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Linda Glawe & Helmut Wagner
(University of Hagen)

Center for East Asia Macro-economic Studies [CEAMeS]
University of Hagen

Universitätsstr. 11, 58084 Hagen, Germany

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China in the Middle-Income Trap?

Linda Glawe[a] and Helmut Wagner[b]

Abstract. Over the last decade, a growing body of literature dealing with the phenomenon of the "middle-income trap" (MIT) has emerged. The term MIT usually refers to countries that have experienced rapid growth and thus reached the status of a middle-income country (MIC) in a very short period of time, but have not been able to further catch up with the group of high-income economies. In particular, since the beginning growth slowdown of the Chinese economy in 2011, there has been rising concern that China is, or will also be, confronted with such a trap. This paper analyzes the Chinese MIT situation taking into account both the (absolute and relative) empirical MIT definitions and MIT triggering factors identified in the literature. We not only survey the recent literature, but also make our own MIT forecasts and analyze under which conditions China could be caught in an MIT.

Keywords: middle-income trap, China, economic growth, economic development

JEL Classification: O10, O40, O47, O53

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[a, b] University of Hagen, Faculty of Economics, Chair of Macroeconomics, 58084 Hagen, Germany, phone +4923319872640, fax +492331987391, e-mail linda.glawe@fernuni-hagen.de and helmut.wagner@fernuni-hagen.de

1 Introduction

Since the beginning of reforms under Deng Xiaoping in 1978, China has undergone remarkable development: For about three decades, the economic performance has been outstanding with even double-digit growth rates. Today, China not only accounts for the world's largest share in world GDP (18.26% versus 15.29% for the United States (US) in 2017; see World Economic Outlook, WEO, 10-2017) but is also the world's leading exporter (having surpassed the US in 2007 and Germany in 2009) and the world's second largest importer (World Trade Organization, WTO, 2015).

However, in 2011, China's growth rate started to decline and amounted to "only" 6.9% in 2017 according to official figures; many observers have assessed growth in China as being even lower (although still quite high compared to other emerging market economies (EMEs) at the same development stage). There is a considerable body of literature has emerged dealing with the concerns that the China's growth strategy is unsustainable, arguing that the Chinese economy needs rebalancing[1] (meaning, among other things, a shift from an investment- and export-led to a more consumption- and inward-driven growth path). Hence, China could soon be confronted with a further severe growth slowdown or could even enter a middle-income trap (MIT).[2] The latter term has already emerged in the political debate in China. For example, in his speech at the World Economic Forum in Davos 2015, the Chinese premier Li Keqiang mentioned the various reforms China has to undertake in order to "successfully overcome the 'middle-income trap'."[3]

Our paper deals with the question of whether China is in the MIT or will enter the MIT in the future. We discuss the relevant (basic and applied) MIT literature and (i) apply various empirical MIT definitions to China and (ii) analyze the development of various MIT triggering factors for the Chinese economy to discuss the answers to this question.

The previous literature on the MIT and China can be divided into two branches. There is *(A) basic research on the MIT* (i.e., cross-country studies[4] and case studies[5] that try to construct MIT definitions and/or find MIT triggering factors in general), often applying its results to China. Furthermore, there are *(B) applied studies* particularly exploring the development indices (and "MIT triggering factors") in China and attempting to derive policy implications to avoid the MIT.[6] While the papers of *branch (A)* discuss their implications for China rather informally and parenthetically, we focus our attention on China and apply, among others, the consensus results of branch (A) for predicting whether China is in the MIT or whether it will fall into the MIT.

Branch (B) has not achieved consensus regarding the answers to the questions of whether China is in the MIT and/or whether it will get caught in an MIT. In contrast to branch (B), we do not base our discussion only on triggering factors, but also consider the MIT defi-

[1] For literature on rebalancing in China, see, for example, Blanchard and Giavazzi (2005), Aziz (2006), Prasad (2009), Kawai and Lee (2015), and Wagner (2015, 2017).

[2] According to some studies, China is already in the MIT (e.g., World Bank, 2013).

[3] The whole speech is available online at: https://www.weforum.org/agenda/2015/01/chinese-premier-li-keqiangs-speech-at-davos-2015/.

[4] For example, Aiyar et al. (2013), Eichengreen, Park, and Shin (2014), and Felipe, Abdon, and Kumar (2012).

[5] Examples include Cherif and Hasanov (2015), Flaaen, Ghani, and Mishra (2013), Hill, Yean, and Zin (2012), Jankowska, Nagengast, and Perea (2012), Jimenez, Nguyen, and Patrinos (2012), and Jitsuchon (2012).

[6] For example, Cai (2012), Huang (2016), Islam (2014), Wagner (2015), Yiping, Qin, and Xun (2014), and Zhuang, Vandenberg, and Huang (2012).

nition approaches, to analyze whether China is or will fall into the MIT. In this way, we add further arguments to the discussion in the literature on branch (B). Furthermore, we have a different focus regarding the choice of the main triggering factors in comparison to the branch (B) consensus, since we base our analysis more strongly on the MIT basic research results (branch (A)).

Despite the increasing number of articles dealing with the MIT, there is still no clear and generally accepted definition, and some researchers are rather skeptical about whether the MIT exists in the sense that middle-income countries more frequently experience a growth slowdown than countries in other income ranges. Obviously, this question is important, since we do not need to worry about China entering an MIT if the MIT does not exist. Therefore, in Section 2, we first take a closer look at the discussion in the literature regarding the existence of an MIT, before we further analyze whether China is or will be confronted with it in Sections 3 and 4. In Section 3, we first analyze the definitions according to which China is or will be in the MIT (or not). In Section 4, we then focus on the MIT triggering factors. There we provide an overview of the triggering factors identified in the literature and study the empirical evidence on the development of the most important triggering factors in China for assessing whether China will enter the MIT. Finally, Section 5 briefly summarizes our main findings and derives some policy implications.

2 Is there an MIT?

In recent years, the phenomenon of the MIT has not only gained increasing attention in the scientific literature but also entered political discussions, particularly with respect to the growth performance of EMEs in Latin America and East Asia. The term MIT, which was introduced by Gill and Kharas in 2007, usually refers to countries that have experienced rapid growth and thus reached the status of a middle-income country (MIC) in a very short period of time, but have not been able to further catch up with the developed high-income economies. Some typical examples of MIT countries are Malaysia and Thailand in East Asia and Brazil and Colombia in Latin America (see Agénor, 2017; Glawe and Wagner, 2016).

There are critical voices that question the existence of the MIT. For example, Barro (2016, p. 8) claims that "the transition (from middle-income to upper-income status) is challenging, but there is no evidence that this second transition (…) is more difficult from the first (from low- to middle-income status). In this sense, a middle-income trap is not different from a lower-income trap." The empirical studies by Im and Rosenblatt (2015) and Bulman, Eden, and Nguyen (2014) support this view.

However, the majority of articles agree that there is an MIT and that this phenomenon affects a significant part of the world. While a large part of this literature (e.g., Eichengreen, Park, and Shin, 2012, 2014; Jankowska, Nagengast, and Perea, 2012; Cai, 2012; Aiyar et al., 2013; Flaaen, Ghani, and Mishra, 2013; Han and Wei, 2015; Arias and Wen, 2016) is empirical, there are some mathematical MIT models as well (e.g., Agénor and Canuto, 2015; Dabús, Tohmé, and Carabello, 2016) that have been published recently.

Moreover, the question of whether income traps occur more frequently at the middle-income range (MIR) or not seems to be more or less irrelevant for the topic of our paper. According to most definitions, China *is* somewhere in the MIR, and *is*, thus, currently confronted with the middle-income transition to a developed country status, which seems to be a very challenging transition in general: Many countries, e.g., several Latin American countries, have failed to leave the MIR and catch up with the high-income countries (HICs) in the past. Therefore, in our understanding, the danger of an MIT (or, more generally, of a prolonged growth slowdown) in China is real and should be analyzed. Finally, even the critical MIT articles concede that a country actually *can* become trapped in the MIR. Overall, a closer (country-specific) analysis of the MIT in China seems fully justified.

That is not to say that the MIT concept is perfect. Indeed, there are several problems with it (see also Yao, 2015; Glawe and Wagner, 2016; Agénor, 2017). As will become apparent in our discussion on the MIT in China, the key problem (when applying the MIT concept for predicting a country's development) is the absence of a clear and widely accepted definition of the MIT. In general, the definitions can be "theoretical/descriptive definitions" or "empirical/quantitative definitions," and the latter can be subdivided into absolute and relative approaches (see Glawe and Wagner, 2016 for an overview of the different approaches and detailed information). In particular, the arbitrary nature of the MIR threshold choices is a serious problem and has strong implications for the economies identified as MIT countries or candidates, a problem also very relevant for China case, as we will see. (The ambiguity of the MIT definition is partly due to the fact that there is little theoretical foundation for the MIT and, to the best of our knowledge, there are only three mathematical MIT models (Agénor and Canuto, 2015; Glawe and Wagner, 2017a; Dabús, Tohmé, and Carabello, 2016).) These problems must be incorporated in a discussion about the Chinese MIT. As we will see, they lead to some ambiguous results. Overall, the MIT concept, although afflicted by several conceptual problems, seems highly useful for analyzing the successful transformation of EMEs and their process of catching up with the HICs.

3 Empirical MIT definitions

In this section, we apply the majority of the empirical MIT definitions to China. By doing so, we aim to answer several questions: First, according to which definitions is China already in the MIT (or, alternatively, has succeeded in surpassing the MIR)? Second, according to which definitions will China face an MIT in the (near) future (or, alternatively, will be able to further catch up with HICs without a severe growth slowdown)? We not only report the results of the different articles (in some papers the results for specific countries are not presented completely but only on a more aggregated level), but also extend the data and use projections to make MIT forecasts (for China). Our discussion has some implications for the extent to which the empirical MIT definitions are an appropriate tool for making statements about the probability of a country (and China in particular) entering the MIT and identifying the most striking weaknesses of the empirical MIT definition approaches.

3.1. Empirical MIT definitions applied to China

The empirical MIT definitions can be subdivided into absolute and relative approaches (see, for example, Im and Rosenblatt, 2015; Glawe and Wagner, 2016). As the names suggest, the former are based on absolute middle-income thresholds whereas the latter usually refer to the per capita income relative to a developed country (frequently the US).

We start with the *absolute* MIT definitions, in particular with Felipe, Abdon, and Kumar (2012) and Eichengreen, Park, and Shin (2014). Felipe, Abdon, and Kumar (2012) analyze a sample of 124 countries from the Maddison (2010) database, which they extend with the growth rates obtained from the WEO (04-2011). They derive the following empirical MIT definition: A country is in the MIT if it stays for more than 28 years in the lower-middle-income range (LMIR) or for more than 14 years in the upper-middle-income range (UMIR), where LMIR stands for the income range between $2,000 and $7,250 and UMIR stands for the income range between $7,250 and $11,750. Furthermore, they: (a) show that China has succeeded in moving from the LMIR to the UMIR within 17 years, which is definitely shorter than the 28-year period the authors calculate as a critical MIT threshold for passing the LMIR; (b) calculate that, until 2010, China had already been in the UMIR for two years; and (c) guess that it is very likely that China will overcome the UMIR within a total of 14 years (until 2023).

We carry out a similar calculation: We extend the Maddison (2010) data on China by using the WEO (04-2011) data and the WEO (04-2011) growth forecast (for the years 2011 to 2016). Furthermore, we apply Felipe, Abdon, and Kumar's (2012) LMIR and UMIR definitions. Our calculations show that China had left the UMIR by 2015. We also check this result by replacing the WEO (04-2011) data and forecast with the most recent IMF data (WEO 10-2017). Our calculations show that China had already left the UMIR in 2016, meaning that it only needed about half the time the authors calculate as the critical threshold for passing the UMIR. Thus, our results imply that, according to the definition of Felipe, Abdon, and Kumar (2012) with extended data until 2016, China had successfully overcome the LMIT and UMIT by 2016 and thus has avoided the MIT.[7] Of course, it is possible that China may fall back if there are adverse events, such as in the case of the Czech Republic and Lebanon, for example (see Bulman, Eden, and Nguyen, 2014, p. 6).

