Factory-free Europe? A two unbundlings perspective on Europe's 20th century manufacturing miracle and 21st century manufacturing malaise

Richard Baldwin
Graduate Institute, Geneva and Oxford University

1. Introduction

For a century, textile mills were abundant in the US state of South Carolina. Jobs were plentiful for high-and low-skill workers alike. This is no longer true (Davidson 2012). South Carolina low-skill workers are fighting robots at home and China abroad. The battle is not going well. Digitally-assisted manufacturing transformed South Carolina textile mills into nearly autonomous, computer-run machines. The telling local joke is that a modern textile mill employs only a man and a dog. The man is there to feed the dog, and the dog is there to keep people away from the machines.

Manufacturing is bifurcating. Stages of production that stay in the US employ a few high-skilled workers and lots of technology. Low-skill occupations are packed up into stages and offshored to low-wage nations, or automatized. Things have not yet gone so far in Europe, but the trend is clear. Europe's postwar manufacturing miracle has turned into the 21st century manufacturing malaise.

This malaise evokes an understandable nostalgia from policymakers, social activists and analysts. In 1950, a fifth of Europeans worked on farms, incomes were low, and social services were meagre. By the 1973 oil shock, Europe was transformed. Postwar hunger, dislocation and destruction were replaced by mass consumerism and middle-class affluence. Europe's cradle-to-grave social policy was the envy of the world. All this was closely correlated with Europe's manufacturing miracle. Industrial output rose faster than national incomes and industrial exports grew faster than either (Crafts and Toniolo 1996).

Many take this manufacturing-prosperity correlation as causal and seem determined to fight Europe's current malaise by fostering European manufacturing. It worked for the post-war generation, why can't it work for the post-Crisis generation?

This paper suggests a stark answer: Manufacturing cannot play the role today that it did in the postwar years for one simple reason. The nature of globalisation changed.

1.1. Globalisation and manufacturing changed

For a century and a half, globalisation was driven by lower trade costs that separated production and consumption internationally while clustering it locally into factories. I call this globalisation's 1st unbundling.[1]

Freer trade allowed Europe to exploit its comparative advantage in high-end manufacturing. Europe's industrial wages were high, but it was globally competitive since the technology gap more than offset the wage gap. Growing production fostered innovation and agglomeration which boosted European competitiveness thus feeding a virtuous helix of production, innovation and employment. The opposite happened in poor nations. This is why

[1] See Baldwin (2008) for the original presentation of the two-unbundlings view of globalisation.

the 1st unbundling saw the 'North' industrialise and the 'South' deindustrialise with most of the action coming before WWI (Table 1).

Table 1: Per Capita Industrialisation Levels, 1759-1913.

(UK in 1900 = 100)	***1750***	***1800***	***1830***	***1860***	***1880***	***1900***	***1913***
Developed Countries	*8*	*8*	*11*	*16*	*24*	*35*	*55*
Europe	*8*	*8*	*11*	*17*	*23*	*33*	*45*
Europe (ex-UK)	7	8	9	14	21	36	57
Austria-Hungary	7	7	8	11	15	23	32
Belgium	9	10	14	28	43	56	88
France	9	9	12	20	28	39	59
Germany	8	8	9	15	25	52	85
Italy	8	8	8	10	12	17	26
Russia	6	6	7	8	10	15	20
Spain	7	7	8	11	14	19	22
Sweden	7	8	9	15	24	41	67
Switzerland	7	10	16	26	39	67	87
UK	10	16	25	64	87	100	115
Outside Europe	*7*	*7*	*11*	*17*	*33*	*63*	*116*
Canada		5	6	7	10	24	46
USA	4	9	14	21	38	69	126
Japan	7	7	8	7	9	12	20
Third World	*7*	*6*	*6*	*4*	*3*	*2*	*2*
China	8	6	6	4	4	3	3
India-Pakistan	7	6	6	3	2	1	2
Brazil				4	4	5	7
Mexico				5	4	5	7
World	*7*	*6*	*7*	*7*	*9*	*14*	*21*

Source: Table 9, Bairoch (1982).

This changed from the late 1980s, when globalisation began to be driven by the ICT revolution rather than lower trade costs (Baldwin 2006). Cheaper, surer and more ubiquitous communication made it feasible to organise complex manufacturing processes at distance. Globalisation's '2nd unbundling' involves the unbundling of Europe's factories in two ways: fractionalisation and dispersion. Manufacturing processes fractionalised of into finer stages of production – many of which had more extreme factor-intensities. Given vast wage differences, many of the unbundled stages shifted to low-wage nations – along with generous doses of European technology. This explains why the 2nd unbundling saw Northern de-industrialisation and Southern industrialisation – just the reverse of the 1st unbundling.

The deep economic fundamentals of this tectonic shift are twofold:

- The heightened international mobility of European technical, managerial and marketing know-how; and
- The fact that know-how is firm-specific rather than nation-specific.

During the 1st unbundling, European workers and European technology were on the same team. Globalisation's 2nd unbundling split up the European labour-technology team.

Before the ICT revolution, high European wages were more than offset by high productivity in skill-intensive stages. While productivity did not offset high wages in low-skill stages, the team as a whole was competitive globally. The ICT revolution made it feasible to spatially unbundling the team. It gave European manufacturers the option of leveraging their firm-specific know-how with high-wage labour at home for some stages and low-wage labour abroad for other.

- In this sense, European manufacturing continues to flourish – at least when one defines 'European' in terms of know-how rather than the location of factories and passports of the workers.

Recombining European technology with low-wage labour is the key. European policy choices mean that low-skill labour cannot move to the technology, so the technology moves to the labour. This outcome has many monikers – offshoring, fragmentation, vertical specialisation, production unbundling, production sharing, global value chains, etc. A similar phenomenon happened during the prewar phase of globalisation's 1st unbundling but then the recombination involved European labour going to New World land.

1.2. Prima facie evidence of the changes

Globalisation's 2nd unbundling had radically different effects compared to the 1st, as Figure 1 shows. During the 1st unbundling, G7 nations saw their share of world GDP soar from a fifth in 1820 to two-thirds by 1990. From about 1990, the G7's shares dropped to under 50% -- about where it was 110 years ago.

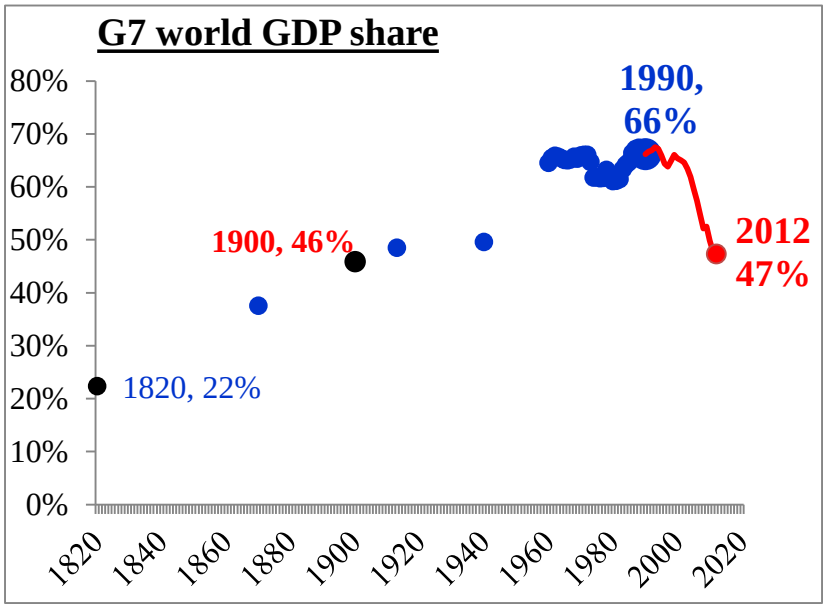


Figure 1: Globalisation: One paradigm or two?

Source: Maddison's database and WTO database.

As Figure 2 shows, the absolute number of manufacturing jobs has fallen in developed economy since globalisation's 2nd unbundling (Figure 2, left panel) and manufacturing's share of jobs fallen steadily since 1970. Globalisation has been only part of the reason for this job loss. Debande (2006) notes that expenditure shifts towards services has pulled labour out of manufacturing[2] just as rapid productivity growth reduced the need for workers at any given level of output. Schott (2012)

[2] Being non-traded, prices and wages adjust until enough local labour is pulled into these sectors to meet local demand. Given that there is so little labour left in agriculture, the shift to services necessarily comes at the expense of industry.

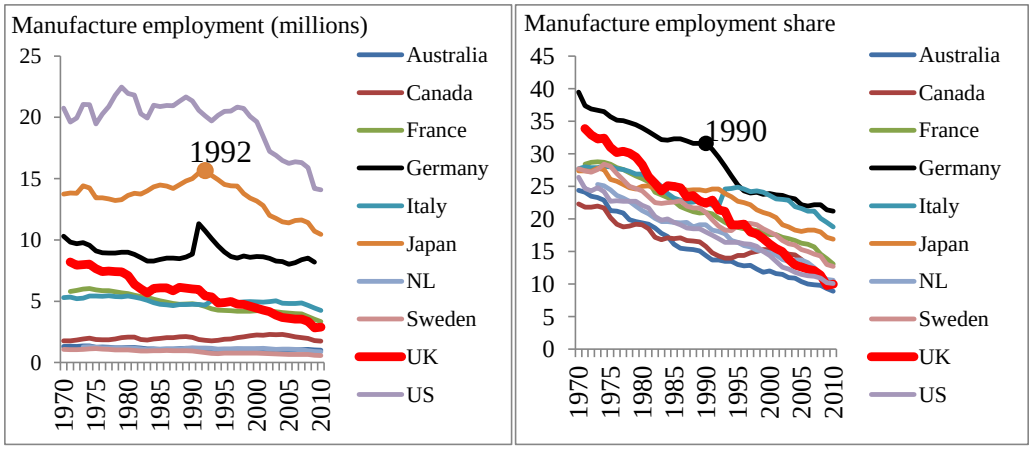


Figure 2: Number and share of employment in manufacturing, rich nations, 1970-2010

Source: US Bureaus of Labor Statistics online data.

European manufactures' position has also slipped – gradually during the 1st unbundling and rapidly since the 2nd (Figure 3, left panel). Europe lost five percentage point in the two decades following 1970, but more than twice that during the two decades following 1990. The chart also shows that the trend is shared by the G7 nations as a whole – this is not a Europe-specific phenomenon. The right panel zooms in on the five biggest European manufacturers, showing how all have lost global market share.

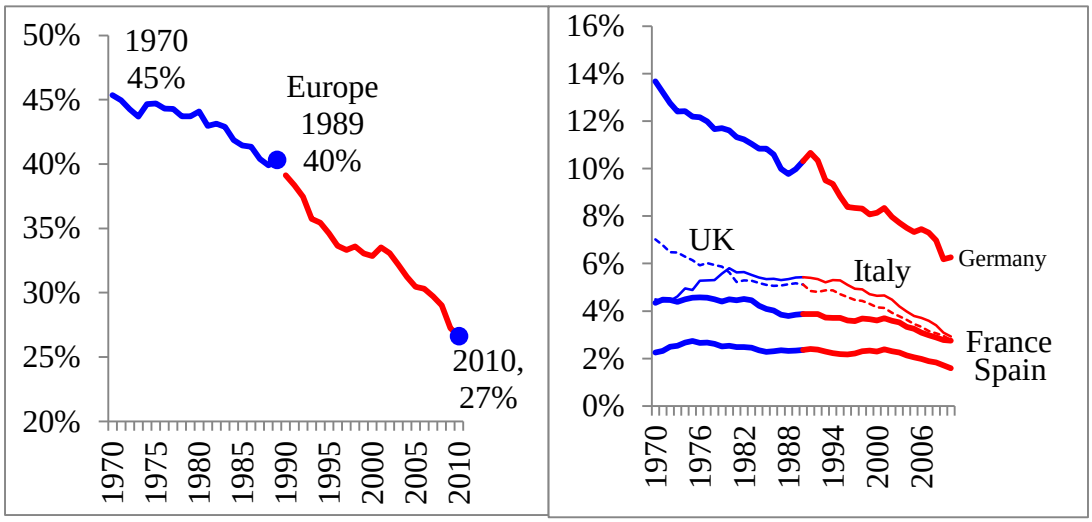


Figure 3: European shares of global manufacturing, 1970-2010.

