Boxes

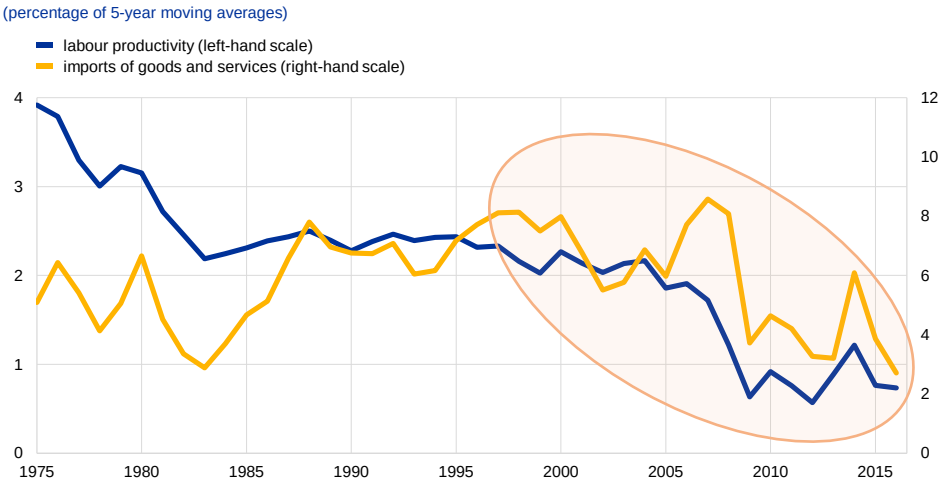
1 Does trade play a role in helping to explain productivity growth?

Against the backdrop of lower productivity and lower trade globally, this box discusses the impact of trade on medium-term labour productivity growth for major emerging and advanced economies. Economic theory advocates a positive relationship between trade and productivity, suggesting that wider participation in international trade leads to improvements in productivity.

Growth in labour productivity and global trade has lost momentum since the late 1990s. This deceleration intensified markedly after the onset in 2007 of the global financial crisis. Labour productivity – defined as real GDP divided by number of workers – slowed down across advanced economies from rates broadly stable at around 2% prior to the crisis to less than 1%. At the same time the growth rate of OECD imports declined from around 7% during the two decades prior to the financial crisis to less than 3% in recent years (see Chart A).

Chart A

Growth in labour productivity and trade across advanced economies



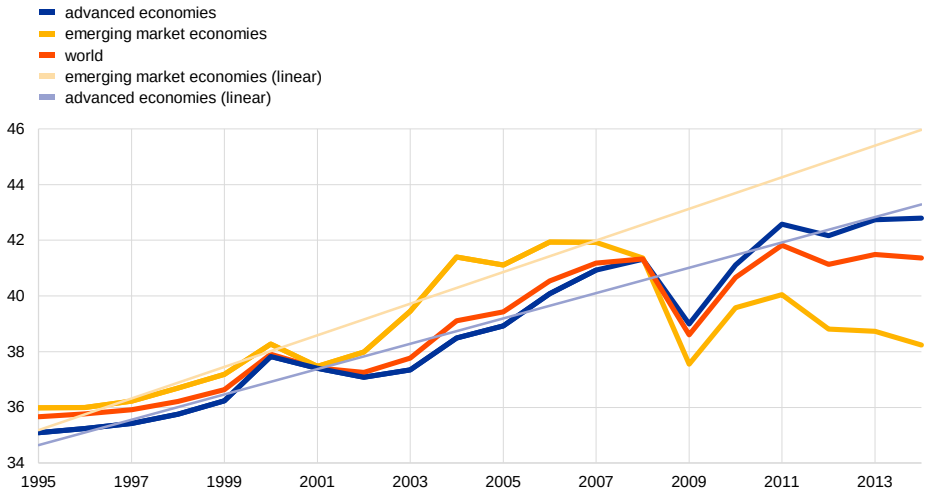
Sources: ECB calculations, OECD, and The Conference Board 2016.
Notes: Labour productivity is a weighted average across advanced economies based on GDP purchasing power parity and refers to output per worker.

A fundamental characteristic of the slowdown in global trade has been the recent stalling in the expansion of global value chains (GVCs). Over the last few years the share of GVC-related trade in world trade has hovered around 41% (see Chart B). A more detailed analysis uncovers key discrepancies across countries. While in advanced economies the share has continued closer to its pre-crisis trend, the international fragmentation of supply chains appears to have slowed and even partially reversed among emerging market economies following the financial crisis.

Chart B

Global value chain participation

(GVC-related trade as a percentage of world trade)



Source: Borin, A. and Mancini, M., "Follow the value added: bilateral gross export accounting", *Temi di discussione*, No 1026, Banca d'Italia, 2015.
Notes: GVC participation is measured as the import content of exports combined with the share of exports that is further processed and re-exported by trading partners. The underlying data are nominal; the measure has been adjusted to exclude value added in energy sectors, thus preventing distortion in the measure from oil price changes.

Economic theory points to a positive relationship between trade and productivity, as engaging in trade is considered to promote advances in productivity. Recent models on the trade-productivity nexus focus on the effect of trade on competition. This line of theory argues that higher exposure to traded goods increases competition among heterogeneous firms, leading to a reallocation of resources towards more productive firms, while the least productive companies are forced to exit the market (e.g. Melitz[2]; Melitz and Ottaviano[3], among others). Increased competition from imported products incentivises firms to invest in the upgrading of technology while the availability of a larger range of intermediate production inputs potentially lowers firms' input costs. On the export side, the possibility to expand into larger (export) markets provides incentives to improve the efficiency or quality of production, thereby boosting productivity within firms.

