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**Industrial Policy for a
Sustainable Growth Path**

Karl Aiginger

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Abstract

Industrial policy is back on the agenda and the consensus is that it must be different "this time" from the past. We redefine industrial policy for industrialised countries as a strategy to promote "high-road competitiveness", understood as the ability of an economy to achieve "Beyond-GDP" Goals. High-road strategies are based on advanced skills, innovation, supporting institutions, ecological ambition and an activating social policy. This "new industrial policy" is systemic, working in alignment with other policy strands and supporting social and environmental goals; it affects the structure of the economy as the whole not only the manufacturing sector. Short-term actions, such as protecting employment in unviable companies, low prices for fossil fuels, or reducing wages in high-income economies are counterproductive. To pursue an industrial policy that targets society's ultimate goals without public micromanagement will be challenging. It could be achieved 1. by setting incentives, particularly those impacting on technical progress (e.g., to make it less labour-saving and more energy-saving), 2. by the use of the important role governments play in the education and research sectors, 3. by greater public awareness and 4. if consumer preferences will call for socio-ecological transition.

E-mail address: Karl.Aiginger@wifo.ac.at
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Keywords: New industrial policy, climate change, competitiveness, innovation strategy

JEL: H50, L16, L50, O20, O32, O38, O40, Q30, Q40, Q50

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Karl Aiginger

Industrial Policy for a sustainable growth path

Abstract	- 1 -
1. Outline and objective	- 2 -
2. Re-emerging attention for manufacturing	- 3 -
2.1 <i>The hypothesis of rise and fall</i>	- 3 -
2.2 <i>Renewed interest</i>	- 3 -
2.3 <i>Stylized facts on the share of manufacturing</i>	- 6 -
3. Industrial policy: From the bottom to the top of the agenda	- 7 -
3.1 <i>Past policy: diversity and demise</i>	- 7 -
3.2 <i>Academia defining elements of a 'New Industrial Policy'</i>	- 8 -
3.3 <i>Policy documents: following academia and overtaking</i>	- 11 -
4. Europe - a success story in need of a vision and benchmarks	- 16 -
4.1 <i>A successful experiment in a midlife crisis</i>	- 16 -
4.2 <i>Low dynamics and conventional remedies</i>	- 16 -
4.3 <i>Towards a new growth path: four game changing proposals</i>	- 17 -
4.4 <i>Status quo bias and political rebound effects</i>	- 19 -
5. Interface of industrial and energy policy: Progress and barriers	- 19 -
5.1 <i>The new consensus</i>	- 19 -
5.2 <i>Signs of change</i>	- 20 -
5.3 <i>Resistance to change</i>	- 20 -
5.4 <i>Low energy prices in the U.S.</i>	- 21 -
5.5 <i>Two strategic answers</i>	- 21 -
6. Summary: A systemic policy, aligned with beyond-GDP goals	- 24 -
References	- 26 -

1. Outline and objective

Industrial policy has again become a major issue in industrialised countries. We analyse why this has happened and to what extent a 'new' industrial policy should be different from the old, discredited policy, which often tended to decelerate structural change. Academic scholars (Rodrik, 2004A, Aghion et al., 2011; Aiginger, 2007, 2012) offer concepts of a 'new' or 'systemic' industrial policy, which should be based on new technologies and support society's long-term targets. This rationale for government intervention goes well beyond the traditional market failure arguments, such as monopolies and is based on international externalities and coordination failures. The U.S. government, the European Commission and the OECD have advocated reindustrialization and industry-oriented 'integrated' policies, since at least the recent financial crisis¹. The European Commission has initiated WWWforEurope, a European research program involving 33 European research teams and supporting U.S. economists, to analyse the feasibility of a new path for growth in Europe, based on social and ecological innovation.² In the meantime, U.S. industrial policy is lured by the prospect of cheap energy, which it hopes will - together with rising wages in China - reduce its large current account deficit. The U.K., which also has twin deficits in its trade and public budgets, is pondering how to revive its industrial sector. At the same time, the U.K. protects its financial sector, which has been a more powerful job generator than manufacturing in the past two decades. France is undecided whether and how to shelter its remaining industry from globalization, relying either on *grand projets*, regional innovation centres (core competition) or public-private sector networks, or alternatively fostering employment and new businesses by reducing social charges and corporation tax. Southern Europe has lost a substantial part of its industrial base and is trying to stop its decline in GDP by revitalising exports to global markets,³ but forfeiting its change to organise 'industrial zones' encouraging start ups and inward foreign direct investment with different administrative rules.

An important question is whether industrial policy and climate policy are partners or adversaries. The European Commission started this discussion by moving 'sustainability' (together with 'competitiveness') to the 'centre stage' of industrial policy (European Commission, 2010). Renewable energy was declared one of the 'enabling technologies'. But Europe also envies the U.S.'s cheap, new energy sources and fears that energy-intensive industries in particular will relocate to the U.S. for lower energy prices, or to Asia for lower environmental standards. These arguments limit the 'greening' of Europe's industrial policy. If the second line of arguments wins, Europe will lose the first-mover advantage of becoming a test-bed for clean technologies, which could be exported to other countries in the future, as worldwide environmental ambitions increase.

¹ European Commission (2010, 2011, 2012); OECD (2012); Veugelers (2013).

² See <http://www.foreurope.eu/>.

³ For an overview on definitions of Industrial Policy see Aiginger (2007) and other papers in the *Journal of Industry, Competition and Trade* (2007). If not otherwise stated, the term 'Industry' is used synonymously with 'manufacturing'.

We discuss the challenges of a 'low-road' answer to the U.S.'s new competitive advantage of low energy prices, and contrast it to a 'high-road' strategy for competitiveness. This strategy connects industrial policy proper with innovation and climate policy, to generate a new, 'systemic' industrial policy. It supports society's long-term goals and is based on the comparative advantages of industrialised countries. The alternative, a low-road strategy aimed at lower standards and wages, would bring the similar short-term relief for troubled companies as 'old' industrial policy used to do, reducing the long-term dynamics of manufacturing in rich countries.

2. Re-emerging attention for manufacturing

2.1 The hypothesis of rise and fall

The eventual decline of the share of manufacturing in industrialised countries' GDP is well established in economic theory (e.g. as the second phase of the so-called three-sector hypothesis, *Clark, 1957, and Fourastier, 1954*). It is driven both by demand forces (the preference for services increases with rising income) and by supply forces (technological progress lowers manufacturing cost). This sectorial shift – after a first phase of industrialisation – has been welcomed as a sign of a mature society, because service jobs are less strenuous and subject to less cyclical variation.⁴ It has been argued that this transformation should not happen too soon or too quickly (see the criticism of the U.K.'s premature deindustrialisation in the 1960s), *inter alia* because the lion's share of technological innovation occurs in manufacturing. Product-cycle theory and trade theory stress that it is a particular feature of the international division of labour that industrialised countries have advantages in the invention and innovation phase, while developing countries have advantages in manufacturing mature products with standardised production. The transfer of parts of the value chain to lower-income countries provides rents for higher-income countries. At the same time, services have changed from personal and government services, to 'production-related' services, the crown jewels being IT- and financial services, which offer dynamic employment and higher wages.

2.2 Renewed interest

Increasing attention towards the manufacturing sector, and calls to limit or reverse its decline have arisen since 2000 at least for two reasons: firstly, emerging-market countries' inroads into global manufacturing; and secondly, industrialised countries' experience of the impact that bubbles in non-trade related sectors had on the severity and length of the financial crisis.

Competitive pressure from emerging-market countries: industrialised countries are losing market share to emerging-market manufacturers, which are making inroads in ever more sectors, and not only in traditional, labour-intensive ones. China now has the largest industrial sector in absolute terms. Trade deficits of several large industrialised countries have ballooned and can no longer be offset by service

⁴ This argument was more convincing when most jobs were permanent, full-time roles and many jobs in manufacturing were dirty or even dangerous. Today manufacturing jobs, especially those in industrialized countries, are safer, while service sector jobs have become more volatile and, in part, precarious.

exports. This has resulted in large current-account deficits (especially in the U.S., as well as in the U.K., France and Italy).