Source: unstats.un.org

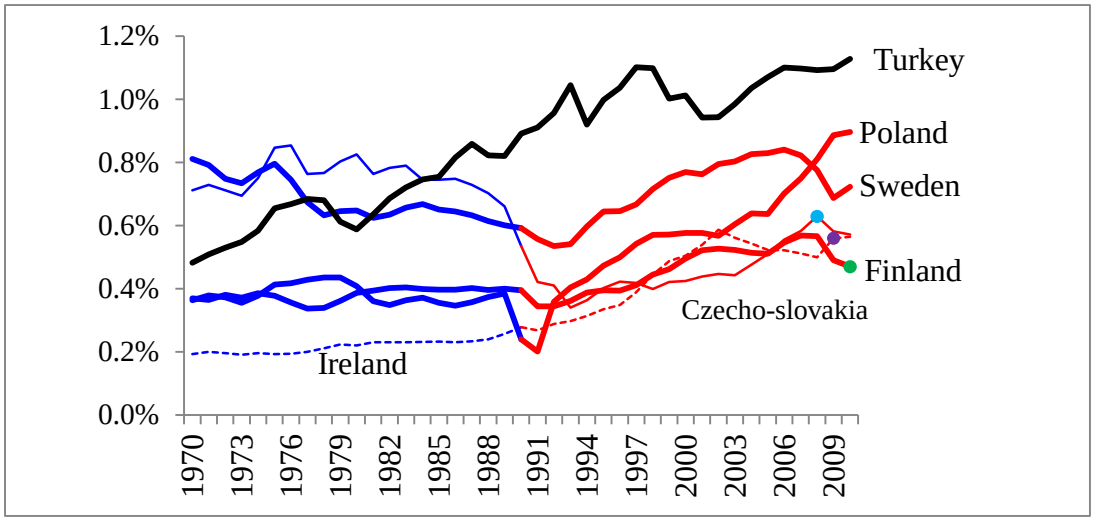


Figure 4: European share winners in manufacturing, 1970-2010.

Source: unstats.un.org

Europe's manufacturing malaise is not universal as Figure 4 shows. Poland has seen a very important industrialisation during the 2nd unbundling as have the Czech and Slovak Republics and Ireland. Sweden and Finland have also managed to counter the general advanced nation deindustrialisation trend. For all of these apart from Turkey, an infliction point of sorts seems to occur around 1990. Note that all these nations are part of the German supply chain (as we document below) except Ireland, which is heavily involved in the British and US supply chains.

1.3. Plan of the paper

The next two sections look at the 1st and 2nd unbundlings in more detail to explain how the first fostered the European manufacturing miracle while the second fostered manufacturing malaise. The subsequent section looks ahead with conjectures on how on-going globalisation is likely to impact European manufacturing. The final section presents my concluding remarks.

2. Globalisation's 1st unbundling

Before turning to details of globalisation's 1st and 2nd unbundlings and their economic logic, we briefly set the stage by considering the pre-globalised world.

2.1. The pre-globalisation world

Since the rise of agriculture, the costs of moving goods, ideas and people forced a geographic "bundling" of production and consumption. Long distance trade did exist, but it was only for exotic items with high value to weight ratios. Every village made almost everything it consumed. Since most humans were engaged in subsistence agriculture, the world's economic geography was quite homogenous. The world really was 'flat' from an economic perspective, apart from a few cities.

The pre-industrialised world had no factories. This dampened innovation on both the demand side and supply side. A brilliant idea meant little if it was only applied on a very local scale so demand was modest. Innovation flourishes when many people look at similar problems from dissimilar angles, so spatially separating problem-solvers hinders the supply of innovations. In the pre-industrial world, there was little technological progress – certainly nothing like the sustained rise in productivity that drives modern growth.

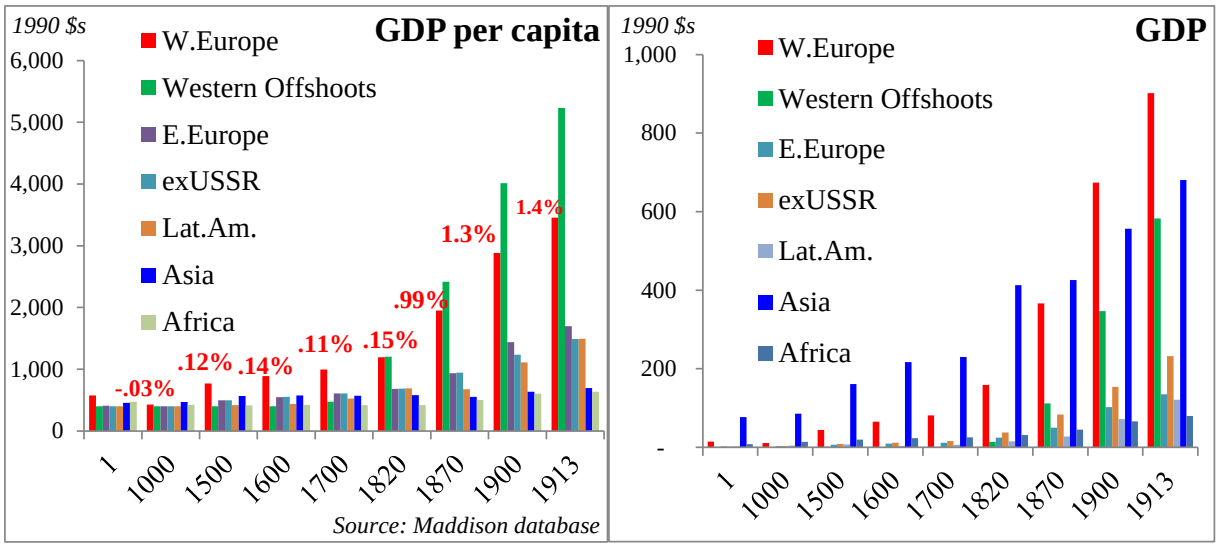


Figure 5: GDP and GDP per capita from year 1 to 1913, various regions.

As Figure 5 shows, there was virtually zero per capita income growth until the second millennium (West European annual growth rates shown above bars in left panel). Growth started only in Western Europe – basically after the Black Plague (Findlay and O'Rourke 2007). Until the industrial revolution, growth remained at zero in most of the world and a pitiful tenth of a percent even in Western Europe. Up until the late 19th century, Asia was by far the largest economic massive given its population. In the pre-globalised world, however, the size of the market mattered little as so little of it was accessible to all but the most local producers.

2.2. Production and consumption unbundle spatially

Improvements in shipping technology, especially steam power, released the world from the shackles of 'village economics'. Railroads and steamships radically lowered transport costs

thus making it feasible to spatially separate production and consumption (O'Rourke and Williamson 1999 Chapter 3). Scale economies and comparative advantage made separation profitable. International trade boomed as production shifted internationally towards the most cost-effective locations. As production dispersed internationally, it concentrated locally into large-scale factories with these gathering in industrial districts. Consumption clustered into ever-larger cities. This was globalisation's 1st unbundling.

Baldwin and Martin (1999) list the five central outcomes of globalisation's 1st bundling: (1) Industrialisation/De-industrialisation – the 'North' (Western Europe, Japan, the US, etc.) industrialised while South (especially India and China) de-industrialised (Bairoch 1982, Findlay and O'Rourke 2007); (2) International income divergence – North and South incomes diverged massively (Prichett 1997) as Figure 5 shows; (3) International Trade boomed (Jacks et al. 2011); (4) growth take-offs occurred (Rostow 1960); and (5) urbanisation accelerated in the North.

2.2.1. Northern industrialisation and Southern de-industrialisation

The Industrial Revolution was revolutionary but came from a century of incremental technical, organisational, social and institutional changes. The starting date 1776 provides as good a landmark as Crafts (1995) finds a structural break in the growth of British industrial production in 1776. Belgium was next – industrialising rapidly between 1820 and 1870 with France, Switzerland, Prussia and the US followed in the 1830s and 1840s. Russia, the Austria-Hungarian Empire, Italy, Sweden, Canada and much of the rest of Europe came along during the end of the 1800s.

As the 19th century reached into its second half, new industries and production methods emerged. Thus began the so-called second industrial revolution. In sectors such as steel, chemicals, electrical goods and engineering products based on internal combustion engines, Germany and the US leapfrogged the UK. As Europe industrialised, the South deindustrialised (Kuznets 1965, p.20, Braudel 1984, Chaudhuri 1966). International trade

The rise of global trade during the industrial revolution has been widely documented (Findlay and O'Rourke 2007). Figure 6 shows the facts from 1870 onward along with two measures of the impact of the steam revolution on trade costs. The volume of trade expanded 328% over the whole period, with a noticeable acceleration from 1895 or so. On average, trade grew at about 4% per year. Trade costs came down from between 40% and 60%; this was enough to open up vast swaths of the world's land masses to international trade.

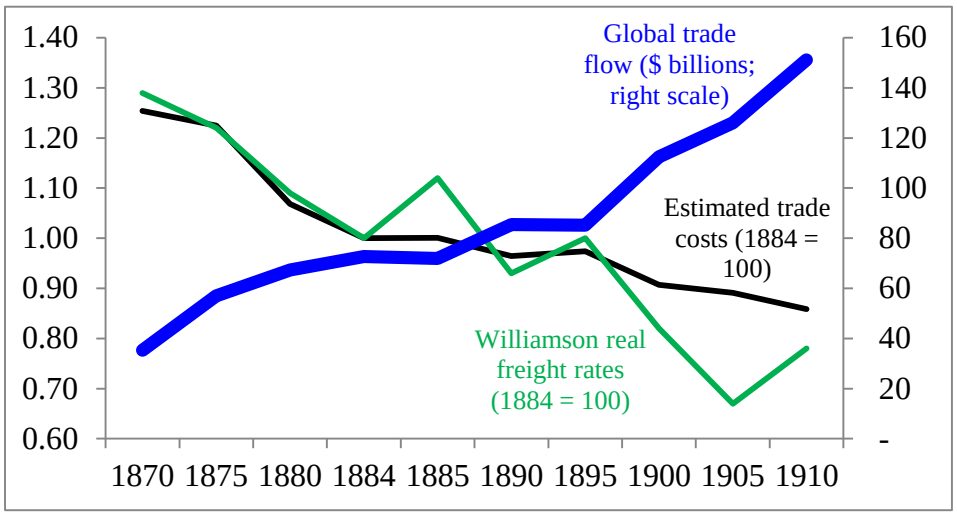


Figure 6: Trade costs and trade volumes, 1870 – 1910.

Source: Jacks et al. (2011), and Williamson and Mohammed (2004).

