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Are automotive global production networks becoming more global? Persistent heterogeneity and convergence of trade patterns

Transnational strategies in the automotive industry workshop

Centre for Innovation Management Research (CIMR)

Birkbeck, University of London



université
de **BORDEAUX**

introduction

Map 1 – Go east!
Share of employees in Total European Supply industry (%) 2000 & 2010

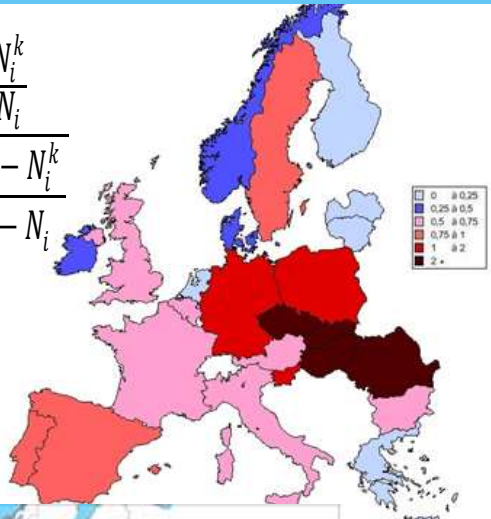


Source : Eurostat, calcul auteurs

Map 2. Sectoral specificity index for automotive supplies manufacturing 2011

Frigant, Vincent & Miollan, Stéphane (2014) "[The geographical restructuring of the European automobile industry in the 2000s](#)," [MPRA Paper 53509](#), <https://ideas.repec.org/p/pr a/mprapa/53509.html>.

$$r_i^k = \frac{\frac{N_i^k}{N_i}}{N^k - N_i^k} \frac{N - N_i}{N_i}$$



Klier, T. and Rubenstein, J. (2011) "Reconfiguration of the North American and European auto industries – a study in contrast", *European Review of Industrial Economics and Policy*, n°3.



- Empirical facts
 - › International production fragmentation :
 - Increasing PF but...
 - Sectoral specificities? Proximity constraints? Institutional constraints/opportunities?
 - Is the auto industry fragmented?
 - › Focus on Europe
 - › Geography of supply industry?
 - Deindustrialisation of old industrial countries/building new capacities in Eastern European Countries (+ Turkey, Maghreb) – “periphery”
 - Following the carmakers + others reasons
 - Key role of mega-suppliers (red points)

- Two research questions:
 - › Measure the facts? How many? Who? What?
 - › Why? How does it work?
- Theoretical background : **Global Production Networks** ((Coe and al., 2004; Coe et al., 2008; Henderson et al, 2002)



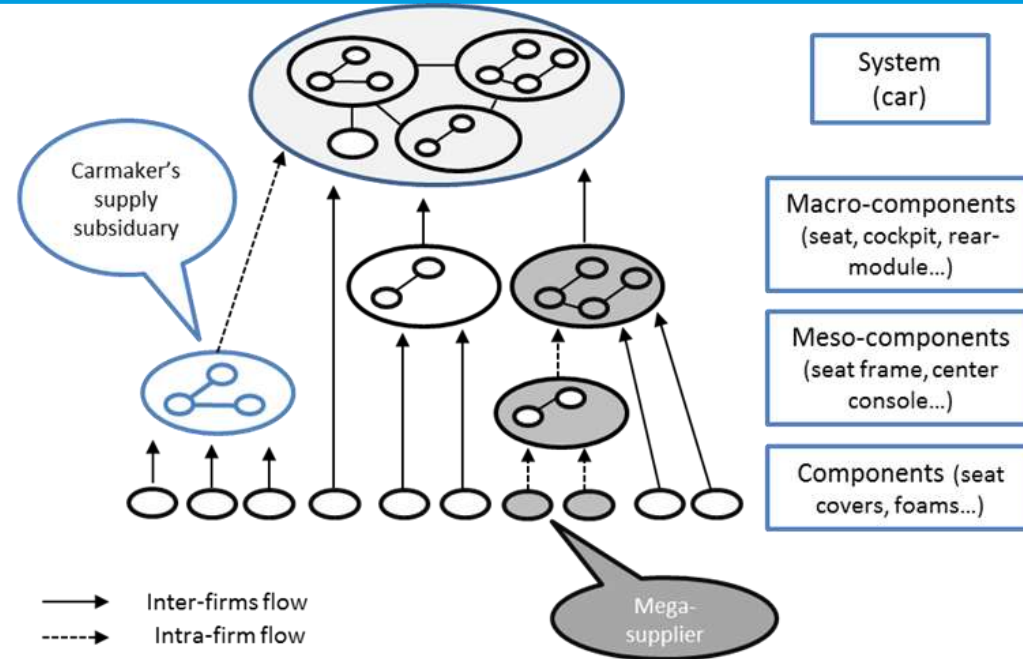
Two theoretical propositions

- **Proposition 1: take into account the characteristics of activities (more than actors)**
- › **Production conditions?**
 - Economies of scale & economies of scope
 - Competencies (skill)
 - › **How the products/services are integrated into the production's cycle of buyer?**
 - **Logistics dimension**
 - Rhythm: Just-in-time? In-line-sequence?
 - Weight/volume/fragility of input
 - Transport capabilities: infrastructure, providers of logistic solutions (firms), location of buyer/suppliers, transportation solutions (trucks, boats, rail...)
 - **Co-location with RD activities / engineering activities?**
 - › **Contractual relationship?**
 - **Stability of the relationships?** (historical client? New client? Institutional (friendly) pressures (local, national)?, Monopoly...)
 - **Contract dimension** (strategic contract [a growing carmaker (VW, Hyundai...) vs. declining one (FIAT???)]; Complete modules or just a component?; margin level, etc.)

