Learning-by-Exporting or Managerial Quality?
Evidence from the Czech Republic

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Abstract

This paper employs firm-level panel data from the Czech Republic to ask about the empirical relevance of the learning-by-exporting hypothesis. To provide convincing estimates, one must be able to disentangle learning-by-exporting from changes in company management that induce the company to both start exporting and introduce productivity increasing measures. Therefore, we compare estimates based on matching on propensity score, which do not control for potential management changes, to estimates based on an instrumental variables strategy. Specifically, we focus on firms that start exporting due to changes in the industry-specific ratio of producer prices on domestic and foreign markets. The results suggest that learning-by-exporting in the Czech Republic is not significant, either statistically or economically, irrespective of the method used.

Keywords: exporting, productivity, matching on propensity score, local average treatment effect

JEL classification: D24, D83, F13, F14-15, C23

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1 Introduction

Exporters are more productive than non-exporters. Empirical evidence for this claim can be found in numerous recent studies\(^1\), though causality in the relationship is not that clear. There are two main non-exclusive theories which attempt to explain these findings. The first, often referred to as the self-selection theory, proposes that more productive firms self-select into exporting due to the existence of sunk costs connected with entering foreign markets\(^2\) and possibly stronger competition on foreign markets. The second theory, referred to as the learning-by-exporting theory, suggests that exporting firms enhance their productivity through selling abroad. This can happen in several ways. Exporters can learn from foreign customers, they can increase productivity due to the pressure of international competition, or they can simply gain new markets and benefit from economies of scale. In terms of causality, there is a clear distinction between the two theories. According to the self-selection theory, causality indicates that higher productivity leads to exporting status. On the contrary, the learning-by-exporting theory argues that exporting enhances productivity. To reiterate, these two theories are non-exclusive, i.e. more productive firms can self-select into exporting but, at the same time, the productivity of exporters can grow faster than the productivity of non-exporters.

The power of the second theory becomes clearer if the domestic economy is less developed and relatively small. For a less developed country, the greater difference in technology levels between domestic and foreign firms increases the possible productivity gains that exporting firms can achieve through contacts with more developed foreign partners. In other words, a firm in a less developed country has a greater potential to learn by exporting than does a firm in an advanced country. Further, a firm operating in a small country can substantially increase its sales by entering foreign markets. If such a firm can benefit from economies of scale, the second theory gains even stronger merit.

While empirical studies unanimously\(^3\) confirm the first direction of causality, i.e. that more productive firms self-select themselves into exporting, empirical evidence on the second direction, i.e. learning-by-exporting, is ambiguous. While the theory was not supported in the cases of the USA, Germany, Taiwan, Korea, Colombia, Mexico and Morocco, learning effects were confirmed in China, some African countries, and to some extent Spain\(^4\) and Italy.

Motivation for this paper is build on the expectation, that exporters from transition countries in the Central and Eastern Europe (CEE) could gain substantially in terms of productivity. One reason is the initial technological gap between domestic and foreign firms (mainly those from Western Europe, where a major part of export was directed soon after the collapse of COMECON) at the beginning of transition. The catch-up

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\(^2\) The existence of sunk costs was empirically confirmed in several recent studies starting with Roberts and Tybout (1997).

\(^3\) To my knowledge, no paper investigating the hypothesis that firms self-select into exporting rejects that hypothesis.

\(^4\) In Spain, Delgado, Farinas and Ruano (2002) do not find significant learning effects for the whole sample, but only for a sub-sample of young firms.
process generally implies strong growth of productivity. In the presence of heavy productivity gains in general, the difference in productivity gains between exporting and non-exporting firms could be more pronounced. Therefore, if learning-by-exporting exists, it should be more significant in transition countries than in countries with benign productivity growth.

Besides searching for evidence of learning-by-exporting in the similar way as previous studies did using firm-level data in other countries, we also address the main issue of this paper: Does simultaneous occurrence of the beginning of exporting and productivity gains confirm the validity of learning-by-exporting theory or can it be a consequence of e.g. change in management? If new manager adopts measures to increase productivity and decides about launching export at the same time, conventional methods would evaluate such an increase in productivity as a result of learning-by-exporting. To disentangle learning-by-exporting from similar effects of management, we employ the movements of exchange rates and producer prices as exogenous factors that can motivate firm to starts to export.

In addition, controlling for ownership can have a serious impact on the empirical results of testing the learning-by-exporting hypothesis. The line of reasoning is as follows: If firms owned by a foreign owner have access to technology directly from a foreign owner, their potential to increase productivity through exporting is limited. On the other hand, exporting may form an important channel of productivity gains for domestic firms that do not have the possibility to acquire productivity-enhancing knowledge from a foreign owner. Therefore, pooling domestic and foreign-owned firms together can conceal the effect of learning-by-exporting.

The paper contributes to the existing literature in two ways. First, by testing the learning-by-exporting hypothesis on data from the Czech Republic, i.e. a representative of the CEE region. Regarding the growth of productivity and the importance of export, the CEE region is unique among those economies for which similar research is available. Second, the study suggests an approach that is focused on firms that start to export due to exogenous factors. Thus, we are able to eliminate the cases of planned simultaneous rise of productivity and start of exporting e.g. the case of firm with new management, which launch exporting and apply measures boosting productivity at the same time.

The remainder of the paper is organized as follows. Related literature and available empirical results are described in the next section. Methodology is outlined in the section three. Fourth section describes the data, results are discussed in the fifth section. Section six deals with robustness issues and section seven concludes.

2 Literature Review

While most empirical studies support the self-selection theory, limited evidence exists for the validity of the learning-by-exporting theory. A pioneering paper is that of Clerides, Lach and Tybout (1998), who employ firm-level data from Colombia, Mexico and Morocco and confirm the self-selection theory, but find little support for

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5 Openness of the Czech economy defined as (Export + Import)/GDP reached 110% in 2000, placing Czech Republic among most open economies in Europe.
the learning-by-exporting theory. The significance of self-selection but lack of evidence for learning-by-exporting is confirmed by Bernard and Jensen (1999) for U.S. firms and by Arnold and Hussinger (2004) for German firms. Isgut (2001) shows that exporters are larger, have higher labor productivity, and pay higher wages three years before entering foreign markets, but that labor productivity doesn’t grow faster in exporting firms after they start exporting. Delgado, Farinas and Ruano (2002) find evidence supporting self-selection in Spanish data and some support for learning-by-exporting, albeit limited to young exporters.

