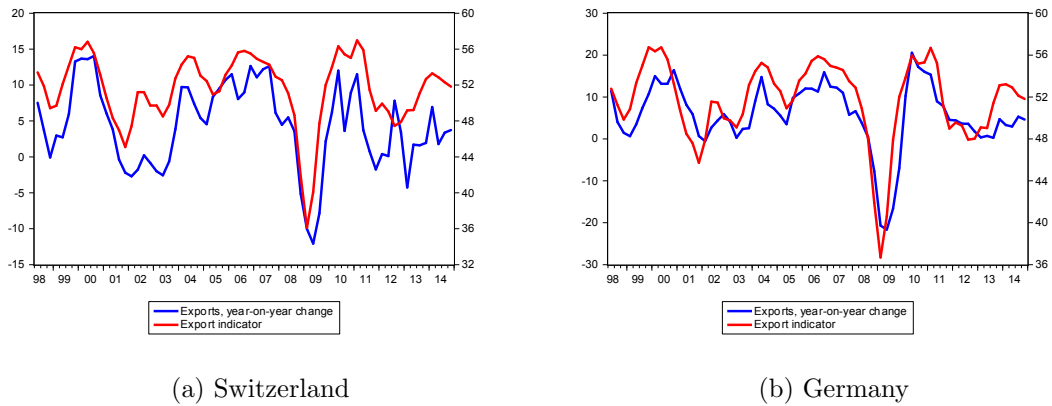


3 Explanatory power

3.1 In-sample evidence

How well does our PMI-based indicator fit Swiss and German exports? We first have a look at quarterly data of goods and total (goods and services) exports as reported by the national accounts for the period 1998Q1 to 2014Q4. The quarterly export indicator (EI) is obtained by simply averaging the monthly data. Panel a) in Figure 5 shows our export indicator (standardized) and the year-on-year change of real Swiss exports on a quarterly basis, panel b) depicts the two series for Germany. The figure reveals a quite close correlation between the two measures.

Figure 5: Export weighted PMIs and year-on-year change of Swiss and German exports



We estimate the year-on-year change of quarterly exports $gr_4 X_t^q$ with the following

equation:

$$gr_4X_t^q = c + \alpha gr_4X_{t-1}^q + \beta_0 EI_t^q + \beta_1 EI_{t-1}^q + \beta_2 gr_4 REER_t^q + u_t \quad (2)$$

The results are provided in table 1 and confirm the visual strong connection. The current export indicator and an additional lag explain at least 3/4 of the change versus previous year. For Switzerland we obtain adjusted R^2 of 0.77 for goods and 0.72 for total exports. For Germany the adjusted R^2 is around 0.8. Including one endogenous lag term and the real effective exchange rate increases the adjusted R^2 between 0.07 and 0.12. Including the endogenous lag term implies that the lagged EI becomes insignificant.

Table 1: Export growth rates (versus previous year) and export indicator

	Switzerland				Germany			
	Total exports		Goods exports		Total exports		Goods exports	
c	-64.47*** (5.32)	-47.31*** (6.77)	-71.20*** (5.07)	-47.58*** (6.99)	-94.33*** (6.07)	-54.31*** (7.91)	-84.72*** (5.52)	-49.12*** (7.08)
EI_t^q	0.78*** (0.18)	0.66*** (0.14)	0.56*** (0.17)	0.67*** (0.16)	0.60*** (0.21)	1.00*** (0.18)	0.52*** (0.19)	0.89*** (0.16)
EI_{t-1}^q	0.55*** (0.18)	0.33 (0.20)	0.90*** (0.17)	0.31 (0.23)	1.33*** (0.21)	0.11 (0.26)	1.22*** (0.19)	0.12 (0.24)
$gr_4X_{t-1}^q$		0.25** (0.10)		0.37*** (0.10)		0.48*** (0.08)		0.47*** (0.08)
$gr_4REER_t^q$		-0.39*** (0.08)		-0.19** (0.08)		-0.15** (0.06)		-0.15*** (0.05)
<i>adjusted</i> R^2	0.72	0.84	0.77	0.84	0.81	0.88	0.80	0.88

