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WHAT FACTORS DRIVE SUCCESSFUL INDUSTRIALIZATION?

EVIDENCE AND IMPLICATIONS FOR DEVELOPING COUNTRIES

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What factors drive successful industrialization? Evidence and implications for developing countries

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Abstract

This paper analyses the drivers of successful industrialization in developing countries. We consider two different periods, 1970-1990 and 1991-2014, which are likely to be affected by different patterns of industrialization due to major political, technological and organizational changes. We subsequently develop a simple methodology to identify a small group of countries for each period, which have exhibited a pattern of industrialization that is not only remarkable in absolute terms, but also sustained (i.e. industrialization that occurs over a long period of time). Based on this classification, our empirical analysis reveals that successful industrialization is driven by a combination of factors, including the country's initial economic conditions, its factor endowments as well as other characteristics, such as demographic structure and geography. We also show that other variables that policymakers can control play a crucial role. This includes, among others, the promotion of investments in capital (both public and privately funded) and education; the management of trade and capital openness; financial sector development and the promotion of both macroeconomic and institutional stability.

Keywords: Industrialization; developing countries; policies

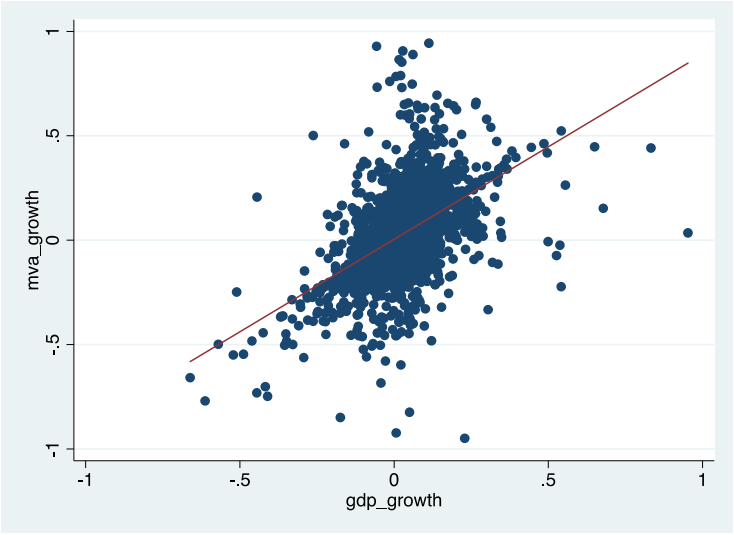
1. Introduction

There is consensus that industrialization plays a key role in the process of a nation's economic development. There are many reasons why pursuing sustained industrialization has long lasting benefits on economic development. Some of these reasons are rooted in Kaldor's law, which provides a conceptual framework for the link between manufacturing and economic growth. The major argument of proponents of industrialization relies on the productivity advantage of manufacturing over other sectors, as well as on the higher externalities that can arise from manufacturing growth (see also Szirmai, 2012, for a detailed discussion). As a matter of fact, not only the manufacturing sector displays levels of productivity that are higher compared to those of other sectors and has a greater capacity to absorb labour force (Timmer et al., 2015; McMillan et al., 2014), it also promotes savings, boosts the process of capital accumulation and offers higher investment opportunities (Lewis, 1954; Szirmaia and Verspagen, 2015). In addition, the manufacturing sector promotes economies of scale by driving technological progress (Arrow, 1962; Thirlwall, 2002), while providing spillover effects through linkages to other economic sectors (Hirschman, 1958). More recent research has shown that industrialization allows for greater economies of scope, with countries that are able to produce larger varieties of goods also being far more likely to undergo rapid economic growth (Hausman et al., 2007; Hidalgo et al., 2007).

As far as developing countries are concerned, both the data (Figure 1) and the existing empirical evidence seem to support the industrialization-growth nexus. Rodrik (2006) emphasizes that episodes of growth acceleration are often associated with an increasing role of manufacturing in the economy. Szirmaia and Verspagen (2015) analyse the importance of manufacturing as a driver of economic growth using data for 88 countries (21 advanced economies and 67 developing countries) over the period 1950–2005. They report that manufacturing has a positive impact on economic growth. Cantore et al. (2014) get to similar results using a sample of 80 countries. Still, this early evidence contrasts with more recent analyses revealing a tendency in developing countries to embark on a path of growth not driven by rapid industrialization (Rodrik, 2016; Diao et al., 2017). According to Haraguchi et al (2017), however, this trend should not be interpreted as one that downplay the importance of manufacturing as an engine of growth. Using very detailed data drawn from different sources, the authors show that the significance of manufacturing for developing countries has not faded over the last decades, but has instead been concentrated in a small number of highly populated countries (Haraguchi et al., 2017). Wood (2017) reaches a similar conclusion using a different lens of analysis. He demonstrates that the pattern of re-distribution of manufacturing is consistent with the results of

an augmented Heckscher-Ohlin model, i.e. a model based on countries' relative factor endowments. Over time, manufacturing value added has moved towards (skill-scarce) labour abundant and land-scarce countries in Asia, while it failed to reach land-abundant countries in Africa and Latin America (Wood, 2017).

Figure 1MVA growth and GDP growth



Source: Authors' elaboration of UN National Accounts Statistics

Yet, what are the factors that contribute to a successful process of industrialization? And why have some countries—more than others—been successful in maintaining a sustained pattern of industrialization over the last decades? Policies obviously play a decisive role. Newman et al. (2016) review the causes of weak manufacturing development in Africa by comparing it to successful cases in East Asia, and claim that the role of policies is key in explaining the different patterns observed in the two country groups. Rodrik (2004) discusses the role of policies in promoting industrialization and emphasizes the importance of strategic collaboration between the government and the private sector. In a subsequent paper, he focuses on the challenge of industrialization within the context of an open economy (Rodrik, 2007). Specifically, Rodrik (2007) explains that successful industrial policies should be based on a combination of targeted interventions to promote new export industries and a competitive exchange rate. Aghion et al (2011) argue that sectoral policies may foster productivity and economic growth when they target the most competitive sectors. A similar argument has been put forward by promoters of the new structural economics approach, namely that countries should pursue a path of development that is based on the identification and the exploitation of existing comparative advantages (Lin, 2012).

Obviously, the successful and extensive experience of many Asian economies with industrialization and structural transformation over the last decades represents the most relevant example for other low- and middle-income countries around the world. Asian countries display a set of policies and institutional conditions that have pushed rapid industrialization and structural change. Yet, in contrast to the current evidence of "premature deindustrialization" in developing countries (Rodrik 2016), many Asian countries still exhibit a strong specialization in manufacturing, alongside sustained economic growth (Wood, 2017; Diao et al., 2017). The key elements for such success stories can be found, among others, in the capacity to implement a transformation based on labour-saving technological change combined with high levels of investment in human and physical capital (Aizenman et al., 2012; Martorano et al., 2016).

In light of the above, the objective of this paper is to analyse the drivers of successful industrialization in developing countries. Our analysis involves two steps. First, we select a group of rapid industrializers by applying a simple analysis to define successful industrialization as a sustained pattern of rapid growth of manufacturing value added. Second, we examine whether their experiences entail a set of common factors. We do this by empirically analysing the determinants of successful cases of industrialization among a large group of emerging and developing countries, accounting for two different periods, 1971-1990 and 1991-2014. The idea of using 1990 as a breaking point follows Rodrik (2016), who shows that pre- and post-1990 trends in manufacturing employment are statistically distinguishable. As a matter of fact, the post-1990 period is not only characterized by strong political changes, but also a phase during which economic globalization definitely began thriving, marking important changes in the organization of international production and thus affecting the industrialization patterns of the majority of countries around the world. Understanding the drivers of successful and sustained processes of industrialization raises important policy implications for a number of developing countries, particularly in SSA, Latin America and South Asia, which are still underperforming in terms of industrialization and their likely capacity to link up to regional and global production networks.

The remainder of the paper is structured as follows. Section 2 develops a simple methodology to select a group of successful industrializers. Section 3 presents the empirical analysis, providing detailed information on the data and the model. Section 4 discusses the results of the empirical specification. Section 5 concludes, highlighting some of the implications of our findings.

2. Identification of successful industrializers

In this section, we explain how we identify "successful" industrializers. Our main source of information is the UN National Accounts Statistics, which provides, among others, annual data on manufacturing value added (MVA) in constant US dollars over the period 1970 – 2014 for virtually all countries in the world. Considering our focus on developing countries, we have removed all countries from our initial sample classified as high income by the World Bank at the end of each of the periods (1970-1990 and 1991-2014). Moreover, we also dropped countries with a population of less than 1 million from our analysis to eliminate potential outliers from our sample.[1] Our final sample includes 126 countries for the period 1971 – 1990 and 112 countries for the period 1991 – 2014.[2]

Based on this sample, we computed the annual MVA growth rates and analysed the distribution of this variable for the sample over the two periods. Table 1 reports the mean, median and 75th percentile value referring to the countries included in our analysis.