2.2.2. Urbanisation

While large cities had arisen at various times in history, up until the industrial revolution, no city grew larger than Rome was when the first millennium started. As Table 2 shows, western cities saw declining populations until the 18th century. Eastern cities reached their peak around the turn of the first millennium and then declined. They re-attained the year 1000 populations only in the 19th century. The key fact for our purposes is that the population in all cities began to rise with the 1st unbundling – not only those in rapidly industrialising nations.

Table 2: City sizes from year 1 to 1900 (populations in hundreds of thousands).

Year	Largest Western	Population	Largest Eastern	Population
1	Rome	1,000	Chang'an	500
200	Rome	800	Luoyang	120
400	Rome	500	Luoyang	150
600	Constantinople	125	Daxingcheng	250
800	Damascus	175	Chang'an	1,000
1000	Cordoba	200	Kaifeng	1,000
1200	Baghdad	250	Hangzhou	800
1100	Cairo	125	Nanjing	500
1000	Constantinople	100	Beijing	600
900	Constantinople	400	Beijing	700
1700	London	600	Beijing	650
1800	London	900	Beijing	1,100
1900	London	6,600	Tokyo	1,750

Source: Morris (2010), Table A.2.

2.3. Economics of the 1st unbundling[3]

The economic logic of the globalisation's 1st unbundling is best understood with a combination of the new economic geography (Krugman 1991a, b, Venables 1996) and endogenous growth theory (Romer 1986, 1990; Lucas 1988; Aghion and Howitts 1991).

To describe the fundamental economic logic as cleanly as possible, we explain the economics a highly simplified economy. There are two nations – North and South – that are identical ex ante, i.e. in the pre-globalised, pre-industrial era. The first task is to consider the 'new economic geography' of the industrial revolution and its association with trade costs. The basic argument is from Krugman and Venables (1995).

2.3.1. NEG forces: Agglomeration and dispersion

The focus of the new economic geography (NEG) is on firms' location decisions. These decisions rest on the balance of two sets of forces – dispersion forces and agglomeration forces.

Dispersion forces favour the geographic dispersion to avoid some sort of congestion broadly defined. The key, global-level dispersion force is local competition, i.e. that firms would,

[3] This section draws heavily on Baldwin, Martin and Ottaviano (2001) and Baldwin and Forslid (2000).

ceteris paribus, prefer to put trade costs between them and the bulk of their competitors. Agglomeration forces favour spatial clustering. While there are many such forces most only operate on a very local scale (like the knowledge spillovers) and are thus not relevant to explaining the 1st unbundling's global pattern of industrialisation and deindustrialisation.

Note in a somewhat dated terminology demand and supply linkages are called 'backward and forward linkages'. The two key agglomeration forces are supply-side and demand-side circular causality. Demand-linked circular causality is driven by market size. Firms want to locate where they have good access to customers to reduce selling costs. But since firms buy inputs from other firms and attract workers who spend locally, firm relocation feeds back into market size. The causality is thus circular. The second agglomeration force involves 'supply linkages'. Firms operating at industrial scales buy many inputs from other firms, so locating near an industrial cluster reduces the cost of inputs (avoids transportation costs). The causality becomes circular since each new firm offers its supply and thus lowers the production cost of the location.

Starting from very high, pre-steam power trade costs, a gradual reduction of transportation costs erodes both the agglomeration forces and the dispersion forces – place begins to matter less. In a wide class of models, dispersion forces start out stronger than agglomeration forces, so the symmetric equilibrium is stable, but improved transportation erodes the dispersion forces faster. As a result, there is a threshold level of trade costs below which all industry moves to one region or the other. As history would have it, this was the North, even though the South was larger economically when taken as a whole (Figure 5).

This explains three of our facts: industrialisation of the North, deindustrialisation of the South and the boom in trade as the South focuses on exporting primary goods and the North on manufacturers. Within each region this sort of 'punctuated equilibrium' time path would appear as a sweeping inter-sectoral resource shift not unlike the observed during the Industrial Revolution.

2.3.2. Growth take-off with endogenous growth theory

This agglomeration of industry surely localised knowledge spillovers. As per the endogenous growth literature extenuating such spillovers is pro-growth.

Virtually all endogenous growth models posit technological externalities that offset that prevents the return to further investments from falling as the human, physical, and/or knowledge capital stocks rise. Indeed, Rosenberg (1994), Macer (1993) and Crafts (1995) explicitly stress the importance of localized cumulative learning processes in their accounts of the Industrial Revolution.

Baldwin, Martin and Ottaviano (2001) show how combining these two sets of lessons can produce a two-region model in which the gradual, exogenous lowering of trade costs driven by lower transportation and communication costs as well as by market opening initiatives can produce three stages of growth.

- In the first stage with high trade costs, gradual improvements in transportation technology boost trade gradually. Growth may be positive, in 'village economy' setting but low since the geographical dispersion of industry hinders the externalities essential to innovation.
- In the middle stage when trade costs have just entered the 'catastrophic' region, industrial agglomeration occurs very rapidly. This industrialization triggers a take-off in North and stagnation in South.

The agglomeration of industry and growth bifurcation produces a massive income divergence that continues until the industrial saturation point is reached in the North.

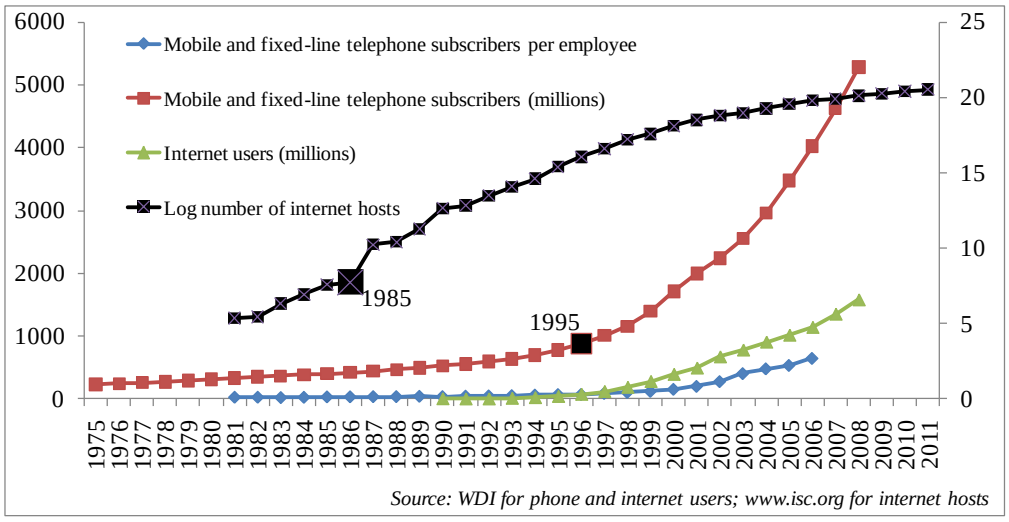
- In the third stage, high growth becomes stable and self-sustaining in both regions, but the income divergence persists.

The Baldwin-Martin-Ottaviano model captures elements of the classic analyses by Kuznets and Rostow. Kuznets (1966) divides growth into two types: traditional growth (pre-1750) and modern economic growth (post-1750). The distinctive feature of modern growth, according to Kuznets, is the rapidity of the shifts in industrial structure (he talks of sweeping structural changes) and their magnitude when cumulated over decades. Rostow (1960) goes further, identifying five stages in economic growth: the traditional society, the preconditions for take-off, the take-off, the drive to maturity and the age of high mass-consumption. The take-off can be traced to a sharp stimulus, Rostow asserts, and he lists a number of these, including one that hinges on lower trade costs. The take-off, "may come about through a technological (including transport) innovation which sets in motion a chain of secondary expansion in modern sectors and has powerful potential external economy effects which the society exploits." (Rostow 1960, p.36). Rostow also lists three conditions for a take-off: a rising investment rate, rapid expansion of one or more industrial sectors marked by external economies, and rapid emergence of structures that are necessary for self-sustaining growth.

3. The 2nd unbundling

The ICT revolution was the exogenous shock that changed globalisation. It started sometime between 1985 and 1995.Starting in the mid-1980s, telecommunications became cheaper and surer. The price of telephone calls plummeted, faxes became standard, cellular phone usage exploded, and the telecommunication network became denser, more reliable and cheaper. Two other trends interacted with cheaper communication costs – the spectacular fall in the price of computing power (Moore's Law) and the equally spectacular rise in fibre optic transmission rates (Gilder's Law). Long-distance information sharing was revolutionised as these developments in telecoms were complemented by the rise of the internet – first email and then web-based platforms.

Figure 7: Growth of global internet hosts and phone lines, 1975 – 2011.



The telecom and internet revolutions triggered a suite of information-management innovations that made it easier, cheaper, faster, and safer to coordinate complex activities at distance. Email, editable files (*.xls, *.doc, etc), and more specialised web-based coordination software packages revolutionised peoples' ability to manage multifaceted procedures across great distances. Working methods and product designs also shifted to make production more modular and thus easier to coordinate at distance. Stages of production that previously had to be performed in close proximity – within walking distance to facilitate face-to-face coordinate of innumerable small glitches – could now be dispersed without an enormous drop in efficiency or timeliness. Collectively, this is known as the ICT revolution.

Figure 7, which displays several ICT, indicators, shows that there was an inflection point in the growth of internet hosts in 1985 and in telephone subscribers in 1995. This suggests that the coordination glue began to weaken sometime between 1985 and 1995.

3.1. Globalisation's 2nd unbundling is different: Stylized facts

At about the same time as the G7's share of global income tanked, international commerce changed. While supply-chain trade among rich nations has long been important (US-Canada and intra-EU), from the late 1980s it boomed between high-tech and low-wage nations. Figure 8 illustrates the timing with two proxies for supply-chain trade – a 'vertical

specialisation' index and partner-wise intra-industry trade indices. These changes have been widely noted.[4]

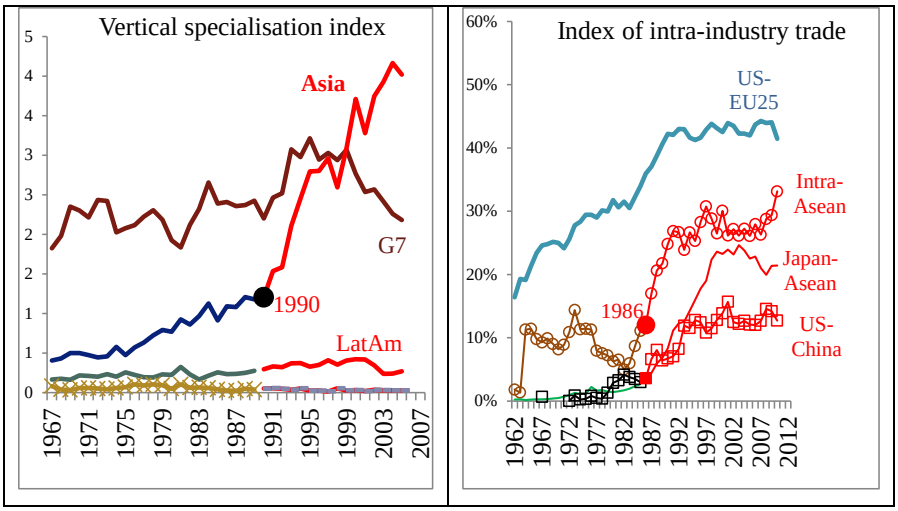
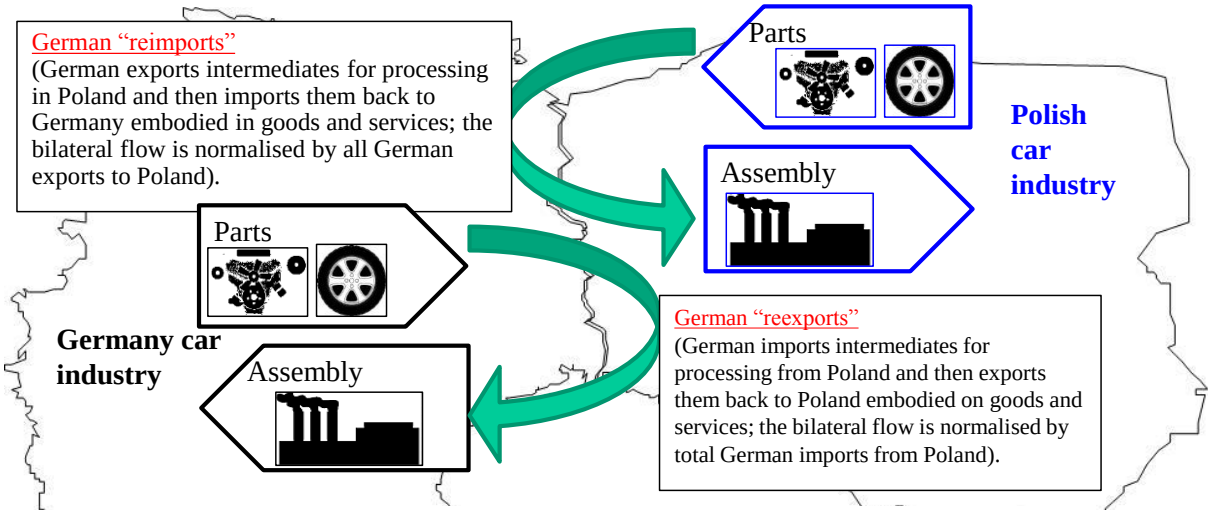


