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Working Paper

Mode Preferences in Business Surveys: Evidence from Germany

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Christian Seiler

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Abstract

With the world-wide spread of the internet in the 1990s, the conduction of web or e-mail surveys became popular in research. Although these surveys provide fast data collection and reduced costs, results may suffer from biases due to the survey mode. While a variety of studies concerning mode effects in household or individual surveys exists, only less is known in case of business surveys. To give a contribution to this topic, we analyse a large German business survey – the Ifo Business Survey – which is answered by about 7,000 respondents each month since 1949. In this paper, we focus on three different aspects with respect to the survey mode: data quality, respondents' profiles and response behavior. Our results show that e-mail or web surveys reduce nonresponse and are more likely used by larger firms which operate in technology-related business areas.

JEL Code: C81, C83.

Keywords: Business survey, data quality, mixed mode survey, response rate.

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1. Introduction

The rapid increase of internet users in the last two decades led to strong changes in the conduction of surveys. Web or e-mail surveys became of great importance as they own important advantages, e.g. a much faster data collection and reduced research costs (Fricker et al., 2005). As electronic surveys can be filled quickly by the respondents, several studies found that response rates are higher and item-nonresponse can be reduced significantly but no general trend seems to exist (Shih and Fan, 2007). In addition, mixed-mode surveys can be affected by biased results if there is a connection between the survey responses and the mode preference (de Leeuw, 2005). In particular, electronic surveys are still more frequently used by younger persons and the proportion of female participants is lower. Moreover, there is a clear link to technology-related characteristics of the respondents (Kwak and Radler, 2002).

While a variety of studies in the context of survey-methodological effects in household or individual surveys does exist, the literature concerning business surveys is rather poor (Janik and Kohaut, 2012). Willimack et al. (2002) adopted the participation framework proposed by Groves and Couper (1998) and transferred it to business surveys. It can be stated that the main difference between these types of surveys is the fact that the participation process is more complex since the respondents act as agents for their company and may collect information from various departments. Willimack and Nichols (2010) formulated a hybrid response process model for business surveys but did not analyse the effects of mode preferences in this context.

Therefore, this paper contributes to both, the literature on mode preferences and business surveys. We analyse the Ifo Business Survey, a monthly German business survey with more than 7,000 respondents. The data set covers the period 2002–2013 and includes more than 750,000 observations. This large amount of data provides detailed insights into the data collection process with respect to the survey mode. In Section 2, we describe the data set and give a short overview on the aim of the survey. Section 3 includes the data analysis. We focus on three different aspects with respect to the survey mode: data quality, respondents' profiles and response behavior. Finally, Section 4 sums up our empirical findings.

2. The data

Our data source is the Ifo Business Survey (IBS) from Germany. The IBS collects data on business level for a variety of different economic parameters such as demand, staff or capacity utilization in the manufacturing, construction, service and trade sector. Most of the variables are measured on a 3-level scale (positive, unchanged, negative) to enable a quick completion by the respondents. The survey results are aggregated to indicators which are intensively used by politicians, analysts and the general public. Figure 1 shows that the most prominent result of the IBS – the Ifo Business Climate Index – traces the growth rates of the German industrial production very well. In the economic literature, the index is characterised as leading for the cyclical development in Germany as it is published much earlier than other business cycle indicators from the Federal Statistical Office of Germany. Similar indices are also obtained by so-called tendency surveys, like the EU Economic Sentiment Indicator or the Purchasing Manager Index for various countries.

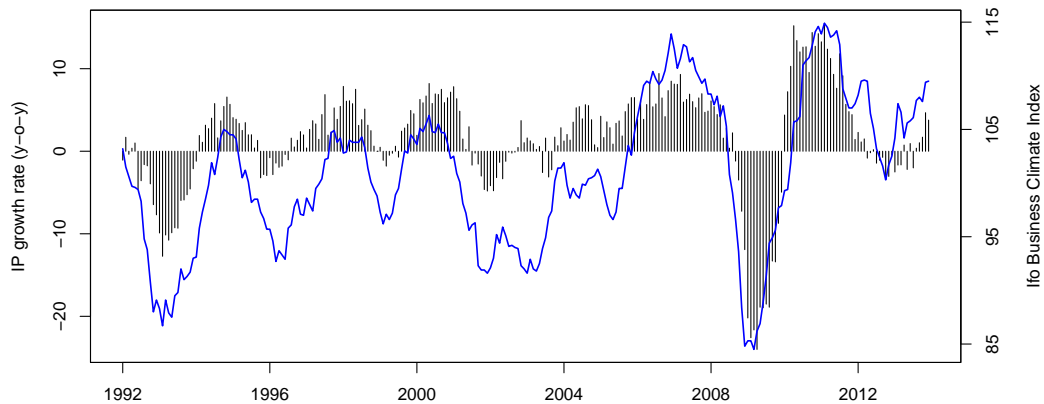


Figure 1: Growth rates of the German industrial production (black, left scale) and the Ifo Business Climate Index (blue, right scale) from January 1992 to December 2013.

