Deutsche Bank Research

Outsourcing

Division of labour gives competitive edge

December 13, 2011

— **Division of labour and specialisation are rightly regarded in economic research as the cornerstones of productivity and prosperity. In keeping with this idea, European firms reduced their degree of vertical integration by about 1.5 percentage points between 2003 and 2007.**

— **Recent research has, however, found a supposedly negative correlation between the degree of division of labour (in the form of outsourcing, for example) and productivity at the company level, meaning that more outsourcing allegedly hurt productivity. This would fundamentally contradict standard management practices.**

— **In our opinion, this supposed contradiction is based on a misleading interpretation of empirical findings which overlooks important effects.**

— **Performing a dynamic analysis reverses the picture: a vertical integration that was 1 percentage point lower in 2003 is statistically associated with 5-10 percentage points higher earnings growth (cumulative) in the following four years.**

— **Disintegrated production thus delivers a competitive edge. The decisive factor, of course, is the optimum degree of vertical integration for each individual company, which can be derived for example from the firm's level of specialisation, the sector in which it operates, its market position and management capacities.**

Outsourcing and offshoring are highly discussed management practices since the dawn of the new millennium. This form of division of labour promises major efficiency benefits because companies can concentrate on their core competencies and get help with their weaknesses from suppliers and business partners.

Economic research has accordingly been largely positive in its assessment of the trend towards outsourcing and offshoring. This view is supported by extensive literature stretching back to the founding fathers Adam Smith (1776) and David Ricardo (1817). With outsourcing it is also a matter of the right degree, striking the right balance between specialisation benefits on the one hand and transaction costs on the other. The maximum possible degree of outsourcing is usually not efficient.

Nevertheless, companies have in recent years evidently become both more inclined and more able to specialise and divide work: export ratios are rising and the degree of vertical integration is falling. The outsourcing wave in the service sector has played a major part in this; after all, technological progress has facilitated various new forms of division of labour. This also applies to manufacturing firms that outsource services such as IT management, bookkeeping or call centres to other companies.

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Trend towards division of labour and specialisation

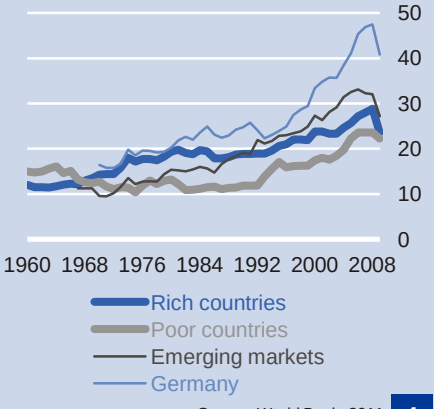
The trend towards division of labour and specialisation is easily illustrated by looking at the growing volume of trade flows. The world has grown closer together economically over the last 50 years (see chart 1). The export ratio had doubled from 12% of global output in 1960 to over 24% in 2009. If there had not been a financial and economic crisis the figure would probably be as much as 30% – an increase of 2 ½ times. This is perhaps less dramatic than the globalisation debate would suggest occasionally; after all, numerous changes in the global economy have strengthened trade relations: advances in communication and information technology, the lowering of tariffs (e.g. via GATT/WTO or bilateral trade agreements), better infrastructure (e.g. container shipping), as well as the increasing integration of the former Warsaw Pact countries and the aspiring emerging markets in the global economy.

Companies in Germany have not ignored this trend. The figures clearly show how the German economy has stepped up export activity: up until the early 1980s the German export ratio was only minimally higher than the average of other rich countries, of late it has been almost twice as high (41% of GDP). The interesting thing is that this decoupling evidently did not commence until after the actual economic miracle. Only reunification was able to briefly slow the surge in exports. German imports have not quite managed to keep pace with this development (the reason for the current account surplus): they rose from 25% of GDP in 1980 to 35% in 2009.

The increasingly integrated global economy corresponds to growing division of labour at the company level in Germany: between 1999 and 2008 the degree of vertical integration (measured in terms of value added relative to sales) fell for example by 22% in mechanical engineering, by 12% in the auto industry and by 8% in the chemicals industry (see chart 2). More recent figures are less meaningful as they are distorted by the financial and economic crisis.

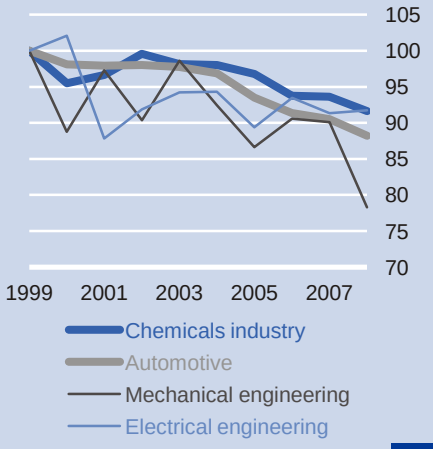
An ever smaller share of value added is generated in-house – upstream and downstream companies are becoming more important in the production chain. Overall, German companies occupy a mid-table position in the European rankings (see chart 3).

