The Role of Comparative Advantage and Endowments in Structural Transformation

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Abstract

In this chapter we discuss the role of country’s given conditions and endowment structures according to two theoretical perspectives. While ‘pure’ theories of trade have mainly seen specialization according to one’s comparative advantages as the key route to development, we outline a ‘heretic’ point of view on the role of technological learning and absolute advantages for structural transformation. Such a theory will provide useful guidance to interpret the effects of unbridled globalization and the role of natural resources vis-à-vis industrial and trade policies in shaping the process of structural change.
1 Introduction

One of the most dramatic structural changes affecting developed economies has been the sharp
decline of employment in the primary sector (mainly agriculture, but also extraction of commodi-
ties). In 1840, about two thirds of US workers worked in the primary sector; at the turn of the new
millennium, this share had fallen to just 2.4% (Jones, 2016).

Still, the common wisdom is that natural resource endowments and the related comparative ad-
vantages are an essential ingredient of prosperity and development. In such a perspective, no further
discussion is warranted: trade benefits all its participants, and comparative advantages shape inter-
national specialization patterns giving rise to efficient outcomes. Unfortunately, all that glitters is not
gold.

Back in 1613, Antonio Serra investigated and discussed why the Republic of Venice was much richer
than the Kingdom of Naples, despite having no comparable natural resources (Serra 1613; Reinert
1999). Although with rudimentary instruments and a mercantilistic approach, Serra found the answer
in the very difference between primary and industrial activities: while the latter enjoy what we would
now call increasing returns, the former do not allow similar long-term wealth generation and eventually
incur in decreasing returns to scale (Reinert, 1996).

In the present essay, we shall try to answer the very same question of Antonio Serra in light
of the recent waves of trade liberalization and globalization since the 1980s. We shall argue that
endowment-based comparative advantages are misleading as drivers of economic development. This
has been historically true and it continues to be so also in the era of globalization. We will try to
offer a theoretical underpinning to discuss the role of natural endowments in structural transformation
and to interpret the most recent evidence. The role of the policy variable and its relevance to shape
comparative advantages and achieve successful development will be extensively discussed.

2 Structural Change, International Trade and Comparative Advan-
tages: an Introductory Detour

2.1 A Tale of Two Theories

Within the huge literature on international trade and comparative advantages, we can roughly
distinguish two research traditions, as already done by one of us in Dosi et al. (1990). On the one
hand, the ‘pure’ theory of trade has its intellectual roots in the seminal work of Ricardo (1817) and
later on Heckscher (1919) and Ohlin (1933), all the way to the recent attempts to relax unrealistic assumptions of the basic general equilibrium model that go under the names of ‘New Trade Theory’ (Krugman, 1979) and ‘New-New Trade Theory’ (Melitz and Trefler, 2012). On the other hand, a long tradition of ‘heretics’, starting from the early contributions of thinkers like the Reverend Tucker, the already mentioned Count Serra, Ferrier and List, has been developing an alternative theory of international trade based on technology gaps and related product-cycle views (Posner 1961; Vernon 1966; Cimoli 1988; Dosi et al. 1990; Fagerberg 1996). In the following, we shall briefly outline the main tenets of the two traditions on the determinants and effects of trade.

The orthodox trade theories identify the main determinant of trade flows in what has come to be known as the law of comparative advantages, first showed by Ricardo with a famous numerical example of two countries (England and Portugal) and two goods (cloth and wine), both produced by a certain fixed amount of the same factor of production (labour). The standard theory goes as follow: given the neoclassical assumptions on technology, demand, perfect competition and market clearing, each country will do better when it specializes in different goods and it engages in international exchanges, even when one country has an absolute advantage in the production of every good (for a formal demonstration and discussion of the result, see Gandolfo 2013). Recent contributions have relaxed some hypotheses or changed the source of comparative advantage, but overall the central adjustment mechanism that guarantees market clearing has been left untouched.

Very different assumptions constitute the starting point of the ‘heretic’ line of inquiry. Building over evolutionary theorizing on technological dynamics (Nelson and Winter 1982; Dosi 1988; Dosi et al. 1990; Dosi and Nelson 2010), this alternative tradition rules out the existence of adjustments processes always leading to a general equilibrium situation and starts from much more realistic assumptions on the nature of technological change (what can be collectively dubbed as the ‘Stanford-Yale-Sussex synthesis’, see the review in Dosi and Nelson 2010). The microeconomics of innovation has assessed that technological change, despite having some informational features, is by and large an evolutionary process that advances along paradigms and trajectories (Dosi 1982; Dosi and Nelson 2010; Martinelli 2012). A first consequence of a theory of production based on such premises is the opposite of the cursory treatment of technology present in Ricardian models of trade (Cimoli and Dosi, 1995). On the contrary, Dosi et al. (1990) argue that (technological) absolute advantages\(^1\) dominate over comparative

\(^1\)The first notion of absolute advantages is to be found in the work of Adam Smith (1776), but with an important difference. Smith simply applied its concept of division of labour to an international context, with the result that each country would eventually specialize into the production of the good for which it possessed an absolute advantage (i.e., a lower cost of production in absolute terms). Thanks to free trade, the overall fixed (and immobile) amount of labour would find an efficient allocation and the total quantity of goods produced would be maximized. However, such a
advantages as determinants of trade flows: absolute advantages account for most of the composition of trade flows by country and by commodity and explain the evolution of such trade flows over time. Whenever there are strong technological interdependencies, hierarchical links between technologies and learning externalities, the pattern of absolute advantage in these dominant technologies, skills or capabilities has to be taken as an autonomous determinant of international competitiveness, independent of the pattern of comparative advantage (Dosi et al., 1990). In turn, international technology gaps and the ensuing absolute advantages are at the basis of the notion of competitiveness, which again is an ‘absolute’ concept (e.g. the market share of exports in a certain sector; see Reinert 1995 and Mulatu 2016). In general, the most advanced countries will show a higher participation in world trade in their sectors of comparative disadvantage than will any backward country show in its sector of comparative advantage (Dosi et al., 1990). These proposition have been confirmed by a large body of empirical literature at country (e.g. Fagerberg 1988) and sector level (e.g. Laursen and Meliciani 2002), which only recently has been complemented by firm-level analyses (Dosi et al., 2015).

In synthesis, only in a world tending to technological convergence, intra-country mechanisms of specialization related to comparative advantages are likely to become the fundamental factor in explaining patterns of international competitiveness and the world distribution of exports. The opposite will apply to a world where technological asymmetries are increasing (or at least not reducing): technological absolute advantages between countries within each sector would become the major determinant of international market share (see Dosi et al. 1990 for a detailed discussion and modelling efforts). But given these two contrasting perspectives, what are the sources of comparative and absolute advantages?

2.2 The Sources of International Differences in Trade

Mainstream trade theories maintain that comparative advantages constitute the fundamental determinant of trade. In the original contribution of Ricardo (1817), inter-country technological differences reflected in labour productivity differentials were the source of comparative advantage. However, as remarked by Eaton and Kortum (2012), the intuition behind the original Ricardian model is much more popular than the model itself, which is usually cursorily presented to undergraduate students and then replaced in economic analyses by generalizations of the Heckscher-Ohlin model (Flam and Flanders, 1991). The latter theory can be described as a factor proportions theory of comparative advantages, where international specialization stems from different endowments structures that in situation seems hard to generalize in practice, and it was Ricardo that later transformed this rudimentary theory into a central tenet of Classical Economics.