Figure 8: Indirect measures of supply-chain trade from 1960s

Source: left: Amador and Cabral (2006); right: Brülhart (2009); adapted from Baldwin and Lopez-Gonzales (2012).

A more direct measure of supply-chain trade is so-called reimport/reexports. This measures the back-and-forth trade that is common in offshoring relationships where one nation is sending parts to another for processing and then bringing them back for further processing or consumption as illustrated by Figure 9.



NB: German "reimports" are Canadian "reexports" but with different normalisations.

Figure 9: Schematic illustration of reimporting and reexporting supply-chain trade

Source: Adapted from Baldwin and Lopez-Gonzales (2012).

The offshoring revolution has also created what could be called Factory Europe – mostly around Germany. The pattern is of reimporting/reexporting between a high-tech hub and low-

[4] The mid1980s structural break has been shown by many (Dallas Fed 2002, Feenstra and Hanson 1996, Ando and Kimura 2005, Fukao, Ishito, and Ito, 2003) and the trade changes by many others (Hummels, Ishii, and Yi 2001, Yi 2003, Bems, Johnson, and Yi 2010, Koopman, Powers, Wang, and Wei 2011, Johnson and Noguera 2012a,b).

wage spoke nations. Figure 10 shows the re-import and re-export pattern around Germany. The top left panel of shows that Germany does a great deal of supply-chain trade with its low-wage neighbours. But it also engages in this sort of trade with high-wage nations such as Austria, Netherlands and France (Baldwin and Lopez-Gonzales 2012). Notice the asymmetric relationships between Germany and its lower-wage neighbours. Germany re-imports from a wide range of nations, but Poland and the Czech Republic are mainly working with Germany.

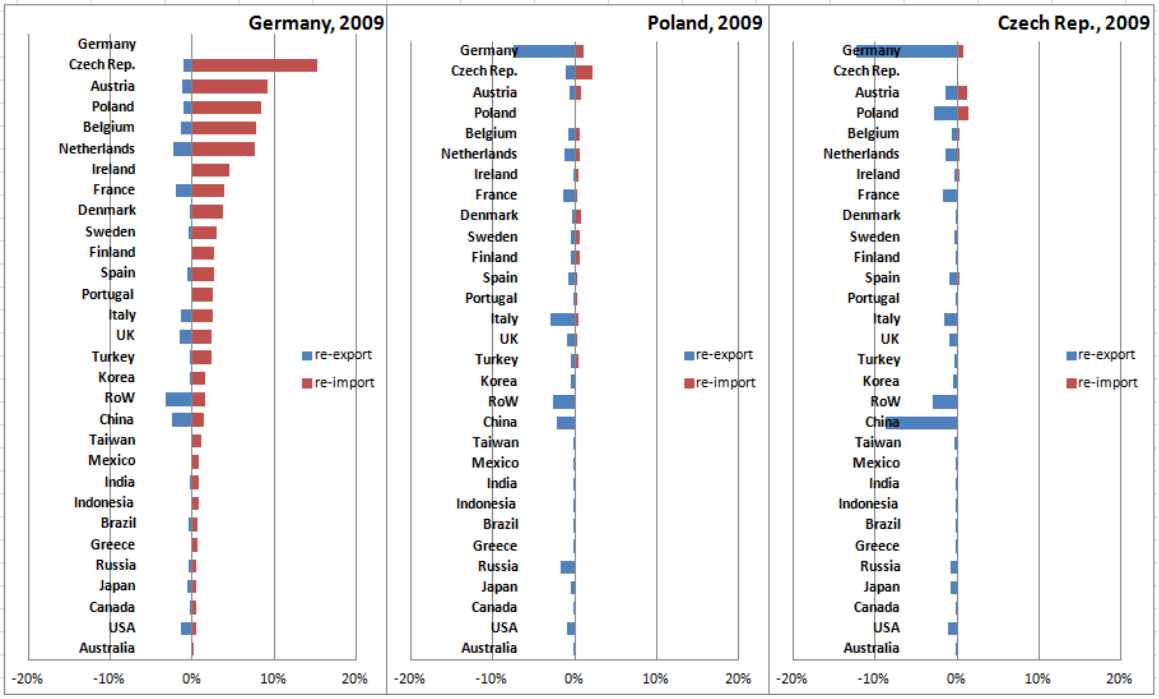


Figure 10: Factory Europe: Germany and low-wage factory economies, 2009.
Source: Baldwin and Lopez-Gonzales (2012).

In addition to Germany, which is one of the four global manufacturing giants (the others being China, the US and Japan), Europe has three other high-technology nations with large manufacturing sectors: Britain, France and Italy. Figure 11 shows their patterns drawn to the same scale as Germany's. We see immediately that these three nations have reimporting and reexporting patterns that clearly place them in the headquarter category – i.e. much more reimporting than reexporting – although Italy is a borderline case. The three reimporting patterns are not as diverse as Germany's. Moreover the overall importance of these with at least one partner is smaller in magnitude. It is also worth stressing that these three do some processing for Germany, but very little for each other. This suggests that there is a hub-and-spoke arrangement in Europe around Germany and the system includes the other headquarters economies as well as the factory economies (Lejour et al 2012a).

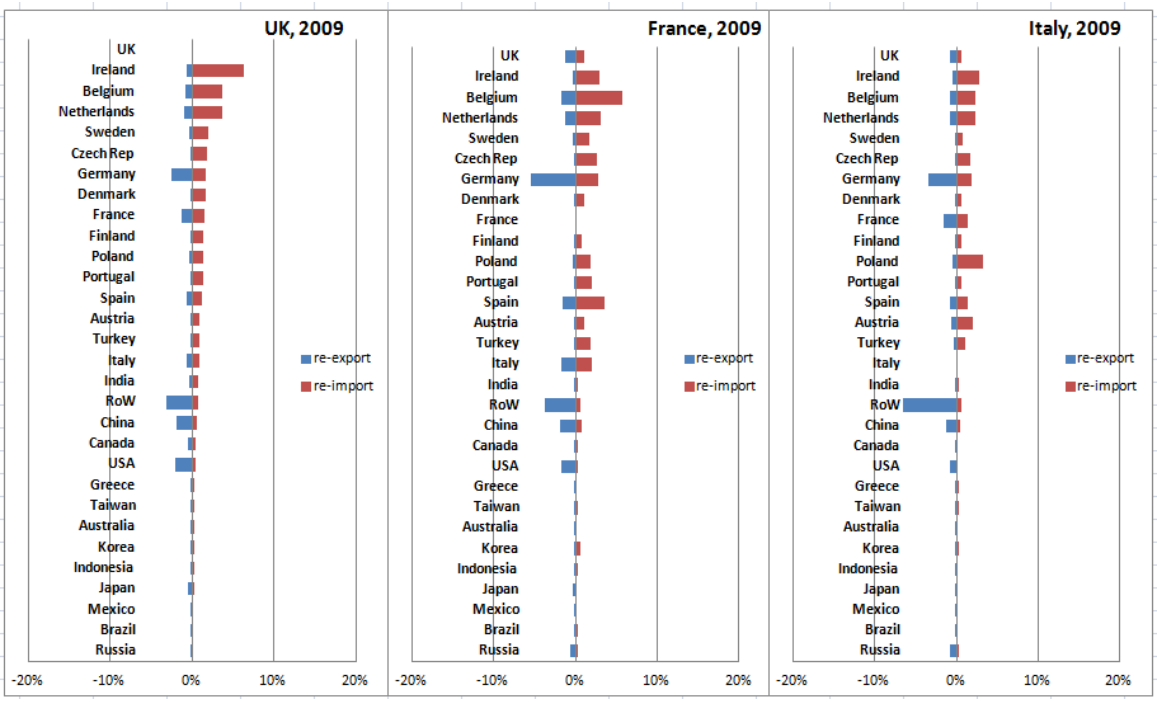


Figure 11: Reexporting/reimporting flows for UK, France and Italy, 2009.

Source: Baldwin and Lopez-Gonzales (2012).

Turning to the broader pattern of global manufacturing, we see that as the 2nd unbundling started, a handful of developing nations' saw their share of global manufacturing output soar. This was not a general trend – only 7 developing nations saw their share of global manufacturing rise by more than half a percentage point between 1990 and 2010. Most developing nations saw their shares decline or stagnate. Figure 12 (left panel) shows the nations whose share of global manufacturing GDP rose or fell by at least one percentage point. All the G7 nations lost shares since 1990 (middle panel) and all 'seven risers' saw their shares rise (right panel). Note that all the risers except perhaps India are near enough to join US, Japanese or German supply chains.

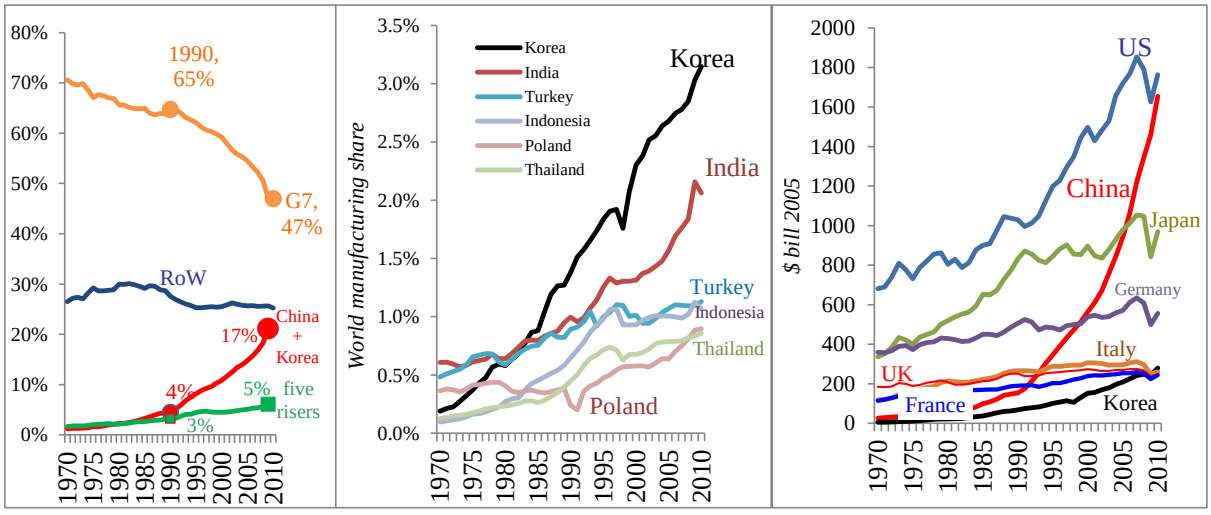


Figure 12: Seven risers and seven losers: Manufacturing reversal of fortunes

Source: UNSTAT.org; Note: Left panel show share of world manufacturing GDP, seven risers are China, Korea, India, Turkey, Indonesia, Thailand and Poland; seven losers are G7; middle panel plots global shares of 6 of the 7 risers; right panel shows manufacturing GDP (2005 USDs) of China and the G7.

