Referee report on *The Export-productivity Link for Brazilian Manufacturing Firms*

*Summary*

This paper takes another look at the productivity-exporting relationship. The authors confirm that self-selection based on productivity governs export entry on the sample of Brazilian firms between 2000 and 2008. Evidence on learning-by-exporting is less convincing as Brazilian exporters only experience an initial spike in productivity once they start to export. The effect does not last beyond the first year of exporting, The key strength of the paper is that it employs an internally consistent productivity estimation algorithm akin to de Loecker (2013), by taking account of the past export experience in estimating future productivity. Secondly, the paper employs a novel dataset of Brazilian enterprises, which has so far not been explored by other studies.

*Comments*

- The motivation seems at odds with itself. On one hand, the authors provide evidence that Brazilian productivity remained virtually constant in the last 30 to 40 years, yet they still end up looking for evidence of how exporting provided a lift to "increasing productivity".

   Reply: The whole Introduction has changed in order to add more motivation to the interest of the paper for the Brazilian economy.

- A minor point, but Slovenia is not considered a developing country. The IMF has been classifying it as an advanced economy since 2007, before that it was classed as a transition economy.

   Reply (we have eliminated the reference to a developing country and now the involved sentence has changed as follows):
   "Although Van Biesebroeck (2005) and De Loecker (2013) also provide evidence from Sub-Saharan and Slovenian manufacturing, Manjón *et al.* (2013) do provide evidence from Spain".

- Perhaps some more time and space could be dedicated to explaining what kind of deflators were used and also a discussion on the impact of using industry-wide deflators on TFP estimates and the productivity-exporting link.

   Reply(we have included two new paragraphs in the paper as follows):

   The first one at the end of section 2:
   "We use sector specific producer price indices supplied by the Instituto Brasileiro de Geografia e Estatistica (IBGE) to deflate the variables in the production function and wages, with the exception of labour. Unfortunately,

the survey PIA *empresa* has not information on firms' prices to be able to construct firm specific deflators".

The second one at the end of section 3 (just after equation 6):
"It is worth mentioning that by allowing the functions $H_E$ and $F_E$ to be different for exporters and non-exporters in Model 2, we also take into account that exporters' prices can be different to non-exporters' prices within a given industry. For instance, since we do not observe firm-level physical output and use industry specific deflators, unobserved firm-level price variation inside the industry can potentially bias the *tfp* estimates. The extent to which differences in output prices between exporters and non-exporters are present, we control for them. Still, if output prices differ across exporter firms and/or across non-exporter firms within an industry, our *tfp* estimates can be subject to some potential bias (Van Beveren, 2012). Unfortunately, without available information on firms individual prices, little can be done on this final concern. Therefore, we proceed under the assumption (like in De Loecker, 2007, and in many other papers in the related literature) that market conditions are, on the one side, common to all exporters within a given industry and, on the other side, common to all non-exporters within a given industry".

- The sample of firms is chosen in part on the number of employees exceeding 30. Firms below the cut-off are sampled, while the census is used for the firms above the cut-off. How are firms on the cusp (of the cut-off) treated? More generally, how are survival and sample selection controlled for?

Reply (as regards this comment we have introduced the following changes and clarifications in the paper):

The first one at the beginning of section 2 (first paragraph):
"PIA is a firm level survey for manufacturing and mining sectors conducted annually by the Brazilian Statistical Institute, IBGE (Instituto Brasileiro de Geografia e Estatistica). Firms with 30 or more employees are included in the sample, while smaller firms of up to 29 workers are included randomly in the sample. Important efforts have been made to minimise attrition and to annually incorporate new firms so that the sample of firms remains representative over time".