Table 1 Descriptive statistics on the two variables of interest

	MVA growth		
	1971-2014	Post 1990	Pre 1990
Mean	4.57%	4.26%	4.99%
Median	3.58%	3.16%	4.23%
75pc	8.06%	7.50%	8.82%

Source: Author's elaboration of UN National Accounts Statistics

To proceed with the identification of "successful" industrializers, our strategy relies on a simple methodology that uses thresholds drawn directly from the observed distribution of the outcome of interests. The identification strategy builds on the following stages:

1. For each country, the average MVA growth rate during the period of analysis (1971-1990 and 1991-2014) *must be higher* than the average growth rate of MVA for the entire sample over the same period (i.e. larger than 4.26 per cent in the post-1990, and larger than 4.99 per cent in the pre-1990 period);

[1] The excluded countries had a population lower than 1 million in terms of average value for both periods.
[2] Over the period 1971 – 1990, our sample includes 42 African countries, 35 Asian Pacific countries, 22 American countries and 20 European countries. Over the period 1991 – 2014, our sample includes 47 African countries, 32 Asian Pacific countries, 19 American countries and 9 European countries.

2. We then define an "episode" of industrialization as *any year* in which the annual rate of MVA growth is *higher than* the average annual MVA growth rate of the reference group/period;

3. A first group of industrializers is identified by grouping countries according to number of successful "episodes" recorded over each of the two periods. Countries are classified as "industrializers" if they experienced a number of episodes *larger than* the average number of episodes for the entire distribution (i.e. 9.5 in the first and 9.9 in the second period).

Table 2 presents the list of industrializers, together with some summary statistics on episodes of industrialization, for the two periods.

Finally, in order to refine our selection and to focus on a smaller group of "successful industrializers", we add two additional criteria that relate to the pattern and sustainability of the industrialization process:

1. We consider only those countries that recorded *less* than 25 per cent negative episodes (i.e. less than 5 drops in 1970-1990 and less than 6 in 1991-2014);

2. We select only those countries that recorded *more* than 75 per cent episodes of above average growth (i.e. 16 or more years of high growth for the first period and 18 or more years of high growth for the second period).

Table 3 provides a list of the selected countries. It is not surprising to see that the list is dominated by Asian countries, including early Tigers, and newly industrialized countries during the first period, and large emerging economies, as well as production hubs involved in global and regional value chains during the second period.

Table 2 List of industrializers

1970 - 1990				1991 - 2014			
Country	**n of episodes**	**n of negative**	**avg MVA growth**	**Country**	**n of episodes**	**n of negative**	**avg MVA growth**
Algeria	13	4	6.49%	Albania	12	6	5.72%
Botswana	14	4	16.10%	Angola	15	3	5.45%
Brazil	13	5	4.92%	Bangladesh	18	0	7.73%
Bulgaria	15	2	5.41%	Belarus	13	6	5.23%
Burundi	11	1	5.81%	Botswana	11	5	5.54%
Cameroon	10	5	5.84%	Cambodia	20	1	12.59%
China	15	2	7.67%	Chad	13	6	9.14%
Costa Rica	11	2	4.91%	China	20	0	9.92%
Côte d'Ivoire	11	5	6.78%	Ethiopia	15	1	8.12%
Egypt	16	2	6.32%	Gabon	13	4	5.58%
Honduras	14	3	4.74%	India	18	0	7.56%
India	12	1	5.83%	Indonesia	13	1	5.46%
Indonesia	19	0	13.53%	Iran	12	6	5.61%
Iran	13	5	8.20%	Jordan	13	1	7.93%
Kenya	15	0	7.48%	Laos	20	0	9.72%
Laos	10	5	6.46%	Lebanon	13	2	6.33%
Lesotho	12	3	9.07%	Lesotho	12	5	7.39%
Libya	14	5	9.53%	Malaysia	14	3	6.36%
Malawi	10	5	5.10%	Mozambique	11	4	7.55%
Malaysia	17	1	10.96%	Myanmar	20	0	15.15%
Mongolia	13	0	6.09%	Nigeria	13	5	6.17%
Morocco	10	1	4.97%	Sri Lanka	17	1	6.14%
Nepal	11	4	5.70%	Sudan (Former)	13	3	7.61%
Niger	12	5	7.01%	Turkmenistan	14	6	10.44%
Nigeria	13	3	8.05%	Tanzania	16	1	6.20%
Oman	16	3	18.95%	Uganda	14	1	7.88%
Pakistan	15	0	6.86%	Viet Nam	21	0	10.43%
Paraguay	11	4	5.33%	Yemen	13	4	9.11%
R. of Korea	18	1	14.25%				
Sri Lanka	10	5	4.85%				
Thailand	16	1	10.10%				
Tunisia	13	2	8.96%				
Turkey	16	2	6.52%				

Table 3 List of "successful" industrializers

	Country	n of episodes	n of negative episodes	Average MVA growth for the period
1971 - 1990	Indonesia	19	0	13.5%
	Malaysia	17	1	11.0%
	Oman	16	3	19.0%
	Republic of Korea	18	1	14.3%
	Thailand	16	1	10.1%
	Turkey	16	2	6.5%
1991 - 2014	Bangladesh	18	0	7.7%
	Cambodia	20	1	12.6%
	China	20	0	9.9%
	India	18	0	7.6%
	Laos	20	0	9.7%
	Myanmar	20	0	15.2%
	Viet Nam	21	0	10.4%

The successful industrializers were selected on the basis of sustained, high MVA growth. These countries' MVA not only grew rapidly over a long period of time, but also experienced structural change with increases in the share of MVA in GDP, indicating faster growth of their manufacturing sector relative to the rest of the economy. At the beginning of the two periods, i.e. 1970 and 1991, the respective groups of successful industrializers with the exception of China had a lower share of manufacturing in GDP than the average of other developing countries (Table 4). After two decades, the majority of successful industrializers had a higher manufacturing share than the average of other developing countries. Even those countries that had a lower manufacturing share than the average increased their manufacturing share significantly over the years.[3]

[3] Oman, which is a resource-rich country, may be an exception. Even though the country's manufacturing share tripled from 1970 to 1990, its share was still low at the end of the period because the country started with a very low manufacturing share of less than 1 per cent.

Table 4 Structural transformation in successful industrializers

	1970				1975				1980				1985				1990			
	AGR	MNF	NON-MNF	SER	AGR	MNF	NON-MNF	SER	AGR	MNF	NON-MNF	SER	AGR	MNF	NON-MNF	SER	AGR	MNF	NON-MNF	SER
Successful countries	23.42%	9.96%	14.83%	51.79%	19.73%	12.73%	15.19%	52.36%	16.33%	14.24%	16.17%	53.26%	13.94%	16.50%	15.81%	53.75%	11.02%	19.58%	15.52%	53.88%
Indonesia	29.45%	5.88%	28.59%	36.09%	23.38%	7.63%	31.86%	37.13%	20.03%	10.79%	29.57%	39.60%	18.58%	15.82%	24.01%	41.59%	15.76%	19.04%	21.54%	43.66%
Malaysia	23.45%	11.12%	33.25%	32.18%	24.33%	13.44%	25.51%	36.72%	20.18%	15.52%	26.77%	37.53%	17.95%	15.29%	27.42%	39.34%	16.25%	21.11%	24.32%	38.32%
Oman	1.41%	0.68%	72.01%	25.89%	1.45%	0.67%	71.73%	26.14%	1.74%	0.71%	68.44%	29.10%	1.28%	2.05%	67.24%	29.43%	1.53%	2.62%	68.75%	27.11%
Republic of Korea	17.27%	7.84%	13.10%	61.79%	14.92%	12.12%	12.51%	60.45%	9.61%	15.78%	14.73%	59.87%	8.83%	17.68%	13.80%	59.69%	5.78%	20.36%	14.34%	59.52%
Thailand	22.03%	15.57%	7.76%	54.64%	20.05%	19.24%	5.98%	54.74%	16.62%	20.89%	7.23%	55.26%	15.67%	20.31%	9.23%	54.79%	11.17%	25.17%	10.30%	53.36%
Turkey	25.75%	11.75%	7.91%	54.59%	21.31%	14.34%	7.96%	56.39%	20.11%	13.42%	7.60%	58.87%	16.54%	15.92%	8.51%	59.03%	14.75%	17.70%	8.95%	58.61%
Other developing countries	14.21%	17.08%	21.62%	47.44%	12.93%	18.07%	21.16%	48.23%	11.45%	18.65%	19.69%	50.59%	11.85%	18.57%	17.89%	52.06%	10.82%	18.80%	19.28%	51.39%

