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INTANGIBLE ASSETS AND PARTICIPATION IN GLOBAL VALUE CHAINS: AN ANALYSIS ON A SAMPLE OF EUROPEAN COUNTRIES

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Intangible Assets and Participation in Global Value Chains: An Analysis on a Sample of European Countries[1]

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This paper investigates the role of intangible assets as factors influencing participation in global value chains (GVC) in a sample of European economies. We distinguish between different forms of participation in GVC entailing a different degree of capability to create value added domestically and we examine how different intangible assets contribute to foster countries' engagement in GVC and the reaping of benefits from such participation. The data cover 14 European countries in two broad sectors (manufacturing and total market services) over the period 1995-2014. We find that investing in intangible assets favours participation in GVC and contributes to value appropriation along the chain. Moreover, different intangible assets contribute differently to forward and backward participation [JEL Classification: F23, O30].

Keywords: Intangible assets; global value chains; forward and backward participation; R&D expenditure

1. Introduction

International fragmentation of production, which implies that countries specialise in portions of the value chain and trade other portions of it, has led to widespread processes of *globalisation of value chains* (GVC) over the past two decades (for recent reviews, see Kaplinsky 2013; De Backer and Miroudot 2013; Timmer et al. 2014). Baldwin (2011) has defined these as a 'second unbundling' of globalisation, which has transformed the terms of international competition and shifted the barycentre of the world's global headquarters and peripheries.

While the international fragmentation of production has allowed more countries to be involved in the production of a final good, not all countries have retained the same benefits from such process. A growing number of studies have pointed out that gains are unevenly distributed across the value chain (Kaplinsky 2000; Gereffi et al. 2005; Dedrick et al. 2010; Shin et al. 2009 and 2012; OECD 2013b). It becomes, therefore, crucial to assess which factors help explaining this uneven distribution.

In this respect, some authors have observed that the economic balance of power often favors nodes with high technology which would imply that firms which control technology through mechanisms like patents or licenses are in extremely powerful positions and are likely to extract maximum rents from GVCs (Mudambi 2007; Dedrick et al. 2010). However, together with technology also better organizational skills and better marketing capabilities might be crucial. Overall, to extract maximum rents, governance becomes an important ingredient in the value chain (Gereffi et al. 2005). Therefore, firms investing in intangible assets (research, marketing, organization capital, etc.) should ceteris paribus be able to generate higher returns with respect to other firms.

Despite the acknowledgement of the important role of intangible assets in determining gains along the value chain, to our knowledge the only study looking at the relationship between one specific intangible asset and backward GVC participation is Marcolin et al. (2016). They provide evidence about the linkages between global value chain and organizational capital. Their analysis supports the assumption that industry-level investment in intangibles is causally linked to GVCs in the form of backward linkages with the foreign market.

The purpose of this paper is to provide a broader perspective on these issues by estimating the relationship between countries' investment in intangible assets, on the one hand, and some indicators of participation and value creation in GVC , on the

other hand. In particular, we use information on countries' stocks of intangible assets (R&D, marketing and advertising, design, training, organization capital) for 14 European countries over the period 1995-2011 for manufacturing and total market services taken from INTAN-Invest.net. We merge intangible data with EUKLEMS information about value added, and hours worked and with different measures of participation in global value chains gathered from OECD-WTO Trade in Value Added (TiVA) database: domestic value added embodied in foreign exports and in foreign final demand (or "forward participation"); foreign value added embodied in domestic exports and in domestic final demand (FVADFD or "backward participation").

The paper is structured as follows. Section 2 provides an overview of both the literature on Global value chain participation and on intangibles and growth. Section 3 illustrates our research hypotheses while section 4 offers some descriptive evidence on the extent of countries' participation in GVC and the gains from such participation. Section 5 focuses on the empirical strategy and the main econometric results, while Section 6 concludes.

2. Background literature

Two streams of literature are relevant for developing the arguments put forward in this paper: the recent literature on factors allowing participation in global value chains and the new contributions on the role of intangible assets for productivity growth.

2.1 *Factors affecting participation in Global Value Chain*

There is general consent that integration into GVCs brings benefits beyond those traditionally associated with international trade in final goods, allowing countries to specialize in single tasks and benefiting from economies of scale and scope. Indeed, empirical evidence shows that joining GVCs brings positive and significant gains in productivity (see, e.g. Baldwin and Yan, 2014).

But what are the factors facilitating countries participation in GVC? To the best of our knowledge there are only few empirical analyses aiming at disentangling the determinants of countries' capability to engage in GVC participation. These studies find that the level of development, infrastructure and human capital favor participation, while tough regulation, tariffs and other trade impediments are

detrimental (Hummels and Schaur 2012; WTO 2014; Cheng et al. 2015; Lopez-Gonzalez et al. 2015).

Whilst the literature mainly agrees that participating in GVCs is largely beneficial, it has also been stressed that advantages are not equally divided among GVC participants. The classic example of the iPod supply chain discussed by Dedrick, et al. (2010) shows that Apple captures between one-third and one-half of an iPod's retail value, Japanese firms such as Toshiba and Korean firms such as Samsung capture another major share while firms and workers in China capture no more than 2 percent from assembling the product. Overall, there is evidence that a great part of the value added of a final product is created in the first and last stages of the production process (R&D, design, marketing and sales), while firms involved in intermediate stages (such as the production of components and assembly) reap only a small part of the final value of the good or service produced (Mudambi, 2007; 2008). The pattern of value-added along the value chain may, therefore, be represented by the 'smiling curve' (Everatt et al., 1999) or the 'smile of value creation' (Mudambi, 2007): ranking activities on the x-axis along the value chain (activities at the left or 'input' end are supported by R&D knowledge while activities at the right or 'output' end are supported by marketing knowledge), value added will be higher in the first and last stages of the value chain. Given that capturing a bigger slice of the GVC pie is positively associated with productivity gains and higher per capita growth, an important under investigated issue is to disentangle the factors allowing countries not only to take part into GVC but also to maximize benefits from such participation.

In this respect it can be useful to distinguish between forward linkages (where the country provides inputs into exports of other countries, generating domestic value-added which goes into other countries' gross exports) and backward linkages (where the country imports intermediate products to be used in its exports, leading other countries to generate foreign value added that goes into the domestic country gross exports). While the share of a country in total value-added created by forward and backward linkages in GVCs (i.e., summing over all countries) can provide a measure of the extent of a country's participation, a break-up of forward linkages and backward linkages in GVCs can provide a useful insight into the gains that go to a country from its participation in GVCs (Banga, 2013). If gains are measured in terms of 'net value-added' by participation in GVCs, then higher the forward linkages as compared to backward linkages, higher are the gains. This would

imply that by its participation in GVCs, a country is creating and exporting more domestic value-added than the foreign value added which it is importing. Using these two measures, Banga (2013) finds that in case of US, Japan and UK, forward linkages are much stronger than backward linkages, indicating net value-added gains from linking into GVCs. China and Korea, on the other hand, have negative net value added gains.