The target population of the IBS follows the definition of the German official statistics (Seiler, 2014). In the construction, trade and service sector, the Ifo Institute surveys at the company-level. As most of the companies in

the manufacturing sector produce different products, they receive one questionnaire for each technical entity which is answered by different persons. To preserve a stable number of participants in the panel, new companies were constantly asked to participate in the IBS. The selection process is stratified according to the business areas. In total, the share of German industrial production represented in the survey is about 40%. The construction sector is represented with 14%, while the trade sector accounts for 5% of total employment in Germany. The IBS for the service sector covers 12% of the employees (Goldrian, 2007).

Since June 2002, the Ifo Institute offers electronic survey participation. It was first introduced for the construction firms and extended to the manufacturing sector in July 2004 and the trade sector in July 2007, respectively. For companies operating in the service sector, it was possible right from the start of the survey in October 2004.¹ The firms can choose between an e-mail questionnaire or a web interface besides the 'classical' form of mail. Figure 2 shows the development of the two different survey modes in the IBS. It can clearly be seen that electronic survey participation has increased since its introduction. Particularly in the service sector their usage is widely spread. In contrast, most of the participants in the construction sector still use the classical mail questionnaire. Therefore, it seems that companies from technology-related business areas generally favor modern survey techniques. In the next section, we analyse the data according to three different issues: data quality, respondent profile and response behavior. To enable a better comparison, we put mail respondents into one category named 'non-electronic' and e-mail and web interface users into a group named 'electronic'.

3. Analysis

3.1. Data quality

In the literature, one of the most frequently analysed aspects of different survey modes is nonresponse. It occurs if complete questionnaire (*unit-nonresponse*) or certain questions on the questionnaire (*item-nonresponse*)

¹In this paper, we used the data sets for the four different sectors including the December 2013-wave: IBS-IND (2013b), IBS-CON (2013b), IBS-SERV (2013b) and IBS-TRA (2013b). We dropped all observations before the introduction of the electronic survey in each data set. This led to 300,632 observations in manufacturing, 106,614 in construction, 267,306 in the service sector and 115,224 in trade.

