Converge and European Value Chains:

How Deep Integration Can Reignite Convergence in the EU

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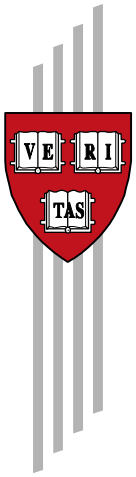

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March 2019

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EXECUTIVE SUMMARY

Convergence, the process by which poorer countries 'catch-up' to rich ones in terms of real incomes, is at the core of the promise of the European Union and the Eurozone. It was enshrined in the founding treaty of the EU and is at the center of policy-making today. However, after several decades of strong European growth, convergence across many core countries has come to a halt. Policymaking has focused on promoting greater integration between EU countries and in particular within the Eurozone to foster further convergence but the political gridlock has stopped these initiatives from moving forward.

Further economic and political integration is not necessary for, and may in fact be orthogonal to, greater convergence in the EU. EU countries have converged at roughly the same rate as non-EU countries since the 1950s, suggesting EU membership is not responsible for convergence. Further, there is no statistically significant difference in the rate of convergence between EA 12 or EA19 members before and after the introduction of the Euro. Finally, many current Eurozone members have converged in the last 10 years suggesting that the Euro structure does not impede convergence. Still, further integration may be desirable in the EU – not least to restore the union to its democratic ideals.

The only variable that is associated with greater convergence in European countries is value chain integration, particularly upstream integration. Upstream integration is domestic value added embodied in intermediate exports that are re-processed abroad. High upstream integration indicates strong participation in value chains and integration into regional production networks. The level of upstream integration varies tremendously within the EU, going from 10% of GDP in Spain to 28% of GDP in Estonia. Once we control for the level of upstream integration, the rate of converge in European countries goes from 1.25% to 4.5%.

High growth countries are deeply integrated in sub-regional supply chains within Europe. Europe is often thought of as a single supply chain but, in fact, there are several sub-regional supply chains within Europe. These sub-regional supply chains are based on strong bilateral ties between neighboring countries. Participation in one of these supply chains appears to matter more for growth than integration with any particular country (e.g. Germany) or to any specific region. Participation in these supply chains is independent of EU membership – it is due to historical ties and deliberate national policymaking.

The EU must put cross-country collaboration at the core Horizon Europe– its €100B mission driven innovation programme – to future-proof European supply chains and reintegrate lagging countries. Horizon Europe is the EU's bet to become a global technology leader. Leading in technology involves not only innovation but also developing the supply chains of the future that allow innovation to be commercially successful. Horizon Europe will not succeed if innovation spending continues occur in national siloes as it did in the Horizon 2020 programme. The EU must pro-actively manage and integrate innovation efforts across the Union and ensure that commercialization occurs at the EU level. Only then can we hope to achieve both EU technological leadership and convergence within the EU.

CONTEXT: CONVERGENCE IN THE EU

Convergence was an explicit goal of the creation of the Monetary Union and of the European Union. Convergence refers to the process by which poorer countries grow faster than rich ones and thereby catch-up (or converge to) rich country levels of income. The Treaty establishing the European Community had convergence as its explicit aim: "The Community shall have as its task… a high degree of competitiveness and convergence of economic performance… the raising of the standard of living and quality of life, and economic and social cohesion and solidarity among Member States" (Treaty Establishing the European Community, 1957). The Delors Report of 1989 on economic and monetary union in the European Community, that laid the foundation for the creation of the euro, recognized that "the process of achieving monetary union is only conceivable if a high degree of economic convergence is attained." (Delors, 1989)

The economic integration of the European Union was expected to bring convergence in real incomes across the continent. Throughout the European Union, freedom of movement would generate labour mobility from low to high wage countries, leading to convergence in marginal products of labour. Barriers to knowledge transfers would also be abated leading to increased transfer of technological know-how to "catching up" economies and increasing convergence. Within the Eurozone, interest rate stabilization and the common currency would increase capital mobility, which would boost growth in poorer states with higher marginal products of capital and contribute to the convergence in per capita income levels.

Convergence remains a priority for EU policy-makers across a variety of EU agencies. Eurofound, the European Foundation for the Improvement of Living and Working Conditions, has convergence as one it's main goals: "Upward economic and social convergence is seen as a common objective of Economic and Monetary Union and of the European Union as a whole" (Eurofound, 2019). Benoit Coeure, who sits on the Board of the European Central Bank, argues – in the spirit of the Delors report - that economic convergence is key for monetary policy. "For the euro area to leave the legacy of the crisis truly behind, we need to see not only reduced dispersion in growth rates, but convergence in real income levels" (Speech: Convergence Matters for Monetary policy, Brussels 2017)

However, after, several decades of sustained convergence, the European 'convergence machine' appears to be faltering. Until the 1970s, not only was growth in Europe phenomenal but the poorer countries of the Southern periphery appeared to be catching up. However, somewhere along the way this convergence ceased and by the 1980s the pace of convergence had neared zero in the EA12 (see Box 1).

Today, the EU28 is converging but this is primarily due to Central European new joiners that have been catching up steadily to GDP levels in the core countries. Convergence in the EA12 meanwhile has come to a standstill, and the original six (France, Germany, Belgium, Netherlands, Luxemburg and Italy) may actually be diverging. (see Appendix 1 for detail)

The literature on convergence in the EU has focused primarily on how the Eurozone – a suboptimal currency area – may contribute to stagnation and divergence. In a sub-optimal currency union, common monetary policy may actually be detrimental to growth. The Eurozone – which lacks fiscal transfers, symmetric shocks, and de facto labour mobility - fails the Optimal Currency Union test. Structural differences in product and labour markets as well as in social policies limit the ability of capital and labour to respond to shocks leading to excessive adjustments in employment and output. Lack of fiscal transfers mean there is no mechanism within the Union to compensate.

Versions of this argument have been in circulation since as early as 1989. Eichengreen (1990), Sala-i-Martin and Sachs (1991), McKinnon (1994), Bayoumi and Masson (1995) and others used the US experience of monetary integration to show the major adjustment issues Europe would face under a single currency without fiscal transfers. Feldstein (1997) argued that imposing a common currency and single interest rate on countries with inflexible wages, low labour mobility, and no fiscal transfers would only increase the level of cyclical unemployment in member states. Salvatore (1997), Tobin (1998), and Krugman (1998) all put forward versions of the argument that the structural weaknesses of the Eurozone were such that any major asymmetric shock would cause it to dissolve.

The recent crisis, and the slow adjustment that followed, have brought this Eurozone critique back in full force. In a recent study, the IMF found that convergence has reversed in the Eurozone in the wake of the crisis and blamed the Maastricht Criteria for focusing on nominal convergence at the expense of "the actual economic requirements of a successful monetary union", citing optimal currency area theory directly (IMF, 2018). The Delors Institute, founded by Jacques Delors of the original Delors Report, argues that the Eurozone is not converging because it "lacks adjustment mechanisms that are needed to correct imbalances, and has a single market that is far from being complete" (Delors Institute, 2015). Twenty years later, Paul Krugman continues to argue that "Europe's problems come from the disastrous decision, a generation ago, to adopt a single currency." (Krugman, 2018)

POLICYMAKING UNDER THE CURRENT NARRATIVE

If we accept this narrative, we have two policy options to reignite convergence: reform the Eurozone or exit it. First, reform. Push for greater structural convergence between countries, and internally devalue to regain competitiveness in low-growth states. Create systematic fiscal transfers between countries to help cushion asymmetric shocks. Support these fiscal transfers, by issuing common euro-level debt. Deepen political integration and relinquish a certain amount of national sovereignty in order to pass all these reforms. Otherwise, exit. Without reform, the Eurozone will continue to drive a wedge between its member states. The costs of membership may become so high that countries like Italy, or Greece would be better of exiting it. Joseph Stiglitz argues, "in the absence of meaningful reforms, the benefits for Italy of leaving the euro are clear, straightforward and considerable." (Stiglitz, 2018)

The problem is that neither exiting nor reforming the EU is a politically tractable solution. The European Commission recognized the need for greater integration in the Delors Report of 1989. More recently, it endorsed reformist policies in its 'Blueprint for a Deeper and Genuine Monetary Union' in 2012 including structural transformation, common fiscal capacity, and euro-level debt. However, the EU requires unanimous agreement of member states to pass these types of reforms and seven years later, there is no agreement. Germany has blocked all virtually all moves towards deeper integration saying the EU should enforce current rules before pursuing further integration. The exit strategy has also seen little progress. If anything, the Eurozone is growing. Despite lack of reform and persistent low growth, no country has seriously attempted to leave the Eurozone and many still seek to join. It would appear that the political and economic costs of an exit outweigh the perceived benefits for any individual state.

Meanwhile, lack of convergence continues to erode faith in the European Union and makes reform ever less likely. Convergence is crucial to sustain support both for the Euro and for the European Union. EU countries have given up control of significant legal, political and economic and, for some, monetary choices, without corresponding democratic accountability at the EU-level. If the benefits of this choice do not materialize, it should be no surprise if they lose faith in the system. The crisis ignited a wave of Euroscepticism across the EU. The rise of extremist parties in several countries of the EU risks limiting the Commission's ability to propose and pass legislation for further integration even further and there is already talk between Italy's La Lega and France's National Rally of creating a blocking minority in the European Parliament (Irish Times, 2018) . To achieve real convergence we need greater integration but for greater integration to be politically, supportable we need greater real convergence. There appears to be no way out.

CONVERGENCE, REVISITED

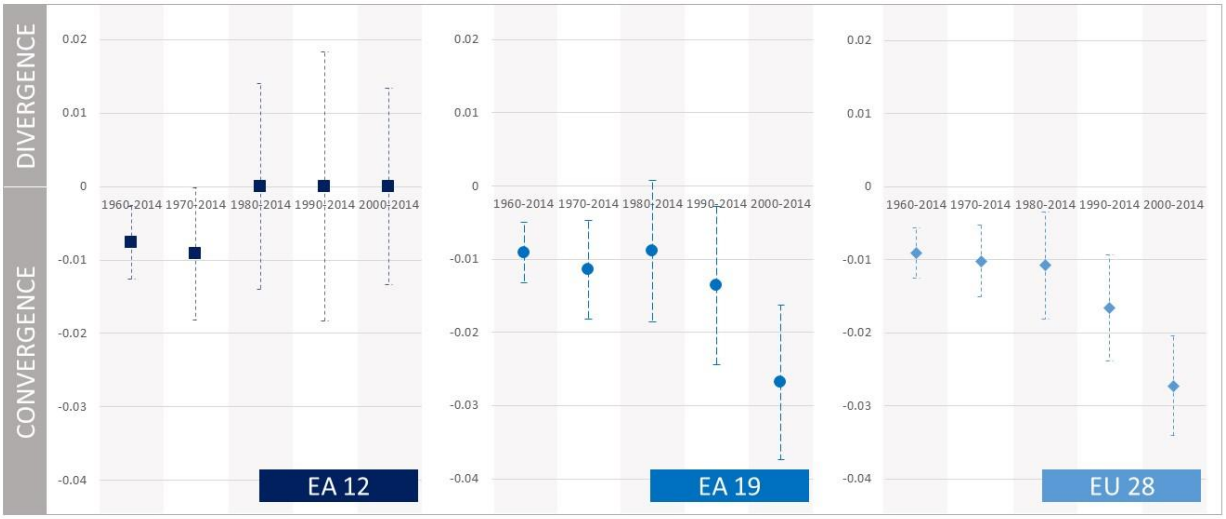
A review of the history of convergence in the EU and the region shows that economic and political integration is not necessary for convergence, and may in fact be orthogonal to it. I should note upfront that the goal of this analysis is not to discredit the EU nor to criticize the integration process. Quite the contrary, further integration may be desirable for many reasons, not least to bring the EU back to its democratic ideals. Nonetheless, it would appear that the relationship between convergence and EU integration is unclear, at best. Given the importance of convergence for the European project, if there are ways to achieve it that allow us to avoid the political gridlock, we should find them. The following section digs into the facts about convergence in an effort to do just that.

There is no statistically significant difference in the rate of convergence of the EA12 before and after the introduction of the euro. Box 1 presents the history of unconditional convergence for three groups of European countries from 1960 to the present: the EA 12 (the original 11 members of the Eurozone plus Greece), the EA19, which includes all current members of the Eurozone, and the EU28 (the current EU members, including the United Kingdom). In the EA12, the rate of convergence was statistically different from zero in the 1960s but statistically indistinguishable from zero since.[1] Though the crisis could in theory be biasing convergence coefficients downwards across all periods, a decade-by-decade analysis shows that this is not the case. (see Appendix 1). The IMF finds similar results: statistically significant evidence of unconditional convergence in the EA12 between 1960 and 2015, and between 1960 and 1992, but not thereafter (IMF, 2018). The difference in our results over the 1960-1990 period is because the IMF excludes Luxemburg from its sample.

[1] A more detailed analysis reveals that early convergence in the EA12 was primarily driven by Spain and Portugal. Recent divergence meanwhile is driven by Greece although the remaining EA12 countries have ceased converging regardless. (see Appendix for detail)

Box 1: Unconditional Convergence in Europe

Beta convergence coefficient and 95% confidence intervals



Note: Linear cross-country regressions of cumulative average growth rates of real GDP per capita between time t+1 through T on the logarithm of real GDP per capita at time t. Group membership is maintained constant through all periods. See Appendix for detailed list of groups.
Source: Maddison 2018 data, own analysis

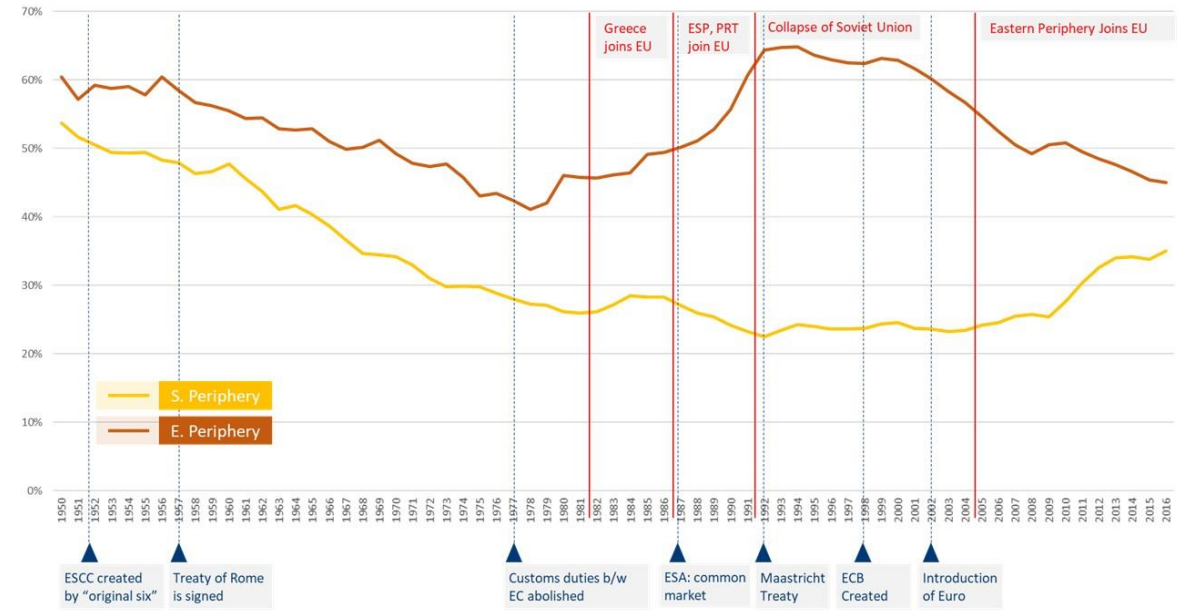
The EA 19, meanwhile, has converged over virtually all periods in our sample – particularly between 2000 and 2014, which is when the new members joined the Euro. Along with our first point, this suggests that Eurozone membership is not the drag on convergence the literature makes it out to be. Rather the problem seems to be something else about the original EA 12. This is consistent with the findings of Daniel Gros at CEPS, whose research shows "no indication that euro area membership has had a negative impact on convergence." (Gros, 2018)

Convergence in the EA19 occurred even as many new joiners were badly hit by the crisis and unable to devalue their currency due to common monetary policy. Slovenia, Cyprus, Malta and Slovakia all had a fixed exchange rate against the Euro before the crisis hit. The case of Slovakia is particularly interesting. When the financial crisis hit, neighboring Hungary, Poland and Czech Republic, were able to devalue their currency but Slovakia could not. Despite this, and without any internal devaluation, Slovakia outperformed its neighbours in terms of growth in the following years. (Bruegels Institute, 2018). Though this is only one case, it illustrates the fact that the theoretical problems of the Eurozone do not always materialize equally. There are undoubtedly a number of factors that help explain why Slovakia was able to do what Greece could not; however, this story shows how the limitations of the Eurozone may not always be as binding as they seem and that convergence, in a crisis no less, is still possible within it.