Next, we check and extend the definition of Eichengreen, Park, and Shin (2014). As the authors use the seven-year growth rate average, we need, for example, data until 2022 if we want to determine whether China had experienced a growth slowdown until 2015. According to the authors, a country experiences a growth slowdown if the following three *conditions* are fulfilled: (1) the seven-year average GDP per capita (p.c.) growth rate was at least 3.5% prior to the slowdown; (2) the difference between the seven-year average growth rate before and after the growth slowdown is greater than two percentage points; (3) the GDP p.c. in the year of the growth slowdown in the specific country is greater than $10,000. Eichengreen, Park, and Shin (2014) use the Penn World Table (PWT) Version 7.1 (in their earlier 2012 paper, they use the older Version 6.3). As the PWT 7.1 only covers the period until 2010, we only have seven-year averages until 2003. In the following, we therefore extend this time se-

[7] It has to be mentioned that in a subsequent paper, Felipe, Kumar, and Galope (2017) derive different results for the estimated median number of years for a country to graduate from the LMIR to the UMIR (55 instead of 28 years) and from the UMIR to the high-income range (HIR) (15 instead of 14 years). They also use the Maddison (2010) database but extend the data until 2013 with the GDP per capita growth rates from the Total Economy Database (TED) of the Conference Board (2014) and the IMF WEO 10-2013. China has to be out of the UMIR in 2024 – one year later than in the 2012 paper – to not experience a "slow middle-income transition" as Felipe, Kumar, and Galope call it in their 2017 paper. In 2013, China's GDP p.c. amounted to (Geary-Khamis) $10,018. According to Felipe, Kumar, and Galope's (2017) definition, China would face a "slow transition" from the UMIR to the HIR if it grew less than (ca.) 1.46% p.a., which is very unlikely (even according to the most pessimistic forecasts, e.g., by Barro, 2016). In all of our scenarios, China would traverse the UMIR within 7 to 9 years. Moreover, in most cases, China passed the upper UMIR threshold in 2015.

ries with the growth rate from the WEO (10-2017) until 2016, and discuss different forecast scenarios for the periods after 2016 to assess whether China is already in the MIT.

As a first step, we extend the *PWT time series* with the IMF forecast, which gives us projections until 2022. Thus, we can check the period until 2015 for a growth slowdown in China. If we use the PWT 6.3 and extend the data in the way described above, China satisfies *conditions (1)–(3)* for the period 2009–2015, and had, thus, experienced a growth slowdown in this period according to Eichengreen, Park, and Shin's (2014) definition. However, if we use PWT 7.1 instead of PWT 6.3, China had not experienced a growth slowdown between 2009 and 2014, because condition no. 3 (GDP p.c. > $10,000) was not satisfied. Note, however, that China fails to fulfill condition no. 3 only by a small amount (for example by $448 in 2014). In 2015, however, condition no. 3 is fulfilled (the GDP p.c. is $160 above the critical threshold) and China is therefore classified as an MIT country. It seems that the Chinese growth slowdown is a borderline case according to Eichengreen, Park, and Shin's (2014) definition. Moreover, we replace the IMF forecasts with growth projections from other studies (Conference Board, 2010, pessimistic scenario; World Bank, 2013; Bailliu et al., 2016; Albert, Jude, and Rebillard, 2015; Zhang, Xu, and Liu, 2015) to test for the cases in which China is or will be in an MIT. Except for Albert, Jude, and Rebillard's (2015) projection, China has not experienced a growth slowdown when using these projections. However, in most cases, again, only condition no. 3 is decisive for these results and the difference between the actual GDP p.c. and the $10,000 threshold is again very small ($448 in 2014).

We repeat the whole analysis with IMF data (*WEO (10-2017)*), instead of the PWT. Since the PWT data, which we used in our previous calculations, are expressed in 2005 PPP constant international dollars, we convert the WEO (*10-2017*) data into 2005 PPP constant international dollars to ensure the comparability of the following calculations with our results above. Our new results imply that China experienced growth slowdowns between 2013 and 2015. No matter which growth forecasts we use (Conference Board, 2010, pessimistic scenario; World Bank, 2013; Bailliu et al., 2016; Albert, Jude, and Rebillard, 2015; Zhang, Xu, and Liu, 2015), China is in the MIT because, now, condition no. 3 is fulfilled. In summary, Eichengreen, Park, and Shin's (2014) definition does not provide us with significant results regarding China, mainly because the lower MIR bound associated with this definition is relatively close to China's present-day p.c. GDP.[8]

We now turn to the *relative* approaches. Here, we face two major problems. First, we need much longer growth projections than we need for applying most of the absolute definition approaches. In the majority of studies that develop a relative approach, a period of approximately 50 years is required for determining whether a country is trapped in the MIR. Second, we also need projections for the reference country, in most cases the US. Therefore, it is much harder to give MIT forecasts for this kind of definition. In our paper, we apply the definitions from the World Bank (2013), Woo et al. (2012), and Bulman, Eden, and Nguyen (2014).

[8] We also extend the PWT 6.3, PWT 7.1, and WEO 10-2017 time series with the five-year plan growth rate for 2016–2020. Again, when using PWT 6.3 and WEO 10-2017 all three conditions for a slowdown are fulfilled (for the period 2009–13 and 2013, respectively), whereas when using PWT 7.1, condition no. 3 is not satisfied.

Studying the data from Maddison (2010), the World Bank (2013) defines the MIR as ca. 4.5%–45% of the US per capita income and classifies countries that were within this range between 1960 and 2008 as MIT countries. According to this definition, China is in the MIT. To reassess this result on the basis of more recent data, we update the Maddison data by four different GDP forecasts: OECD (2012), WEO (10-2017), World Bank (2013), and Albert, Jude, and Rebillard (2015). According to the OECD (2012) projection, the Chinese GDP p.c. will grow around 6.4% per annum (p.a.) and that of the US around 1.5% p.a. between 2011 and 2030. In this scenario, China will leave the MIR in 2022. If we use the forecast of the WEO (10-2017), China will leave the MIR by 2021. Our calculations on the basis of the World Bank (2013) growth rate projections imply that China will leave the MIR between 2020 and 2023 depending on the US performance (we assume US growth rates of between 1% and 3% p.a.). If we base our calculations on more pessimistic growth forecasts (e.g. Albert, Jude, and Rebillard, 2015), China will stay in the MIR until 2022 (if the US grows at an average rate of 1.5% p.a.) or until 2030 (if the US grows on average at 3.1% p.a.). Overall, according to the World Bank's (2013) MIT definition, China definitely *is* in the MIT and, according to our extensions, *it will stay* in the MIR/MIT for at least three more years.

Woo et al. (2012), using the Maddison (2010) database, have constructed a Catch-Up Index (CUI), which reflects each country's income in relation to US income. According to Woo et al.'s (2012) MIT definition, a country is in the MIT if its CUI is in the 20%–55% range for more than 50 years. In our calculations, this definition and data imply that China entered the MIR in 2008, which is relatively late in comparison to the results of the World Bank's (2013) MIT definition discussed above (where China was already in the MIR in 1960). Again, to assess how long China will be in the MIR and whether it is or will be in an MIT we must extend the Maddison data set with other data sets and growth projections. As above, we use the WEO (10-2017) data (for the period 2009–2016) and projections (for the period 2017–2022). Our calculations on the basis of these data imply that, in 2022, China will have been in the MIR for 15 years and will be more than 7 percentage points away from the upper MIR threshold (CUI 55%). By carrying out similar calculations on the basis of OECD (2012) growth projections, we obtain the result that China left the MIR in 2026, i.e. stayed in the MIR for a total of 18 years, which is below the 50-year threshold, and thus implies that China avoids the MIT. Finally, we can also calculate some critical values for US and Chinese growth rates for which China escapes the MIT. Here are some examples: (1) If the US grows at an average of 2% p.a. over the period 2017–2058, China must grow at a rate of at least 2.99% p.a. over the same period to leave the MIR within the 50-year threshold; (2) if the US grows at 2.5% p.a. (3% p.a.) over the period 2017–2058, China must grow at an average rate of at least 3.50% (4.00%) over the same period to avoid the MIT. If we now look back at the different growth rate scenarios in the literature, we can see that most of the (very few) projected long-run growth rates of the needed length for China are close to the Chinese growth rates that are required in our examples to avoid the MIT. However, if the US grows at an average rate of only 1.5% per annum, our discussion implies that it seems "unlikely" that China will face an MIT according to Woo et al.'s definition.

Bulman, Eden, and Nguyen (2014) use PWT 7.0 data in their study. According to their definition, the MIR is 10%–50% of the US p.c. income. By using this definition and PWT 7.1 data on China, we calculate that China entered the MIR in 2005. Furthermore, by using PWT 7.1 data (for the period 2005–2010) and the OECD (2012) forecast (for the post-2010 period), we find that China will leave the MIR by 2043, i.e., will stay in the MIR for a total of 38 years. Evidently, this retention period (38 years) is significantly longer than the retention period (18 years) implied by Woo et al.'s (2012) definition, which we calculated above. As before, we calculate some critical thresholds according to which China would just escape an MIT: If the US grew at an average rate of 2% p.a., China would need a growth rate of at least 3.99% p.a. to pass the MIR within the 50-year threshold (by 2055); if the US grew at 2.5% p.a. (3% p.a.), China would need an average growth rate of at least 4.50% (5.01%). These minimum growth rates, which are required to overcome the MIT, are higher than those calculated in our application of Woo et al.'s (2012) definition; they are also higher than several growth forecasts for the Chinese economy. Thus, Bulman, Eden, and Nguyen's (2014) definition implies a higher probability of an MIT in China than Woo et al.'s (2012) definition does.

Table 1 summarizes the main findings of our different scenarios. Note that, as discussed above, the scenarios that are based on Woo et al.'s (2012) and Bulman, Eden, and Nguyen's (2014) definitions are based on growth forecasts for very long (future) periods of time. Obviously, these scenarios inherit all the uncertainty of the growth projections on which they are based.

Table 1. China in the MIR – results based on the relative approaches.

MIR definition based on:	Date of entrance into the MIR (t_{MIR})	50-year threshold reached (t_{MIR}+50)	Years in the MIR until 2016	Date of exit from the MIR (years spent in the MIR) based on OECD (2012) growth projections	Critical threshold (average annual GDP p.c. growth rate) (beginning in 2016) to overcome the MIT for different average growth rates of the US		
					1.5%	2.5%	3%
Woo et al. (2012)	2008	2058	9	2025 (18)	2.49%	3.50%	4.00%
World Bank (2013)	before 1960*	before 2010*	57*	2021 (62)*	-	-	-
Bulman, Eden, and Nguyen (2014)	2005	2055	12	2042 (38)	3.48%	4.50%	5.01%

* The World Bank (2013) study restricts its analysis to the Maddison (2010) data for the period 1960–2008, according to which China has been in the MIR since 1960. The longer-run Maddison (2010) data indicate that China was in the MIR even before 1950.

We now return to our initial question: According to which MIT definitions is or will China be in the MIT?

Our calculations reveal that most definitions imply ambiguous results, because they strongly depend on the database and growth projections that are used. Only the World Bank (2013) study provides us with a clear result by stating that China is already in the MIT and will stay in it for several years. In contrast, our results based on Felipe, Abdon, and Kumar's (2012), Felipe, Kumar, and Galope's (2017) and Woo et al.'s (2012) definitions imply that it is relatively unlikely that China will face an MIT; the former analysis also provides strong evidence that China has already succeeded in overcoming the MIR without experiencing an MIT (or slower middle-income transition).[9] Our results are less clear for Eichengreen, Park, and Shin's (2012, 2014) and Bulman, Eden, and Nguyen's (2014) definitions. In particular, Eichengreen, Park, and Shin's definition presents a borderline case – depending on whether China's GDP per capita is a bit (around $448) bigger or not, China has already experienced a growth slowdown or not. It is obvious that the empirical definitions are not able to give us a clear answer to our question; in fact, all four cases (China is in the MIT, China has successfully avoided the MIT, China will face an MIT, China will not face an MIT) are supported by the evidence/literature. Thus, it is relatively easy to produce (or manipulate) a "desired outcome." (In Section 3.2, we will further discuss the main weaknesses of the empirical definitions that lead to the ambiguous results.) Nevertheless, certain consistencies stand out: First, the majority of our scenarios imply that China is not yet in an MIT; the only exceptions are the scenarios based on the World Bank (2013) study and some of our Eichengreen, Park, and Shin (2012, 2014) scenarios (which are actually borderline cases). Second, in most of our scenarios, China is or soon will be in the MIR but not caught in an MIT. Indeed, China will only enter an MIT if the growth rate drops to the levels predicted by the most pessimistic scenarios in the literature, that is, 3–4%. Overall, our analysis yields slightly optimistic results regarding China.