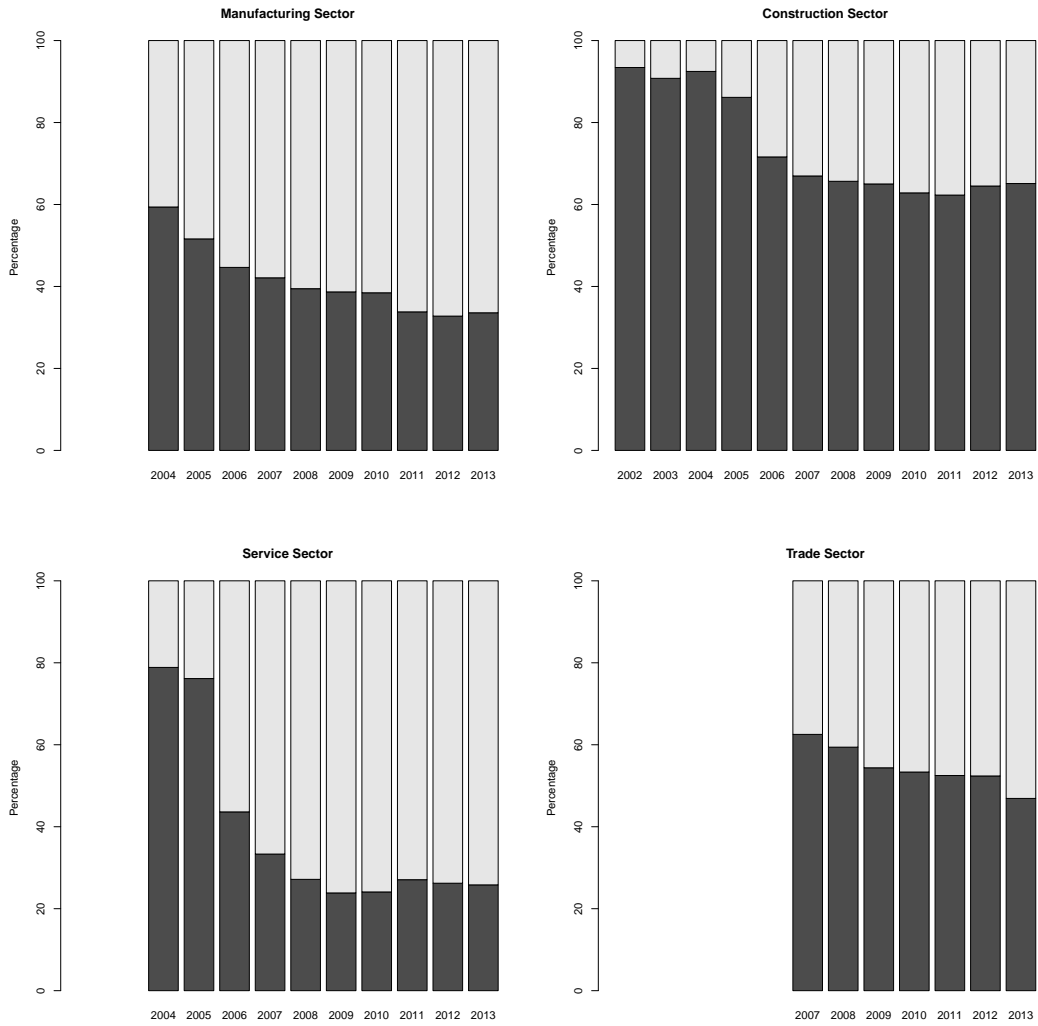


Figure 2: Development of survey mode usage according to the four different sectors in the Ifo Business Survey (2002–2013). Dark bars denote non-electronic, light bars electronic usage.

remain unanswered. A low nonresponse rate therefore is an indicator for good survey quality. Kwak and Radler (2002) and Sax et al. (2003) found that electronic surveys lead to significant reduction of unit- and item-nonresponse compared with mail surveys. In contrast, Shih and Fan (2007) underwent a meta-analysis on mode preferences in mixed-mode surveys and found no clear trend. Bech and Kristensen (2009) found that the response rate in web surveys is higher but item-nonresponse is reduced.

Table 1 shows the rates of unit-nonresponse with respect to the four main sectors in the IBS. With exception of the trade sector, there was a significant reduction of unit-nonresponse in all business areas. Particularly in the service sector, the unit-nonresponse rate is about 30% lower compared to the traditional mail survey. In the manufacturing and construction sector, the decreases are rather small.

Sector	non-electronic	electronic	p-value
Manufacturing sector	15.6%	12.6%	0.000
Construction sector	23.9%	22.8%	0.000
Service sector	52.5%	23.6%	0.000
Trade sector	13.4%	14.1%	0.999

Table 1: Unit-nonresponse rates by survey mode and different business areas. The p-value indicates if the electronic survey mode leads to significantly lower unit-nonresponse rates according to a one-sided Fisher’s exact test.

To analyse effects of the survey mode on the item-nonresponse rate, we additionally analyse each wave separately as the number of questions on the questionnaire differ between the four different sectors and survey waves. This ensures that companies which received a questionnaire with the same number of questions are compared. We perform a one-sided t-test to test whether item-nonresponse was significantly reduced with electronic surveys. In Figure 3 the p-values for the four sectors over the time span 2002–2013 are drawn. It can be seen that a significant reduction of item-nonresponse was achieved in nearly all sectors. For the manufacturing sector, this effect was measured in all months since the introduction of the electronic survey. Also in the construction (88%) and trade sector (96%) item-nonresponse was mainly reduced. For the service sector, this reduction was found only in 43% of the months. However, these significant reductions are relatively small. They led to an average decrease of item-nonresponse in the manufacturing

sector by 3.4 questions, in the construction sector by 1.7, in the trade sector by 1.8 and in the service sector by 0.5 questions.