Current EU members have been converging since well before they joined the EU – not because they joined it. Rapid growth in EU countries is often attributed to the integration with the rest of Europe that occurred as these countries first signed association agreements and later joined the European Union. "With the signing of the first EU Association Agreements in 1994 by Hungary and Poland, Eastern Europe began to integrate with the rest of Europe. This integration of markets and institutions propelled the convergence of east with west" (World Bank, 2012) However, this story of the Eastern European convergence fails to look back far enough. As we can see in Box 2, the convergence of the Eastern Periphery in the last 20 years is in fact merely picking up where the region had left off before the collapse of the Soviet Union threw it off track. Between 1950 and 1980 the Eastern Periphery, which was not integrated in the European Union, was converging at roughly the same speed as the Southern Periphery, which was.[2] What is more, the speed of convergence today is roughly the same as it was during this earlier period.

Box 2: Convergence of the Southern and Eastern Peripheries

Convergence gap: difference in Income levels as a percentage of Northern country incomes



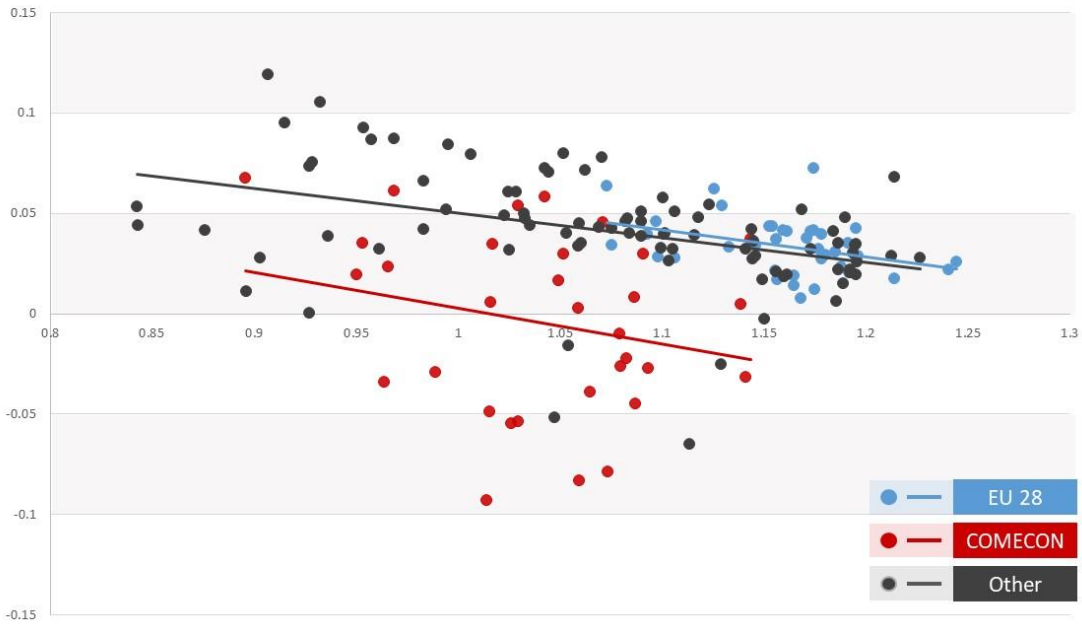
Note: Eastern Periphery includes Slovakia, Slovenia, Czech Republic, Hungary, Poland and Romania. Southern Periphery includes Spain, Greece, Portugal and Italy. Northern countries include Austria, Belgium, Germany, Denmark, Finland, France, the Netherlands, Luxemburg, Sweden and the United Kingdom. Convergence gap is the difference in income levels as a percentage of Northern country incomes. Source: Maddison 2018 data, own analysis

[2] Italy, which is part of the Southern Periphery, is a founding member of the EU. Greece joined the EU in 1981 but signed its association agreement in 1961. Portugal applied for ascension in 1977 and joined in 1986. The Eastern Periphery countries all joined in the 2000s. See Appendix for detail.

More generally, EU membership has not been determinant for convergence in the region – EU members and non-members have converged at a statistically indistinguishable rate since the 1950s. Box 3 extends the convergence analysis to all countries in Europe and Central Asia between 1950 and 2010. It distinguishes between EU members, members of the COMECON (the economic community of the USSR) and countries that were never part of either structure. What we see is that while EU member countries are on average richer than their other European and Central Asian counterparts, they have not historically converged faster. The rate of convergence in the EU is statistically indistinguishable from that of the other groups. Visually, the COMECON countries seems to converge a more slowly, primarily due to the collapse of its economies in the lead up to its dissolution. A regression confirms what the graph shows, there is no statistically significant difference between the rate of convergence in the European Union as opposed to its peers. This analysis holds up to changes in periods (beginning in the 1960s, instead of the 1950s) to different country classifications, such as by date of application to the EU rather than ascension, and to different data sets such as the Penn World Tables. Unconditional convergence, it would appear, is not an EU or even a strictly European phenomenon and EU integration policies should not be lauded for it.

Box 3: Unconditional Convergence in Europe and Central Asia

15-year real gdp per capita growth rates from 1950 to 2010 vs. baseline log real gdp per capita as percent of average



Note: Three fifteen year periods are considered: 1950-65, 1965-80, 1980-95 for the last period a 12-year time-frame from 1995-07 is considered to exclude the crisis years. USSR classification based on COMECON membership. EU membership is based on date of ascension. Other includes countries that were once members of the COMECON or that later became members of the EU or countries in the region that have applied

(unsuccessfully) for EU membership. A country is classified as part of a certain group if it was a member for more than half of the period under consideration. Country group membership shifts over time. See appendix for detail

Source: Maddison 2018 data, own analysis

These revised facts, taken together, signal that we should look towards other explanations for economic convergence beyond the structural integration that occurred in the region. If the Eurozone countries stopped converging before the introduction of the euro then maybe the monetary system is not (entirely) to blame for their woes. If the new Eurozone joiners are still converging then perhaps there is space for the core countries to learn from them. Finally, if the Eastern Periphery countries (and others in the region) were converging at roughly the same speed as those in the EU but without any of the economic integration then perhaps we should look for explanations for convergence outside of the politico-economic integration that has occurred within the EU.

VALUE CHAINS: A WAY OUT?

EU integration likely did not drive real income convergence because capital and labour movement among EU countries did not materialize as expected. Movement of capital and labour were expected to drive convergence in the EU. However, despite the free movement of labour guaranteed in the common market, labour mobility in the EU is still a fraction of that in the US. In any given year, 0.1% of the working age population changes country compared to 3% in the US (OSA Institute for Labour Studies, 2008). Meanwhile, the share of working-age citizens living in another EU country stands at 3 percent, a fraction of the 25-30% percent observed in the US (IMF, 2018). At the same time, the recent crisis has shown that while capital flows to poorer countries did occur, they were often directed towards unproductive activities (such as housing) and in several cases ended up being a destabilizing force. Finally, despite further integration via the monetary union, the IMF reports that intra-euro area trade increased less than trade with non-euro area countries in the last fifteen years (IMF, 2018).

A complementary explanation is that convergence requires more than movement of people and capital, it requires transfer of know-how. Barro, arguably the father of convergence theory, explains that convergence occurs because the cost of copying technology is smaller than the cost of producing it. "*In the long run, the world growth rate is driven by discoveries in the technologically leading economies. Followers converge toward the leaders because copying is cheaper than innovation over some range*" (Barro, Sala i Martin, 1995). To put it another way, "*the rate at which lagging economies catch up is determined by their ability to absorb ideas and knowledge from the technology frontier*." (Rodrik, 2011).

While it is true that the movement of labour and capital may contribute to the transfer of technological know-how between countries it is not guaranteed to, nor is it the only way for such transfers to happen.

In richer countries, convergence may mean *keeping up* with the latest advances in technology and ensuring their diffusion throughout the economy. If there is a lack of convergence in some parts of the EU today, it may be because the technological frontier is growing faster than the pace of technological adoption. For richer countries, *keeping up* with technology is as or more important as *catching up*. If countries are not technological leaders (which presumably not all countries can be), they need to have a sure way of adapting and adopting technology as fast as it progresses. Further, even in countries that do manage to keep up with the latest technologies – there needs to be a way for these technologies to diffuse within the economy in order to have a growth impact.

Supply chain integration may be one avenue for such "technological catch-up" and diffusion both domestically and internationally. Vertical supply chain integration is the process by which firms unbundle the production of their products or services. Until the mid-1980s, this unbundling was primarily domestic but with the advent of communications technologies unbundling crossed borders. Today, supply chains mix both domestic and international elements. The classic example of the modern, international supply chain is the production of Apple's iPhone. While the design of the iPhone takes place in the United States, production of the iPhone 6 was spread over thirty-one countries and more than two-hundred suppliers, each specializing in their particular piece of the puzzle.

Supply chains are different from traditional trade in finished goods because partnerships are required to unbundle production– these partnerships are how know-how is transferred. Traditional trade can stimulate productivity gains through reallocation of activities or specialization in high-productivity activities, leading to efficiency gains overall. In addition, it can lead to financial deepening and, if supported by investments such as FDI, can lead to technological transfers. (IMF 2013). Vertical supply integration takes this even further. To unbundle production requires investment in production facilities and training of local counterparts. In addition, given that most technology is firm specific it often requires technology sharing and the offshoring of know-how. These activities require long-term business relationships and repeated interactions between technicians and manager of the different companies, which are crucial for knowledge sharing. (Baldwin, 2013) Finally, supply chain integration overwhelmingly occurs in manufacturing, which is more prone to fragmentation of production and which exhibits a strong tendency for unconditional convergence (WDR 2020; Rodrik, 2011)

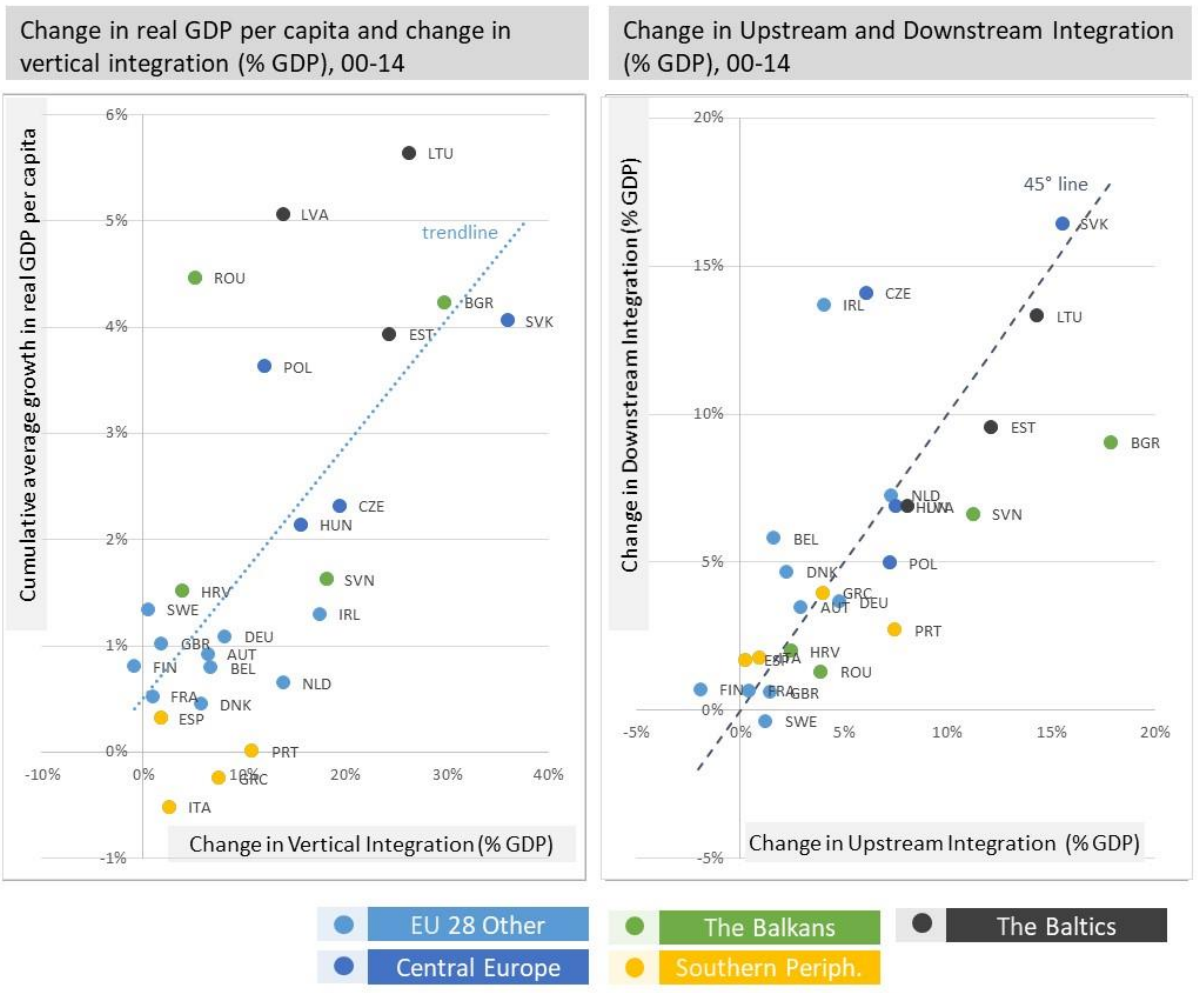
Supply chain trade is more than just outsourcing to countries with cheaper labour – horizontal unbundling is equally important. Much of the discussion around supply chain integration has focused on developing countries benefiting from outsourcing of production. European countries cannot compete on labour costs alone and, if supply chain integration was mainly outsourcing one might not expect it to be a successful strategy in Europe, where income differentials are smaller. However, Baldwin shows that supply chain trade was prevalent between the United States and Canada and among European Nations since before the 'great unbundling' that globalized them. This is because of what Baldwin calls "horizontal" specialization, which is based on firm-level excellence rather than wage differentials. Furthermore, Baldwin shows that globally, the North-South supply chain (primarily based on wage-differentials) is not substituting for the North-North supply chain (based on firm specialization). This is encouraging news for Europe. In addition, despite advances in communications technologies, supply chains require a human element. Modern supply chains are mostly regional (North American, Asian, European) which indicates that proximity may be a more important factor than pure cost competition.

Vertical supply chain integration is associated with both growth and income convergence. The upcoming World Development Report on Global Value chains shows how countries more integrated into global value chains appear to have faster growth and greater poverty reduction. In addition, the countries most embedded in these value chains have experience unparalleled convergence in income levels. (WDR 2020, Concept Note). The IMF also finds that countries in the central European supply chain are converging faster than can be explained by initial income levels and attributes the difference to their supply chain (IMF 2018). However, there have been limited studies in this regard and causality is difficult to establish. It could be that a third factor is driving both high growth and supply chain integration.

This relationship appears to hold for EU countries over the last two decades – value chain integration is strongly associated with growth. The first graph in Box 4 maps change in real GDP per capita and change in value chain integration over the 2000 -2014 period. In the top right corner of the graph, we have the economies of the Eastern Periphery that have significantly integrated into global value chains and experienced stupendous growth. In the middle, we have the 'old core' or Northern Economies of Europe that have experienced reasonable growth and some integration into global value chains. Finally, in the bottom left we have the Southern Periphery that has experienced sluggish growth and modest integration. The second graph breaks down the change in into change in upstream add and downstream integration over the same period. Upstream integration is domestic value added in intermediate exports that are further processed abroad, while downstream integration foreign value add in exports. Here again,

we see that those countries that have performed best are those that have increased their participation in both dimensions – the defining characteristic of supply chain integration. Of course, we should be clear that while this relationship is striking, the simultaneous changes do not allow us to establish causality.