2.2 *Intangibles and productivity growth*

The changing nature of the global economy has placed a novel attention on intangible capital as a new source of growth. The structural and technological changes associated with the rapid progress in Information and Communication Technologies (ICT), the rising role of the service sector and the emergence of new business models make intangible investment a key element of global competition. The seminal paper by Corrado et al. (2005) is the first of a number of studies showing that intangible capital is an essential ingredient for economic growth.

The literature on the sources of economic growth considers the accumulation of intangible capital expanding the core concept of business investment in national accounts by treating much business spending on "intangibles"— computerized databases, R&D, design, brand equity, firm-specific training, and organizational efficiency—as investment (e.g., see Corrado et al. 2005, 2009).

When this view is adopted empirical evidence shows that business investments in intangible assets are fundamental drivers of growth and productivity. Corrado et el (2016) found that once intangible capital is included in a sources-of-growth analysis it accounts for 20-33% of labor productivity growth in the market sector of the US and EU economies.

First empirical work on intangibles dates back to Nakamura (1999, 2001) who found that in 2000 US investment in intangibles was US$1 trillion (approximately equal to that in nonresidential tangible assets), with an intangible capital stock of at least US$5 trillion.

Starting form Nakamura's work, Corrado et al. (2005) developed expenditure-based measures of a larger range of intangibles for the United States. They calculated that previously unmeasured intangible capital contributed 0.24 of a percentage point (18 per cent) to conventionally-measured Multifactor Productivity (MFP) growth in the United States between the mid-1990s and early 2000s. The same methodology has

been applied in a number of other country studies — with estimates of the contribution of previously unmeasured intangible capital to MFP growth of 14 per cent (United Kingdom in Marrano et al. 2007), and 3 per cent (Finland in Jalava, et al. 2007) over a similar period. Other country studies estimated only the contribution of all intangibles to MFP growth — -19 per cent in Japan (Fukao et al. 2008), 19 per cent in France, 18 per cent in Germany, 9 per cent in Spain and 0 per cent in Italy (Hao et al. 2008).

More recently, Corrado et al. (2014) found that intangibles generate spillovers to the economic system thus fostering also indirectly productivity growth.

3. Intangible assets and participation in Global Value Chains: research hypotheses

Empirical studies have shown that export specialization in skill intensive industries is positively correlated with intangible intensity (OECD, 2013a). Thus the more a country invests in intangible assets, the more likely is to foster comparative advantages in international trade in such industries. In this respect, organizational capital has the biggest impact among the intangible assets.

But is there a role for investment in intangible assets to affect participation in Global Value Chains? This will probably depend on the tasks along the value chain in which a country becomes specialized. Advanced countries are expected to organize their production along a value chain by keeping at home those activities that have a higher strategic value, are more complex in nature (involve higher transaction costs) and allow them to keep control over the value chain. Assets such as R&D expenditures, training, organizational capital may play a strategic role in creating domestic value added in these activities. Therefore, we put forward our first hypothesis: *HP1 Advanced countries investing more in intangible assets display a higher participation in global value chains.*

While participation in GVC can be important in itself by allowing countries at different stages of development to exploit foreign demand and specialise in tasks along the value chain rather than having to set up entire processes of production from scratch (see also OECD, 2013b; Baldwin and López-Gonzalez 2015), not all forms of participation entail the same gains (Gereffi et al. 2005; Kaplinsky 2000; Schmitz and Strambach 2009).

Overall, there is evidence that a great part of the valued added of a final product is created in the first and last stages of the production process, while firms involved in intermediate stages (such as the production of components and assembly) reap only a small part of the final value of the good or service produced (Mudambi, 2007; 2008). This pattern of value-added creation along the value chain has been represented by the 'smiling curve' (Everatt et al., 1999) or the 'smile of value creation' (Mudambi, 2008).

We argue that, although this might not necessarily be true in all countries (e.g. in many resource intensive countries upstream activities can consist in providing raw materials in the value chain), in Europe activities at both ends of the value chain are intensive in their application of knowledge and creativity, which are strictly linked to investing in intangible assets. Moreover, generally, the allocation of value created in a GVC varies according to the ability of participants to supply sophisticated products or services. The supply of these products or services critically depends on intangible assets such as R&D, brands, organizational structure. Therefore we introduce our second hypothesis: *HP2 Benefits from participation in GVC (in terms of value added creation) increase with investment in intangible assets in advanced economies.*

Finally, the role of intangible assets might differ according to the position of a country in the GVC. While assets such as R&D and design may be strategic in the upstream activities stages of the value chains, other assets such as marketing and advertising may be more important in downstream activities. Following Koopman et al. (2010), total GVC participation can be decomposed in foreign value added embodied in one country's exports and the value of exports of intermediates in value added exports of other countries. The former indicates the extent to which a country's exports are dependent on imported content, the so-called backward integration. It is therefore likely to be higher if a country (or sector) is involved in downstream production. Conversely, the second measure is likely to be higher for countries (and sectors) involved in upstream production, with output and exports of that country feeding into the production and exports of downstream producers (i.e. forward integration). The analysis of backward and forward integration can provide hints on where within a GVC a particular country is. We, therefore, put forward our third hypothesis: *HP3 intangible assets provide a different contribution to forward and backward participation in GVC. R&D, and design contribute more to forward linkages while marketing and advertising more to backward linkages.*

## 4. Descriptive evidence: intangible capital and GVC participation

In advanced countries, higher levels of intangible investment are associated with higher rates of productivity growth. Empirical evidence shows that many EU countries are experiencing a shift from tangible to intangible investment, particularly in areas where they have greatest comparative advantages. The driving factors of the relatively faster accumulation of intangible capital are related to the shift from industry to services, the rise of the digital economy, the changing global specialization in production, and general technological progress (OECD, 2015).

Our goal is to investigate to what extent the growing relevance of intangible capital affects the degree and the benefits of countries' participation to global value chains. Thus we start our analysis providing an overview of the diffusion of intangible capital accumulation and the level of participation to GVC across the EU countries.

Figure 1 shows that intangibles account for a relatively higher share of value added in services (8.2%) than in manufacturing (7.0%) in six out of eleven countries. Services are significantly more intangible intensive than manufacturing in UK, Netherlands, Denmark and Belgium while in Austria and Spain the two sectors show relatively comparable shares.