Results consistent with learning-by-exporting theory can be found in Girma, Greenway and Kneller (2002) for U.K. firms, or in the study of firms from four African countries performed by Bigsten et al. (2004). Castellani (2002) in his study employing data on Italian firms finds that exporting status itself has no effect on productivity, but that productivity growth is positively related to export intensity. Focusing on labor productivity only, Wagner (2002) uses German firms to show that exporting has positive effects on labor productivity growth. Finally, Bleaney, Filatotchev and Wakelin (2000) test the learning-by-exporting hypothesis for Belarus, Russia and Ukraine, and yield results in support of the learning-by-exporting theory. However, caution is called for here, since the authors use the number of employees as the only measure of productivity. Moreover, the used sample is rather small (“roughly 75 from each of the three countries”) and likely not representative.

In addition to the self-selection and learning-by-exporting theories, Hallward-Driemeier, Iarossi and Sokoloff (2002) propose an alternative explanation for a correlation between export and productivity. They argue that firms entering foreign markets do not show higher productivity due to an exogenous productivity shock, but rather as a result of their past decision to enter foreign markets and subsequent decisions aimed at increasing productivity. The authors use survey data from five Asian countries to assess the appropriateness of their theory. Comparing information on firms already exporting in the first year of their existence with firms that start exporting only later, the authors find support for their view. Based on their results, they argue that expansion of export opportunities in less developed countries could increase the incentives of firms to export, and consequently to increase their productivity.

Different results from different studies do not necessarily have to be attributed to country specifics only. In terms of methodology, the studies mentioned above employ a variety of approaches. Two main features can influence the results of causality described above: the way productivity is measured and the estimation strategy. As for measuring productivity, measures of total factor productivity (TFP) based on different production functions are employed in several cases (e.g. Bigsten et al. (2004) use TFP based on Translog and Cobb-Douglas production functions; Girma, Greenaway and Kneller (2004) use TFP based on Cobb-Douglas production function, etc). Arnold and Hussinger (2004) use the Olley and Pakes (1996) two-step semi-parametric procedure to control for the simultaneity problem in TFP estimation. Clerides, Lach and Tybout (1998) proxy productivity by average variable costs and labor productivity. Finally, as mentioned earlier, Bleaney, Filatotchev and Wakelin (2000) use employment as the measures defined in monetary terms unusable. 

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6 Some learning was found in the case of Morocco.

7 The authors justify the use of employment as a measure of productivity by pointing to the presence of rapid inflation, which makes measures defined in monetary terms unusable.
only measure of performance, due to the impossibility of using monetary measures stemming from the presence of high inflation.


3 Methodology

3.1 Productivity measures

Three productivity measures are employed to evaluate productivity developments at the firm level: labor productivity based on output, labor productivity based on value added and total factor productivity utilizing a methodology suggested by Levinsohn and Petrin (2000).

Labor productivity based on output is defined as output divided by labor (see Table 1 for the definitions of underlying variables). Labor productivity based on value added is defined as value added divided by labor. Total factor productivity is defined as the residual from Cobb-Douglas production function. To address the simultaneity problem in input choice, we use approach suggested by Levinsohn and Petrin (2000) to estimate total factor productivity. Due to different nature of labor productivity total productivity measures, it is not possible to compare the results based on these to approaches directly.

Productivity of export starters and non-exporters is compared in levels and growth rates. In the level version, productivity of each firm in each year is recomputed vis-à-vis average productivity in the group of firms from the same 2-digit industry, same size group and same year, where the average productivity is set to 100. The whole population of firms is used in group comparison, not only export starters and non-exporters. Growth rates are year-on-year growth rates of original productivity levels without within group comparison.

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8 Firms are divided into four size groups based on the number of employees recomputed on an eight hour day basis
3.2 Matching on propensity score

Matching on propensity score is not a new approach in the literature on learning-by-exporting (see Wagner 2001, Girma, Greenaway and Kneller 2004, Arnold and Hussinger 2005). The idea is to match two otherwise similar firms with one difference – one of the firms starts with exporting, the other remains on the domestic market only. The two firms have to be matched in the year preceding the year when export starter launches exporting. Outcome of interest, in our case productivity measure is than compared between the groups of export starters and non-exporting firms.

We implement matching on propensity score using the Stata command `psmatch2`, described in detail in Leuven and Sianesi (2003). Matching is based on the probability of firms to start with exporting given the covariates. In our case, labor, investments, revenues, wages, industry-specific exchange rates, year dummies, industry dummies (based on two-digit NACE code), and ownership dummies are used as covariates. We opt for one-on-one matching, with common support\(^9\) and logit function used for estimation.

\(^9\) Common support means that treatment observations whose propensity score is higher than the maximum or less than the minimum propensity score of the controls are dropped.
3.3 Regression Analysis and Local Average Treatment Effect

Besides estimating average treatment effect using matching on propensity score, we employ also regression analysis. Specifications estimated on the sample of non-exporters and export starters are described below. First, we estimate the effect of exporting on productivity measure using pooled OLS:

$$productivity_{i,t} = \beta_0 + \beta_1 firstyear_{i,t} + \beta_2 \ln l_{i,t-1} + \beta_3 \ln k_{i,t-1} + \delta controls_{i,t} + \epsilon_{it}$$  (1)

where productivity$_{i,t}$ is a selected productivity measure of the firm i in the year t, firstyear$_{i,t}$ is a dummy variable equal to 1 if the firm i exports in the year t, but does not export in the year t-1. Variables l and k denote labor and capital, controls$_{i,t}$ include region, industry and year dummies. Finally, $\epsilon_{it}$ is the error term. To capture the correlation between the productivity and export decision one year before and one year after start of exporting, we also estimate (1) with lag and lead on firstyear:

$$productivity_{i,t} = \beta_0 + \beta_1 firstyear_{i,t-1} + \beta_2 \ln l_{i,t-1} + \beta_3 \ln k_{i,t-1} + \delta controls_{i,t} + \epsilon_{it}$$  (1a)

$$productivity_{i,t} = \beta_0 + \beta_1 firstyear_{i,t+1} + \beta_2 \ln l_{i,t-1} + \beta_3 \ln k_{i,t-1} + \delta controls_{i,t} + \epsilon_{it}$$  (1b)

Second, fixed effect version is estimated:

$$productivity_{i,t} = \beta_0 + \beta_1 firstyear_{i,t} + \beta_2 \ln l_{i,t-1} + \beta_3 \ln k_{i,t-1} + \delta controls_{i,t} + \alpha_i + \epsilon_{it}$$  (2)

where controls include only year dummies in this case. Specifications with the lag and lead of firstyear are created in the same fashion as (1a) and (1b).