2 For a systematic and updated review of empirical studies, see Dosi et al. (2015), Section 3.
turn predict the ensuing patterns of trade. Crucially, in the basic model both countries share the same production functions exhibiting positive but decreasing marginal productivities and constant returns to scale (Gandolfo, 2013). Note also that in dealing with countries’ comparative advantages, mainstream theories do not provide an ad hoc treatment of cheap labour endowments. If anything, abundance of unskilled workforce if treated precisely as any other possible commodity endowments, leading to the analogue prescription of specializing in labour-intensive low-technology manufacturing activities (see for instance Lin 2011). However, it should be acknowledged that large availability of unskilled workers entails specific challenges for development\(^3\): while the workforce is intrinsically able to learn new skills through learning-by-doing, this fact per se is not enough to automatically climb the development ladder. As an example, consider the Mexican *maquila*-type assembly lines producing for the US market, that have not been able to bring countrywide technological upgrading and thus have recently been severely hit by the competition of cheaper Asiatic products (Cimoli and Katz, 2003). Rather, specific public policies fostering human capital accumulation and the development of innovation capabilities would have been needed, as we shall argue in the concluding section.

The well-known weak empirical performance of the classic trade theories (see the controversy following Leontief 1953) led to a florid literature of ‘revisionists’ gradually improving the workhorse model (Feenstra 2015 for an overview). Starting in the 1970s, the so-called ‘New Trade Theory’ relaxed the standard assumptions with reference to the production function by introducing economies of scale (Krugman, 1987b). This class of models places the microfoundations of intraindustry trade in the strategic behaviours of firms operating in conditions of monopolistic competition due to assumptions of ‘love of variety’ and product differentiation (Krugman 1980; Grossman and Helpman 1989). Despite not abandoning a general equilibrium approach, New Trade Theory posits that comparative advantages stemming from economies of scale and the market structure, more than natural endowments, give rise to international trade. Furthermore, simple North-South models à la Krugman (1979) were already able to show the key importance of innovation capabilities in determining international trade patterns.

More recently, general equilibrium theories of trade have been expanded on two directions. First, ‘New-New Trade Theory’ has dropped the assumption of the representative firm. Melitz (2003) developed a general equilibrium model where firms differ in their productivity levels: only the most productive ones engage in international trade, which in turn is beneficial by selecting out of the mar-

\(^3\)As well as potential advantages over commodity endowments; for instance, discovery of natural resources often leads to currency overvaluation and diversion of investment from more productivity-enhancing activities (the so-called ‘Dutch disease’) and it may also induce rent-seeking behaviours from the leading elite (the so-called ‘political Dutch disease’, more on this later). Clearly, these negative effects should not be observed when the source of comparative advantage is constituted by cheap labour.
ket less productive plants and raising aggregate productivity. The heterogenous firm model may be combined with a Heckscher-Ohlin model as proposed in Bernard et al. (2007). The resulting model exhibits both inter-industry and intraindustry trade and shows that trade reallocates resources especially toward firms operating in comparative advantage industries. A second strand of studies is constituted by Neo-Ricardian models (Eaton and Kortum 2012, for an overview). Building on the classic paper of Dornbusch et al. (1977), Eaton and Kortum (2002) included geographic barriers in the Ricardian model with a continuum of goods in order to reach a formulation testable against the data. While the empirical testing generally provides support for the model, technology is usually modelled as determined by a completely random draw from country-specific distributions (Eaton and Kortum 2002, Costinot et al. 2011). Even relaxing the latter assumption by allowing correlation in the patterns of comparative advantage across pairs of industries, as done by Hausmann et al. (2014), leaves the overall treatment of technological differences as source of comparative advantage rather rudimentary and unrealistic.

Conversely, the heretic thinkers locate the main source of absolute technological advantages into the accumulation of technological capabilities (Cimoli et al., 2009a). Unlike sheer information, knowledge is usually organization- and people-embodied, consisting of tacit elements (Bell and Pavitt, 1993) that make it ‘sticky’, that is spatially clustered and persistent (Breschi and Lissoni, 2001). Given the complexity and cumulativeness of technology (Pavitt, 1987), learning processes become of the utmost centrality. In addition to ‘learning-by-doing’ (Arrow 1962; Dosi et al. 2017a), a big (and historically increasing) part of learning is attributable to deliberate activities of research and development. Besides direct discovery and technical advances, R&D is often essential to build absorptive capacity (Cohen and Levinthal 1990; Keller 1996) and to effectively profit from knowledge produced elsewhere. Learning is not limited to individuals and organizations, but the concept can easily be extended to the entire economy as well (Lundvall and Johnson 1994; Stiglitz and Greenwald 2014). Similarly, the concept of capability as the ability to make effective use of technological knowledge in order to use or improve existing technologies can be applied country-wide (Kim, 1999). For all these reasons, in any given moment there will be one or very few best practice techniques that dominate the others, and that heterogeneity of techniques is bound to persist over time (Fagerberg 1994; Dosi and Nelson 2010). Taken together, this theory provides a consistent explanation of the persistent cross-country heterogeneity in output growth (Castaldi et al., 2009) and technological levels (Fagerberg, 1994), with the differentiate nature of technological accumulation accounting for the markedly different paths of technological specialization (Bell and Pavitt, 1993). In such evolutionary dynamics, comparative ad-
vantages are only the ex-post outcome of technological learning processes and public policies are of the utmost importance for the acquisition of absolute technological advantages and competences (Dosi et al. 1990; Bell and Pavitt 1993; Cimoli et al. 2009a; Mulatu 2016).

Indeed, natural resources make no exception. As already noted, in the theory developed by Heckscher and Ohlin they constitute the sole determinant of international trade flows and specialization. But in a world characterized by uneven technological diffusion, learning and capabilities accumulation, availability of natural resources is far from being the whole story. Rather, resource endowments are bound to be at most a constraint on development that can act as inducement mechanism in the search to alleviate relative factor scarcity (Bell and Pavitt 1993; Dosi and Nelson 2010). Furthermore, the contribution to growth of the fixed set of natural endowments is the result of technological learning, too. Wright (1997) is an excellent illustration of the point: even in the case of mineral resources, Wright shows that opportunities themselves have been the outcome of institutional arrangements and both public and private search and innovation efforts (see also David and Wright 1997). Therefore, physical and social technologies (Nelson and Sampat, 2001) are pervasive even in the relevance of natural resources.

2.3 The Effects of Trade upon the Process of Development

Orthodox trade theory has generally poor descriptive power, with only the most recent models providing a better fit with the data. However, its normative prescriptions are very clear: free trade benefits every nation taking part to it, even if showing an absolute disadvantage in every sector. In general equilibrium models specialization according to comparative advantages provides the best strategy for structural transformation, since it leads to a globally optimal utilization of resources. The fundamental premise underlying this set of propositions is what we can call a Ricardian adjustment mechanism, as discussed at length in Dosi et al. (1990). To put it bluntly, Ricardian adjustments are ‘stationary’ adjustment processes (i.e. holding technology constant) based on the behavioural tendency at the microeconomic level towards minimum-cost/maximum-profit activities. At best, this induces a once-and-for-all increase in the short-term efficiency of the international location of productive activities. In this perspective, trade affects only the intersectoral allocation of inputs quantities and prices, but does not affect the rate of utilisation of the stock of inputs themselves.