Experience before and during the financial crisis: economic growth in non-manufacturing was particularly strong in the run-up to the crisis; bubbles occurred in the construction sector, in property prices and in financial markets, often driven by low interest rates or public support. Evidence has mounted that economic growth is no longer positively affected by the size of the financial sector, as bubbles in finance and construction have destabilised economies (Schneeweiß, 2012, Cecchetti - Kharroubi, 2012). Looking for indicators to explain different national performance during the Financial Crisis has shown the current account balance as the most important determinant of the depth of the crisis across countries (Aiginger, 2011B).⁵ Countries with current account deficits at the start of the crisis together with a small manufacturing base endured a particularly long crisis and output is often still lower than in 2007 (see Figure 3). In Southern Europe ⁶, where the share of manufacturing declined to 11% (2012) from 16% (1960), and current account deficits amounted to 13% of GDP before the crisis, GDP is today still more than 10% below its pre-crisis peak.⁷ Ireland, which also had a severe crisis resulting from bubbles in the construction and finance sectors, recovered more quickly *inter alia* by boosting exports through its large industrial base.

In summary, it is difficult to explain differing national performance during the recent financial crisis with one single factor, but if there is a candidate it is pre crises balance of current account.⁸ The importance of manufacturing as a basis for growth is well known. This sector conducts the largest share of R&D and many sophisticated services are based on production.⁹

⁵ Robustness checks show that this relation is not dependant on outliers (like Greece at the one end or China at the other end), but still current account balances may signal deeper and more complex problems of an economy which cannot be proxied easily by additional variables.

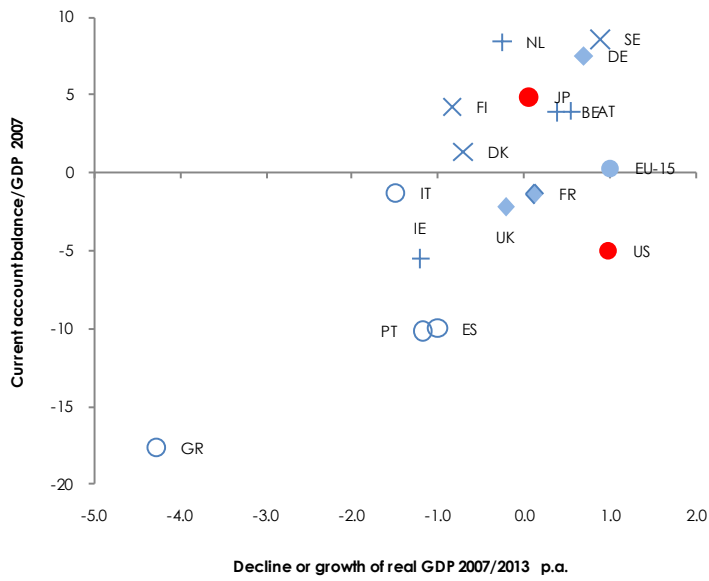
⁶ Defined as Greece, Spain and Portugal; unweighted average.

⁷ In Greece the industrial sector declined to 8% (2011) from 15% (1980) and the current account deficit reached 18% of GDP (2008). Similar developments occurred in Portugal, Spain and Latvia.

⁸ Budget deficits and the debt/GDP ratio were far less able to explain country differences during the crisis. There is no easy relationship between the share of manufacturing at current prices in 2007 and the changes in countries GDP thereafter (see Figure 2).

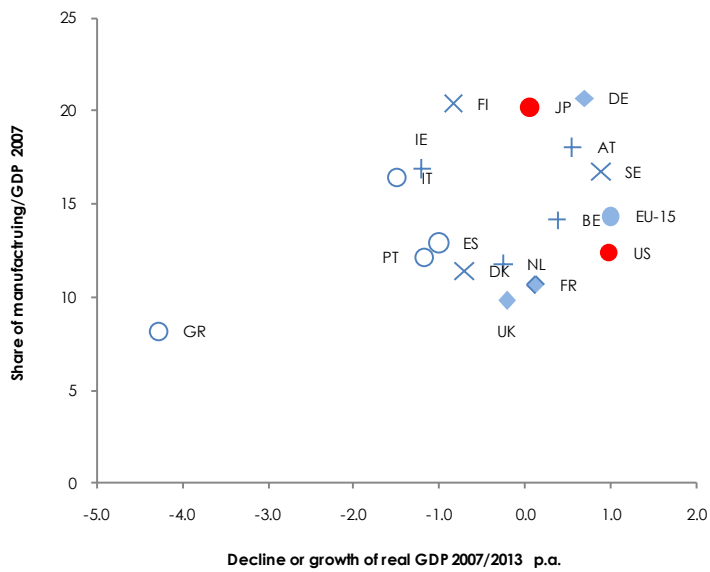
⁹ The decline of manufacturing's share in GDP is higher, if measured in nominal terms (which reflects wages and incomes generated in manufacturing) and in employment, less in volumes.

Figure 1: Current account and growth of real GDP



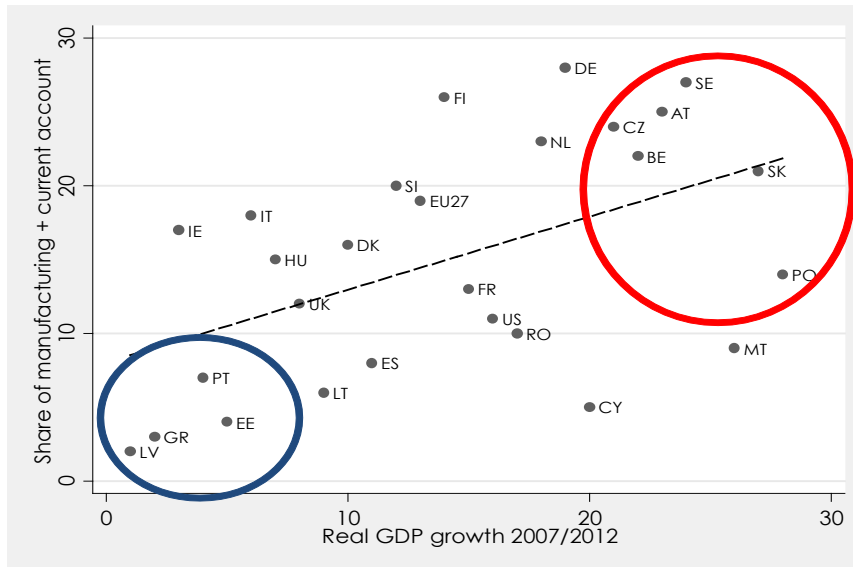
S: Eurostat (AMECO).

Figure 2: Share of manufacturing (current prices) and growth of real GDP



S: Eurostat (AMECO).

Figure 3: Depth of the crisis vs. 'industrial base'
Ranked by performance and industrial base



Remark: industrial base = share of manufacturing/GDP 2007 plus share of current account; the sum is ranked (low sum of shares = 1); output performance = change in real GDP growth 2012/2007 (lowest rate = 1). Source: Eurostat (AMECO).

2.3 Stylized facts on the share of manufacturing

In the U.S., manufacturing today generates only 12% of GDP, less than half its share in 1960. The financial sector's contribution to GDP is increasing, approaching 10% of value-added and 40% of all corporate profits (Wolf, 2014). A new argument for the declining manufacturing base in the U.S. is provided by recent MIT studies (Berger, 2013), namely that although new products' invention phase still starts in the U.S., the offshoring of production to low-cost countries occurs earlier (Berger, 2013). As a consequence, the learning process from new products in the late innovation and early production phases, is transferred to other countries. This reduces positive spillover effects to other companies and subsequent innovations. Cooperation in the U.S. manufacturing sector is less developed than in Europe. U.S. companies are 'alone at home', instead of being part of a cluster of related companies or embedded in industrial ecosystems.

In Western Europe (EU-15) manufacturing's declining share of GDP, to 14% (2012) from 21% (1960), is less dramatic.¹⁰ But Europe is unable to eliminate the gap in per-capita income and labour productivity compared to the U.S. (which is larger in per-capita terms and smaller per hour; see Aiginger - Bärenthaler-Sieber - Vogel, 2013). R&D expenditure particularly by companies is lower in Europe, and Europe lacks top universities.