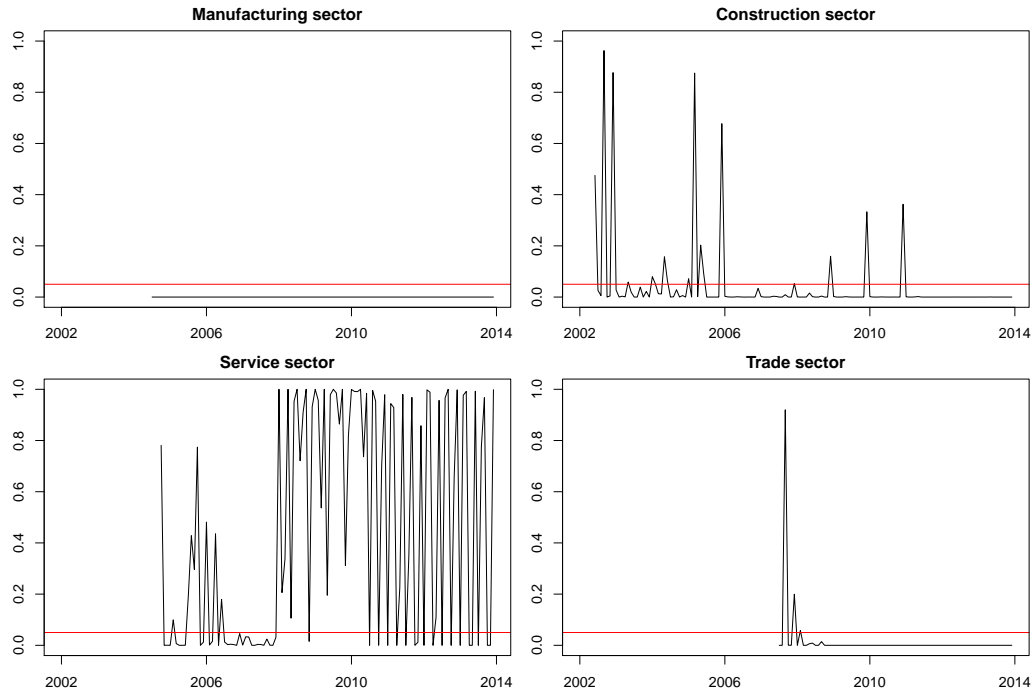


Figure 3: P-values of a one-sided t-test for the different business areas in the IBS. Red lines denote the 5%-threshold which indicate a significant reduction of item-nonresponse.

3.2. Respondent profile

To get a clearer picture of the participating units, we report the respondents' profiles according to the different survey modes in this section. Two characteristics can directly be used from the survey: The size of the company and the region in Germany where the firm is located. In addition to this, we also included information about the first participation in the IBS which might date back to the first wave in 1949.

In Table 2 we report the shares of non-electronic and electronic usage in the IBS with respect to the size which is measured by the number of employees. It can be seen that the usage of electronic questionnaires is more frequent for larger firms which may have a better technological infrastructure than smaller companies. A similar picture can be seen when the survey

mode usage is displayed according to the German states. Figure 4 shows that firms from Eastern Germany less frequently use electronic questionnaires in contrast to companies from Western Germany which is presumably due to the fact that the spread of internet infrastructure is lower in the east of Germany.² The highest share of electronic survey users was found in Hamburg with 66%, the lowest in Mecklenburg-Vorpommern with 38%. These findings support the presumption that firms which are more active in technology-related business areas tend to use electronic questionnaires. Similar effects were found for small and medium enterprises (SMEs) by Meckel et al. (2005).

Concerning the length of participation in the IBS, Figure 5 shows the distribution of survey mode usage across the four sectors by the end of 2013. With exception of the trade firms, there exists no general trend to use electronic surveys if a firm participates in the IBS more recently.

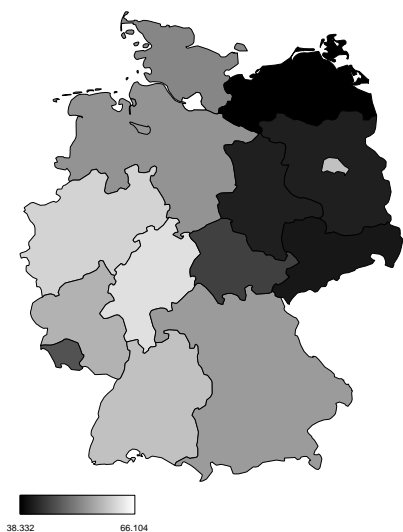


Figure 4: Survey mode usage according to the German states. The lighter the region, the higher the share of electronic survey mode usage.