The 2nd unbundling was also accompanied by radical changes in developing nation trade and investment policies. From the early post war days right up to the late 1980s, most developing nations eschewed trade liberalisation and viewed foreign investment as a ruse. They viewed protection of industry as just that – protecting industry. For most of them, this changed in the early 1990s. Openness that facilitated international production sharing was suddenly embraced by developing nations. As Figure 13 shows, they:

- Slashed tariffs unilaterally (left panel);
- Signed Bilateral Investment Treaties, which are mostly unilateral concessions to rich-nation firms seeking to invest (middle panel); and
- Signed a massive wave of RTAs with 'deep' provisions that are pro-supply-chain, e.g. assurances for intellectual property, capital movements, competition policy, business visas, etc. (right panel).

Importantly, this is not the 1970s and 1980s view of trade openness embraced by Singapore, Hong Kong and Taipei (lower tariffs, fewer quotas, etc.). This liberalisation wave included many measures traditionally viewed as purely domestic since joining a supply chain meant a much more thorough integration of the developing nation's economy with that of the headquarter nation directing the supply chain.

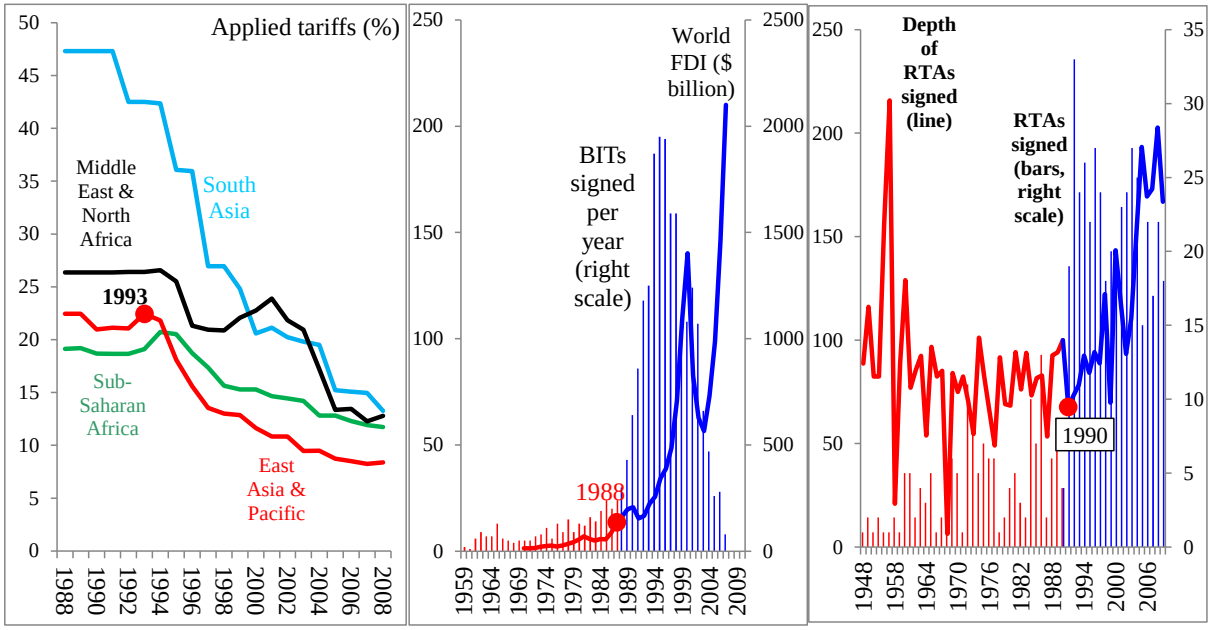


Figure 13: Take-off in BITs, FDI, unilateralism, and deep RTAs

Sources: Tariffs from World databank, WTO, BITs from ICSID, RTAs and depth from Duer et al (2012); adapted from Baldwin and Lopez-Gonzales (2012).

3.2. Economics of the 2nd unbundling[5]

Traditional trade economics focuses on simple, made-here-sold-there goods. The producing nation accounts for 100% of the export's value added, so exports can be thought of as a bundle of national technology and factors of production. There are two key points here as far as Europe's manufacturing miracle and malaise are concerned. During the 1st unbundling:

- Comparative advantage is conceptualised as a purely national concept.

[5] This section draws heavily on Baldwin (2012, 2013).

- Trade costs reductions allow nations to specialise in producing what they make best while importing the rest.

To put it differently, the 1st unbundling made it easier to buy and sell goods internationally. These two facts go a long way to explaining Europe's manufacturing miracle in the 19th and 20th centuries – at least if one adds in the agglomeration forces favouring Europe as a location for manufacturing.

The ICT revolution changed this. High-tech firms found it profitable to combine their firm-specific know-how with low-wage labour in developing nations. Simplifying to illustrate the point clearly, this is what turned Europe's manufacturing miracle into malaise. The malaise was not caused by problems with European manufacturing technology. It was caused by the way the 2nd unbundling allowed European firms to combine it with labour outside of Europe.

The fundamental change is that comparative advantage has become a multi-national concept. The competitiveness of a nation's exports depends upon the combination of several nations' technology, labour, capital, etc. Moreover, the location of 'comparative advantage' is under the control of the firms that own the know-how. Know-how was always the property of firms, but before the ICT revolution, it was hard to take it abroad. Observe that this is not technology transfer in the traditional sense. Firms go to great lengths to avoid transferring their firm-specific know-how to other firms be they domestic or foreign. Nevertheless, from the macro perspective it was as if some of the advanced nations' technology was moving to developing nations.

For the purposes of this paper, there are two main implications: (i) for the location of manufacturing jobs, and (ii) for developing nation growth. The economics of these are addressed in turn.

3.2.1. Implications for manufacturing jobs and location of value added

The recombination of technology and factors across nations comes in two forms.

- In its most direct form, 21st century trade involves high-tech firms from high-wage nations combining their managerial, marketing and technical know-how with low-wage labour in developing nations.

There are many names for this 'technology lending', foreign affiliates, joint ventures, contract manufacturing, offshoring, reimporting, export platforms, etc. A more indirect form of 21st century trade involves imported intermediates that embody foreign technology and productive factors.

- Here the recombination technology and factors across nations happens via the foreign know-how and factors embodied in imported parts and components (Jones 1980, Deardorff 2005).

In both the direct and indirect cases, comparative advantage becomes a multi-national concept.

We can more precisely illustrate the two aspects of production unbundling with two partial equilibrium diagrams. We start with the direct recombination and to set the stage, we show how the basic diagram can be used to elucidate how different the notion of comparative advantage is in the 1st and 2nd unbundlings.

To keep the analysis simple, consider a world where 'North' has better technology but higher wages than 'South'. The North's technology edge, however, outweighs its high-wage disadvantage, so North has a comparative advantage in the industry under study. We think of

this a generic manufacturing sector. The point of departure is the 1st unbundling where globalisation means relaxation of the transportation constraint.

Figure 14 helps organise the economic logic. The left and right panels show the South's and North's supply and demand curves using obvious notation. The middle panel shows world export supply and import demand curves (XS and MD). The initial situation with high trade costs is shown by the grey lines. The initial trade cost of 'T' drives a wedge between the price that the importing South pays – namely P' – and the price exporting North receives (P'-T).

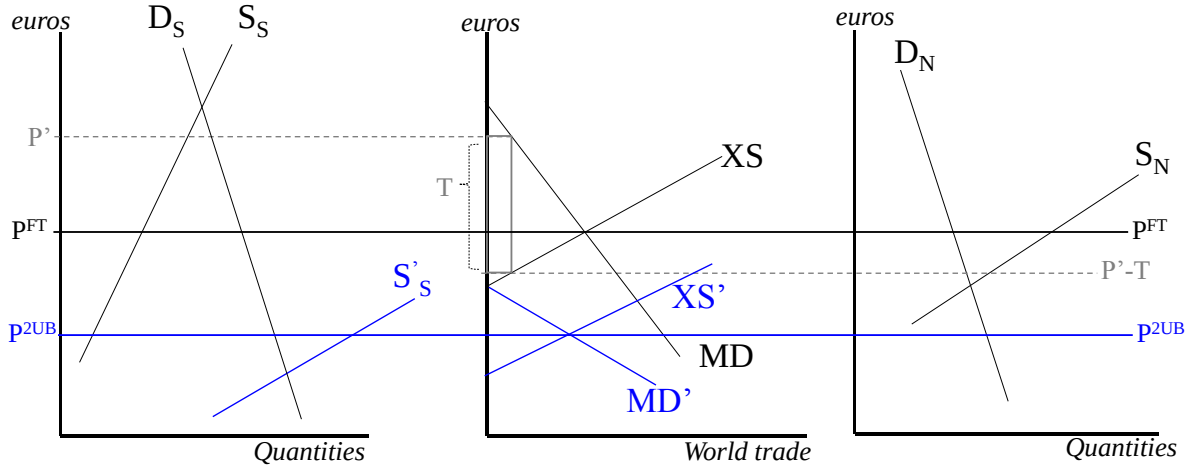


Figure 14: Comparative advantage in the 1st and 2nd unbundlings.
Source: Author's elaboration.

The 1st unbundling eliminates T, resulting in a convergence of prices on the free trade level shown as P^{FT}. This trade cost reduction allowed Northern firms to better exploit there comparative advantage by producing more and selling more of it to South. In aggregate, this would look like an industrialisation of the North and a deindustrialisation of the South. While this diagram does not admit such effects, the tendency was strengthened by agglomeration forces and knowledge spillovers as discussed above.

Now consider the impact of the 2nd unbundling starting from free trade in goods. The change we focus on is how the ICT revolution gives high-tech Northern firms the confidence to deploy their firm-specific know-how abroad. As it is now safe, high-tech firms combine their know-how with low-wage labour in South. The impact of this is a massive downward shift in South's supply curve.[6] The new Southern supply curve is shown as S_S'. Nothing happens to the North's supply curve as Northern production still uses North technology and North labour.

The main changes are:

- 'National' comparative advantages appear to flip.

The world price of manufactures drops to P^{2UB} and at this price North is an importer of manufactured goods rather than an exporter.

[6] Tecall that neoclassical supply curves are marginal cost curves, so high-tech plus low wages shifts S_S down massively.

- North appears to deindustrialise while South industrialise, but Northern firms' share of global production is maintained or increased, but with more of it in the South.

Next we turn to more indirect combinations of comparative advantage.

In the previous example, trade is only allowed in final goods. In the real world, production unbundling typically involves intermediate goods (Ando and Kimura 2005).[7] Here we present an illustration that allows for such considerations. To spotlight the indirect recombination, we revert to assuming that technology is immobile while trade in goods is perfectly free.