Notes: Standard errors are reported in parentheses. Significance levels are denoted by *** = $p < 0.01$;

** = $p < 0.05$; * = $p < 0.1$.

Next, we look at quarter-on-quarter development of exports. First, we investigate the causal direction in a Granger sense. When our export indicator is meant to have some explanatory power it should cause exports (null hypothesis: exports are not caused by the export indicator). Since exports from a small country like Switzerland should not influence foreign PMI's, we expect a one-way direction of causality running from the export-indicator to exports and not vice versa. Table 2 shows the results for Granger-causality tests for quarterly exports (total and goods). We use the Akaike criterion to select the number of lags. These tests confirm for both Switzerland and Germany that causality is running from the indicator to export which implies that the export indicator is Granger-causing exports. This further indicates that our PMI based measure might be a good indicator for future export developments.

Table 2: Granger causality tests

$$EI_t = a + \sum_{j=1}^p b_j EI_{t-j} + \sum_{j=1}^p c_j gr_1 X^i, \quad gr_1 X_t^i = a' + \sum_{j=1}^p b'_j EI_{t-j} + \sum_{j=1}^p c'_j gr_1 X^i$$

	Switzerland		Germany	
	Total exports	Goods exports	Total exports	Goods exports
$EI_t \rightarrow GCX_t^i$	0.036	0.014	0.000	0.000
$X_t^i \rightarrow GCEI_t$	0.512	0.472	0.805	0.797
p (lag length)	4	4	2	2
T	64	64	66	66

Notes: The Granger causality test is based on a bivariate VAR using an F -Test (p -values are displayed in the table). Lag selection is done by Akaike.

The Granger-causality test also has implications for finding a good forecasting equation for exports. Due to one-way causality we can ignore any feedbacks and specify a autoregressive distributed lag model for exports with the indicator as an exogenous variable (see Granger and Newbold, 1977, Chapter 8.2, for a discussion).

The correlation between the export indicator and quarterly growth rates of exports is also quite high. For the quarter-on-quarter change of exports $gr_1 X_t^q$ we estimate the following equation

$$gr_1 X_t^q = c + \alpha gr_1 X_{t-1}^q + \beta_0 EI_t^q + \beta_1 EI_{t-1}^q + \beta_2 gr_1 REER_t^q + u_t \quad (3)$$

Again we estimate two specifications. The first sets $\alpha = \beta_2 = 0$ while the second allows for the lagged endogenous term and takes the real effective exchange rate into account. The results of the two equations for our export measures are shown in table 3. Without the real exchange rate and the lagged endogenous term we obtain for Switzerland an adjusted R^2 of 0.48 and 0.32 for goods and total exports respectively. Adding the exchange rate and the lagged term increases the adjusted R^2 to 0.52 and 0.57, for goods and total exports respectively. The results suggest that the real exchange rate is more important for services than it is for goods which supports previous findings. For Germany the adjusted R^2 is 0.6 for both goods and total exports if we restrict $\alpha = \beta_2 = 0$. Even if we focus only on the current information from the export indicator, i.e. we constrain also $\beta_1 = 0$, the R^2 is equal to 0.49. The R^2 increases to 0.66 when we include the real effective exchange rate and the lagged endogenous term. For Germany the results for goods and total exports are much more similar. This can be explained by the fact that the share of services in Swiss exports is much larger (about one third) than it is for Germany (around 15%).

