Economics Bulletin

Volume 43, Issue 3

Export upstreamness and financial development

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Abstract

As international data reveal evidence on distancing (upstreaming) of products' conception from their end use, Antràs et al. (2012) examined bivariate correlations between export upstreamness and country characteristics. In particular, they reported an "especially robust" negative correlation between a country's export upstreamness and financial development. We revisit the robustness of this inference and observe that such an association is highly sensitive.

I had withdrawn (04/03/2022) my initial submission (04/02/2022) in order to update the citations.
Citation: Hamid Beladi and Avik Chakrabarti, (2023) "Export upstreamness and financial development", *Economics Bulletin*, Volume 43, Issue 3, pages 1514-1518
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Submitted: April 08, 2022. **Published:** September 30, 2023.

1. Introduction

The dominance of international fragmentation continues to be sustained by the strengthening of coordination of international production networks due to factors including sharp declines in transportation and communication costs, rapid reduction in the barriers to international trade and investment through regional integration agreements, as well as unprecedented innovations in telecommunications and information technology. The resultant processes have injected wide cross-country variations in the typical distance (*upstreamness*) between the conception of a commodity and final stage of its production with goods increasingly crossing multiple national borders while they are in process, as Multinational Corporations (MNCs) have been incessantly using cost-cutting tools to slice conventional value chains. With this backdrop, as international flow of intermediates exceeds 50% of global manufactured imports and 70% of global services imports and large MNCs continue to aggressively extend merger activities across borders to acquire disproportionate influence on aggregate economic outcomes, Antràs *et al*. (2012) provided a timely examination of associations between upstreamness and country characteristics, offering new insights into trade patterns at the country level by describing a country's average position in global production chains i.e. whether a country typically tends to be an exporter (importer) in relatively upstream versus downstream industries. With this backdrop, in what follows, we revisit a key inference drawn by Antràs *et al*. (2012): "Column 4 (*ref*. table I below) indicates that the role of the private credit variable is especially robust." In context, it may be noted that column 1 indicates that "the simple bivariate correlation between country upstreamness and log real GDP per capita is not statistically significant," while in columns 2 through 4 Antràs *et al*. (2012) "introduce variables related to country institutions": the negative partial correlations can be interpreted as implying "better rule of law and stronger financial development are associated at the country level with a basket of exports that is relatively more downstream in terms of production line position."

Table I. Export Upstreamness and Financial Development

	(1)	(2)	(3)	(4)
Log(Y/L)	−0.035	0.146***	0.156**	0.083
	(0.032)	(0.054)	(0.060)	(0.142)
Rule of law		−0.313***	−0.164*	−0.029
		(0.070)	(0.091)	(0.103)
Credit/Y			−0.404***	−0.437***
			(0.128)	(0.136)
Log(K/L)				0.156
				(0.131)
School				−0.085***
				(0.031)
N	181	181	151	120
R^2	0.01	0.11	0.11	0.15

Notes: Robust standard errors reported.
***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Source: Antràs *et al*. (2012)

However, there is no compelling reason behind any assumption that bivariate correlations between export upstreamness and financial development (measured by the ratio of private credit to GDP) would not be conditional on any of the other explanatory variables. As a check for robustness, à la Chakrabarti (2001) and Chakrabarti and Zeaiter (2014), we infuse interactions between the "private credit variable"[1] and each of the other controls used in Antràs *et al*. (2012).

2. Analysis and Results

Leamer (1983) had cautioned, since economic theories do not generate a complete specification of which variables are to be held constant when statistical tests are performed on the relation between a dependent variable and the independent variables of primary interest, that many candidate regressions often appear to have equal theoretical status. When a regression involves a set of variables that are always kept in the equation (free variables) and some others that the researcher feels comfortable experimenting with (doubtful variables), in practice, such experimentations are typically limited to a small subset of the feasible models that could have been estimated.

In such instances, the estimated coefficients on the variables of interest often turn out to be sensitive to the conditioning set of information. Any meaningful analysis should, thus, consider a range of models in each of which the free variables and some reasonable combination of the doubtful variables are included. If it turns out that inferences on variables of interest are essentially the same, in the sense that the estimates fall within a reasonable range for all choices of the combinations of the doubtful variables, then there need be no debate. If, on the other hand, the resultant range of estimates turns out to be too wide then the inferences are identified as fragile.