²A graphical representation of internet infrastructure in Germany can be found here: http://www.zukunft-breitband.de/Breitband/DE/Breitbandatlas/BreitbandVorOrt/breitband-vor-ort_node.html (accessed: 21 October 2014)

Size	non-electronic	electronic	Size	non-electronic	electronic
Manufacturing sector			Construction sector		
small	51%	49%	small	71%	29%
medium	39%	61%	medium	61%	39%
large	34%	66%	large	80%	20%
Service sector			Trade sector		
small	25%	75%	small	55%	45%
medium	22%	78%	medium	51%	49%
large	21%	79%	large	43%	57%

Table 2: Usage of non-electronic and electronic questionnaires according to the size of the company and the business area.

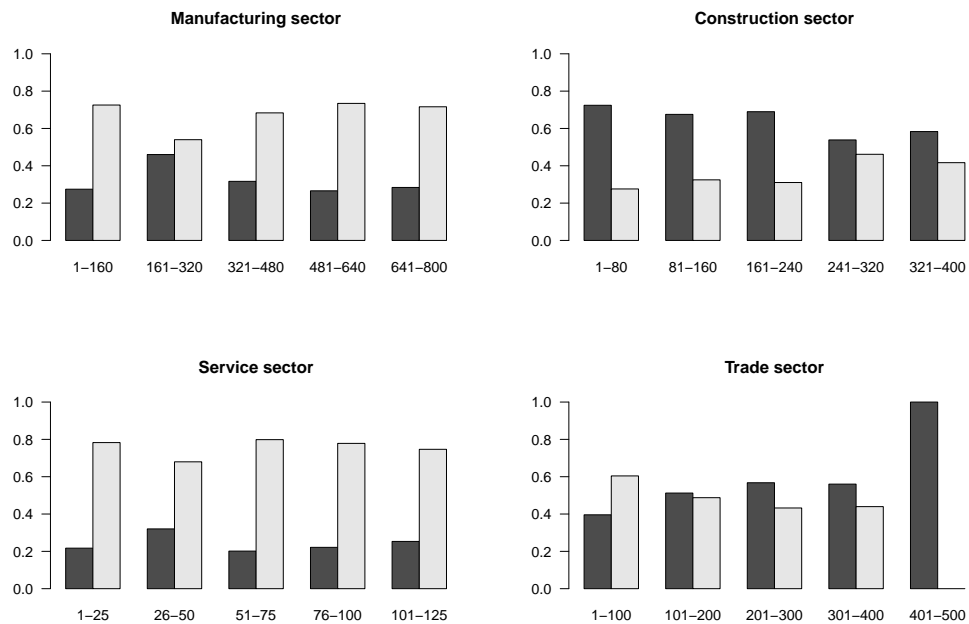


Figure 5: Survey mode usage according to the length of survey participation in months and the four main sectors in December 2013. Dark bars denote non-electronic, light bars electronic usage.

3.3. Response behavior

As noted in Section 2, the IBS is a monthly survey to trace the cyclical development in Germany. The survey indicators are intensively used for forecasting macroeconomic parameters such as the German gross domestic product or the industrial production. Various studies showed that these business tendency survey indicators have very good forecasting properties, especially in the short-run, see for instance Carriero and Marcellino (2011), Drechsel and Scheufele (2012) or Robinzonov and Wohlrabe (2010). For this reason, survey methodological biases may result in a lower forecasting performance. Seiler and Heumann (2013) showed that unit-nonresponse does not affect the IBS indicators significantly. To analyse possible biases through the survey mode, we calculate the indicators for both subgroups and test whether there is a significant difference in the response pattern for the two main variables of the survey: The business situation and the business expectations.³

Figure 6 shows the two indicators for the business situation and the business expectations according to the four main sectors. It can be seen that firms using an electronic questionnaire on average have a better business situation and are more optimistic with respect to their future development. This is particularly pronounced in the trade and service sector. For construction and manufacturing, the difference of the time series is of similar direction but statistical significance is measured less often as can be seen in Figure 7. The p-values for the corresponding Chi-Squared Test for Homogeneity are lower 5% in most of the months in the trade and service sector. However, the results also show that – despite the difference in the level – the shape of the indicators is mainly the same for both subgroups.