Overall, it appears that in the U.S. spending on innovation – and resulting productivity – is high, although this is not used to produce enough goods or services to balance trade. In contrast, Europe has a balanced trade position, with low dynamics and a

¹⁰ Country differences are large. In the U.K. the share of manufacturing in GDP dropped to 10.5% (average over 2001 to 2012, see figure A2), from 25.7% (average over 1961 to 1970, nominal terms); in France it fell to 10.8%, from 21.1%. It was stable in Finland (due to the ICT boom) and in Ireland.

persistent productivity deficit¹¹ compared to the frontier economy. At the same time, emerging-market countries are gaining market share in both regions.

These trends have led to calls for a new industrial policy in academic papers and policy documents.

Table 1: Share of manufacturing and the dynamic of industrial production

	Share of manufacturing at current prices								Increase of production index	
	1960	1980	1990	1995	2000	2009	2011	2012	2000/2008	2008/2012
	ln %								% p.a.	
Germany	29.8	26.2	24.8	19.9	20.0	17.4	20.3	20.0	2.3	-0.4
Ireland	11.5	14.9	19.3	20.6	23.1	19.5	21.4	21.0	4.4	0.3
Greece	12.4	15.3	12.8	10.6	9.6	7.9	8.1	8.6	-0.6	-6.8
Spain	14.8	23.7	18.8	16.4	16.2	11.4	12.2	12.2	0.1	-6.0
France	22.2	18.4	15.8	14.4	13.6	9.6	9.2	8.9	-0.3	-2.8
Italy	23.8	26.2	20.5	19.4	18.0	14.3	14.8	14.0	-0.2	-4.9
Austria	26.7	20.7	19.1	17.5	18.1	16.2	16.7	16.4	4.0	0.5
Portugal	20.3	21.5	19.7	16.0	15.0	11.1	12.0	12.2	-0.9	-3.6
United Kingdom	26.2	19.9	17.3	17.1	13.8	9.3	9.1	8.9	-0.7	-2.6
USA	25.2	20.0	16.3	15.8	14.3	11.1	11.6	-	0.5	0.2
EU-15	21.3	20.2	19.7	17.6	16.4	12.7	13.5	13.5	0.8	-2.3
Euro area				17.7	17.1	13.3	14.4	14.2	-	-
EU-27				17.6	16.5	13.0	-	-	-	-

S: Eurostat (AMECO).

3. Industrial policy: From the bottom to the top of the agenda

We have shown that the renewed interest in manufacturing is based on two economic arguments: (i) emerging-market countries' increasing share of global GDP; (ii) the evidence from the financial crisis that a decline in the manufacturing sector combined with a current account deficit delayed recovery; we had known before that the manufacturing sector is necessary for research and innovation, which are the main growth drivers in industrialised countries. But this line known - before the financial crisis - has attracted increased attention following evidence from the U.S. that early offshoring can lead to a loss of learning and skills in frontier technologies. We may add the political argument that public budgets, which were used to rescue banks and finance unemployment and pensions, were not subsequently directed towards job creation and growth in the real economy. As a result, politicians and policy documents are now unanimously calling for a new industrial policy in countries from the U.S. to the U.K. and France. This section gives an overview first on 'old' industrial policy, and then for calls of academia and economic policy for a new one.

3.1 Past policy: diversity and demise

Industrial policy in Europe has been implemented differently over time and across countries. As far as a timeline is concerned, European industrial policy began with the European Coal and Steel Community. For a while thereafter, it remained primarily a national policy with a predominantly sectorial focus (French style, large projects, national champions), this was followed by a period of horizontal competitiveness policies (German style, broad 'measures' that did not discriminate between sectors). The European Community failed to mention industrial policy at all in the 'Treaty of

¹¹ Thus holds more for per capita productivity than for per hour productivity.

Rome' and its successor, the EU, mainly followed the horizontal approach. In the 1990s, it looked as if interest in industrial policy was dying in the EU, as well as at national level (Aiginger, 2007). An early revival was attempted by defining a 'matrix-type' approach (European Commission, 2005; the term was proposed in Aiginger – Sieber, 2006): Here it was argued that industrial policy should be predominantly horizontal, complemented with sector-specific measures, because horizontal measures have different impacts across sectors.

As far as the success of different instruments of industrial policy is concerned, empirical analyses of previous strategies reveal that countries relying on state aid and regulation as their main policy instruments, registered an inferior macroeconomic performance,¹² whereas countries focusing on promoting positive externalities as their main instrument of industrial policy had superior macroeconomic results (Aiginger – Sieber, 2006). A group of Scandinavian countries (Sweden, Finland and Denmark) invested heavily in R&D and education, focusing especially on ICT industries, thus implementing an industrial policy with the aim of promoting a knowledge-driven economy. These Scandinavian countries could be the benchmark for a future-oriented industrial and innovation policy, since they managed to achieve a broad selection of economic goals (income, social inclusion, ecological excellence, fiscal prudence) by a high-road strategy.

Overall, industrial policy was landed with the image of a 'born loser'. All too often governments intervened to preserve old structures or national interests. 'Old' industrial policy often implicitly decelerated structural change and slowed technological progress. It even impeded policy goals, such as improving energy efficiency and green technologies, while sheltering large, ecologically disastrous businesses, ranging from petrochemicals companies to steelmakers (e.g. U.S. Steel in the 20th century or polluting steel plants in southern Italy in the 21st). Industrial policy in this mode was ineffective, since its goals contradicted other policies (competition or employment policy) and did not create synergies with innovation, education, regional or climate policy. 'No industrial policy is the best industrial policy' was the conclusion in the U.S. and 'horizontal industrial policy only' was Germany's mantra, before later gaining acceptance at EU-level.

3.2 Academia defining elements of a 'New Industrial Policy'

Academic literature took the lead in defining how in a globalised world a future oriented industrial policy could be different from the past. Many proposals exist, and here we mention only three: Rodrik (2004) first offered the perspective of industrial policy for developing countries, and later a 'manufacturing imperative' (Rodrik, 2011) and recently a blueprint for a 'green industrial policy' (Rodrik, 2013). Aghion *et al.* (2011) present a pro-market approach for an industrial policy in frontier economies. In addition, Aiginger (2012) introduces the concept of a systemic industrial policy, based on the finding that the European countries that fared best during the financial crisis had strategies combining innovation, education and openness.

The following elements seem to be common to these 'new approaches':

¹² As measured by a set of indicators on economic dynamics, employment and the stability of the economy.

- Industrial policy should be a state of mind ... create a climate of cooperation between government and the private sector ... a discovery process ... generate positive spillovers to other sectors and not be based on purely financial incentives ... not picking winners (Rodrik, 2011). It should target activities and broad sectors, never firms; it should promote new activities not prevent exit ... follow markets instead of leading them (Aghion et al., 2011).
- Industrial policy is necessary to prevent 'lock-in' situations, of investing in old technologies. Producers of 'dirty products' tend to innovate in 'dirty programs'. In a nutshell Aghion et al. (2011) argue that new research follows old paradigms and that companies invest where they have been successful in the past. The task of industrial policy is to prevent conservative path-dependent decisions.
- Industrial policy should create new comparative advantages and help developing countries to diversify; it should stimulate exports, not prevent imports. New industrial policy should favour competition, instead of being an adversary of competition policy. Industrial policy should not protect non-viable domestic firms (a criticism of older industrial policy); Aghion et al. (2011).
- Governments should only intervene where they have a long-term interest (not just short-term goals such as saving jobs in distressed regions or during the depths of a recession); it has to be connected with societal needs. Industrial policy should benefit society as a whole, not just individual companies (Aghion et al., 2011; Rodrik, 2008, 2011).
- Industrial policy should no longer be an isolated policy. It has already merged with innovation policy ... it has to build up and be supported by education policy. It has to be systemic, pushed by competition, pulled by 'beyond-GDP' goals (Aiginger, 2012; see also Box 1). Industrial policy should start from the vision of where an economy wants to be in 20 or 30 years in the future, of which factors (income, social goals, ecological sustainability) will define welfare, and of which capabilities will provide competitiveness and growth on a path aligned with these pillars (Aiginger – Bärenthaler–Sieber - Vogel, 2013).