Instruments are employed in the remaining two specifications. In both of them, firstyear dummy is instrumented using industry specific exchange rate and industry specific ratio of producer prices in the Czech Republic and abroad, their lags and year-on-year differences. In such a way, we obtain the local average treatment effect (LATE) of start of exporting on the firms that entered export markets due to change in relative prices, i.e. due to clearly exogenous factor. In the instrumental variable settings, we do not assume the firms to enter exporting in reaction to increased productivity or to prepare themselves before the change in the relative prices occurred. Therefore, the correlation between productivity and start of exporting is estimated only in the year of start of exporting and the year after.

As in the case of matching on propensity score, we use altogether six productivity measures, i.e. levels and growths of labor productivity based on output, labor productivity based on value added and total factor productivity.

4 Data and descriptive statistics

Firm-level panel data are provided by the Czech Statistical Office. We employ the sample of manufacturing firms covering the period 1997-2002. Firms that do not occur in the sample every year over the six-year period were eliminated. Also, due to

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10 See chapter 4 for detailed description of construction of industry specific exchange rate and industry specific ratio of producer prices home and abroad.
the relatively small number of firms owned by municipalities, associations and cooperatives, those were eliminated as well.

The industry of firm is identified using 3-digit NACE code, although we use 2-digit NACE division in all cases except of the construction of industry specific exchange rates. Geographically, firms are divided into eight regions. The ownership of firm is defined as follows. If domestic private, domestic state or foreign owners control more than 50% of a firm, then the ownership indicator takes the value of private, state, or foreign, respectively. If a firm is owned by domestic owners only, but no ownership type controls more than 50%, the ownership indicator takes the value of mixed. Finally, if foreign owners control not more than 50% of a firm, the ownership indicator is international. Numbers of export starters as well as non-exporters in each industry and year are reported in the Table 10 in the appendix.

Two indexes are constructed to be used as instruments – industry specific exchange rate iser and industry specific ratio of producer prices in the Czech Republic and abroad isfp. Two datasets were combined in construction of industry-specific exchange rates. Bilateral average yearly exchange rates for the Czech currency and currencies of its 26 main trading partners come from the database of the Czech National Bank. Detailed data on bilateral trade at the 3-digit SITC level were provided by the Ministry of Industry and Trade of the Czech Republic. Having SITC categories linked to NACE industry codes, industry specific exchange rates for each industry were constructed as the weighted average of exchange rate indexes with the weights based on the relative importance of export destinations. The value of index iser have been set such that iser is equal to 1 for each sector in 1997.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Corresponding entry from CSO dataset</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>Revenue from sales of own products and services + change in inventories, adjusted for inflation using industry-specific producer price index</td>
</tr>
<tr>
<td>Labor</td>
<td>Average number of employees (recomputed on an eight hour day basis)</td>
</tr>
<tr>
<td>Capital</td>
<td>Intangible and tangible fixed assets</td>
</tr>
<tr>
<td>Investments</td>
<td>Purchase of intangible and tangible investment goods</td>
</tr>
<tr>
<td>Export</td>
<td>Dummy equal to one if firm exports in respective year, zero otherwise</td>
</tr>
<tr>
<td>Region</td>
<td>Regional dummies based on the division into eight regions</td>
</tr>
<tr>
<td>Industry</td>
<td>Industry dummies based on 2-digit NACE codes</td>
</tr>
<tr>
<td>Firstyear</td>
<td>Dummy equal to one if firm exports in the respective year, but did not export in the proceeding year. Zero otherwise.</td>
</tr>
<tr>
<td>Nonexporter1year</td>
<td>Dummy equal to one if firm does not export in the respective year and did not export in the proceeding year either. Zero otherwise.</td>
</tr>
<tr>
<td>Iser</td>
<td>Industry specific exchange rate</td>
</tr>
<tr>
<td>Isfp</td>
<td>Industry specific ratio of producer prices in the Czech Republic and abroad</td>
</tr>
<tr>
<td>Productivity</td>
<td>Three productivity measures are employed: labor productivity based on output, labor productivity based on value added and total factor productivity based on methodology suggested by Levinsohn and Petrin (2000). Each measure is used in level and growth ver</td>
</tr>
</tbody>
</table>

In order to eliminate false changes in export status which can emerge in case of misreported value of exports, three alternative datasets are constructed. In the first dataset, firms that changed their export status for one year only (i.e. reported no export in one year while reported non-zero exports in both previous and next year or
vice versa) are eliminated. In the remainder of the paper, this dataset is referred as baseline dataset. In the second dataset, all firms that changed their export status more than once are eliminated. Finally, in the third dataset, no firms are eliminated. While results obtained using baseline dataset are reported in section five, results from baseline dataset and results obtained using two alternative datasets are compared as a part of robustness checks in section six.

To construct \( isfp \), sectoral producer price indexes of 12 most important export destinations have been used besides bilateral exchange rates. For each country and each sector, the index of producer prices in local currency was constructed first. Subsequently, index was recalculated into the Czech currency using bilateral exchange rates and ratio of domestic and foreign producer prices was constructed. Finally, industry specific ratio of producer prices \( isfp \) was calculated for each industry as weighted average of country and industry specific ratios with the weights of countries based on their relative importance as export destinations of Czech firms. The value of index \( isfp \) have been set such that \( isfp \) is equal to 1 for each sector in 1997. Table 11 in the appendix shows the values of iser and isfp and their year-on-year differences averaged across 2-digit NACE industry division.