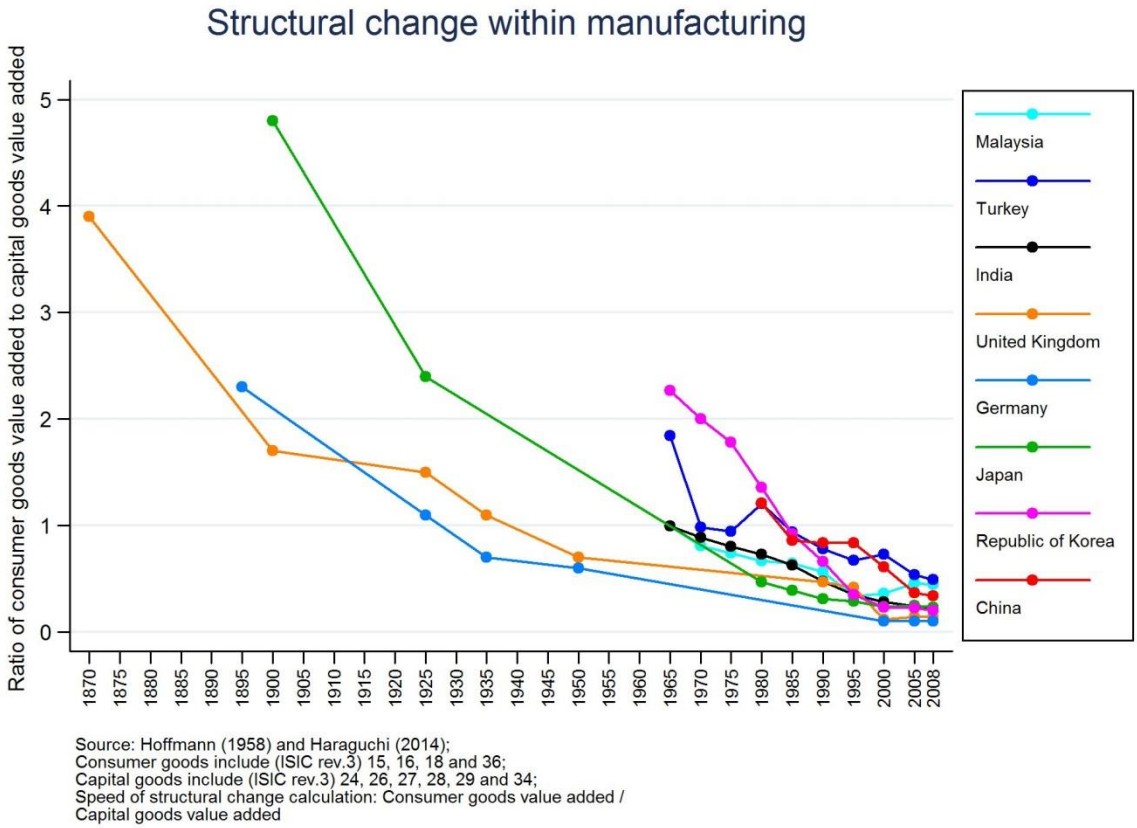
	1991				1995				2000				2005				2014			
	AGR	MNF	NON-MNF	SER	AGR	MNF	NON-MNF	SER	AGR	MNF	NON-MNF	SER	AGR	MNF	NON-MNF	SER	AGR	MNF	NON-MNF	SER
Successful countries	27.82%	25.36%	7.53%	39.29%	22.20%	28.12%	10.55%	39.13%	18.06%	27.46%	12.95%	41.53%	14.27%	28.53%	14.83%	42.37%	9.01%	31.27%	13.46%	46.26%
Bangladesh	26.60%	12.98%	7.25%	53.18%	23.51%	15.16%	8.26%	53.07%	23.17%	15.45%	9.35%	52.03%	20.14%	16.53%	10.69%	52.63%	17.01%	20.49%	11.63%	50.87%
Cambodia	49.60%	7.40%	3.28%	39.72%	46.97%	7.86%	5.90%	39.27%	39.19%	15.22%	6.08%	39.51%	32.40%	18.79%	7.58%	41.23%	25.61%	22.16%	8.78%	43.45%
China	26.11%	30.97%	2.98%	39.95%	19.58%	32.83%	8.63%	38.95%	15.47%	31.52%	12.26%	40.74%	12.06%	32.34%	14.68%	40.93%	7.43%	34.70%	13.71%	44.17%
India	30.33%	16.97%	15.78%	36.93%	27.32%	19.38%	14.88%	38.42%	23.50%	18.64%	14.63%	43.23%	19.32%	18.88%	15.36%	46.43%	13.32%	19.92%	12.61%	54.16%
Lao People's DR	47.47%	5.49%	8.63%	38.41%	46.25%	6.39%	10.00%	37.36%	44.07%	7.69%	11.78%	36.46%	36.25%	8.53%	14.70%	40.52%	24.67%	9.47%	21.80%	44.06%
Myanmar	58.49%	6.79%	1.99%	32.73%	56.94%	7.29%	2.88%	32.90%	54.33%	8.20%	3.43%	34.04%	46.69%	12.80%	4.71%	35.80%	31.02%	20.58%	6.54%	41.85%
Viet Nam	32.89%	12.75%	15.09%	39.27%	27.68%	13.69%	18.12%	40.52%	24.24%	16.44%	21.66%	37.66%	21.01%	20.49%	21.02%	37.48%	16.62%	25.61%	16.65%	41.12%
Other developing countries	10.22%	17.05%	19.64%	53.39%	9.76%	17.20%	19.28%	53.98%	9.57%	17.48%	19.17%	53.95%	9.52%	17.27%	18.32%	55.06%	8.87%	16.21%	16.29%	58.75%

Aside from economy-wide structural change, Hoffmann (1958) empirically showed that successful industrialization was accompanied by structural change within manufacturing. In his analysis on industrial development of advanced countries, he illustrated that the value added share of consumer goods industries declined while the share of capital goods increased as industrialization proceeded in those countries.[4]

Figure 2 presents structural change within manufacturing and its speed (slope) based largely on Hoffmann's industry classification (Hoffmann, 1958).[5] The Y axis represents the ratio of consumer to capital goods value added. The smaller the ratio is, the more capital intensive the manufacturing structure. The required value added data for the set of industries over the long period of time are limited, especially for post-1990 successful industrializers. The figure therefore only includes four countries from the pre-1990 group, one country (India) from the post-1990 group, and the long-term trends of Germany, Japan and the UK for reference purposes. The recently successful industrializers followed the trends of early industrializers and changed their manufacturing structure by steadily increasing the contribution of capital goods industries relative to that of the consumer goods industries to manufacturing value added. As indicated by the slope of their curves, the speed of their structural change was much faster than that of Germany and the UK. It only took around 40 years for the Republic of Korea to reduce the ratio from 2 to the level commonly observed in industrialized countries, while it took the UK and Germany more than 100 years and Japan around 70 years to achieve such transformation.

[5] In our analysis, consumer goods industries include food and beverages, wearing apparel, and furniture while capital goods industries include chemicals, non-metallic minerals, fabricated metals, machinery and equipment, and motor vehicles. Although Hoffmann's classification included tobacco in the consumer goods industries and basic metals in the capital goods industries, they were dropped here due to data limitation.

Figure 2 Pattern of structural change within manufacturing



3. Data and model specification

In this section, we present the setting of an empirical test that aims to identify the factors that promoted industrialization in the selected group of successful countries. The following baseline model is estimated:

$$industrializer_{it} = \beta \sum Z_{it} + \theta_t + u_{it} \qquad (1),$$

where i and t indicate the country and the year. θ_t are the time fixed effects used to control for country invariant shocks (such as global financial crises; international commodity price fluctuations) that might have affected growth and industrialization, while u_{it} is the idiosyncratic error term.

Our dependent variable is a binary indicator which takes a value of 1 if the country is classified as a successful industrializer according to the definition provided in Section 2. The method we use to identify successful industrializers influences the way we implement our empirical strategy. Since we selected a sub-set of countries with a sustained pattern of industrialization over the two periods considered (i.e. with a very small variation of the dependent variable

during each sub-period), the dummy takes a value of 1 for the entire sub-period of interest if the country is in the group of successful industrializers. For example, while Indonesia and Oman report a value of 1 for *all* 19 years of the period 1971-1990, the value for all the years included in the 1991-2014 period is 0, as both countries were not classified as successful industrializers in the second period. In view of this, our analysis uses the pooled dimension of the data applying a standard probit estimator. The results should therefore be interpreted as the incidence of each factor on the probability of belonging to the group of more successful industrializers in any given period.

3.1 Control variables

In equation 1, *Z* is a vector of variables on which we base our main output (Table 5). Along the lines of existing literature (Haraguchi, 2014; Chenery and Syrquin, 1975; Lin, 2012), these variables refer to economic, demographic, institutional and policy-related factors that may have affected the incidence of successful industrialization over the period of analysis. While these variables cover a number of dimensions found in previous literature to matter for industrialization, structural transformation and overall economic development (McMillan et al., 2012; Hausman et al., 2005), data limitations, especially concerning the coverage of earlier years and of some low-income economy, have affected the possibility to include additional variables that might contribute to the identification of sustained patterns of industrialization.