Proposition 2: A typology of auto parts : lessons from the modularisation of the auto industry

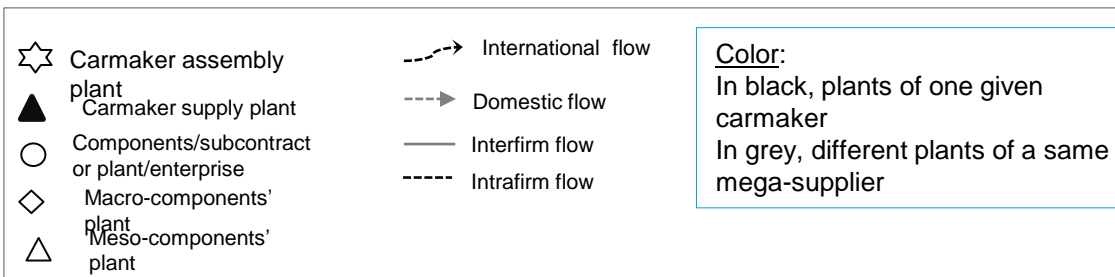
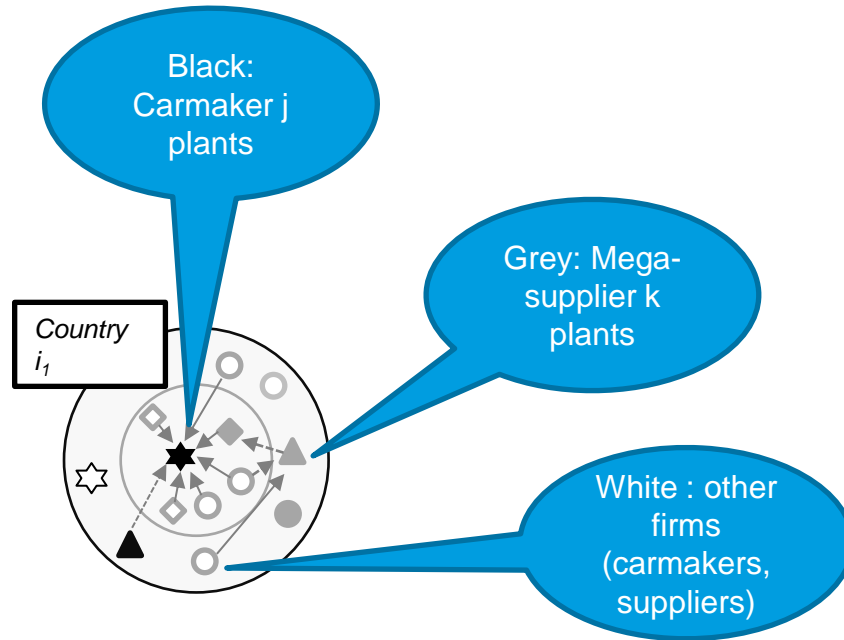
→ Criteria:

- › **Exclusivity:** parts are exclusive when dedicated to a specific vehicle model - and where they amount to a visible element of product differentiation
- › **Complexity:** technological complexity + production conditions (economies of scale/scope)
- › **Integration** into the production process (flows)

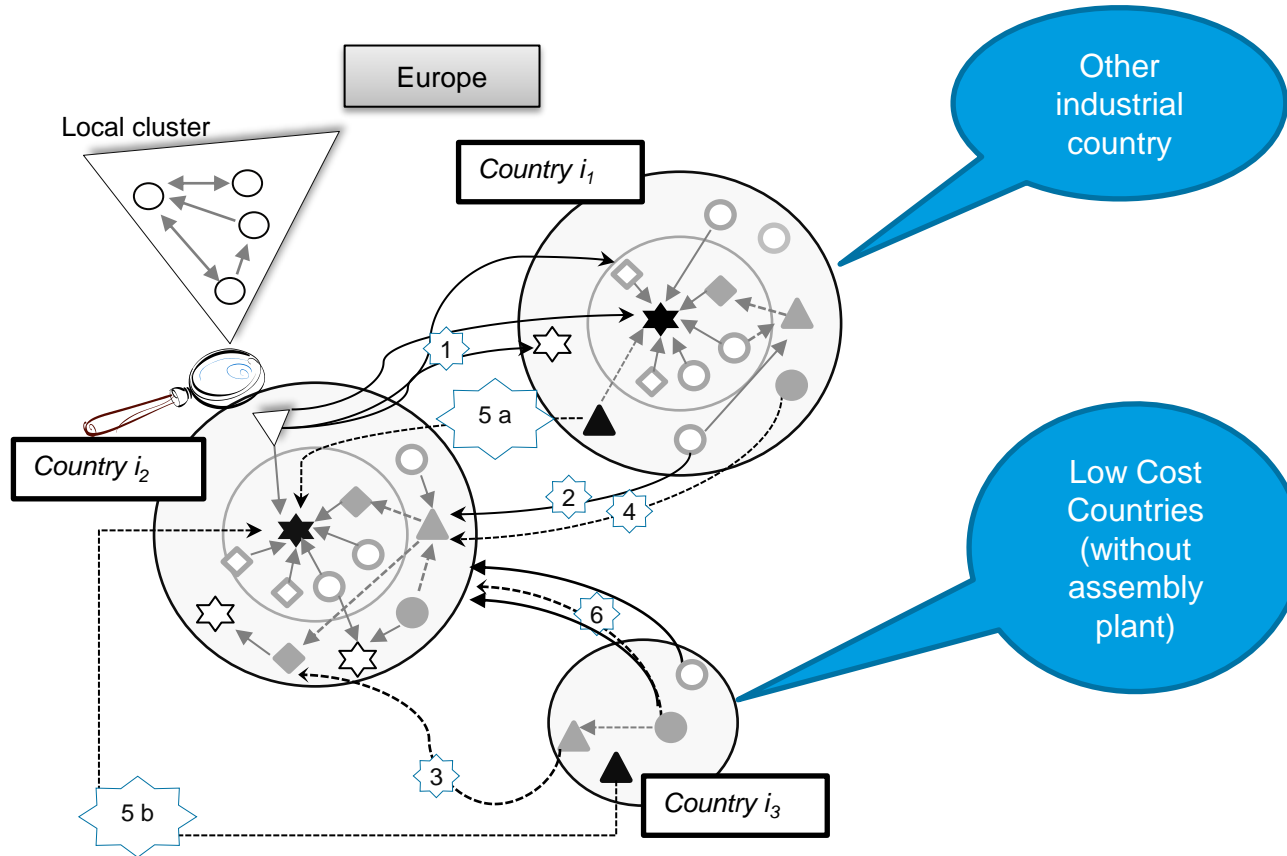


- Macro-components: exclusive/complex/transport requirements
- Components:
 - No exclusivity
 - Weak transport constraints
 - « Simple »
- Meso-components:
 - Weak exclusivity
 - Strong integration into the production process but with organizational proximity (intrafirm)
 - Complexity: rather yes + scale economies