3.2 Weaknesses of the empirical definitions

As already pointed out in Section 3.1, the empirical definitions have various weaknesses. In this section, we focus on the (rather conceptual) problems of the empirical MIT definitions that arise due to: (I) the existence of different definitions of the MIR, (II) GDP data discrepancy across and within different (versions of) databases, and (III) some further aspects. In particular, we demonstrate how these problems generate the ambiguity of the results mentioned at the end of Section 3.1.

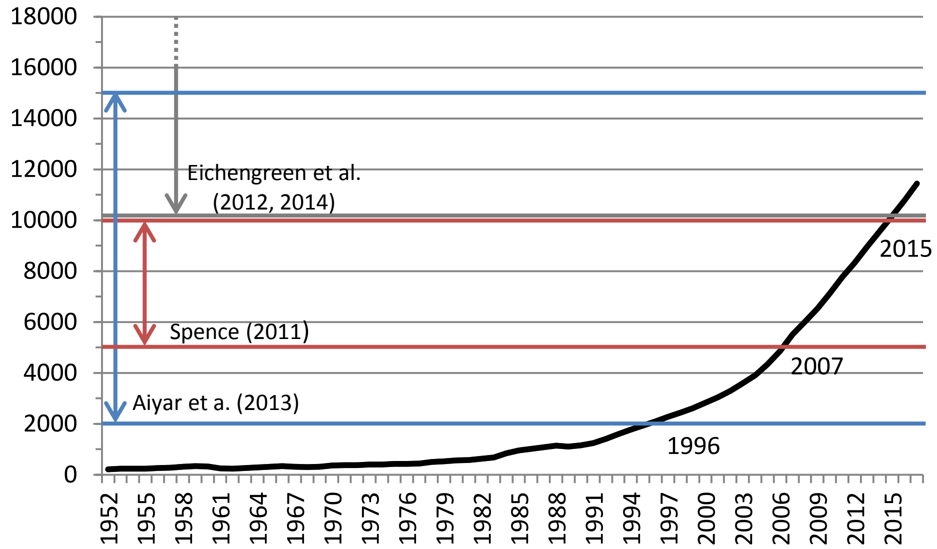
Different definitions of MIR (point I)

The main point of criticism relates to the *definition of the MIR* (point I). The middle-income thresholds *differ significantly across studies*. These differences, among others, generate the aforementioned (cf. end of Section 3.1) ambiguity of the results of the definition approaches regarding the question of whether China is in the MIT or not. To elucidate this fact, we discuss several examples in the following, where we distinguish between absolute and relative MIT (MIR) definition approaches.

[9] A further study, which is often cited in the MIT literature and which we have not discussed above, is the study by Spence (2011). Spence (2011) does not give an exact MIT definition but an MIR, which is $5,000–$10,000. Note that China has already overcome the $5,000–$10,000 range (or will soon do so) according to the majority of databases and growth forecasts (see also Section 3.2).

The following examples highlight the differences across the *absolute* MIR/MIT definition approaches: (a) Eichengreen, Park, and Shin (2012, 2014) only consider countries with a GDP per capita higher than $10,000 (GDP p.c. in constant 2005 int. prices); (b) Aiyar et al. (2013) define the MIR as the range between $2,000 and $15,000 (also in 2005 constant int. prices); (c) according to Spence (2011), who does not explicitly mention the MIT but refers to middle-income transitions instead, the MIR is $5,000 to $10,000. These threshold differences across studies have a significant impact on the dates of entrance into the MIR that are implied by the studies in the case of China. This fact is elucidated by Figure 1, where we depict the absolute thresholds mentioned above and the GDP development in China (solid black line). We can see that: (1) Aiyar et al.'s (2013) MIR definition implies that China has entered the MIR in 1996; (2) according to Spence's (2011) definition, China hit the MIR in 2007; (3) Eichengreen, Park, and Shin's definition implies that China has only been an MIC since 2015; (4) moreover, according to the definition by Spence (2011), China has already left the MIR; in particular, China's output exceeds the upper MIR bound ($10,000) in 2015. Note that these MIR entrance dates are sensitive to database choice (for the Chinese GDP data), a problem which we discuss later (database discrepancy).

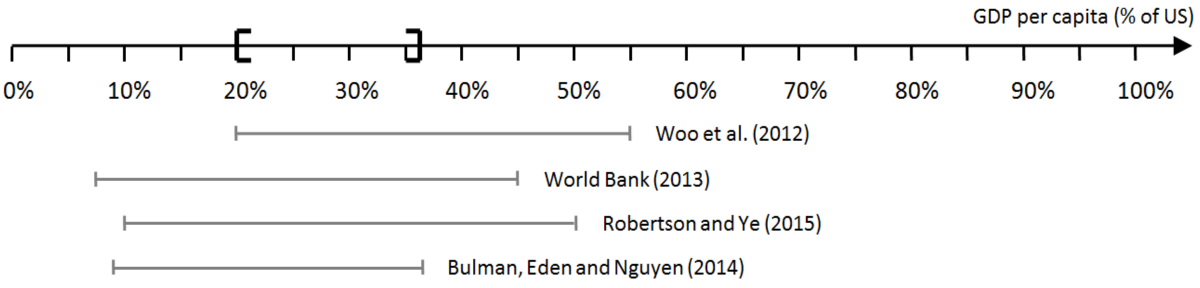
Figure 1. Absolute thresholds and Chinese GDP p.c. development.



Data Source: PWT Version 7.1, WEO (10-2017), and own calculations. Thresholds are obtained from the authors mentioned above. *Note*: To obtain the Chinese GDP p.c. series for the period 1952–2017 (solid black line in Figure 1), we extend the PWT Version 7.1 data (Chinese GDP per capita, PPP adjusted, at 2005 constant prices, 1952–2010) to 2017 by using growth rates of Chinese GDP p.c. at constant prices (national currency), which we calculate on the basis of WEO (10-2017) data.

With respect to the *relative* MIR/MIT definition approaches, two comparisons are very illustrative of the differences regarding the MIR definitions. First, Woo et al. (2012) and the World Bank (2013) – both use the Maddison database (1990 int. Geary-Khamis $) – have very different MIR thresholds, especially regarding the lower bound: According to Woo et al. (2012), the MIR is 20%–55% of the US per capita income whereas the World Bank defines the MIR as 4.5%–45% of the US per capita income. Second, there are similar differences between Robertson and Ye (2015) and Bulman, Eden, and Nguyen (2014). Both use the PWT, 2005 constant int. prices, but have very different MIR thresholds (the former has a 10%–50% and the latter an 8%–36% definition). These MIR differences are illustrated in Figure 2. We can see that only the 20%–36% range is covered by all studies. Overall, in light of the differences regarding the MIR definitions depicted in Figure 2, it is not surprising that the *relative approaches* yield very different results regarding the Chinese entrance date into the MIT (cf. Table 1).

Figure 2. Relative thresholds.



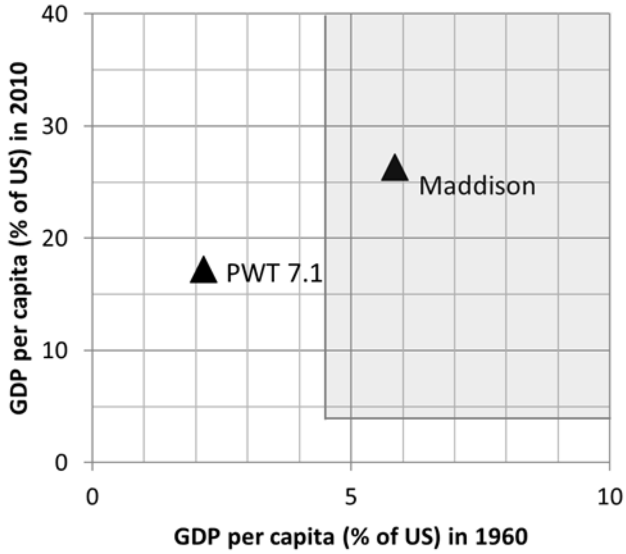
Data Source: Thresholds are obtained from the authors mentioned above. The square brackets indicate the minimum range (20%–36%) covered by all studies.

GDP data discrepancy (point II)

Different MIT studies use *different databases*. In the MIT literature, the most frequently used databases are Maddison (2010), PWT, IMF Database (WEO), and World Bank (WDI). Furthermore, there are different versions of most of these databases (e.g., Versions 6.3, 7, 7.1, and 8 of the PWT are used in the MIT literature) and there are steady updates (e.g., for the IMF WEO). The GDP data differ significantly across databases and across different versions of databases, and this can have significant impacts on the MIT results (i.e., on the question of whether a country is identified as an MIT country). We will demonstrate this fact by using two examples.

First, to get an impression of the differences *across databases* and their implications for the MIT results, we compare the PWT and the Maddison data on the basis of the World Bank's (2013) MIT definition as an example. In Figure 3, we plot the Chinese GDP per capita in % of the corresponding US level in 2010 against that in 1960, by using PWT and Maddison data. Furthermore, we depict the relative middle-income thresholds suggested by the World Bank (2013) as a shaded square. If a country is in the shaded area, it stayed within the MIR between 1960 and 2010 and is thus classified as an MIT country, according to the World Bank (2013) MIT definition. Figure 3 shows two facts. First, there is a "significant" discrepancy between the PWT and Maddison GDP data. Second, this discrepancy is relevant for the classification of China as an MIT country: If we use Maddison data, China is in the MIT; if we use PWT data, China is not in the MIT.

Figure 3. Differences within and between databases and their implications.



Data Source: Maddison (2013) and PWT 7.1.[10] Thresholds (shaded square) are obtained from the World Bank (2013). The black triangles represent China's GDP per capita (% of the US) plotted for the years 1960 and 2010.

Now, we turn to the *discrepancies across different versions of databases*. We focus on the PWT as an example. According to Version 6.3 (Version 7.1) of the PWT, the Chinese GDP per capita in constant 2005 PPP $ amounted to $980 ($581) in 1981. This corresponds to a difference of $399 between the two PWT versions. (Analogously, we calculate that the difference between the two versions amounts to $2999 for the year 2007.)[11] Eichengreen, Park, and Shin use the PWT Version 6.3 in their 2012 article but the 7.1 Version in their 2014 article. As they show, a consequence of this version change is that 20 growth slowdown episodes identified in the 2012 paper are not identified in the 2014 paper. Specifically, Latin American countries (Argentina, Chile, Uruguay) are not identified as MIT countries anymore because their GDP per capita does not exceed $10,000 (i.e., the lower MIR threshold in Eichengreen, Park, and Shin's definition) when using PWT 7.1 (in contrast to the situation when using PWT 6.3). Overall, data discrepancy across (different versions of) databases is a further source of ambiguity in the results of the definition approaches.

Further aspects (point III)

One weakness of definition approaches (in contrast to triggering factor approaches), which has become apparent in their application to China in Section 3.1, is the necessity of long-run GDP projections for assessing whether a country (and in particular China) is *today* in the MIT. As we have seen in Section 3.1, according to most MIT definitions, a country is in the MIT only if it stays in the MIR for a relatively long period of time (e.g., Eichengreen, Park, and Shin's (2014) definition requires the slowdown to persist for 7 years; most relative definition approaches require the country to stay in the MIR for ca. 50 years). Thus, in the case of some countries, and particularly in the case of China, we have to rely on long-run growth pro-

[10] Note that we use PWT 7.1, but our results do not change using either PWT 6.3 or 7.

[11] Comparing the WEO Versions 04-2011 and 10-2017 reveals similar discrepancies: The Chinese GDP per capita (PPP, current int. dollar) differences range between $59 and $2,162.

jections to assess whether a country/China is in the MIT today, as demonstrated in Section 3.1. Thus, the assessment of the current MIT situation of China inherits all the uncertainty associated with such long-run projections.

A further weakness, which particularly applies to the relative MIT definitions, comes from the fact that they require the choice of a reference country. Most relative approaches choose the US as the reference country. However, other reference countries could be used as well. For example, the studies could use the regional well-developing economies as a benchmark (e.g., the EU success countries as a benchmark for the middle-income countries in Europe, the Asian success countries for Asian developing countries, etc.). Using the average per capita GDP of the high-income OECD countries as a reference is another alternative. The existence of such alternatives, and the fact that the choice of the reference country has an impact on the results of the relative definition approaches, calls for a theoretical foundation (or at least an intuitive explanation) for the choice of the reference country and, in particular, for the choice of the US over other developed countries. In general, the MIT definition approaches do not provide such a foundation. Therefore, their results (sets of MIT countries) do not seem to be robust to the variation of ad hoc assumptions (choice of reference country), which seems to be a severe point of critique.