The second one at the end of section 3:
"Additionally, in this literature there is also a concern about selection bias or "endogeneity of attrition" in the sample of firms. Traditionally, *tfp* estimation was obtained on a balanced panel subsample from the original sample and, therefore, omitting all firms entering or exiting over the sample period. In that case, for instance, because exiting firms tend to be less productive than their continuing counterparts, omitting them may generate a bias in the estimates (Van Beveren, 2012). However, the literature is

nowadays more keen on employing for estimation unbalanced samples, in which entry and exit are implicitly taken into account in the analysis (something already stressed by OP). Provided OP show that once they move to an unbalanced panel, their explicit selection correction does not change their results, and LP found that selection corrections made little difference once the simultaneity correction (between productivity and some input choices) was in place, we simply notice that our sample is unbalanced, and that we do not focus here on selection issues. Further, our dataset would not allow us to distinguish properly between firm death, survey non-response, etc."

Notice above that OP stands for Olley and Pakes (1996) and LP for Levinsohn and Petrin (2003).

-    Are the statistics presented in Table 3 mean values? The table caption should state as much. Maybe the authors should consider presenting the numbers in a more straightforward way (by changing the unit of measurement) and also add standard deviations so that a comparison can be made between exporters and non-exporters. The numbers listed in the table appear to be enormous. The sales values are in million R$, which would make the average sales for exporters in year 2000, 60.3 trillion R$ or some 50 times the GDP of the country in 2000.

Reply: We would like to apologize, as there was an error in the figures in table 3. The mean values were in units and wages in 1000s. Now they are corrected to millions all. See table 3 in the new version of the paper.

Table 3. Firms' characteristics by export status (R$ million, labour as number of workers).

| | | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Exporters | Output | 60.47 | 68.60 | 76.29 | 69.55 | 65.71 | 74.43 | 76.59 | 78.04 | 97.93 | 74.18 |
| | | (384.02) | (596.70) | (677.40) | (439.23) | (397.72) | (530.77) | (768.60) | (538.37) | (1547.06) | (653.32) |
| | Labour | 342.76 | 334.48 | 341.99 | 337.81 | 357.74 | 368.18 | 380.99 | 412.29 | 421.78 | 366.45 |
| | | (858.28) | (929.93) | (934.39) | (940.21) | (1054.34) | (1128.26) | 1216.46) | (1363.28) | (1516.87) | (1104.67) |
| | Capital | 84.19 | 87.98 | 95.62 | 77.09 | 65.95 | 74.50 | 87.77 | 118.46 | 131.34 | 91.43 |
| | | (695.80) | (916.36) | (1129.51) | (591.47) | (550.71) | (619.43) | 1192.79) | (1796.40) | (3335.95) | (1203.16) |
| | Materials | 42.86 | 49.19 | 56.17 | 53.49 | 48.60 | 56.78 | 55.49 | 55.11 | 67.14 | 53.87 |
| | | (226.43) | (369.54) | (475.00) | (369.00) | (293.73) | (416.26) | 479.03) | (349.19) | (815.62) | (421.53) |
| | Wages | 15.39 | 16.48 | 16.33 | 15.25 | 13.34 | 14.87 | 14.72 | 14.41 | 16.33 | 15.24 |
| | | (26.49) | (38.70) | (40.58) | (36.08) | (22.11) | (29.06) | 31.44) | (22.01) | (52.40) | (33.21) |
| Non-exporters | Output | 5.27 | 5.10 | 4.91 | 4.47 | 4.40 | 4.31 | 4.37 | 4.86 | 4.93 | 4.74 |
| | | (16.62) | (22.01 | (19.30) | (22.91) | (17.46) | (16.56) | (15.38) | (17.87) | (19.13) | (18.58) |
| | Labour | 83.58 | 79.25 | 78.56 | 75.40 | 78.29 | 76.01 | 78.30 | 83.41 | 80.89 | 79.30 |
| | | (129.25) | (129.83) | (126.45) | (126.54) | (126.67) | (128.77) | (143.26) | (156.40) | (158.93) | (136.23) |
| | Capital | 7.57 | 6.48 | 5.78 | 4.50 | 4.49 | 4.63 | 5.08 | 5.38 | 13.95 | 6.43 |
| | | (52.09) | (38.56 | (30.37) | (24.07) | (22.58) | (29.52) | (36.40) | (31.81) | (352.53) | (68.66) |
| | Materials | 3.96 | 3.77 | 3.64 | 3.33 | 3.25 | 3.17 | 3.16 | 3.48 | 3.60 | 3.48 |
| | | (12.57) | (16.52 | (15.71) | (18.05) | (13.75) | (13.40) | (12.01) | (14.69) | (17.04) | (14.86) |
| | Wages | 7.76 | 7.97 | 7.72 | 7.16 | 6.87 | 7.14 | 7.14 | 7.20 | 7.20 | 7.35 |
| | | (12.73) | (14.22) | (14.60) | (15.22) | (14.15) | (13.12) | (11.86) | (11.64) | (10.39) | (13.10) |