Box 4: Global Value Chain Integration in Europe



Note: Change in real GDP per capita is the cumulative average growth rate over the period. Upstream integration are intermediate exports that are further processed abroad. It corresponds to elements 2 to 5 of the Koopman, Wang and Wei (2014) decomposition. Downstream integration is foreign value added in a country's exports. It corresponds to elements 7 and 8 of the Koopman, Wang and Wei decomposition (see appendix for detail). Vertical integration is the sum of Upstream and Downstream Integration. Figures here cover integration with all countries (not just within Europe). Central Europe refers to the Czech Republic, Hungary, Slovakia and Poland. The Baltics refers to Estonia, Latvia and Lithuania, The Balkans refers to Bulgaria, Croatia, Slovenia and Romania. The Southern Periphery refers to Italy, Portugal, Greece and Spain.
Source: WIOD 2014 data, Maddison 2018 data, own analysis

To test whether supply chain integration matters for convergence, we run a conditional convergence regression over three ten-year periods from 1980-2010. We include four variables that are typically associated with productivity gains and allocative improvements: trade, investment, FDI and education. This specification is in line with the convergence literature more broadly, which finds that education and

investment level are significant drivers of growth. FDI and trade are included as they are often also discussed in the growth literature. We include a dummy for European Union membership and an interaction term between baseline real GDP per capita and EU membership to test whether the convergence relationship is different for EU countries. We add a war dummy to account for the many armed conflicts in the region since the 1980s (independence wars and others). Finally, we include a measure of upstream integration into global value chains to test our hypothesis on the importance of value chains for knowledge transfers, and therefore growth. We measure upstream using the Koopman, Wang and Wei gross exports decomposition (Koopman, Wang and Wei 2014). Upstream integration corresponds to elements two through five of the decomposition (see Appendix 4 for detail)

We test for the impact of upstream integration because, out of the components of supply chain integration, it has the strongest association with growth. Participation in global value chains involves two elements: upstream integration and downstream integration. Upstream integration measures the domestic value added in intermediate exports. Downstream integration captures the foreign value added in a country's exports. While a value chain cannot exist without an element of both, upstream integration significantly more correlated with future growth than downstream integration (see Appendix 5). In Box 4 we see that countries such as Ireland and the Czech Republic saw strong increases in downstream integration but not upstream integration, and their growth performance was not as good. This is because downstream integration captures foreign value add in both final exports and intermediate exports. Foreign value add in *intermediate exports* is strongly correlated with future growth but foreign value add in *final exports* is not. There are similar differences between the components of upstream integration but overall, total upstream integration is still strongly correlated to future growth (see Appendix 5).

This association between upstream integration and growth may reflect the deeper linkages that occur when production is truly transnational. One might think that foreign value add in final exports has a weaker correlation with growth because poorer, faster growing countries tend to be in intermediate stages of production. However, upstream linkages in Germany – one of the wealthiest countries in our sample – represented 18% of GDP in 2014, up from 13% a decade earlier. Denmark, Sweden and Austria had even higher figures despite all being wealthy countries. From a theoretical perspective, if domestic products are further processed abroad it is likelier that they are truly part of a value chain (with transfers of know-how). Foreign value add in final exports is more likely to a foreign product that is repackaged for export than to reflect a true supply chain. It may also be that the final stages of production are more often assembly and packaging and therefore are less knowledge intensive or have fewer knowledge transfers.

Box 5: Conditional Convergence

Conditional convergence in Europe and Central Asia, 10 year periods, starting 1955

	Unconditional Convergence	Unconditional Convergence, FE	Unconditional Convergence, FE & controls	Conditional Convergence, FE & controls	Conditional Convergence, FE & controls + upstream int.	Conditional Convergence (upstream integration)
VARIABLES						
Baseline log real gdp per capita	-0.0111***	-0.00900***	-0.0125***	-0.0106***	-0.0451***	-0.0333***
	[0.00285]	[0.00268]	[0.00325]	[0.00372]	[0.0143]	[0.00502]
Baseline education (yrs of schooling)				0.00114	0.000175	
				[0.00172]	[0.00166]	
Baseline trade (% GDP)				2.57e-05	3.57e-05	
				[7.76e-05]	[7.81e-05]	
Baseline FDI inflows (% GDP)				0.00101	-0.000571	
				[0.00113]	[0.00107]	
Baseline investment (% GDP)				-0.000257	-0.000319	
				[0.000453]	[0.000530]	
1965-1975		0.000859	0.00257			
		[0.00788]	[0.00734]			
1975-1985		-0.0154*	-0.0120			
		[0.00806]	[0.00754]			
1985-1995		-0.0478***	-0.0334***			
		[0.00753]	[0.00741]			
1995-2005		0.00312	0.0137*	-0.00121		
		[0.00742]	[0.00720]	[0.00637]		
2005-2015		0.00426	0.0112	-0.00476	-0.00131	
		[0.00778]	[0.00741]	[0.00825]	[0.00589]	
War dummy			-0.0433***	-0.0174	-0.0449**	
			[0.00777]	[0.0112]	[0.0212]	
EU membership dummy			0.121*	0.178***	-0.100	
			[0.0670]	[0.0647]	[0.130]	
EU * baseline GDP interaction term			-0.0121*	-0.0183***	0.00908	
			[0.00697]	[0.00662]	[0.0126]	
Baseline Upstream Integration (% GDP)					0.00107**	0.000787***
					[0.000526]	[0.000262]
Constant	0.130***	0.121***	0.148***	0.132***	0.480***	0.350***
	[0.0265]	[0.0235]	[0.0280]	[0.0369]	[0.144]	[0.0474]
Observations	240	240	240	89	55	57
R-squared	0.060	0.339	0.436	0.373	0.581	0.491
Standard errors in brackets						
*** p<0.01, ** p<0.05, * p<0.1						

Note: Linear regression of cumulative average growth rates on initial income levels and baseline characteristics. Regression includes 42 countries in Europe and Central Asia, see appendix for detailed classification and construction of variables. FE refers to time-fixed effects. Source: Maddison 2018 data; World Development Indicators 2018, World Bank; World Economic Outlook Data, IMF; Barro-Lee Educational Attainment Dataset, WIOD 2013 and 2016 databases, own analysis

Regression results show that upstream integration is the only control variable that is statistically significantly associated with growth. The first three specifications show a rate of convergence of around 1%, which barely changes with time-fixed effects (2 and 3) and controls (3). The fourth specification, which includes covariates (Education, FDI, Investment and Trade) as well as controls, finds that both the EU dummy and the EU interaction term are statistically significant. This indicates that EU membership is positively associated with both growth and rate of convergence. However, once we add the upstream integration term (specification 5), this association disappears. This suggests that the EU terms were capturing the fact that EU members are on average more upstream integrated than other countries in the region and that this upstream integration is what is actually associated with growth. Once we include upstream integration as a control variable, the rate of convergence in our sample increases from 1% (specifications 1 to 4) to 4.5% (specification 5).

The variable of interest is robust to changes in specifications but other covariates are not. To test for robustness, we run the same regressions with different time intervals. A specification taking 1960 as the starting point, and also considering 10 year periods, finds that FDI and educational attainment are statistically significantly associated with growth in specification 4 (which does not include upstream integration) but no longer significant once we include the upstream integration measure as a control (specification 5). The only coefficient that is robust to the changes in specification is the upstream integration coefficient. What is more, a conditional convergence regression with only baseline GDP per capita and upstream integration (specification 6) gives us an R2 of close to 0.5 in this regression (which includes upstream data for two 10 year periods from 1995 to 2015). In the alternative specification (which includes upstream data for one 10 year period from 2000 to 2010) the R2 is 0.9 (see Appendix 1).

These regressions cannot establish causality, and there is still a problem of endogeneity - a third factor could explain both growth and upstream integration. One such factor could be institutional quality. Acemoglu and Robinson showed how institutional factors were responsible for long-run growth –these could be at play here. Still, it is worth noting that Acemoglu blames Eastern European institutions for poor growth performance, saying that the persistence of feudalism explains why it trailed its Western peers. (Acemoglu and Robinson, 2005) This would seem to preclude the institutional explanation as presumably Soviet control could only have made the institutional problems worse. Still, other third factors such as an openness to outsiders or propensity to explore in certain countries could also be behind our results. From an EU-wide policy perspective, this is not particularly helpful but it is important to keep in mind.

There are also legitimate questions as to whether these results can be extended to thinking about future growth. The data on upstream integration is limited to the period between 1995 and 2014 and so only captures the trends of the last 20 years. It may be that the conditions of the time lead to this association between integration and growth and that the experience could not be replicated today. Perhaps countries that failed to integrate in the last 20 years have missed the boat. It is hard to know. Even if they haven't, supply chain integration is certainly not the only explanation for growth. European countries have been converging since at least the 1950s, when value chains were very different. In addition, even today, some countries, such as Romania, continue to experience strong growth without commensurate increases in integration (see Box 4). We should treat integration as a promising avenue for convergence but not the only one. Nonetheless, this association is worth exploring further as we have seen there are strong reasons to believe it matters for growth.

UPSTREAM INTEGRATION: DEEP DIVE

The German-Central European Supply Chain (GCESC) has been widely discussed; however, there are at least two other supply chains in Europe whose members have also seen strong growth. There has been extensive research around the GCESC from the IMF and others but there is virtually no research other value chains within the EU. Yet, a quick look at Box 4 reveals that while the CE4 have combined fast growth and increases in value chain integration, they are not alone in this feat: Estonia, Lithuania, Latvia, Bulgaria, and Romania are also in this situation, and none of them are part of the GCESC. My research shows that there are at least two other significant European value chains that these countries have integrated into, these are what I call the Nordic-Baltic Supply Chain (Norway, Sweden, Finland, Denmark, Estonia, Latvia, Lithuania) and the Balkan Supply Chain (Turkey, Greece, Romania, Bulgaria, Slovenia, Croatia[3]).

The best way to understand these supply chains is by mapping them. Box 6 shows these supply chains in 2000 and 2014 as exemplified by Estonia, Slovakia and Romania's bilateral upstream integration. Box 7 shows the same maps for the Southern Periphery countries: Spain, Italy, Portugal and Greece. Box 6 includes additional maps for Germany, for the purpose of comparison.

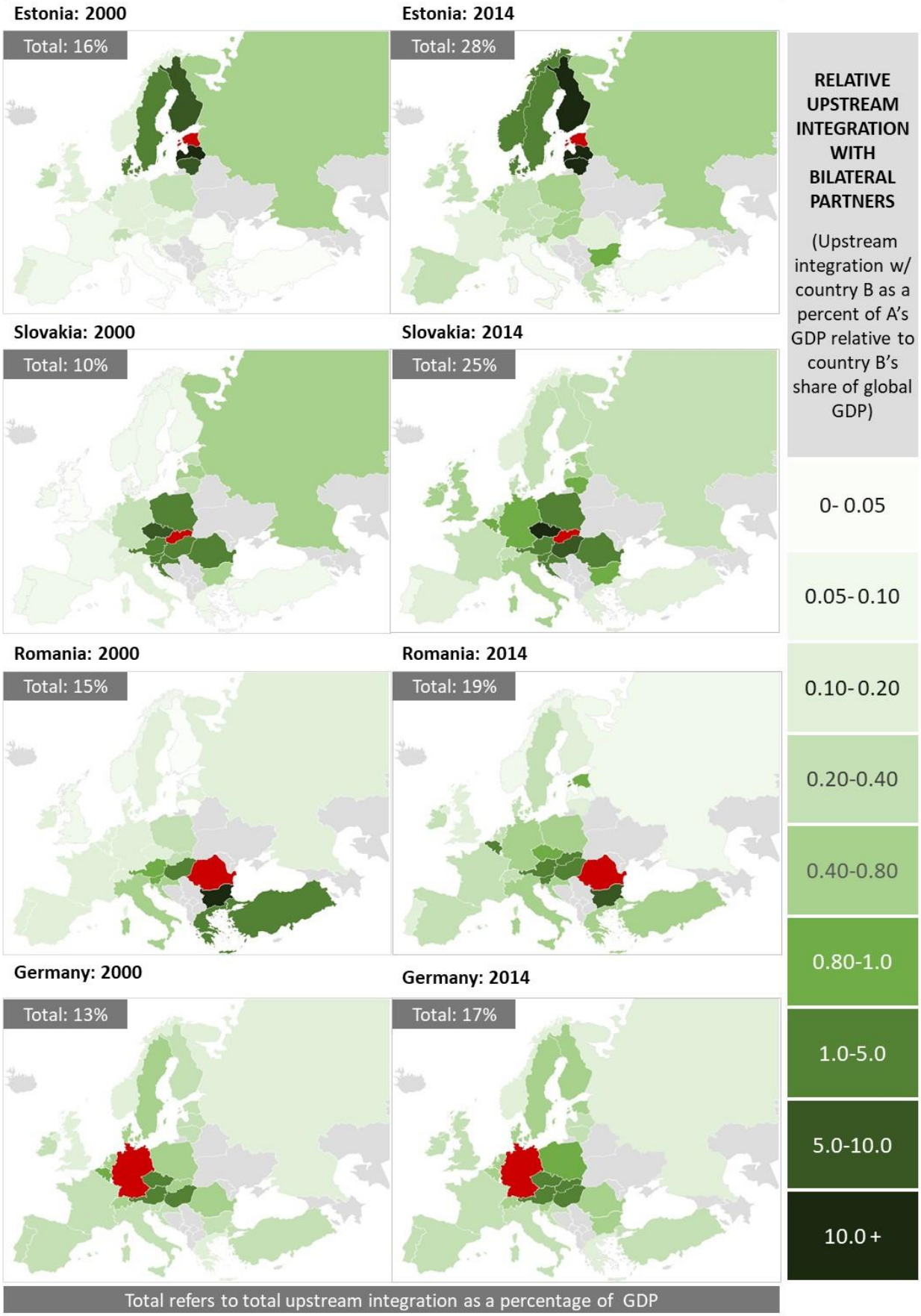
Maps are based on the relative integration of each country with its bilateral trading partners, α, where

$$\alpha = \frac{\left(\frac{Upstream\ Exports_{A,B}}{GDP_A}\right)}{\left(\frac{GDP_B}{World\ GDP}\right)}$$

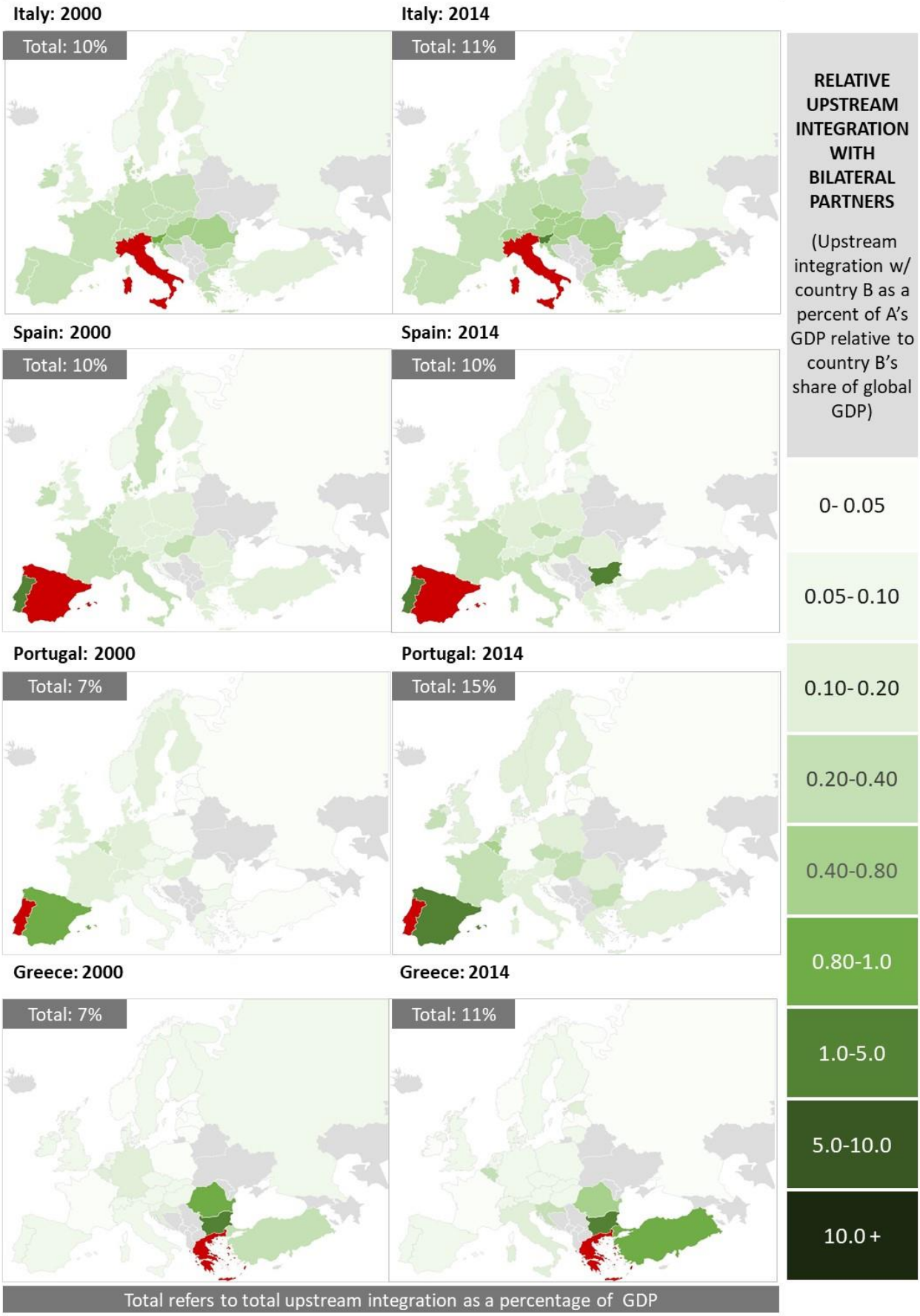
We use a measure of relative integration to control for the fact that we should expect countries to be more integrated (as a share of GDP) with larger economies. The darker a country the deeper the upstream linkages between the core country (in red) and it. A country is considered deeply integrated if α is greater than one (the last three shades of green). For example, Estonia's upstream linkages with Germany represented about 1.1% of its GDP in 2000. This is similar (in monetary terms) to its upstream linkages with Denmark (1.5% of GDP that same year). However, Germany represented 6% of global GDP in 2000, while Denmark represented 0.5%. Denmark is three times more important in Estonian upstream integration than one would predict from its size (α=3.04). Upstream linkages with Germany, on the other hand, are a mere 20% of what we would expect given its share of global GDP (α=0.19). Countries in grey are those for which there is no country-level data in the World Input Output Database (WIOD).