Last not least, due to data limitations, among other things, not all studies include the same economies. This again is problematic if the MIR or MIT is defined on the basis of this country choice. For instance, as Agénor (2017) notices, Felipe, Abdon, and Kumar (2012), for example, would obtain other MIT thresholds if they used another set of countries. Furthermore, the time periods under consideration also differ across the studies.

4 Triggering factors of the MIT

As noted in Section 1, there is applied research (branch (B)) that studies the development indices in China and tries to elaborate policy implications for ensuring long-run growth (and thus for avoiding the MIT) in China. An overview of these studies is given in Table A1 in Appendix A. Most of these studies imply that improvements in human capital, innovation, institutions, and inequality are necessary for avoiding the MIT in China.

In this section, we focus as well on such MIT triggering factors, and our approach is as follows. First, we give a systematic overview of the MIT basic research (branch (A)); in particular, we give an overview of the cross-country studies and case studies that try to derive the MIT triggering factors in general. Second, we identify the three most often identified triggering factors (human capital, export structure, and TFP) in this literature. Finally, we study the development of these three indices in China and discuss whether these factors will trigger an MIT in China.

Note that we are well aware of the general weaknesses of such meta-analyses. First, one could claim that the choice of studies is arbitrary. However, we try to mitigate that problem by conducting a research by key words in various research databases (EconLit, EBSCOhost, Google Scholar).[12] We only incorporate studies that particularly focus on the identification of triggering factors/determinants of the MIT. Moreover, we exclude studies that primari-

[12] In particular, the article or working paper has to include the term "middle-income trap" or "middle income trap" in either its title or its main text.

ly report the results of other studies. Second, with respect to the weighting of the different studies, all kinds of subjective weightings (by ranking, reputation of the authors, publication date, depending on whether the studies are published in journals or only working papers, etc.) are contentious. We therefore opt for an unweighted equal treatment (equal weighting) of all studies. Last but not least, it could be criticized that the identified triggering factors are not theoretically grounded. Therefore, we show that the choice of triggering factors in the focus of our analysis (human capital, export structure, and TFP) is consistent with the (verbal and mathematical) MIT theories known to us; furthermore, since the MIT theory is still a relatively new branch of research and thus there are only a few mathematical MIT models, we discuss the results of the general (i.e., not MIT related) growth modeling literature regarding the relationship between human capital, export structure, TFP, and growth.[13]

Overall, there are about 18 factors that are considered relevant for identifying an MIT (or a growth slowdown) by studies in branch (A). Our results are presented in Table 2. An "X" indicates that the corresponding triggering factor is identified by the respective study, whereas a blank space indicates the opposite. Furthermore, we also distinguish whether the empirical analysis is descriptive or econometric; the latter studies are marked with an asterisk (*).

[13] The mathematical models of the MIT support our focus on human capital, exports, and TFP as triggering factors. For example, Agénor and Canuto (2015) argue that an MIT "is characterized by low productivity growth" and "a relatively low share of high-ability workers" in the innovation sector. This is consistent with our focus on TFP growth and human capital as triggering factors. Furthermore, Dabús, Tohmé, and Carabello (2016) focus on exports, particularly the high external demand for them, which is consistent with our focus on exports as an MIT triggering factor.

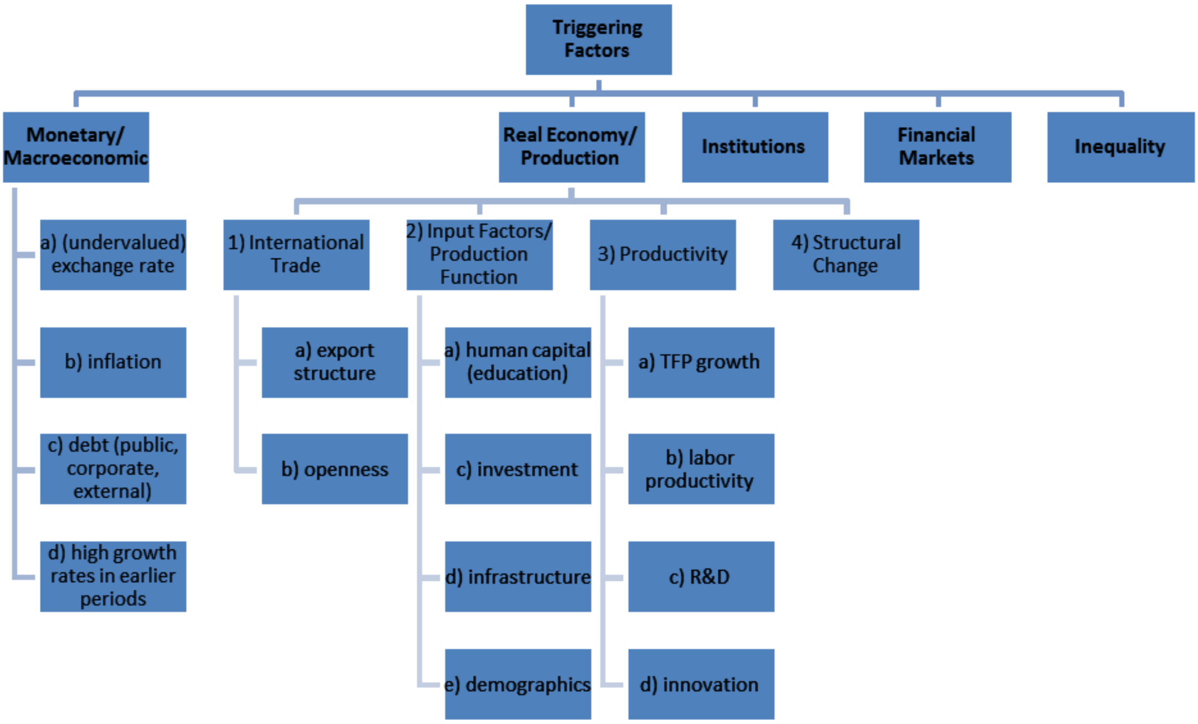
Table 2. MIT triggering factors – baseline literature.

Empirical Study	Cross-country or case study	CHN	EXR	CPI	DEB	GR	EXP	OPN	HC	INV	INF	DEM	TFP	LAP	R&D	INN	SC	INS	FNM	INQ
Aiyar et al. (2013)*	CC	X	X			(X)			(X)		(X)	X		X					X	
Andrianjaka and Rougier (2017)*	CC						X		X[iii]			X				(X)				
Arias and Wen (2016)*	CC	(X)						X[i]		X										
Bulman, Eden, and Nguyen (2014)*	CC	(X)	X	X	X			X	(X)			X	(X)				X			X
Cherif and Hasanov (2015)	CS (MAL)						X	X	X		X		X	X[ii]	X	X				
Daude (2010)*	CS (LA/C)								(X)			(X)	X			(X)		(X)	(X)	
Daude and Fernández-Arias (2010)*	CS (LA/C)												X							
Doner and Schneider (2016)	CC	X						X	X						X			X		X
Eichengreen, Park, and Shin (2012)*	CC	X	X			X				X		X	X							
Eichengreen, Park, and Shin (2014)*	CC	X	X			X	X		X	X		X	X							
Egawa (2013)*	CS (A)								X											X
Flaaen, Ghani, and Mishra (2013)*	CS (MAL)						X	X	X		X		X	X		X	X			
Felipe, Abdon, and Kumar (2012)*	CC	X					X										X			
Glawe and Wagner (2017b)*	CC																	X		
Han and Wei (2015)*	CC				X							X							X	
Hill, Yean, and Zin (2012)	CS (MAL)			X	X		X	X	X		X			X	X		X	X	X	X
Jankowska, Nagengast, Perea (2012)*	CS (A/LA)	X					X						X				X			
Jimenez, Nguyen, and Patrinos (2012)	CS (MAL/THA)								X											
Jitsuchon (2012)	CS (THA)								X	X			X		X	X		X		
Tho (2013)	CS (ASEAN)						X		X				X	X	X			X		
Yilmaz (2014)	CS (TUR)						X		X						X	X	X	X		
Total	-	-	3	2	4	2	**9**	7	**13**	5	4	6	**11**	4	6	6	6	8	3	4

Note: Econometric studies (in contrast to descriptive studies) are marked with an asterisk (*). The MIT triggering factors (columns 4–21) are abbreviated as follows: EXR = undervalued exchange rate, CPI = inflation, DEB = debt (public, corporate, external), GR = high growth rates in earlier periods, EXP = export structure, OPN = openness, HC = human capital, INV = investment, INF = infrastructure, DEM = demographics, TFP = total factor productivity, LAP = labor productivity, R&D = research and development, INN = innovation, SC = structural change, INS = institutions, FNM = financial markets/financial institutions, INQ = inequality. An "X" indicates that the corresponding triggering factor is identified by the respective study, whereas a blank space indicates the opposite. The countries of the case studies are abbreviated as follows: MAL = Malaysia, LA/C = Latin America and the Caribbean, A = Asia, THA = Thailand, TUR = Turkey, ASEAN = Association of Southeast Asian Nations. Baseline studies that refer to China are marked with an "X" in the third column (CHN = China). [i]Arias and Wen (2016) refer to gross trade volume and market orientation. [ii] manufacturing output per worker. [iii]If introducing the log distance to the technological frontier as an additional term in the interaction.

Next, we classify the triggering factors into several groups and subgroups to allow for a clearer overview/discussion on a more aggregated level. We distinguish between monetary/macroeconomic factors, real economic factors (with the four subgroups international trade, input factors, productivity, and structural change), institutions, financial markets, and inequality. Figure 4 illustrates this classification.[14]

Figure 4. Triggering factor classification.



Our analysis reveals that the triggering factors related to the real economy/production appear to be most important, particularly **human capital** (identified by 13 out of 21 studies), **export structure** (identified by 9 out of 21 studies), and **TFP** (identified by 11 out of 21 studies). Interestingly, these are exactly the main growth drivers emphasized in the (endogenous) growth theory. We will concentrate on these three aspects (human capital, export structure, and TFP) in the rest of this section.

It is important to note that there are various overlaps between the different triggering factors – not only between human capital, the export structure, and TFP but also between other factors such as innovation and structural change. In fact, one should interpret the MIT as the result of a **combination** of different factors that **interact** with each other (against the background of the country-specific characteristics). However, still, most research on MITs aimed at identifying triggering factors tends to focus on the determinants separately. Very few studies have considered the interconnections between the different factors or potential cumulative effects beyond scratching the surface (see, for example, Andrianjaka and Rougier, 2017). As already mentioned, this is probably due to the absence of a sound theory of MITs

[14] Note that "Financial Markets" is actually a subgroup of "Institutions." In our classification, we separate the "Financial Markets" from "Institutions," since most studies that we analyzed do so.

on which empirical tests could rely. In Section 4.5, we focus particularly on the interrelationships between the MIT triggering factors and discuss the importance of the institutional and political framework. Although institutional aspects are often ignored or not discussed sufficiently by the MIT literature, we think that due to the strong interaction between the institutional environment and the development of the other MIT indicators, special attention should be paid to this aspect.

4.1 Human capital

As already mentioned in the above introduction, the importance of human capital in the economic development process of a country is emphasized in the standard growth literature, especially in various endogenous growth models, where human capital is an input factor in production (as modeled by, for example, Lucas, 1988) and in the R&D sector (as in Romer 1990-type models).

The importance of human capital is also recognized in the theoretical MIT literature. For example, Aoki (2011) discusses five different phases of development – the Malthusian (M), the government-led (G), the Kuznets (K), the human capital-based (H), and the post-demographic-transition (PD) phase – and the MIT occurs between the K and H phase. According to Aoki (2011), China is currently undergoing this K/H transition, particularly the coastal provinces. In general, the MIT literature regards human capital – and, closely related to it, the educational system – as an important factor in overcoming the MIT (e.g., Jimenez, Nguyen, and Patrinos, 2012; Jitsuchon, 2012; Egawa, 2013; Eichengreen, Park, and Shin, 2014; Yilmaz, 2014).