Mazzucato (2011) – focusing on the interface of industrial and innovation policies - advocates a procurement policy that actively promotes innovation, specifically innovation in non-technical fields i.e. social and ecological innovation. The state is an important source and catalyst in virtually all new technologies. The vision of an entrepreneurial state facilitating the emergence of new generic technologies may be a little over-optimistic, nonetheless because of path dependency, government decisions are vital, if big changes in technology or society are to occur. Meanwhile, Johnson (2009) calls for industrial policy to rebalance the economy towards non-financial sectors (such as manufacturing) and away from the financial sector.

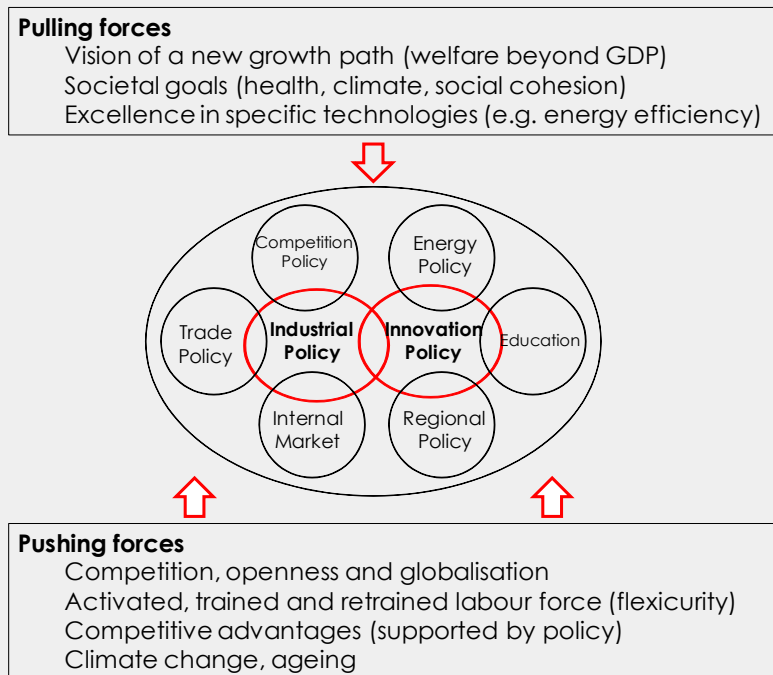
Rodrik (2013) makes the case for a green industrial policy, describing in detail green growth policies in the US (including the spectacular rise and fall of the public subsidised Californian solar cell company 'Solyndra'), in Germany, China and India. He stresses that we have to understand that failures are a necessary 'part and parcel' of successful industrial policy efforts. Among better rules required for green industrial policy he mentions interaction with the private sector ('embeddedness, but not in bed' or – in other words - between 'arm's length and capture'). A new industrial policy

needs discipline, firms must know they cannot 'game government'. Further principles are that underperformance have to result in removal of assistance and accountability meaning that the public agencies must explain what they are doing and how. Industrial policy is one plank of a strategy to avert catastrophic climate change, and subsidy wars are far better than tariff wars since they expand the global supply of clean technologies.

Box 1: A systemic industrial and innovation policy: Driven by vision, pushed by competition and openness (Aiginger, 2012)

A future-oriented industrial policy has to be systemic in the sense that it needs to be derived from society's goals. If the European citizen's welfare function gives a large weighting to rising incomes, more social inclusion (less wage dispersion), a stable financial system and sustainability, then industrial policy has to promote these goals. Innovation should be shifted to social and ecological innovation (a feasible task given the scope of government involvement in R&D). Industrial policy should also make use of forces that promote change and foster higher incomes, e.g. competition, globalisation, education and training. Thus a 'Systemic Industrial Policy' is pulled by a vision and pushed by competition.

The Systemic Industrial and Innovation Policy (SIIP) in a nutshell



There are caveats to all of these calls for industrial policy. Procurement policy with specific goals can result in disguised protectionism. 'Following the market' versus 'concentration on new activities' can be a trade off; enforcing exports can be an argument for preventing imports with some mercantilist or anti-globalisation perspectives and so on. Companies will behave strategically and lobby for public support, which limits any industrial policy based on dialogue and cooperation between government and industry, if government does not have the experts who are willing and able to distinguish between companies' superior knowledge and their short-term interests. To minimise some of these risks there should be benchmarks and the criteria for success and failure should depend on productivity and exports; if goals

are not attained by the policy measures, subsidisation should end, following clearly defined rules.

In summary, the 'new industrial policy' should be forward-looking, favour competition and support long-term societal needs (like e. g. 'green industrial policy'). It should be an integrated or systemic policy, not an isolated policy strand in conflict with other policies. Policy measures should have a clearly communicated goal and the results of intervention should be carefully monitored. The concept of a systemic industrial and innovation policy (SIIP) is summarised in Box 1.

3.3 Policy documents: following academia and overtaking

This section analyses concepts for a new industrial policy, from policy documents that were inspired first by the challenges of globalisation and then by the financial crisis. Due to space constraints we shall concentrate on Europe and on European Commission documents, with some reference to an OECD's document at the end of the section. Attempts to reformulate industrial policy have been made for industrialised countries and for developing countries, for Europe, for the U.S. and for Asian countries.

New Industrial Policy in recent EU documents

The European Commission's new industrial policy developed in phases and through several documents (*European Commission, 2005, 2009, 2011A, 2011B, 2012, 2013, 2014A, 2014B*).

In a first stage (after the impact of globalisation became visible and before the financial crisis set in) these documents sidestepped the old divide between the horizontal and the vertical approach, by declaring both necessary. The horizontal approach continued to dominate, while sectorial ideas enter through different sector-specific effects of horizontal policies (and the necessity to fine-tune or complement them).¹³ The documents also call for 'key enabling technologies', 'flagship initiatives' and 'priority lines', which all have a certain sectorial or thematic 'ring'.

In a second stage, the Commission attempted to resolve old trade-offs and conflicts, e.g. between competition policy (which is critical of very large companies and national champions) and industrial policy proper (sheltering incumbent champions and looking for new ones), by calling for an 'integrated' industrial policy. Competition, trade, internal markets, regions, innovation, and resource and energy policies should cooperate and develop synergies to arrive at a 'wider industrial policy'. All these policy documents refer to the Europe 2020 strategy goals for smart, inclusive and sustainable growth, as their background framework.

In the third stage, pressure for a 'greener' industrial policy arises from the 20/20/20 energy goals and from the roadmap for 2050, which sets European goals to reduce greenhouse gases by 80-95 % by 2050. Hurdles to 'greening' come from the repeated assertion that all industries are important and that all parts of the value chain - from resource extraction to after-sales services - are relevant for competitiveness. In addition, the threat that energy-intensive industries could relocate to regions with

¹³ For an overview see Aiginger – Sieber (2006) and Peneder (2009, 2010).

lower energy prices and lower environmental standards (including the carbon leakage argument) is used to limit ambitions for higher fossil fuel taxes. This results in documents where different goals for industrial (and energy) policy are merely accumulated or listed, without addressing the conflicts between them or establishing any priorities. Setting 'competitiveness' and 'sustainability' at the 'centre stage' is one such compromise (*European Commission, 2010*). If competitiveness is understood as cost competitiveness (which is the dominant implicit interpretation in some documents), this calls for low energy costs, while sustainability requires higher energy prices for fossil energies to incentivise greater efficiency or switching to renewable energy sources.

Resilient manufacturing plus ambitious new target

All documents¹⁴ show the European Commission's confidence in the performance of Europe's manufacturing sector. It is frequently mentioned that Europe's share of world trade was relatively stable (at least in the decade before the financial crisis) and that the manufacturing sector (excluding energy and raw materials) had a large trade surplus. The importance of manufacturing is highlighted by evidence that one in four private sector jobs is created in manufacturing (and one further job in associated services; *European Commission, 2010*), and that 75% of exports and 80% of private R&D originates in manufacturing. The Commission further states that Europe is a world leader in many strategic sectors such as car-making, aeronautics, engineering, aerospace, chemicals and pharmaceuticals (*European Commission, 2012*).