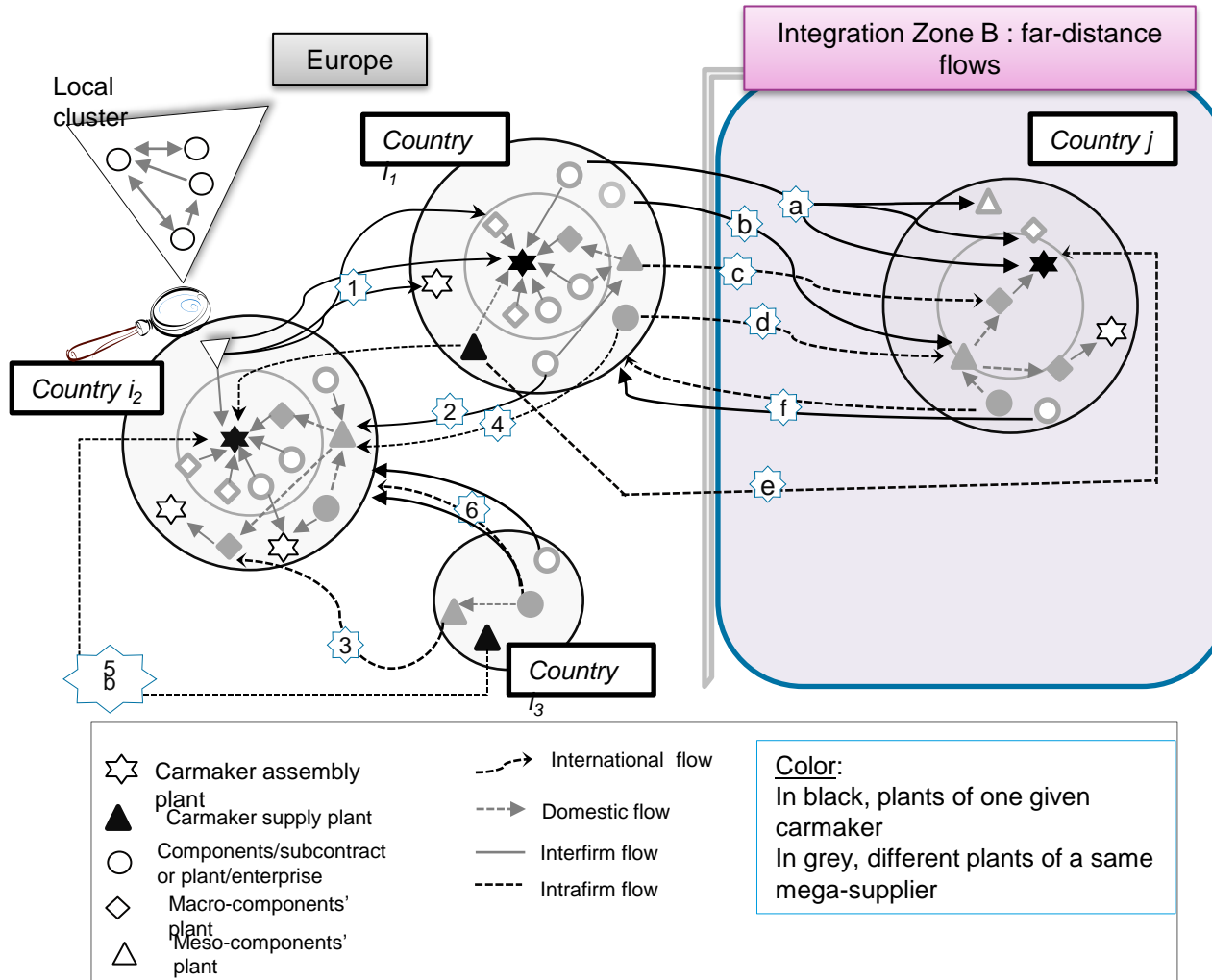
GPN: mapping the network...from national to European level...to...



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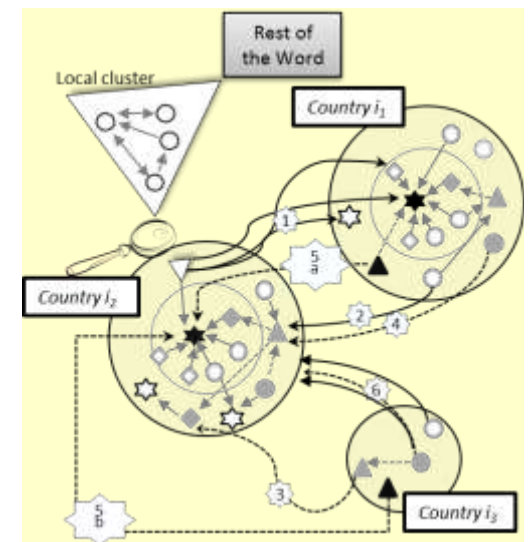
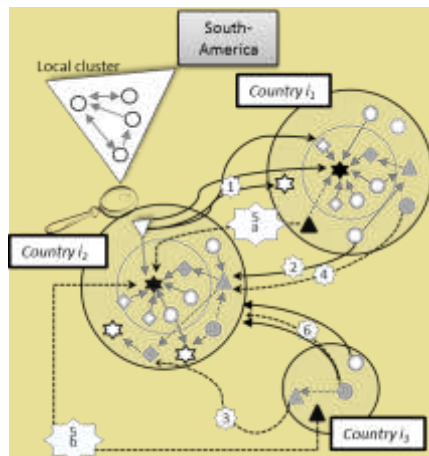
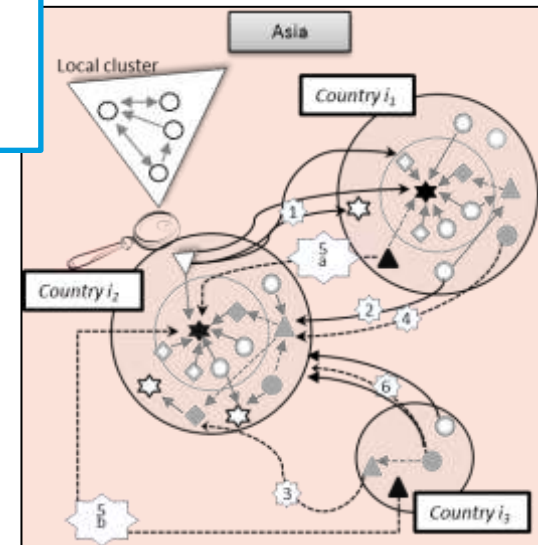
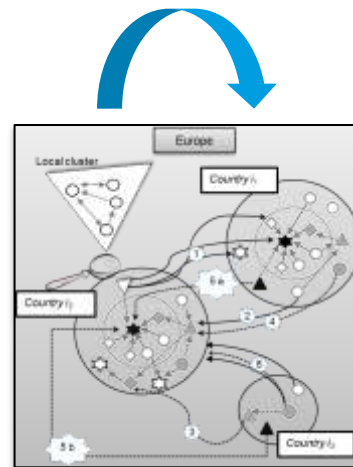
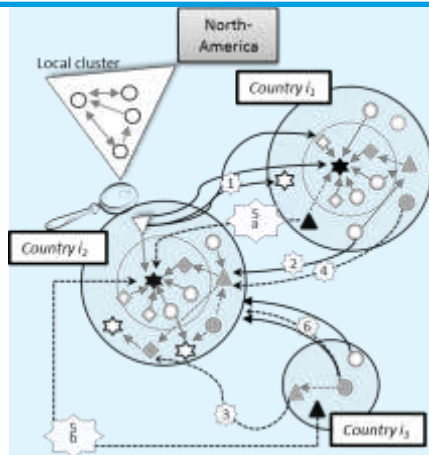
Complete European GPN...