[3] The Balkan countries are also deeply integrated with Hungary. However, Hungary is typically classified as part of the German Central European Supply Chain so it is not listed here. Not all countries in this list are technically part of the Balkans; however, the name captures the general geographic location of the supply chain.

Box 6: Three European Value Chains, and Germany



Box 7: Supply Chain Integration in the Southern Periphery



Upstream integration in the EU is deeply regional - countries are most integrated with their direct neighbors. This is likely due to a mix of geography, culture and history. This is consistent with traditional gravity models of trade that predict trade between two countries based on country size and distance. However, European countries may be more integrated than geography alone can explain. A paper by the European Central Bank in 2005 found that the Central European countries were already approaching the level of integration with Europe that would be predicted by a gravity model – they expected that trade, in particular with Germany, would slow down in the subsequent years (ECB 2005). However, despite the crisis, supply chain integration has continued to grow suggesting that other factors are driving integration.

Integration with the EU does not appear to depend on EU membership and the economic and political integration that comes with it. Neither Slovakia, Romania, nor Estonia were part of the EU in 2000. Yet, as the maps above show they were already deeply integrated with EU countries at that time. They were also deeply integrated with other future member states in their region. All three countries were members of the EU in 2014 and had been for close to a decade. Yet, their integration maps remained roughly unchanged. This suggests that factors other than trade liberalization are behind these supply chain linkages. This will be important when it comes to thinking of policy recommendations.

High growth countries are more integrated overall (as a percentage of GDP), but more importantly have deeper bilateral relationships. The Southern Periphery countries today have roughly the same levels of upstream integration (as a percentage of GDP) as Slovakia, Romania and Estonia had in 2000. However, the shape that integration takes is vastly different. The Southern Periphery countries have extremely diffused upstream relationships with all EU countries while Slovakia, Romania and Estonia have deep bilateral upstream linkages with the countries nearest to them. In 2000, upstream integration represented 10% of Slovakia's GDP and Slovakia had deep linkages ($\alpha>1$) to seven countries. Upstream integration was also 10% of Italy's GDP in 2014; however, it had deep linkages ($\alpha>1$) only with one country, Slovenia. It appears that what matters is not only how much a country is integrated into regional supply chains but how deeply it integrates.

The example of Germany shows that differences in bilateral upstream relationships are not due differences in country size or income levels. One might think that integration appears more significant for smaller countries because trade as a percentage of GDP is generally higher in small open economies. There could also be limits to how many countries a small economy can integrate with and this could

[4] Sources for the maps on the previous two pages: World Input Output Database 2016 release, own analysis

explain why their upstream integration is more concentrated. Yet, Germany, the largest economy in Europe (by population and by GDP), had relative integration coefficients of more than one with Austria, the Czech Republic and Hungary and close to one with Belgium, Switzerland and Slovakia in 2000. Further, its upstream linkages actually became even more concentrated in 2014.

Our three cases show that for upstream integration to be successful it need not be with wealthier nations - most of the deep bilateral relationships were with countries with similar levels of GDP per capita. Slovakia was and is as much or more deeply integrated with other Central European countries than it is with Austria or Germany. In 2000 Romania was not deeply integrated ($\alpha>1$) with any of the wealthier European nations. Even Estonia, which has deep ties to the Nordic countries, was more integrated (relative to the size of their economies) with Latvia and Lithuania than it was with Sweden or Finland (true both in 2000 and 2014). This may seem to fly in the face of our theoretical assumptions on knowledge transfers between rich and developing countries in value chains. However, having similar levels of GDP per capita does not imply that countries have the same skills. We should still expect to see increased specialization and skill transfers via upstream integration, even between similar countries.

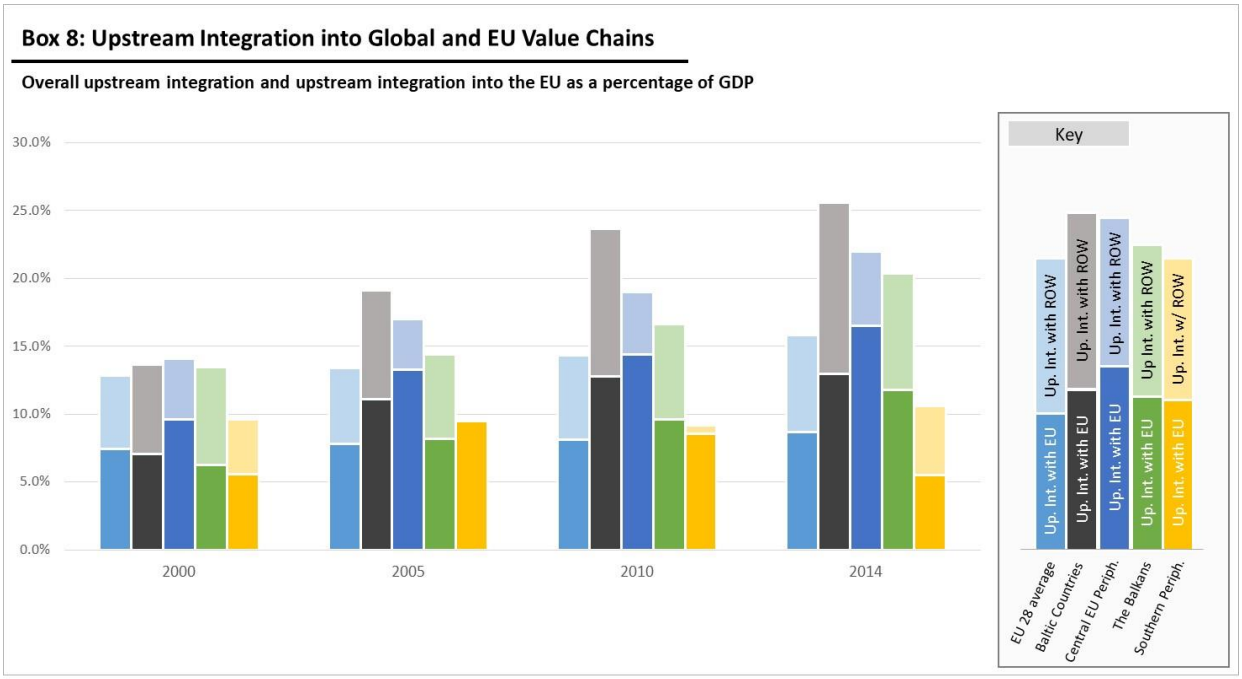
Integration with Germany (often called the 'industrial motor' of Europe, does not appear play an outsized role in these value chains. Even in the case of Slovakia, which is a part of the GCESC, upstream integration with Germany was less important, relative to the size of its economy, than with Austria or with other Central European states. Estonia and Romania, meanwhile, are barely integrated into Germany at all (relative integration, α of 0.2 for Estonia and Romania and of 0.4 for Slovakia). That is not to say that integration with Germany has not made a difference. As a percentage of GDP, Germany is Slovakia's biggest partner in terms of both upstream and downstream integration. For Romania and Estonia, it is in second and third position respectively. What is more surprising than Germany's integration into these value chains (which could be expected due to its sheer size) is how little integration with other EU superpowers such as France, the United Kingdom and Italy represents as a percentage of GDP.

Upstream integration (domestic value added in intermediate exports) increased by more than downstream integration (foreign value added in exports) in all fast growing countries. The only exceptions are the Czech Republic, which underperformed its peers in terms of growth, and Slovakia which integrated upstream and downstream by roughly equal amounts. (Box 5) This dispels the notion that supply chain integration does not develop domestic capabilities. Still, the most successful countries have integrated both upstream and downstream. Interestingly, downstream integration is not limited to wealthier countries investing in poorer ones. In fact, relative to GDP, there is about 5x as much Latvian

foreign content in Estonian exports as there is Swedish (and we see a similar dynamic for Slovakia and Romania). This is likely because downstream integration mixes both FDI that is embodied in exports (more likely to come from wealthier countries) and parts produced in other countries (more likely to come from poorer ones). In addition, when it comes to downstream integration and foreign value added in exports, total amounts may be more important than relative measures. German value added in Slovakian exports represented 2% of Slovakian GDP in 2000, Swedish value added in Estonian exports represented about the same. These are not small numbers - these investments surely played a role in the technological upgrading and growth that followed.

The evolution of these supply chains over time has also been dramatically different – the Southern Periphery has stagnated while other countries have continued to deepen their bilateral relations. There appears to be significant path dependency in upstream integration. Intuitively, this makes sense, as it is much easier to displace suppliers if the relationships are ad hoc than if they are part of a well-developed value chain. In addition to being much more integrated. There may also be geographic limitations in the case of Portugal and Spain, which are more distant from deeply integrated Eastern countries. However, the case of Italy and Greece show that geographic proximity does not guarantee integration.

Box 8: Upstream Integration into Global and EU Value Chains



Note: ROW = Rest of World. Upstream integration refers to exports of intermediate goods. Overall upstream integration, it is calculated as the sum of terms 2 to 5 of the Koopman, Wang, and Wei (2014) export decomposition. Integration into the EU is calculated as the sum of terms 2a through 5 of the bilateral Borin and Mancini sink decomposition, which is equivalent but allows for a country by country view. See appendix for detail. Balkan Periphery countries refers to Bulgaria, Croatia, Romania, and Slovenia. Central European Periphery refers to the Czech Republic, Hungary, Poland, and Slovakia. The Baltic Periphery refers to

Estonia, Latvia, and Lithuania. Integration with the Rest of the World appears unusually high for the Baltic countries due to increasingly deep integration with Norway, which is not part of the EU.
Source: WIOD 2016 data, own analysis

In addition to being more deeply integrated, fast growing countries have also retained larger share of EU integration relative to overall upstream integration. Baldwin's theory of the second unbundling of production is based on the advent of modern communications technologies, which allow production to be disaggregated and managed at a distance. Internet use became fully ubiquitous between 2000 and 2014. One might expect that supply chains would have gotten more global – taking advantage of new communications technologies to access cheaper production. However, this does not appear to have been the case. If anything, supply chain linkages deepened in Europe during this period. Box 8 shows that upstream integration with the rest of the world remained relatively stable. This suggests that there is more to value chain trade than merely cost competition. Note that the case of the Baltic countries is misleading since there are deep upstream links to Norway, which is not part of the EU). This may again be thanks to the initially deeper integration that existed.

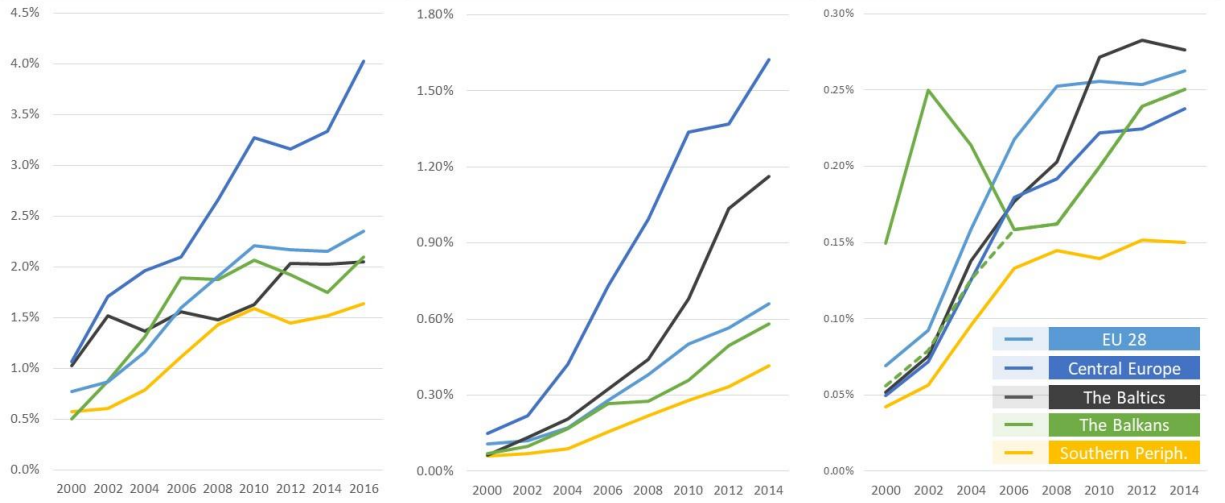
Integration with China is also markedly different in the Southern Periphery as compared to fast growing EU countries (Box 9). The Central European and Baltic countries appear to be using Chinese inputs in their supply chains – in Central Europe, 40% of Chinese imports are re-exported, in the Baltics this number is closer to 60%. The Balkans and Southern periphery, on the other hand appear to be consuming Chinese imports rather than employing them in production - a mere 25% of imports from China are re-exported in the Southern Periphery countries, in the Balkan countries, this number is slightly higher at 30%. These trends may be linked to the lack of development of value chains in the Southern Periphery. It is easy to imagine how cheap manufacturing in Asia could displace EU production. It might be easier to simply import manufactures from China than to coordinate their production via cross-country supply chains in the EU.

While Chinese downstream integration in Europe is growing, upstream and downstream integration with European countries is growing by more. Chinese value added in exports in Central Europe and the Baltics have grown by +1.5pp of GDP for CE4 and +1.1pp for Baltics between 2000 and 2014. However, upstream and downstream integration with the EU is growing by much more (+6-7pp for both upstream and downstream integration for both country groups). This suggests that imports from China are not replacing domestic production but rather contributing to it in the form of inputs. This competitive sourcing may actually be helping EU value chains to remain competitive. It may also indicate that these regions

have agile firms that are pro-actively sourcing cheaper inputs and constantly trying to improve productivity.