On the other hand a 'fresh approach' (*European Commission, 2010*) is seen as necessary, because three million jobs have been lost in manufacturing since the start of the crisis, and because recovery in Europe has been generally slow. Together with the past experience of the decline of the share of manufacturing in GDP, this motivated the European Commission to set the goal to 'reverse the declining role of industry in Europe from its current level of around 16% of GDP to as much as 20% by 2020'. This ambitious statement is complemented by calls for higher levels of investment, greater intra-European trade and a significant increase in the number of SMEs (small- and medium-sized enterprises) and exports to third (non-EU) countries.

Given the reasons for the declining share of manufacturing (higher productivity, lower relative price increases as well as a lower income elasticity of demand for manufactured goods compared to services), this goal is unlikely to be achieved, without a dramatic change in the general economic growth path. If Europe wishes to improve the competitiveness of its manufacturing sector in the traditional sense, it must raise productivity or lower costs, actions which are both likely to lead to declining shares of industrial goods produced for the home market (see *Peneder, 2014*). Lower costs and higher productivity could improve Europe's trade position,

¹⁴ This refers to policy documents. They often refer to basic scientific work done for the annual Competitiveness Reports (e.g. *European Commission, 2009, 2011A, 2011B*), which are prepared by a research network under the coordination of WIFO - Austrian Institute for Economic Research (see *Janger et al., 2011*).

although given Europe's existing export surplus, this is neither pressing nor is it a strategy that would be left unchallenged by other regions.¹⁵

The picture changes only if we take into consideration the fact that core manufacturing products are combined ever more with production-related and value-enhancing services. If products become more durable, more consumer-specific (e.g. via digitalisation) or ecologically sustainable, and if production is aligned with training, social innovations and larger resource efficiency, this could allow price increases in line with increasing consumer valuation. These are the features of a new growth path, which requires new incentives and changing consumer preferences, and where the costs involved have to be assessed by domestic and international markets as increasing consume value. Whether this increasing 'service component' will be included statistically in the measurement of value-added by the manufacturing sector, or in related services or government accounts is another question. What the European Commission intends with its goal - if taken literally - is to dampen the decline of the share of industry and to limit other regions' inroads into European domestic markets.

OECD's call for a 'soft industrial policy'

The OECD, formerly the fiercest critic of the old industrial policy, views clean technologies as essential elements of the 'soft industrial policy' strategy (OECD, 2012).¹⁶

OECD advocates an industrial policy based on a 'more facilitating, co-ordinating role for government, consistent with the systems approach' (networks, strategies, priorities). Warwick (2013) adopts a broad and inclusive definition of industrial policy. Industrial policy has moved from a traditional approach based on product market interventions (subsidies, state ownership, tariff protection), through a phase of correcting market failure by taxes and subsidies, operating mainly on factor markets (R&D, training, access to finance) to a third stage of helping to build up systems, create networks, develop institutions and align strategic priorities. He summarises recent experience with industrial policy in France, UK, Netherlands, as well as in Japan, India, China and other Asian countries, and offers a new typology for industrial policy by policy domains (product markets, labour and skills, capital markets, technology and systems/institutions) and by policy orientation (horizontal, selective). Warwick (2013) distinguishes between policies for catching up and frontier countries (each developing or following comparative advantages). Analysing industrial policy in action he analyses green growth policy describing policy instruments for a green industrial policy. All important for the future success are better evaluation techniques and monitoring.¹⁷

¹⁵ With the exception of southern European countries, which need more exports to restart growth. On the other hand Germany's large surplus is clearly not maximizing German welfare.

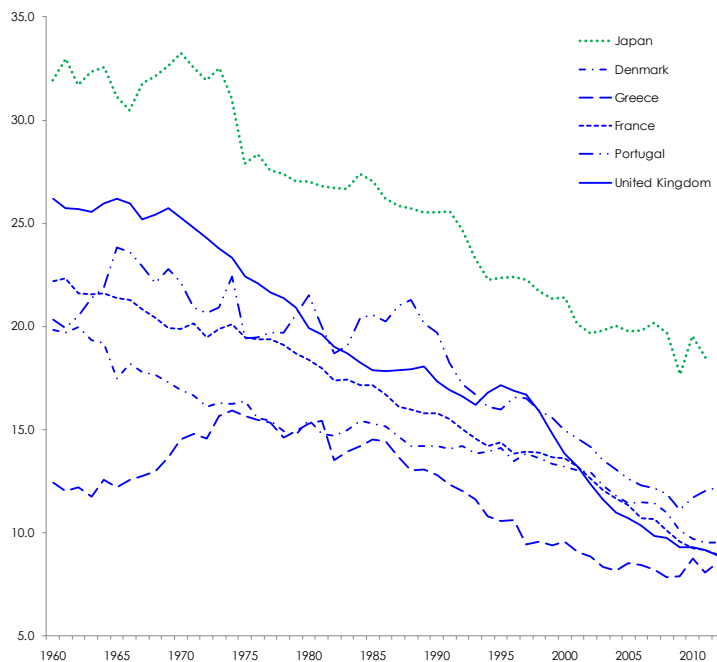
¹⁶ For an overview of OECD documents see Warwick (2013).

¹⁷ The discussion of a new industrial policy is still an ongoing debate. See Warwick (2013) also for risks and possible failures in future industrial policy.

"Remaking" vs. "alone at home" in the U.S.

In the U.S., discussion is labelled as the 'remaking' or the 'second spring' of manufacturing, with highlights like the declaration by Jeff Immelt (General Electric CEO) of 'outsourcing as the most outdated model', furthermore the praise for Lenovo for restarting computer production in North Carolina and for General Electric for returning washing machine manufacture to Kentucky.¹⁸ For a broader approach highlighting the principal reasons for the decline of U.S. manufacturing, as being the lack of cooperation across U.S. companies and the loss of learning capacity due to early offshoring, see Berger (2013). The hope to base the 'renaissance' on cheap energy prices and its impact on the structure of U.S. manufacturing is analysed in section 5.

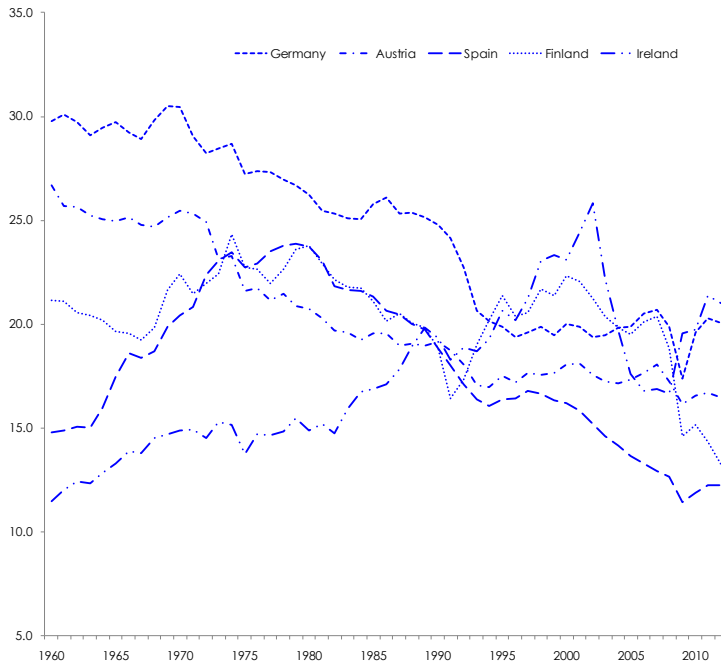
Figure 4: Share of manufacturing from 1960 to 2012: countries with a strong decline
Nominal value; in % of GDP



S: Eurostat (AMECO).

¹⁸ Notice that these popular examples are related to qualified labour in the U.S. or to wage increases in China, not to energy prices.

Figure 5: Share of manufacturing 1960 to 2012: countries with a smaller decline. Nominal value; in % of GDP



S: Eurostat (AMECO).