The comparative advantage mechanism of adjustment relates to the intersectoral changes in the allocation of resources, pulled by relative prices and thus changed profitabilities. Conversely, competitiveness-related mechanisms of adjustment also have macroeconomic dimensions, such as
changes in the absolute amount of employed resources, rate of growth, wage rates and exchange rates (Dosi et al. 1990; Mulatu 2016). The ‘heretic’ perspective on trade takes into account other two fundamental mechanisms: Schumpeterian and Keynesian adjustments. Starting with the latter, Keynesian efficiency relates to the property by which open economies pull each other’s demand via imports, while at the same time constraining each other’s possibilities of growth via the need to balance the foreign accounts (Cimoli 1988; Dosi et al. 1990). Instead, Schumpeterian efficiency is a ‘dynamic’ concept that pertains technological change and the specialization in sectors that create more technological externalities, which have higher technological opportunities and exhibit higher rates of innovation. Technical change is of paramount importance in shaping the inner dynamism of the international system by expanding the possibilities of growth and possibly redistributing them between countries. Schumpeterian adjustments are thus fundamental, and specialization in the most innovative sectors dominates over the short-term gains induced by Ricardian comparative advantages. Note that analogue conclusions and policy suggestions can be derived with a formal apparatus akin to mainstream trade theory, by simply allowing for some form of increasing returns and imperfect competition (see for instance Krugman 1979 and Krugman 1980). Even without adopting the ‘radical’ view on technology that we espouse, the sheer presence of dynamic scale economies in the form of learning-by-doing are sufficient to justify policy interventions to alter the given pattern of comparative advantages (Krugman, 1987a).

And what about the kind and characteristics of exported goods? Again, ‘pure’ trade theories provide a clear-cut answer: specialization along comparative advantages is always the best path to prosperity, whatever the outcome of the specialization process. In so doing, they are agnostic on the quality of goods traded, implicitly assuming that trade is good for everyone no matter the kind of goods effectively traded (Kemp and Van Long 1984; similar prescriptions are also heralded by the proponents of ‘New Structural Economics’, see Lin 2011). This is not the case of the second strand of literature that we discussed above.

To begin with, resource-based economic activities suffer from a drawback relative to other industrial activities, namely diminishing returns (Reinert, 1996). The basic idea is that output increases in resource-based activities will eventually lead to reach a point after which the crucial resource is no

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4This remark, which may at a first glance appear a platitude, is actually a very controversial view in the economic debate. Indeed, a strict application of neoclassical trade theory would imply the infamous proposition attributed to Michael Boskin, who allegedly claimed that ‘it does not make any difference whether a country makes potato chips or computer chips!’ (Thurow, 1994). However, we would suggest that much of the economic profession has now abandoned such extreme views, despite not yet being ready to take fully in account the role played by technological difference on trade dynamics.
longer available (or it is left only in lower quality). Extractive activities provide the most straightforward example of such a situation. This is what Erik Reinert (1996) dubbed ‘double trap of resource-based nations’: the resource-based nation is locked into an economic activity which yields less and less as its specialization according to its comparative advantage deepens. This situation justifies the need for undertaking structural transformation against comparative advantages in order to specialize in activities characterized by increasing returns, learning and positive externalities.

Reinert (2007) provides also the theoretical foundation to reject the Ricardian assumption that all traded goods are qualitatively equal. It is an historical fact that countries producing and exporting only raw materials have not grown rich at the same pace of industrialized countries, despite the main tenets of classical trade theories (Dosi et al. 1990; Chang 2002; Cimoli et al. 2009a). To make his point, Reinert creates two ideal types of economic activities, Schumpeterian and Malthusian activities. While the former are distinguished by continual innovations and dynamic increasing returns that lead to increasing wages and prosperity, the latter keep low wage-levels because of the absence of technological learning. Needless to say, Schumpeterian activities are more common in manufacturing, whereas the other category is found typically in agriculture and commodity production (Reinert 2007; Hausmann et al. 2007). This partition easily explains why developing a manufacturing core has historically proved as a necessary condition for accumulation of capabilities and, ultimately, development (Syrikin 1988; Chang 2002; Reinert 2007; Cimoli et al. 2009a; Zirmai 2012; Zirmai and Verspagen 2015).

At this point, it can be useful introducing the distinction proposed by Bell and Pavitt (1993) between ‘production capacity’ and ‘technological capabilities’ during the development process. Production capacity concerns the stocks of resources, the nature of capital-embodied technologies and labour skills in use. Technological capabilities rest on the knowledge and resources requested for the generation and management of technical change. Even without suggesting an invariant sequence of industrial sectors which account for the process of structural change, Cimoli and Dosi (1995) are able to identify some rough sequences in the development of a national production capacity (from manufacturing of clothing and natural resource processing, eventually moving on to more complex and knowledge intensive activities). Overall, the development of domestic manufacturing appears somewhat to follow the Pavitt’s taxonomy (Pavitt, 1984). However, the key point for policymakers is that not every

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5 For a more optimistic perspective on specialization in natural resources, see Perez (2016). Perez argues that the ICT revolution has fundamentally changed the way natural resources are extracted and processed, thus increasing overall technological dynamism of the mining sector. Still, we do not see this position as necessarily implying that these sectors will now have a positive effect on capabilities accumulation (for instance, new mining processes employing advanced ICT technologies may still remain an enclave and fail to trigger economy-wide learning spillovers). Be that as it may, when it comes to suggest development policies, Perez actually espouses a view very akin to ours and she advocates a major role of the government in leading the development process.
type of manufacturing activity is bound to generate the same levels of learning and accumulation of technological capabilities. Different commodities and sectors are likely to be associated with different levels of opportunities for innovation and different income elasticities of demand (Dosi et al., 1990). The presence of increasing returns and learning effects may even ‘lock-in’ the economy to an inferior technology (David 1985; Dosi et al. 1994). Specialization patterns thus bear important implications for international competitiveness: engaging into high-value sectors (usually the high-technology ones) characterized by a high income elasticity of demand and high learning opportunities will likely result in higher wages and wealth for the entire country (Cimoli et al., 2009a). However, comparative advantages may not induce a country to specialize in those sectors: if left to themselves, countries endowed with natural resources will likely end up exporting primary goods. It is thus easy to imagine situations where Ricardian efficiency in static terms could conflict with the achievement of the maximum rate of innovative dynamism, namely Schumpeterian efficiency. Similarly, countries might ‘efficiently’ specialize in the production of commodities that a small or decreasing number of world consumers wants to buy, with the ensuing negative long-term effects in terms of Keynesian efficiency (Dosi et al., 1990). This is precisely what Engel’s law would predict for the primary sector: as per capita incomes rise, the share of agricultural expenditures in total expenditures declines due to low income elasticity (Szirmai and Verspagen, 2015).

3 Historical Evidence on Structural Change and Natural Resources: Many Exceptions or a Different Rule?

We discussed how the results of Heckscher-Ohlin and Ricardian-like models crucially depend on the assumptions of full employment of resources, uniform welfare effects of exported goods and the simplistic treatment of technological dynamics. Their general-equilibrium settings are ill suited to account for the complex dynamics of trade and structural change, with the full employment of production factors obscuring ex-ante the possibility of having both winners and losers from trade (Samuelson, 2004). As a matter of fact, the other major weakness of factor proportion theories of comparative advantages is the absence of any dynamics in comparative advantages themselves: trade relations are basically frozen to pre-existing asymmetries across countries. In doing so, they neglect the fundamental role of learning (Arrow 1962; Dosi et al. 2001; Dosi et al. 2017a) and policies in changing the structure of the economies and their comparative advantages (Dosi et al. 1990; Chang 2002; Reinert 2007; Cimoli et al. 2009a).
Since the late 1950s, the economics profession has been investigating the issues of growth and structural transformation intensively (Chenery 1960; Kuznets 1966; Syrquin 1988, for a review of the other early contributions). In his Nobel Prize lecture, Kuznets (1973) highlighted what he saw constituting the main characteristics of modern economic growth. Indeed, the third of these ‘Kuznets facts’ is the high structural transformation rate of the economy: Kuznets was referring to the progressive shift away from agriculture to nonagricultural production and, in a second time, from industry to services. Evidence of these changes for some developed countries is showed in Figure 1.