Export ratio has doubled in 50 years
Exports as % of GDP



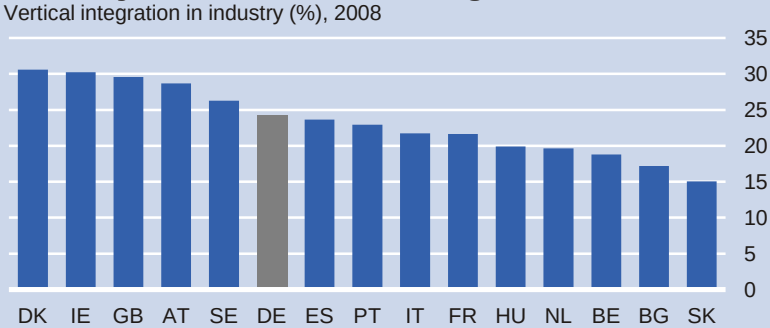
Source: World Bank, 2011 **1**

In-house share is shrinking
Vertical integration levels in DE, 1999=100



Sources: DB Research, Eurostat, 2011 **2**

Germany has a mid-table ranking
Vertical integration in industry (%), 2008



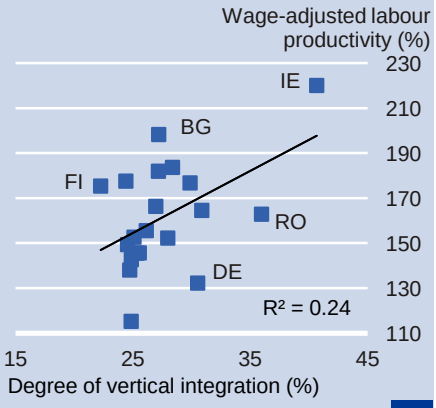
Sources: DB Research, Eurostat, 2011 **3**

A low value-added ratio is ultimately also an indicator of a disintegrated production chain. In light of the trend described above the question arises as to whether the degree of vertical integration has a systematic impact on corporate performance metrics, that is

whether the degree of division of labour has a measurably positive or negative influence on productivity, returns or profits.

Is outsourcing “a load of rubbish”?

What can we learn from this?
Mechanical engineering, 2008



Sources: DB Research, Eurostat, 2011 **4**

One obvious approach is to set the degree of vertical integration against productivity. Such a comparison across different sectors and countries does in fact reveal a systematic correlation, however, it is the opposite of what we expected. The greater the degree of vertical integration in the sector (meaning more in-house production, less division of labour), the higher labour productivity appears to be (see also model 1 in table 6 below). For this comparison we always use wage-adjusted labour productivity since a key factor for a company is that potentially higher productivity is not eaten up by higher wages. Chart 4 illustrates this relationship using the example of mechanical engineering in Europe. It would represent a clear contradiction to the prevailing view to date.

This analysis comes to a similar conclusion as previously reached by Broedner et al. (2009) and Lay et al. (2009).[1] The scientists at the Fraunhofer Institute analysed a random sample of nearly 500 German manufacturing firms in 2003 to identify “instruments for boosting productivity”. This also included testing the influence of the outsourcing ratio, which they define as the difference between the degree of vertical integration level and 100%: hence, the lower the level of vertical integration, the higher the outsourcing ratio. Contrary to their own hypothesis, the authors also found that less vertical integration is accompanied by lower productivity. In other words: the higher the outsourcing ratio, the more inefficiently that companies produce. According to the authors, the specialisation benefits must be outweighed by the growth in transaction costs.

The important thing is that this view is not based on erroneous individual entrepreneurial decisions – mistakes are made again and again – but on a systematic negative correlation between division of labour and productivity. This would have major significance for economic policy and management consultancy. The findings of the Fraunhofer Institute are ultimately interpreted by the public as making a case for more in-house manufacturing and insourcing (“outsourcing is a load of rubbish”).

Right calculation, wrong interpretation?

Profits are part of value added

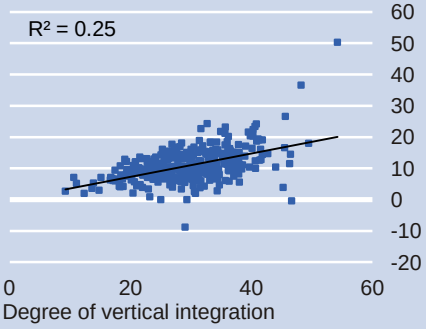
In a first step, our own analysis does indeed serve to back up this conclusion (which we found surprising) with a new data set. However, this correlation could be distorted by other factors, which would alter the interpretation of the results.