Figure 6: Share of manufacturing 1960 to 2012: EU-15, USA, Japan. Nominal value; in % of GDP



S: Eurostat (AMECO).

4. Europe - a success story in need of a vision and benchmarks

4.1 A successful experiment in a midlife crisis

Much analysis of Europe's low dynamics over the past decade forgets that the European Union has been a tremendously successful integration experiment. It started with only 6 members 50 years ago. It now has 28 members with 10 more countries applying for membership or neighbourhood contracts. Europe has integrated former communist countries at such a high speed that the World Bank labelled it an 'integration machine' (*World Bank*, 2012). A once divided and fractured continent is now united as a peaceful region (rewarded with the Nobel Prize). Europe is lauded for its 'soft' foreign policy and for spreading the rule of law (*Sachs*, 2008).

The current EU-28 is the largest economic region in the world, as measured by Gross National Product. Its share of world trade is more stable than the U.S.'s, albeit falling slightly due to the impact of the newly-industrialised countries. Europe takes the lead in pushing for environmental goals (Kyoto protocol, EU-2020 energy goals) and has promoted a system of carbon emissions trading.¹⁹ Europe has lower shares of poverty and less income inequality than other economic areas.

4.2 Low dynamics and conventional remedies

Nevertheless there are also indications of weaknesses. Economic output in the Eurozone in 2014 is still lower than it was in 2008.²⁰ Europe has a double-digit unemployment rate, its banks are undercapitalised and its member states pay higher interest rates for their sovereign debt (despite lower debt/GDP ratios) than the U.S. and Japan. There are internal trade disequilibria with large surpluses in Germany, the Netherlands and Austria, deficits in some big countries (U.K., France) and in Southern Europe (the deficits in the latter region are now declining, in part due to reduced imports). Europe will miss its employment, R&D and poverty reduction goals set out in the Europe 2020 strategy (and adapted by national policy decisions). It will not reach its goals for energy efficiency and curbing CO₂ by 2020, and it will grossly miss the trajectories of the energy roadmap to 2050.

Lower dynamics²¹ and large disequilibria are partly a consequence of the problem that the European institutions (which were adequate for a small number of countries and an integration process limited to trade) are no longer adequate for 28 countries, the majority of which also share a common currency.

Five rather conventional policies are needed to revive Europe's dynamics (*Aiginger*, 2014; *Aiginger – Glocker*, 2014); (i) reducing the disequilibria by joint responsibility²² of the debtor and the creditor countries; (ii) increasing domestic demand either by boosting consumption via higher wages or less income inequality, or, in a climate of reduced uncertainty, by encouraging companies to reinvest their profits; (iii)

¹⁹ The system broke down since too many energy-intensive sectors were exempted, and other energy-intensive companies were able to buy extremely cheap permits from ailing eastern European companies or from companies severely hit by the financial crisis.

²⁰ In contrast to the U.S. where it is 9% higher; world output exceeds its pre-crisis level by 20% compared to 2008.

²¹ Of employment, GDP and productivity.

²² See *Aiginger et al.* (2012).

restructuring government expenditure and taxes so that they become more growth-friendly; (iv) boosting investment in education, retraining, innovation, and young people; and (v) making use of higher market growth – albeit also higher volatility - in the neighbourhood for exports and investment, including the Black Sea region, Russia and North Africa.

4.3 Towards a new growth path: four game changing proposals

However, changes need to go further. Europe must develop its existing socio-economic model into a role model for a dynamic, inclusive and ecological society in a globalising world.²³ Social expenditures and ecological ambitions should be turned from costs into drivers of new dynamics (e.g. through an activating labour market policy or an innovation-based sustainability strategy). A new European model could be attractive for young people, as well as for countries climbing up the income ladder, which are looking for alternatives to the Chinese catch-up model or the U.S. frontier model based on individualism, with low priority for social goals and sustainability.

The European Commission – reacting to this need for a new and far-reaching strategy – tendered a large socio-economic research program ('WWFforEurope') to develop a new growth path that, on the one hand, extends the goals of Europe 2020 into the future and on the other targets a much deeper socio-ecological transition.²⁴ Tentative results indicate that several important changes have to be made, if Europe wishes to develop its socio-economic model into a compelling vision. We start by noting some of the overarching changes needed, then discuss some 'barriers' to change.

Game changer 1: From GDP to beyond-GDP

Economists always understood that GDP is not a welfare indicator – both for technical reasons and for the concept. GDP and its growth nevertheless dominate the discussion of economic policy and are seen as the single overarching measure of success of an economy or region. The criticism of this indicator and its alternatives were summarised by the so-called *Stiglitz - Sen - Fitoussi* Commission, leading to the 'beyond-GDP goals' (*Stiglitz et al., 2009*). These are now widely accepted as a superior theoretical approach. The OECD has published a corresponding set of 'Better Life Indicators', which many countries now start to use as measure of performance.

Income per capita and income growth will remain important goals particularly for low-income individuals, regions and countries. Other goals receive greater priority, as the marginal utility of income declines. This does not preclude GDP dynamics from remaining an instrument for reaching other ultimate goals, such as full employment, social security, health, consumer choice and so on – the key point is that we should measure the achievement of the ultimate goals, not of the instruments used to reach them.

²³ Of course the European Model is not itself monolithic today (see *Aiginger, 2006*). Different European models share common elements, particularly when compared to the models in Asian and the U.S.

²⁴ A team of 33 European research groups, coordinated by WIFO, won the DG Research tender. The project is now halfway into its four-year term, with about 100 research articles available at <http://www.foreurope.eu/>.

For a new European growth path and industrial policy, this change from GDP to beyond-GDP is particularly important. The industrial sector is one of the largest production sectors and is responsible for the lion's share of research and development. If the innovations developed in manufacturing do not help attain welfare (as defined by the beyond-GDP goals) the potential of the economic system is not fully utilised. Industrial policy should enforce and accelerate manufacturing's welfare orientation, should support also non-technical innovation and it should be systemic and forward-looking.

Game changer 2: Redefining competitiveness

The term competitiveness has been used over and over again in the narrow sense of cost competitiveness, calling for lower wages and other production costs as policy instruments to 'stay' competitive or 'regain' competitiveness. In its enlightened version productivity is acknowledged as a second element of cost competitiveness, leading to unit cost approaches. The cost focus has been criticised for a long time, spawning approaches that emphasise technological or qualitative competitiveness, and measuring 'outcome competitiveness' using a combination of targets (e.g. income, employment).²⁵ Finally, competitiveness should be based on capabilities like skills, innovation, institutions, an empowering social system and ecological ambitions. Outcomes should be defined by the achievement of broad, socio-economic goals. *Aiginger – Bärenthaler-Sieber - Vogel (2013)* therefore propose defining competitiveness as the 'ability to deliver beyond-GDP goals'. This definition could end the preoccupation of economic policy with costs instead of capabilities.

Game changer 3: Distinguishing between a low road and a high road

In principle, countries have two ways to close current account deficits, to increase dynamics of the economy or to reduce unemployment. One is to lower costs (wages, taxes, energy prices); the other is to raise productivity, by boosting capabilities (education, innovation), and by becoming a leader in energy efficiency and renewable energy.²⁶ We label the first path to regain competitiveness a 'low-road strategy' and the second a 'high-road strategy'. It is difficult for countries with high wages to increase per-capita GDP by reducing wages, because low-income countries have greater competitive advantages in this aspect. Industrialised countries can more successfully compete on quality, innovation and new services (see *Aiginger, 1997*).

Game changer 4: Industrial policy as a strategy for high-road competitiveness

Academic literature and commentary provide many definitions of industrial policy,²⁷ without an agreement on a common definition. We propose to define industrial policy as economic policy to promote the competitiveness of a country or region,

²⁵ See concepts used by the OECD and the European Commission analysed in *Aiginger (2006)* and several other papers in the special issue on competitiveness in the *Journal of Industry, Competition and Trade (2006)*.

²⁶ We could label this as a multiple equilibrium point of view.