Table 3: Export growth rates (versus previous quarter) and export indicator

	Switzerland				Germany			
	Total exports		Goods exports		Total exports		Goods exports	
c	-44.68*** (15.25)	-68.49*** (15.23)	-59.56*** (12.03)	-81.92*** (14.30)	-86.40*** (12.49)	-87.61*** (16.72)	-78.76*** (11.52)	-79.80*** (15.22)
EI_t^q	2.84*** (0.51)	3.08*** (0.49)	2.88*** (0.40)	3.05*** (0.40)	3.77*** (0.43)	3.71*** (0.43)	3.34 *** (0.40)	3.28*** (0.39)
EI_{t-1}^q	-1.88*** (0.51)	-1.63*** (0.44)	-1.64*** (0.40)	-1.34*** (0.37)	-1.98*** (0.43)	-1.88*** (0.41)	-1.71*** (0.40)	-1.62*** (0.37)
$gr_1 X_{t-1}^q$		-0.28** (0.11)		-0.24** (0.11)		-0.08 (0.11)		-0.08 (0.11)
$gr_1 REER_t^q$		-0.53*** (0.12)		-0.35*** (0.10)		-0.31*** (0.09)		-0.30*** (0.08)
$adjusted R^2$	0.32	0.52	0.48	0.57	0.60	0.66	0.59	0.66

Notes: Standard errors are reported in parentheses. Significance levels are denoted by *** = $p < 0.01$;

** = $p < 0.05$; * = $p < 0.1$.

3.2 Relative forecast performance based on MIDAS models

In this section we analyze how well our export indicator performs in a realistic out-of-sample forecasting setting. Moreover, we compare it with other German and Swiss indicators described in section 2.3.¹⁰

A framework that employ directly the information content of monthly indicator information was proposed by Ghysels et al. (2004); Andreou et al. (2011) and has been recently applied by Clements and Galvão (2009) and Marcellino and Schumacher (2010) to macroeconomic forecasting. We follow their called MIXed DATA Sampling (henceforth MIDAS) methodology here. The main advantage is that the specification allows for flexible responses with only a small number of parameters has to be estimated (we follow the procedure as outlined in Drechsel and Scheufele, 2012).

Compared to ARDL models, the following MIDAS methodology exploits the availability of monthly information by directly relating the quarterly export series to the monthly indicator information. This is an important advantage. As shown in Ghysels et al. (2004) aggregating the data to the least frequently observed series (which is necessary to estimate ARDL models) is less efficient than a MIDAS regression. Our MIDAS approach follows a direct modelling technique (see Marcellino et al., 2006, for a comparison). Hence, the forecasting equations are re-optimized (by information criteria) in each prediction round.

The standard MIDAS model with a single explanatory variable and for given state of

¹⁰Because Germany and Switzerland have a similar export structure we also take the German counterparts into account, which should reflect similar things.

information l can be described by

$$y_t = \beta_0 + B(L^{1/m}; \theta)x_{t-l}^{(m)} + \epsilon_t^{(m)} \quad (4)$$

where $B(L^{1/m}; \theta) = \sum_{k=1}^K b(k; \theta)L^{(s-1)/m}$ and $L^{s/m}x_{t-1}^{(m)} = x_{t-1-s/m}^{(m)}$. t is the time index of interest (in our case, quarters), m is the higher sampling frequency (i.e. $m = 3$ for monthly data), s is a continuous index ($s = 0, 1, 2, \dots$) and K is the maximum number of lags. We parameterize $b(k; \theta)$ as an Almon-Distributed Lag model which is estimated with a restricted least squares approach and can be represented as:

$$b(k; \theta) = \theta_0 + \theta_1 k + \theta_2 k^2 + \dots + \theta_q k^q, \quad (5)$$

where q is the polynomial degree ($q < K$) which can be substantially lower than K . Even with very small q many flexible forms can be approximated. In practice one has to make a choice for q and K . We use information criteria, namely the SIC, to evaluate different combinations of q and K for the in-sample period and choose the one that optimizes the SIC.

In the MIDAS specification (eq. 4) the target variable y_t is directly related to information available at period $t-l$. l does therefore reflect the exact state of monthly information ($l = 0, \frac{1}{3}, \frac{2}{3}, \frac{3}{3}, \dots$). This implies that given different information assumptions for the current quarter $b(k; \theta)$ can generally vary for different forecasting rounds and depending on the publication lag l is specified. Under the assumption that one month of the actual quarter is already available, $K = 12$ (one year of information), and $m = 3$ (three observation within one quarter) the MIDAS regression model equals

$$y_t = \beta_0 + B(L^{1/3}; \theta)x_{t-2/3}^{(3)} + \epsilon_t^{(3)}, \quad (6)$$

so that

$$y_t = \beta_0 + b(0; \theta)x_{t-2/3}^{(3)} + b(1; \theta)x_{t-1}^{(3)} + b(2; \theta)x_{t-1-1/3}^{(3)} + \dots + b(K; \theta)x_{t-4-1/3}^{(3)} + \epsilon_t^{(3)}. \quad (7)$$