FIG.1

INTANGIBLE INVESTMENT 1995-2010: AVERAGE VALUE ADDED SHARE
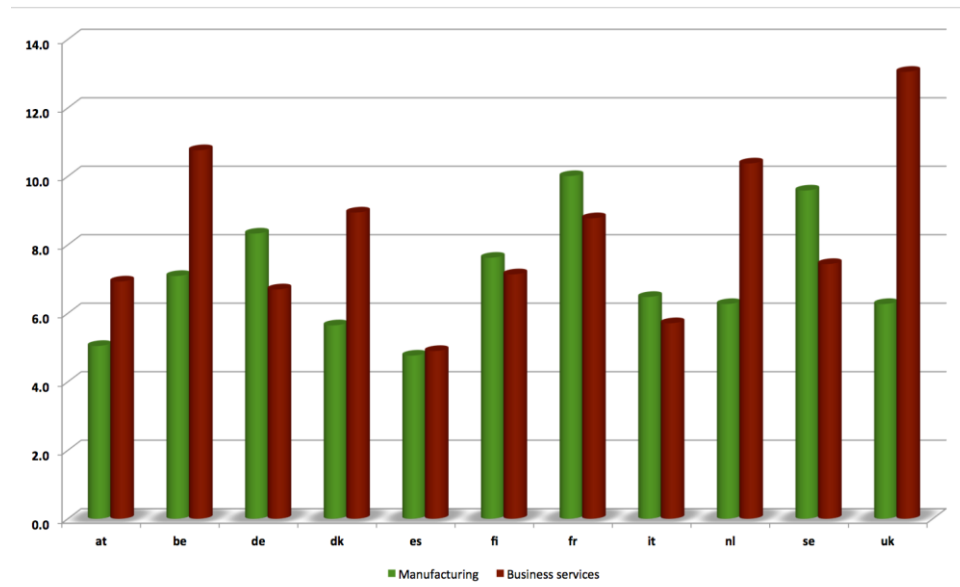
Source:INTAN Invest (www.INTAN-Invest.net)

Participation in global value chains (standardized by hours worked) is rather heterogeneous across countries with higher indexes for manufacturing compared to services (Figure 2). Nordic and Continental EU economies (with the exception of Belgium and Finland) show relatively higher degree of participation compared to the Mediterranean countries.

However, the index of participation is not informative about the position of a country along the supply chain. To identify if a country is specializing in activities upstream or downstream in the production network we need to look at its forward and backward linkages in GVC.

FIG. 2

PARTICIPATION IN GLOBAL VALUE CHAINS
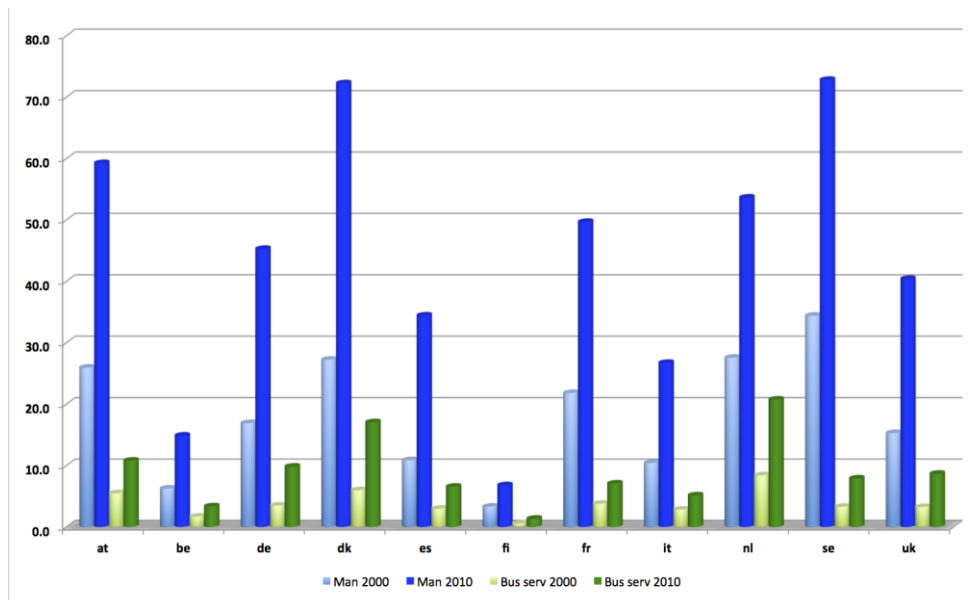
Source: TIVA OECD Database

Figures 3 and 4 provide evidence on the extent of forward and backward participation in the EU sample economies. In 2010, Denmark, Sweden and the Netherlands have higher forward than backward participation in manufacturing suggesting they lie relatively more upstream in the production network. Germany is instead more involved in downstream production as supported by a higher backward than forward participation index, while France has comparable values for both forward and backward participation.

FIG. 3

FORWARD PARTICIPATION TO GVC

Man 2000 Man 2010 Bus serv 2000 Bus serv 2010
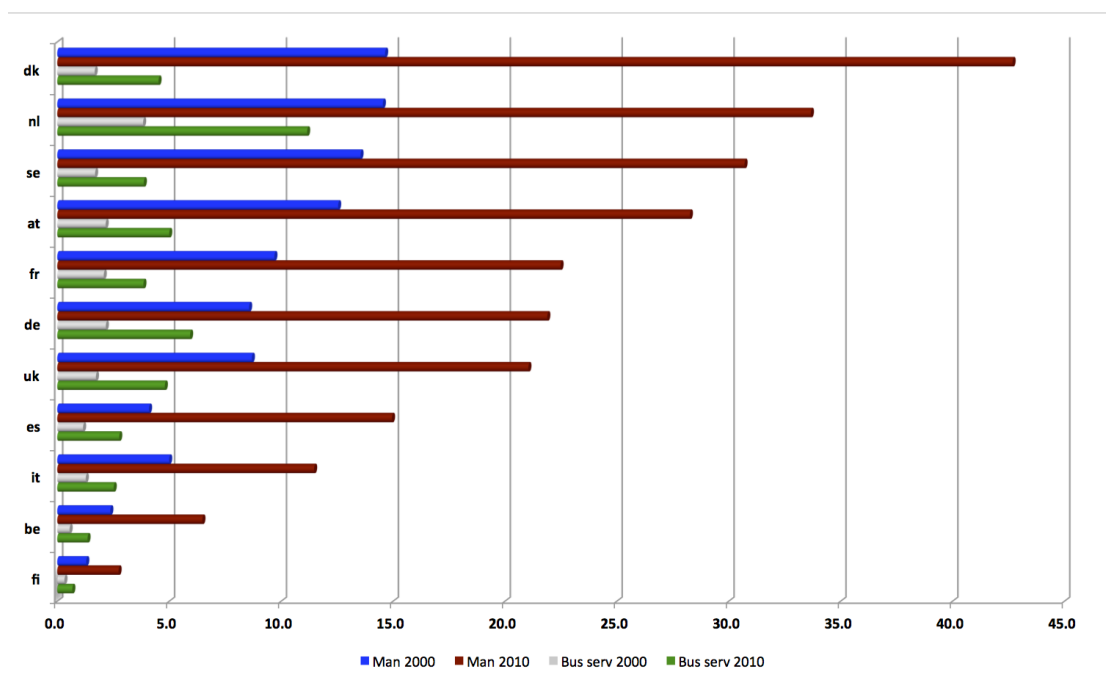
FIG. 4