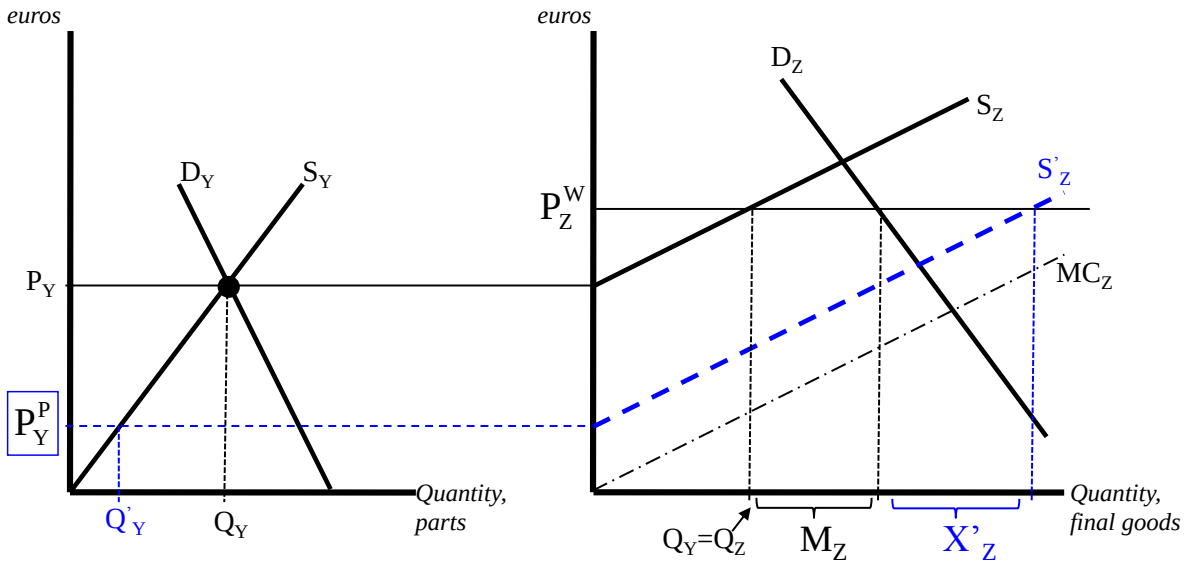


Figure 15: Supply-chain trade with intermediate goods and no technology lending.
Source: Author's elaboration.

In the pre-RTA world, all stages of production in both nations are bundled spatially into factories or industrial district to economise on communication and coordination costs. Exports have 100% local value added. The 2nd unbundling makes possible the two-way flows of goods, ideas and people need to support international production unbundling. When the various stages of production are performed in different nations, the downstream good becomes a multi-nation combination of technology and factors.

To illustrate simply, we allow for an upstream or intermediate good, Y, and a downstream good, Z (the mnemonic is that as Y comes before Z, so Y is upstream of Z). The linked diagrams (Figure 15) show the equilibrium in South for the upstream goods Y (left panel) and downstream good Z (right panel). Supply and demand curves are marked with S and D respectively with subscripts indicating the good. The input-output linkage is simple; one unit of Y is required for each unit of Z. In addition to the cost of the input Y, there is a marginal cost producing Z shown as MS_Z in the right diagram. The supply curve for Z is the vertical sum of MC_Z and the price of Y.

Before the 2nd unbundling, South must make its own Y locally since it is prohibitively expensive to undertake the production of Y and Z in separate nations (even though trade in goods is perfectly free). The idea here is that producing Y and Z requires continuous

[7] Also see Gereffi (2001) for early examples and the website http://www.globalvaluechains.org/ for abundant recent case studies.

coordination in the form of two-way flows of goods, ideas and people. Before the RTA, it is too expensive or too risky to attempt this coordination internationally. One of the things we have in mind is unreliable supply-chain logistics (express mail, air cargo), telecommunications, and business mobility (key managers and technicians moving to coordination Y and Z production). In short, firms cannot count of cheap and quick exchanges that are necessary to allow a Z factory in one nation to source its Y in another nation. As a result, the supply curve in Z is MC_Z plus the equilibrium price of P_Y. Note that South is producing Y and Z, however, given S_Z, South imports Z in an amount indicated as M_Z (right panel).

After the 2nd unbundling, supply-chain linkages become costless and perfectly reliable, so South can import Y from North at the price, P_Y^P. South starts to import Y, reducing its own Y production to Q'_Y. The lower price for Y lowers S_Z to S'_Z. The key effects are:

- South switches from importing Z to exporting it, and it starts to import Z.

Importantly, this new trade did not stem from trade liberalisation per se; there were no trade barriers before or after. The switch came from a relaxation of the coordination constraint, not the transportation constraint.

Although we have not shown North explicitly, it would be easy to draw a case where:

- North exports Z before the 2nd unbundling, but afterwards imports Z and exports Y.

This is a clear example of how foreign technology and factors embodied in the imported component can transform South's comparative advantage. New trade in Y is created and the South's pattern of trade in Z is reversed.

There is no mystery in this outcome. Before the 2nd unbundling, South had a latent comparative advantage in Z, but a latent comparative disadvantage in Y. The 2nd unbundling allows South to specialise in its comparative advantage sector.

3.2.2. Southern growth take off

A key feature of the 1st unbundling was the Northern growth take-off that was driven by the agglomeration of industry in the North and the resulting knowledge spillovers that accelerated technology innovation. The central pillar in this take-off story was the localised nation of knowledge spillovers. The 2nd unbundling – with its emphasis on the heightened international mobility of know-how – almost surely affects the extent to which pro-innovation knowledge spillovers are localised in the North. As per the endogenous growth theory, this should have growth implications.

When it comes to Southern growth, the 2nd unbundling has two conflict effects. The dispersion of manufacturing reduces the localisation of spillovers that sparked the 19th century growth take-offs. This effect would tend to lower the global steady state growth rate. The application of Northern technology in the South would directly boost Southern growth during the transition, and it is also likely to increase pro-innovation, and pro-imitation knowledge spillovers in the South. This effect would tend to boost Southern grow rates in transition.

Overall, the ICT revolution is clearly pro-growth for the South at least in the medium term, but the dispersion of manufacturing globally might lower global growth in the long run. The key is whether the reduced localisation of spillovers is sufficient to offset the anti-growth effects of the dispersion of manufacturing.

As Baldwin and Forslid (2000) show, lowering the barriers to the spatial diffusion of public knowledge is a powerful dispersion force when it comes to the location of manufacturing. To see this, we can draw a parameter space that allows for trade costs and knowledge spillovers to vary independently Figure 16.

The diagram works with two ex ante symmetric regions (North and South as usual) and it plots the 'freeness' of goods trade on the horizontal axis, and the freeness of knowledge spillovers on the vertical axis. The dashed curve shows the combinations of the two forms of freeness where an symmetric division of industry is a stable equilibrium. The dashed line is upward sloped since freer spillovers favour dispersion while free trade favours concentration of industry. The solid curve shows the 'sustain' points, i.e. the level of freeness where full agglomeration is the stable outcome. The northwest corner has dispersed industry; the southeast corner has clustered industry. To be concrete, the clustering occurs in the North if it is stable.

The idea here is that the 1st unbundling was dominated by the lowering of trade costs via better transportation technology (before WWI) and lower tariffs (after WWII) even though the development of international postal services, sub-sea telegraph cables, telephones and radios also freed up the flow of knowledge by making international communication cheaper. This pushes the world from a situation where dispersion was stable to one where clustering was stable. The 2nd unbundling saw the reverse emphasis, with communication costs falling much faster than trade costs. In the diagram, this is drawn as taking the world back into the disperse industry range of parameters.

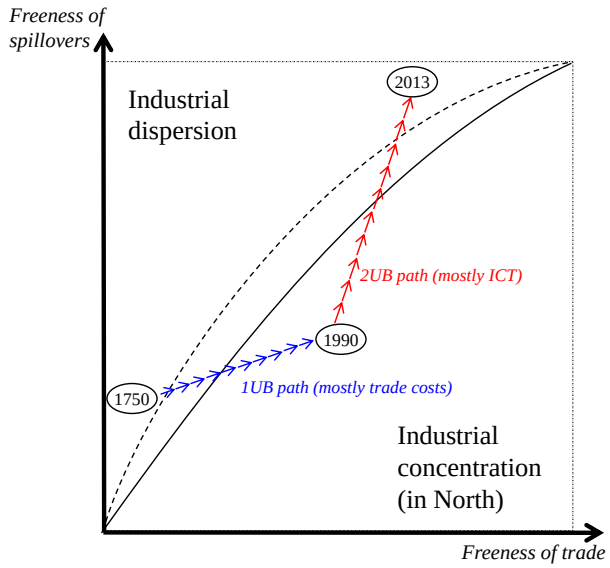


Figure 16: Stabilizing and Destabilizing Integration: 1st and 2nd unbundlings.

3.2.3. Urbanisation and trade volumes

The last bit of economics concerns the rising volume of trade and urbanisation. Both features among the key elements of the 1st unbundling and continue to be features of the 2nd.

There is no mystery where it comes to urbanisation. The Glaeser-forces that encouraged urbanisation during the 19th and 20th centuries continue to apply in the 21st century. Cities are still places where people meet and the drop in the cost of messages has not replaced the need for meetings. Indeed, there is a very close analogy with the income and substitution effects of canonical consumer theory. While the ICT revolution radically shifted the relative price of messages versus meetings, the rising in business activity that resulted increased the overall

need for meetings (Gaspar and Glaesner 1998). Moreover, good communication technology actually allowed great specialisation in service provision and thus raised the need for occasional face2face meetings. Empirical evidence is provided by De la Roca and Puga (2012).

The rise in trade is very naturally boosted by the 2nd unbundling as note by Yi (2003).

4. Factory-free Europe?

This section looks ahead to make conjectures about the future of manufacturing in Europe. Two analytic tools are useful in this context – the TOSP framework for thinking about the implications of future ICT advances, and the 'smile curve' that helps integrate the likely outcomes with developments to date.

4.1. The TOSP framework[8]

As ICT improves, the unbundling of European factories will continue. But what will this mean for manufacturing jobs and value added in Europe?

The economics of this change is best looked at by decomposing the 2nd unbundling into two phenomena: fractionalisation of production into stages, and international dispersion of stages.

4.1.1. Fractionalisation of the manufacturing process

Think of the supply chain at four levels of aggregation (Figure 17).At the base is the full list of everything that must be done to get the product into consumers' hands and provide them with associated after-sales services. Following Grossman and Rossi-Hansberg (2008), and recent important contributions by Acemoglu and Autor (2010) and others, we refer to these as 'tasks'. Individual workers undertake specific tasks so the next natural aggregation is 'occupations'. Sets of occupations are typical performed in tight proximity and we refer to these sets as 'stages of production'. Typically stages are the small unit that is offshored. The top level is the product. Consider the economics of the optimal tasks per occupation and occupations per stage.