In discussing the role of human capital for the MIT, the literature distinguishes between the quantity, the quality, and the types of skills/education as well as access to education. For example, Eichengreen, Park, and Shin (2014) argue that growth slowdowns occur less frequently in countries where a large share of the population has at least a secondary level of education. Additionally, the authors emphasize the importance of "high-quality human capital" (in contrast to "low-quality human capital") as it goes along with skilled workers who are needed to move to high value-added activities (Eichengreen, Park, and Shin, 2014) and to successfully manage the structural transformation process (see also Tho, 2013, p. 110). In the same vein, Flaaen, Ghani, and Mishra (2013), who refer especially to the Malaysian "skill crises," underline the need to expand the secondary and tertiary educational system in order to provide graduates with the skills required by employees. Jimenez, Nguyen, and Patrinos (2012) argue that it is decisive for an MIC to ensure *access to education* for a large part of the population in order to create a strong middle class and to fight against the widening inequality that often is a consequence of technological progress. Improving access to secondary education is also a key factor for avoiding the MIT, according to Egawa (2013). (As indicated above, human capital is interrelated with other factors, such as the structural change process and the upgrading of production (and exports). We will focus more extensively on these interconnections in Section 4.5.)

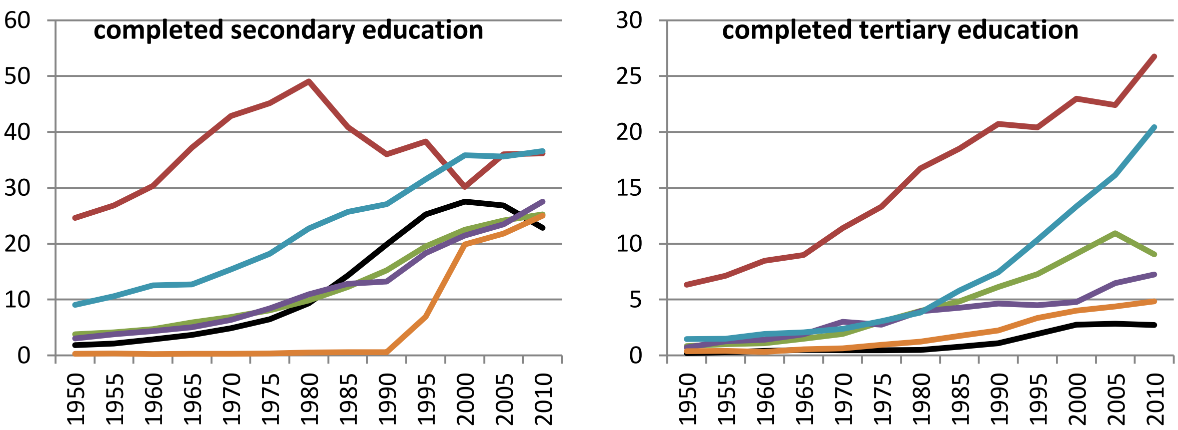
We can conclude that the majority of MIT studies focusing on human capital consider the quality of education/skills to be especially important (e.g., Jimenez, Nguyen, and Patrinos, 2012; Eichengreen, Park, and Shin, 2014; Cherif and Hasanov, 2015). However, this aspect of human capital is much more difficult to measure than the quantity that can, for example, be expressed as the average number of years of schooling or the graduation rate among the population aged 15 and over. One possibility for evaluating the educational quality performance is to take cognitive results in international test scores, for example PISA and the Trends in International Mathematics and Science Study (TIMSS), or international university rankings (see also Hanushek and Woesmann, 2008). In the following discussion on the Chinese education situation, we focus on the former.

The Chinese case

We now take a closer look at the human capital and education situation in China. With the beginning of the reforms in 1978, the Chinese education system was modernized under Deng Xiaoping in the 1970s and 1980s in order to support the general economic development strategy. Among others, the government shifted expenditure priorities towards education and achieved significant improvements with respect to *primary education*.

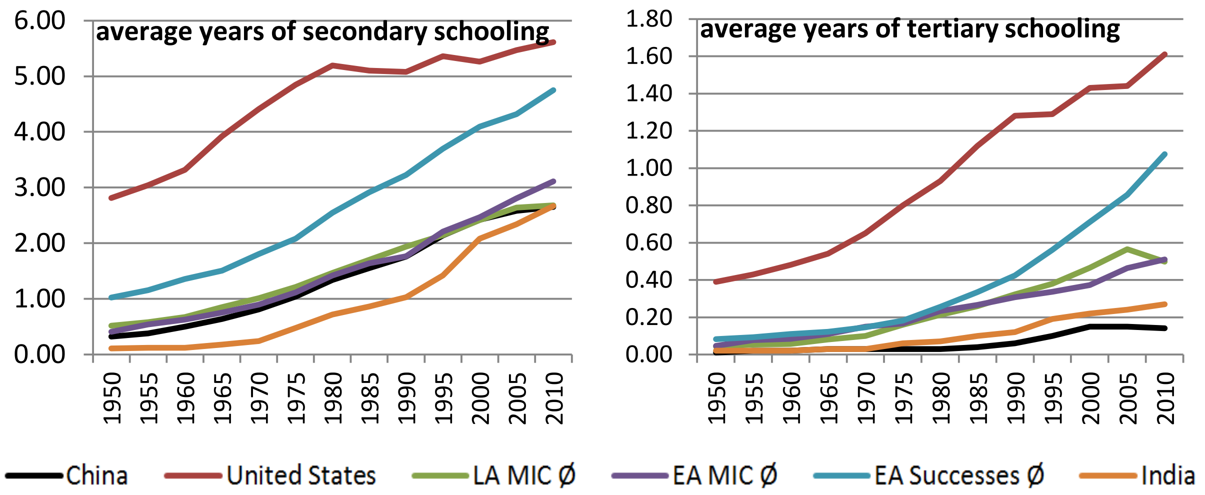
In the following, we focus on the development of *secondary and tertiary education*, a triggering factor identified in various empirical MIT studies, where we compare the Chinese development with the development of the US, the Asian success countries (the Republic of Korea; Japan; Singapore; and Hong Kong, China) and the average of some East Asian MIT countries (Malaysia, the Philippines, and Thailand) and Latin American MIT countries (Brazil, Peru, Bolivia, and Mexico) identified in various empirical studies (see Figure 5).[15] In general, this country set includes the representatives of all the relevant development stages (middle-income and high-income stages) and geographical/economic groups (Asia, South America, and the US as representative of first-tier highly developed countries) to compare them with China. In addition, we report data for India because of the similarity in size (geographically and with respect to the population) to China.[16] As the Barro-Lee (2013) data set is used by the majority of empirical studies, we base our analysis on it.

Figure 5. Secondary and tertiary education in China.



[15] See Table B1 in Glawe and Wagner (2016).

[16] According to the World Bank income classification, India is currently a LMIC. However, the country has not been long enough in the MIR to make statements on whether India is trapped or not.



Data Source: Barro and Lee (2013), own calculations. Completed secondary or tertiary education is expressed in % of the total population aged 15 and older. LA (EA) MIC Ø stands for Latin American (East Asian) middle-income countries (average) that are identified as MIT countries by various empirical studies (cf. Glawe and Wagner, 2016). EA Successes Ø stands for East Asian success countries (average).

The data in Figure 5 reveal several facts. The *average years of secondary schooling* have increased continuously since the 1950s in China. Over the period 1980–2000, the percentage of people with *completed secondary education* soared from 9.4% to 27.5%, a total increase of 193% and a yearly increase of more than 5.5%. In contrast, the corresponding development of *tertiary education* started (more moderately) in the mid-1980s. Strikingly, there seems to be a trend change around 2000: All the indicators were either stagnating or even declining since 2000 and there was even a sharp drop in the measure of completed secondary education between 2005 and 2010.

What does the cross-country comparison show? As we can see in Figure 5, in 2010, China recorded the lowest indicator levels among all the countries in our sample. In particular, with regard to tertiary education, China's indicator levels were even much lower than those of various Latin American (MIT) countries. Furthermore, it is striking that with respect to the completed-secondary-education indicator, China first seemed to catch up with the East Asian success countries and the US, being only 2.7 percentage points below the latter before the trend reversed dramatically around 2000. Moreover, around 2010, India surpassed China with respect to the secondary education indicators.

To control more clearly for the differences in the development stages between China and the reference countries we proceed as follows. First, by focusing on the East Asian success countries, we determine the years in which Japan; the Republic of Korea; Singapore; Hong Kong, China; and Taipei,China each reached the per capita income China had in 2010. According to the PWT 7.1 data, China had a similar GDP p.c. in 2010 to Japan around 1960; the Republic of Korea around 1985; Singapore and Hong Kong, China around 1970; and Taipei,China around 1980. Second, we compare the education indicator levels of the latter countries on the determined dates to China's education indicator levels in 2010. Our findings are reported in Table 3.

Table 3. Secondary and tertiary education – China and the East Asian success countries.

	Completed secondary education	Completed tertiary education	Average years of secondary schooling	Average years of tertiary schooling
China (2010)	**22.9**	**2.7**	**2.65**	**0.14**
Japan (1960/65)	23.3	2.5	2.10	0.16
The Republic of Korea (1985)	32.2	7.2	3.26	0.41
Singapore (1970)	11.6	1.3	1.71	0.07
Hong Kong, China (1970)	18.8	1.4	2.17	0.08
Taipei,China (1980)	22.3	3.6	2.43	0.27
East Asian success countries average	**21.6**	**3.2**	**2.33**	**0.20**

Data Source: Barro and Lee (2013), own calculations. Note: For Japan, we take the average value of 1960 and 1965 for each indicator. Shaded cells indicate that the respective East Asian success country performs better than China.

Table 3 reveals that China recorded a larger number of average years of secondary schooling than the East Asian success countries (except the Republic of Korea) did at comparable development stages. The results on tertiary education (and "completed secondary education") are rather mixed. With respect to all indicators, Singapore and Hong Kong, China recorded lower levels than China. The Republic of Korea's tertiary education indicator values were more than 2.5 times larger than the corresponding Chinese figures.

Overall, the education indicators show that China has improved significantly since the 1950s. There are, however, two rather negative aspects of its (recent) development: the stagnating (or even negative) trends in secondary and tertiary education indicators since the 2000s, and the low levels and slow growth of tertiary education indicators in cross-country comparisons. One possible explanation for these negative developments (and, in particular, for the relatively low levels of Chinese tertiary education indicators in cross-country comparisons) is that China's employment share in agriculture is relatively high,[17] given its development stage (as measured by GDP per capita).[18]

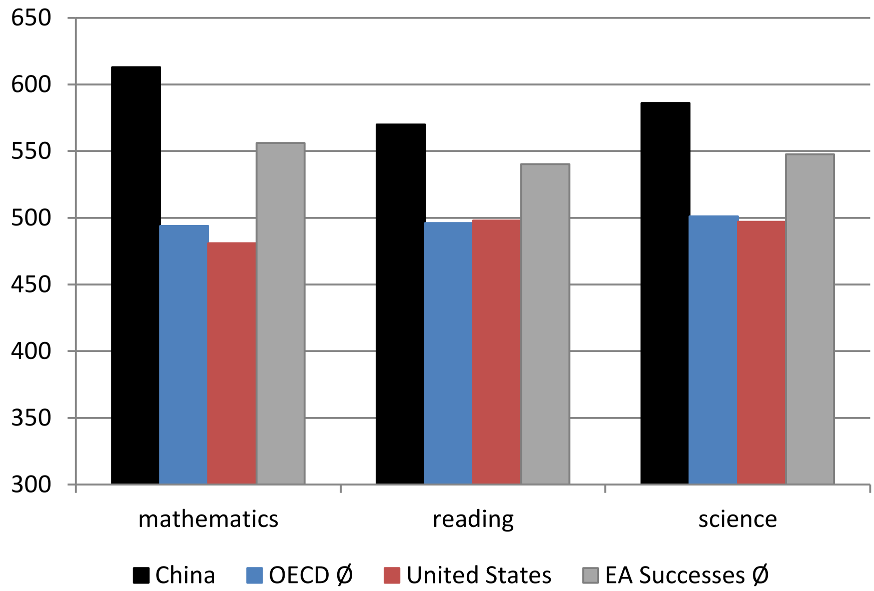
Next, we turn to the quality aspect of education. As mentioned above, the quality of education is much harder to measure than the quantity. One possibility is to analyze test

[17] We assume here that the demand for employees with higher (and, in particular, tertiary) education is relatively low in the agricultural sector.