BACKWARD PARTICIPATION
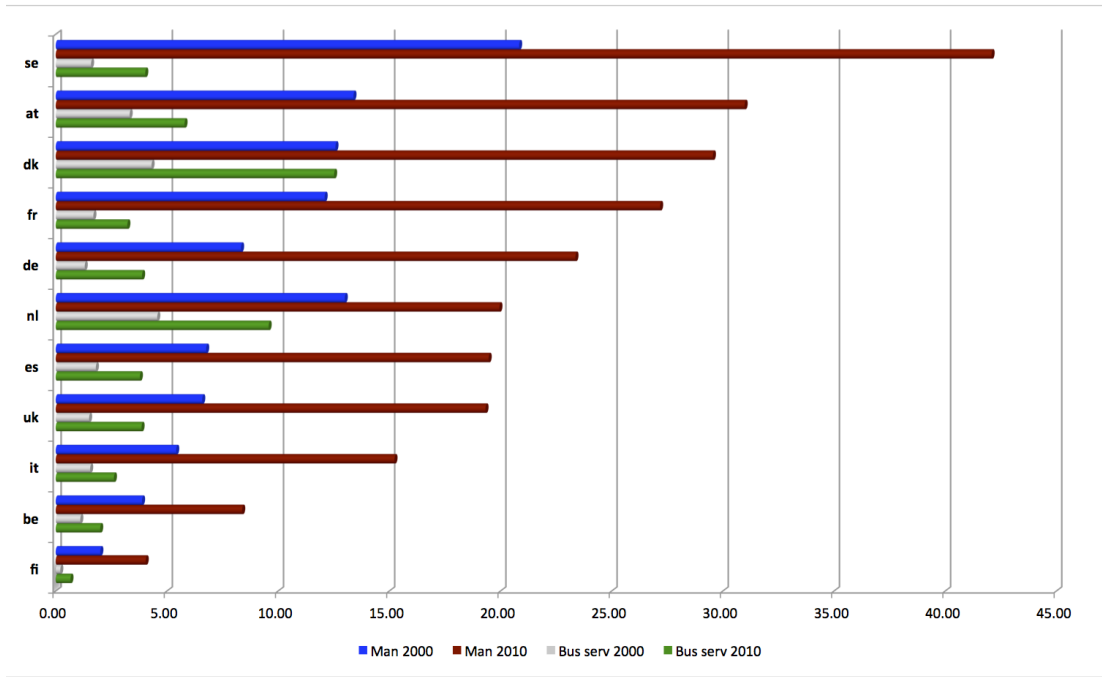
Gains from participation refer to the capability of a country to appropriate a large share of value added. In 2011, UK and Netherlands have relatively higher gains both in manufacturing and services, Denmark higher in manufacturing and Germany in services (Figure5).

FIG. 5

GAINS FROM PARTICIPATION
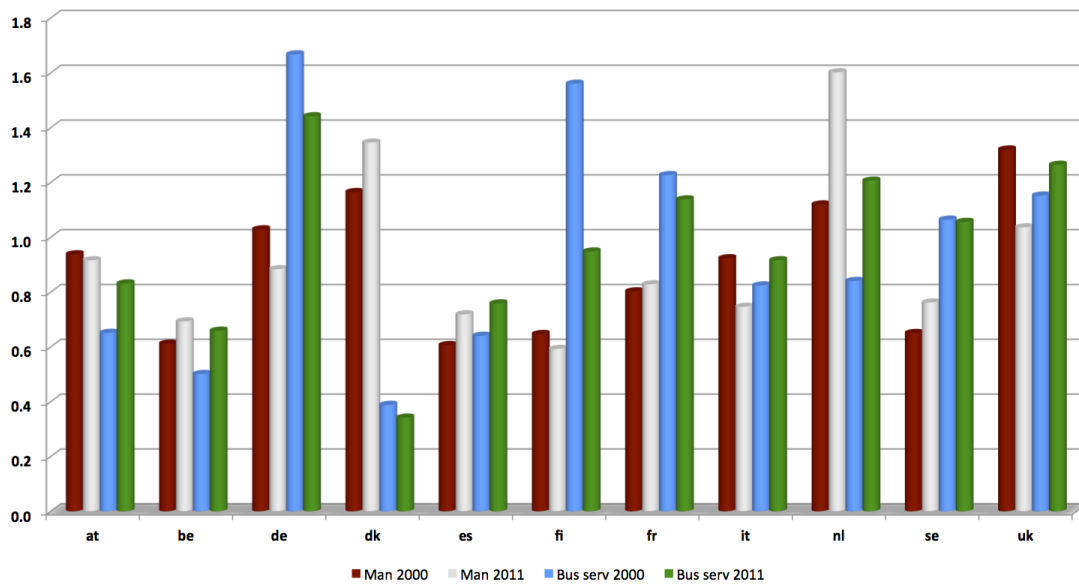
Higher participation in GVC is not necessarily linked to higher gains. In our sample this is the case of Sweden and Austria showing very high participation but relatively low gains. The Netherlands instead has both high participation and high

gains implying that it is creating and exporting more domestic value added than how much it is importing foreign value added. The Mediterranean countries have both low participation and gains from GVC.

5. Intangible capital and GVC

5.1 *Exploring the correlation between intangible capital and GVC participation and benefits*

The main goal of our analysis is to investigate if and to what extent intangible capital accumulation is related to the degree and the benefits of country's participation in GVC. Thus this section provides an overview of the correlations between different measures of participation in GVC and intangible assets.

Figure 6 shows data on per hour worked total intangible capital against participation in GVC in manufacturing and services across the sample countries. Correlation is significantly positive in both sectors suggesting a deeper analysis is warranted.