One of the most comprehensive historical accounts of structural transformations and industrialization is discussed in detail by Ha-Joon Chang (2002). The most telling cases of successful latecomers’
industrialization are probably the United States and Germany. Indeed, it was the first Secretary of the US Treasury, Alexander Hamilton, who systematically set out the infant industry argument in 1791. In a nutshell, Hamilton argued that foreign competition would have prevented domestic industries from becoming internationally competitive, unless the state had intervened to compensate initial losses or to enforce import duties (Hamilton, 1791). American industries ended up being literally the most protected in the world until after WWII (Chang, 2002): needless to say, this goes a long way in explaining the US pattern of structural change. Furthermore, the role of the Federal government in industrial development has been substantial even in the post-war era, thanks to the large amount of defense-related procurements and mission-oriented research (Mazzucato 2015; Mowery 2012). And while natural resources played a significant part in the growth of the American economy, their importance is mainly due to the increasing returns associated to technological learning (Wright, 1997). Similarly, in List (1841) we find a very lucid discussion of the shortcomings of simply adhering to comparative advantages: in his view, the true objective of developed countries trying to impose free trade over Europe was simply ‘kicking away the ladder’ that they themselves had climbed (Chang, 2002). The German experience also points to the importance of ad-hoc institutional innovations which facilitated catching-up and were the basis of the successive forging ahead with respect to Britain. Of particular importance was the introduction of the Humboldtian model of higher for the education of graduate engineers, which supplied human capital that proved essential for the diffusion of in-house industrial R&D departments (Dosi et al., 1994). Another pillar of German industrialization was the emulation of imported British machine tools (often thanks to British craftsmen attracted to Prussia, see Freeman 1995).

More recently, Japan (Freeman, 1987) and the ‘Asian tigers’ (Nelson and Pack, 1999) were able to reap the benefits from fast growing technological markets, unlike comparable Latin American economies. At the roots of the Japanese success there was the explicit decision by Japanese political authorities to neglect the path of ‘natural’ development implied by comparative advantages (Freeman, 2004). In few years, Japan ceased being an importer of foreign technology and developed important indigenous innovation capabilities, even surpassing the United States in terms of R&D efforts. The secret of its success was building up of one of the most successful Innovation Systems (actually the one that inspired the concept, see Freeman 1987), where the long-term planning of the MITI fostered

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6Some historical accounts even question the basic tenet that natural resource endowments actually fostered US industrialization. Allen (2014) argued that abundant natural resources eventually retarded the industrialization of the United States given that the large volumes of exports of primary products were inflationary and produced a ‘Dutch disease’ situation.
learning and spurred innovation in the export-led industrial complexes.

Some general patterns can be distilled from these historical cases. First, all countries that successfully industrialized appear to have been guided by the principle of emulation of the countries at the technological frontier (Reinert, 2007). As argued by Reinert (2009), successful catch-up policies put emulation chronologically ahead of comparative advantages. Ever since Renaissance, countries that have got rich have usually disregarded their endowment structures, rather preferring to ‘get the prices wrong’ and guide their structural transformation toward high value added sectors (Amsden, 1989). Secondly, as the Japanese and German experiences highlight, successful development cannot be achieved without introducing the necessary social technologies and institutional changes tailored on the specific needs of the country (Abramovitz 1986; Dosi et al. 1994; Nelson and Sampat 2001).

As a final point, virtually every now developed country actively used industrial and trade policies to protect and promote its industrial sector (Chang 2002; Reinert 1999; Cimoli et al. 2009a). Each country had to develop its own substitutive factors according to its idiosyncratic necessities and the then prevailing techno-economic paradigm (Gerschenkron 1962; Dosi et al. 1994; Reinert 1999; Freeman and Louçã 2001). Often, the state had to do more than simply forcing entrepreneurs into certain strategic sectors, sometimes even ending up acting as ‘entrepreneur of last resort’ (Reinert 1999; Baldwin and Krugman 1988; Head 1994). This evidence is markedly in contrast with the main tenet of the ‘New Structural Economics’, namely that government policies should follow comparative advantage rather than defying it (Lin, 2011). However, Lin’s arguments are hardly compatible with the historical records (Lin and Chang 2009, Cimoli et al. 2009a) and suffer from theoretical flaws as well. As pointed out by Rodrik (2011), Lin pays lip service to his own principle when he asks the government to step in to address the many market failures present in developing economies. Indeed, market failures alter the reliability of market prices as economic signals, and any state interventions to ‘get the prices wrong’ is actually against what sheer comparative advantages would imply.\(^7\) This does not deny that Lin is right in emphasizing the difficulties involved in technological upgrading. But while deviations from comparative advantages are rare, they are empirically found to lead to faster growth (Coniglio et al., 2018). Furthermore, Lin seems to assume that achieving static Ricardian efficiency would automatically lead to technological upgrading, but this is not necessarily true. For

\(^7\)There are other claims in Lin’s theory that would deserve long discussions, such as his rejection of dependency theories on the ground that globalization ‘[...] sees opportunities for developing countries to counter negative historical trends by diversifying their economy and building industries that are consistent with their comparative advantage [...]’ (Lin 2011, page 206). We find it difficult to see how passively conforming to the historical dualism between advanced manufacturing economies and low-income exporters of natural resources would open up a new season of rapid catch-up among the Least Developed Countries (LDCs), unless one allows for massive state interventions in changing the given pattern of comparative advantages (Cimoli et al., 2009a).
instance, Mexican *maquiladoras* remained a very productive manufacturing enclave that did not lead to accumulation of innovation capabilities or technological spillovers economywide (Cimoli and Katz, 2003); even worse, in recent years structural change in Latin America has been biased toward an increased reliance upon comparative advantages in natural resources that ended-up being growth-reducing (McMillan and Rodrik, 2011).8

This cursory overview of historical experiences served the purpose of highlighting what we would consider the general rule of successful catch-up. In all cases discussed, comparative advantages and natural resources played no role: rather, states’ policies and idiosyncratic institutional solutions constituted the primus motor of what can be loosely dubbed *policy-directed structural change*9.

The historical record has also consistently showed a widespread underperformance of economic growth in resource-rich economies (Auty 1983; Van der Ploeg 2011; Venables 2016).10 As noted by Sachs and Warner (1995), falling costs of transport can explain why natural resources are losing their centrality in development. While in the 19th century availability of iron and coal deposits was a prerequisite for indigenous steel production, during the following century there was an impressive fall in transportation costs and the switching to a petroleum-based economy (Sachs and Warner, 2001). However, the remarkable finding of Sachs and Warner (1995) is that resource abundance often turns out to actually hinder economic growth: resource-rich countries grew on average about one percentage point less during the period 1970-1989, even after controlling for many potential explanations. This result was dubbed ‘natural resource curse’ in a classic book by Auty (1983) and was later found to be particularly robust (Sachs and Warner 2001; Van der Ploeg 2011). In Table 1 we provide a list of the most important mechanisms that have been proposed to explain the findings.