Box 9: EU Integration into Chinese Value Chains

Chinese imports, foreign content in exports and EU investments in china as a percentage of GDP



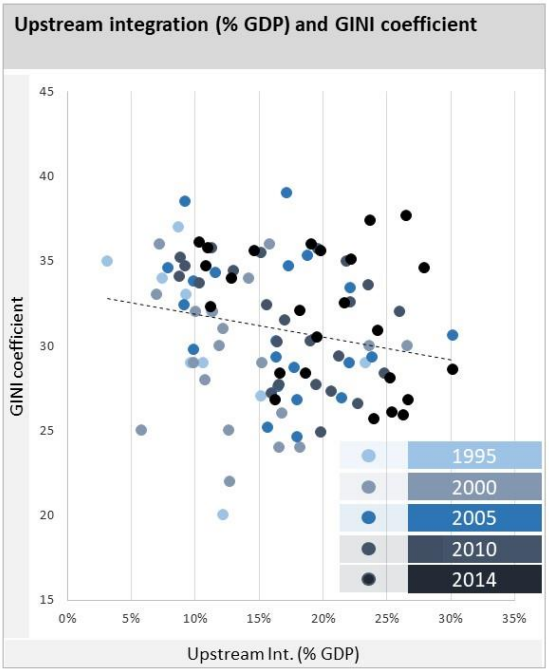
Note: Romania is an outlier in the third graph. The dotted green line represents the Balkan periphery countries (Croatia, Slovenia and Bulgaria), without it. Chinese value add in exports refers to terms 7 and 8 of the Borin and Mancini bilateral decomposition for each EU country summed across all exporting partners. In all cases these values are expressed as a percentage of the EU group GDP. For example, Central European value added in Chinese exports represented almost 0.25% of Central European GDP in 2014. Balkan Periphery countries refers to Bulgaria, Croatia, Romania, and Slovenia. Central European Periphery refers to the Czech Republic, Hungary, Poland, and Slovakia. The Baltic Periphery refers to Estonia, Latvia, and Lithuania. Integration with the Rest of the World appears unusually high for the Baltic countries due to increasingly deep integration with Norway, which is not part of the EU.
Source: Eurostat Import data, WIOD 2016 data, own analysis

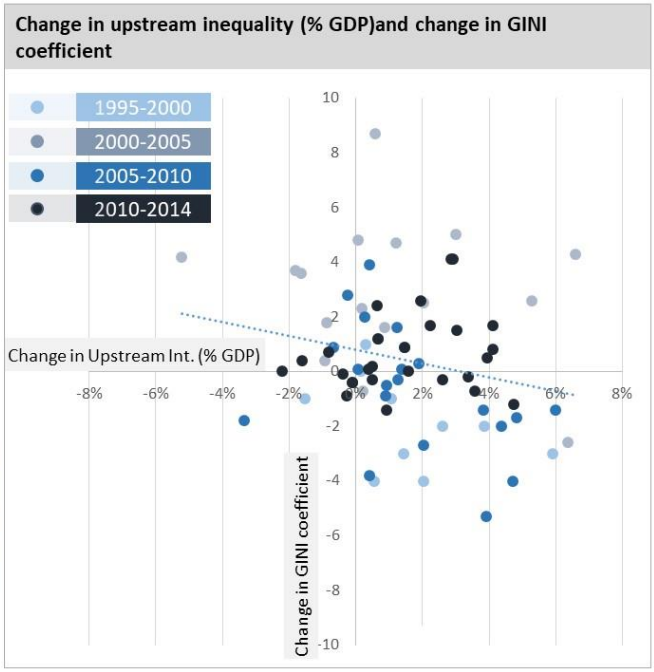
The Southern Periphery also contributes markedly less to the Chinese economy (relative to its size) as foreign value add than other regions. The value added of the Southern periphery in Chinese exports plateaued in 2006 and never picked up again. Meanwhile, the other peripheral countries have seen strong increases in their downstream participation in Chinese value chains, although the overall value remains quite small. EU value added in China may reflect outsourcing of production of goods designed in Europe and may be another facet of maintaining the competitiveness of EU industry. Alternatively, it could represent foreign direct investment by EU firms in China.

Higher upstream integration is associated with lower inequality in the EU; increases in upstream integration are also associated with reductions in inequality at the country level. The last few decades have shown a link between increased globalization and increasing inequality. The benefits of globalization accrue to a small subset of people and firms able to exploit them and leave the rest behind. It would be

reasonable to worry that value chain integration (and upstream integration) might do the same thing. However, the relationship appears to be in the opposite direction although the association is not that strong. The upcoming World Development report on global value chains finds. The forthcoming World development report finds that there is no association between overall value chain integration and inequality, but it does not distinguish between components (WDR 2020, Concept Note). Employment in exports to the EU has been increasing steadily in Central Europe and increasing slightly in the Baltics and the Balkans but has remained flat in Europe overall and in the Southern Periphery. This may be tied to the differences in types of integration between these regions. Employment embodied in exports to non-EU countries started increasing in 2011 after plateauing for many years. (See Appendix 6). These increases in employment may be linked to better distributional outcomes and reductions in inequality. Finally, misallocation increased in the Southern periphery over the period considered in this analysis (Gopinath, 2018). While we cannot attribute this to the lack of integration, they are likely linked. Further, increasing misallocation may also contribute to increasing inequality – suggesting a possible pathway between integration and inequality (inequality increased in Southern periphery countries during this period).

Box 10: Upstream Value Chain Integration and Inequality





Note: Negative y values in the second graph represent a reduction in inequality. Upstream Integration refers to domestic value add in intermediate exports further processed abroad. It is computed as elements 2 to 5 f the Koopman Wang and Wei (2014) decomposition. Graph includes all EU countries except for Luxemburg, Malta and the Netherlands, which are outliers in terms of integration (Netherlands due to the 'Dutch Sandwich' scheme, Malta and Luxemburg due to their small size.
Source: WIOD 2016 data, WIOD 2013 data, own analysis

THE ORIGINS OF REGIONAL SUPPLY CHAINS IN EUROPE

There are unfortunately not many studies on sub-regional value chains within Europe and even fewer on how they developed. The only European value chain that has been rigorously identified and studied is the German Central European Supply chain. Here, emphasis has been placed on disproportionate FDI flows from Germany to Central Europe in the early 90s but little attention has been paid to how integration between firms occurred (IMF 2013, FIW 2015). The focus of existing analyses has been either on descriptive statistics on overall value chain integration for a particular country, or on the macroeconomic consequences of this deep integration (IMF 2013, OSW 2016). To try to understand how these value chains developed requires digging into the history of these regions – once we do, it becomes clear that European Supply chains have deep historical roots but were also shaped by deliberate policy choices.[5]

The supply chains that we see in Europe today have deep historical roots – the Baltic supply chain traces its origins at least as far as the early 1900s. The example of Swedish telephone manufacturer Ericsson illustrates how this integration came to be. In the early 1900s, Ericsson was a rapidly growing manufacturer of telegraphs. As part of their expansion plan, and in an effort to capture consumers further east, the founders decided to move their headquarters to St. Petersburg in Russia. The Bolshevik Revolution of 1917, however, thwarted this eastward expansion and the company decided to move its St. Petersburg plant to Tartu, Estonia. Here they began to produce telephones under the Ericsson name and, eventually, this Estonian partner became Ericsson's most important partner in Eastern Europe. Here again, historical circumstance, in particular the advent of WWII and Soviet occupation ended this relationship. However, shortly after the fall of the Soviet Union, in the early 1990s, Ericsson came back to Estonia and set up a local representative and a wholesale organization. By 2010, Ericsson was responsible for 10% of Estonia's total exports. (Example drawn from Kalvet and Tiits 2012)

The German-Central European Supply chain has similar historical roots in trade patterns of the late 19th and early 20th century. Analysis of trade data of German regions from 1885 to 1933 shows that regions within Germany were not much better integrated than those on either side of German borders. What is more, even after the introduction of the railroad (which was responsible for the first great unbundling, as per Baldwin 2006), trade remained mostly determined by the water routes of the three main rivers in Germany. These waterways led to a natural border between East and West Germany, with each side having vastly different trade partnerships and with little economic integration between the two. Here

[5] I was unable to find studies of the formation of the Balkan supply chain. Intra-European supply changes other than the German Central European Supply chain have not been the subject of much academic research.

again, WWII and Soviet occupation ended these close relationships but they resumed quickly thereafter. Even before the end of the Soviet Union, West German *Ostpolitik* renewed ties with countries in the Eastern Bloc and in particular those that today form part of the German-Central European Supply Chain. Trade with the eastern bloc picked up well before the fall of the Berlin Wall and exploded thereafter. The 1990s saw a surge of German FDI in Eastern European countries matched only by the Netherlands and focused primarily on manufacturing – setting the stage for the supply chain we see today. (see Box 11 for details, examples drawn from Wolf 2008, Gross 2013)

Box 11: The Historical and Geographical Roots of the German Central European Supply Chain

Cooperation dating back to the 1800s is behind the deep trade linkages seen today

HISTORICAL TRADE TIES	INTEGRATION WITH THE EASTERN BLOC	PREPARATION FOR EU ASCENSION
BEFORE AND DURING UNIFICATION Trade flows between German regions and regions of neighbouring states from 1885-1933 show that regions within Germany were not much better integrated than those on two sides of the German border Trade mostly followed the natural water routes of the three waterway systems of the Rhine-Main, Elbe-Oder and Danube despite the introduction of railways There was a "natural border" separating the country into East and West Germany and there was very little economic integration between the two *"The process of European integration after 1945 and even more so after 1989 reopened the opportunities of cross-border cooperation, which more often than not resembled old patterns of exchange." (Wolf, 2008)*	**GERMAN *OSTPOLITIK*** German *Ostpolitik* of the 1970s led to signing of several bilateral agreements with the Soviet Bloc In 1975 Germany signed technical and industrial treaties with Poland, Czechoslovakia and Hungary to encourage joint undertakings between firms The German gov. extended it's export credit programme to the Eastern Bloc. By 1976, 20% of insured contracts were in the East. *"During the 1970s German trade with East-Central Europe rose above 2 percent [of trade] …for the first time since 1945. By the1980s, West German firms were involved in over a hundred joint ventures in Eastern Europe. By 1989 one-third of JVs in Hungary were with German firms and one quarter of foreign trade was with Germany." (Gross, 2013)* **EASTERN BLOC REFORM** The 1971 Program for Socialist Economic Integration 'liberalized' trade regulations with Europe. The Central European Countries decentralized trade and allowed firms to pursue their own trade agendas in other countries In 1973 Poland and Hungary began allowing foreign firms to advertise in their countries	**SURGE OF GERMAN FDI** In the early 80s loosened capital controls led to German investments in the US, Scandinavia and elsewhere. The Europe Agreement of 1991 and Copenhagen Council of 1993 set the criteria for EU ascension of ex-communist countries including rules on capital movement, which led to a surge of German FDI in the region. *"By the end of the 1990s, three quarters of German FDI in Eastern Europe was in the manufacturing sector, and one-third of all German investment in the region went toward "greenfield sights," or brandnew production centers." (Gross, 2013)* **REGIONAL FREE TRADE AREA (CEFTA)** In preparation for EU ascension, the Central European Free Trade agreement between the Poland, Slovakia, the Czech Republic and Hungary came into force in 1994. This helped strengthen trade linkages between the four countries

Source: Wolf 2008, Gross 2013

Though historical ties clearly mattered, policy-making still played a role in developing these supply chains and inter-firm linkages. The case of the Nordic-Baltic supply chain shows how targeted government initiatives helped foster ties between private sector entities in both groups of countries. After the fall of the Soviet Union, Nordic countries played an outsized role in helping the Baltic states transform into market economies and prepare for EU ascension. This involved inter-governmental cooperation through regional groups, such as the Nordic-Baltic Eight, which brought together political figures from across the region to set political priorities, as well as more targeted activities. Among these more targeted initiatives of the early 1990s, one in particular stands out for its focus on knowledge transfers and international linkages between firms: the Baltic Investment Programme.

In the Baltics, the Baltic Investment Programme of the 1990s played a key role in creating linkages between Nordic and Baltic firms. The programme was created by the Nordic countries as a means to help the transition of the Baltic countries to market economies. It created a Baltic Investment Bank in each of the member states with equity stakes and guarantees from the Nordic Investment Bank. The idea was to increase investment in the Baltic states, that were locked out of capital markets, but more importantly to inject Nordic know-how in the banking sector. The equity stake of the Nordic Investment Bank as well as technical assistance assured Nordic influence in the development of the Banks and helped facilitate ties between Nordic companies and the Baltic States. A second element of the programme, the Nordic Project Fund (NOPEF) was specifically created to help Nordic companies implant in the Baltic States. It provided funding for pre-investment studies for firms scoping out opportunities. The projects had to involve Nordic firms operating in the Baltics and were prioritized based on whether they were strategic for the Nordic firms and would have technological and industrial impact in the Baltic States. The last element of the programme was the Turnaround Management Program, which was sponsored by the EBRD. The programme provided companies that were facing a crisis but that had potential with support from outside senior managers. This allowed for direct transfer of managerial expertise from Western countries to the Baltic States and likely facilitated further linkages with the outside world. (See Box 12 for details)

Box 12: The Baltic Investment Program– an Engine of Regional integration

Established in 1992 the program contributed to cooperation between Nordic & Baltic firms and transfers of know-how

BALTIC INVESTMENT BANKS	NORDIC PROJECT FUND	TURNAROUND MANAGEMENT PROGRAM
Three Baltic Investment Banks were created backed by a €60 Million guarantee from the Nordic Investment Bank (NIB). The NIB and EBRD provided technical assistance to the Banks and were also equity holders. This involvement led to knowledge transfers in the development of the financial sector in the Baltics. Baltic Investment Loans from the NIB also required projects to have a Nordic element in them. In 1998 the NIB found that the financial sector in the Baltics was well developed and sold its shares of the Baltic Investment Banks at a profit.	The Nordic Project Fund provided funding for Nordic small and medium enterprises (SMEs) seeking to collaborate with firms in the Baltics The funding was used mostly for pre-investment studies for potential opportunities for business to business collaboration. The fund prioritized proposals that were strategic for Nordic firms but that would also have an important technological and industrial impact in the Baltic countries. 473 projects were approved with 235 Nordic companies starting activities in Baltic countries. The fund was closed in 2003.	Funded by the EBRD, the Turnaround Management Program provided senior management assistance to 25 selected enterprises that had potential but required management assistance Each firm would get assistance from a team of senior private sector business leaders to help turnaround their business. Embedding high productivity managers in local companies ensured transfer of know-how The program was evaluated in 1997 and was so successful that it became a mainstay of the EBRD, a 2004 evaluation confirmed its impact.
*"The NIB's participation would also give the national investment banks an increased Nordic profile **and facilitate contacts between the banks and Nordic enterprises**. Such contacts would also have a positive impact on the **flow of know-how** and capital to Baltic enterprises."* *(Nordic Council of Ministers, 2013)*	*"The idea behind this scheme was that investment and **establishment of subsidiaries** or joint ventures by Nordic enterprises would be **important in the transfer of modern industrial technology and skills** to the Baltic countries."* *(Nordic Council of Ministers, 2013)*	*"[TAM] increased annual sales by … US$ 1.6 million and profits by an average of US$ 0.25 million… with one-off costs of less than US$ 0.1 million. **Few technical cooperation programmes would be likely to generate comparable returns**."* *(EBRD Evaluation, 2004)*

Source: The Baltic Investment Programme, Norden Report 2013; Turnaround Management Programme Evaluation, EBRD 2004

The crux of this programme was embedding knowledge-transfers and cross-border collaboration each step of the way. What we should draw from these experiences is the importance of embedding knowledge transfers into policy instruments and actively encouraging cross-border collaboration. There is no clear counterfactual against which to judge the success of these policy initiatives but it is clear that they contributed to the development of a robust private sector in the Baltic countries with strong ties to the Nordic states. The German case has fewer clear examples. However, the *Ostpolitik* policy of extending credit to German projects in Eastern Europe undoubtedly played a role in increasing production and trade across borders. Perhaps today extending credit for projects abroad does not seem particularly novel but doing so in the middle of the Cold War certainly was and signaled a marked desire to increase production-sharing and cross-country exchange. Chancellor Willy Brandt clearly saw the benefits of increased trade with Central European countries before anyone else did.

POLICY IMPLICATIONS FROM AN EU PERSPECTIVE

The main contribution of this document to policy-making is to shift the direction of thinking around convergence. In particular, to show that:

- Greater economic, fiscal and political integration in the EU is not necessary for and may in fact be orthogonal to convergence
- Convergence, in the last 20 years has been strongly associated with value chain integration and in particular with upstream integration
- Deep integration does not require EU membership: EU integration is not decisive for value chain integration with the EU
- Successful integration is extremely regional and characterized by strong bilateral linkages with a handful of countries rather than shallow linkages to all EU countries
- Deep bilateral linkages appear to matter more for growth than linkages to any particular country or region (for example, as is often suggest, to Germany)
- Integration with China can be complementary to further integration within the EU

These conclusions are relevant to the policy-making of the EU in many regards. Among other things, this work can contribute to shifting the focus away from the politically intractable negotiations for deeper integration in the Eurozone that have been the focus for the last 10 years or more. It helps to shed new light on the debate around globalization by showing that growth does not appear to depend on open trade with the world but rather on deep linkages with neighboring countries and further that not all types

of trade have negative distributional consequences. It can help illuminate the debate around the role of China and to give greater nuance to claims that Chinese competition is a threat to EU production. Finally, it can help shift the focus away from Germany as the productive core of Europe by showing that integration among other countries has been an avenue for growth.

We will now turn to how these findings can be incorporated in EU-level policy-making. Broadly, there are three ways in which the EU can intervene to incentivize these deep linkages:

I. **<u>COORDINATING</u>: disseminating information to facilitate production in or collaboration with other countries.** This can be information on investment opportunities (as in the case of NOPEF) or general information to facilitate the investment process (information on taxes, standards, sources of financing etc…). For example, via a platform that allows different firms seeking suppliers or customers to connect. The EU could also coordinate meetings between chambers of commerce or business groups in different countries and act as a facilitator.

The examples of the Nordic-Baltic and supply chain suggest that information is crucial to developing linkages between countries. The Nordic-Baltic and Central European supply chains began developing well before EU integration and the adoption of the *Acquis Communautaire* by eastern states. This suggests that regulatory differences may not be great a barrier to trade as we sometimes think. Instead, what may be missing is information about the way the other country works and what it is like to do business there or access to suppliers or business-to-business customers in the other country. This would help explain why border regions are more prone to cross-border production and exchange – they have access to both information and people directly in ways that other citizens of their countries don't.