FIG. 6

PARTICIPATION TO GLOBAL VALUE CHAINS VS INTANGIBLE CAPITAL
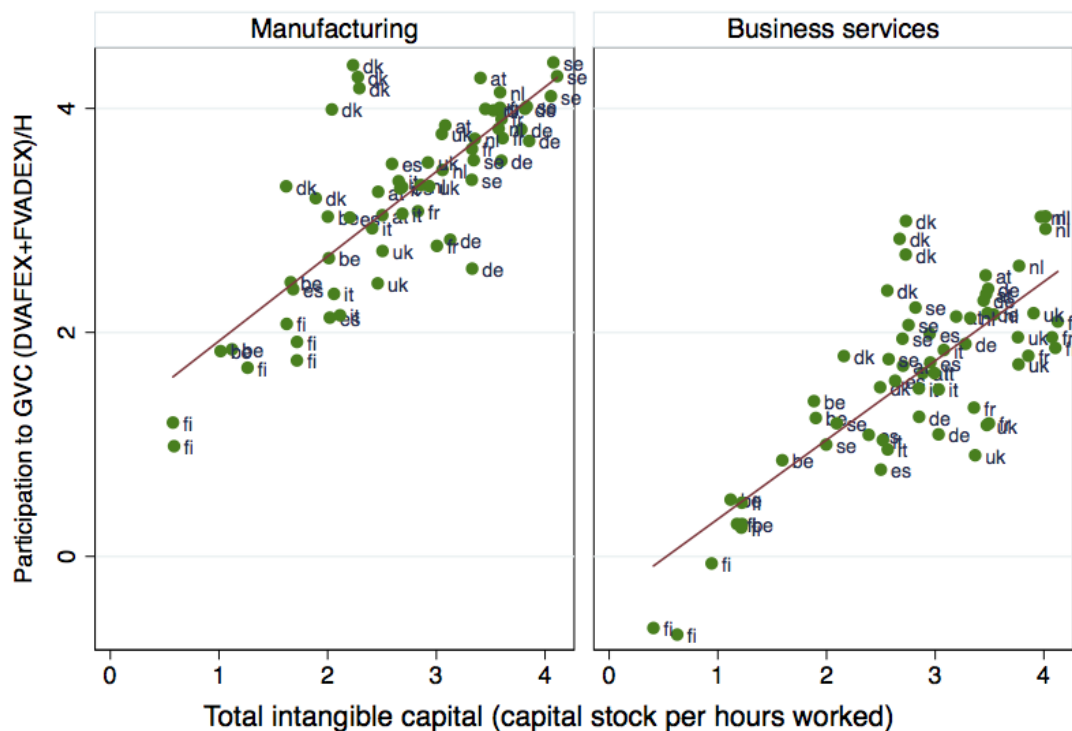
Figures 7 and 8 show forward and backward measures of GCV participation plotted against four different types of intangibles: R&D, Training, Advertising and Organizational capital. The linkages with R&D is rather strong for both indicators while for the remaining assets the correlation is relatively stronger with forward than with backward linkages.

FORWARD PARTICIPATION TO GLOBAL VALUE CHAINS AND INTANGIBLE ASSETS
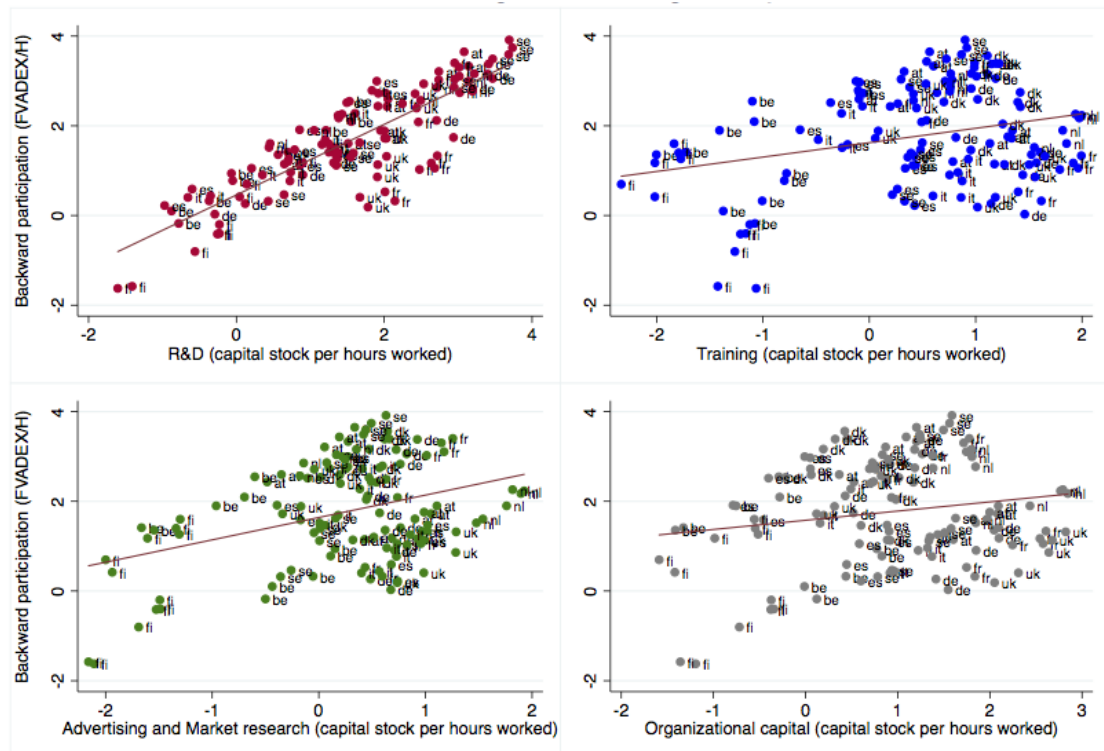
Finally, Figure 9 provides evidence of the correlation between gains from participation in GVC and per hour total intangible capital in manufacturing and services.

