



Rue de la Banque

No. 20 ■ March 2016

Specialisation in international trade: facts, vulnerabilities and remedies

Walter STEINGRESS
Economics and International
and European Relations Directorate

This letter presents the findings of research carried out at the Banque de France. The views expressed in this post are those of the authors and do not necessarily reflect the position of the Banque de France. Any errors or omissions are the responsibility of the authors.

Countries tend to specialise in international trade as shown by the strong concentration of foreign trade. A country exports on average 10% of all existing goods and derives half of its export earnings from only 1% of its exported goods. As regards imports, a country imports on average a third of all existing goods, while half of its expenditure covers 2% of imported goods. The degree of concentration is inversely proportional to the size of the economy: small countries specialise more than large countries. This specialisation creates vulnerabilities. It affects the structure of the economy and increases its dependence on the shocks that may impact the sectors and goods concerned. This risk can be mitigated by R&D investment aimed at raising productivity.

The pattern of specialisation is at the core of international trade theory. A consequence of international trade is that countries do not need to produce all their goods; instead they can specialise in the production of goods that they are relatively good at producing and import those goods that they are relatively less good at producing. Due to the reallocation of production towards more efficient sectors and the possibility of buying goods cheaper from abroad, countries will experience welfare gains from trade. Analysing the determinants of specialisation is crucial since it not only allows us to measure the gains from trade but also informs us on how trade affects the structure of an economy. For example, a high degree of specialisation increases the likelihood that product specific shocks will have aggregate effects in terms of output volatility and/or an impact on the terms of trade.¹

The aim of this article is twofold. First, it documents facts on the pattern of specialisation by looking at both export and import concentration. To do so, it breaks down the overall level of concentration into a measure of the extensive and the intensive product margins. The extensive product margin indicates specialisation in the number of

goods traded (how many of all the possible products in the world does a country trade). The concentration index for the intensive margin measures specialisation in the value of goods traded (how are export and import values distributed). Second, the article assesses the ability of a standard Ricardian model (Eaton and Kortum, 2002) to account for the observed specialisation patterns. Specifically, it assesses the model based on three basic questions: What explains the level of specialisation in exports and imports? What determines the gap between import and export specialisation? Does specialisation occur in the intensive or extensive product margin?

The starting point is an empirical assessment of cross-country specialisation patterns using measures of concentration for exports and imports for 130 countries. The trade data come from the BACI dataset provided by the CEPII (Gaulier and Zignago, 2009) and a product is defined as a 6-digit Harmonized System code resulting in a total

¹ An illustrative example is Saudi Arabia and its dependence on crude oil, which accounts for 90 percent of its export revenue and 55 percent of its GDP. Thus, any change in the price of oil will raise volatility and have significant macroeconomic consequences.

of 4,529 tradable products. To measure specialisation, I calculate the Theil index following Cadot, Carrère and Strauss-Kahn (2011), which has the advantage of being additively decomposable into intensive and extensive components. Note that an index of 0 means complete diversification (a country exports all products) and receives the same export revenues from each product. Conversely, an index of 8.4 means that a country is completely specialised and exports only one product.²

Fact 1: exports and imports are highly concentrated

Based on the definition of the extensive and the intensive Theil indexes, I show in a companion paper, Steingress (2015), that the concentration indexes in Table 1 and Table 2 imply the following: a country exports on average 10% of all the possible products and receives 50% of

T1 Summary statistics of average export concentration indexes.

Data	Theil Exports		
	Extensive Margin	Intensive Margin	Total
Level	2.60	2.13	4.73
Share (%)	55	45	
Regression (Data)			
log(GDP)	-0.470*** [0.0257]	0.001 [0.00205]	-0.469*** [0.0330]
Observations	130	130	130
R-squared	0.754	0.003	0.627

Source: Steingress, 2015.

T2 Summary statistics of average import concentration indexes.

Data	Theil Imports		
	Extensive Margin	Intensive Margin	Total
Level	1.10	1.61	2.71
Share (%)	40	60	
Regression (Data)			
log(GDP)	-0.247*** [0.0206]	0.061*** [0.0144]	-0.185*** [0.0209]
Observations	130	130	130
R-squared	0.498	0.044	0.348

Source: Steingress, 2015.

its export revenues from 1% of the products; as regards imports, the Theil indexes imply that the average country imports 33% of all possible products and spends 50% of its expenditure on 2% of the products that it imports.

Fact 2: exports are more concentrated than imports

Table 1 and Table 2 also show that exports are more concentrated than imports on all margins. The gap between export and import concentrations is explained by the extensive margin, i.e. countries export few products and import many products.

Fact 3: the extensive margin is more important for exports, while the intensive margin is more important for imports

Regarding the breakdown, for exports, the main driver of concentration is the extensive margin with a share of 55 percent, whereas, for imports, the intensive margin dominates with a share of 60 percent.

Fact 4: concentration declines with economic size

In terms of cross-country differences, Table 1 and Table 2 show the estimated coefficients when the log of GDP is regressed onto the concentration indexes. Note that the Theil indexes of both, exports and imports, decrease with GDP, i.e. smaller economies specialise more than large ones.