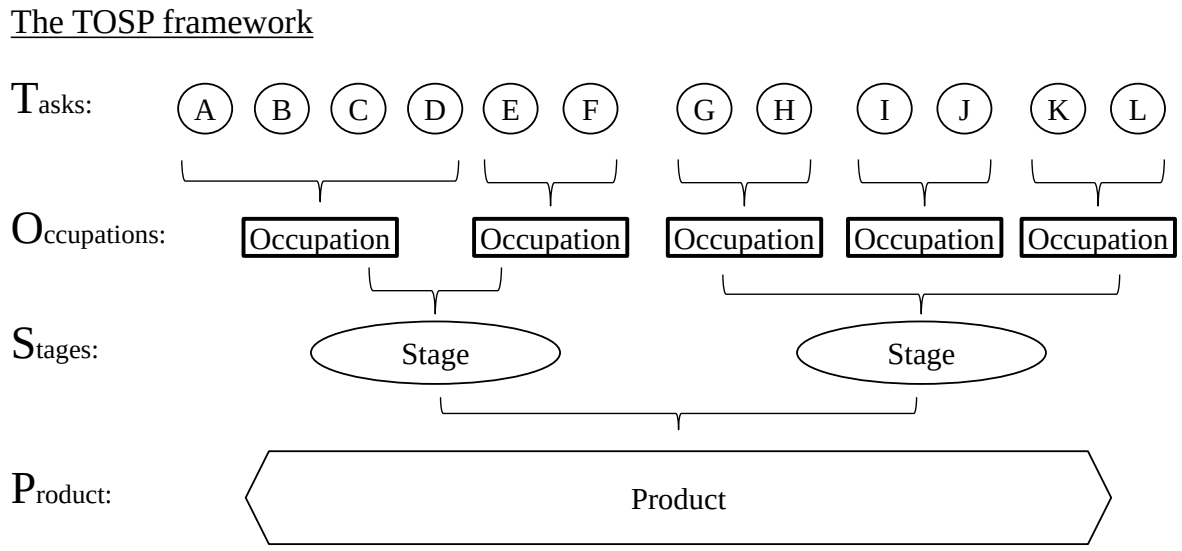


Figure 17: Tasks, occupations, stages and product – the TOSP framework

Notes: The circles represent individual tasks, the rectangles represent individual occupations and the ovals represent individual stages of production.
Source: Adapted from Baldwin (2012a).

The key trade-off in the TOSP framework (Baldwin 2012a) is between the efficiency and coordination. Great specialisation improves efficiency but raises coordination costs. As ICT

[8] This section draws heavily on Baldwin (2012a).

improves, the effects on the specialisation-versus-coordination trade-off are not straightforward, as Bloom et al (2006) show. Some ICT improvements reduce the benefits of specialisation while others reduce the cost of specialisation.

ICT affects the optimal division of labour via two channels:

- Communication and organisational technologies – call them coordination technologies, or CT, for short – facilitate transmission of ideas, instructions and information. CT favours specialisation by reducing the cost of coordination.
- Information technology, or IT for short, makes it easier for individual workers to master more tasks. IT disfavours specialisation by reducing the cost grouping many tasking into a single occupation.

This happens in several ways. Computer Integrated Manufacturing (CIM) and Computer Aided Design/Computer Aided Manufacturing (CAD/CAM) started with numerically controlled machine tools in the 1950s, but today many factories can be thought of as computer systems where the peripherals industrial robots, computerised machine tools, automated guided vehicles and so on. This has moved manufacturing from a situation where machines helped workers make things to one where workers help machines make things. Perhaps in the future it will be called "compufacturing". In terms of the TOSP framework, this is an advance in information technology that brings many routine tasks within the ambit of a single machine operator.

The integration and automation of tasks, however, does not stop at the factory gate. Many design, engineering, and management tasks have been computerised (Alavudeen and Venkateshwaran 2010). Computers have greatly boosted the productivity and speed of product design as well as greatly reduced the need for prototyping. Once designed, the production process can be outlined using computer-aided process planning systems and design programmes can create instructions for numerical-control machines. Models of the manufacturing system can be simulated before they are built. The basic manufacturing functions – machining, forming, joining, assembly, and inspection – are supported and integrated by computer-aided manufacturing systems and automated materials-handling systems. Inventory control is automated, tracking inventory movement, forecasting requirements and even initiating procurement orders.

A recent special report by *The Economist* extrapolates these trends even further (Economist 2012). It notes that manufacturing may be going through a new industrial revolution due to the advent of additive manufacturing. This bundles virtually all stages of manufacturing into a single machine. While this is an important trend, it is not new; "Automation, the Advent of the Automatic Factory" was the title of a 1956 book and indeed the Luddite movement was about the same thing.

Bloom et al. develop a similar result by focusing on a hierarchy model where the key trade-off is between the cost of training workers to deal with problems and the cost of hiring managers to help workers with problems that cannot solve. This Bloom et al. insight has recently received some empirical support from Lanz et al (2012). They find that offshoring of business services complements manufacturing activities, in the sense that increased import penetration in business services is associated with a shift in local task content from information and communication related tasks towards tasks related to handling machinery and equipment. Offshoring of other services complements local information-intensive tasks in that it shifts local task composition towards ICT-related tasks.

Box 1: Example of IT and task regrouping

The principal example in Davidson (2012) contrasts workers in a Greenville factory making fuel injectors. One type of worker does manual tasks that require little training or education. Her real competitors are not Chinese workers, but American-designed robots. Earning $13 an hour, she is still cheaper than the robot but many of her co-workers have already been replaced.

The second type is a $30-an-hour skilled machinist who got his job after three years studying machine tooling, five years of on-the-job experience in another factory, and a month of training on his particular piece of the digitised manufacturing revolution – a half-million-dollar turning contraption which machines valves to a tolerance of a quarter micron. For the machinist, manufacturing is basically applied engineering. To maintain such extreme precision, he tests parts every few minutes with sophisticated testing tools and makes the necessary adjustments – about 20 per shift – by entering them into the machine's computer.

This polarisation of the shop floor has many implications but for the low-education worker, the worse is that there is no longer a gradual path of skill accumulation between the $13 and $30 jobs. The in-between-skilled jobs have all been bundled in to the machine.

The digitisation of manufacturing is changing the nature of the stages not offshored in a way that is important for policy makers. Many of the manufacturing jobs being 'reshored' are of the $13 type, not the $30 manufacturing jobs that still come to mind when people speak glowingly of manufacturing.

An instructive example of this can be found in the recent Boston Consulting Group study, BCG (2011). This shows that faster wage growth in China brings US job competitiveness close to the 'tipping point', i.e. the point where making things in the US will be cheaper than in China. "By around 2015," the report notes, "the total labour-cost savings of manufacturing many goods in China will be only about 10 to 15 percent when actual labour content is factored in." But new manufacturing jobs created here will be low-skill/low-wage jobs.

The fact that low-skilled Americans are almost competitive with low-skill Chinese is not an unmitigated blessing. Chinese wage rose by almost 20% per year while US manufacturing wages have actually fallen (Moretti 2012 p.25). For example, as part of the deal that let it survive the recent global economic crisis, Ford now pay new hires only $15 to $16 per hour – about half what the legacy workers receive.

4.1.2. Spatial dispersion: Offshoring[9]

The TOSP framework as hereto presented does not directly address the impact of the 2nd unbundling on manufacturing in Europe. The missing piece of the puzzle involves the process of moving some stages abroad – especially to low wage nations. Plainly this has radical implication for manufacturing jobs in the high-wage nations.

Before the ICT revolution, Northern firms had to exploit their firm-specific assets by manufacturing in the North. After the ICT revolution, they have the option of offshoring labour intensive stages. There are three subtle points in this line of reasoning: One involving

[9] The section draws on Baldwin and Evenett (2012).

better IT, one involving better CT, and one involving the development of very skill and technology intensive advance manufacturing technologies.

First, IT makes it easier to wrap labour-intensive tasks into occupations that involve higher degrees of skill. Thus IT tends to:

- Make the stages that remain in Europe more skill intensive,
- Reduce the number of workers needed to complete the tasks, and
- Allow firms to group remaining unskilled tasks into stages that can be offshored.

Second, the rapid advance of CT tends to increase the range of stages that can be profitably offshored.

Third, the rapid evolution on advanced manufacturing technology is likely keep some manufacturing in Europe, but this value added with be associated with few jobs, most of which are for high-skilled workers. There will be no 'jobs for yobs' in the factories of the future. There will be jobs for applied engineers and jobs for robots.

The key Dispersion forces favouring the geographic dispersion of stages are wage gaps and firm-level excellence. Wages gaps determine 'vertical specialisation'; firm-level specialisation and excellence determine 'horizontal specialisation'.

Two wage gaps matter: low-skilled and high-skilled. 'Headquarter economies', like the UK, have sent labour-intensive stages to nearby low-wage neighbours – what might be called 'factory economies' (Figure 18). High-skill labour, however, remains relative abundant and thus relative cheap in headquarter economies (Figure 19).

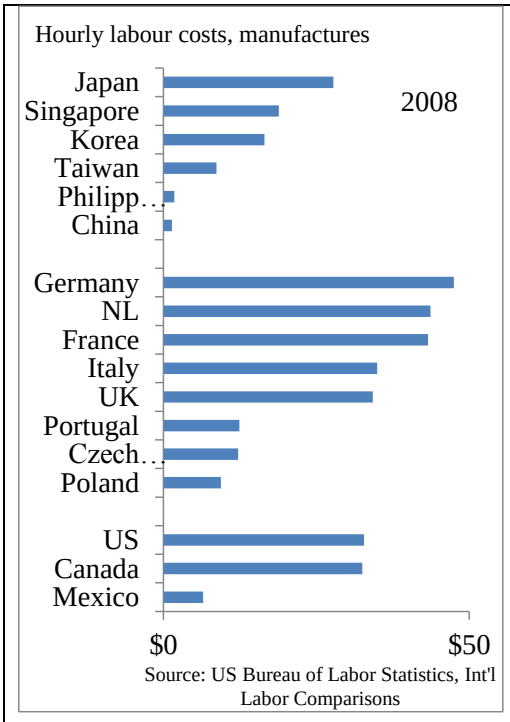


Figure 18: Wage differences in Factory Asia, Factory North American and Factory Europe.

Source: Baldwin and Evenett (2012).

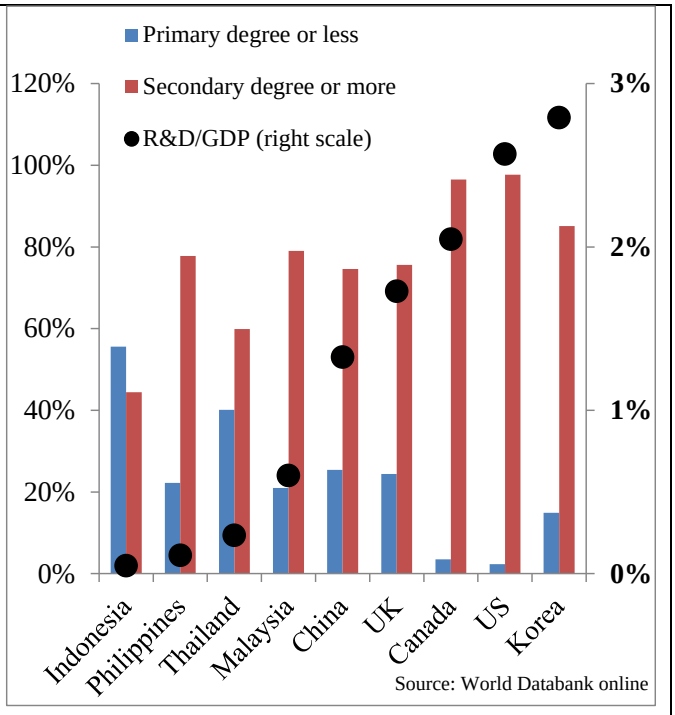


Figure 19: Education and R&D: ASEANs, China, Korea, US, Japan and Canada, 2005.

Source: Baldwin and Evenett (2012).

Wages gaps are not the only motive for supply chain internationalization. International supply chains existed among high-wage economies long before the second unbundling (Figure 8). The dispersion here is driven by a much more micro gain from specialisation.