4. Summary and Outlook

In this paper, we analysed a large German business survey for differences in the survey mode. We tested for nonresponse and found that participants using electronic ways to answer the survey generally have a lower probability for unit- and item-nonresponse. Regarding the structure of the participating units we found that firms which operate in technology-related business areas more likely use electronic surveys. The same applies to the size of the

³The 'business climate' is calculated from these two variables and is not directly questioned on the questionnaire.

company. Concerning the response pattern we found some differences in the answering behavior resulting in more positive replies to the current situation as well as future expectations when electronic questionnaires are used. Future research should focus on potential decreases in forecasting performance and if the results found here also hold for other types of business surveys.

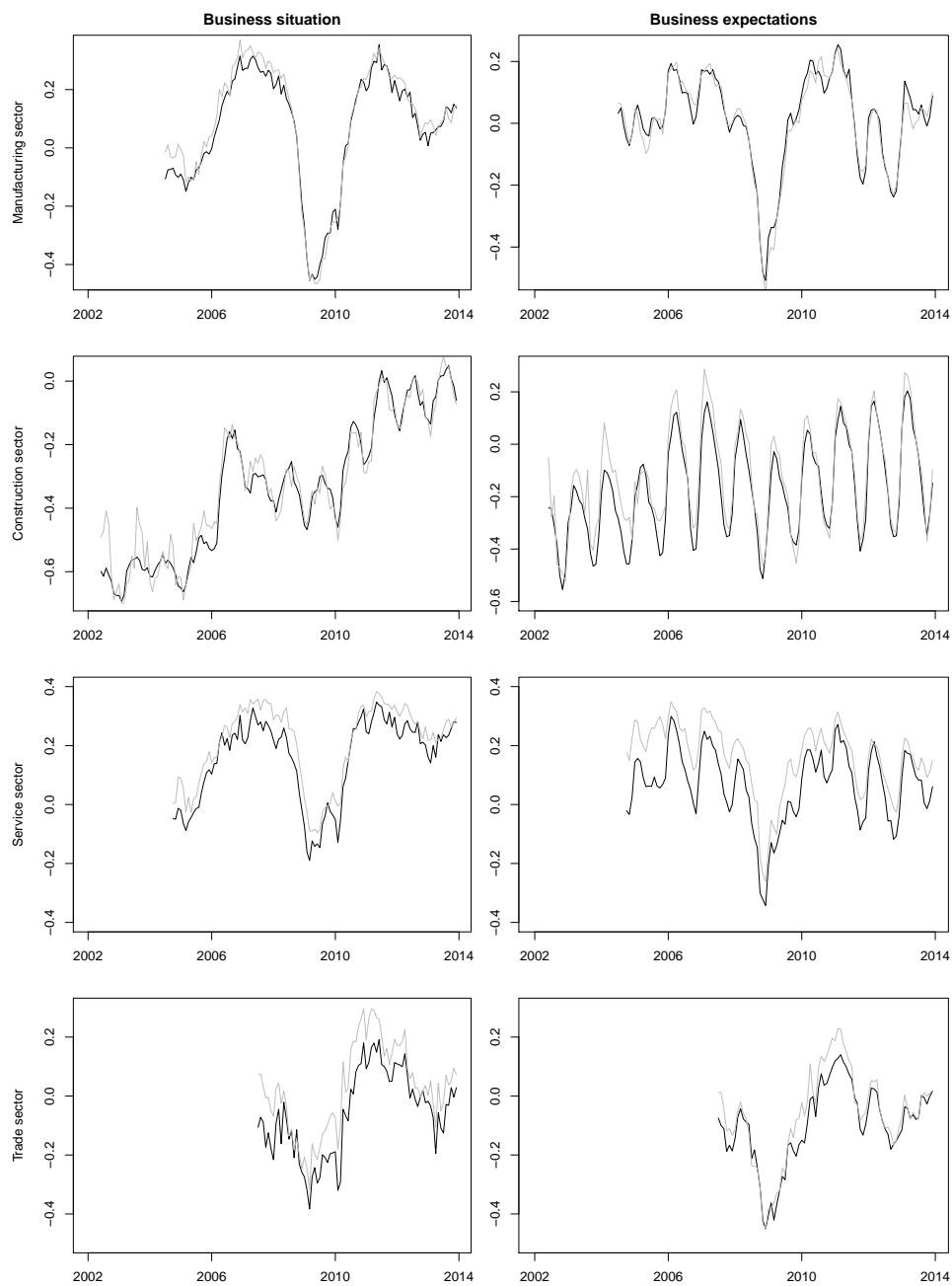


Figure 6: Balance statistics indicators for the business situation and business expectations variables according to the four main sectors. Dark lines denote non-electronic, light lines electronic usage.