Among the plausible mechanisms, two are particularly tied to the issues of structural change and trade. Back in the 1980s, some economists studied the peculiar case of the Netherlands after the discovery of the Groningen gas field (Corden and Neary 1982; Corden 1984). Due to the discovery, two

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8These considerations notwithstanding, one has to bear in mind also the many instances where industrial policies failed in achieving their aims (Harrison and Rodríguez-Clare, 2010). The interested reader is referred to the discussion in Cimoli et al. (2009a) on the practical challenges in designing industrial policies consistent with the internal power balances and institutional setting of each country. Interestingly enough, when proposing practical policy measures Lin (2011) is very sensible and we would agree on the majority of its proposals (such as very gradual approach to liberalization, public coordination of investments and a focus on building infrastructures).

9We stress the role of policy in order to distinguish the concept from recent models of ‘directed structural change’ (Kane, 2017) mimicking directed technical change models à la Acemoglu. Rather, we want to emphasize the political degrees of freedom that policymakers enjoy in shaping structural transformation.

10This finding is not only inconsistent with orthodox trade theories, but also seems to go against what common sense would suggest. The first to suggest that countries can profit from their endowments was Adam Smith (1776) with his ‘vent for surplus’ theory: poor countries can export under-used natural resources which are highly valued abroad, thus generating economic rents. However, economic research has shown that other more subtle mechanisms are at play when dealing with exports of natural resources.
Table 1: List of the main causal mechanisms explaining the ‘natural resource curse’

<table>
<thead>
<tr>
<th>Mechanism</th>
<th>Description</th>
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<tbody>
<tr>
<td>Prebisch-Singer Hypothesis</td>
<td>Manufactured goods have a greater income elasticity of demand than primary products: as incomes rise, the demand for manufactured goods increases more rapidly than demand for primary products. In addition, primary products have a low price elasticity of demand, so a decline in their prices tends to reduce revenue rather than increase it (leading to a secular reduction of the terms of trade for primary exporting countries)</td>
</tr>
<tr>
<td>Dutch Disease</td>
<td>The idea behind this Dutch disease is that the extra wealth generated by the sale of natural resources induces appreciation of the real exchange rate and an ensuing contraction of investments in the traded sector, which loses international competitiveness</td>
</tr>
<tr>
<td>Loss in Learning by Doing</td>
<td>The traded sector is the engine of growth and benefits most from learning-by-doing and other positive externalities, while the commodity export sectors do not entail learning given their few ‘forward and backward linkages’ with the economy</td>
</tr>
<tr>
<td>Damages to the Institutional Quality</td>
<td>Political economy problems (rents induce more inequality and undermine democratic institutions), entrepreneurial spirits are stifled because badly defined property rights, imperfect markets, and poorly functioning legal systems provide ideal opportunities for rent seeking behaviours</td>
</tr>
<tr>
<td>Corruption</td>
<td>Resource dependence elicits corruption and rent seeking via protection, exclusive licenses to exploit and export resources by the political elite, oligarchs and their cronies to capture wealth and political power</td>
</tr>
<tr>
<td>Macroeconomic Instability and Volatility of Commodity Prices</td>
<td>Boom-bust cycles induced by volatile commodity prices lead to balance of payment crises and macroeconomic instability. When commodity prices are high, resource rich countries use them as collateral for debt, but when prices fall they find themselves in a debt overhang situation</td>
</tr>
<tr>
<td>Conflicts over Resources Control</td>
<td>Higher resource income makes warfare more attractive as there is more to fight over and many groups try to seize the rents generated by extractive activities</td>
</tr>
<tr>
<td>Government Mismanagement</td>
<td>Natural resource wealth may encourage countries to engage in ‘excessive’ borrowing, reduction of productive and infrastructural investments because the resources bonanza induces a false sense of economic security and lead to postpone economic reforms</td>
</tr>
<tr>
<td>‘Political’ Dutch Disease</td>
<td>Rent seeking from political elites: resource abundance generates the consolidation of elites’ allocative power (distributive influence)</td>
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phenomena were observed. On the one hand, the booming commodity sector required new workforce, with the result of both raising wages and drawing workers away from tradable industries\(^\text{11}\). On the other hand, wealth due to the increase in exports changed the international balance of payments and induced an appreciation of the local currency vis-à-vis the foreign ones, with strong negative effects on domestic manufacturing producers. In other words, the increase of extractive activities crowded out production of tradable goods, a phenomenon eloquently named ‘Dutch Disease’ after then (Torvik 2009; Van der Ploeg 2011). Another problem connected to these static losses concerns the dynamic growth loss resulting from a contraction of the manufacturing sector. The basic intuition is the following: given that several studies document how the manufacturing sector is the true engine of growth due to externalities, learning by doing and innovativeness (Dosi 1988; Szirmai 2012; Pisano and Shih 2012; Berger 2013; Stiglitz and Greenwald 2014), the reduction of manufacturing activities will harm growth even in the years following the adjustment. This result is easily seen in the models of Matsuyama (1992) and Sachs and Warner (1995), where the traded sector is conductive of growth.

\(^{11}\)This first effect, dubbed ‘direct deindustrialization’ (Corden, 1984), is however of smaller magnitude when compared with the ‘indirect deindustrialization’ mechanisms operating via international trade, given the generally low labour-intensity of modern extraction activities.
via learning by doing and human capital spillovers.

4 Globalization and Comparative Advantages

After the liberal turn of the early 1980s, we entered a new phase of rapid trade liberalizations and globalization. Do the patterns identified above still hold in an increasingly globalized economy?

4.1 Washington Consensus, Liberalizations and Technological Learning

Starting from the early 1980s, a set of policies emerged to form an invariant recipe for development. These policies, known under the heading of ‘Washington Consensus’, rested over three main tenets: a market economy, openness to the world, and macroeconomic discipline (Rodrik 2006a; Serra and Stiglitz 2008). The Consensus entailed a development strategy markedly differed from the set of policies followed by development states during the previous two decades. In practical terms, it translated into deep fiscal adjustment and a dramatic reduction for the role of the state in the economy. The Consensus also spurred a widespread liberalization of international trade and generalized reduction of tariffs. The new trade landscape, crystalized by the creation of the World Trade Organization in 1995, entailed very low tariffs on industrial products, with very narrow tariff dispersion both across countries and across products (Akyz, 2009). Furthermore, the policy space of single countries has been substantially reduced, depriving them of basically every industrial and trade policy tools.

A first effect of these changes is what can be dubbed ‘Vanek-Reinert effect’ (Reinert, 2007): a sudden overture of trade between nations with asymmetrical technological levels will likely harm the most advanced and knowledge-intensive industry of the more backward country. This is a situation typical of asymmetric integration, which is the norm given the persistent technological gap existing between countries. A corollary of such mechanism is the impact on growth of the least advanced countries, given that the most advanced sectors are the ones most subject to dynamic increasing returns. Reinert (2007) goes on arguing that the ensuing ‘primitivization’ the national production system will ultimately reduce welfare as it will eliminate the production of Schumpeterian goods in developing countries.\(^{12}\)

Premature liberalization can have other negative consequences protracted over time. Given the presence of localized increasing returns and learning, greater integration may lead to phenomena of

\(^{12}\)The exact same mechanism is dubbed by Dani Rodrik as ‘imported deindustrialization’: a sudden opening of developing countries to free trade reverses a long process of import-substitution and leads to a decline in manufacturing capabilities. Note also that this result is obtained by Rodrik through a formal model that rests on rather conventional assumptions.
increasing differentiation with self-reinforcements and lock-in of particular production activities and specialization patterns (Dosi et al. 1990; Cimoli et al. 2009a). The strand of research that better acknowledges this point is probably the Latin American Structuralism (see the Chapter by Cimoli and Porcile), which explicitly deals with the center-periphery dynamics that emerge between unequal trading partners (as shown in the North-South model developed by Cimoli 1988). In sum, a world which becomes increasingly integrated but not necessarily identical in technological terms due to local learning and dynamic increasing returns might be subject to various forms of local vicious circles as well as de-industrialization (that will harm the least developed countries the most, but that could possibly backfire advanced economies too; see the discussion in Pisano and Shih 2012).