The first control is the level of real GDP per capita (*LGDP_PC*), which is used to account for cross-country differences in stages of development. Such differences may matter since countries that start from lower levels of economic development have more probability to catch up with more advanced countries and therefore, to undertake sustained patterns of industrialization. Indeed, poorer countries are characterized by a higher productivity growth rate in their manufacturing sector, which in turn promotes an unconditional convergence with the technological frontier (Rodrik, 2013).

To control for the role of investment, we introduce the gross fixed capital formation (private and public) on GDP (*GFCF_GDP*). Higher investments are expected to promote industrialization by stimulating aggregate demand and boosting productive capacities (Weiss and Clara, 2016). As a result, higher investments can play a key role in sustaining the development of the local industry, fostering structural transformation and being a pre-requisite for long-term growth (Cornia and Martorano, 2012).

Several growth theories also emphasize the crucial role of human capital. Endogenous growth models assume that investment in human capital prevents returns to capital from falling and

contributes to an increase in capabilities for innovation and the adaptation of new technologies (Romer, 1986). This is clearly relevant for industrialization. To capture this effect, we include a variable representing human capital endowments measured by the average number of years of education of the workforce (*HC*), derived from the Barro-Lee (2013) dataset.

We use information on the domestic credit to the private sector (as a percentage of GDP) to control for the level of financial development (*CREDIT*). The nexus between financial development and production goes back to Schumpeter, who claimed that well-functioning financial institutions boost technological innovation by selecting and funding the winners, i.e. entrepreneurs with high probabilities of implementing innovative processes and realizing innovative products. There is a large body of literature that focuses on the role of financial systems in promoting savings and investment decisions of individuals and firms, especially in industries within the manufacturing sector (Rajan and Zingales, 1998).

Macroeconomic policies related to international openness and integration are also included, since they can—directly or indirectly—affect the manufacturing sector's development. First, we include the real effective exchange rate (*REER*), which plays an important role in fostering the productive sector, as discussed extensively in the literature (Rodrik, 2008). More specifically, a stable and competitive exchange rate is expected to promote the growth of the tradable sector (Martorano and Sanfilippo, 2015). A competitive exchange rate has been found to be more protective of the nascent domestic manufacturing sector compared, for instance, to tariffs (Helleiner, 2011), especially in countries that specialize in labour intensive industries. Second, we also include an indicator of capital account openness (*KAOPEN*). Capital account can result in both positive and negative spillovers to the domestic economy, and it has been managed differently by developing countries over time. In a Solow growth model, opening to capital inflows lowers interest rates and allows firms to borrow, thus raising their investment rates (Chari et al., 2012). On the other hand, capital liberalization might lead to higher volatility and economic instability (Cornia, 2005).

We also account for the countries' institutional conditions. Stable institutions have been identified as a key precondition for economic development, as well as a way to enable a good business climate for the private sector (Alesina et al., 1992; Xu, 2010). We use the number of consecutive years under the current regime type (Boix et al., 2014) as a proxy for political stability (*POL*). The underlying idea is that a strong and stable government might ensure the successful implementation of a long-term plan, which might be necessary to promote the development of new industries.

To capture other important characteristics of the country, including their endowments, we add the share of mineral rents as a percentage of GDP (*NAT_RES*). Greater reliance on natural resources tends to increase cyclical fluctuations in national income and raises the probability of negative performance in the long run (Rodriguez and Sachs, 1999). More specifically, Sachs and Warner (2001) use the Dutch disease argument to point out the potential detrimental effects of high natural resource rents on the development of the manufacturing sector.

Finally, factors related to geography can also impede industrialization. We add a dummy accounting for each country's access to the sea (*LANDLOCKED*). Landlocked countries have fewer opportunities to be open to trade and to foster a successful process of industrialization (Easterly and Levine, 2003). As such, geographic constraints hamper the ability of these countries to increase productivity due to their limited access to large markets or their opportunities to exploit economies of scale (Sachs and Warner, 1995).

Table 5 presents a description of the variables and their source. Table 6 provides descriptive statistics for the entire sample disaggregated by period. The means of the two sub-periods do not differ significantly. This might be understood as an indication of similarities among countries' policies and characteristics over the two sub-periods. The only exceptions are represented by the variables measuring openness-related policies (REER and KAOPEN), which reflect a different international trend as regards trade and financial liberalization policies. Moreover, the level of domestic credit to the private sector increased following the process of internal liberalization while the stability of the political regime has decreased.

Table 5 Variable description

Variable	Description	source
LGDP_PC	level of real GDP per capita	UNIDO
GFCF_GDP	gross fixed capital formation (both private and public) on GDP	UNIDO
CREDIT	domestic credit to private sector (as a percentage of GDP)	World Development Indicators database
REER	real effective exchange rate	Darvas[6]
KAOPEN	indicator of capital account openness	Chinn and Ito (2008)
HC	the average numbers of years of education of the workforce	Barro and Lee (2013)
POL	the number of consecutive years of the current regime type	Boix et al. (2014)
NAT_RES	the share of mineral rents as percentage of GDP	World Development Indicators database
LANDLOCKED	dummy accounting for each country's access to the sea	CEPII

Table 6 Descriptive statistics on the overall period and the two sub-periods

						<1991		>=1991	
Variable	Obs	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Mean	Std. Dev.
MVA_GROWTH	4607	0.05	0.34	-0.95	18.14	0.05	0.14	0.05	0.44
LGDP_PC	4734	7.02	1.11	4.03	9.68	7.00	1.16	7.04	1.07
GFCF_GDP	4689	0.22	0.12	0.01	1.59	0.22	0.14	0.22	0.10
CREDIT	3849	25.69	23.85	0	166.5	23.33	17.3	27.23	27.17
REER	4106	150.09	892.56	0.38	56273.63	207.14	1363.15	107.71	66.47
KAOPEN	4058	-0.51	1.3	-1.89	2.39	-0.78	1.15	-0.31	1.36
HC	4213	5.41	2.7	-0.7	11.87	4.64	2.67	6.17	2.51
POL	3975	37.53	46.75	1	211	41.18	51.02	34.06	42.01
NAT_RES	3900	1.46	4.06	0	44.64	1.49	3.96	1.44	4.13
LANDLOCKED	5067	0.27	0.44	0	1	0.26	0.44	0.27	0.44

[6] http://bruegel.org/publications/datasets/real-effective-exchange-rates-for-178-countries-a-new-database/

Table 7 reports a disaggregation of previous statistics distinguishing between the groups of successful industrializers and the rest of the countries, for the entire period as well as for both sub-periods separately. In nearly all cases, the mean values are statistically different, which is promising in view of the multivariate analysis. A preliminary assessment of such differences seems to indicate that the group of successful industrializers are, on average—and independently of the period considered—characterized by lower income; higher investments, access to credit and institutional stability, as well as by a lower dependence on natural resource rents and more competitive exchange rates. Other variables, such as capital openness and education, show less obvious differences.

Table 7 Means comparison between successful industrializers and other countries

	All Countries			Rest of countries		Industrializers		
Period	Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	diff
	MVA_GROWTH	0.05	0.01	0.04	0.01	0.11	0.00	**-0.07**
1970 - 2014	LGDP_PC	7.02	0.02	7.03	0.02	6.85	0.06	**0.18**
	GFCF_GDP	0.22	0.00	0.22	0.00	0.25	0.01	**-0.03**
	CREDIT	25.69	0.38	24.88	0.38	36.28	1.92	**-11.40**
	REER	150.01	13.90	151.85	14.73	119.34	2.75	**32.51**
	KAOPEN	-0.51	0.02	-0.51	0.02	-0.47	0.08	-0.04
	HC	5.39	0.04	5.42	0.04	5.02	0.10	**0.40**
	POL	37.45	0.74	36.20	0.73	58.78	4.61	**-22.58**
	NAT_RES	1.46	0.06	1.51	0.07	0.67	0.14	**0.84**
	LANDLOCKED	0.27	0.01	0.28	0.01	0.08	0.02	**0.20**

	All Countries			Rest of countries		Industrializers		
Period	Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	diff
	MVA_GROWTH	0.05	0.03	0.04	0.00	0.12	0.01	**-0.08**
1970 - 1990	LGDP_PC	7.00	0.03	6.96	0.03	7.71	0.08	**-0.75**
	GFCF_GDP	0.22	0.00	0.22	0.00	0.23	0.01	-0.01
	CREDIT	23.33	0.44	22.50	0.45	33.65	1.92	**-11.15**
	REER	207.31	32.68	211.77	34.72	136.29	5.63	**75.48**
	KAOPEN	-0.78	0.03	-0.87	0.03	0.41	0.13	**-1.28**
	HC	4.61	0.06	4.59	0.06	4.94	0.19	-0.35
	POL	41.19	1.17	40.47	1.17	52.73	6.60	-12.26
	NAT_RES	1.50	0.10	1.59	0.11	0.23	0.03	**1.36**
	LANDLOCKED	0.26	0.01	0.27	0.01	0	0	**0.27**

	All Countries			Rest of countries		Industrializers		

Period	Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Diff
	MVA_GROWTH	0.05	0.01	0.05	0.01	0.10	0.00	**-0.05**
1991 - 2014	LGDP_PC	7.04	0.02	7.09	0.02	6.20	0.06	**0.89**
	GFCF_GDP	0.22	0.00	0.22	0.00	0.26	0.01	**-0.04**
	CREDIT	27.23	0.56	26.42	0.56	38.16	2.98	**-11.74**
	REER	107.83	1.37	107.94	1.44	105.91	1.18	2.03
	KAOPEN	-0.31	0.03	-0.25	0.03	-1.08	0.06	**0.83**
	HC	6.17	0.05	6.27	0.06	5.07	0.10	**1.20**
	POL	33.94	0.93	32.19	0.89	65.06	6.40	**-32.87**
	NAT_RES	1.43	0.09	1.46	0.09	1.08	0.25	0.38
	LANDLOCKED	0.27	0.01	0.28	0.01	0.14	0.02	**0.14**

Note: Means in bold are statistically significant at 5 per cent.