Platforms for coordinating firms and disseminating information should be user friendly and have learning mechanisms embedded within them. If they are not user friendly then they will never be used. The learning aspect concerns the difference between understanding regulatory differences in theory and dealing with regulatory differences in practice. Firms and individuals that have collaborated with or produced for firms in other EU countries will be able to explain the tricks and difficulties involved in the process. The platform should seek to capture this knowledge to avoid firms having to go through the pains of figuring it out again.

There seems to be a great deal of support in the EU for these types of policies, judging by the number of these initiatives that are already in place (see Box 14). This is likely a result of the gridlock around further integration: if regulation cannot be standardized, at least the differences in regulation across countries can be explained. Given the number of existing information programmes, political support should not be difficult to obtain. Administratively, it should be relatively straightforward to set up information portals though it may be harder to make sure the right people know about them and that they are actually being used.

Technical Correctness: high
Political Supportability: high
Administrative feasibility: med/high

II. **<u>REGULATING</u>: reducing or removing barriers that stop firms from seeking opportunities in other countries**. In the case of Germany this meant signing bilateral agreements with the Eastern Bloc and removing existing legal barriers to trade. The Baltic Free Trade Area (BAFTA) and Central European Free Trade Area (CEFTA) also helped develop trade linkages between countries in the lead up to EU ascension.

There is extensive evidence pointing to the benefits of trade liberalization of productivity growth (IMF, 2016). The theory is that removing tariff barriers equalizes conditions for domestic and international producers and therefore makes trade more competitive. Though tariffs are not an issue in the EU there are numerous non-tariff barriers to trade and in particular to cross-country production sharing. If one compares differences in regulation across European and US states, for example, there is clearly room for greater standardization: taxes, labour regulation (hours and wages but also professional titles and required qualifications), health and safety standards etc… These are all barriers to firms seeking to produce and sell in other EU states.

Nonetheless, while standardizing regulation and removing barriers to trade may be helpful to the creation of value chains it does not appear to be a precondition for it. Outside of Europe, the Asian and North American supply chains operate across wildly different regulatory environments and within Europe, the strongest supply chains developed prior to regulatory integration. The lack of regulatory homogeneity likely affects the form that inter-country collaboration takes (e.g. employing local subsidiaries to help navigate the cultural and regulatory

environment) but does not appear to impede it. There is also a lack of clarity as to which elements of standardization and regulation would have the greatest impact on value chain development. Given the political and administrative difficulties involved in this task (see below), it seems unwise to move forward without greater clarity. In this sense, the coordination and information campaign could be used to inform further standardization efforts. For example, if firms constantly report that differences in VAT (a purely hypothetical example) are stopping them from operating across borders despite having information on how to do so, then standardization could be considered.

'Completing the single market' is politically very complicated since it implies regulatory changes in virtually all countries in the union. It is highly unlikely that significant progress could be made on homogenizing regulatory environments in the short run. Some smaller changes – such as establishing equivalencies between countries for things like professional titles – should be more feasible. However, even for these types of measures there are likely to be political concerns of a 'race to the bottom' where everyone seeks certifications or does paperwork in the country where it is easiest or cheapest and then takes advantages of the equivalencies to work somewhere else.

Even if we suppose that we could garner political support, the implementation of standard regulation is extremely difficult since it requires adapting the laws in each country (and considering all the direct and indirect consequences this may have in each case). Presumably, the initiatives would have to be done all at once, meaning the intricacies of the implementation would have to be resolved for all 28 countries before they could come into force. The EU has made notable progress on standardization as pertains to the characteristics of products and processes, and personal and environmental safety, but very little in terms of common regulation in business codes, labour protection etc…, which are the ones that are presumably the greatest impediments to value chain development.

Technical correctness: med/high
Political Supportability: low
Administrative feasibility low

III. **FUNDING: directly incentivizing production with or in other countries**. In the case of NOPEF, this was mostly through grants for pre-investment studies, though the Baltic Investment Banks presumably also funded Nordic projects in the Baltic States. In the case of Germany, this was through government provided export credit programme for projects outside the country.

There may be a learning curve for businesses, and in particular for SMEs, which may make it risky, and initially unprofitable, to establish subsidiaries or supplier/customer relationships abroad. This is particularly the case if this learning is then public and the first mover loses their advantage but still bears all the initial costs. As the German case shows, credit institutions may also be unwilling to lend to projects outside their territorial limits. Providing funding to help cover some of these initial costs, can remedy these externalities and help increase the number of firms that engage in cross-border production.

When it comes to disbursing funds for productive policy, it is important to keep in mind three key design elements of embeddedness, carrots and sticks, and accountability (Rodrik, 2008). A good incentive scheme to encourage investment abroad should help discover where the binding constraints and bottlenecks are that are preventing firms from collaborating across borders (embeddedness), provide funds to overcome these bottle-necks (carrots), taper off once the initial uncertainty and costs of producing abroad are overcome (sticks) and involve some type of reporting back about the success (or failure) of the endeavor (accountability).

The political supportability of this measure should be relatively high, as it does not necessarily require new funds to be added to the EU budget. A transnational production element could easily be added to existing funding programmes, without changing their basic goals. In many cases, EU funds already target scalable projects (projects with an export-oriented mindset), adding an element of transnational collaboration could be understood as an element of this scalability. Furthermore, there is a general concern in EU-policy making today that European firms operate in siloes in their respective countries, and that this has prevented the rise of more EU unicorns (IT companies valued over 1B). Adding elements of transnational cooperation to tech grants could be a way to overcome this. From an administrative perspective, managing grants and incentives is nothing new for the EU. However, we have to be sure to successfully engrain the elements of embeddedness, carrots and sticks, and accountability into the process and this may be administratively more challenging.

Technical correctness: high
Political Supportability: med/high
Administrative feasibility: high

Box 13 summarizes the three types of policy instruments in terms of technical correctness, political supportability and administrative feasibility in the current EU context. Given the tally below, we will proceed to focus on the coordination and funding options in the current EU context.

Box 13: Correctness, Supportability and Feasibility of Policy Options

Coordination and funding are the strongest options to promote deep integration in the EU

	Technical Correctness	Political Supportability	Administrative Feasibility
Coordinate	✓	✓	✓
Regulate	✓	✗	✗
Fund	✓	✓	✓

Our philosophy, when it comes to policy in the EU, is that it is better to *adapt* than to *add* policy instruments. There are countless policy instruments and initiatives in place or being developed in the EU. Further, all of these policies are in addition to those that exist at the national level in all 28-member states. This creates and endless labyrinth of possible funds and mechanisms that individuals and firms can turn too. The ins and outs of EU programmes are hard to navigate even for the well informed and they may often generate more confusion than answers. Out of pure practicality, it seems wiser to seek to adapt than to add to the fray. From an impact standpoint this is also better as creating new programmes within the EU is a lengthy process and could delay action for several years.

As we can see in Box 13, the EU already has a number of initiatives in place to tackle the issues of coordination, regulation and funding for cross border collaboration. There are three different coordination or information programmes, a widespread standardization initiative to 'complete' the single market and several funding mechanisms targeting firms across the EU. While these initiatives are a good starting point, it is important to recognize that the programmes that exist today have not led to the development of deep value chains between EU countries. Simply maintaining the status quo will not be enough. We need to understand what is missing from these programmes and what needs to be changed if we are to expect different results.

Box 14: Existing European Initiatives to Increase Cross-country Collaboration

How the EU is addressing issues of coordination, regulation and funding for cross-border collaboration

Type	Description	Existing EU Frameworks and Policies
1 COORDINATE	Increase deep trade linkages by helping firms to coordinate across borders and diffusing information that facilitates the process	**European Cluster Collaboration Platform** • Goal is to help SMEs involved in clusters to access third markets and find strategic partners in global value chains. • Provides a database of clusters, organizes match-making events, provides profiles of strategic countries of interest, helps clusters implement joint strategies to go international and specialize
		The Single Digital Gateway: Your Europe • Goal is to facilitate online access to the information, administrative procedures and assistance services that citizens and businesses need to get active in another EU country • The platform is currently a work in progress – the full version should be online in 2020. Hope is that the platform will be fully user centric and fill information gaps that currently exist
		Enterprise Europe Network • Goal is to help businesses innovate and grow on an international scale. It is the world's largest support network for small and medium-sized enterprises (SMEs) with international ambitions • Includes technology poles, universitites and research institutions, regional development organizations, chambers of commerce etc.. • Teams of experts offer personalized services to business, assistance includes help to find financing (such as Horizon 2020 funds)
		EU and ME • Gives citizens and business owners information on how to navigate the EU • The business page links to both the Enterprise Europe Network and the Single Digital Gateway as well as other information on funding, business support etc...
2 REGULATE	Increase deep trade linkages by standardizing regulation to reduce friction for firms operating across borders	**Single Market Strategy** • Goal is to reduce cross-border regulatory differences in the EU to facilitate trade in goods and services and cross-border collaboration. • Initiatives include: re-evaluating regulated professions (professions that can only be exercised with specific qualifications or titles in each country), simplifying VAT regulations to make it easier for SMEs to work across borders, consolidating Europe's Intellectual property Framework, developing EU-wide regulation for the collaborative economy.
		Cross-Border Collaboration Funds (INTERREG) • Goal is to facilitate cross-border collaboration between local governments in 'Euroregions' to tackle common problem. (Euroregions are transnational cooperation structures between contiguous territories in different EU states) • Provides funds and technical assistance for these projects
3 FUND	Increase deep trade linkages by supporting firms that seek to invest across borders via direct funding for their projects or technical assistance	**Horizon 2020 & Horizon Europe** • Goal is to ensure Europe's global competitiveness by funding research and innovation projects across the Union • It is the largest EU Research and Innovation programme with a budget of €77B for the 2014-2020 period and €100B budgeted for the upcoming Horizon Europe Programme • The main innovation in Horizon Europe is to make investments Mission Driven based on Marianna Mazzucato's research and proposal to the EU Commission • Horizon 2020 is open to funding projects in collaboration with non-EU researchers and organizations. Intra-EU collaboration is authorized but not particularly encouraged

Note: non exhaustive

Source: EU websites and programme documents.

POLICY RECOMMENDATIONS

COORDINATION

The EU already has at least three programmes seeking to help businesses establish themselves in other EU countries – it should consolidate them for greater effectiveness. There are countless more for other purposes (not included here for example is the Market Access Database, which gives firms information on how to import to and export from the EU to third countries). From the perspective of a firm trying to find information this can be quite confusing. There is also a risk that information will be presented in different ways, or updated at different times and so business owners may find themselves getting slightly different information from each site and getting confused. Finally, having so many different sites makes communicating around the platforms more difficult. Each platform has its own communication campaign and citizens end up either having never heard of any of them or at best being unsure what is where. If the platforms are grouped under one 'master' platform, the EU can launch a large-scale communication campaign around that platform to encourage uptake.

- ***Recommendation**:* Ensure that all existing platforms are internally consistent and updated at the same time
- ***Recommendation**:* Link all platforms and advertise the 'master' platform massively across the EU

The EU should put more emphasis on coordination and collaboration rather than solely act as a purveyor of information. While information is undoubtedly important for firms seeking to engage in cross-border production, it is not be enough. The cluster collaboration programme organizes matchmaking events, lists and mapping of partner organizations and clusters, and encourages the formation of European Strategic Cluster Partnerships that regroup clusters working on similar topics in different EU countries. These are all worthwhile activities; however, limiting them to defined 'clusters' of businesses may be counterproductive.

Rather than creating a new platform for this, it should make the European Cluster Collaboration platform more accessible to all businesses even those that are not formally part of a cluster. The concept of cluster is generally used to describe a group of businesses in a particular location. Their proximity, in theory, creates agglomeration effects that positively affect the productivity of the firms in the group. While this definition is helpful in an academic context, it may not be very helpful for individual firms trying to determine whether they are eligible to use the platform or not and whether they are part of a cluster. On its information page, the Cluster Collaboration Platform describes participants as "*businesses and*

other innovation stakeholders involved in cluster initiatives", cluster initiatives in turn are organized by cluster organizations, which "*take various forms, ranging from non-profit associations, through public agencies to companies*" and "*provide services to the cluster initiative participants*" (CCP website).

By focusing only on clusters the platform may be excluding businesses that could benefit from cross-border collaboration and sourcing. There are undoubtedly reasons why the EU chose to focus on clusters rather than on particular firms for this initiative – requiring a cluster organization to represent a group of business could be a screening mechanism to weed out less productive firms for example. However, by focusing these coordination initiatives *only* on clusters it may be losing out. Smaller firms in particular may not be aware that they are or could be part of a cluster of firms but even medium to large firms may not be coordinated at an organizational level with firms in their cluster. This does not preclude them from seeking to and gaining benefits from participating in value chain trade in the EU.

- ***Recommendation**:* Clarify what a cluster is, what firms gain from being part of a cluster and what types of firms gain most (with examples). Clarify why this initiative is directed at clusters.
- ***Recommendation**:* Add a user-friendly functionality that allows individual firms to find and join clusters near them
- ***Recommendation**:* Open up matching, events and other features to non-clustered firms

FUNDING

Funding for cross-border collaboration and expansion into value chains is notably lacking in the EU. Neither INTERREG nor the Horizon 2020 initiative precisely tackles the problem. INTERREG funds cross-border collaborative projects between local governments. Some of these projects – such as one seeking to improve the internationalization of SMEs – speaks directly to our objective, but a quick look at ongoing projects reveals that this is not generally the focus. Horizon Europe (the successor to Horizon 2020 that will be voted on by the incoming European parliament) focuses on Mission driven investments in research and innovation. Again, not funding for the development of European value chains.

However, the Horizon Europe programme can help develop the value chains of the future and generate deep integration throughout Europe. The Horizon Europe programme is the key to future proofing our productive infrastructure and ensuring that Europe is front and center in the value chains of tomorrow. It is also the key to revitalizing those regions that have fallen behind. The markets of tomorrow will come from the innovations and investments made as part of the Horizon Europe programme. Be it the development of self-driving cars or the production of biodegradable plastics or the creation of products

and services we have yet to imagine. It is crucial that these innovations do not occur in siloes within individual countries. For Europe's competitiveness, and growth these innovations need to be imagined and produced through cross-country collaborative efforts. These collaborative efforts can help develop European value chains in the countries that have fallen behind and maintain strong value chains in the countries that already have them. We must therefore look at how to adapt the Horizon Europe programme to make sure this is the case.

Horizon Europe's 'Missions' are broad societal goals that would set the direction for innovation at the EU level but allow initiatives to surge from the bottom up. The classic example, on which the idea is based, is the United States' Moon Landing Mission. The mission was to get to the moon, 'solving' this mission required innovation from and collaboration between all areas of life: computation, medicine, food, electronics, communications etc... The 'Moon Landing Mission' was a success but more importantly, the broad collaborative effort resulted in dozens of unexpected spinoffs and technologies that we use today. If we are to replicate this same spirit in Europe, it will require collaboration across countries. Horizon Europe recognizes this, saying, "attitudes of openness and collaboration are not a nice complement, but rather a critical factor for success…Europe needs to take the next step and take advantage of its unique nature as a common market of diverse economies." (Mazzucato, 2018)

Cross-country collaboration must be at the heart of the upcoming Horizon Europe program if it is to succeed in its 'Missions'. Much of the mission-driven investment is based off the model and success of the Defense Advanced Research Program Agency (DARPA) in the United States. If we look at the model of DARPA more closely, it becomes apparent that enabling missions involved much more than funding isolated researchers. Arguably, DARPA's most important role was as a connector. In her book, the *The Entrepreneurial State*, Marianna Mazzucato explains how DARPA used its oversight role to connect the actors in the innovation ecosystem, fund the creation of new research groups were there were none[6] and create new independent centers where it brought together researchers from different areas to collaborate.

"*Using its funding networks, DARPA increased the flow of knowledge across competing research groups. It facilitated workshops for researchers to gather and share ideas while also learning of the paths*

[6] DARPA funded the creation of computer science departments at various universities in the US

identified as 'dead ends' by others. DARPA officers engaged in business and technological brokering by linking university researchers to entrepreneurs interested in starting new firms." (Mazzucato, 2013. p83)

The current expert report on Horizon Europe recognizes the importance of cross-country collaboration in missions but does not detail how this collaboration might be achieved. In Horizon 2020, the precursor to Horizon Europe, the majority of EU funds were re-directed towards the investment vehicles of member countries and then invested in local initiatives, which has a tendency to reinforce siloes. In France and Germany close to three quarters of funds went to National Research Institutions or Universities. While this is undoubtedly good for the research corps of both countries, it does not do much to foster cross-country collaboration on these issues in a systematic manner. The existing mechanism for collaboration, the EU Research Area, is more of a 'free market' for researchers than a directed initiative and is insufficient if the EU is to drive bold Missions. Collaboration in scientific work cannot simply be authorized, it must be actively encouraged and driven by the Commission. The importance of integrating research, new technologies, firms and producers for the success of the Horizon Europe initiative cannot be overstated.