Our general research agenda: understand the (dynamic) evolution of this GPN

→ Macro-regional integration vs. inter-continental integration?

- Literature : Macro-regional integration but...
- Organisational transformations (more modular design + rise of mega-suppliers + newcomers in Europe (foreign carmakers, suppliers + insitutionnal changes...) → inter-continentalisation of value chains?



Comparing Germany, France, United-Kingdom, Spain import patterns

Countries: Germany, France, United-Kingdom, Spain

Database: Chelem CIN

Product codes: auto parts (FS)

Period : 2000-2012 -3 years, 2000, 2009, 2012

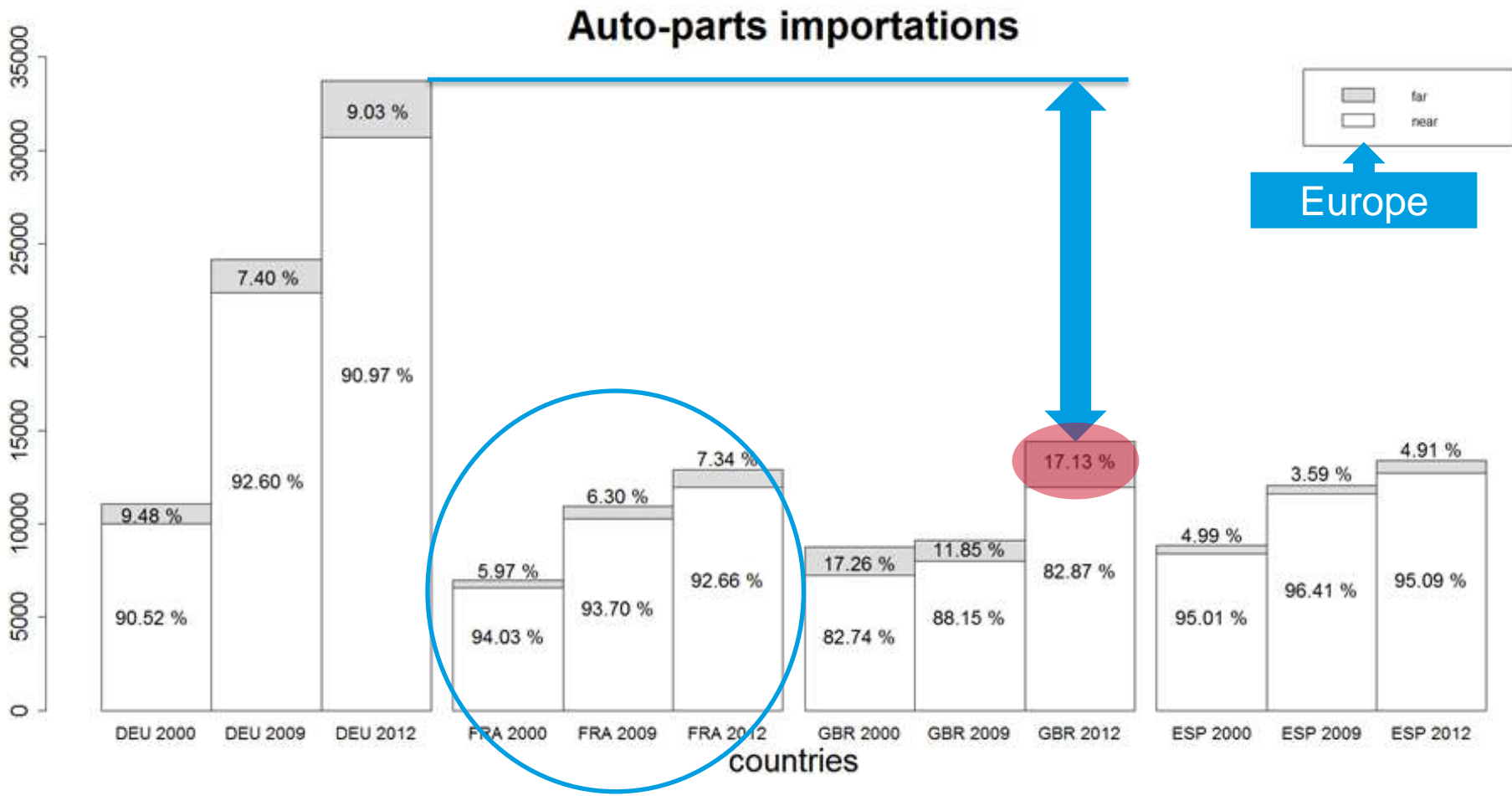
Other continents

Europe: UE+Turkey+North African countries

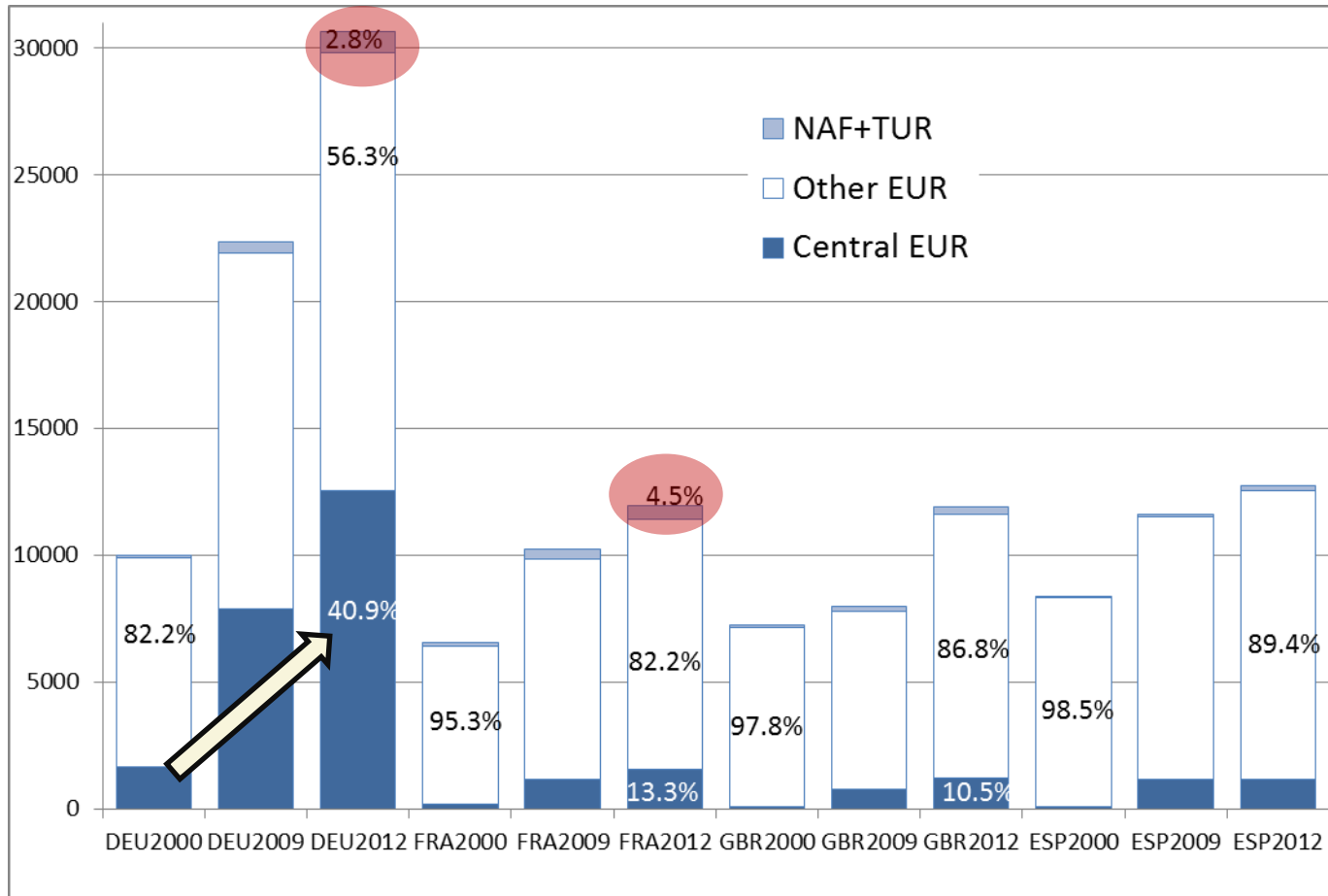
Table 1. 2000-2012 growth of nominal auto-parts importations from Europe (near-distance) and from other countries (far-distance)

	Germany	France	United-Kingdom	Spain
import growth	205.17 %	84.93 %	64.45 %	51.59 %
near-distance import growth	206.69 %	82.23 %	64.70 %	51.72 %
far-distance import growth	190.66 %	127.41 %	63.26 %	48.95 %

Figure - Nominal importations from near-distant and far-distant countries (in millions of current USD)