4. Regression results

Table 8 presents the main output of our analysis, in which the variables described in the previous section are regressed against a dummy variable identifying the successful industrializers vis-à-vis other countries in our sample, for both the entire period (Column 1), and the two sub-periods (pre- and post-1990, Columns 2 and 3, respectively).

The coefficient related to the level of real GDP per capita is negative and statistically significant. This result seems consistent with standard patterns of structural transformation identified in previous studies (Timmer et al., 2013), and confirms that countries that experienced a prolonged period of high MVA growth are generally those at earlier stages of economic development. Note that this pattern is consistent across the different time periods. Though this might seem to contradict the trend of "premature de-industrialization" in the most recent period as highlighted by Rodrik (2016), it does not seem to be an issue here considering that the successful industrializers in the post-1990 period include countries (all Asian) that have not been affected by this trend.

Table 8 Results – Determinants of industrialization periods

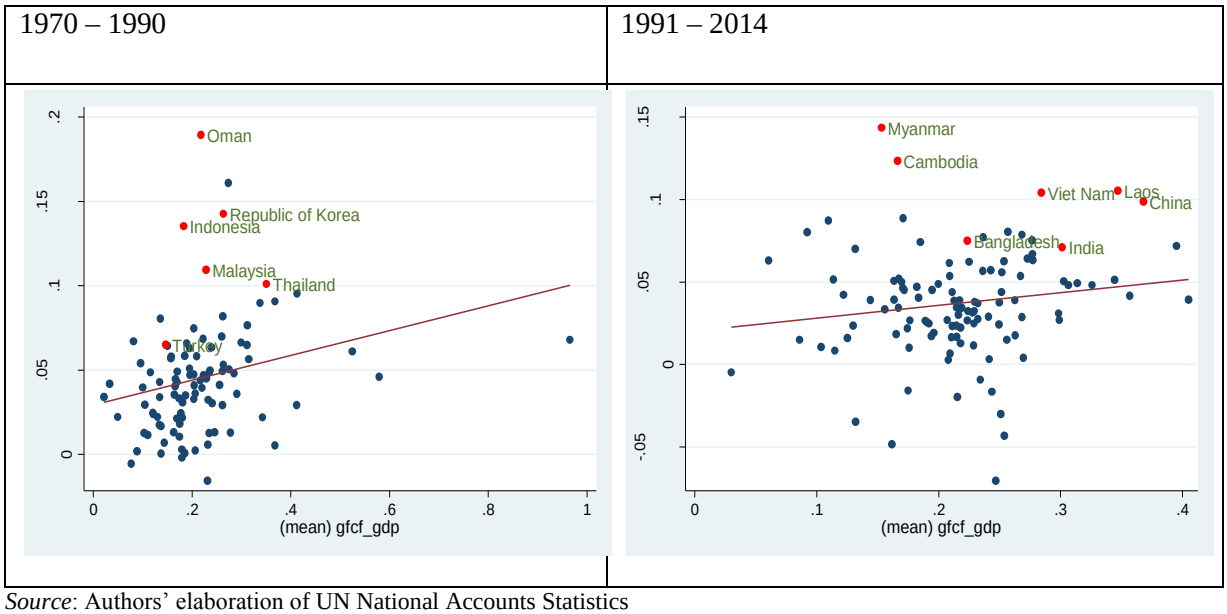
VARIABLES	(1) Whole period	(2) Pre_1990	(3) Post_1990
LGDP_PC	-0.444***	-0.190**	-1.701***
	[0.058]	[0.087]	[0.181]
GFCF_GDP	1.104***	-0.416	6.455***
	[0.263]	[0.325]	[0.810]
CREDIT	0.012***	0.010**	0.024***
	[0.001]	[0.004]	[0.003]
REER	-0.006***	-0.005***	-0.005*
	[0.001]	[0.001]	[0.003]
KAOPEN	-0.055	0.239***	-1.011***
	[0.035]	[0.045]	[0.181]
HC	0.062***	0.084*	0.105***
	[0.022]	[0.045]	[0.028]
POL	0.002***	-0.002	0.008***
	[0.001]	[0.002]	[0.002]
NAT_RES	-0.041**	-0.369***	-0.014
	[0.017]	[0.066]	[0.017]
LANDLOCKED	-0.528***		-0.752***
	[0.115]		[0.220]
Constant	1.839***	0.729	5.847***
	[0.455]	[0.604]	[1.041]
Observations	2,745	998	1,491

Robust standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1

Second, Table 8 shows that investment was an important factor in the industrialization process over the period of analysis. Yet, there are some differences when looking at the two periods. While investment was a key ingredient in explaining the successful process of industrialization in the post-1990 period, our analysis indicates that it was less important in promoting industrialization in the pre-1990 period. One potential explanation is the characteristics of the countries considered and the models of specialization followed over time. While development in the first wave of industrializers was mostly attributable to labour intensive industries requiring lower shares of fixed assets, and the pre-1990 period is characterized by low FDI inflows (in turn, an important component of GFCF, Amighini et al., 2017), investment played a key role in

the process of development in countries such as China, India, Laos and Viet Nam. These trends are illustrated in Figure 3. While the figure depicts a strong positive relationship between investments and industrialization over time, it also shows that over the period 1991–2014, successful industrializers represent a cluster reporting above average levels of investment compared to the rest of the countries included.

Figure 3 MVA growth and GFCF_GDP



Source: Authors' elaboration of UN National Accounts Statistics

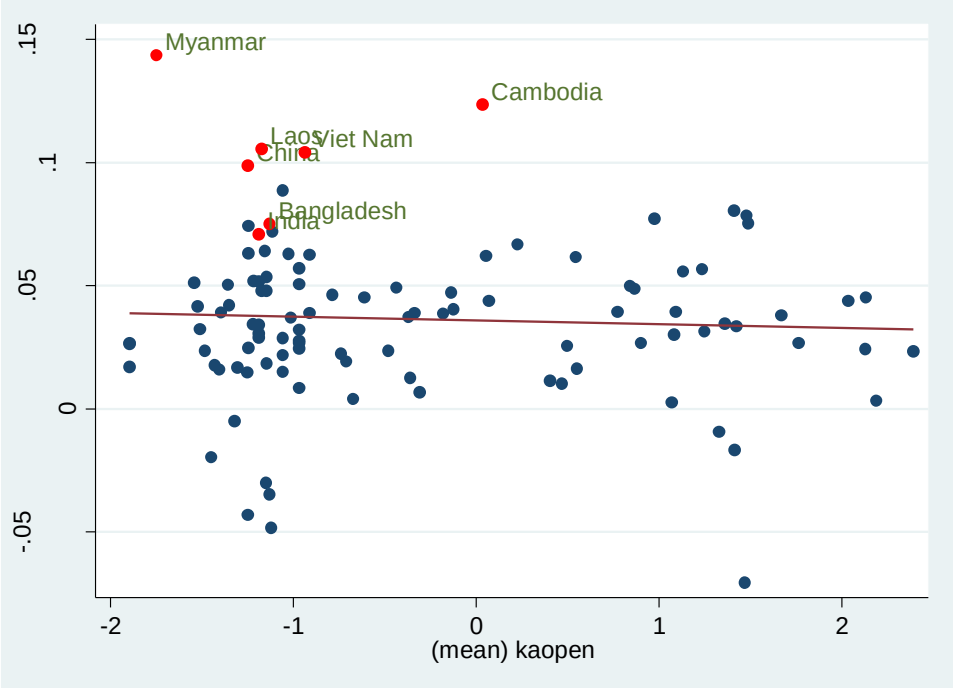
Our results also show that human capital endowments, measured by the number of years of education, are among the key factors contributing to a sustained process of rapid industrialization. This result is in line with our expectations. Countries that experienced rapid industrialization, such as the early Asian Tigers (and, most notably, the Republic of Korea) or most recently China, invested in human capital to fuel the increasing demand from expanding industries, as well as by upgrading the labour force's skills as soon as the industries moved up the value chain (Jankowska et al., 2013).