5 Results

Unmatched productivity differences between export starters and non-exporters suggest that the level of labor productivity of export-starters is significantly higher already before they start with exporting (Table 2). Once we control for self selection into exporting using matching on propensity score, the difference becomes non-significant. Unmatched differences in growth rates of labor productivity indicate no significant difference between non-exporters and export starters one year before export entry but significantly higher productivity in the year of entry and one year later. In case of growth of labor productivity based on output, significantly higher productivity of export starters in the year of export entry is observed also when non-exporters and exporters are matched.

Regression results in the Table 3 provide slightly different picture. When no instruments are used, labor productivity levels and growths are significantly higher for export starters in the year of export entry. In addition, fixed effects panel data estimation suggest that level of labor productivity based on output is significantly higher for export starters also one year after export entry. Once instruments are used to evaluate the productivity gains of firms that entered foreign markets due to exogenous impetus, significant and substantially higher differences in productivity levels and growths are observed in the year of export entry as well as year before. The result suggests that extremely productive firms are those that are able to enter and exit foreign markets depending on the favorableness of exogenous conditions like exchange rates or foreign producer prices. Such firm is substantially more productive (both in terms of level and growth) compared to otherwise similar average firm already before export entry. Productivity difference vis-à-vis non-exporting firm subsequently shrinks one year after export entry, possibly due to deterioration of favorable external conditions. This is in line with self selection hypothesis and provides no support for learning-by-exporting theory.
Tables 2 and 3 provide results based on labor productivity of domestically owned firms with changes in export status lasting longer than one year. Results based on labor productivity of all domestic firms and domestic firms with not more than one change in export status are provided in Tables 4-7 in the appendix and discussed in section 6 focused on robustness issues. Tables 8-9 in the appendix provide results based on total factor productivity. Likely due to residual character of total factor productivity computation, these results are not robust and therefore not discussed. Finally, results based on the sample of all firms (i.e. not only domestically owned) are not included. In line with expectations, analysis employing the sample of all firms provides less significant and less substantial productivity differences, reflecting the fact that foreign owned firms are in general more productive than domestically owned firms thanks to access to know-how of foreign owners.

6 Robustness checks

We perform a number of robustness checks to examine how sensitive our results are to different specifications. First, we use three measures of productivity: labor productivity based on output, labor productivity based on value added and total factor productivity based on methodology proposed by Levinsohn and Petrin (2000). Second, we look at the effects of exporting at both levels and growth rates of productivity measures.

The other robustness issue emerges from the possible miscoding in the definition of being an exporter. As indicated in section 4, only firms that are observed in all 6 years are included in the dataset. For each year, firms with the exports higher than zero are coded as exporters, firms with zero export as non-exporters. As a result, about 20% of all firms do change their exporting status at least once during the six year period. There is, however, a risk that exports of some firms were not recorded correctly every year and transition between exporting and non-exporting in case of these firms is just artificial. The most prominent candidates for this group would be firms which did not export only in one year. To examine how this type of miscoding could have influenced the results, we construct three alternative data sets. In the first alternative dataset, all firms which changed their exporting status for one year only are eliminated. In the second dataset, all firms are included. In the third alternative dataset, all firms that changed exporting status more then once are eliminated.

Comparison of the results based on labor productivity gained using three alternative datasets suggests that the results are robust in the sense that magnitude and significance of coefficients are comparable across three datasets. This is, however, not the case of the results based on total factor productivity comparisons (Tables 8 and 9).
### Table 2: Productivity level and productivity growth differences between export starters and non-exporters: matching on propensity score approach

Firms included: firms with domestic owner with changes in export status lasting more than one year

#### Labor productivity based on output

<table>
<thead>
<tr>
<th></th>
<th>Level</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>One year before</td>
<td>Year 0</td>
</tr>
<tr>
<td>Number of starters</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Number of controls</td>
<td>59</td>
<td>59</td>
</tr>
<tr>
<td>Unmatched difference</td>
<td>6.97 **</td>
<td>8.27 ***</td>
</tr>
<tr>
<td>S.E.</td>
<td>(2.39)</td>
<td>(2.41)</td>
</tr>
<tr>
<td>ATT</td>
<td>-3.86</td>
<td>-2.63</td>
</tr>
<tr>
<td>S.E.</td>
<td>(3.83)</td>
<td>(3.96)</td>
</tr>
<tr>
<td>ATE</td>
<td>0.90</td>
<td>1.83</td>
</tr>
</tbody>
</table>

#### Labor productivity based on value added

<table>
<thead>
<tr>
<th></th>
<th>Level</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>One year before</td>
<td>Year 0</td>
</tr>
<tr>
<td>Number of starters</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Number of controls</td>
<td>59</td>
<td>59</td>
</tr>
<tr>
<td>Unmatched difference</td>
<td>1.65</td>
<td>2.75</td>
</tr>
<tr>
<td>S.E.</td>
<td>(2.47)</td>
<td>(2.58)</td>
</tr>
<tr>
<td>ATT</td>
<td>-4.33</td>
<td>-4.99</td>
</tr>
<tr>
<td>S.E.</td>
<td>(6.76)</td>
<td>(3.40)</td>
</tr>
<tr>
<td>ATE</td>
<td>-0.79</td>
<td>-2.06</td>
</tr>
</tbody>
</table>
### Table 3: Productivity level and productivity growth differences between export starters and non-exporters: regression approach

Estimated coefficient on the variable `firstyear` reported along with standard error

Firms included: firms with domestic owner with changes in export status lasting longer than one year