According to Clements and Galvão (2009) one may also include autoregressive dynamics

into the model. Therefore, we also consider the following model

$$y_t = \lambda y_{t-h} + \beta_0 + B(L^{1/3}; \theta) \left(1 - \lambda L^1\right) x_{t-l}^{(3)} + \epsilon_t^{(3)}. \quad (8)$$

For various states of information and for each forecast step the optimal model is selected by SIC, namely the polynomial degree q , the lag length K as well as whether to include an additional lagged term of exports.

One advantage of the MIDAS approach is that it easily allows to simulate a realistic flow of indicator information in such a way that different information sets can be compared. In our setting it would be interesting to see how the forecasting performance changes from the situation where the indicator series is complete to situation where some months are missing. To investigate the different states of information we consider four different situations: the indicator is available for all months of the forecasted quarter, two months are available, only one month is available and the indicator is available for the last month from the previous quarter.

3.2.1 The Swiss case

Table 4 displays the results on the MIDAS forecast methodology for Switzerland. It compares the forecast performance in different states of information for each indicator. Forecast accuracy is highest in the case where the indicator is available for the entire quarter, thereafter it deteriorates. The PMI based export indicator performs best among the leading indicators in basically all situations. Even when no PMI information is available for the quarter of interest, PMI information from the previous quarter can help to predict the development of exports in Switzerland. For goods, it is even significantly better than using an AR(1) model (see table 5). The last row of table 5 indicates that in between 40 and 60% the PMI indicator ranks first among all indicators. As already suggested by the previous results, the PMI indicator is somewhat better in forecasting goods exports than total exports. Monthly exports perform especially well when at least two months of a quarter are available. The IP indicator is best for goods exports if all three months are available.

Taking into account the date of publication we would need to compare the EI, IFOEXPORTEXP, IFOCLIMATE and BACKLOGSW with at least one month less information for IFOEXPORTCL and ORDERDEF (see the timeline figure 4). The majority of the IPs

Table 4: Switzerland: Forecast errors (RMSE), MIDAS models

	Total exports				Goods exports			
	<i>Available indicator information</i>							
	all 3M	2M	1M	prev. Q	all 3M	2M	1M	prev. Q
AR-Model	12.52				10.10			
Without real exchange rate								
Soft indicators:								
EI ^a	0.86	0.88	0.91	0.91	0.80	0.81	0.79	0.80
IFOEXPORTEXP ^a	0.91	0.94	0.96	1.03	0.81	0.88	0.89	1.00
IFOEXPORTCL ^c	0.87	0.87	0.91	0.98	0.91	0.92	0.95	0.96
IFOCLIMATE ^a	0.97	0.97	0.99	0.99	0.92	0.95	0.96	1.10
BACKLOGSW ^a	0.96	1.03	1.00	1.00	1.03	0.99	1.11	1.07
ORDERDEF ^c	1.06	1.06	1.10	1.10	1.12	0.91	0.92	0.98
Hard indicators								
IPIND ^c	0.87	0.96	1.02	1.14	0.72	0.84	0.99	1.10
EXPORTSM ^b	0.81	0.85	0.94	1.01	0.63	0.67	0.86	1.23
Including real exchange rate								
Soft indicators:								
EI ^a	0.82	0.78	0.98	1.17	0.74	0.78	0.83	0.82
IFOEXPORTEXP ^a	0.93	0.88	0.96	1.11	0.79	0.82	0.81	1.10
IFOEXPORTCL ^c	0.90	0.82	0.99	1.01	0.93	0.96	0.98	0.99
IFOCLIMATE ^a	0.93	0.85	0.94	1.04	0.86	0.93	1.05	1.11
BACKLOGSW ^a	0.96	0.89	1.06	1.03	1.02	1.04	1.06	1.07
ORDERDEF ^c	1.04	0.93	1.14	1.13	1.01	1.02	1.02	1.03
Hard indicators:								
IPIND ^c	1.04	0.86	1.13	1.17	0.77	0.81	1.02	1.22
EXPORTSM ^b	0.83	0.80	1.02	1.03	0.76	0.74	0.92	1.13