Next, I use a standard Ricardian trade model developed by Eaton and Kortum (2002) to shed light on the underlying determinant of specialisation. A key implication of this model is that it shows how comparative advantage determines specialisation endogenously on both the extensive and intensive margins. It identifies geography together with the elasticity of substitution and the degree of absolute and comparative advantage as the main determinants of specialisation. A higher level of technology increases a country's absolute advantage (i.e. its productivity) and leads to more products being exported. The degree of comparative advantage heightens the sensitivity of concentration to changes in unit costs of production, thereby dictating specialisation on both margins. Trade costs decrease comparative advantage and increase specialisation on

² The Theil index is defined as

$$T = \frac{1}{N} \sum_{k=1}^N \frac{R_k}{\bar{R}} \log\left(\frac{R_k}{\bar{R}}\right)$$

where R_k denotes export revenues of k , \bar{R} the average export revenues and N the total number of products. If a country exports only one product, the Theil becomes $\log(N)$. The total number of tradable products (N) is 4,529, which implies $T = \log(4,529) = 8.4$.

T3 Simulated export concentration indexes

Data	Theil Exports		
	Extensive Margin	Intensive Margin	Total
Level	5.04	3.10	8.14
Share (%)	62	38	
Regression (Data)			
log(GDP)	-0.690*** [0.0259]	0.129*** [0.0285]	-0.560*** [0.0244]
Observations	130	130	130
R-squared	0.847	0.139	0.805

Source: Steingress, 2015.

T4 Simulated import concentration indexes

Data	Theil Imports		
	Extensive Margin	Intensive Margin	Total
Level	0.82	1.89	2.71
Share (%)	30	70	
Regression (Data)			
log(GDP)	-0.0350** [0.0150]	0.00261* [0.00134]	-0.0324** [0.0139]
Observations	130	130	130
R-squared	0.041	0.029	0.041

Source: Steingress, 2015.

the extensive and intensive margins. A higher elasticity of substitution allows for better substitution between products and countries can channel their expenditure into few low price sectors. As a consequence, concentration on the intensive margin increases.

To calibrate the model, I follow Waugh (2010) and use bilateral trade data together with geographical data (distance, border) to obtain trade costs, technology levels and the elasticity of substitution. The simulated results, see Table 3 and Table 4, show that qualitatively the model produces the observed specialisation pattern,

with countries being specialised in exports and diversified in imports on all margins. More importantly, the simulated model also reproduces the degree of concentration on the extensive versus the intensive margin for both exports and imports. Quantitatively, the levels obtained for exports are too high in comparison with the data.

Chart 1 plots the corresponding cross-country pattern for the simulated and empirically observed concentration levels against the log of GDP. The model replicates the empirical pattern where export concentration decreases as market size (GDP) increases. However, in the model, countries specialise excessively in the number of products exported (Chart 1(c)). On the import side, the calibrated model is unable to replicate the L-shaped relationship between GDP and concentration (Chart 1(d)). In the simulation, countries tend to import fewer goods than in the data. As regards the intensive margin (Charts 1(e) and 1(f)), the results show that, in line with the data, the model predicts no relationship between concentration and GDP.

Overall, the results show that the Ricardian model of Eaton and Kortum is qualitatively consistent with the observed specialisation patterns; in particular, it can replicate the respective shares of concentration in the extensive and intensive margins for both exports and imports. Therefore, a country's export and import concentration is a consequence of its underlying productivity and trade costs. In other words, the link of causality goes from productivity and geography to specialisation. Finally, in terms of cross country differences, concentration will be higher for those countries with low productivity and high trade costs.

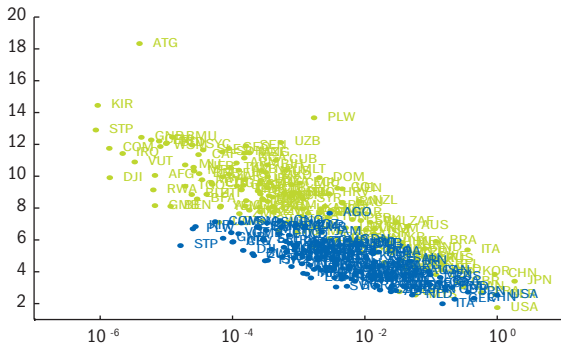
This has important macroeconomic policy implications. The empirical literature finds that export and import concentration increases a country's exposure to sector specific shocks, which leads to output and terms of trade volatility, see Ramey and Ramey (1995) and Jansen (2004). The resulting volatility may then in further instance decrease income, see Koren and Tenreyro (2007). Reducing trade costs or increasing productivity through R&D investment would lead to diversification of both exports and imports, and consequently reduce such risks.