In light of this discussion, we can conjecture what the effects of two decades of unbridled globalization might look like. Provided that technology gaps have not reduced, one could suppose a polarization of manufacturing in few countries. In turn, the curtailing of policy space might have increased the relative importance of natural resources endowments and curbed the virtuous structural transformation into industrial economies of less developed countries (McMillan and Rodrik, 2011). It is then hard to imagine an effective convergence in worldwide incomes should these conjectures turn out to be warranted. However, such an outcome should not be totally unexpected given what happened during the first wave of globalization promoted by the British Empire during the 19th century. By means of its ‘gunboat diplomacy’, the British Empire imposed a regime of free-trade that confined India and the other colonies to the production of primary products and lead to their de-industrialization (Clingingsmith and Williamson 2004; Allen 2014). And while the context has much changed from the period of imperialism, there are many similarities in the ways the imposition of free trade may be endangering the future of LDCs.

4.2 Globalization and Structural Change: Recent Evidence

Global differences in income distribution are no news, given the ‘Great Divergence’ in incomes that started around the First Industrial Revolution (Jones, 2016). The historical record reviewed in Meissner (2014) suggests that liberalizing international markets is neither a sufficient nor a necessary condition to achieve economic growth. Empirically one finds a statistically significant and positive correlation between the average growth rates and levels of income, both the total and the per capita income (Castaldi and Dosi, 2009). In what follows, we outline recent findings on natural resources and structural change, while highlighting how these dynamics are conditioned by endowments-based comparative advantages.
To begin with, the curse of natural resources has seen a revival of interest, with many studies addressing empirical weaknesses of the Sachs and Warner’s (1995) study. New research has addressed some of the shortcomings of earlier studies, like omitted variable bias (by employing panel data) and endogeneity of natural resources’ effect on growth (using instrumental variable estimation). Several authors documented that having large shares of natural resources exports is problematic only if institutional quality is very poor (Brunnschweiler 2008; Mehlum et al. 2006; Boschini et al. 2007). In turn, this result has come to be criticized on several grounds. On the one hand, some have pointed toward the resource drag effect associated with declining mineral production due to stock exhaustion (Davis, 2011). Even if sometimes associated with higher growth, dependence from natural resources raises important issues of sustainability over the long-term, especially because minerals and energy sources are inherently non-renewable. On the other, slow growth of some resource-dependent countries from the 1980s onwards was partly due to decline in price of those commodities that they were producing (James, 2015).

This last finding hints at the perverse effect of unbridled globalization on resource exporting countries. During all the 20th century, world demand for commodities has been growing, and their price in real terms has been declining (Jones, 2016).\textsuperscript{13} Trade liberalization and the demonization of industrial policies have thus created a situation where poor countries specializing according to market

\textsuperscript{13}The data showed in Jones (2016) also show a large increase in the real price of commodities since 2000. Part of the explanation is to be found in the rapid growth of China and India over this period, which entailed a large increase in the demand for commodities. This phenomenon had two effects on development countries: while initially stimulating growth, they also lead to an increasing reliance on exports of natural resources.
demand were pushed toward the production of commodities with declining real value, as predicted long ago by Prebisch (1950) and Singer (1950). Suggestive descriptive evidence is provided in Figure 3, which summarizes the growth of export production during the last decade broken down by sector. While developed countries mostly exported services and manufacturing goods, Latin America, Middle East and North Africa (MENA) and sub-Saharan Africa (SSA) witnessed increases of exports mainly concentrated in natural commodities (amounting to 30%, 42% and 31% respectively, see Verspagen and Kaltenberg 2015). This pessimistic picture is aggravated by the most recent estimates of the Dutch disease, that quantify 74 cents of non-resource exports displacement for every dollar of resource exports (Harding and Venables, 2016). Finally, Coniglio et al. (2018) document how large natural resource endowments make it more difficult to diversify away from the current comparative advantage.

In a series of studies, McMillan and Rodrik went deeper into investigating the role of natural resources in structural change (McMillan and Rodrik 2011; McMillan et al. 2014; Diao et al. 2017). Their basic finding confirms the evidence commented above: when globalization is left to itself without any policy intervention to guide structural transformation, countries specialize according to comparative advantages. The problem for countries with large endowments in natural products is that primary sectors operate at relatively high productivity levels, but they generate very low employment (Figure 4). The positive impact of structural change is found to be larger for countries that have large employment in agriculture and that manage to reallocate it to manufacturing activities (McMillan

Figure 3: Growth of production for foreign markets broken down by sector, over 2001-2011 (per country group)

Source: Verspagen and Kaltenberg (2015)
et al., 2014). Therefore, economies with large endowments of commodities will have small positive contribution to growth from structural change.

On the technological front, the promised globalization and diffusion of technological capabilities has been disappointing. Unlike the optimistic previsions of mainstream models, technological and innovation capabilities remain highly concentrated in few countries (Castaldi et al. 2004; Castellacci 2008; Castellacci and Archibugi 2008). In particular, Castellacci and Archibugi (2008) identify three ‘technology clubs’ whose membership has proven rather constant over time, with very few crossovers during the 1990s. Among those clusters, some convergence was seen only in the quality of technological infrastructures, but not in innovation performance (Castellacci, 2011).

Latin America constitutes the perfect example of sacrificial victim on the altar of unbridled globalization. Castaldi et al. (2009) discuss the Latin America performance after the liberal reforms of the 1980s and show how almost the whole region ended up caught in a ‘low growth trap’. Indeed, after the sudden opening of their economies, many Latin American countries saw an increase of the income elasticity of the demand for imports, which was not matched by an equal increase of exporting activities (Cimoli et al., 2009b). A key difference between the Latin American and contemporaneous Asian experience is that for the latter group of countries openness was symmetric in both the export and import sides of international trade.

Cimoli and Correa (2005) show how Latin American economies have changed their specialization according to their factor endowments, namely cheap labour and natural resources. The emerging
vicious pattern of specialization in export-led industries destroyed deeply rooted forms of technology accumulation and learning. Rather, Latin America witnessed an increasing specialization in low-technology products and the emergence of a dualistic economy where only few firms were able to compete internationally (Cimoli and Katz 2003; Cimoli and Correa 2005). Table 2 provides additional evidence for some major countries in Latin America. It is not surprising, then, that McMillan et al. (2014) found that structural change has been growth reducing in Latin America since the 1990s.14 Figure 5 provides suggestive evidence of the time evolution of indicators of exports’ technological intensity (share of high-technology exports in total exports) and international competitiveness (the country’s share in total world exports).

Figure 5: Structural change and export share patterns, 1961-2004

Source: Cimoli et al. (2009b). Latin America includes Argentina, Bolivia, Brazil, Chile, Colombia, Mexico, Peru and Uruguay. Asia includes Indonesia, Korean Republic, Malaysia, Philippines, Singapore and Thailand.