The level of credit to the private sector is an additional factor that may explain the good performance recorded by successful industrializers. Indeed, credit constraints hamper firms from exploiting investment opportunities (Levine, 2005). This is especially true in low income settings in which the economy operates in a suboptimal equilibrium (Banerjee and Newman, 1993; Aghion and Bolton, 1997). Moreover, in case of macroeconomic shocks, this also affects the innovation process and long-term growth (Aghion et al., 2004). Easier access to finance represents an important pre-requisite for firms to expand and for industry to grow quickly.

As regards the role of external policies, the results in Table 8 seem to suggest that the successful industrializers adopted an undervalued exchange rate regime allowing the domestic sector to become more competitive. This tends to confirm the role of the exchange rate as an effective industrial policy tool (Rodrik, 2008). By keeping the exchange rate low, these countries were able to promote their tradable sector.

Table 8 also shows that the coefficient measuring the degree of openness of the capital account was positive and statistically significant in the pre-1990 period, but turned negative in the post-1990 period. The result for the pre-1990 period can be explained by the model of development followed by countries included in the list of successful industrializers. During that period, those who were part of the group of the Asian "Tigers" (Republic of Korea) and the other newly industrialized countries (NICs) (Malaysia, Thailand, Indonesia) adopted more pragmatic policies to maximize the advantages from international integration in a period in which volatile financial flows were of lesser concern. By contrast, successful industrializers in the post-1990 period implemented more conservative policies, as shown in Figure 4. The relatively closed capital account strategy gave China's economy the opportunity to buffer the negative consequences of financial crises which affected many developing countries (Gallagher et al., 2016). A similar strategy was followed by India, which was able to reduce the volatility of its exchange rate and take advantage of the necessary policy space (Yoshino et al., 2015).

Figure 4MVA growth and capital account liberalization, 1991 - 2010



Source: Authors' elaboration of UN National Accounts Statistics and Chinn-Ito (2015)

Crucially, our results confirm the role of political stability as a driver of sustained industrialization. Higher stability provides the right environment to promote investments and is a necessary precondition for economic development. Finally, we show that geographic characteristics and countries' endowments play a role as well. Geographic remoteness represents a major constraint to the development of a strong industrial sector due to the difficulty of achieving economies of scale caused by high transport costs. Column (3) shows that geographic characteristics also played a role in the period between 1991 and 2014. Indeed, all countries included in the list of successful industrializers has access to the sea. The only exception is Laos. By contrast, the dummy accounting for each country's access to the sea is omitted in the analysis for the period 1970 to 1990 due to the lack of landlocked countries in the list of successful industrializers.

On the other hand, however, we find that the probability of a country to initiate a rapid and sustained process of rapid industrialization reduces, the higher the dependence on natural resources, whose curse may crowd-out the local industry through an increase in the price of domestic factors.

4.1 Additional specifications

In this section, we provide a set of additional specifications and robustness checks in which we take potentially relevant dimensions into account, which have not been included in our core regressions due to (a) their high correlation/substitution with some of the key variables in (1); and (b) the lack of a sufficient number of observations, especially for earlier periods and for some lower income countries. Table 9 reports a first set of such variables.

Table 9 Determinants of industrialization episodes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
LGDP_PC	-0.492***	0.053	-0.691***	-0.586***	-2.713***	-2.724***	-0.298***	-0.364***	-0.424***	-0.516***
	[0.065]	[0.086]	[0.072]	[0.068]	[0.447]	[0.448]	[0.072]	[0.053]	[0.047]	[0.057]
GFCF_GDP		0.388	2.097***	4.164***	21.958***	21.986***	1.319***	1.121***	1.561***	1.365***
		[0.308]	[0.377]	[0.922]	[3.570]	[3.579]	[0.288]	[0.251]	[0.279]	[0.263]
CREDIT	0.010***	0.019***	0.014***	0.003	0.045***	0.045***	0.012***	0.003**	0.014***	0.012***
	[0.001]	[0.002]	[0.002]	[0.002]	[0.008]	[0.008]	[0.002]	[0.001]	[0.002]	[0.001]
REER	-0.006***	-0.011***	-0.009***	-0.010***	0.007	0.007	-0.006***	-0.004***	-0.005***	-0.006***
	[0.001]	[0.002]	[0.002]	[0.002]	[0.005]	[0.005]	[0.001]	[0.001]	[0.001]	[0.001]
KAOPEN	-0.074**	0.093**	-0.133***	0.125**	-0.220**	-0.222**	-0.002	0.037	-0.026	-0.070*
	[0.035]	[0.042]	[0.049]	[0.049]	[0.097]	[0.098]	[0.037]	[0.032]	[0.036]	[0.037]
HC	0.056***	0.046	0.062***	-0.130***	0.208***	0.208***	-0.011			0.090***
	[0.021]	[0.039]	[0.022]	[0.032]	[0.065]	[0.065]	[0.018]			[0.019]
POL	0.002***	0.004***	0.001	-0.004***	0.007**	0.007**	0.002***	0.004***	0.001	0.002**
	[0.001]	[0.001]	[0.001]	[0.001]	[0.003]	[0.003]	[0.001]	[0.001]	[0.001]	[0.001]
NAT_RES	-0.043**	-0.166***	-0.012	-0.569***	-0.057*	-0.056*	-0.015	-0.032**	-0.006	-0.038**
	[0.019]	[0.040]	[0.010]	[0.109]	[0.034]	[0.034]	[0.010]	[0.016]	[0.011]	[0.016]
LANDLOCKED	-0.669***		-0.450***		-0.951***	-0.957***	-0.582***	-0.399***	-0.560***	-0.520***
	[0.121]		[0.132]		[0.335]	[0.333]	[0.125]	[0.115]	[0.130]	[0.118]
GOV_INV	3.028***									
	[0.714]									
PRIV_INV	2.591***									
	[0.587]									
LWAGE_OC		-0.860***								
		[0.087]								
LEND_RATE			-0.018***							
			[0.006]							
PATENTS				0.323***						

				[0.035]						
TARIFFS					-0.014					
					[0.018]					
TARIFFS M						-0.014				
						[0.017]				
I_DEBT							-0.228***			
							[0.033]			
AGE_DEP								-0.026***		
								[0.003]		
GINI									-5.763***	
									[0.405]	
RELIGION										-0.730***
										[0.168]
Constant	1.993***	5.864***	0.108	2.645***	4.288**	4.323**	1.079**	3.619***	4.433***	2.523***
	[0.472]	[0.778]	[0.620]	[0.757]	[1.876]	[1.878]	[0.521]	[0.628]	[0.550]	[0.500]
Observations	2,617	1,354	1,785	1,233	736	736	2,426	3,072	2,944	2,745

In Column 1, we replace the investment variable with two new variables derived from the IMF and differentiate between public and private investment. This may be of relevance, since the government plays a key role in providing basic infrastructures that are necessary to promote the process of industrialization. Recent contributions emphasize the potential role public investment can play in terms of risk-taking, fostering technological development and innovation (Mazzucato, 2011). Existing evidence also shows that in some of the successful cases of industrialization, such as in the Republic of Korea, public investment has been crucial for creating pecuniary externalities without crowding-out private investments (Vos, 1982; Storm, 2017). Table 9 confirms these assumptions and shows that private investment on its own has a positive and significant role in promoting industrialization. Still, after computing the average marginal effect, we find that the coefficient is slightly higher in the case of public investment compared to private investment (0.332 and 0.284, respectively).

In Column 2, we consider the cost of labour. We do this by comparing countries according to their level of real wages per worker. Finding this information across a wide range of developing countries and over such a long time period is difficult. We therefore rely on information provided in related works by Lavopa (2015) and Haraguchi et al. (2017), which collects data on the shares of manufacturing wages in total and on the total number of persons employed in manufacturing, which we have merged to calculate an indicator of labour costs per worker. Including this variable in our model slightly reduces the number of observations, but does not affect the main results. Crucially, it reveals another characteristic of successful industrializers, namely their relatively lower labour cost (due, for instance, to an abundant labour force like in China or Bangladesh) that has given them a competitive edge in building low-value added specializations from which to kick-start their process of industrialization.

In Column 3, we introduce the lending interest rate (in %) which represents the bank rate for meeting the financing needs of the private sector.[7] The coefficient is negative and statistically significant. This confirms the key role monetary policy plays in the process of industrialization, demonstrating that higher interest rates can have adverse effects on manufacturing firms by raising the cost of borrowing and thereby reducing their investments (Stiglitz, 2017).

In Column 4, we introduce a variable reporting the number of patent applications, which is a proxy for countries' innovation potential. There is a wealth of literature on the link between the innovative capacity of a country, the ability to build national innovation systems and the sustainability of their industrialization (Nelson and Winter, 2009). In fact, our results indicate

[7] More information is available at http://data.worldbank.org/indicator/FR.INR.LEND.

that being innovative is positively correlated with the probability of being a successful industrializer.