- ***Recommendation***: create European research centers around the missions that bring together specialists from around the Union for either permanent work or residencies.
- ***Recommendation****:* Increase funding to non-core countries to develop long-term capabilities there (Horizon 2020 funding disproportionately went to wealthier EU states)
- ***Recommendation***: Create an oversight body with a *pro-active* integration role - tasked with generating connections between players in the ecosystem: researchers, start-ups, manufacturers etc… at the Mission level in the EU, not at the country or industry level.
- ***Recommendation***: ensure commercialization of innovation is done at the EU level rather than the country level for greater impact

The recommendations for Horizon Europe are generally politically supportable although there may be some opposition from national research centers that will receive less direct funds. Governments from countries that received fewer funds in Horizon 2020 will likely be supportive of the new arrangement. However, research centers in countries such as Germany or France may be reluctant to see their funding reduced. In order to garner their support it will be critical to involve their researchers in collaborative efforts and draw on their expertise. At the EU level it will be crucial to communicate the importance of these collaborative efforts to the Missions. Governments throughout Europe must understand that the Missions require collaboration between countries to succeed.

APPENDIX

Appendix 1: Convergence Regressions

UNCONDITIONAL CONVERGENCE IN THE EU

COUNTRIES		FRA ITA DEU BEL NLD LUX	+ DEN IRL GRB	+ GRC	+ ESP PRT	+ AUT FIN SWE	+ CYP CZE EST HUN LVA LTU MLT POL SVK SVN BGR ROU	+ HRV	EA 12	EA 19	EU 28
Entry Year		**1958**	**1973**	**1981**	**1986**	**1995**	**2004 & 2007**	**2013**			
Period											
1960	1970	-0.013	-0.003	-0.019 *	-0.021 ***	-0.021 ***	-0.014 ***	-0.014 ***	-0.020 ***	-0.014 ***	-0.014
1970	1980	-0.014	-0.011	-0.007	-0.002	-0.005	-0.026 ***	-0.026 ***	0.001	-0.030 ***	-0.026
1980	1990	0.044	-0.001	0.003	-0.008	-0.008	-0.003	-0.003	-0.007	-0.012	-0.003
1990	2000	0.024	-0.024	-0.011	-0.009	-0.010	0.013	0.013	-0.008	0.023	0.013
2000	2010	0.011	0.013	0.006	0.000	0.000	-0.029 ***	-0.028 ***	0.001	-0.025 ***	-0.028 ***
2010	2014	-0.014	-0.011	-0.007	-0.002	-0.005	-0.026 ***	-0.026 ***	0.001	-0.030 ***	-0.026 ***
1960	2014	0.007 *	-0.007	-0.005	-0.006 **	-0.007 **	-0.011 ***	-0.011 ***	-0.005 *	-0.009 ***	-0.011 ***
1970	2014	0.016	-0.009	-0.004	-0.005	-0.006	-0.011 ***	-0.011 ***	-0.003	-0.011 **	-0.011 ***
1980	2014	0.031	-0.011	-0.003	-0.006	-0.007	-0.009 **	-0.009 **	-0.006	-0.006	-0.009 **
1990	2014	0.016 **	-0.009	0.000	-0.002	-0.002	-0.015 ***	-0.014 ***	-0.001	-0.008	-0.014 ***
2000	2014	0.011	0.012	0.017 **	0.011 *	0.011 **	-0.028 ***	-0.027 ***	0.011 *	-0.026 ***	-0.027 ***

Note: figures vary slightly from those in Box 1 due to different datasets – source: Penn World Tables (Box 1 uses Maddison Data), own analysis

UNCONDITIONAL TFP CONVERGENCE IN THE EU

COUNTRIES		FRA ITA DEU BEL NLD LUX	+ DEN IRL GRB	+ GRC	+ ESP PRT	+ AUT FIN SWE	+ CYP CZE EST HUN LVA LTU MLT POL SVK SVN BGR ROU	+ HRV	EA 12	EA 19	EU 28
Entry Year		**1958**	**1973**	**1981**	**1986**	**1995**	**2004 & 2007**	**2013**			
Period											
1960	1970	-0.0341	-0.0308	-0.05 **	-0.05 **	-0.04 **	-0.04 ***	-0.04 ***	-0.05 **	-0.05 ***	-0.04 ***
1970	1980	-0.0251	-0.0255	-0.0102	-0.0272	-0.0335	-0.03 *	-0.03 *	-0.013	-0.0508	-0.03 *
1980	1990	-0.0219	-0.00991	-0.00916	-0.00884	-0.0134	0.00194	0.00194	-0.0136	-0.0102	0.00
1990	2000	-0.0197	-0.03	-0.0104	-0.00767	-0.0118	-0.03 ***	-0.03 ***	-0.00974	-0.0145	-0.03 ***
2000	2010	-0.0611	-0.0479	-0.03 *	-0.04 **	-0.05 ***	-0.05 ***	-0.05 ***	-0.04 ***	-0.05 ***	-0.05 ***
2010	2014	-0.0251	-0.0255	-0.0102	-0.0272	-0.0335	-0.03 *	-0.03 *	-0.013	-0.0508	-0.03 *
1960	2014	-0.03 ***	-0.03 ***	-0.0162 *	-0.0163 **	-0.0166 **	-0.02 ***	-0.02 ***	-0.02 **	-0.02 ***	-0.02 ***
1970	2014	-0.03 **	-0.02 **	-0.0169	-0.0226 **	-0.0217 **	-0.02 ***	-0.02 ***	-0.03 **	-0.03 ***	-0.02 ***
1980	2014	-0.02 *	-0.02 *	-0.00975	-0.00984	-0.0151 *	-0.03 ***	-0.03 ***	-0.02 *	-0.01 *	-0.03 ***
1990	2014	-0.0335	-0.03 **	-0.0131	-0.0118	-0.0192* *	-0.04 ***	-0.04 ***	-0.0173	-0.03 ***	-0.04 ***
2000	2014	-0.0447	-0.0385	-0.00144	-0.00295	-0.0174	-0.05 ***	-0.04 ***	-0.0133	-0.04 ***	-0.04 ***

Source: Penn World Tables, own analysis

UNCONDITIONAL CONVERGENCE IN EUROPE AND CENTRAL ASIA – 1950-2010

VARIABLES	(1) 1950-65	(2) 1965-80	(3) 1980-95	(4) 1995-10	(5) 1950-65	(6) 1965-80	(7) 1980-95	(8) 1995-10
Baseline log real gdp per capita	-0.0135*** [0.00433]	-0.0115*** [0.00380]	0.00186 [0.00892]	-0.0143*** [0.00435]	-0.0117** [0.00473]	-0.0118** [0.00434]	0.00810 [0.0121]	-0.0142*** [0.00446]
USSR dummy	-0.00852 [0.00804]	-0.0135** [0.00603]	-0.0308*** [0.0111]		0.000364 [0.118]	-0.0751 [0.0923]	0.0600 [0.181]	
EU dummy	0.00393 [0.00741]	-0.00214 [0.00558]	0.0209* [0.0118]	0.000102 [0.00882]	0.211 [0.148]	0.126 [0.156]	0.321 [0.311]	0.0176 [0.275]
EU baseline interaction term					-0.0236 [0.0168]	-0.0136 [0.0166]	-0.0308 [0.0318]	-0.00173 [0.0271]
USSR baseline interaction term					-0.00101 [0.0153]	0.00725 [0.0108]	-0.00968 [0.0195]	
Constant	0.160*** [0.0360]	0.146*** [0.0340]	-0.0146 [0.0858]	0.180*** [0.0390]	0.145*** [0.0393]	0.149*** [0.0387]	-0.0744 [0.116]	0.179*** [0.0400]
Observations	31	32	47	48	31	32	47	48
R-squared	0.270	0.311	0.374	0.277	0.323	0.343	0.389	0.277

Standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Box 5: Conditional Convergence

Conditional convergence in Europe and Central Asia, 10 year periods, 1960 onwards

	Unconditional Convergence	Unconditional Convergence, FE	Unconditional Convergence, FE & controls	Conditional Convergence, FE & controls	Conditional Convergence, FE & controls + upstream int.	Conditional Convergence (upstream integration)
VARIABLES						
Baseline log real gdp per capita	-0.0128***	-0.00886***	-0.0145***	-0.0253***	-0.0525***	-0.0495***
	[0.00345]	[0.00326]	[0.00368]	[0.00349]	[0.00574]	[0.00460]
Baseline education (yrs of schooling)				0.00458**	0.00311	
				[0.00185]	[0.00188]	
Baseline trade (% GDP)				-0.000119	-5.87e-05	
				[8.10e-05]	[8.65e-05]	
Baseline FDI inflows (% GDP)				0.00265**	-0.000366	
				[0.00113]	[0.000869]	
Baseline investment (% GDP)				-0.000303	-0.000430	
				[0.000402]	[0.000627]	
1970-1980		-0.00909	-0.00582			
		[0.00863]	[0.00811]			
1980-1990		-0.0334***	-0.0283***			
		[0.00815]	[0.00771]			
1990-2000		-0.0427***	-0.0248***	0.0124**		
		[0.00822]	[0.00838]	[0.00603]		
2000-2010		0.00181	0.0121	-0.00500		
		[0.00820]	[0.00813]	[0.00794]		
War dummy			-0.0469***	-0.0732***		
			[0.0100]	[0.0124]		
EU membership dummy			0.200*	0.180	0.253	
			[0.109]	[0.111]	[0.185]	
EU * baseline GDP interaction term			-0.0190*	-0.0180	-0.0241	
			[0.0111]	[0.0110]	[0.0177]	
Baseline Upstream Integration (% GDP)					0.00210***	0.00150***
					[0.000419]	[0.000327]
Constant	0.145***	0.127***	0.172***	0.248***		0.508***
	[0.0321]	[0.0290]	[0.0324]	[0.0379]		[0.0433]
Observations	208	208	208	76	30	30
R-squared	0.063	0.278	0.376	0.677	0.914	0.853

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

Note: Linear regression of cumulative average growth rates on initial income levels and baseline characteristics. Regression includes 42 countries in Europe and Central Asia. FE refers to time-fixed effects.

Source: Maddison 2018 data; World Development Indicators 2018, World Bank; World Economic Outlook Data, IMF; Barro-Lee Educational Attainment Dataset, WIOD 2013 and 2016 databases, own analysis

Appendix 2: Model Specifications, Conditional Convergence

Appendix: Conditional Convergence

Model Specifications

VARIABLE	CONSTRUCTION	SOURCE
Growth	Cumulative average growth rates of real GDP per capita over 10 year periods from 1950 to 2010	Maddison 2018 data
Base	Baseline log real GDP per capita over 10 year periods from 1950 to 2010	Maddison 2018 data
Trade	Baseline trade (X+M) as percent of GDP	World Bank, World Development Indicators 2018
FDI	Average FDI inflows as percent of GDP in the first five years of period (average is used to reduce volatility of FDI measures)	World Bank, World Development Indicators 2018
Education	Baseline average years of schooling per capita	Barro-Lee Educational Attainment database
Investment	Baseline investment as a percentage of GDP	IMF, World Economic Outlook
EU	Dummy variable equal to 1 if country was an EU member for more than half of the period under consideration	
EU conversion	Interaction between the EU dummy variable and baseline log real GDP per capita	
War	Dummy variable equal to 1 for Croatia, Bosnia, Serbia and Montenegro (1991-1995), Russia and Georgia (1991-1993), Moldovia, Romania and Ukraine (1992), Tajikistan, Uzbekistan and Russia (1992-1997), Ukraine and Russia (1994-1996), Albania (1997), Albania, Serbia and Montenegro (1998-1999), Macedonia (2001-2002), Serbia and Montenegro (2001) and all corresponding periods.	
Upstream Integration	Baseline global upstream integration expressed as a percentage of GDP. Calculated as elements 2 through 5 of the Koopman Wang and Wei gross export decomposition. The data covers exports of goods and services for the period 1995 to 2014 for 28 EU countries and 15 other major countries in the world.	World Input Output Database, 2013 and 2016 releases

Appendix 3: Country Classifications

EU AND EUROZONE MEMBERSHIP OVER TIME

Founding Members	EA 11	EA 12	EA 19	EU 28
Belgium	Belgium	Belgium	Belgium	Belgium
France	France	France	France	France
Germany	Germany	Germany	Germany	Germany
Italy	Italy	Italy	Italy	Italy
Luxemburg	Luxemburg	Luxemburg	Luxemburg	Luxemburg
Netherlands	Netherlands	Netherlands	Netherlands	Netherlands
	Austria	Austria	Austria	Austria
	Finland	Finland	Finland	Finland
	Ireland	Ireland	Ireland	Ireland
	Portugal	Portugal	Portugal	Portugal
	Spain	Spain	Spain	Spain
		Greece	Greece	Greece
			Cyprus	Cyprus
			Estonia	Estonia
			Latvia	Latvia
			Lithuania	Lithuania
			Malta	Malta
			Slovakia	Slovakia
			Slovenia	Slovenia
				Bulgaria
				Czech Republic
				Croatia
				Denmark
				Great Britain
				Hungary
				Poland
				Romania
				Sweden

EU & COMECON MEMBERSHIP OVER TIME

*Note: *For founding members of the EU membership of the European Coal and Steel Community began in 1952 while the European Economic*

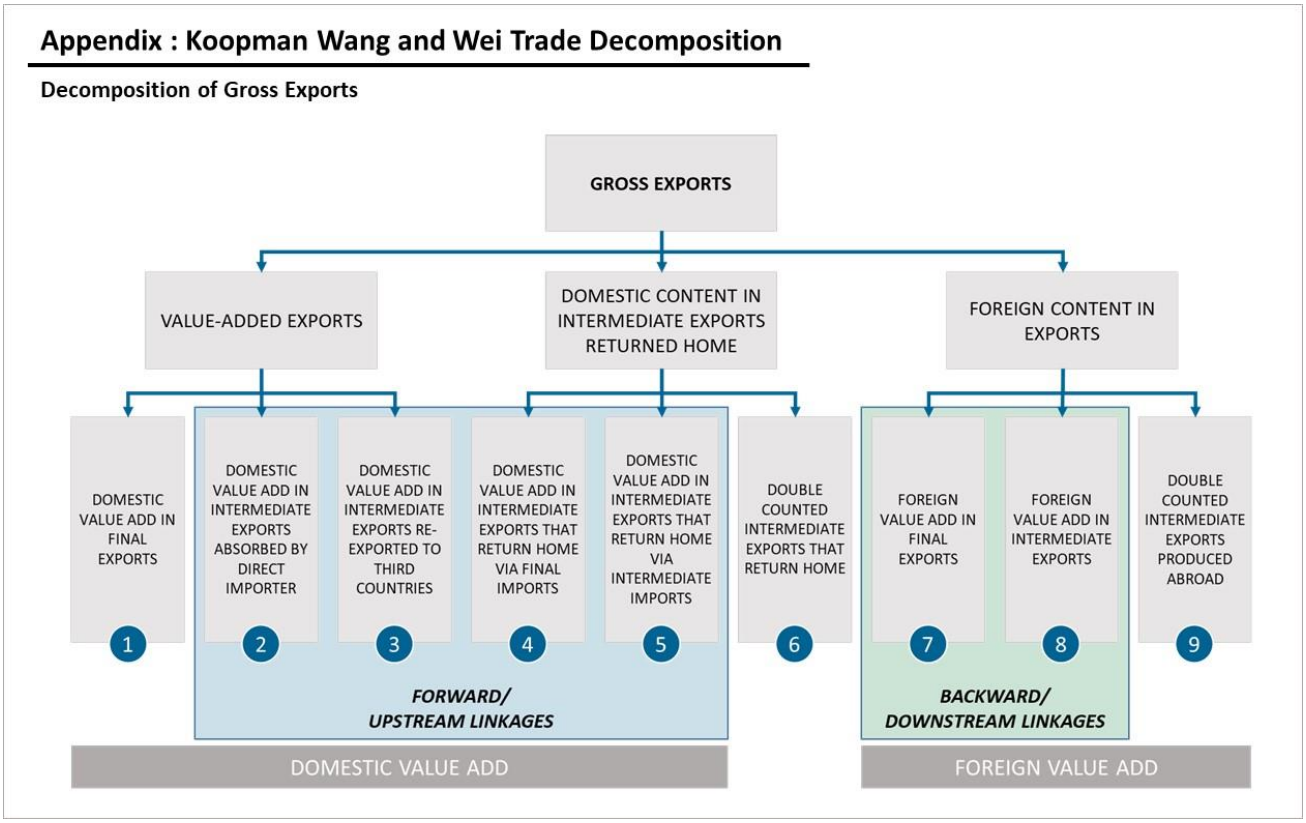
Country	Applied EU	Joined EU	Joined COMECON	Country	Applied EU	Joined EU	Joined COMECON
Albania	2009	-	1949^^	Latvia	1995	2004	1949
Armenia	-	-	1949	Lithuania	1995	2004	1949
Austria	1989	1995	-	Luxemburg	1952/58*	1958	-
Azerbaijan	-	-	1949	Macedonia	2004	-	-
Belarus	-	-	1949	Malta	1990	2004	-
Belgium	1952/58*	1958	-	Moldovia	-	-	1949
Bosnia	2016	-	-	Montenegro	2008	-	-
Bulgaria	1995	2004	1949	Netherlands	1952/58*	1958	-
Croatia	2003	2013	-	Norway	1962***	-	-
Cyprus	1990	2004	-	Poland	1994	2004	1949
Czech Republic	1996	2004	1949^	Portugal	1977	1986	-
Denmark	1961**	1973	-	Romania	1995	2007	1949
Estonia	1995	2004	1949	Russia	-	-	1949
Finland	1992	1995	-	Serbia	2009	-	-
France	1952/58*	1958	-	Slovakia	1995	2004	1949^
Georgia	-	-	1949	Slovenia	1996	2004	-
Germany	1952/58*	1958	-	Spain	1962**	1986	-
Great Britain	1961**	1973	-	Sweden	1991	1995	-
Greece	1975	1981	-	Switzerland	1992****	-	-
Hungary	1994	2004	1949	Tajikistan	-	-	1949
Iceland	2009 (frozen)	-	-	Turkey	1987	-	-
Ireland	1961**	1973	-	Turkmenistan	-	-	1949
Italy	1952/58*	1958	-	Ukraine	-	-	1949
Kazakhstan	-	-	1949	Uzbekistan	-	-	1949
Kyrgyzstan	-	-	1949				