<table>
<thead>
<tr>
<th>Labor productivity based on output</th>
<th>Level</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>One year before</td>
<td>Year 0</td>
</tr>
<tr>
<td><strong>OLS</strong></td>
<td>2.63</td>
<td>5.81 **</td>
</tr>
<tr>
<td></td>
<td>(2.10)</td>
<td>(2.53)</td>
</tr>
<tr>
<td><strong>FE</strong></td>
<td>-0.36</td>
<td>2.12 ***</td>
</tr>
<tr>
<td></td>
<td>(0.88)</td>
<td>(0.80)</td>
</tr>
<tr>
<td><strong>IV</strong></td>
<td>61.44 ***</td>
<td>68.85 ***</td>
</tr>
<tr>
<td></td>
<td>(20.28)</td>
<td>(23.90)</td>
</tr>
<tr>
<td><strong>IV FE</strong></td>
<td>3.33</td>
<td>3.69</td>
</tr>
<tr>
<td></td>
<td>(3.64)</td>
<td>(3.17)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Labor productivity based on value added</th>
<th>Level</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>One year before</td>
<td>Year 0</td>
</tr>
<tr>
<td><strong>OLS</strong></td>
<td>-1.61</td>
<td>1.56</td>
</tr>
<tr>
<td></td>
<td>(2.02)</td>
<td>(2.55)</td>
</tr>
<tr>
<td><strong>FE</strong></td>
<td>-3.12</td>
<td>-0.88</td>
</tr>
<tr>
<td></td>
<td>(1.93)</td>
<td>(2.32)</td>
</tr>
<tr>
<td><strong>IV</strong></td>
<td>22.57 *</td>
<td>31.11 **</td>
</tr>
<tr>
<td></td>
<td>(11.70)</td>
<td>(14.78)</td>
</tr>
<tr>
<td><strong>IV FE</strong></td>
<td>10.22</td>
<td>14.28</td>
</tr>
<tr>
<td></td>
<td>(8.81)</td>
<td>(11.04)</td>
</tr>
</tbody>
</table>

Notes: Dependent variable is the logarithm of level or growth rate of respective productivity measure. Explanatory variables are logarithms of capital and labor as well as industrial dummies, regional dummies and yearly dummies. Number of observations ranges fr
7 Conclusion

The effect of exporting on the productivity is estimated using firm-level panel data from the Czech Republic. In addition to matching on propensity score and simple regression with the change of export status included, we estimate the local average treatment effect (LATE) of the start of exporting on the firms that started with exporting due to changes in industry-specific exchange rates and industry-specific ratios of producer prices on domestic and foreign market. In this way, we address possible false interpretation of the case of new management which simultaneously starts with exporting and implementing productivity boosting measures as evidence of learning-by-exporting. Despite relatively important differences in productivity levels between the Czech Republic and most of its export destinations, the results of both methods suggest that the learning-by-exporting effect is insignificant in the case of Czech exporters.
References


Appendix

**Table 4:** Productivity level and productivity growth differences between export starters and non-exporters: matching on propensity score approach

Firms included: firms with domestic owner

<table>
<thead>
<tr>
<th></th>
<th>Labor productivity based on output</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level</td>
<td>One year before</td>
<td>Year 0</td>
</tr>
<tr>
<td>Number of starters</td>
<td>38  38  37</td>
<td>38</td>
<td>38</td>
</tr>
<tr>
<td>Number of controls</td>
<td>161  161  151</td>
<td>161</td>
<td>161</td>
</tr>
<tr>
<td>Unmatched difference</td>
<td>**5.40 ***  5.86 ***  6.04 *****</td>
<td><strong>-0.07 ****  0.07 **  0.02</strong></td>
<td></td>
</tr>
<tr>
<td>S.E.</td>
<td>(1.64)  (1.67)  (1.72)</td>
<td>(0.04)  (0.03)  (0.04)</td>
<td></td>
</tr>
<tr>
<td>ATT</td>
<td>0.96  1.80  2.40</td>
<td>-0.05  0.10  0.01</td>
<td></td>
</tr>
<tr>
<td>S.E.</td>
<td>(2.47)  (2.51)  (2.38)</td>
<td>(0.06)  (0.07)  (0.08)</td>
<td></td>
</tr>
<tr>
<td>ATE</td>
<td><strong>2.46</strong>  <strong>3.37</strong>**  1.94**</td>
<td><strong>0.00</strong>  <strong>0.11</strong>**  <strong>-0.03</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Labor productivity based on value added</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level</td>
<td>One year before</td>
<td>Year 0</td>
</tr>
<tr>
<td>Number of starters</td>
<td>38  37  37</td>
<td>38</td>
<td>38</td>
</tr>
<tr>
<td>Number of controls</td>
<td>158  152  152</td>
<td>161</td>
<td>161</td>
</tr>
<tr>
<td>Unmatched difference</td>
<td><strong>2.29</strong>  **3.28 **  <strong>2.49</strong></td>
<td><strong>-0.18</strong>  <strong>0.17</strong>  <strong>-0.54</strong></td>
<td></td>
</tr>
<tr>
<td>S.E.</td>
<td>(1.56)  (1.61)  (1.56)</td>
<td>(0.11)  (0.14)  (0.62)</td>
<td></td>
</tr>
<tr>
<td>ATT</td>
<td><strong>-3.21</strong>  0.52  <strong>-3.35</strong></td>
<td><strong>-0.51</strong>  <strong>0.18</strong>**  <strong>-1.80</strong></td>
<td></td>
</tr>
<tr>
<td>S.E.</td>
<td>(2.75)  (2.17)  (2.19)</td>
<td>(0.31)  (0.27)  (2.07)</td>
<td></td>
</tr>
<tr>
<td>ATE</td>
<td><strong>0.93</strong>  <strong>0.83</strong>  <strong>-0.32</strong></td>
<td><strong>-0.14</strong>  <strong>0.05</strong>  <strong>-0.80</strong></td>
<td></td>
</tr>
</tbody>
</table>
Table 5: Productivity level and productivity growth differences between export starters and non-exporters: regression approach

Estimated coefficient on the variable firstyear reported along with standard error