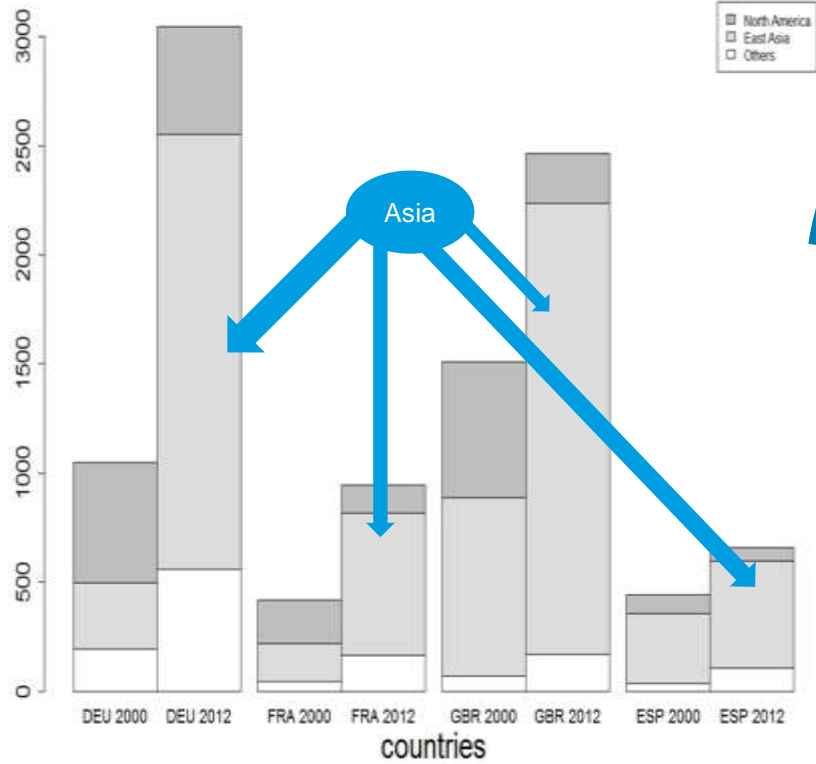


Europe → Europe

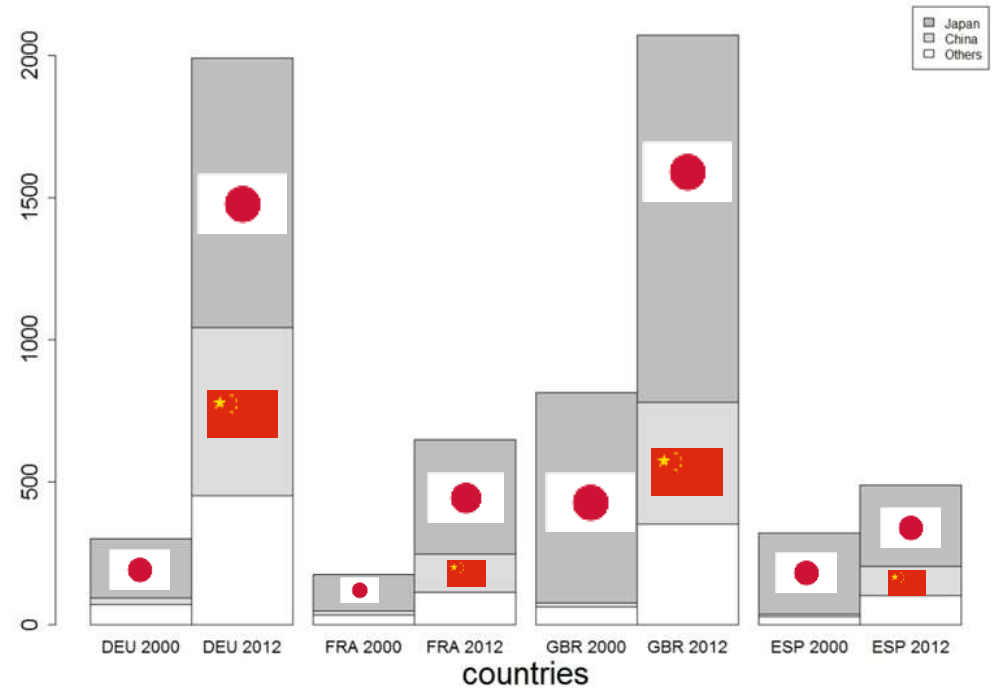


Far-distance imports

Far-distance importations



Importations from East Asia



→ But... we need to take into account the car productions growth

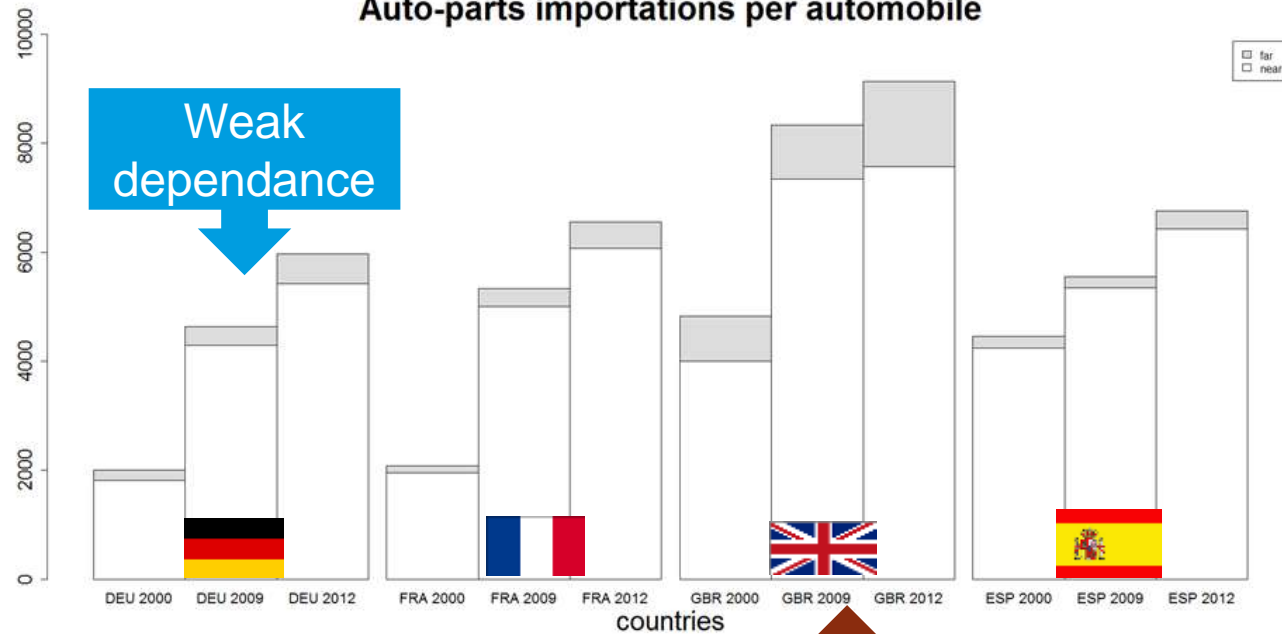
$$G_t^{i \rightarrow j} \approx \frac{X_t^{i \rightarrow j}}{y_t^j}$$

Number of produced cars

→ Two explanations

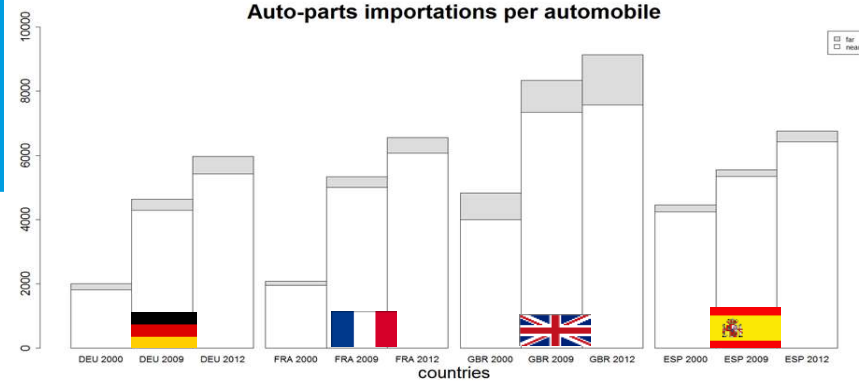
- › Vertical integration ratio (carmakers)
- › Strength of domestic network