FIG. 9

GAINS FROM PARTICIPATION TO GLOBAL VALUE CHAINS AND INTANGIBLE CAPITAL
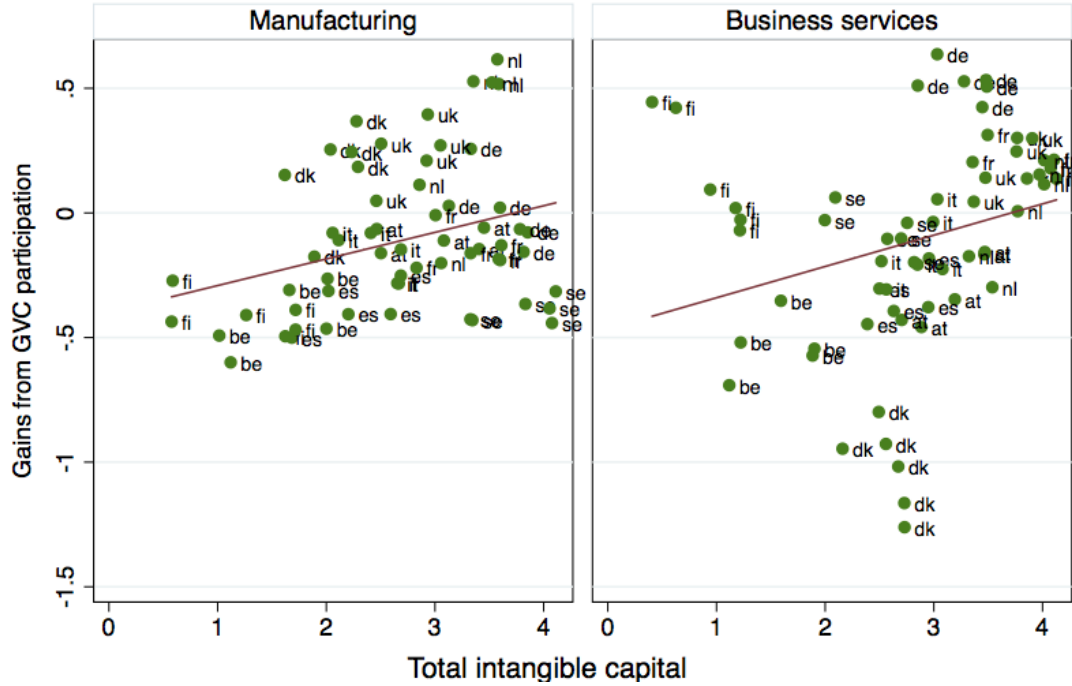
Gains from participation are positively correlated with intangible capital accumulation with services showing a more widespread distribution across countries.

5.2 *Empirical strategy*

We start by exploring the relationship between the participation in GVC and intangible capital accumulation testing the relevance of intangible assets as drivers of forward and backward participation in GVC.

$$\ln Y_{i,c,t}^{GVC_j} = \alpha_1 \ln K_{i,c,t}^{Intg_s} + \alpha_2 \ln K_{i,c,t}^{ICT} + \alpha_3 \ln K_{i,c,t}^{Non\ ICT} + \alpha_4 \ln X_{i,c,t} + \delta_t + \gamma_i + \varepsilon_{c,i,t}$$

where:

c=country (14 EU member countries), i=industry (manufacturing and business services), and t time (1995, 2000, 2005, 2008-2011). Y^{GVC_j} represents different indicators for GVC participation (total, forward and backward) and gains from GVC measured as the ratio between forward and backward indicators. K^{Intg_s} is intangible capital with s=Total Intangible, R&D, Training, Design, Advertising and marketing, Organizational capital; K^{ICT} is ICT capital and $K^{Non\ ICT}$ is tangible Non ICT capital

stock; X are other controls (corporate income taxes, country size); δ_t and γ_i are time and industry dummies. All variables are in per hour term.

We use an export-based indicator to measure participation in GVC that can be split into backward and forward participation.

In particular, domestic value added embodied in foreign exports (DVAFEX) captures the domestic value added content of gross exports and includes the value added generated by the exporting industry during its production processes as well as any value added coming from upstream domestic suppliers that is embodied in the exports. This measure is likely to be higher for countries (and sectors) involved in upstream production, with output and exports of that country feeding into the production and exports of downstream producers (i.e. forward integration).

Foreign value added content of gross exports (FVADEX) captures the value of imported intermediate goods and services that are embodied in a domestic industry's exports. The value added can come from any foreign industry upstream in the production chain. It is used to measure the extent to which a country's exports are dependent on imported content, the so-called backward integration. It is therefore likely to be higher if a country (or sector) is involved in downstream production.

Finally the sum of the two indicators is a measure of overall participation in GCV. Therefore HP1 requires the coefficient of K^{int} to be positive and significant when the dependent variable is the sum of DVAFEX and FVADEX, while HP3 requires a different impact of investment in R&D, design, marketing and advertising on the two indicators (for R&D and design higher for DVAFEX and for marketing and advertising higher for FVADEX).

Domestic value added embodied in foreign final demand (DVAFFD) measures the contribution in terms of value added to the final demand of foreign countries including their consumption and gross fixed capital formation together with their exports.

Foreign value added embodied in domestic final demand (FVADFD) measures how much foreign countries contribute in terms of value added to the final demand of the domestic country. Therefore, the ratio between DVAFFD and FVADFD and the ratio between DVAFEX and FVADEX are used as indicators of the capability of a country to appropriate a large share of value added. Therefore HP3 requires K^{int} to positively affect these ratios.

6. Econometric results

We first estimate the determinants of participation in GVC (Table 1), then assess how different intangible assets affect forward and backward participation (Tables 2 and 3) and finally look at the relationship between intangible assets and gains for participation (Tables 4 and 5). In all estimations we report results for total intangible assets (column 1) and distinguishing between R&D and other intangible assets (columns 2, 3 and 4). Finally, we consider separately training (column 5), marketing and advertising (column 6), architectural design (column 7) and organizational capital (column 8).

Looking at table 1, we find support for our first hypothesis: total intangible assets positively affect participation in global value chains. This confirms the important role played by this type of investment for advanced countries. Moreover, when looking separately at R&D and other intangible assets, they both show up with a positive and significant coefficients, with other assets playing a larger role with respect to R&D. Finally, all assets but architectural design contribute to explaining participation in GVCs and the larger impact is associated to investment in training.

The results also show that tangible capital and ICT positively contribute to participation in GVCs pointing to the complementary role of tangible capital, intangible capital and ICT for countries and industries to take part to the global production process. However, while tangible assets have a positive impact on GVC participation across all specifications, ICT loses significance in some specifications. This can be due to some collinearity between ICT capital and investment in some intangible assets. Finally as expected small countries and countries with a lower income corporate tax rate enjoy higher participation in GVCs.