²⁷ For an overview, see *Aiginger (2007, 2012)*

where competitiveness is defined as the ability to deliver the beyond-GDP goals.²⁸ For industrialised countries with high per-capita incomes, industrial policy should therefore explicitly be a high-road strategy of competitiveness based on capabilities, good institutions and high ambitions for social and ecological behaviour. For Europe and its vision of a socio-economic system with a strong emphasis on inclusion and sustainability, this high-road strategy explicitly includes equality and green goals.

This definition should end (or at least mitigate) the conflict between industrial policy favouring on the one hand specific sectors, and on the other hand activities with positive external effects like innovation and education. It should also mitigate the conflict between industrial policy calling for low energy prices and environmental policy aimed at significantly reducing carbon emissions. Society's ultimate goals determine the direction in which it should move and the weighting of these goals will differ according to income levels, preferences and cultural attitudes. These ultimate goals should set the direction of policy interventions and the instruments of industrial policy.

4.4 Status quo bias and political rebound effects

We have defined four game changing proposals that are far from easy to implement: (i) a new yardstick for performance; (ii) a new definition of competitiveness; (iii) the choice between a low and a high road to competitiveness (suggesting that welfare increases in industrialised countries require a high-road strategy); and (iv) a broader industrial policy encompassing goals that were considered beyond its ambit until now. We have to expect hurdles on this path. Some resistance comes from the traditional inefficiency of governments in reaching their goals, some from the fact that voters tend to vote for their short-term interests, often influenced by lobbying groups that benefit from the status quo. Discussion of these hurdles is part of WWWforEurope's remit and can be found on <http://www.foreurope.eu/> (Aiginger, 2013; Arrow, 2013; Aiginger, 2014, Geels, 2013). In the next section we will highlight some barriers and political 'rebound effects'²⁹ at the interface of industrial and energy policy. As political rebound effects we label successful lobbying by defenders of the status quo, after there had initially been strong political support for change.

In general, government and old industrial policy tend to support the status quo. Political rebound effects usually set in once transition has started and some low-hanging fruit has been harvested.

5. Interface of industrial and energy policy: Progress and barriers

5.1 The new consensus

The need for and the success of a new industrial policy, which promotes 'high-road' competitiveness in industrial countries and explicitly takes societal goals into account,

²⁸ Of related interest, see *Peneder* (2014).

²⁹ Political rebound effects mean successful lobbying by defenders of the status quo, after there had initially been strong political support for change.

can be illustrated through the measures taken for reaching climate goals and the industrial sector's contribution to this path.

Global warming and the need to limit temperature change to 2°C (relative to the preindustrial age) until 2100 are now well understood. This holds also for the contribution of human activities and the extent to which greenhouse gases have to be curbed (*Stern, 2007, IPCC, 2014*). Europe has established a roadmap, according to which emissions should be reduced between 80% and 95% by 2050.³⁰ Worldwide negotiations led to the Kyoto Protocol in 1997 and there is still hope that this could be extended in 2015. Europe has set a shorter-run goal to reduce its greenhouse emissions by 20% by 2020 and plans exist to possibly increase this target to 30% or 40%. The European Commission puts sustainability at the centre stage of its industrial policy (see section 3.3). While the U.S. does at federal level cooperate not really in negotiating ambitious international climate targets, some states have their own sustainability strategies. While not agreeing to contractual limits, China acknowledges the 'big city problem' and has carbon emission targets for 200 cities (*Financial Times, April 15th 2013*). China is also leading the development of electrical cars.

5.2 Signs of change

There are encouraging signs that energy policy is on a new path:

- The EU-27's greenhouse gas emissions for 2010 are 10% below their 1990-levels.
- Material consumption was 14% lower in 2000 than in 1970, and further declined by 13% between 2000 and 2010 (*Fischer-Kowalski - Hausknost, 2014*).³¹
- Nearly all industrialised countries show signs of relative decoupling, insofar as energy consumption (and in particular fossil energy use) is increasing at a lower rate than GDP.
- Denmark succeeded in achieving an absolute decoupling of its energy consumption: while GDP more than doubled between 1970 and 2010, fossil fuel consumption decreased by 23%.
- The share of energy derived from renewables is increasing. In Portugal, Sweden and Austria 50% or more of electricity comes from renewable sources.

5.3 Resistance to change

There are also backlashes and rebound effects:

- The European CO₂ emission trading system collapsed and there is little political will to re-establish it - let alone to deepen its ambitions. The new Australian government abolished its CO₂ tax (in contrast, China introduced such a tax in seven cities).
- In energy policy, the focus is shifting backwards, away from supporting energy efficiency and renewable energy, and towards the old strategy of emphasising

³⁰ Simulations by the PRIMES energy system model show that this very ambitious target is in principle feasible without reducing economic growth, although this would require radical technological innovations (energy efficiency improvement greatly above the historical trends) and de-carbonization initiated by a carbon price of 250 €/t (*European Commission, 2011; Kupers, 2012; Schleicher – Köppl, 2013*).

³¹ For differences in decoupling between production and consumption, see *Munoz – Steininger (2010)*. Thanks to Angela Köppl for this reference.

'affordable' prices and security of supply. Germany's *Energiewende* – the plan to phase-out nuclear energy - is under pressure and has already been softened in a new coalition agreement. In Europe coal use has increased after the collapse of CO₂ emission trading, as it has become cheaper than gas. It is also used to complement renewable energy at times of low supply. Nuclear energy is also returning via the so-called 'neutrality approach'; the U.K. has openly requested new subsidies, based on the argument that without subsidies nuclear energy is too expensive without such subsidies.

5.4 Low energy prices in the U.S.

The availability of new energy sources, especially liquefied gas and gas extracted via new technologies such as fracking, has caused U.S. energy prices to plummet; this is regarded as a chance to revitalise U.S. manufacturing.³² Spillover effects to Europe exist as U.S. coal is now exported causing European gas prices to decline. Europe's energy-intensive industries are calling for the region to match the U.S.'s renewed (and now amplified) comparative advantage in energy prices: Europe should copy the U.S. in exploiting similar new energy sources (such as fracking for gas). At the same time, Europe has already been assisting its energy-intensive industries with free allowances for CO₂ emissions. It has also postponed restoring the CO₂ emission trading system or taxing fossil fuels and kerosene.

Table 2: European and U.S. sector balances and export share

	EU				US			
	1999	2011	1999	2011	1999	2011	1999	2011
	Trade in bn €		Shares of exports		Trade in bn €		Shares of exports	
Energy intensive industries								
Exports	77.7	247.4	11.3	15.5	57.3	123.1	9.7	16.0
Imports	64.1	216.9	9.3	13.6	79.0	106.0	13.3	13.8
Trade balance	13.6	30.5	2.0	1.9	-21.7	17.1	-3.7	2.2
Technology driven industries								
Exports	252.1	530.9	36.6	33.2	280.0	246.3	47.2	32.0
Imports	250.1	436.8	36.3	27.3	371.1	424.3	62.5	55.1
Trade balance	2.1	94.1	0.3	5.9	-91.1	-178.0	-15.3	-23.1
Resource intensive industries								
Exports	76.1	192.2	11.1	12.0	50.2	76.0	8.5	9.9
Imports	72.0	198.1	10.5	12.4	121.6	116.2	20.5	15.1
Trade balance	4.1	-5.8	0.6	-0.4	-71.4	-40.1	-12.0	-5.2
Engineering industries								
Exports	365.1	767.8	53.1	48.1	379.7	367.9	64.0	47.7
Imports	328.5	580.8	47.7	36.3	490.7	576.3	82.7	74.8
Trade balance	36.6	187.0	5.3	11.7	-111.0	-208.5	-18.7	-27.1

S: Eurostat (AMECO), WIFO database.