The level of vertical integration and labour productivity are influenced by many factors that are not directly related to outsourcing decisions. Profits play a pivotal role in this respect since profits make up a portion of value added.

The average degree of vertical integration among European firms in 2003 was about 30%, while the average gross operating rate (i.e. operating surplus relative to sales) was around 11% (both unweighted). Variations in the gross operating ratio alone account

[1] Broedner, Peter; Steffen Kinkel and Gunter Lay (2009). Productivity effects of outsourcing: New evidence on the strategic importance of vertical integration decisions. International Journal of Operations & Production Management. Vol 29. No 2. pp. 127-150 and Lay, Gunter; Steffen Kinkel & Angela Jäger (2009). Stellhebel für mehr Produktivität: Benchmarking identifiziert Potenziale zur Steigerung der Produktivität. Mitteilungen aus der ISI-Erhebung zur Modernisierung der Produktion. Number 48.

Market position has a major influence
2003 (%)



Basis: 15 sectors / 25 countries in Europe
Sources: DB Research, Eurostat, 2011
5

for some 20-30% of the differences in degree of vertical integration (see chart 5). The probability is thus very high that the correlation between vertical integration and productivity is decisively influenced by other factors.

The opposite effect applies to inputs: if prices rise for inputs, the degree of vertical integration falls – all other things being equal. This is definitely a relevant factor; after all, material costs as a share of gross production value in the German manufacturing sector rose by 5.8 percentage points (to 48%) between 2003 and 2007.[2] The rise in steel prices could, for example, partly explain why specifically the share of value added in engineering has fallen sharply.

Market positioning also plays an important role. It could influence both productivity and degree of vertical integration. After all, with outsourcing the objective is not to achieve an absolute figure but to determine the optimum outsourcing ratio for each individual company: the more specific the production, the lower the optimum outsourcing ratio as a rule. Specific production is often associated with specialised products. It would therefore be normal to expect that for example a manufacturer of highly specialised products would tend to have a larger share of in-house production than other firms. At the same time such specialist manufacturers often operate in lucrative niche markets in which correspondingly high margins are to be earned. The observable outcome at these manufacturers would thus be high productivity (on account of the margins) combined with a high degree of vertical integration (on account of the specialisation). This correlation would not, however, be the result of the outsourcing decision, but of the market positioning. The management recommendation derived from this observation would thus be completely different.

Dynamic instead of static analysis

We use three different empirical approaches to isolate the influence of vertical integration on productivity and other metrics. All models are based on a sample at sector level (15 manufacturing sectors) in 25 European countries.

— First, we construct a model that uses dynamic instead of static performance metrics. This reduces static distortions such as differences in market position. The premise here is that the market position does not change fundamentally in a short space of time. The dependent variables are the changes in productivity, return on sales and profit between 2003 and 2007. The dynamic approach also takes better account of the fact that outsourcing decisions can only pay off over time.

— Secondly, we supplement the static model with gross operating ratio as an explanatory variable. It serves as a direct indicator of market position.

— Thirdly, we use a two-stage statistical estimation method that helps to isolate the observation of the influence of other endogenous variables (IV method). The instrument used is the number of people worldwide that speak the respective language. This instrument is based on the premise that language has no direct influence on productivity (an English-speaking worker is just as productive as a German-speaking worker *ceteris paribus*). However, offshoring is made a lot easier if the local language is

[2] Auer, Josef and Oliver Rakau (2011). Commodity boom: More than just risk for German industry. Current Issues. September 20, 2011. Deutsche Bank Research. Frankfurt am Main.