[18] While the Chinese employment share in agriculture was 36.7% in 2010, the Republic of Korea recorded a much lower level (24.9%) in 1985 (as noted above, this is approximately the year when the Republic of Korea reached a similar GDP per capita level as China in 2010). The differences to the United States are even higher: In 1940, when, according to the Maddison (2013) database, the United States had approximately the same GDP per capita level as China in 2010, the US employment share in agriculture was 20 percentage points lower than the Chinese share (see Lebergott, 1966).

scores. As China did not participate in the TIMSS, we examine the 2012 PISA results. In all three main categories, Shanghai-China's performance was outstanding. For example, in mathematics it reached a mean score of 613 points (119 points above the OECD average), in science it was still 85 points above the OECD average, and in reading 74 points above the OECD average. Shanghai-China even recorded significantly better results than the average for the Asian success countries that participated in the test (see Figure 6). These results indicate that the educational quality in China is quite strong. In general, these results should be treated with caution since Shanghai's students need not be representative of China's education system as a whole.[19]

Figure 6. Pisa 2012 results.



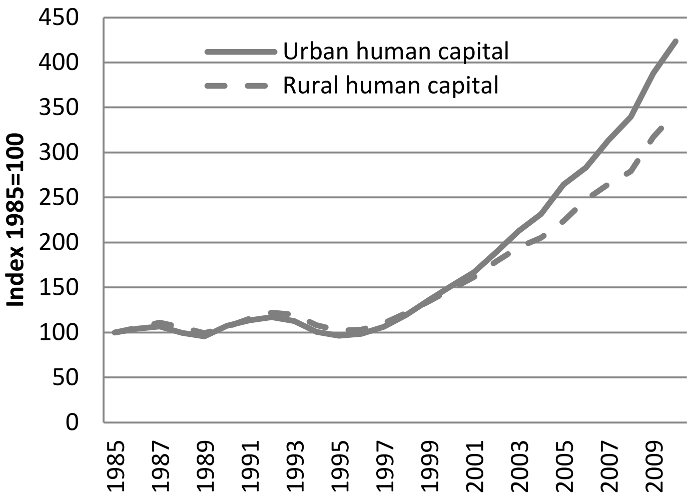
Data Source: OECD (2015).

The rural-urban educational inequality is a major challenge in the context of (future) human capital accumulation in China (e.g., Zhang, Li, and Xue 2015, p. 196) and thus a potential triggering factor for an MIT. In 2013, around 46.27% of the Chinese population was located in rural areas and, according to NBS (2015), the rural-urban migrant workforce was 277.47 million, representing 20.19% of China's total population (cf. Yao, 2014, p. 972). Due to income inequality and institutional barriers such as the *hukou* (household registration) system, which limits access to social welfare benefits and public services, the educational levels of rural or rural-urban migrants' children were significantly lower than those of urban children. Only 6% of rural children entered senior high school at later ages and only 2% attended a university subsequently. In contrast, 63% of their urban counterparts enrolled in senior high school and 54% studied (Zhang, Li, and Xue, 2015, p. 200). In accordance with that, a recent OECD (2012) study reveals that the human capital accumulation in rural areas was much slower and that the rural-urban gap has been widening, especially since 2000 (see Figure 7).

[19] Shanghai's share in the country's total population is small (about 1.78% in 2014, China Statistical Yearbook, 2015, own calculation) and the GDP per capita is more than twice the Chinese average.

In combination with a decreasing urban birth rate, these facts emphasize the need to improve the educational situation for rural and rural-urban migrants' children as they represent the future (urban) labor supply (Zhang, Li, and Xue, 2015, p. 216).

Figure 7. Urban and rural human capital in China.



Data Source: China Center for Human Capital and Labor Market Research (2013).

Overall, with regard to the triggering factor "human capital," we can draw the following conclusions. First, in terms of the quantitative aspect, we can state that China's primary, secondary, and tertiary education indexes have undoubtedly improved since the 1950s. However, the cross-country comparison shows that there is still large potential for improvements in secondary and, in particular, tertiary education; furthermore, the recent downward trend with respect to secondary and tertiary education indicators should be interpreted as a reminder of the need for further reform efforts. Second, as regards the qualitative aspect, although the PISA data indicate that China performs very well, this should be treated with caution as only a small part of the country is covered in this study. Last but not least, the insufficient access to education for rural and rural-urban migrant children could have serious negative impacts on the quality of large parts of the future labor supply. It seems that further efforts are necessary in China to create a well-educated workforce and thus avoid a potential MIT.

4.2 Export structure

A large body of literature emphasizes the importance of export structure (among others, export diversification and product upgrading) for growth (e.g., Sachs and Warner, 1995; Schott, 2004; Hummels and Klenow, 2005; Hausmann, Hwang, and Rodrik, 2007). As noted by Hausmann, Hwang, and Rodrik (2007, p. 1), "specializing in some products will bring higher growth than specializing in others."

Similarly, a large strand of the MIT literature regards the export structure as an important MIT triggering factor (see also Vivarelli, 2015, p. 6; Paus, 2014, p. 14). According to the analysis of Eichengreen, Park, and Shin (2014), MICs with a relatively high share of high-tech products experience a growth slowdown less frequently. Felipe, Abdon, and Kumar

(2012) analyze the properties of the export structure of MIT countries and success countries (escapees). They find that countries that successfully avoided the MIT have had, in comparison to MIT countries, a more diversified, sophisticated, and nonstandard export basket with more opportunities for structural transformation when they were confronted with the challenge that the middle-income transition countries like Argentina, Brazil, and Malaysia are facing today. Andrianskaja and Rougier (2017) note that in the MIT context, export issues are related to the so-called *scissor effect*, meaning that MICs are 'squeezed between the low-wage poor country competitors that dominate in mature industries and the rich-country innovators that dominate in industries undergoing rapid technological change' (Gill and Kharas, 2007, p. 5). Therefore, deeper trade integration may not be as beneficial to the productive transformation of MICs as for LICs or HICs, which have firmer comparative advantages (see Andrianjaka and Rougier, 2017; Kharas, Zeufack, and Majeed, 2010). Thus, the sheer volume of exports is not a reliable MIT predictor.

There are also various country (group)-specific MIT studies. For example, Jankowska, Nagengast, and Perea (2012) apply the "product space" approach developed by Hidalgo et al. (2007) to Latin American countries and compare their performance with that of some East Asian newly industrialized countries (NICs), in particular Taipei,China; Hong Kong, China; the Republic of Korea; and Singapore. Their analysis reveals that the NICs were able to follow a gradual approach of upgrading towards higher-value-added industries whereas the majority of Latin American (MIT) countries specialized in industries that were relatively far away[20] from high-value industries and exhibit export profiles with lower connectivity (both partly due to their below-world-average capabilities; see Jankowska, Nagengast, and Perea, 2012, p. 27).[21]

In addition, there are also some articles that apply export sophistication analysis, especially to Malaysia. Cherif and Hasanov (2015) argue that Malaysia performs quite well having achieved about the same export sophistication level in 2006 as the Republic of Korea had in 1990, whereas Flaaen, Ghani, and Mishra (2013) add that there is further room for improvement regarding the Malaysian service sector. In particular, the expansion of modern services that can be digitized and traded globally is an important potential growth driver for EMEs such as Malaysia, requiring improved market integration and technological changes in information networks (see Flaaen, Ghani, and Mishra, 2013, p. 24).

The Chinese case

Now we turn to the export structure in China. As mentioned above, several MIT studies, e.g., Eichengreen, Park, and Shin (2014), Jankowska, Nagengast, and Perea (2012, p. 34), and Flaaen, Ghani, and Mishra (2013, pp. 16, 33), mention the importance of a large share of high-technology exports in total manufacturing exports for reducing the likelihood of a growth slowdown.

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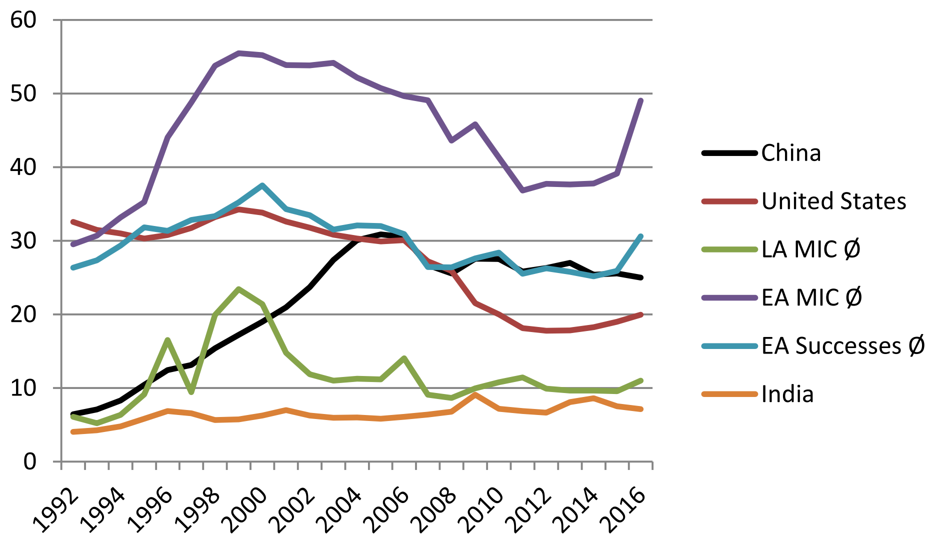
[20] Here, the term "far away" relates to the "proximity" of industries. Simply speaking, "far away" means that industries (e.g., industry A and industry B) use very different resources and skills and thus the (conditional) probability that a country exports the goods of one industry (A) is relatively low given that it exports the goods of the other industry (B); cf. Jankowska, Nagengast, and Perea (2012).

[21] Capabilities mean productive skills; connectivity indicates the proximity of a country's export profile to high-value products (see Jankowska, Nagengast, and Perea 2012, pp. 5 and 19).

As we can see in Figure 8, the Chinese high-tech exports as a share of manufactured exports surged between the early 1990s and 2006 and then leveled off at around 26%. Despite this stagnation, the Chinese high-tech export share has been on average 7.20 percentage points greater than the US share between 2009 and 2016. It is noteworthy, however, that the domestic value added to most high-tech industries in China is relatively low and the high-tech exports mainly originate from foreign-owned enterprises (see OECD, 2008; Ma, Wang, and Zhu, 2013).

Interestingly, Figure 8 also reveals that the East Asian MIT countries performed significantly better than the East Asian success countries and the US. However, this can be partly explained by the fact that the share of high-tech exports in manufacturing exports does not provide information about the relevance of high-tech exports for the economy as a whole. This is especially so if an economy has a relatively small share of manufacturing exports in total exports (and/or of total exports in GDP). Therefore, we also take a look at the share of high-tech exports in GDP (see Figure 9).[22]

Figure 8. High-tech exports (as % of manufacturing exports).

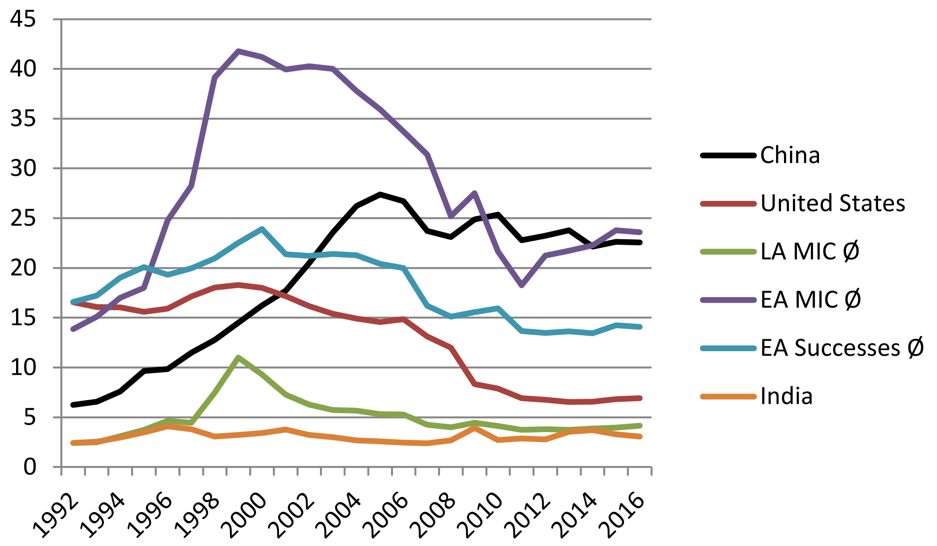


Data Source: World Bank (2018). Own calculations.

The first striking finding is that between 2010 and 2013, China has recorded the highest share of high-tech exports in GDP in our sample. Although the East Asian middle-income country group overtook China in 2014, China still performed very well compared to the other countries (and country groups). This could be a hint that China will be able to avoid an MIT. In general, however, Figures 8 and 9 imply that the high-tech exports share is not a reliable MIT predictor in our case: In Figures 8 and 9, (some) MIT countries have a greater high-tech exports share than success countries and the US. Therefore, in the following, we have to rely on other indexes of export sophistication.