Tab. 1

The determinants of participation in global value chains

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				((DVAFEX+FVAFEX)/H)				
	xtgls							
lnH_D_totintg	0.169***							
	(0.050)							
lnH_D_intg_xrd_kstock			0.346***	0.397***				
			(0.067)	(0.120)				
lnH_D_rd_kstock_k		0.247***		0.143***				
		(0.035)		(0.047)				
lnH_D_train_kstock_k					0.596***			
					(0.049)			
lnH_D_adv_mkt_kstock_k						0.306***		
						(0.069)		
lnH_D_arch_des_kstock_k							0.015	
							(0.063)	
lnH_D_orgcap_kstock_k								0.250***
								(0.045)
lnH_D_k_ict	0.316***	0.262***	0.173**	0.025	0.103	0.199**	0.495***	0.160**
	(0.080)	(0.058)	(0.084)	(0.091)	(0.065)	(0.091)	(0.077)	(0.081)
lnH_D_all_tang_kstock_k	0.447***	0.406***	0.421***	0.355***	0.098**	0.412***	0.359***	0.539***
	(0.065)	(0.058)	(0.055)	(0.062)	(0.047)	(0.057)	(0.061)	(0.064)
ln_pop	-0.148***	-0.124***	-0.223***	-0.230***	-0.283***	-0.197***	-0.103	-0.140***
	(0.049)	(0.046)	(0.052)	(0.051)	(0.036)	(0.058)	(0.070)	(0.051)
corporateincometaxrate	-0.028***	-0.019***	-0.028***	-0.014***	-0.010**	-0.031***	-0.028***	-0.030***
	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)
Observations	92	82	92	82	92	92	92	92
Number of ctrysec	18	16	18	16	18	18	18	18
Standard errors in parentheses								
*** p<0.01, ** p<0.05, * p<0.1								

When looking separately at forward and backward participation (Table 2 and 3), we find partial support for our third hypothesis. Most intangible assets appear to contribute positively to both forward and backward participation; however, the impact of R&D is larger for forward than for backward participation (coefficients are respectively 0.38 and 0.12) while that of marketing and advertising is larger for backward linkages (coefficients are respectively 0.14 and 0.40). This is consistent with R&D being more important in upstream production and marketing and advertising in downstream production. However, contrary to our hypothesis, in the case of architectural design the results show no significant impact on forward participation. Finally, training and organizational capital (for which we had no a priori hypotheses) appear to be more important for forward participation. In particular, while training positively affects both forward and backward participation, organizational capital has a negative effect on backward participation. This is an interesting result deserving more investigation.

As far as other assets are concerned, ICT appears to be more important for backward participation while tangible capital for forward participation. High corporate income taxes discourage both forward and backward participation and the size of the country is negatively association to both types of participation.

TAB. 2

THE DETERMINANTS OF FORWARD PARTICIPATION

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				(lnH_dvafex)				
VARIABLES	xtgls							
lnH_D_totintg	0.301***							
	(0.060)							
lnH_D_intg_xrd_kstock			0.503***	0.540***				
			(0.083)	(0.116)				
lnH_D_rd_kstock_k		0.385***		0.251***				
		(0.040)		(0.051)				
lnH_D_train_kstock_k					0.787***			
					(0.048)			
lnH_D_adv_mkt_kstock_k						0.141*		
						(0.076)		
lnH_D_arch_des_kstock_k							-0.001	
							(0.051)	
lnH_D_orgcap_kstock_k								0.124**
								(0.057)
lnH_D_k_ict	0.160**	0.108*	0.005	-0.206**	-0.137***	0.277***	0.419***	-0.177**
	(0.074)	(0.063)	(0.089)	(0.093)	(0.051)	(0.092)	(0.051)	(0.076)
lnH_D_all_tang_kstock_k	0.553***	0.513***	0.505***	0.441***	0.213***	0.518***	0.479***	0.075
	(0.069)	(0.067)	(0.071)	(0.071)	(0.040)	(0.059)	(0.050)	(0.059)
ln_pop	-0.222***	-0.250***	-0.236***	-0.285***	-0.272***	-0.130*	-0.064	-0.248***
	(0.042)	(0.034)	(0.049)	(0.052)	(0.035)	(0.067)	(0.070)	(0.039)
corporateincometaxrate	-0.032***	-0.015**	-0.034***	-0.016**	-0.012**	-0.029***	-0.029***	-0.025***
	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.004)	(0.005)	(0.006)
Observations	92	82	92	82	92	92	92	92
Number of ctrysec	18	16	18	16	18	18	18	18
Standard errors in parentheses								
*** p<0.01, ** p<0.05, * p<0.1								

TAB. 3

THE DETERMINANTS OF BACKWARD PARTICIPATION

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				(lnH_fvadex)				
	xtgls							
lnH_D_totintg	0.144***							
	(0.046)							
lnH_D_intg_xrd_kstock			0.281***	0.277*				
			(0.088)	(0.152)				
lnH_D_rd_kstock_k		0.119***		0.036				
		(0.041)		(0.064)				
lnH_D_train_kstock_k					0.415***			
					(0.063)			
lnH_D_adv_mkt_kstock_k						0.404***		
						(0.074)		
lnH_D_arch_des_kstock_k							0.158**	
							(0.074)	
lnH_D_orgcap_kstock_k								-0.203***
								(0.050)
lnH_D_k_ict	0.385***	0.399***	0.299***	0.254**	0.255***	0.178*	0.413***	0.278***
	(0.084)	(0.070)	(0.100)	(0.110)	(0.088)	(0.099)	(0.087)	(0.077)
lnH_D_all_tang_kstock_k	0.325***	0.319***	0.256***	0.264***	0.084	0.265***	0.262***	-0.224***
	(0.069)	(0.066)	(0.068)	(0.073)	(0.063)	(0.065)	(0.070)	(0.059)
ln_pop	-0.158**	-0.158**	-0.187**	-0.234***	-0.335***	-0.225***	-0.162*	-0.293***
	(0.075)	(0.074)	(0.078)	(0.078)	(0.063)	(0.060)	(0.084)	(0.076)
corporateincometaxrate	-0.027***	-0.019***	-0.024***	-0.016***	-0.010	-0.026***	-0.027***	-0.028***
	(0.005)	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)	(0.006)
Observations	92	82	92	82	92	92	92	92
Number of ctrysec	18	16	18	16	18	18	18	18

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

While intangible assets appear to matter for European countries to take part in global value chains, we may ask whether they also contribute to the appropriation of a great share of value added created in a GVC. We expect that since value appropriation varies according to the ability of participants to supply sophisticated products or services, countries investing more in intangible assets have a comparative advantage in producing such products or services. Tables 4 and 5 report estimates of the gains from participation. In Table 4 these are measured as the ratio between domestic value added embodied in foreign exports and foreign value added embodied in domestic exports. The idea is that the higher is domestic value added to foreign value added, the higher is the domestic appropriation of value along the value chain. In table 5, a similar indicator is built considering the ratio between domestic value added embodied in foreign final demand and foreign value added embodied in domestic final demand. This second indicator considers not only value added embodied in

exports but also that embodied in consumption and investment giving a broader picture of overall value creation.