Dynamic analysis delivers more contrasting outcomes

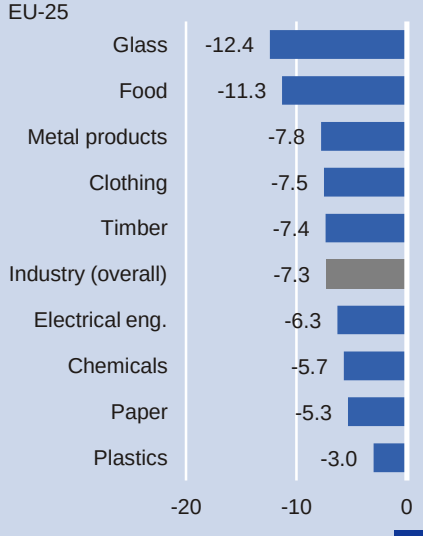
Dependant variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(10)
	Productivity		**Δ Productivity**		**Δ Return**	**Δ Earnings**			
	2003		*Respective change 2003-2007*						
Method	OLS	OLS	OLS	IV	OLS	OLS	OLS	OLS	IV
Degree of vertical integration (2003)	3.0*** (0.70)	-3.5*** (0.62)	-2.8*** (0.37)	-4.8** (2.02)	-0.21*** (0.03)	-7.3*** (1.18)	-5.5*** (1.40)	-6.0*** (1.03)	-10.2* (6.08)
Δ Degree of vertical integration (2003-2007)							6.0** (2.51)	1.7 (1.92)	
Gross operating ratio (2003)		13.9*** (0.81)					-0.8 (2.02)	5.2*** (1.54)	
Δ Personal costs (% of sales) (2003-2007)								-11.2*** (0.70)	
R^2	20%	60%	25%	18%	23%	28%	28%	61%	27%
N	313	313	321	321	331	331	331	331	331

Standard error in brackets, levels of statistical significance: ***1%, **5%, *10%
IV: Number of people worldwide that speak the language
All models include sector dummies
Basis: 25 countries in Europe / 15 sectors
Raw data: Eurostat

Source: DB Research, 2011 **6**

Ballast costs earnings

Change in earnings growth (percentage points) 2003-2007 for 1 percentage point higher degree of vertical integration 2003, EU-25



Source: DB Research, 2011 **7**

spoken worldwide (English, for example), since this enables straightforward communication with foreign suppliers. We were able to identify clear evidence of this effect specifically for the IT outsourcing field.[3] Of course, only a fraction of outsourcing is international in nature. This fraction is, however, sufficient as a statistical instrument.

Table 6 provides a summary of the results – as well as a simple statistical analysis (model 1) as a reference point. The coefficients of degree of vertical integration (2003) are negative in all the other models (2-10). This means that the greater the vertical integration, the poorer the performance metrics the sectors achieve. None of these estimates is perfect, but they all point in a similar direction. The only exception is the model in the first column which replicates the simple static approach described above.

The augmented models thus generate more differentiated outcomes than the static analysis. For example, model (6) shows that statistically speaking for each additional percentage point of vertical integration in 2003 earnings growth was 7 percentage points lower (cumulative for 2003-2007). This is obviously an economically relevant figure. The reaction is particularly sensitive in the glass industry; for plastics makers the degree of vertical integration has less of an influence (see chart 7).

The generally positive business trend between 2003 and 2007 – profits and productivity rose for the majority of companies – could arouse suspicions that it is a fair-weather effect: that outsourcing only helps when the economy is booming. Comparable results can, however, also be achieved if the sample is limited to sectors where profits declined.

Not a fair-weather effect

Models (7) and (8) factor in not only the level of vertical integration in 2003, but also the change in vertical integration between 2003

[3] See Meyer, Thomas, 2007. India's specialisation in IT exports: Offshoring can't defy gravity. Research Notes 27. Deutsche Bank Research. Frankfurt am Main.

and 2007. This ensures that the relationship is not based solely on the adjustment following a potential shock in some sectors. Although the effect is weaker in models (7) and (8) it retains its direction and statistical significance. The positive correlation between the change in degree of vertical integration and earnings growth in model (7) does not contradict the message. Rather, it reflects the fact already shown in chart 5 that earnings are part of added value. Rising profits thus also boost added value, all other things being equal.

Overall, the results are robust when set against numerous different specifications. The two-stage estimations (IV, models 4 and 10) back up the findings and result in higher coefficients.

Smart outsourcing delivers a competitive edge

Outsourcing on the increase

The trend points towards falling vertical integration levels: of the 375 sectors analysed here 241 reduced their vertical integration between 2003 and 2007 while only 93 increased it (there is no data for the other cases). Overall, the levels of vertical integration throughout Europe have fallen by an average of around 1.5 percentage points. It would be very astonishing if a management practice were to be so widely deployed even if it systematically destroyed productivity.

Static analyses, however, show a positive correlation between the level of vertical integration and productivity. This observation prompts some people to call for a revision of current outsourcing practices because transaction costs or other problems appear to be systematically higher than the potential profits from specialisation. However, this is not necessarily the right interpretation in our opinion as the static relationship is biased by other factors.

No hard-and-fast rules

Our dynamic analysis shows the opposite: sectors which make stronger use of division of labour in the production process tend to boast better performance metrics. This also applies to static observation in cases where different market positions are taken into account. The basic idea of division of labour and specialisation thus still appears to have something going for it. There are, however, no hard-and-fast rules. Maximum outsourcing does not necessarily result in the optimum degree of vertical integration. The production depth must suit the corporate strategy, sector and market position.

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ISSN: 2193-5963