5.5 Two strategic answers

In principle European industrial policy has two options to answering the challenge of lower U.S. energy costs: the first, to try and lower its own energy costs; and the second to boost energy efficiency so as to limit the cost difference, plus providing additional measures to improve high road competitiveness, if improvements in energy efficiency

³² Focussing on cheap energy as main characteristic of the new industrial policy in the U.S. may not tell the whole story since there are also several innovation and technology initiatives.

alone cannot bridge the gap. The first answer follows the logic of 'old' industrial policy. If some input costs are too high, try to get cheaper inputs too or subsidise the firm (low cost strategy). The second answer is to try to increase productivity and/or to foster factors which increase tomorrow's competitive advantages, specifically those fitting to the long run goals of the society. It is not even evident that low energy prices will help to decrease the U.S. trade deficit. The U.S. currently have a surplus in trade with energy-intensive goods and a large deficit in technology-driven industries (178 bn €). Energy costs are very low in technology-driven industries and only in these sectors a rich country can be successful in the long run. Investment in skills and research thus would promote the long-run specialisation of a rich country much better.

Box 2: Carbon leakage

Carbon leakage addresses the problem that ambitious standards and emission taxes in one country may shift the production of resource intensive products to countries with lower standards, thus raising worldwide greenhouse gases. This argument is used to oppose higher energy prices or standards in Europe.

The carbon leakage argument is not completely wrong in the short-run, but not convincing in the long-run. Actual shifts in production depend on broader strategies, innovation efforts; spill over effects and policy measures.

- If a company is forced to reduce emissions due to higher prices, it may introduce a better technology, not only in respect to energy but also labour or capital efficiency. This 'innovation effect' may exceed the 'relocation effect'.
- Emission trading can provide an 'efficiency discount' to the three most efficient companies (e.g. half price per ton emitted). Then innovating companies receive a double dividend from innovation: first lower costs from the advanced technology and secondly a lower price for the remaining emissions. Furthermore, research funds like those in the EU framework program could promote technologies radically reducing emissions. A program to develop an ultra-low carbon technology in steel production exists, the technology has been developed, a site for a test factory still needs to be built.
- Carbon leakage could be reduced if companies are urged to deploy the 'best technology' to plants in countries with lower standards. Incentives range from moral suasion or stakeholder activism, and to trade or investment agreements. A minimum requirement would be that multinational firms have to report plant-specific emissions.
- A tax or import duty could be levied on the difference between minimal and actual emissions. Such 'border adjustment schemes' should however be treated carefully, as duties reduce trade, are open to protectionist misuse and may provoke counter-measures. 'Climate funds' accelerating the global diffusion of the best technology, financed by emission trading or by a financial transaction tax are a better alternative.

The carbon leakage argument stresses the short run decision where to locate a new plant at a given point of time; it is less convincing for relocations if plants already exist. And worldwide emissions in the longer run depend firstly on technological progress in frontier countries and secondly on the speed of the global diffusion of clean technologies. Higher prices and standards in frontier countries will shift the frontier of efficiency, and trade and investment policy, political, moral and legal pressure and technology transfer funds will decide about the speed of diffusion of best technology. Recall that total subsidies for fossil fuels are estimated to equal 400 billion Euros,¹ and could be used to boost technology transfer.

Summing up, a strategy to slow technological progress via cheaper energy and emissions prices in the countries at the frontier will probably increase worldwide emissions in the long-run.² A green industrial policy will dynamically push *all* countries up the environmental quality ladder.

¹ This is six times as much as the subsidies for renewable energy sources. - ² The carbon leakage element is restricted to a few industries. Only four industries have energy costs of 10% of total costs; for most industries, energy costs are between 1% and 2% of total costs (Aiginger, 2013).

6. Summary: A systemic policy, aligned with beyond-GDP goals

(1) Industrial policy is back on the political agenda, driven by fear (globalisation, deindustrialisation) and hope (increasing employment, sustainability). Bubbles in non-manufacturing sectors (finance, construction, housing) have fuelled the financial crisis, and recovery is especially difficult in countries with a small manufacturing sector, particularly when it is combined with a current account deficit.

(2) Academia suggests that a new industrial policy must be different from the past. It should promote competition and be a discovery process in a cooperative climate between government and companies. It should align industrial policy with the long-term interests of the society. It has to be systemic and driven by a wider vision, instead of a standalone policy in conflict with other strands of government policy. It should stop extending the life of non-viable industries or artificially creating national champions requiring shelter from global competitors.

(3) A new industrial policy requires three new yardsticks and a redefinition of industrial policy.

- First, economic performance should be measured by a broader set of goals or a more comprehensive indicator, instead of GDP (or GDP growth). This could be the 'beyond-GDP goals' or some overall indicator of wellbeing like life satisfaction, happiness or life expectation.
- Second, it should downgrade or abandon the concept of price competitiveness, which emphasises low costs (or in its enlightened version low unit labour costs). Competitiveness should be defined as 'ability to achieve beyond-GDP goals'.
- Third, in trying to increase welfare (beyond-GDP goals) countries may pursue a low-road strategy (emphasising low costs, taxes, social and ecological standards) or a high-road strategy based on research, skills, ecological ambition, an empowering employment policy and excellent institutions. Industrialised countries have to pursue a high-road strategy, if they want to maintain their frontier position.
- Industrial policy for high-income countries should be defined as the sum of policy measures to achieve 'high-road competitiveness'. By targeting high-road competitiveness and achieving society's wider aims (including social and ecological goals), industrial policy thus merges into a systemic socio-economic strategy.

(4) Policy documents developed by international organisations, by the European Commission, and national governments have defined new goals for industrial policy that partially follow the ideas of academia. All proposals directly or indirectly focus on the structure of the economies as a whole, not only on a narrowly defined manufacturing sector since the borders between manufacturing and services are ever more blurred. The OECD's 'New Perspectives Program' promotes the inclusion of social and ecological goals into economic models and thinking.

(5) The European Commission puts sustainability 'at the centre stage' of industrial policy (unfortunately jointly with a rather conventional defined competitiveness). Its Energy Roadmap 2050 sets the goal to reduce greenhouse gas emissions by as much

as '80 to 95%'. Radical innovation projects – e.g. on ultra-low carbon steel - have been started. Recently, the European Commission set a goal to increase manufacturing's share of nominal value-added GDP to 20% by 2020 (from 16% currently) which is realistic only if quality of production is significantly upgraded and service components are added.

(6) The renewed interest in industrial policy in the U.S. was motivated by the current account deficit. Reducing energy imports and becoming a net exporter for energy seem to be the overarching policy priorities. But a large share of the U.S. deficit - 180 billion euro - stems from an U.S. trade deficit in technology-driven industries (where energy costs are about 1% of total costs). Reducing energy prices will not boost the U.S.'s share of manufacturing in global trade, as keeping the median wage constant for 50 years did not help.

(7) The new intentions of industrial policy are still on trial. Europe's fear of losing cost competitiveness relative to the U.S. is reducing its determination to put sustainability at the 'centre stage'. On the positive side the share of renewable energy has increased strongly, with some countries producing 50% of electric energy from 'green' sources. But new energy sources need complementary fossil fuels and investment in the power-grid infrastructure. Coal use in Europe increased after the collapse of the European emissions trading scheme. Increasing U.S. coal exports made coal cheaper in Europe than gas. At the same time China is undertaking a deep transformation, trying to increase resource and energy efficiency – albeit from a very low initial level. It has set goals to increase R&D investment to 2% of GDP (the current EU share) and makes advances in electric vehicles and alternative energies.

(8) Europe has in principle two choices to cope with high energy prices: to go for lower energy prices itself (by exploiting shale gas or by reducing taxes on energy) or to further its lead in energy efficiency *plus* to increase investment in innovation and top education. Given a vision of a system encompassing social and ecological goals, the only viable choice is to pursue an industrial policy to encourage energy efficiency, social and ecological innovation.

(9) Going for a socio-ecological transition can make Europe a 'role model' for other countries, even if different preferences and circumstances will always call for some heterogeneity. Industrial policy should foster the long-run transition, not decelerate structural change. This is a demanding challenge, given vested interests and the traditional role of governments to preserve the status quo and national champions.

(10) Refocusing on the economy's industrial base makes sense, particularly after the experience of bubbles in financial and real-estate markets. New industrial policy should support the transition of traditional narrowly defined manufacturing to a sector producing greater consumer value, supporting the economy's long-term goals. We therefore define an industrial policy for high-wage countries as strategy to promote high-road competitiveness where competitiveness is defined as the ability of an economy to provide 'beyond-GDP goals'.

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