Notes: Different states of information are compared. All numbers show the RMSE relative to the benchmark model. Forecasts are generated from 2005q1-2014q4 by a direct method (following the MIDAS methodology eq. 4). Each equation is re-optimized in every forecast step. ^a: early availability; ^b: medium run availability; ^c: late availability.

are available 1.5 months after the PMIs but there are still a few that are published three or even four months later. If we take the timing into account, the PMI indicator performs by far better than all soft indicators and the IP in all situations.

As our in-sample-analysis shows, the exchange rate is relevant for the development of Swiss exports. We therefore undertake the same experiment as before but including the real effective exchange rate. The results are provided in the lower panel of table 4. We find that for total exports for all indicators two months of information performs best and is better than without taking into account the real exchange rate. For goods exports, forecast accuracy increases with the number of available months. In some cases the real exchange rate improves the performance somewhat.

Table 5: Switzerland: Performance of the EI

	Total exports				Goods exports			
	<i>Available indicator information</i>							
	all 3M	2M	1M	prev. Q	all 3M	2M	1M	prev. Q
RMSE AR	12.52				10.10			
EI relative to AR	0.86	0.88	0.91	0.91	0.80	0.81	0.79	0.80
p-value	0.19	0.21	0.30	0.16	0.11	0.18	0.06	0.01
average rank (EI)	1.58	1.58	1.45	1.43	1.43	1.45	1.38	1.40
% of best (EI)	42.5	42.5	55	57.5	57.5	55	62.5	60

Notes: Different states of information are compared. All numbers show the RMSE relative to the benchmark model (AR(1) model as in table 4). Forecasts are generated from 2005q1-2014q4 by a direct method (following the MIDAS methodology eq. 4). Each equation is re-optimized in every forecast step.

3.2.2 The German case

For Germany, the PMI indicator reduces the error by 30% compared to the AR-Model. Overall, all indicators perform better in forecasting German exports than forecasting Swiss exports. The PMI also outperforms on average the other indicators. The average rank is around 1.5 and the percentage of ranking first is roughly 50% (see table 7). The information contained by foreign PMIs can be useful if only one month is available. Similar to the finding for Switzerland, when no PMI is available for the current quarter, PMI information of the previous quarter can help to predict the development of German exports. However, in contrast to Swiss goods exports it is not significant (see table 7). Table 7 provides also the average rank of the EI and the percentage of ranking first among all indicators. These numbers are quite similar to the Swiss case.

We also provide the results for Germany including the exchange rate in the lower panel of table 6. Combining the EI with the real exchange rate improves the performance of the EI for total exports. *ORDERDEF* also performs better if we take in addition the real exchange rate into account. In most other situations the performance is worse.

3.3 Encompassing tests

A further analysis provides information on the additional information contained in the PMI compared to other indicators. Hence, we ask: given any indicator, do we improve the forecast performance by including the PMI indicator? Table 8 provides the p-values. Combining the PMI indicator with any of the indicator listet in the table provides significantly better forecasts in almost all cases. For Switzerland, the EI does not improve