Auto-parts importations per automobile



UK: strong dependance

2000-2008		DM341 - Manufacture of motor vehicles									
2008-2012		C291 - Manufacture of motor vehicles									
		Number of ent.	Production value (m€)	Growth rate (%) (period)	Total purchases of goods and services (m€)	Growth rate (%) (period)	Employees (full time equivalent units)	Growth rate (%) (period)	Value added/product ion value (%)		
France	2000	235	90 415	(2000-2008) -44,9%	81 419	(2000-2008) -7,0%	143 154	(2000-2008) 6,3%	13,1		
	2009	141	36 666		61 060		97 769		18,1		
	2012	182	37 035	(2008-2012) -24,7%	69 652	(2008-2012) -6,0%	130 712	(2008-2012) -11,0%	19,4		
Germany	2000	175	156 621	(2000-2008) 37,5%	154 749	(2000-2008) 45,1%	521 376	(2000-2007) -7,7%	19,4		
	2009	164	172 920		181 299		464 929		16,9		
	2012	263	246 289	(2008-2012) 14,6%	246 957	(2008-2012) 10,1%	485 164	(2008-2012) 2,2%	22,3		
Spain	2000	132	32 530	(2000-2008) 3,4%	36 804	(2000-2008) -4,8%	82 517	(2000-2007) -18,2%	14,9		
	2009	164	27 420		27 940		53 461		13,2		
	2012	143	29 278	(2008-2012) -13,0%	29 279	(2008-2012) -16,3%	51 607	(2008-2012) -16,2%	13,0		
UK	2000	652	37 945	(2000-2008) 2,2%	40 428	(2000-2008) -5,7%	103 102	(2000-2008) -29,4%	15,1		
	2009	712	26 042		27 693		75 103		14,4		
	2012	640	46 896	(2008-2012) 21,0%	44 005	(2008-2012) 15,5%	61 876	(2008-2011) -17,6%	18,2		



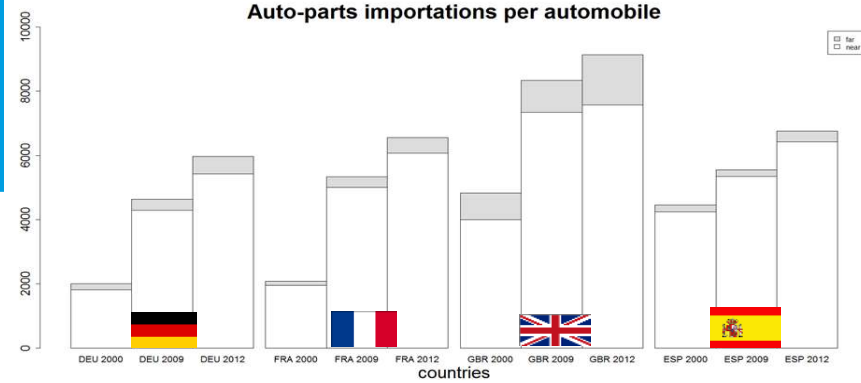
200-2008: DM343 - Manufacture of parts and accessories for motor vehicles and their engines

2008-2012: C293 - Manufacture of parts and accessories for motor vehicles

		Number of ent.	Production value (m€)	Growth rate (%)	Total purchases of goods and services (m€)	Growth rate (%)	Employees (full time equivalent units)	Growth rate (%)	Value added/product ion value (%)
France	2000	662	20 085	(2000-2008) -30,2%	16 282	(2000-2008) -27,7%	91 230	(2000-2007) -31,5%	23,8
	2009	564	13 922		11 131		62 824		23,3
	2012	703	18 341	(2008-2012) -10,5%	15 400	(2008-2012) -8,4%	76 945	(2008-2012) 0,4%	23,0
Germany	2000	946	10 355	(2000-2008) 31,1%	38 633	(2000-2008) 56,7%	280 242	(2000-2007) 8,6%	34,6
	2009	1 340	49 396		38 385		236 846		25,7
	2012	1 189	69 345	(2008-2012) 31,1%	53 235	(2008-2012) 1,3%	268 090	(2008-2012) 2,0%	27,9
Spain	2000	1 108	10 355	(2000-2008) -13,7%	7 633	(2000-2008) 44,5%	65 068	(2000-2007) -1,7%	29,1
	2009	1 093	13 314		10 565		64 329		23,1
	2012	884	15 187	(2008-2012) 3,1%	12 055	(2008-2012) -12,9%	61 257	2008-2012 -19,3%	23,1
UK	2000	1 451	14 064	(2000-2008) -23,2%	9 588	(2000-2008) -11,9%	98 586	(2000-2007) -33,2%	35,1
	2009	1 429	7 778		6 205		74 602		25,9
	2012	1 225	12 596	(2008-2012) -0,9%	9 139	(2008-2012) -5,8%	46 389	(2008-2011) -37,8%	28,6

Table. Exports-imports ratio.

Source: authors from Chelem database



	2000		2009		2012	
	near	far	near	far	near	far
DEU	1,602	4,076	1,264	5,762	1,087	7,434
FRA	1,525	4,082	1,246	3,451	1,357	3,956
ESP	0,590	1,709	0,688	2,775	0,701	3,430
GBR	0,617	0,981	0,429	1,013	0,335	0,779



Comparing evolution of per auto imports from different areas

- In order to compare the evolution of *per automobile* importation flows from zone i to country j and k (with $i = WLD, near, far$ and $j, k = DEU, FRA, GBR, ESP$), one can now define the *evolution comparison ratio*, noted $\delta_{t,t+l}^{i \rightarrow j/k}$ between the countries j and k

$$\rightarrow \delta_{t,t+l}^{i \rightarrow j/k} \equiv \frac{\frac{G_{t+l}^{i \rightarrow j}}{G_t^{i \rightarrow j}}}{\frac{G_{t+l}^{i \rightarrow k}}{G_t^{i \rightarrow k}}} = \frac{\frac{X_{t+l}^{i \rightarrow j}}{X_t^{i \rightarrow j}}}{\frac{X_{t+l}^{i \rightarrow k}}{X_t^{i \rightarrow k}}} \times \frac{\frac{y_t^j}{y_{t+l}^j}}{\frac{y_t^k}{y_{t+l}^k}}$$

- A ratio higher than 1 highlights that the number of auto-parts (per produced automobile) imported from zone i has risen faster in country j than in country k between periods t and $t + l$.

Table 5. Evolution comparison ratios of importations per produced automobile to Germany, France, United-Kingdom and Spain.