For example, when it comes to automobile air conditions, the French company Valeo competes in the European market through excellence – not low wages. While each European carmaker could make their air conditioners, scale economies mean that it is cheaper for Italian and German automakers to source them from France. Given the systemic importance of learning-by-doing and the growing role of scale economies in an ever more fractionalised supply chain, it is natural that regional champions will emerge in particular parts and components.

This firm-level excellence is the key to the 'horizontal' internationalisation of value chains among high-wage nations.

4.2. Smile curve economics[10]

The 2nd unbundling made it feasible to offshore stage of production. Some stages moved; others did not. Curiously, value added along the value chain seemed to shift away from the offshored stages. This observation is known as the "smile curve" which shows the value added at each stage of production (Figure 20).

This concept, which was first proposed around 1992by the founder of Acer computers, Stan Shih, asserts that fabrication involves less value creation today than it did before the 2nd unbundling. Putting it differently, the smile deepened, so to speak.

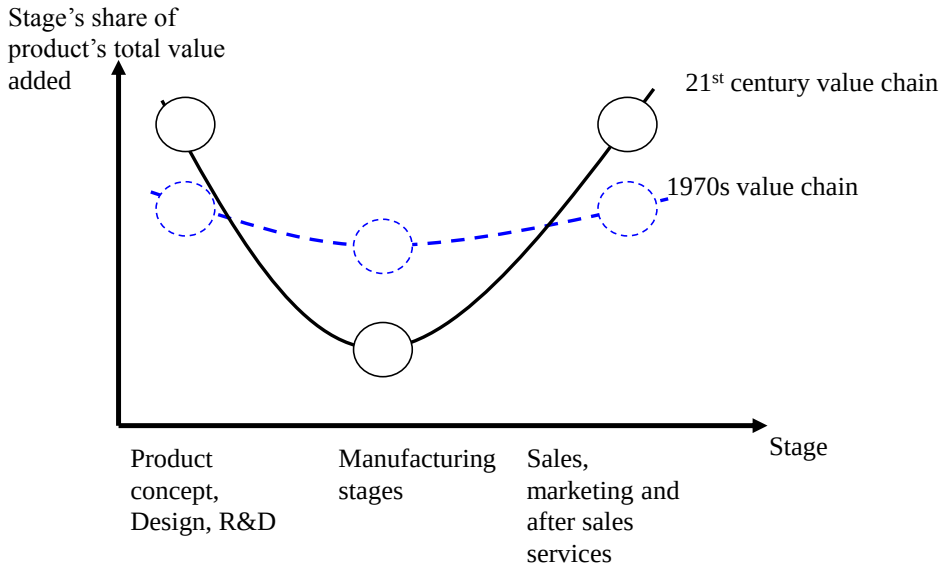


Figure 20: The smile curve: Good and bad stages in the value chain.
Source: Baldwin (2012a).

An example of the allocation of value added along a value chain can be seen in the decomposition of the total retail sales price of the Nokia N95 phone (Ali-Yrkkö et al 2011). Although the phone is mostly 'made' in Asia, Figure 21 shows that most of the value added accrues in Europe. The total value added in Europe depends on where the phone is sold (retail

[10] This section draws heavily on Baldwin (2012a).

margin) and assembled (China or Finland). In the worst of cases – an N95 assembled in China and sold in the US – more than half the value added is in Europe; the high end figure is 68%.

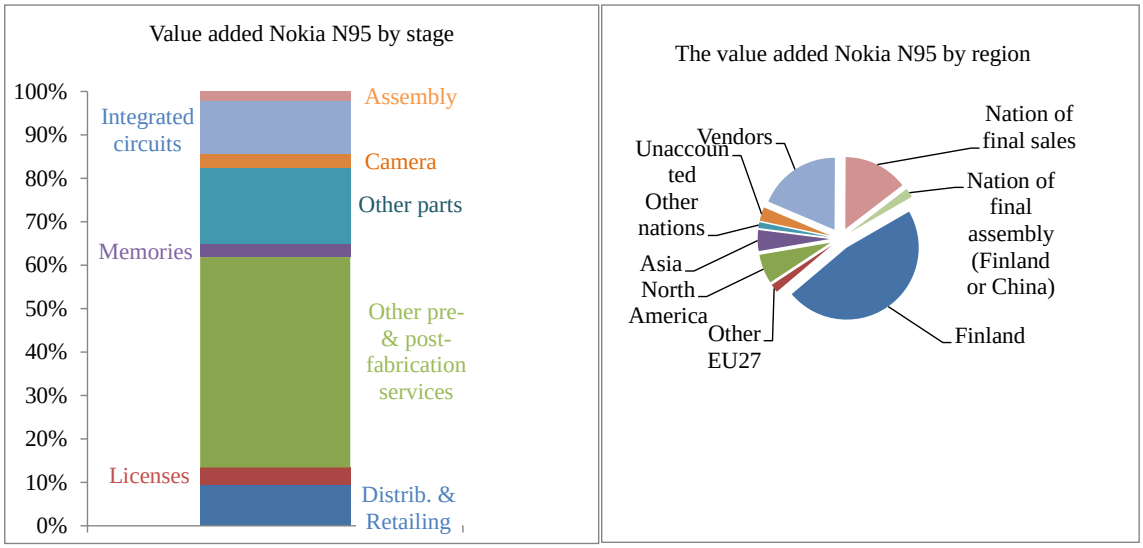


Figure 21: Breakdown of the phone's €546 pre-tax retail price circa 2007
Source: Ali-Yrkkö et al (2011).

The smile curve is the basic concept behind the thought that Europe might soon be 'factory free' so it is important to explore it empirically and theoretically. Unfortunately, neither has been done convincingly.

4.2.1. Why did the smile deepen?

A definitive answer this question awaits detailed empirical research. Simple economics and cost accounting, however, suggest an obvious explanation. When a stage's cost is reduced by offshoring, its share in value added falls since a stage's value added is based on costs. Even if the cost-saving is fully passed on to consumers, the offshored stage's share of value added will fall.

Baldwin (2012a) conjectures that the reduced cost share of offshored stages derives from three distinct mechanisms. The first is the usual cost reduction that comes from better exploitation of comparative advantage (low-skill stage undertaken in low-skill abundant nations). The second is the recombination of high-tech with low-wages. The third is market power of the offshoring firms. Offshored tasks tend to be things that can be done in many emerging nations – most of them eager to attract such stages. The non-offshored stages, by contrast, tend to involve things where firms naturally have market power due to product differentiation, branding, etc. In short, offshored tasks become commoditized; the onshore tasks do not.

5. Concluding remarks: The new landscape of work

The changed nature of globalisation and the digitisation of manufacturing mean that European manufacturing firms are likely to retain a leading global role. This does not mean, however, that manufacturing as traditionally conceived will flourish in Europe.

European technical, managerial and marketing know-how are increasingly combined with labour abroad. Just as the surfeit of labour and shortage of land led European labour to flow to New World land in the 19th century, European manufacturing technology is now flowing to emerging market labour. This is not traditional tech transfer since it is under the control of European firms, but the impact on the economic landscape in Europe and emerging markets has been dramatic.

The upshot is plain. European manufacturing will never again be a source of high paying jobs for the 'common man'.

- The total number of manufacturing production jobs will almost surely continue to decline;
- The remaining jobs will increasingly resemble applied engineering positions that require post-secondary education.
- Progress in 'advanced manufacturing' techniques may keep more manufacturing value added in Europe, but it will not bring more factory jobs with it.

European policymakers must adjust to this new reality. There may be good reasons for promoting manufacturing, but mass employment is not one of them. These labour market outcomes are as much a consequence of technological advance as they are globalisation. Even if the clock was somehow turned by on globalisation, the trend of 'manu-facturing' turning into 'compu-facturing' would continue.

The smile-curve concept points the way forward. Good jobs will continue to be associated with manufacturing, but they will be in the pre-fabrication and post-fabrication stages rather than in fabrication. Most of them will be in services and located in cities.

One very attractive idea that flows from this is the Dutch thinking on the future of Europe's economy as elucidated by Bas ter Weel, Albert van der Horst and George Gelauff (CPB 2010) in a publication strongly influenced by the thinking of Ed Glaeser, for example, Glaeser (2011). It is also reflected more recently in the US setting by Moretti (2012).

5.1. Cities as 21st century factories

Since talented people gather in cities and make each other more productive, human capital and cities are likely to be the foundations of the 21st century landscape of work.[11] This logic is straightforward. Cities are where people meet – in a sense cites are a 'technology' for reducing the cost of face-to-face interactions. Cities also optimise the matching between workers and firms, and between suppliers and customers. In this sense, cities become skill-clusters – or as Moretti (2012) call them, 'brain hubs'. The link between city success and

[11] There is symmetry here. In the 1st unbundling workers clustered in factories, and factories clustered in industrial districts – in part to reduce coordination costs and in part to benefit from knowledge spillovers. A standard story was that they were jointly working out how best to exploit a 'general purpose technology' that were new at the time – electric motors and chemical processes. Cities are now playing a similar role when it comes to today's new general purpose technology, ICT.

human capital is a close one. One of the most persistent predictors of urban growth over the last century is the skill level of a city.[12]

Important thinking in CPB (2010) and a new book by Enrico Moretti (2012) suggest that ICT advances are leading to a spikier landscape of work. The reason is that high-skilled jobs in the tradable sector tend to be subject to agglomeration economies. One type is highly localised knowledge spillovers where workers and firms implicitly benefit from each other's knowledge creation. Another type is the chicken-and-egg aspect of labour-pooling; firms locate near wide and deep local labour markets that are in turn supported by the presence of many firms. The City of London is a classic example of this.

In writing about the US Moretti (2012 p.5) say: "More than traditional industries, the knowledge economy has an inherent tendency towards geographical agglomeration. … The success of a city fosters more success as communities that can attract skilled workers and goods jobs tend to attract even more. Communities that fail to attract skilled workers lose further ground."

Of course, most Europeans will never work in innovation activities. But just as good factory jobs created multiplier effects in communities, high-tech jobs can create/attract many more jobs. Approximately two-thirds of jobs are in local service sector, such as government administration, health, and education sectors, retail, leisure and hospitality sectors. For the most part, these are sheltered from international competition by the dictates of proximity. But their location is very sensitive to 'anchor' jobs. Moretti estimates, for example, that each new high-tech job creates an additional 5 jobs in the local economy.

The agglomeration economies mentioned create another important fact: 'sticky' jobs tend to be good jobs and vice versa. As Moretti (2012 p.15) writes: "In innovation, a company's success depends on the entire ecosystem that surrounds it. … it is harder to delocalise innovation than traditional manufacturing. … you would have to move not just one company but an entire ecosystem."

Cities should not be thought of as mere collections of people, but rather as complex work spaces that generate new ideas and new ways of doing things. In a nutshell, cities are to the 21st century what factories were to the 20th century. Urban policy will be the new industrial policy.

[12] The Complementarity between Cities and Skills Edward L. Glaeser and Matthew G. Resseger NBER Working Paper No. 15103 June 2009

ABSTRACT There is a strong connection between per worker productivity and metropolitan area population, which is commonly interpreted as evidence for the existence of agglomeration economies. This correlation is particularly strong in cities with higher levels of skill and virtually non-existent in less skilled metropolitan areas. This fact is particularly compatible with the view that urban density is important because proximity spreads knowledge, which either makes workers more skilled or entrepreneurs more productive. Bigger cities certainly attract more skilled workers, and there is some evidence suggesting that human capital accumulates more quickly in urban areas.

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