Finally, recent research has also started acknowledging the principal tenets of development theories based on evolutionary accounts of technology, namely that ‘what you export matters’. This fact has been re-discovered introducing the notions of ‘complexity’ and ‘product space’ (Hausmann et al. 2007; Hidalgo and Hausmann 2009; Tacchella et al. 2013; Cristelli et al. 2015). In a nutshell, this empirical literature associates a measure of complexity to each commodity using product-level data. In this way, one can relate the performance of a country to the overall complexity of its export basket: producing and exporting sophisticated goods turns out to be a very good predictor for growth. Note that this finding is nothing different from the distinction of Schumpeterian and Malthusian

14Diao et al. (2017) find that the very recent growth acceleration in Latin America is almost entirely due to within-sector productivity increases, while the contribution of structural change to growth remains negative (i.e. with labour still moving from high- to low-productivity sectors).
Table 2: Exports of primary products as a share of total exports for the main Latin American economies

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<tbody>
<tr>
<td>Argentina</td>
<td>75.6</td>
<td>76.9</td>
<td>78.6</td>
<td>70.9</td>
<td>66.1</td>
<td>67.5</td>
<td>69.2</td>
<td>66.8</td>
<td>71.2</td>
</tr>
<tr>
<td>Brazil</td>
<td>74.7</td>
<td>62.8</td>
<td>56.3</td>
<td>48.1</td>
<td>46.5</td>
<td>41.6</td>
<td>47.0</td>
<td>63.4</td>
<td>62.4</td>
</tr>
<tr>
<td>Chile</td>
<td>90.0</td>
<td>90.9</td>
<td>93.1</td>
<td>88.7</td>
<td>86.5</td>
<td>83.8</td>
<td>84.9</td>
<td>87.4</td>
<td>85.9</td>
</tr>
<tr>
<td>Colombia</td>
<td>79.1</td>
<td>80.4</td>
<td>83.1</td>
<td>74.9</td>
<td>65.2</td>
<td>67.5</td>
<td>64.2</td>
<td>76.1</td>
<td>...</td>
</tr>
<tr>
<td>Mexico</td>
<td>68.9</td>
<td>88.1</td>
<td>72.9</td>
<td>56.5</td>
<td>22.3</td>
<td>16.5</td>
<td>22.9</td>
<td>24.0</td>
<td>17.9</td>
</tr>
<tr>
<td>Peru</td>
<td>97.1</td>
<td>83.2</td>
<td>88.0</td>
<td>81.6</td>
<td>85.2</td>
<td>77.6</td>
<td>82.6</td>
<td>86.3</td>
<td>88.6</td>
</tr>
<tr>
<td>Uruguay</td>
<td>70.0</td>
<td>62.1</td>
<td>65.0</td>
<td>61.2</td>
<td>61.2</td>
<td>58.1</td>
<td>68.1</td>
<td>74.0</td>
<td>79.8</td>
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Source: ECLAC-CEPALSTAT Database

goods already proposed by Reinert (2007). In addition to complexity, Rodrik (2012) shows that the manufacturing sector exhibits unconditional convergence in labour productivity: the poorer a country is, the faster the productivity in its manufacturing sector will increase towards the technological frontier. Relative to other sectors, manufacturing has a higher potential for technological progress without being dependent on other country-specific conditions (Haraguchi et al., 2017) and it has traditionally absorbed significant quantities of unskilled labour, unlike mining activities (Rodrik, 2016).

These results confirm the hypothesis of manufacturing as the ‘engine of growth’ (Szirmai 2012; Szirmai and Verspagen 2015; Haraguchi et al. 2017) and it is particularly relevant given that convergence of economies as a whole is the exception rather than the rule (Cimoli et al., 2009a). For these reasons, policies nurturing young industries and directing structural change against comparative advantages are more essential than ever, especially in light of recent tendencies toward premature deindustrialization in developing economies (Rodrik, 2016) and the increasing difficulties in pursuing the industrialisation-route to development (Szirmai and Verspagen 2015; Haraguchi et al. 2017).

4.3 Is This Time Different? What China can Teach to Latin America

Despite this dismal overview, some exceptions to the common pattern exist. Globalization did not harm the East Asia Tigers, which kept growing and industrializing at a satisfactory pace. This is partly explained by their overall defiance of the Washington Consensus prescriptions that led them to retain a wide range of heterodox policies (Cimoli et al., 2009a). These examples show the importance of staging and gradual opening to international trade according to the specific needs of each economy. Countries that managed to keep in place their trade and industrial policies achieved successful development performances, China being the obvious example. Indeed, the last three decades witnessed an impressive growth of the Chinese economy (Yao, 2014). China undertook a deep and fast structural
transformation leading from a traditional and mostly rural economy to an economy driven by industrial activities. It is fair to say that China has been able to enormously profit from globalization, and it is now its fiercer advocate (New York Times, 2017).

The causes of this success are manifold. In primis, unlike what suggested by Washington Consensus proponents, China has adopted a gradualist approach of economic reform and market opening (Yu et al., 2015). Chinese firms entered the global markets only after several decades of protection and capabilities accumulation, avoiding the negative Reinert-Vanek effect of sudden international competition. Reforms had a ‘dualistic nature’, where a separate export-promoting regime was created alongside the existing regime of import-substitution (Harrison, 2014). Secondly, China has been using a whole range of industrial policies and direct state interventions to govern its industrialization (see Dahlman 2009, for a throughout analysis). Those have entailed controls of FDIs, establishment of special export-processing zones amidst diffused protectionism, local content requirements, the establishment and successive privatization of heavily subsidized State-owned enterprises and massive investments in education and training. With reference to trade policy, tariffs have been generally high and consistently biased towards export-oriented sectors (Harrison, 2014). Furthermore, China has institutionalized the policy of emulation of foreign technologies by means of a deliberately lax IPRs regime (Reinert 2009; Dahlman 2009). Recent microeconometric evidence confirms this view, locating the roots of the Chinese manufacturing catching-up into ‘creative restructuring’ and accumulation of absorptive capabilities by domestic firms, rather than sheer ‘creative destruction’ fostered by globalized markets (Yu et al. 2015; Dosi et al. 2017b).

Whether the Chinese path to structural change constitutes a new ‘Beijing Consensus’ (Ramo, 2004) or it is simply an idiosyncratic adaptation of the development state (Kennedy, 2010) it is not relevant to the purpose of this discussion. The interesting feature is the congruity between gradual globalization and interventionist policies aimed at building strong manufacturing capabilities (Dahlman, 2009). Chinese enterprises were able to move beyond labour cost advantages and gradually improving their international competitiveness through a mix of technology imports and increasing endogenous learning (Yu et al. 2015; Dosi et al. 2017b).

The Chinese example offers an interesting model for economies not yet industrialized, especially when compared with the opposite trajectory of Latin America.\textsuperscript{15} The Chinese success story entails

\textsuperscript{15}At the same time, the very emergence of China as a major industrial player has profoundly changed the patterns of opportunities and constraints facing other economies (Kaplinsky and Morris, 2008). As an example, Coxhead (2007) argues that China’s growth and globalization are likely to cause South-East Asian countries to experience negative terms-of-trade shocks for labour-intensive manufactures, and positive shocks for primary products. Similarly negative impacts on developed economies are increasingly documented within a growing strand of empirical research (Autor et al. 2013;
a mix of careful industrial and trade policies that actively fostered the accumulation of technological capabilities. We do not agree with claims that China’s success was only a matter of capital accumulation gradually changing its original comparative advantages in labour-intensive produce (Lin, 2014). On the contrary, Rodrik (2006b) shows that China’s exports in 1992 were associated with an income level more than six times higher than the actual Chinese GDP at that time. Such a gap was clearly too large to have occurred naturally, and we espouse Rodrik’s contention that it was the result of deliberate industrial policies. Given the huge involvement of the government in the economic sphere, China provides also a good counterexample to the second tenet of New Structural Economics, namely that the best allocation of resources is always mediated by the market.