	$\delta_{2000,2012}^{i \rightarrow DEU / FRA}$	$\delta_{2000,2012}^{i \rightarrow DEU / GBR}$	$\delta_{2000,2012}^{i \rightarrow DEU / ESP}$	$\delta_{2000,2012}^{i \rightarrow FRA / GBR}$	$\delta_{2000,2012}^{i \rightarrow FRA / ESP}$	$\delta_{2000,2012}^{i \rightarrow GBR / ESP}$
<i>WLD</i>	0.949	1.578	1.285	1.663	1.355	0.814
<i>near</i>	0.968	1.584	1.290	1.637	1.333	0.815
<i>far</i>	0,735	1,514	1,246	2,061	1,695	0,823

Sources: data from OICA and Chelem, authors treatment

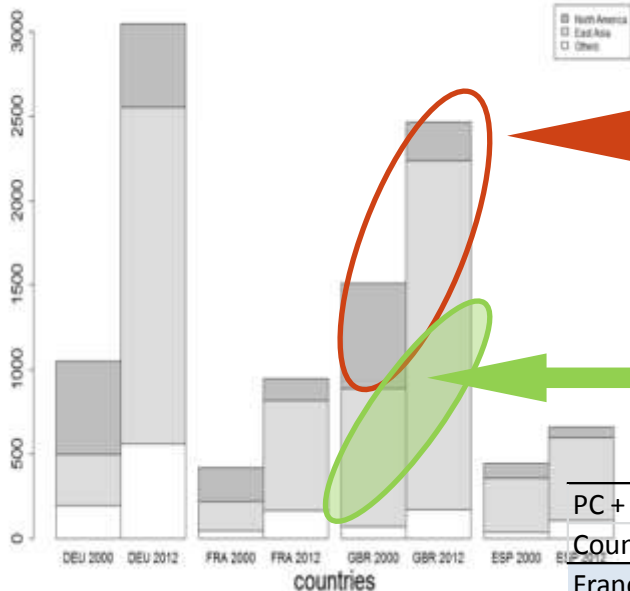
Far-distance imports progression ranking: FRA > DEU > ESP > GBR
Near-distance imports progression ranking: DEU > FRA > ESP > GBR
Total imports progression ranking: FRA > DEU > ESP > GBR

in 2000, 1.88% of French auto-parts imports came from Japan; in 2012, Japanese importations accounted for 3.13%

FRA > DEU > ESP > GBR

PC + LCV		Total produc	Domestic	Foreign	Foreign... of which		
Country	Year	Units	%	%	Asia	Europe	America
France	2000	3281336	95,3%	4,7%	0,0%	4,7%	0,0%
	2009	2018176	82,6%	17,4%	10,3%	6,9%	0,2%
	2012	1968328	83,7%	16,3%	10,2%	6,1%	0,0%
Germany	2000	5029041	75,5%	24,5%	0,0%	0,0%	24,5%
	2009	5131067	75,5%	24,5%	0,0%	0,0%	24,5%
	2012	5648267	80,9%	19,1%	0,0%	0,0%	19,1%
Spain	2000	2957973	0,0%	100%	5,6%	70,1%	24,3%
	2009	2187798	0,0%	100%	2,4%	68,3%	29,3%
	2012	2002721	0,0%	100%	7,1%	72,1%	20,7%
UK	2000	1609288	0,0%	100%	35,7%	11,8%	52,6%
	2009	870544	0,0%	100%	67,3%	17,8%	14,9%
	2012	1561031	0,0%	100%	73,9%	14,7%	11,4%

Far-distance importations



PC + LCV		Total produc	Domestic	Foreign	Foreign... of which		
Country	Year	Units	%	%	Asia	Europe	America
France	2000	3281336	95,3%	4,7%	0,0%	4,7%	0,0%
	2009	2018176	82,6%	17,4%	10,3%	6,9%	0,2%
	2012	1968328	83,7%	16,3%	10,2%	6,1%	0,0%
Germany	2000	5029041	75,5%	24,5%	0,0%	0,0%	24,5%
	2009	5131067	75,5%	24,5%	0,0%	0,0%	24,5%
	2012	5648267	80,9%	19,1%	0,0%	0,0%	19,1%
Spain	2000	2957973	0,0%	100%	5,6%	70,1%	24,3%
	2009	2187798	0,0%	100%	2,4%	68,3%	29,3%
	2012	2002721	0,0%	100%	7,1%	72,1%	20,7%
UK	2000	1609288	0,0%	100%	35,7%	11,8%	52,6%
	2009	870544	0,0%	100%	67,3%	17,8%	14,9%
	2012	1561031	0,0%	100%	73,9%	14,7%	11,4%



Conclusion - 1

- Germany imports a lot... but because Germany produces a lot of cars...
- UK is more imports-oriented (in relative terms), following by Spain and France
- But... catch-up process : France: sharp increase of imports per car in particular from far-distance countries
- But in Spain and UK: « slow » growth
- Origins fo far-away imports:
 - › Decline of imports from Americas...
 - › Increase from Asia (in particular China, but Japan still robust)
- Germany : specific role of Eastern countries (similar results with monographic studies)
- The persistent role of « national relationships »:
 - › UK : Japanese carmakers → imports from Japan by carmakers and Japanese mega-suppliers
 - › Decrease of American carmakers → explains a part of decrease of imports from Americas + location of American mega-suppliers in Europe

Conclusion

→ Three main conclusions

- › Macro-regional integration is still dominating in the auto industry
- › Globalisation (inter-continental exchanges) is more related to specific bilateral relationships (location of a foreign carmakers, of their mega-suppliers...)
- › Even if some components are coming from specific far-away countries (China + Japan, “core in the networks”)

Alessia Amighini
and
Sara Gorgoni,

*The international
reorganization of
auto production:
dynamics of
multinational
networks*

Thank you!

→ Analytic conclusion:

- › Our method confirms the monographic studies of GPN
- › GPN a useful framework in order to understand the trade pattern (give some 'real life' to the 'abstract' data)
- › We can explain the persistent heterogeneity of *trade patterns* – of our 4 studied countries
 - *No real convergence... except an increasing use of importations (international fragmentation of production)*
 - *... despite individual evolution*

→ Further researches:

- › More precise data: from Chelem 'auto-parts' category to individual parts (macro-components, meso-components, components)