Consider, for illustration, conditional hypotheses (e.g. 'a change in X is associated with a change in Y if and only if condition Z is met') that are ubiquitous in all fields of economics. An allowance for interaction terms enriches a model by enhancing its capability of incorporating such conditional hypotheses. In that spirit, as a robustness check, we introduce interaction terms in the conditioning information set otherwise identical to that used in Antràs *et al*. (2012):

$$Export\ \ Upstreamness_i = \alpha + \beta\ Financial\ Development_i + X_i\Gamma + \varepsilon_i \qquad (1)$$

In equation (1), i indexes countries; financial development is measured by the ratio of private credit to GDP as adopted by Antràs *et al*. (2012) from Beck *et al*. (2010); and X_i (the other explanatory variables) include *a*) log real GDP per capita, from the PennWorld Tables, following Antràs *et al*. (2012), *b*) strength of contracting institutions captured in a rule of law index, adopted by Antràs *et al*. (2012) from Kaufmann *et al*. (2011), *c*) log physical capital per worker, as calculated by Antràs *et al*. (2012) from the Penn World Tables using the perpetual inventory method in Hall and Jones (1999), *d*) the average years of schooling in the population aged 15 and over, as adopted by Antràs *et al*. (2012) from

[1] Beladi *et al*. (2017) include this "private credit variable", among controls in a companion paper, when exploring plausible links between cross-border mergers and upstreamness. See Mukherjee (2022) for a rationale.

Barro and Lee (2010), and *e*) variables measuring interactions of financial development with each of the other controls considered, in isolation, by Antràs *et al*. (2012).

In column 1, of table II below, we replicate the result of Antràs *et al*. (2012) on a significant negative association between export upstreamness and financial development. In columns 2 through 5, infusing explanatory variables that interact financial development with each of the other controls, we report our findings on whether a significant negative association between a country's export upstreamness and financial development remains robust. It is apparent that the bivariate correlation between export upstreamness and financial development is fragile: the coefficient of the variable of interest (financial development) not only loses its significance but switches signs, as well, when financial development interacts with any of the other explanatory variables considered by Antràs *et al*. (2012). The loss of statistical significance and/or change in the sign of correlation between upstreamness and financial development should, of course, not be construed to infer any claim on parameter stability.

Table II. Export Upstreamness and Financial Development: Sensitivity Analyses

	(1)	(2)	(3)	(4)	(5)
Log (Real GDP Per-capita)	0.083	- 0.001	0.051	- 0.047	0.045
	(0.142)	(0.175)	(0.186)	(0.240)	(0.233)
Rule of Law	- 0.029	- 0.057	- 0.139	- 0.137	- 0.099
	(0.103)	(0.104)	(0.148)	(0.149)	(0.145)
Private Credit / GDP Ratio	- 0.437 ***	- 2.142	- 0.375	0.438	1.268
	(0.136)	(1.404)	(2.491)	(2.527)	(2.668)
Log (Physical Capital per Worker)	0.156 *	0.205	0.208	0.307	0.348 *
	(0.131)	(0.146)	(0.145)	(0.199)	(0.188)
School	- 0.085 ***	- 0.082 ***	- 0.084 ***	- 0.089 ***	- 0.173 ***
	(0.031)	(0.031)	(0.031)	(0.031)	(0.046)
Log (Real GDP Per-capita) x (Private Credit / GDP Ratio)		0.277	- 0.033	0.274	- 0.087
		(0.307)	(0.279)	(0.449)	(0.486)
Rule of Law x (Private Credit / GDP Ratio)			0.277	0.257	0.217
			(0.307)	(0.308)	(0.305)
Log (Physical Capital per Worker) x (Private Credit / GDP Ratio)				- 0.327	- 0.263
				(0.341)	(0.332)
School x (Private Credit / GDP Ratio)					0.204 ***
					(0.063)
Number of Observations	120	120	120	120	120
R-squared	0.154	0.166	0.172	0.177	0.222

3. Conclusion

It is futile to contest that, for meaningful modeling, any analysis must be as rigorous as possible when assessing the robustness of inference(s). In that spirit, with specific reference to the findings by Antràs *et al*. (2012), we have looked into the sensitivity of any significant negative association between a country's export upstreamness and financial development to parsimonious iterations of the conditioning information set. More specifically, we have incorporated interactions between financial development and other controls considered by Antràs *et al*. (2012). The importance of infusing these interactions is evident since there is no compelling reason to assume that bivariate correlations between financial development and export upstreamness, with or without the standard disclaimer that no causality is construed, would not be conditional on any of the other explanatory variables. We observe that neither the sign of the coefficient, from regressing export upstreamness on financial development, nor its significance could be sustained after the inclusion of interaction terms in an otherwise Antràs *et al*. (2012) specification. This leads us to conclude that an association between a country's export upstreamness and financial development is fragile. Our findings not only reinforce the importance of robustness checks for restoring

confidence in inferential economics but serves as a caution for researchers against drawing policy implications from associations, without sensitivity analyses, between upstreamness and financial development.

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