Firms included: firms with domestic owner

<table>
<thead>
<tr>
<th></th>
<th>Labor productivity based on output</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level</td>
<td>Growth</td>
<td></td>
</tr>
<tr>
<td></td>
<td>One year before</td>
<td>Year 0</td>
<td>One year after</td>
</tr>
<tr>
<td><strong>OLS</strong></td>
<td>1.38</td>
<td>1.30</td>
<td>0.42</td>
</tr>
<tr>
<td></td>
<td>(1.25)</td>
<td>(1.43)</td>
<td>(1.72)</td>
</tr>
<tr>
<td><strong>FE</strong></td>
<td>-0.14</td>
<td>2.37 ***</td>
<td>0.43</td>
</tr>
<tr>
<td></td>
<td>(0.59)</td>
<td>(0.63)</td>
<td>(0.86)</td>
</tr>
<tr>
<td><strong>IV</strong></td>
<td>10.28</td>
<td>0.81</td>
<td>7.77</td>
</tr>
<tr>
<td></td>
<td>(8.84)</td>
<td>(9.55)</td>
<td>(10.92)</td>
</tr>
<tr>
<td><strong>IV FE</strong></td>
<td>5.14</td>
<td>0.12</td>
<td>0.42</td>
</tr>
<tr>
<td></td>
<td>(4.32)</td>
<td>(3.54)</td>
<td>(2.17)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Labor productivity based on value added</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level</td>
<td>Growth</td>
<td></td>
</tr>
<tr>
<td></td>
<td>One year before</td>
<td>Year 0</td>
<td>One year after</td>
</tr>
<tr>
<td><strong>OLS</strong></td>
<td>0.29</td>
<td>0.05</td>
<td>-0.39</td>
</tr>
<tr>
<td></td>
<td>(1.19)</td>
<td>(1.43)</td>
<td>(1.69)</td>
</tr>
<tr>
<td><strong>FE</strong></td>
<td>-1.11</td>
<td>0.24</td>
<td>0.87</td>
</tr>
<tr>
<td></td>
<td>(1.37)</td>
<td>(1.68)</td>
<td>(2.53)</td>
</tr>
<tr>
<td><strong>IV</strong></td>
<td>14.97</td>
<td>-12.84</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td>(9.68)</td>
<td>(11.09)</td>
<td>(9.96)</td>
</tr>
<tr>
<td><strong>IV FE</strong></td>
<td>14.98</td>
<td>-0.92</td>
<td>1.11</td>
</tr>
<tr>
<td></td>
<td>(11.13)</td>
<td>(9.33)</td>
<td>(6.15)</td>
</tr>
</tbody>
</table>

Notes: Dependent variable is the logarithm of level or growth rate of respective productivity measure. Explanatory variables are logarithms of capital and labor as well as industrial dummies, regional dummies and yearly dummies. Number of observations ranges from 10 to 11.
Table 6: Productivity level and productivity growth differences between export starters and non-exporters: matching on propensity score approach

Firms included: firms with domestic owner with no more than one change of export status

<table>
<thead>
<tr>
<th></th>
<th>Level</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>One year before Year 0</td>
<td>One year after</td>
</tr>
<tr>
<td>Number of starters</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Number of controls</td>
<td>92</td>
<td>92</td>
</tr>
<tr>
<td>Unmatched difference</td>
<td>7.27 ** 9.02 *** 9.46 ***</td>
<td>-0.02 0.15 *** 0.05</td>
</tr>
<tr>
<td>S.E.</td>
<td>(2.83)</td>
<td>(2.85)</td>
</tr>
<tr>
<td>ATT</td>
<td>3.55</td>
<td>5.35</td>
</tr>
<tr>
<td>S.E.</td>
<td>(4.15)</td>
<td>(4.56)</td>
</tr>
<tr>
<td>ATE</td>
<td>4.22</td>
<td>5.56</td>
</tr>
</tbody>
</table>

|                                | Level                  | Growth                  |
|                                | One year before Year 0 | One year after          | One year before Year 0 | One year after |
| Number of starters             | 11                     | 11                      | 11                     | 11             |
| Number of controls             | 92                     | 92                      | 88                     | 92             |
| Unmatched difference           | 1.35                   | 3.02                    | 4.40                   | -0.08 0.57 ** | -0.34 |
| S.E.                           | (2.66)                 | (2.72)                  | (2.63)                 | (0.14) 0.23 (1.23) |
| ATT                            | -2.25                  | -0.11                   | 1.77                   | -0.23 0.79 | -0.05 |
| S.E.                           | (6.53)                 | (2.84)                  | (3.00)                 | (0.19) 0.90 (0.17) |
| ATE                            | 1.64                   | 1.61                    | 2.64                   | 0.02 0.33 | -0.64 |
### Table 7: Productivity level and productivity growth differences between export starters and non-exporters: regression approach

Estimated coefficient on the variable `firstyear` reported along with standard error.

Firms included: firms with domestic owner with no more than one change of export status.

<table>
<thead>
<tr>
<th></th>
<th>Level</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Labor productivity based on output</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>One year before</td>
<td>Year 0</td>
</tr>
<tr>
<td><strong>OLS</strong></td>
<td>1.97</td>
<td>2.96</td>
</tr>
<tr>
<td></td>
<td>(1.94)</td>
<td>(2.01)</td>
</tr>
<tr>
<td><strong>FE</strong></td>
<td>-0.22</td>
<td>2.59***</td>
</tr>
<tr>
<td></td>
<td>(0.90)</td>
<td>(0.80)</td>
</tr>
<tr>
<td><strong>IV</strong></td>
<td>147.18</td>
<td>76.68</td>
</tr>
<tr>
<td></td>
<td>(102.86)</td>
<td>(84.75)</td>
</tr>
<tr>
<td><strong>IV FE</strong></td>
<td>10.92</td>
<td>6.08</td>
</tr>
<tr>
<td></td>
<td>(6.88)</td>
<td>(3.95)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Level</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Labor productivity based on value added</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>One year before</td>
<td>Year 0</td>
</tr>
<tr>
<td><strong>OLS</strong></td>
<td>-1.22</td>
<td>0.62</td>
</tr>
<tr>
<td></td>
<td>(1.82)</td>
<td>(1.94)</td>
</tr>
<tr>
<td><strong>FE</strong></td>
<td>-4.71 **</td>
<td>-1.35</td>
</tr>
<tr>
<td></td>
<td>(2.10)</td>
<td>(2.43)</td>
</tr>
<tr>
<td><strong>IV</strong></td>
<td>40.96</td>
<td>26.63</td>
</tr>
<tr>
<td></td>
<td>(35.64)</td>
<td>(40.81)</td>
</tr>
<tr>
<td><strong>IV FE</strong></td>
<td>21.17</td>
<td>22.19</td>
</tr>
<tr>
<td></td>
<td>(16.22)</td>
<td>(15.17)</td>
</tr>
</tbody>
</table>

**Notes:**
- Dependent variable is the logarithm of level or growth rate of respective productivity measure.
- Explanatory variables are logarithms of capital and labor as well as industrial dummies, regional dummies and yearly dummies.
- Number of observations ranges fr
Table 8: Productivity level and productivity growth differences between export starters and non-exporters: matching on propensity score approach

**Total factor productivity**
Firms included: firms with domestic owner with changes in export status lasting more than one year