*Community was created in 1958. **Denmark withdrew its application and reapplied in 1967. The United Kingdom was vetoed and reapplied in 1967. Ireland withdrew its 1961 application and reapplied in 1967. Spain's application was rejected in 1962, it reapplied in 1967 *** Norway applied three times in 1961, 1967 and 1992 and was rejected all three times. **** Switzerland withdrew its 1992 application and never reapplied.*

^The Czech Republic and Slovakia are considered members of the COMECON since 1949, as Czechoslovakia was a founding member. ^^ Unlike other countries, Albania was only a member of the COMECON until 1987. The 15 Soviet Republics were founding members of the COMECON. Though East Germany was a COMECON member starting in 1950, Germany is not counted in COMECON membership.

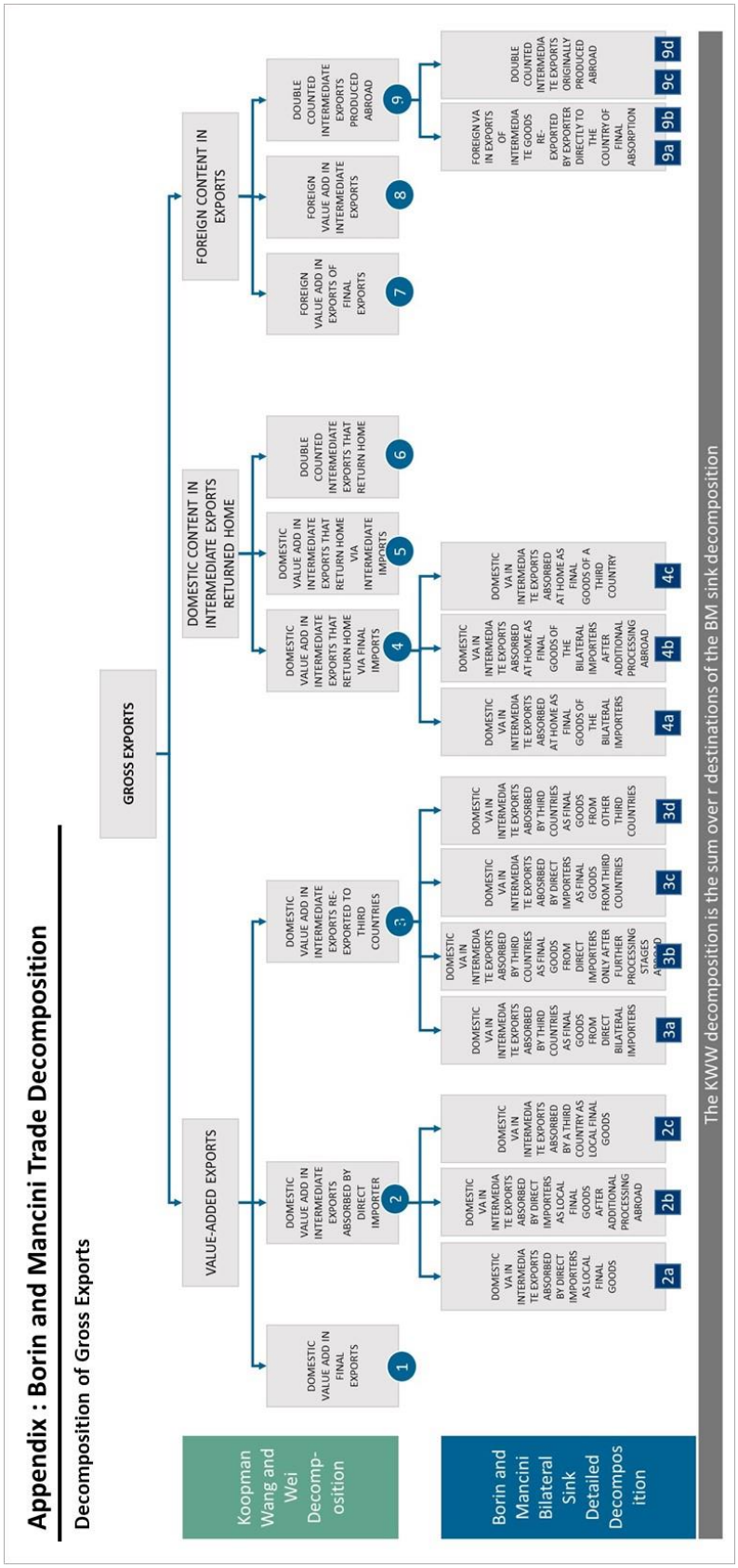
Appendix 4: Export Decomposition Methodology

KOOPMAN WANG AND WEI 2014 DECOMPOSITION



Source: Author based on Koopman, Wang and Wei (2014)

BORIN AND MANCINI 2017 DECOMPOSITION

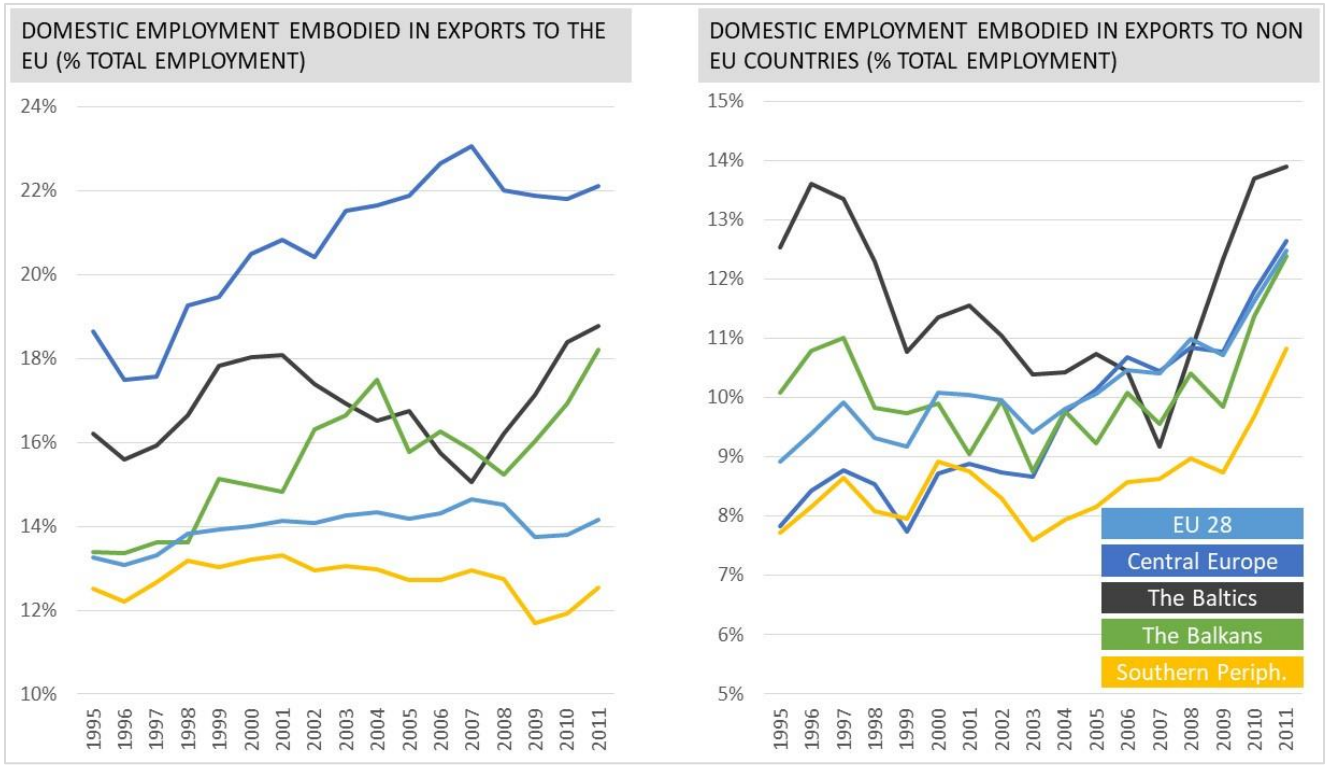


Appendix 5: Trade decomposition correlations with growth

Koopman Wang and Wei Element	1	2	3	4	5	6	7	8	9	2-5	7-8	2-5+7-8	1-9
Description	Domestic Value add in final Exports	Domestic Value add in intermediate exports absorbed by the direct importer	Domestic value add in intermediate exports re-exported to third countries	Domestic value add in intermediate exports that return home via final imports	Domestic value add in intermediate exports that return home via intermediate imports	Double counted intermediate exports that return home	Foreign value add in final exports	Foreign value add in intermediate exports	Double counted intermediate exports produced abroad	Upstream Integration	Downstream Integration	Vertical Integration (Upstream + Downstream)	Gross Exports
Correlation between 2000 level and real GDP growth 2000-2014*	-11.2%	27.6%	29.4%	-43.0%	-44.5%	-40.1%	4.8%	21.3%	25.0%	27.2%	12%	20%	14%
Average contribution to Gross Exports	27%	33%	8%	0%	0%	0%	13%	10%	8%	42%	23%	65%	100%

Note: correlations for 27 EU countries, excluding Luxemburg
Source: WIOD 2016 database, Maddison 2018 data, own analysis

Appendix 6: Employment embodied in EU exports

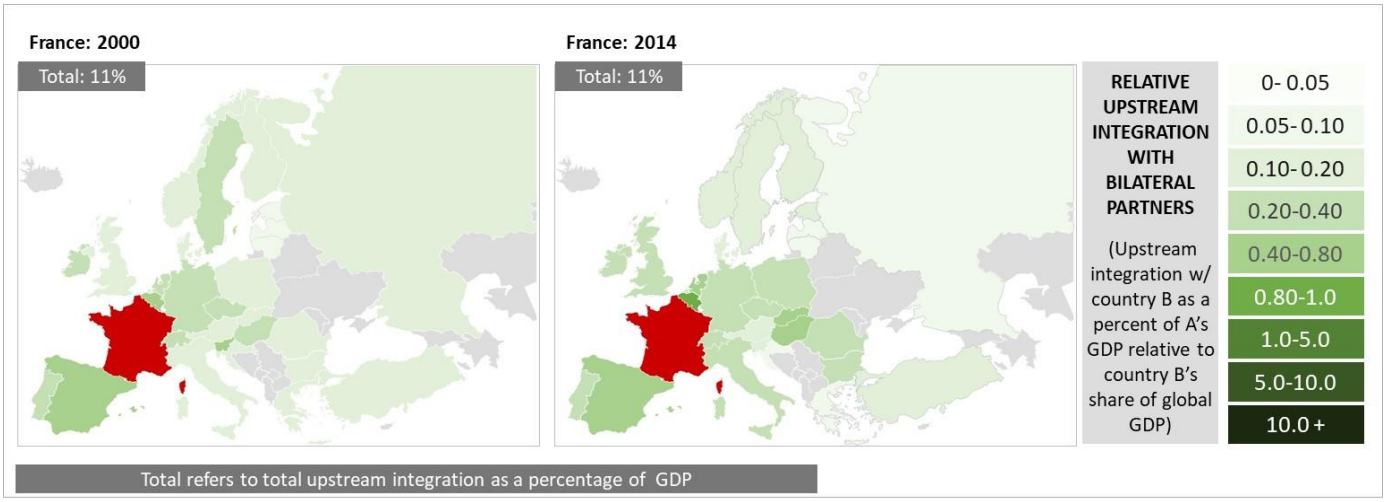


Source: OECD Trade and employment database, own analysis

Appendix 7: Political Supportability and Administrative Feasibility of Proposals

Policy	Detail	Technically Correct	Politically Supportable	Administratively Feasible
Deepen Integration	Move towards a 'genuine' monetary union in the Eurozone with : • Fiscal Transfers • Banking Union • Pooling of Debt • Emission of Eurobonds Pursue greater structural conversion in Eurozone countries in • Labour Laws • Social Security Systems Move towards greater democratic representation, such as • Directly elected European officials	✓ • It is quite likely that further integration would bolster convergence although not necessarily the case (see for example the lack of convergence between Italian regions contained within a single currency area, (Boeri et al., 2014)) • There are many other valid reasons why further integration would be good for the EU	✗ Further political and economic is currently politically unsupportable • Germany and other creditor nations refuse greater economic integration • The vast majority of European nations oppose further political integration due to loss of national sovereignty and political power • The nations that would have to make the largest structural adjustments are dramatically opposed	✗ The administrative complexity of implementing further integration is enormous • Some instances, such as the creation of fiscal transfers or of common debt may have a smaller administrative burden but will nonetheless be complex to implement • In the case of labour laws and social security the complexity of dealing with temporary workers that move across countries (and systems) is indicative of the challenges that would be faced • Implementing a greater political union would be extremely complicated
Continue with the Status Quo	• Propose no structural changes to the EU or Eurozone, and continue to push for structural adjustments in Southern Periphery countries	✗ • Though convergence has been occurring in the EU despite lack of integration there is no reason to believe that this policy would contribute to convergence in those countries that are no longer converging nor bolster convergence in those that are	✗ The status quo is politically untenable. • Countries that have stagnated in recent years are failing to see the benefits of continued membership in the Union rebelling against it • Countries that have seen sustained growth within the EU attribute poor performance in other countries to structural differences and are resentful for 'footing the bill'. There must either be structural changes or there must be growth	✓ • Maintaining the status quo requires no administrative changes and is therefore perfectly administratively feasible
Pursue further integration into Global Value Chains	• Improve existing EU information and collaboration platforms • Put cross-country collaboration at the core of Horizon 2020, the EU's €100B Mission Driven Innovation Programme - Create European Research Centers around the Missions - Increase funding to non-core countries - Create an oversight body to pro-actively coordinate and integrate research across the EU - Commercialize resulting innovation at the EU level	✓ • Upstream integration is the only variable statistically significantly associated with greater convergence in Europe in recent decades	✓ • Funding has already been allocated to Horizon Europe. This proposal simply changes how it will be distributed – this makes it less politically sensitive to pass • There may be some resistance from countries that have received disproportionate funding in past years. Integrating their research institutions into collaborative efforts will be crucial to success	✓ • The EU has been administering a similar fund for the past 7 years so most administrative aspects are in place • A new administration will have to be set up to play a coordinating role – it needs to be staffed with the highest caliber scientists and innovation leaders with a strong team that understands the EU innovation ecosystem for the collaborations to succeed

Appendix 7: Additional Upstream Integration Maps



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