In Columns 5 and 6, we include information on trade policies, namely the average rates of applied tariffs, calculated for all goods and the manufacturing industries. Though the literature shows that tariffs are often used as an industrial policy tool, especially to protect infant industry (Storm, 2017), we only find weak evidence for this. The two coefficients are in fact negative, but both are not statistically significant and the number of observations drops consistently due to the lack of coverage of many years and countries. The result may also highlight the heterogeneity among countries, since tariffs are used differently according to distinctive domestic conditions and periods, i.e. tariffs are less compelling for labour-abundant than for labour-scarce countries (the latter being those countries that are more likely to adopt import substitution policies, see O'Rourke and Williamson, 2017).

In Column 7, we introduce a variable for the interest payments on external debt (% of GNI) as a proxy for macroeconomic stability (*I_DEBT*). Although the macroeconomic environment is not a sufficient condition to promote industrialization, it is a necessary condition to provide a better playing field and favouring domestic and foreign investments (Rodrik, 2006). Results in Table 9 confirm these expectations, showing that countries that experienced sustained industrialization over both periods considered were also those with a lower cost on their debt, and were therefore more likely to free resources to foster economic growth, including through industrialization.

As industrialization is a process characterized by its potential to promote inclusiveness and broader participation of a large number of people in new opportunities in the manufacturing sector, it is likely that demographic variables may explain certain patterns as well. Column 8 presents the results of our main specifications, including a coefficient measuring the age dependency ratio (% of working age population) and a proxy for the supply side (*AGE_DEP*).[8] The coefficient that measures the age dependency ratio is negative and statistically significant; this is consistent across periods. This adds an important point to our investigation of factors shaping sustained industrialization, i.e. the industries in countries with 'demographic windows' are more likely to experience high growth. In fact, demographic effects played a key role in East Asia's economic "miracle" (Bloom and Williamson, 1998; Bloom et al., 2000). Another notable example is China, whose pattern of industrialization has followed the prediction of Lewis, exploiting the large availability of young (mostly unskilled) workers moving from the rural to urban areas to fuel the manufacturing sector's development (Yao, 2011).

[8] Importantly, this model specification does not include the variable on education due its high correlation (-0.75) with the age dependency ratio.

In Column 9, we include information on inequality. On the one hand, high disparities push many people into low-wage jobs, hampering the development of domestic markets and the process of industrialization (Murphy et al., 1989). On the other hand, high inequality tends to reduce the effectiveness of policies due to the high dependence of institutions on class-based power structures. This was the case of Latin American countries where "the state's lack of relative autonomy precluded certain policies from being pursued" (Jenkins, 1991: 201). Our results seem to confirm the view that high inequality tends to be harmful for the process of industrialization, with countries that experienced fast MVA growth being among the less unequal in their group.

Finally, in Column 10, we introduce an index of religion fractionalization (REL) to account for social stability.[9] A large strand of literature argues that less fractionalization and more social networks may promote civic engagement and contribute to industrialization (Putnam et al., 1993; Knack and Keefer, 1997; Narayan and Pritchett, 1999). By contrast, a more fractionalized society is expected to be less cohesive and hence less able to join forces, and moreover contributes less to the development of local industries. Indeed, our results seem to confirm the above-mentioned arguments, demonstrating that a more cohesive society is on average more likely to undertake prolonged periods of high industrialization.

4.2 Robustness checks

This section introduces some additional analyses to control for the robustness of our results.

A first robustness test is carried out on the methodology. Our dependent variable, measuring the successful periods of MVA growth for a relatively small group of countries (6 or 7 for each sub-period) could, in principle, be affected by the so-called "rare events" bias. Such a bias, commonly known as a "small sample bias", is higher the smaller the number of cases in the less frequent of the two events, and could affect the maximum likelihood estimation of a model such as a standard probit or logit. An alternative method consists of estimating the model through penalized likelihood. Penalized likelihood is a general approach to reducing a small sample bias in a maximum likelihood estimation (Firth, 1993)[10]. Table A1 in the Appendix replicates our core estimation (as reported in Table 7) using a penalized likelihood estimator. We do not find any major differences, thus reducing any potential concerns about the small size of our selected sample of successful industrializers.

[9] This index measures the probability that two randomly selected individuals from a given country will belong to a different religious group.
[10] We do this by means of the user-written STATA command firthlogit (Coveney, 2015)

Second, our selection of samples used for the analysis might be questioned. One could argue for instance that the characteristics that seem to be peculiar to the sub-group of successful industrializers may be common to other industrializers as well, this being particularly true for those countries reporting high levels of MVA growth but do not have a sustained pattern of growth (i.e. those countries reported in Table 2). To deal with this issue, we compare the successful industrializers with the sub-group of other industrializers only (i.e. those countries included in Table 2, but that are not selected among the successful industrializers). The results, reported in Table A2 in the Appendix, appear consistent with the previous ones (except for the investment variable), and seem to strengthen our findings by showing that the characteristics discussed above appear unique to the smaller group of industrializers.

Third, the choice of variable on which we based the selection of successful industrializers may be challenged as well. To some extent, periods of high growth of total MVA could be linked to more general periods of sustained economic growth, which could raise the question about an industrial take-off. One might argue that an additional condition for determining successful industrialization is a high rate of MVA on GDP (see also Table 4), an indicator that can separate the growth of manufacturing from a possible link to overall economic growth[11]. To check the robustness of our results, we follow a similar procedure to that described in Section 2, but use the rate of growth of the MVA on GDP ratio. We can thereby adjust the list reported in Table 3 by *excluding* those countries that have not been listed among the successful industrializers based on the new criteria. While no substantial differences were visible during the pre-1990 period, a more precise selection was made for the post-1990 period, since countries like China, Cambodia, India and Laos were excluded, considering the high growth experienced by these economies over the last decades. We then run our estimates on the adjusted samples. The results, reported in Table A3 in the Appendix, confirm once again the robustness of our key findings. Two striking differences emerge and—unsurprisingly—both relate to the post-1990 sample. First, the coefficient of political stability turns negative and significant. Such a negative coefficient might be explained by the decrease in the number of countries with long lasting regimes (China, Cambodia and India), whereas the sample of successful industrializers mostly includes countries that have recently experienced political transitions, such as Bangladesh, Myanmar and Viet Nam. Second, the coefficient of the exchange rate now turns positive and significant. Still, the adoption of a pegged regime or the dollarization strategy might be a proper

[11] For instance, Uganda's MVA growth rate was higher than 5 per cent over the period 2004 – 2011, while in Equatorial Guinea, it was even higher (around 15 per cent in 2007, 2008 and 2009). However, in both cases, the MVA growth rate was lower than the GDP growth rate. As a result, the growth rate of the MVA/GDP variable decreased, signalling a reduction in the importance of the manufacturing sector in these economies.

solution for small economies with less diversified exports and highly volatile terms of trade (Cornia, 2012).

5. Conclusions and policy implications

Industrialization is one of the key elements of long-term economic growth. Due to the manufacturing sector's capacity to absorb workforce, enhance diversification and structural transformation, while spurring the growth of other sectors through linkages, it remains essential for many developing countries to promote their own industrialization. What countries can do to initiate a sustained process of strong industrialization, especially laggard countries (such as SSA, see Newman et al., 2016), remains a crucial question and lies at the core of national and international policymakers' agendas.

In this study, we explored whether it is possible to identify some factors that are common to countries that have been able to initiate a strong and sustained process of industrialization over the last decades. We considered two different periods, 1970-1990 and 1991-2014, which were likely to be affected by different patterns of industrialization due to significant political, technological and organizational changes. We then developed a simple methodology to identify a small group of countries for each period, which have shown a pattern of industrialization that is not only remarkable in absolute terms, but also sustained (i.e. occurring over a long-time span). Using these selected groups of countries (mostly made up of East Asian economies), we ran a multivariate analysis with the objective of identifying the key characteristics of their exceptional industrialization pattern.

The results of our analysis have several important implications for countries with a manufacturing sector that does not yet make a noteworthy contribution to value added.

First, industrialization is driven by a combination of factors, including initial economic conditions, factor endowments, as well as country characteristics such as demographic structure and geography. Countries that are more likely to embark on a path of sustained industrialization are usually those with a lower level of income per capita, and are thus more likely to still be specialized in industries with low productivity growth, a fact that is consistent with basic theories of structural transformation. Other country-specific factors we have found to drive industrialization are demographics and geographic conditions. The former is particularly relevant since it shows that over time, countries that industrialized were those that benefited from 'demographic windows' (as was the case in East Asian countries, see Bloom and Williamson, 1998).

Factor endowments clearly play a key role, since they affect a country's comparative advantage and its pattern of development (Lin, 2011; Wood, 2017). Despite being constrained by data limitations, we show that industrialization is more likely to be successful in countries with low labour costs, and less likely in resource rich economies. This is consistent with the pattern of redistribution of manufacturing output and employment towards some developing regions recently described by Wood (2017), who attributes this pattern to the availability of the low-skilled (and hence cheaper in relative terms) labour force in most East Asian countries. The wearing apparel industry, for example, which is usually one of the major manufacturing industries for low and lower middle income countries in terms of value added and employment, is labour intensive in nature. The difficulty of substituting capital for labour in this industry makes it challenging to increase labour productivity. Consequently, the main source of competitiveness for the wearing apparel industry comes from a low wage level. This explains why the majority of countries cannot sustain the growth of the wearing apparel industry once their GDP per capita reaches an upper middle income level (Haraguchi, 2015). It also underscores the importance of structural change within manufacturing or upgrading to sustain the process of industrialization (see Figure 2). At the same time, once industrialization has started, maintaining low wages can have a negative effect on the sustainability of the industrialization process, thus affecting the domestic market's growth.