<table>
<thead>
<tr>
<th></th>
<th>Level</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>One year before</td>
<td>Year 0</td>
</tr>
<tr>
<td>Number of starters</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Number of controls</td>
<td>59</td>
<td>44</td>
</tr>
<tr>
<td>Unmatched difference</td>
<td>-87.53</td>
<td>650.69 ***</td>
</tr>
<tr>
<td>S.E.</td>
<td>(56.59)</td>
<td>(199.37)</td>
</tr>
<tr>
<td>ATT</td>
<td>-199.17</td>
<td>809.91</td>
</tr>
<tr>
<td>S.E.</td>
<td>(208.02)</td>
<td>(708.69)</td>
</tr>
<tr>
<td>ATE</td>
<td>-70.37</td>
<td>260.32</td>
</tr>
</tbody>
</table>

**Total factor productivity**
Firms included: firms with domestic owner with no more than one change of export status

<table>
<thead>
<tr>
<th></th>
<th>Level</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>One year before</td>
<td>Year 0</td>
</tr>
<tr>
<td>Number of starters</td>
<td>38</td>
<td>37</td>
</tr>
<tr>
<td>Number of controls</td>
<td>161</td>
<td>126</td>
</tr>
<tr>
<td>Unmatched difference</td>
<td>40.16</td>
<td>121.33 ***</td>
</tr>
<tr>
<td>S.E.</td>
<td>(25.54)</td>
<td>(33.29)</td>
</tr>
<tr>
<td>ATT</td>
<td>8.17</td>
<td>120.12 *</td>
</tr>
<tr>
<td>S.E.</td>
<td>(44.54)</td>
<td>(60.79)</td>
</tr>
<tr>
<td>ATE</td>
<td>0.98</td>
<td>101.98</td>
</tr>
</tbody>
</table>

**Total factor productivity**
Firms included: firms with domestic owner with no changes in export status

<table>
<thead>
<tr>
<th></th>
<th>Level</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>One year before</td>
<td>Year 0</td>
</tr>
<tr>
<td>Number of starters</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>Number of controls</td>
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<td>125</td>
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<tr>
<td>Unmatched difference</td>
<td>39.05</td>
<td>120.04 **</td>
</tr>
<tr>
<td>S.E.</td>
<td>(27.81)</td>
<td>(45.76)</td>
</tr>
<tr>
<td>ATT</td>
<td>52.79</td>
<td>90.84</td>
</tr>
<tr>
<td>S.E.</td>
<td>(47.26)</td>
<td>(99.31)</td>
</tr>
<tr>
<td>ATE</td>
<td>26.52</td>
<td>236.23</td>
</tr>
</tbody>
</table>
Table 9: Productivity level and productivity growth differences between export starters and non-exporters: regression approach

Estimated coefficient on the variable firstyear reported along with standard error

### Total factor productivity

**Firms included: firms with domestic owner with changes in export status lasting more than one year**

<table>
<thead>
<tr>
<th></th>
<th>Level</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>One year before</td>
<td>Year 0</td>
</tr>
<tr>
<td><strong>OLS</strong></td>
<td>-74.24</td>
<td>74.35</td>
</tr>
<tr>
<td></td>
<td>(49.89)</td>
<td>(55.00)</td>
</tr>
<tr>
<td><strong>FE</strong></td>
<td>-145.98 ***</td>
<td>31.12</td>
</tr>
<tr>
<td></td>
<td>(53.89)</td>
<td>(22.16)</td>
</tr>
<tr>
<td><strong>IV</strong></td>
<td>174.64</td>
<td>443.96 **</td>
</tr>
<tr>
<td></td>
<td>(221.22)</td>
<td>(195.30)</td>
</tr>
<tr>
<td><strong>IV FE</strong></td>
<td>-123.66</td>
<td>179.02 **</td>
</tr>
<tr>
<td></td>
<td>(211.97)</td>
<td>(87.77)</td>
</tr>
</tbody>
</table>

### Total factor productivity

**Firms included: firms with domestic owner**

<table>
<thead>
<tr>
<th></th>
<th>Level</th>
<th>Growth</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>One year before</td>
<td>Year 0</td>
</tr>
<tr>
<td><strong>OLS</strong></td>
<td>22.62</td>
<td>31.76</td>
</tr>
<tr>
<td></td>
<td>(25.00)</td>
<td>(25.41)</td>
</tr>
<tr>
<td><strong>FE</strong></td>
<td>-31.79</td>
<td>57.11</td>
</tr>
<tr>
<td></td>
<td>(20.18)</td>
<td>(20.98)</td>
</tr>
<tr>
<td><strong>IV</strong></td>
<td>-24.29</td>
<td>195.94</td>
</tr>
<tr>
<td></td>
<td>(164.39)</td>
<td>(183.87)</td>
</tr>
<tr>
<td><strong>IV FE</strong></td>
<td>-190.09</td>
<td>12.94</td>
</tr>
<tr>
<td></td>
<td>(139.78)</td>
<td>(106.14)</td>
</tr>
</tbody>
</table>

### Total factor productivity

**Firms included: firms with domestic owner with no more than one change of export status**

<table>
<thead>
<tr>
<th></th>
<th>Level</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>One year before</td>
<td>Year 0</td>
</tr>
<tr>
<td><strong>OLS</strong></td>
<td>22.68</td>
<td>18.78</td>
</tr>
<tr>
<td></td>
<td>(31.41)</td>
<td>(30.45)</td>
</tr>
<tr>
<td><strong>FE</strong></td>
<td>-8.78</td>
<td>49.94 **</td>
</tr>
<tr>
<td></td>
<td>(22.47)</td>
<td>(22.27)</td>
</tr>
<tr>
<td><strong>IV</strong></td>
<td>987.50</td>
<td>139.36</td>
</tr>
<tr>
<td></td>
<td>(769.62)</td>
<td>(475.94)</td>
</tr>
<tr>
<td><strong>IV FE</strong></td>
<td>-74.36</td>
<td>131.66</td>
</tr>
<tr>
<td></td>
<td>(121.11)</td>
<td>(97.01)</td>
</tr>
</tbody>
</table>

**Notes:** Dependent variable is the logarithm of level or growth rate of respective productivity measure. Explanatory variables are logarithms of capital and labor as well as industrial dummies, regional dummies and yearly dummies. Number of observations ranges fr
Table 10: Number of export starters and number of non-exporters by industry and year