C1 Simulated and empirical concentration of exports and imports over GDP

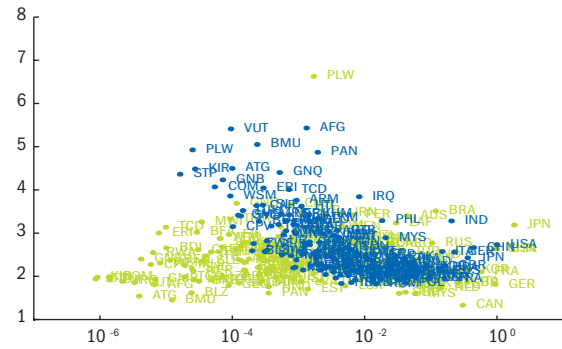
(x-axis: Log of the relative GDP over the GDP of the United States;
y-axis: export concentration)

(x-axis: Log of the relative GDP over the GDP of the United States;
y-axis: import concentration)

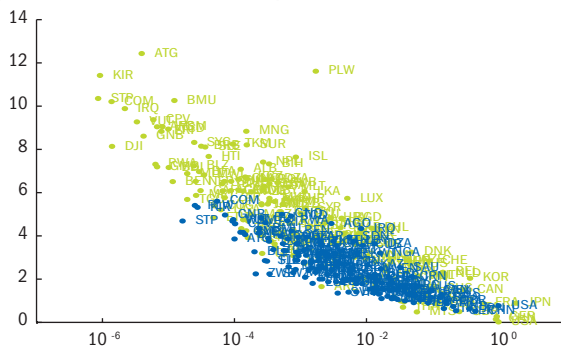
a) Overall concentration of exports



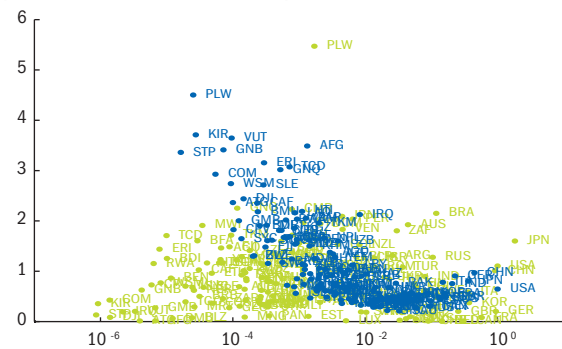
b) Overall concentration of imports



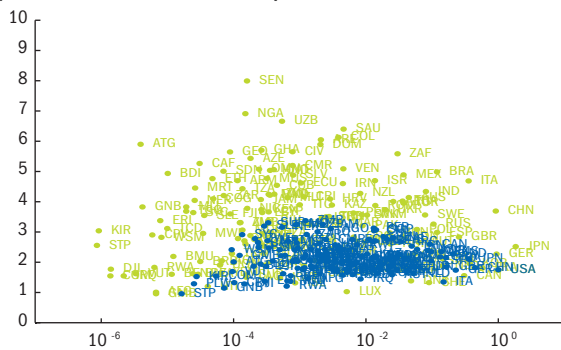
c) Extensive concentration of exports



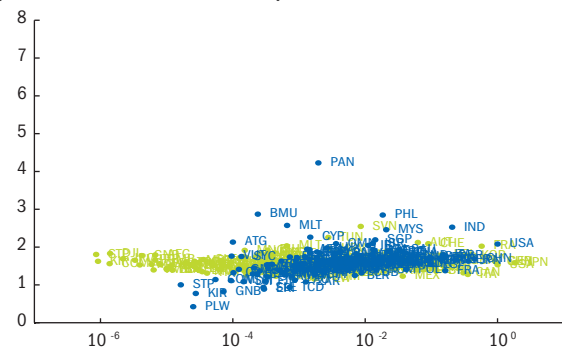
d) Extensive concentration of imports



e) Intensive concentration of exports



f) Intensive concentration of imports



● Simulated data

● Empirical data

Source: Steingress, 2015.

References

Cadot (O.), Carrère (C.) and Strauss-Kahn (V.) (2011)

“Export diversification: what’s behind the hump?”, *The Review of Economics and Statistics*, 93, pp. 590-605.

Eaton (J.) and Kortum (S.) (2002)

“Technology, geography, and trade”, *Econometrica*, 70(5), pp. 1741-1779.

Gaulier (G.) and Zignago (S.) (2009)

“BACI: international trade database at the product-level”, *CEPII Working Paper* 2010-23.

Jansen (M.) (2004)

“Income volatility in small and developing economies: export concentration matters”, *WTO Discussion Papers* 3, World Trade Organization.

Koren (M.) and Tenreyro (S.) (2007)

“Volatility and development”, *The Quarterly Journal of Economics*, 122, pp. 243-287.

Ramey (G.) and Ramey (V.) (1995)

“Cross-country evidence on the link between volatility and growth”, *American Economic Review*, 85, pp. 1138-1151.

Steingress (2015)

“Specialization patterns in international trade”, *Document de travail de la Banque de France* No. 542.

[Download the paper](#)

Waugh (M. E.) (2010)

“International trade and income differences”, *American Economic Review*, 100, pp. 2093-2124.

Published by

Banque de France

Managing Editor

Marc-Olivier STRAUSS-KAHN

Editor-in-Chief

Françoise DRUMETZ

Production

Press and Communication Department

March 2016

www.banque-france.fr