Furthermore, our work reveals that governments have a number of instruments at their disposal to promote industrialization and embark on a path of sustainable development.

Our analysis highlights that investment—both in terms of physical and human capital—is one of the most relevant factors in explaining industrialization. Investment in physical capital is particularly crucial in increasing local production capacity. Our analysis shows that this relationship holds for both publicly and privately funded capital. Public investment, in particular, could be key in providing positive externalities to the private sector and in reducing potential bottlenecks on the supply side (Storm, 2017). In fact, in the majority of countries included in our group of successful industrializers, public investment played a key role by crowding-in private investments, such as in the Republic of Korea early on or in China more recently.

Similarly, investments in the provision of a well-trained labour force are essential in ensuring that the industrialization process is sustainable, since it allows an upgrade of local capabilities and skills and facilitates the process of structural transformation. Countries that experienced rapid industrialization and grew successfully over time through more advanced specializations

within manufacturing, such as the early Asian Tigers, have invested large amounts in human capital formation to fuel rapid demand from the expanding industries.

Another area of major policy relevance is access to credit, a necessary factor to ease the growth of firms and industries by increasing their investment opportunities (Rajan and Zingales, 1998). Given that access to capital represents a major constraint to growth in many developing countries, it is of utmost importance to develop a well-designed financial system with a capillary network of financial institutions accessible to private actors both in rural and urban areas, granting easier access to finance to firms and individuals (Lin, 2011).

The above mentioned conditions would have little effect in small domestic markets or in the absence of a stable economic and institutional setting. Our study points out that high inequality may hamper the process of industrialization since it has negative consequences, among others, on the size of the domestic market. In turn, industrial upgrading and an increase in the complexity of the industrial structure tend to be accompanied by decreases in income inequality due to the coevolution of more inclusive institutions, education system and production networks (Hartmann et al., 2017). Policies still play a central role in stimulating the redistribution of income, which may boost domestic demand since low-income groups tend to have a higher propensity to consume. This is consistent with recent arguments about the significance of industrial policies, not only to adjust market failures, but also to favour higher income equality (Stiglitz, 2017).

We also show that countries that achieved sustained industrialization were largely those that have both macroeconomic—namely a lower degree of indebtedness—and high levels of political and social stability. Both dimensions contribute to the creation of a sound investment climate, which in turn needs to build on high institutional stability. These are dimensions that have strongly characterized the rise of emerging economies in East Asia over the last decades and in which substantial policy efforts are being undertaken in other low-income economies (Newman et al., 2016).

Finally, our results provide important recommendations about the role of external policies. More specifically, our analysis seems to confirm arguments about policy selectivity in trade and capital flows can largely affect industrial development in developing countries (Lall, 1993; Lin, 2011). In this respect, our work again emphasizes the role of the exchange rate as an effective industrial policy tool. Successful industrializers adopted a more competitive exchange rate regime allowing the domestic sector to become more competitive internationally. At the same time, a competitive exchange rate might be more protective for the nascent domestic

manufacturing sector than tariffs. This seems especially true for larger countries, such as China and India, who have broadened their industrial sector by keeping the exchange rate competitive (Rodrik, 2006). Still, it has to be noted also that in smaller economies with less diversified exports and highly volatile terms of trade, a pegged regime or the dollarization strategy might be a better strategy to reduce transaction costs, assure price stability and increase policy credibility (Frankel, 1999).

Our study also depicts the crucial responsibility governments assume to develop policies that are effective under different circumstances and in different periods. The openness of the capital account, for instance, deserves special attention considering the different types of capital (e.g. short vs. long-term), the direction of capital flows and their potential consequences in terms of economic stability. The most recent group of rapid industrializers, such as China and India, have followed more conservative strategies or a gradual process of capital account liberalization to reduce the volatility of their exchange rates while leaving margins to pursue economic adjustments.

Finally, policies tend to interact with one another. Consequently, the effect of single measures should be considered in combination with other policy instruments since the effectiveness of the policy mix seems to depend on the policy's overall coherence and coordination. This, for example, means that the adoption of a competitive exchange rate regime may require interventions in the currency market and the introduction of capital controls as well as countercyclical fiscal and monetary policies.

To sum up, our work shows that both factor endowments and policies may play a key role in the process of industrialization and, consequently, for the economic development of nations. The factors characterizing the selected group of countries analysed in our study show that there are some common features that appear relevant to the process of industrialization of different countries across different periods. Some of the factors discussed above may provide useful recommendations to promote sustained industrialization in developing countries. Yet, the cases analysed here remain largely confined to the experiences of a selected group of countries based mostly in East Asia. There is no unique model of industrial policy or of public intervention to promote industrialization, not even within the group of East Asian countries, with cases such as the Republic of Korea earlier on or China and Viet Nam more recently indicating remarkable differences. No one-size-fits-all solution exists and specific policies will therefore have to be implemented to reflect the different sizes, economic specializations, levels of development and countries' institutions.

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Appendix

Table A1. Results – Determinants of industrialization periods, controlling for the rare event bias

	(1)	(2)	(3)
VARIABLES	Whole period	Pre_1990	Post_1990
lgdp_pc	-0.808***	-0.234	-2.948***
	[0.119]	[0.163]	[0.366]
gfcf_gdp	2.058***	-0.141	10.802***
	[0.504]	[0.855]	[1.438]
credit	0.020***	0.018**	0.043***
	[0.003]	[0.007]	[0.007]
reer	0.000	0.000	-0.007
	[0.000]	[0.000]	[0.008]
kaopen	-0.122*	0.371***	-1.764***
	[0.073]	[0.083]	[0.337]
bl_asy15mf_int	0.152***	0.182**	0.190**
	[0.049]	[0.079]	[0.080]
bmr_demdur	0.003**	-0.006*	0.015***
	[0.002]	[0.003]	[0.004]
wdi_mineralrent	-0.083*	-0.507**	-0.019
	[0.044]	[0.197]	[0.036]
landlocked	-1.089***	-3.400**	-1.417***
	[0.262]	[1.436]	[0.360]
Constant	1.973**	-1.150	10.336***
	[0.918]	[1.194]	[2.198]
Observations	2,736	1,258	1,486

Robust standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1

Table A2. Results – Determinants of industrialization periods: successful industrializers with the sub-group of other industrializers

	(1)	(2)	(3)
VARIABLES	Whole period_1_2	pre_1_2	post_1_2
lgdp_pc	-0.219***	0.583***	-14.285***
	[0.070]	[0.123]	[3.331]
gfcf_gdp	-0.473*	-1.443***	0.613
	[0.266]	[0.365]	[2.461]
credit	0.013***	0.014**	0.204***
	[0.003]	[0.006]	[0.044]
reer	-0.009***	-0.012***	-0.039***
	[0.001]	[0.003]	[0.011]
kaopen	-0.047	0.760***	-1.020***
	[0.053]	[0.106]	[0.283]
bl_asy15mf_int	0.010	0.153***	1.997***
	[0.031]	[0.051]	[0.532]
bmr_demdur	-0.000	0.001	0.085***
	[0.001]	[0.003]	[0.023]
wdi_mineralrent	0.119***	-0.843***	0.496***
	[0.043]	[0.264]	[0.098]
landlocked	-0.589***		0.485
	[0.147]		[0.534]
Constant	1.622***	-3.301***	72.896***
	[0.583]	[1.070]	[16.515]
Observations	828	365	319

Robust standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1

Table A3. Results – Determinants of industrialization periods (MVA/GDP)

VARIABLES	(1) Whole period	(2) Pre_1990	(3) Post_1990
LGDP_PC	-0.437***	-0.177**	-8.323***
	[0.072]	[0.088]	[1.453]
GFCF_GDP	-0.213	-0.343	14.199***
	[0.265]	[0.312]	[4.311]
CREDIT	0.011***	0.009**	0.097***
	[0.002]	[0.004]	[0.018]
REER	-0.005***	-0.005***	0.010*
	[0.001]	[0.001]	[0.006]
KAOPEN	0.080**	0.236***	-1.397***
	[0.038]	[0.045]	[0.357]
HC	0.070**	0.081*	0.766***
	[0.029]	[0.046]	[0.143]
POL	-0.005***	-0.002	-0.067***
	[0.002]	[0.002]	[0.015]
NAT_RES	-0.424***	-0.325***	-0.300
	[0.068]	[0.061]	[0.494]
Constant	2.426***	0.472	37.307***
	[0.570]	[0.627]	[6.671]
Observations	2,115	996	1,119

Robust standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1

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