Notes: 1. Standard Errors are in parenthesis.
        2. Source: Authors' own elaboration from SECEX and PIA.

- Seven cohorts of export starters are compared with non-exporting firms. The export starter definition though is flexible with respect to the number of preceding periods of non-exporting. <u>These may range from one period of non-exporting to eight. It would make more sense to restrict the non-exporting period to at least two periods</u> as that would eliminate firms that regularly (yearly) switch between exports and non-exports.

 <u>Reply</u>: In fact, we already were doing in the paper what the referee suggests, because our definition of export starters was and is as follows in the paper "To classify a firm as an export starter in year $t$ we require two conditions: i) the firm has not exported in the sample period previous to year $t$ and it exports in year $t$; and, ii) for at least two years previous to $t$, we observe the firm in the sample.". Hence, by adding the condition ii) we guarantee that we use at the minimum export starters for which we observe two years previous to $t$ that they do not export (but this will be mainly for the cohort starting to export in 2002, the survey starts in 2000). For the other cohorts we even observe more than two previous to $t$ years without exporting for export starters.

- The authors should, in order to provide more support for their matching results, to provide evidence that the balancing property in matching is satisfied for the included regressors. Matching on unbalanced covariates namely means that the assignment of treatment may not have been completely random given the set of covariates.

 <u>Reply</u>: We agree with the referee and we have incorporated this information that was in our estimation output but we did not incorporate in our previous version of the paper. Now it is incorporated. We provide now the balancing property statistics. These are included in "Table A.2. Quality of the matching analysis" in the Appendix.

- I cannot discern the value added of including Table 8. Table 7 namely provides exactly the same information, while offering more detail. I suggest dropping Table 8 from the text.

 <u>Reply</u>: Following the suggestion of the referee we have removed Table 8 in the new version of the manuscript.

- The final point relates to the notion that the data indicates learning-by-exporting. Namely, the impact only appears in the first period after the start of exporting and its magnitude does not change subsequently. One would expect learning to have substantially different dynamics than a one period hike in productivity in the initial year of exporting. Learning-by-exporting implies that firms improve with the amount of goods they export.

Reply:

In the previous to the final paragraph in section 1 we have written now: "We also find <u>certain</u> evidence on learning-by-exporting: the productivity of firms that start exporting grows more than that of non-exporters the first year they sell in international markets. Further, our results confirm the importance of accounting for firms export status on the TFP estimation when testing for learning-by-exporting. Not accounting for firm export status leads to underestimate the extra productivity growth of export starters vs. non-exporters (from 7.1% when accounting for firms export status to 1.6% when not accounting for it). <u>However, our found learning-by-exporting effect that only appears in the first year after the start of exporting is somehow poor. One would expect learning to have more dynamics than a one period hike in productivity in the initial year of exporting. This may be pointing out to a short term nature of learning from foreign markets for Brazilian firms and/or to the nature of exports and product markets where they operate (and the possibilities of learning from these markets)</u>."

We also added a final paragraph in the Conclusions section:
"Overall, our results confirm for the case of Brazil the main finding in the literature: firm self-selection into export markets is an important part of the story. Interestingly, we also find some evidence of learning-by-exporting, but of modest magnitude and of short duration. These findings thus imply that the export surge in the Brazilian economy probably helped productivity growth, but to a lesser extent than expected, may be due to the importance of the self-selection mechanism or to the nature of exports and export markets possibilities of learning."