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Food products and beverages</td>
<td>11</td>
<td>75</td>
<td>9</td>
<td>72</td>
<td>18</td>
</tr>
<tr>
<td>Tobacco products</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Textiles</td>
<td>1</td>
<td>8</td>
<td>7</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Wearing apparel; dressing and dyeing of fur</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Leather and leather products</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Wood and of products of wood and cork, except furniture</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Pulp, paper and paper products</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Publishing, printing and reproduction of recorded media</td>
<td>5</td>
<td>13</td>
<td>7</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>Coke, refined petroleum products and nuclear fuel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemicals and chemical products</td>
<td>2</td>
<td>7</td>
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<td>6</td>
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<td>9</td>
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<td>5</td>
<td>7</td>
<td>6</td>
<td>4</td>
<td>4</td>
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<tr>
<td>Machinery and equipment n.e.c.</td>
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<td>9</td>
<td>5</td>
<td>6</td>
<td>3</td>
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<tr>
<td>Office machinery and computers</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>electrical machinery and apparatus n.e.c.</td>
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<td>4</td>
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<tr>
<td>Radio, television and communication equipment and apparatus</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Medical, precision and optical instruments, watches and clocks</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Motor vehicles, trailers and semi-trailers</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Other transport equipment</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Furniture; manufacturing n.e.c.</td>
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<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Recycling</td>
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<td>3</td>
<td>4</td>
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21
Table 11: Industry specific exchange rates and producer price ratios

<table>
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<tr>
<th></th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
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<tbody>
<tr>
<td></td>
<td>iser</td>
<td>diser</td>
<td>isfp</td>
<td>iser</td>
<td>diser</td>
</tr>
<tr>
<td>Food products and beverages</td>
<td>0.98</td>
<td>-0.02</td>
<td>0.84</td>
<td>0.02</td>
<td>0.96</td>
</tr>
<tr>
<td>Tobacco products</td>
<td>0.99</td>
<td>-0.01</td>
<td>1.06</td>
<td>0.09</td>
<td>0.94</td>
</tr>
<tr>
<td>Textiles</td>
<td>0.99</td>
<td>-0.01</td>
<td>0.83</td>
<td>0.02</td>
<td>1.01</td>
</tr>
<tr>
<td>Wearing apparel; dressing and dyeing of fur</td>
<td>1.00</td>
<td>0.00</td>
<td>0.91</td>
<td>0.04</td>
<td>1.02</td>
</tr>
<tr>
<td>Leather and leather products</td>
<td>1.00</td>
<td>0.00</td>
<td>0.91</td>
<td>0.06</td>
<td>1.02</td>
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<tr>
<td>Wood and of products of wood and cork, except furniture</td>
<td>1.00</td>
<td>0.00</td>
<td>0.91</td>
<td>0.04</td>
<td>1.02</td>
</tr>
<tr>
<td>Pulp, paper and paper products</td>
<td>0.98</td>
<td>-0.02</td>
<td>0.86</td>
<td>0.07</td>
<td>0.97</td>
</tr>
<tr>
<td>Publishing, printing and reproduction of recorded media</td>
<td>0.99</td>
<td>-0.01</td>
<td>0.88</td>
<td>-0.01</td>
<td>0.99</td>
</tr>
<tr>
<td>Coke, refined petroleum products and nuclear fuel</td>
<td>0.98</td>
<td>-0.02</td>
<td>0.73</td>
<td>-0.08</td>
<td>0.99</td>
</tr>
<tr>
<td>Chemicals and chemical products</td>
<td>0.98</td>
<td>-0.02</td>
<td>0.76</td>
<td>0.02</td>
<td>0.97</td>
</tr>
<tr>
<td>Rubber and plastic products</td>
<td>0.99</td>
<td>-0.01</td>
<td>0.89</td>
<td>0.02</td>
<td>1.01</td>
</tr>
<tr>
<td>Other non-metallic mineral products</td>
<td>0.99</td>
<td>-0.01</td>
<td>0.80</td>
<td>0.03</td>
<td>1.01</td>
</tr>
<tr>
<td>Basic metals</td>
<td>0.99</td>
<td>-0.01</td>
<td>0.86</td>
<td>0.06</td>
<td>1.00</td>
</tr>
<tr>
<td>Fabricated metal products, except machinery and equipment</td>
<td>0.99</td>
<td>-0.01</td>
<td>0.91</td>
<td>0.02</td>
<td>1.01</td>
</tr>
<tr>
<td>Machinery and equipment n.e.c.</td>
<td>0.99</td>
<td>-0.01</td>
<td>0.84</td>
<td>0.03</td>
<td>1.01</td>
</tr>
<tr>
<td>Office machinery and computers</td>
<td>1.00</td>
<td>0.00</td>
<td>0.66</td>
<td>0.05</td>
<td>1.02</td>
</tr>
<tr>
<td>electrical machinery and apparatus n.e.c.</td>
<td>1.00</td>
<td>0.00</td>
<td>0.94</td>
<td>0.01</td>
<td>1.02</td>
</tr>
<tr>
<td>Radio, television and communication equipment and apparatus</td>
<td>1.00</td>
<td>0.00</td>
<td>0.73</td>
<td>0.04</td>
<td>1.03</td>
</tr>
<tr>
<td>Medical, precision and optical instruments, watches and clocks</td>
<td>1.00</td>
<td>0.00</td>
<td>0.92</td>
<td>0.02</td>
<td>1.01</td>
</tr>
<tr>
<td>Motor vehicles, trailers and semi-trailers</td>
<td>0.99</td>
<td>-0.01</td>
<td>0.89</td>
<td>0.07</td>
<td>1.01</td>
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<tr>
<td>Other transport equipment</td>
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<td>-0.01</td>
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<td>0.16</td>
<td>1.01</td>
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<tr>
<td>Furniture; manufacturing n.e.c.</td>
<td>1.00</td>
<td>0.00</td>
<td>0.89</td>
<td>0.03</td>
<td>1.03</td>
</tr>
</tbody>
</table>

Note: iser denotes industry specific exchange rate. isfp denotes industry specific producer price ratio. Diser and Disfp are their respective year-on-year differences.