Table 6: Germany: Forecast errors (RMSE), MIDAS models

	Total exports				Goods exports			
	<i>Available indicator information</i>							
	all 3M	2M	1M	prev. Q	all 3M	2M	1M	prev. Q
AR-Model	10.87				9.63			
Without real exchange rate								
Soft indicators:								
EI ^a	0.70	0.72	0.70	0.66	0.66	0.71	0.71	0.76
IFOEXPORTEXP ^a	0.66	0.72	0.87	0.88	0.68	0.74	0.82	0.92
IFOEXPORTCL ^c	0.74	0.69	0.71	0.69	0.67	0.76	0.68	0.70
IFOCLIMATE ^a	0.88	0.87	0.90	0.93	0.89	0.89	0.90	0.93
ORDERDEF ^c	0.70	0.76	0.81	0.95	0.75	0.80	0.85	0.97
Hard indicators:								
IPIND ^c	0.66	0.62	0.85	0.91	0.70	0.64	0.98	0.93
EXPORTSM ^c	0.50	0.49	0.72	1.15	0.63	0.51	0.74	1.16
Including real exchange rate								
Soft indicators:								
EI ^a	0.68	0.71	0.77	0.84	0.72	0.69	0.77	0.77
IFOEXPORTEXP ^a	0.74	0.76	0.82	1.14	0.81	0.85	0.84	1.14
IFOEXPORTCL ^c	0.73	0.76	0.80	0.76	0.80	0.85	0.79	0.78
IFOCLIMATE ^a	0.80	0.90	0.82	0.89	0.89	0.92	0.87	0.88
ORDERDEF ^c	0.65	0.73	0.84	0.96	0.69	0.79	0.80	0.90
Hard indicators:								
IPIND ^c	0.66	0.62	0.93	1.10	0.67	0.67	0.98	1.08
EXPORTSM ^c	0.52	0.48	0.79	1.15	0.64	0.55	0.80	1.20

Notes: Different states of information are compared. All numbers show the RMSE relative to the benchmark model. Forecasts are generated from 2005q1-2014q4 by a direct method (following the MIDAS methodology eq. 4). Each equation is re-optimized in every forecast step. ^a: early availability; ^b: medium run availability; ^c: late availability.

Table 7: Germany: Performance of the EI

	Total exports				Goods exports			
	<i>Available indicator information</i>							
	all 3M	2M	1M	prev. Q	all 3M	2M	1M	prev. Q
RMSE AR	10.87				9.63			
EI relative to AR	0.70	0.72	0.70	0.66	0.66	0.71	0.71	0.76
p-value	0.08	0.15	0.16	0.13	0.13	0.28	0.27	0.32
average rank (EI)	1.50	1.48	1.45	1.43	1.48	1.53	1.45	1.53
% of best (EI)	50	52.5	55	57.5	52.5	47.5	55	47.5

Notes: Different states of information are compared. All numbers show the RMSE relative to the benchmark model (AR(1) model as in table 4). Forecasts are generated from 2005q1-2014q4 by a direct method (following the MIDAS methodology eq. 4). Each equation is re-optimized in every forecast step.

the forecast for goods exports only in the case where all three months of goods trade are available. For Germany, the forecast performance of two available months of goods trade for both total and goods quarterly exports can not be significantly improved with the EI.

Table 8: Encompassing test

	Total exports				Goods exports			
	<i>Available indicator information</i>							
	all 3M	2M	1M	prev. Q	all 3M	2M	1M	prev. Q
Switzerland								
IFOEXPORTEXP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IFOEXPORTCL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IFOCLIMATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BACKLOGSW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ORDERDEF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IPIND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EXPORTSM	0.00	0.00	0.00	0.00	0.92	0.02	0.00	0.00
Germany								
IFOEXPORTEXP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IFOEXPORTCL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IFOCLIMATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ORDERDEF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IPIND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EXPORTSM	0.77	0.55	0.09	0.00	0.68	0.43	0.14	0.01

Notes: Different states of information are compared. All numbers show the RMSE relative to the benchmark model (AR(1) model as in table 4). Forecasts are generated from 2005q1-2014q4 by a direct method (following the MIDAS methodology eq. 4). Each equation is re-optimized in every forecast step.

4 Conclusion

We built a simple export indicator based on a weighted sum of various foreign PMIs. Accounting for the importance of a country's economic situation for Swiss (German) exporters we use export shares as weights. We then analyze the performance of the export-weighted PMI index for predicting Swiss and German exports and compare it with other commonly used indicators based on a MIDAS model. Our results show that our indicator contains reliable information to forecast exports on a quarterly basis. Moreover, we find that the indicator based on foreign PMIs in most cases outperforms other indicators. Especially, taking into account the early availability of the PMIs, our export indicator would score even better and outperforms other indicators.

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