Overall, the recent trends and effects exerted by globalization on developing economies resemble very much the de-industrialization due to the coerced push toward free-trade of the 19th century. In that case it was the British gunboat diplomacy that forced many countries into unequal terms of trade with the most technologically advanced economy (Clingingsmith and Williamson 2004; Allen 2014). Today, the political economy of free-trade no longer uses warfare but rather relies on the enforcement of the Washington Consensus (Serra and Stiglitz 2008; Dreher et al. 2008). However, in many respects we would contend that challenges facing LDCs are even greater than those faced two centuries ago. On the one hand, the multilateral trade systems has seen little advances on issues concerning development since the launch of the Doha Development Agenda in 2001. The majority of LDCs are members of the World Trade Organization (WTO) and despite several preferential treatments, their policy space is much reduced by the overall provisions of WTO agreements. Furthermore, today’s developing nations lack the support of intellectuals like Hamilton or List: the consensus in the economic profession is in favour of deeper trade and financial integration at the international level (even though few would still defend the shock therapies of the original Washington Consensus) and very few voices are advocating changes that would leave LDCs the policy space to industrialize.16 We deem it difficult to reach a new consensus and set of policies without at the same time breaching the orthodoxy of the economic theory on trade, similarly to what Hamilton originally did in justifying the infant industry argument. The picture is complicated by the tendency of the new winners of globalization to join forces with developed countries in defending the merits of free trade (New York Times, 2017), despite their development being based on the blatant neglect of those same principles (Chang, 2002). On the technological side, the rapid pace at which manufacturing is merging with digital technologies (e.g. Lasi et al. Pierce and Schott 2016; Acemoglu et al. 2016).

16Dani Rodrik and Joe Stiglitz are notable exceptions among the economic profession.
2014) is likely to prove a further obstacle to industrialize for countries not possessing the necessary capabilities in ITC. Furthermore, the more innovative end of the economy in recent years has been the development of so-called ‘digital platforms’ (from Uber to Amazon and its Chinese counterpart, Alibaba). Many platforms by their very nature prove to be winner-take-all markets, in which only one or two companies survive and are able to monopolize the global marketplace (Kenney and Zysman, 2016). Entering those markets is proving difficult even for many advanced economies, and thus will pose a serious challenge for LDCs constrained in their policy space.\textsuperscript{17} And the digital economy may prove to be much more difficult to ‘reverse engineer’ with respect to the technologies of the 19\textsuperscript{th} century, which were for the most part embodied in artefacts (e.g. mechanical engineering). Without even greater government involvements in designing the necessary catch-up policies we would hardly see many successful stories in the near future.

5 Conclusions and Implications for Policy

In this work we have analysed the effects of globalization upon structural change and the role played by endowment-based comparative advantage. The last three decades of globalization have substantially affected patterns of structural change in many developing countries. International demand for primary commodities has pushed resource-rich countries toward increasing specialization in their comparative advantages, as showed by the increasing weight of commodities in the production for foreign markets. McMillan et al. (2014) also documented that for many developing countries the net contribution of structural change to growth has been negative, with the manufacturing sector contracting and workers relocating into low-productivity activities or the informal sector. On the technological front, innovative capabilities remain highly concentrated in the leading ‘technology club’, with less developed countries still lagging behind. A notable exception is constituted by the rapid industrialization of China, but whose performance can be traced back to the implementation of the set of policies that we championed throughout this essay.

We also suggested some political and technological forces that are likely to curtail policy space in LDCs and make catch-up efforts even more difficult. The main practical implication for policy is the need to avoid lock-in into natural resources specialization. On the one hand, exploiting natural

\textsuperscript{17}We are not discussing here our concerns applying more in general to the long-term patterns that the Fourth Industrial Revolution is likely to strengthen, even in developed economies. The digital economy paradigm does not seem to the able to bring net job creation comparable to the Fordist era; in addition, we are assisting to a growing polarization of the job market partly due to the gig-economy (but also to specific policies of labour market flexibilization). ‘Digital Taylorism’ without the positive mitigation of Fordism in creating middle-class jobs in manufacturing is a worrying trend that policymakers should urgently deal with.
resources can be a viable way to accumulate resources in the early phases of industrialization, but the rents generated need to be purposefully distributed against comparative advantages in order to foster productive diversification (Cimoli et al., 2009a). On the other, relatively backward economies typically display an absolute disadvantage in everything, that is, they are less efficient in the production of every commodity. In this situation, a viable solution could be the ‘infant economy argument’, i.e. the protection of the entire manufacturing sector in developing economies (Stiglitz and Greenwald, 2014). In order to do so, policymakers in poor countries should employ all the policy space left by multilateral trade agreements to protect their strategic industries and nurturing specialization in dynamic sectors. Nevertheless, the existing regime might still end-up to be too tight, and in this case partial renegotiations may be necessary (Cimoli et al., 2009a).

Quite surprisingly, the most recent critiques to the multilateral trade system are coming by the world technological leader, the United States (The Washington Post, 2018). In particular, the Trump Administration has started imposing tariffs on imports (especially from China) with the stated aim of reducing the US trade deficit. In light of our preceding discussion, we contend that the set of industrial and trade policies that we have been advocating should be clearly tailored to the level of development of each country. While for Latin America it may be a priority achieving structural transformation and building a strong manufacturing base, the strategic need of advanced countries is bound to be different. The recent protectionist surge in the US has so far mainly targeted ‘old’ industries, such as steel and aluminium (New York Times, 2018). These hare hardly the industries from which the next technological paradigm is going to arise, and the potentiality of technological learning from them is very reduced for the USA. Overall, it seems that recent protectionism has been targeted to labour-intensive declining industries, with the aim of protecting jobs. This is consistent with the so-called ‘Australian case for protection’ (Samuelson, 1981), a policy usually very costly but that at times can have positive welfare effects in imperfectly competitive sectors (Harrison, 1994). We do not agree with commentators seeing it as a policy that will necessarily harm the US welfare; however, we do think that the right set of policies for the technological leader should be focussed on pushing ahead the endless frontier by means of innovation subsidies (Akcigit et al., 2018) and mission-oriented programs (Mazzucato 2015; Mowery 2012), rather than pouring resources on sunset industries. Also, the stickiness and the tacitness of much advanced technologies make technology transfer and international emulation second order concerns as long as the US keeps investing to retain

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18 Even though plans of the Trump Administrations are to expand tariffs on a large variety of investment and consumer goods in the near future.
the technological leadership; therefore, adopting an ‘innovation mercantilist’ approach may not be warranted.

As a final remark, let us conclude with some thought-provoking proposals. Given that the country which has been the pillar of the current world trade order is starting questioning it, we think that a fortiori developing countries and, more in general, losers of the last globalization wave should start designing new trade and industrial policies. Renewed efforts on both the policy and the academic arena are needed to address the current imbalances and possibly come up with workable solutions. We have made a thorough case for the adoption of heretic trade and industrial policies in developing countries, as this seems the only way to defy the comparative advantage specialization induced by unbridled globalization. However, some of our advices can be extended also to countries that already reached a higher level of development. For instance, we would argue that there may be a political economy point in introducing strategic tariffs even for a developed country which has lost its absolute advantage in every technological production. Such policies could be used as a ‘disciplinary device’ to encourage newly developed countries that reached technological leadership to adopt labour regulation or allow the formation of free labour unions.

Overall, many questions remain to be answered, and the research on development and structural change has not yet reached a definitive set of practical policies for escaping the resource curse and the lock-in into comparative advantages. In any case, the evidence seems to suggest the continuing importance of the puzzles of Antonio Serra on the wealth of Venice vis-à-vis the poverty of Naples: indeed, it is technological learning and not endowments what will lead underdeveloped countries to become tomorrow’s Venice.
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