[22] In addition, Figure B1 in Appendix B depicts the Chinese high-/new-tech exports as a share of total exports.

Figure 9. High-tech exports (% of GDP).

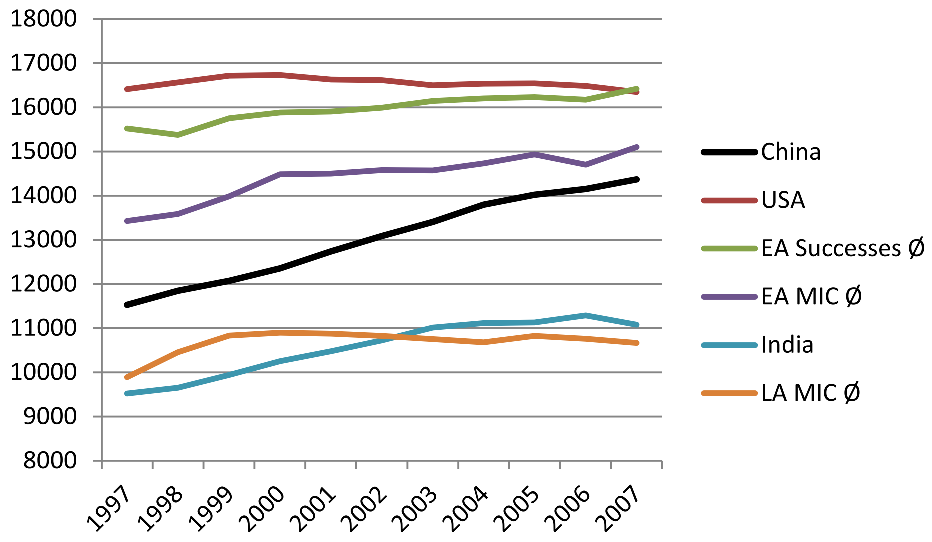


Data Source: World Bank (2018). Own calculations.

Hausmann, Hwang, and Rodrik (2007, p. 1) construct an "EXPY" index that is also widely utilized by various empirical MIT studies (e.g., Jankowska, Nagengast, and Perea, 2012; Flaaen, Ghani, and Mishra, 2013; Felipe, Abdon, and Kumar, 2012; Felipe, Kumar, and Galope, 2017) and captures the sophistication of a country's export basket by building the export-weighted average of the productivity levels for each exported good.[23] Various empirical studies argue that China's EXPY level is higher than what would be expected considering its GDP per capita (see, for example, Rodrik, 2006; Schott, 2006; Hausmann, Hwang, and Rodrik, 2007). As depicted in Figure 10, China has steadily improved its export sophistication, having the highest average growth rate between 1998 and 2007 of all economies in our sample (2.23% p.a.).

[23] While, in general, the analyses of export sophistication focus on goods, some articles, e.g. Anand, Mishra, and Spatafora (2012), extend the sophistication analysis to services as well.

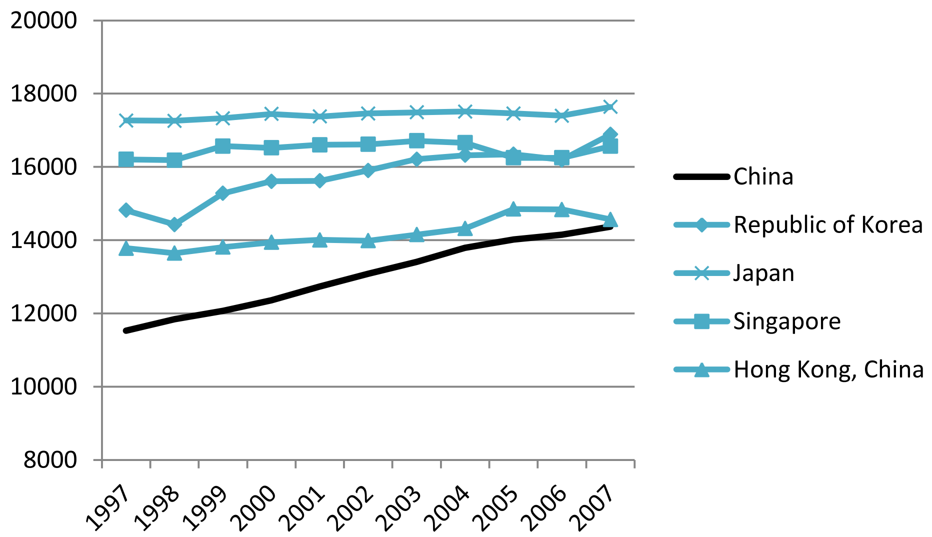
Figure 10. EXPY index.



Data Source: Jarreau and Poncet (2009), own calculations.

However, although China's EXPY level is higher than the (average) EXPY level of the Latin American MIT countries, it is still lower than the corresponding levels of our East Asian successes and MIT country samples, where, in 2007, the former (latter) recorded an EXPY level that is 14.2% (5.1%) higher than China's EXPY level. Nevertheless, the gap between China and the East Asian success and MIT countries is closing significantly. Figure 11 reveals that China is converging with each of the countries of our East Asian success sample and almost reached the EXPY level of Hong Kong, China (the weakest country in our success countries sample) in 2007 (cf. Hausmann, Hwang, and Rodrik, 2007).

Figure 11. EXPY index – China and the East Asian successes.



Data Source: Jarreau and Poncet (2009).

Following a "product space" approach, Jankowska, Nagengast, and Perea (2012) focus (among other things) on export diversification and export upgrading in East Asian and Latin American countries. They find that all the countries in their sample increased the number of industries in which they have a revealed comparative advantage (RCA), and thus, have diversified their export baskets; however, only a few countries managed to upgrade their exports. The authors find that the Chinese export development was characterized by a very gradual upgrading with a simultaneous increase in diversification (p. 18).[24] Jankowska, Nagengast, and Perea (2012) also investigate various other (related) measures of the product spaces such as "connectivity", which is measured by an index labelled the "potential EXPY index". The rationale behind this measure is that the prospects for export upgrading depend on the relative location of a country's export basket in the product space, particularly its proximity to high-value added products. There is an inverted-U-shape relationship between diversification and the potential EXPY index (p. 17). Jankowska, Nagengast, and Perea (2012) state that China has one of the highest levels of potential EXPY in their sample; however, it has already entered the range of diversification with diminishing returns to potential EXPY. For China, this strengthens the importance of a stronger focus on export upgrading instead of further diversifying its export basket. In fact, as found by Andrianjaka and Rougier (2017), further diversifying exports has an adverse impact on medium-run growth in MIT countries (especially regarding diversification at the extensive margin) (see also Cadot, Carrère and Strauss-Kahn, 2011 and Imbs and Wacziarg, 2003 for general evidence on the hump-shaped relationship between economic development and export diversification). Andrianjaka and Rougier (2017) underline that MICs should instead re-concentrate their exports and move from extensive to intensive margins.

In this subsection, we have analyzed various indicators of China's export structure. In principle, we can say that as far as export sophistication is concerned, China seems to converge quickly with the East Asian success countries and that the Chinese product space profile looks promising. Nonetheless, especially with respect to high-tech products, there is much room for improvement: Although the Chinese indexes are close to (or even higher than) those of East Asian success countries, China's main proportion of high-tech exports originates from foreign-owned enterprises, and the Chinese value-added to high-tech industries in China is relatively low. This aspect is of relevance when assessing the Chinese domestic technology levels and innovation ability, which is an important growth determinant at more mature stages of development.

4.3 Total factor productivity

A large number of studies underline the importance of productivity growth (measured as TFP growth) in the context of MITs (e.g., Daude, 2010; Daude and Fernández-Arias, 2010; Eichengreen, Park, and Shin, 2012; Jitsuchon, 2012; Aiyar et al., 2013; Tho, 2013; Cherif and Hasanov, 2015).

[24] Beginning with RCAs in some agricultural, light-manufacturing, chemical, and vehicle-related products, according to the authors, the country also built up RCAs in textiles, garments, and chemicals in the 1970s before it established and diversified RCAs in electronic vehicles and related machinery in the following two decades.

Total factor productivity (TFP) indicates how efficiently the available production factors are transformed into final output (see Daude and Fernández-Arias, 2010, p. 8). It is not possible to measure TFP directly. Instead, it can be interpreted as a residual that accounts for the portion of output that is not explained by the other inputs, in particular labor and capital (see Comin, 2008). In a Cobb-Douglas production function of the type $Y=A \cdot K^{\alpha} \cdot L^{1-\alpha}$ (where Y is the output, and K and L are the input factors capital and labor), TFP growth is captured by the growth rate of the parameter A (Hicks-neutral technology parameter).

According to the neoclassical growth theory, in particular the Solow model, TFP growth (as technological change) is the main source of long-term economic growth. There are numerous other models that focus on the explanation and effects of technological change (and thus TFP), e.g., the models developed by Aghion and Howitt (1992, 1998), Grossman and Helpman (1991), and Romer (1990).

On a more general level (not explicitly referring to the MICs), Easterly and Levine (2001) argue that the TFP residual accounts for most of the cross-country variation in per capita income. Many other studies arrive at the same conclusion (e.g., Krugman, 1994; Klenow and Rodriguez-Clare, 1997; Hall and Jones, 1999). TFP is in particular important as various other growth determinants only unfold their effect on GDP indirectly through their direct impact on productivity (see Miller and Upadhyay, 2000).

In the MIT literature, TFP is also one of the most important triggering factors. For example, using a growth accounting framework, Eichengreen, Park, and Shin (2012, p. 54) estimate that the drop in the TFP growth rate on average explains about 85% of the growth slowdowns in their sample, whereas the decreases in labor and capital growth only play a relatively minor role. Bulman, Eden, and Nguyen (2014) and Jitsuchon (2012) argue that countries that managed to successfully overcome the MIR had relatively high TFP growth; Tho (2013) emphasizes that MICs have to master the "transition from input-driven to TFP-driven growth."

Several MIT studies emphasize the importance of TFP growth in Latin America. Daude and Fernández-Arias (2010) argue that the poor growth performance of Latin American countries (relative to the developed economies such as the US) can be mainly attributed to a negative TFP growth gap rather than to impediments in factor accumulation. Therefore, according to the authors, closing that productivity gap is key to catching up further with the developed countries. In the same vein, Aiyar et al. (2013) conclude that sharp declines in TFP growth seem to have strongly contributed to past growth slowdowns in Latin America (in contrast to the Asian Tigers, China, and India that all experienced steady TFP growth). The TFP growth problem is not only of relevance for Latin American countries. For example, Cherif and Hasanov (2015) argue that the Malaysian TFP growth was relatively low (around 0.8%) during 1970–2010, whereas other Asian countries recorded significantly higher TFP growth rates, e.g., the TFP in the Republic of Korea and Taipei,China grew at about an average of 1.8% p.a.

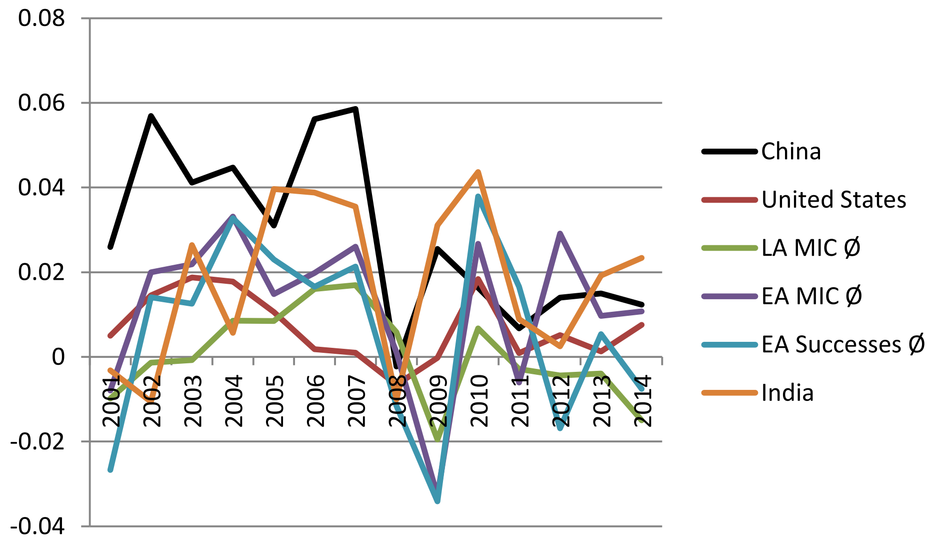
Overall, the literature implies that (i) having a high TFP growth rate in general (i.e., managing the transition from input-driven to TFP-driven growth) may help to avoid an MIT, and (ii) MITs may be associated with TFP growth drops.