With the wider availability of data on GVC participation, a more recent strand of the literature examines the link between productivity and the interaction of firms within global supply chains. Two mechanisms point to productivity increases resulting from the interaction of firms within global supply chains. First, by outsourcing parts of production to international suppliers, efficiency gains in the form of lower cost or higher quality are realised and raise productivity. Second, joining international production chains typically entails knowledge spillovers, reducing the distance to the technological frontier and thereby boosting firm-level productivity. The literature on the link between GVC participation, trade and productivity has only

2 Melitz, M., "The impact of trade on intra-industry reallocations and aggregate industry productivity", *Econometrica*, Vol. 71, No 6, 2003, pp. 1695-1725.

3 Melitz, M. and Ottaviano, G., "Market size, trade, and productivity", *Review of Economic Studies*, Vol. 75, 2008, pp. 295-316.

recently developed. For example, Schwörer[4] uses European data to find evidence that offshoring of certain activities can increase firm-level productivity. Constantinescu et al.[5] observe that GVC participation is associated with higher labour productivity at the global level.

An empirical model is used to investigate the various transmission channels between trade and productivity growth. Specifically, the baseline model is a fixed effects panel regression that explains labour productivity with a range of trade variables that capture the import and export channels, as well as GVC-related trade. Two GVC measures were used – one reflects the import content of exports (backward GVC participation), while the other adds exports that are further processed and re-exported by the trading partner (forward GVC participation). The data sample is annual and covers 13 manufacturing industries in a set of 40 advanced and emerging market economies over the period 1996-2007. Following Bernard, Jensen and Schott[6], the data are divided into three-year non-overlapping periods, with the change in trade and GVC variables in a given three-year period explaining the changes in productivity over the subsequent three years.[7]

The results suggest a positive and significant relationship between productivity and international trade (in real terms). For the manufacturing sector (excluding oil-related industries), the regression in column (1) of Table A shows a positive link between growth rates of both total exports and total imports of goods and services on the one hand, and labour productivity growth on the other. When disentangling trade between final and intermediate goods, the results show that real imports of intermediate goods and services dominate the trade impact on productivity. This suggests that the more important efficiency gains from trade come through both increased competition in the domestic market and access to lower input costs.

Across trade variables, GVC-related trade is the most relevant driver of productivity, and hence activity. When differentiating the imports of intermediate goods between GVC-related imports and non-GVC-related imports, only GVC-related trade is statistically significant for labour productivity. This would suggest that beyond the positive gains to productivity from the input cost channel, the international integration of production processes provides an additional source for labour productivity growth, possibly via knowledge-transfer effects. All other things being equal, a 10 percentage point increase in GVC-related trade growth increases productivity growth by about 0.5 percentage point. The results are qualitatively similar for backward and forward GVC participation.

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4 Schwörer, T., “Offshoring, domestic outsourcing and productivity: evidence for a number of European countries”, *Review of World Economics*, Vol. 149, 2013, pp. 131-149.

5 Constantinescu, C., Mattoo, A. and Ruta, M., “Does vertical specialization increase productivity?”, World Bank, *Policy Research Working Paper* 7978, 2017.

6 Bernard, A., Jensen, J. and Schott, P., “Trade costs, firms and productivity”, *Journal of Monetary Economics*, Vol. 53, 2006, pp. 917-937.

7 This modelling choice guards against endogeneity issues and accounts for the potential time dimension over which knowledge transfer and competition effects materialise.

Table

Regression results; manufacturing sector (excluding oil)

(dependent variable: labour productivity; all variables are in log-differences; all trade and GVC variables are lagged by one period)

	All countries				Advanced economies		BRIC	
	(1)	(2)	(3)	(4)	(3)	(4)	(3)	(4)
Capital/employee	0.405***	0.404***	0.410***	0.411***	0.289***	0.291***	0.332***	0.326***
Total exports	0.052**							
Total imports	0.007							
Final exports		-0.014						
Intermediate exports		0.029						
Final imports		-0.005	-0.004	-0.004	-0.026	-0.026	-0.072	-0.070
Intermediate imports		0.076*						
Non-GVC intermediate imports			0.015	0.015	0.025*	0.025*	0.040	0.039
Backward GVC participation			0.045**		0.041*		0.136*	
Forward GVC participation				0.054**		0.049*		0.152
Observations	1032	1032	1012	1012	728	728	104	104
R^2	0.450	0.453	0.459	0.460	0.467	0.468	0.468	0.468

Source: ECB staff estimates.
Notes: The sample period is 1996-2007 and is divided into four three-year period averages. Regression includes fixed effects at the country-period level to capture technology differences across countries and time. Fixed effects at the industries level were dropped from the regression, since they were not significant. All variables are in real terms. The asterisks indicate statistical significance at the 10% (one asterisk), 5% (two asterisks) and 1% (three asterisks) level based on robust standard errors.

However, the relative importance of GVC-related trade measures for productivity differs between advanced economies and large emerging market economies. In advanced economies, the broader proxy for GVC-related trade (which includes forward participation) has a somewhat more pronounced impact on productivity than the more narrow measure (backward participation), which would be justified by the reinforced channel of learning by exporting. Among key emerging market economies (Brazil, Russia, India and China, or BRIC), the magnitude of the estimated coefficients on the backward GVC participation measure is significantly larger than in advanced economies. This suggests that in these countries productivity benefits more from backward participation, while the broader proxy for GVC-related trade is found to be marginally insignificant.

Overall, the analysis suggests that global trade and, in particular, participation in GVCs exert a significant impact on labour productivity over the medium term. A further weakening of global trade, for example through greater use of protectionist measures, could therefore entail economically significant costs in terms of lower growth in labour productivity.