Looking at the results of gains from participation measured referring to exports (Table 4), we find that intangible assets positively affect value appropriation and the results are robust to introducing separately R&D and other intangible assets. However, not all intangible assets have the same importance: training and organizational capital have a large positive effect while marketing and advertising and architectural design do not appear to matter. The big role of organizational capital in affecting value appropriation in GVC confirms the importance of governance for extracting maximum rents also for advanced countries. More difficult to interpret is the negative impact of ICT on gains from participation in most specifications. Although this might depend on some degree of collinearity with intangible assets (in the specification where only architectural design is included ICT shows up positive and significant), it could also be linked to the higher importance of ICT for downstream with respect to upstream production. Finally, tangible capital, population and the corporate income tax rate do not appear to affect gains from participation.

When looking at value appropriation in terms of final demand, results are only partly confirmed. Intangible assets positively affect value appropriation, although with a lower coefficient. Moreover, when R&D and other intangible assets are introduced simultaneously in the regression, only R&D has a significant impact. Another important difference is that organizational capital is no longer significant. Finally, tangible capital and the corporate income tax rate negatively affect gains from participation and larger countries appear to appropriate a larger share of value added compared to smaller ones.

TAB. 4

THE DETERMINANTS OF THE DOMESTIC TO FOREIGN VALUE ADDED CONTENT OF EXPORTS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				((DVAFEX/FVAFEX))				
VARIABLES	xtgls							
lnH_D_totintg	0.285***							
	(0.056)							
lnH_D_intg_xrd_kstock			0.450***	0.221*				
			(0.071)	(0.116)				
lnH_D_rd_kstock_k		0.152***		0.095**				
		(0.025)		(0.043)				
lnH_D_train_kstock_k					0.331***			
					(0.049)			
lnH_D_adv_mkt_kstock_k						-0.102		
						(0.080)		
lnH_D_arch_des_kstock_k							0.042	
							(0.064)	
lnH_D_orgcap_kstock_k								0.297***
								(0.038)
lnH_D_k_ict	-0.204***	-0.083**	-0.307***	-0.218***	-0.254***	0.152*	0.039	-0.254***
	(0.076)	(0.042)	(0.083)	(0.078)	(0.068)	(0.078)	(0.069)	(0.077)
lnH_D_all_tang_kstock_k	0.048	0.014	-0.035	-0.024	-0.021	0.031	0.011	0.076
	(0.059)	(0.046)	(0.056)	(0.051)	(0.050)	(0.055)	(0.057)	(0.061)
ln_pop	0.053	0.017	0.077	0.042	0.030	0.115*	0.091	0.048
	(0.057)	(0.059)	(0.060)	(0.065)	(0.055)	(0.063)	(0.065)	(0.051)
corporateincometaxrate	-0.001	-0.000	-0.000	0.002	0.007	-0.005	-0.005	0.003
	(0.007)	(0.005)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Observations	92	82	92	82	92	92	92	92
Number of ctrysec	18	16	18	16	18	18	18	18
Standard errors in parentheses								
*** p<0.01, ** p<0.05, * p<0.1								

TAB. 5 THE DETERMINANTS OF THE DOMESTIC TO FOREIGN VALUE ADDED CONTENT OF FINAL DEMAND

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				((DVAFFD/FVADFD))				
VARIABLES	xtgls							
lnH_D_totintg	0.044*							
	(0.026)							
lnH_D_intg_xrd_kstock			0.027	0.014				
			(0.035)	(0.063)				
lnH_D_rd_kstock_k		0.080***		0.077***				
		(0.023)		(0.026)				
lnH_D_train_kstock_k					0.056*			
					(0.030)			
lnH_D_adv_mkt_kstock_k						0.027		
						(0.038)		
lnH_D_arch_des_kstock_k							0.054*	
							(0.032)	
lnH_D_orgcap_kstock_k								0.033
								(0.021)
lnH_D_k_ict	0.046	-0.013	0.055	-0.022	0.012	0.061	0.042	0.051
	(0.042)	(0.046)	(0.045)	(0.060)	(0.049)	(0.045)	(0.042)	(0.043)
lnH_D_all_tang_kstock_k	-0.119**	-0.069	-0.123**	-0.071	-0.109**	-0.131**	-0.134***	-0.120**
	(0.051)	(0.058)	(0.052)	(0.060)	(0.046)	(0.052)	(0.051)	(0.052)
ln_pop	-0.062***	-0.079***	-0.062***	-0.079***	-0.072***	-0.054**	-0.056***	-0.064***
	(0.021)	(0.025)	(0.022)	(0.026)	(0.022)	(0.025)	(0.021)	(0.021)
corporateincometaxrate	-0.019***	-0.016***	-0.019***	-0.016***	-0.017***	-0.020***	-0.020***	-0.018***
	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
Observations	92	82	92	82	92	92	92	92
Number of ctrysec	18	16	18	16	18	18	18	18

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

7. Conclusions

A recent stream of literature has emphasized the importance of intangible assets, including R&D but also organizational capital, training, marketing and advertising for firms' and countries' productivity growth. At the same time a growing field of research has highlighted how the globalization of value chains has changed the traditional factors of international competitiveness with different benefits accruing to different firms and countries depending on the tasks performed within the value chain. This paper is a first attempt at bridging the two streams of literature by investigating whether and how intangible assets contribute to foster advanced countries' participation in global value chains. The main results of this analysis can be summarized as follows.

First, intangible capital as a whole is positively related to participation in global value chains in advanced countries. Moreover non-R&D intangibles play a larger role than R&D, with training being the main driver of participation.

Secondly, intangibles contribute positively, but to a different extent, to both forward and backward participation: R&D is more relevant for forward linkages while marketing and advertising are more important for backward linkages. This evidence supports the assumption that R&D is a factor affecting upstream production while marketing and advertising have a role in downstream production.

Finally, intangibles positively affect value appropriation along the value chain (measured as the domestic value added embodied in foreign exports relative to the foreign value added embodied in domestic exports) and the results are robust to introducing separately R&D and other intangible assets. Training and organizational capital have a large positive effect on value appropriation while marketing and advertising and architectural design do not.

The descriptive evidence reported in the paper has also shown the heterogeneous behavior of European countries in terms of both intangible capital accumulation and participation in global value chains. In this respect the low figures for Mediterranean countries (Italy and Spain) suggest that these countries are in a vicious circle of low investment in high value added creating activities and low competitiveness in international markets.

Although the paper does not address this issue directly, the poor performance in productivity and growth of the Italian economy could be partly due to the joint effect of underinvestment in intangible assets and relatively low intensity of firm participation in GVCs. Therefore, higher levels of public investment in intangible assets and fiscal and innovation policies promoting private investment are highly needed to enhance competitiveness and growth.

Due to the short time series, this paper has not tested the possible two way relationship between investment in intangible assets and participation in GVC. This is left for future studies that could also address their joint impact on sectoral/national productivity.

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