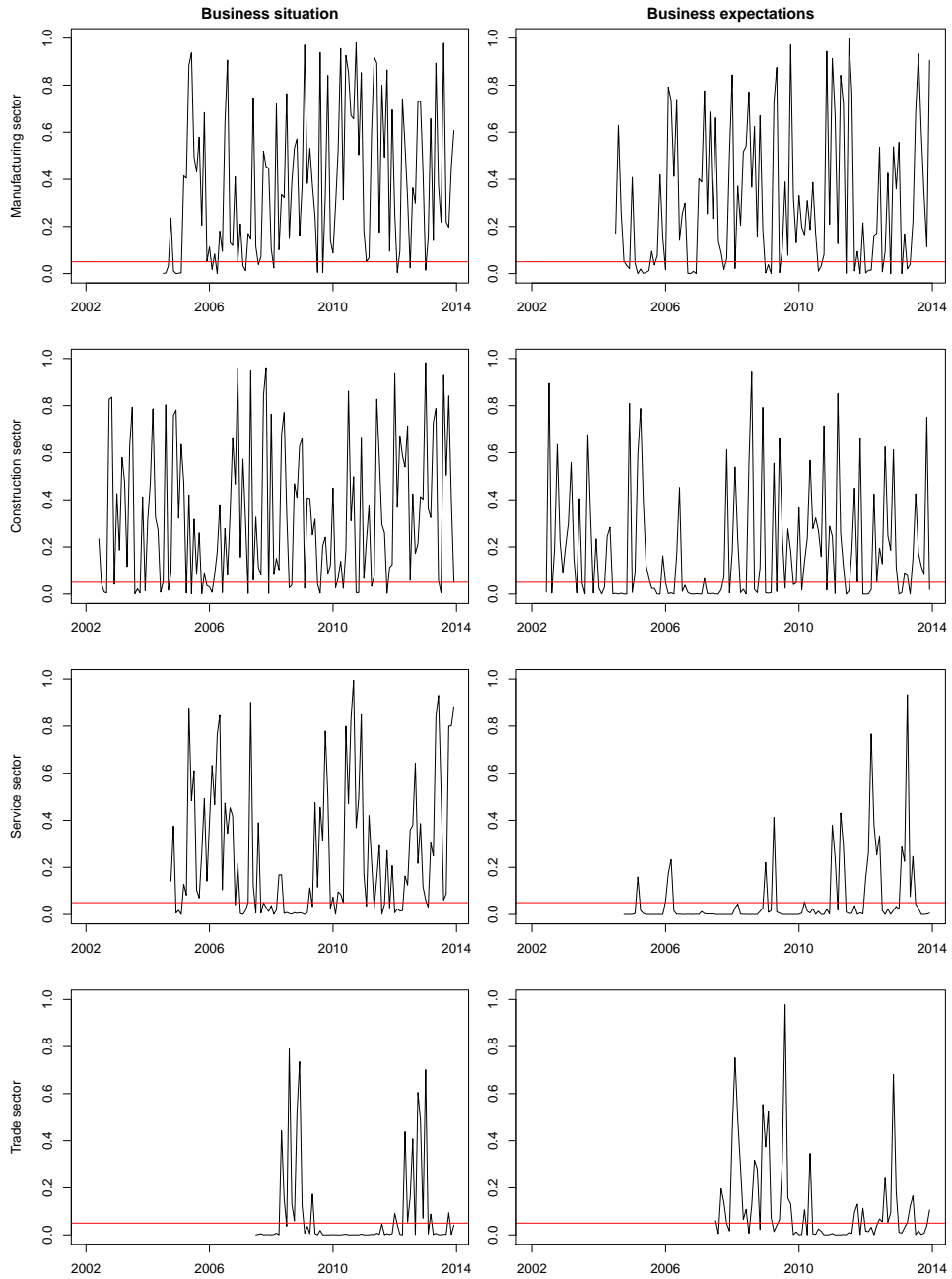


Figure 7: P-values of a Chi-Squared Test for Homogeneity for the business situation and business expectations variables according to the four main sectors. The red lines denote the 5% threshold.

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