The Chinese case

In the literature, the estimates of TFP growth in China (and its contribution to overall growth) vary strongly, depending on the data source and estimation method. The magnitude of these differences is well reflected by the two opposite views regarding the TFP growth in China since the beginning of the reforms under Deng Xiaoping in 1978. The optimistic analyses (e.g., Borensztein and Ostry, 1996; Hu and Khan, 1997; Fan, Zhang, and Robinson, 1999; Perkins and Rawski, 2008) estimate that the annual TFP growth was between 3.8% and 4.2% and contributed around 40% to output growth (Perkins and Rawski, 2008), whereas the pessimistic ones argue that TFP played a much smaller role with an annual growth rate ranging between 0.3% and 1.4% (Woo, 1998; Young, 2003; Cao et al., 2009) in the post-1978 period.

Keeping these estimation discrepancies in mind, we take a brief look at Chinese TFP growth in the following, since at least a cross-country comparison regarding TFP growth may provide us with interesting information, as long as we take the TFP estimates for all countries from one and the same source (thus, at least controlling for methodological differences within the cross-country comparison). We use the TFP data from the PWT (Volume 9), which depicts the TFP at constant national prices (2011=1), to calculate the TFP growth rates.

Figure 12.TFP growth rates.



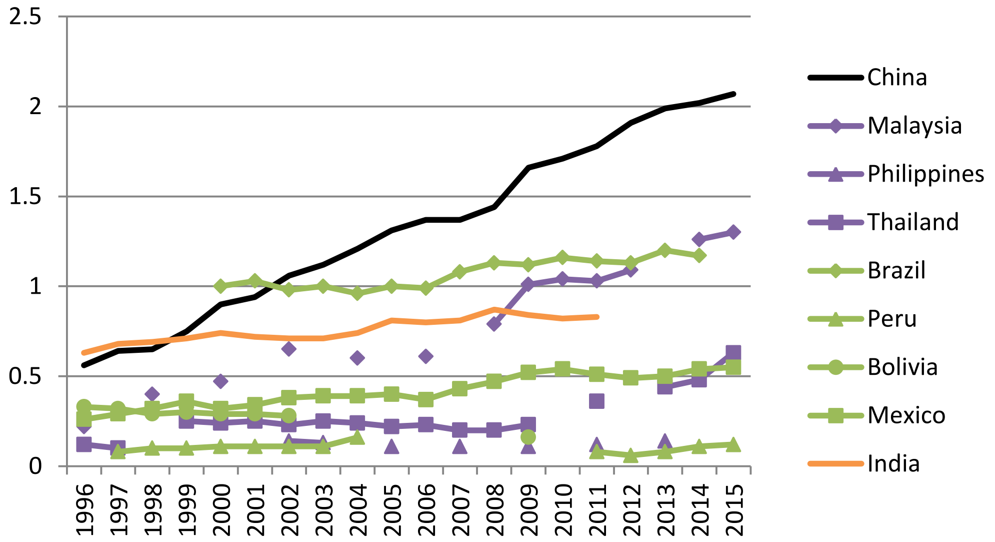
Data Source: PWT 9.0, own calculations.

According to these data, China had an average TFP growth rate of 1.85% between 1978 and 2014, which is slightly above the pessimistic estimates from the literature. As can be seen in Figure 12, in the seven-year period before the financial crisis of 2007, China had the highest average TFP growth in our selection of countries (4.49% p.a.). The global financial crisis of 2007 initiated a sharp decline in TFP growth for the whole sample. Even though China recorded one of the highest average TFP growth rate in the post-2007 seven-year period (1.25% p.a.) in our sample (surpassed only by India), the difference between China and the other countries in our sample has narrowed. In addition, China recorded the greatest difference between the average pre- and post-2007 TFP growth rate and had the sharpest decline in TFP growth between 2007 and 2008 in our sample.

Overall, the PWT data indicate that China had a relatively high TFP growth rate in cross-country comparison (even in the period after 2007). However, China experienced a sharp decline in TFP growth (in 2007), which is characteristic of MITs.

There are various articles (e.g., Englander, Evanson, and Hanazaki, 1988; Grossman and Helpman, 1994; Coe and Helpman, 1995) arguing that R&D expenditure is an important determinant of TFP growth.[25] Since R&D is also identified as a possible MIT triggering factor, we take a closer look at it in the following. Using World Bank data (R&D expenditure as % of the GDP), two major observations can be made. First, as depicted in Figure 13, China performed much better than the majority of MIT countries, both Latin American and East Asian ones; it surpassed India in 1999 and Brazil in 2002. Second, China converged steadily with the US and the East Asian success countries, above the Hong Kong, China level and almost reaching the Singaporean level in 2012 (see Figure 14).

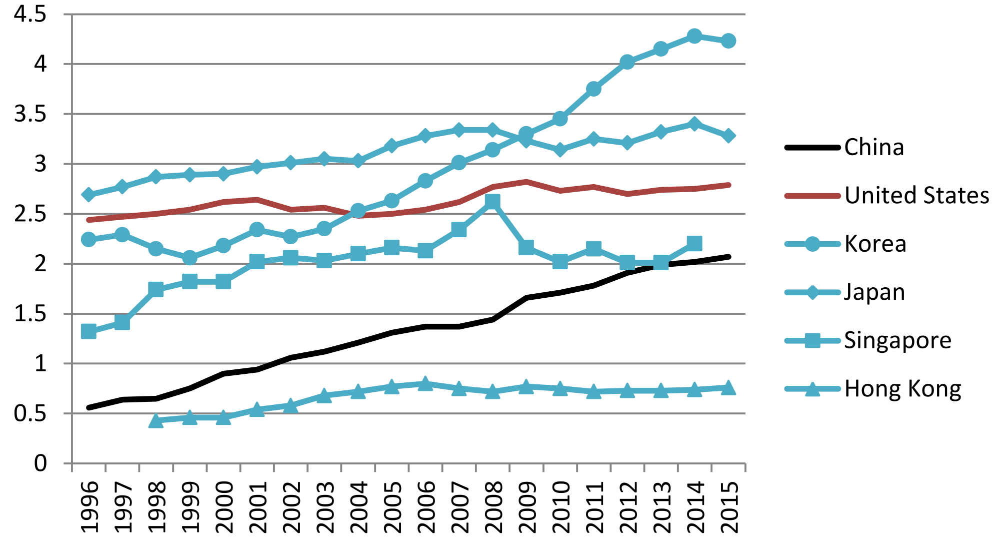
Figure 13. R&D expenditure (% of GDP) – China, MIT countries and India.



Data Source: World Bank (2018).

[25] There are also some more critical contributions, e.g., Atella and Quintieri (2001).

Figure 14. R&D expenditure (% of GDP) – China, US, and East Asian success countries.



Data Source: World Bank (2018).

We can summarize our discussion as follows. The PWT data on TFP indicate that China has a relatively high TFP growth rate in cross-country comparison but recorded a strong decline in TFP growth after the 2007 crisis. The theoretical/empirical literature on MITs implies that the former is a good sign, while the latter is a bad sign in the context of MITs. However, TFP estimates differ significantly across studies, in general, and especially for China. Thus, we cannot postulate here an unambiguous conclusion with respect to TFP as an MIT triggering factor in China. Our results regarding the R&D expenditure, which is a major determinant of TFP growth, show that China still has not achieved the level of the US, Japan, or the Republic of Korea; however, it steadily closes the gap, at least with the two former mentioned countries.

4.4 Summary of the China-related triggering factor analysis and main weaknesses

Table 4 summarizes our main findings with respect to the MIT triggering factors by listing most of the indicators discussed in Sections 4.1 to 4.3. "CA" indicates a catching-up tendency (with the East Asian success countries and/or the United States), whereas a blank space signals room for improvement.

Our analysis reveals that China shows catching-up tendencies regarding several indicators; in particular, the export situation looks promising. In contrast, the results with respect to the educational situation leaves room for further improvements as China still lags behind even various Latin American and East Asian MIT countries regarding several indicators. A key challenge to future human capital accumulation is the high educational inequality within China and the severe rural-urban divide. We derive less clear results for the Chinese productivity performance due to disagreement on the Chinese TFP growth rate in the literature.

Figure 15. Overview triggering factors – the Chinese performance.

Triggering Factor	Indicators	Chinese Performance
Education	Sec. education completed	CA (trend reversal around 2000)
	Sec. education average years	
	Tert. education completed	
	Tert. education average years	
	PISA results (2012)	Excellent results (representative for all of China ?)
Export	High-tech exports (% GDP)	CA
	EXPY Index	CA
	Product space profile	CA
Total Factor Productivity	TFP Index	?
	R&D expenditure (% of GDP)	CA

Our analysis of the development of the key MIT triggering factors in China reveals that the current research on MIT determinants still has various shortcomings and could be extended in various ways which we briefly discuss in the following.

First, it would be very helpful to have established *threshold effects* for the various triggering factors (for example, the level of human capital or export sophistication which is required for an MIC in order to be able to switch to an innovation-based growth strategy).[26] This would allow for a more precise and less arbitrary evaluation of the performance of MIT candidate countries regarding the various MIT determinants and the corresponding reform policies.

Second, it is desirable to have a *hierarchization* of the triggering factors because it is difficult to coordinate, control, and finance the implementation of various political measures at the same time. However, such a hierarchization is also difficult, since (i) the triggering factors are interconnected (see below), and (ii) there is no comprehensive theoretical foundation/basis (in the MIT context) on which we can rely. Standard growth theory underlines the central role played by human capital in explaining the rapid growth of the newly industrialized economies (see, for example, Mankiw, Romer, and Weil, 1992; Barro, 2001; and Aghion and Howitt, 2009). As stressed by Abrigo, Lee, and Park (2018), human capital accumulation is even more important against the background of rapid ageing in East Asia (particularly in China) because more productive workers can offset the adverse effect of fewer workers (p. 1). The hierachization of triggering factors within the MIT literature is still in its very early stages. Nonetheless, the tendencies of the standard literature are supported. For example, in his literature survey, Agénor (2017) underlines that human capital is a key constraint preventing a

[26] Agénor (2017) also identifies the development of an empirical test to further investigate such threshold effects as an important topic for future research.

country from transitioning to a higher income status. In his verbal-theoretical model, Aoki (2011) also assigns a central role to human capital accumulation in avoiding getting trapped at the middle-income level (see also Section 4.1).

Third, although human capital appears to have a central role in overcoming an MIT, one has to keep in mind that when identifying the dominant triggering factor in a country, the *(country-specific) context* (such as past reforms and the institutional/political environment) and *cumulative effects/interconnections* between the various MIT determinants matter, although they are very difficult to identify. In Section 4.5, we will give a more detailed overview of these interconnections between the various MIT triggering factors and discuss the implications for China. (It is, however, beyond the scope of this paper to provide a final selection of interrelationships on the various triggering factors.) This analysis also reveals that the role of the *institutional-political framework* for overcoming an MIT has not been acknowledged sufficiently within the MIT literature.

4.5 Interconnections between the triggering factors and the institutional-political framework

As already mentioned throughout Section 4, the triggering factors are actually interconnected, and an MIT should be understood as the result of a combination of various factors, although some factors – such as human capital – can have a more central role than others. Although these issues are rarely discussed within the MIT literature, and there is no comprehensive theoretical foundation, we nonetheless think that it is important to discuss these aspects. We refer to the findings of the standard growth literature and the rare treatment in the MIT literature. In general, our findings are in line with the results of the previous Section 4.4, namely that human capital appears to be in the center of the various interconnections. However, the discussion (below) also reveals that another fundamental, namely the institutional and political environment, is strongly connected to the other factors. Therefore, we also briefly discuss the institutional and political factors in China.

Interconnections between the triggering factors

There is agreement in the standard growth literature that human capital drives R&D activities, affects imitation and innovation abilities, and thus, fosters productivity (see, for example, Romer, 1990; Benhabib and Spiegel, 1994; Teixeira and Fortuna, 2010; Bodman and Le, 2013; Vandenbussche, Aghion, and Maghir, 2006). In accordance with those findings, Agénor (2017) argues that in the MIT context as well, (the quality of) human capital determines the ability of a country to absorb more advanced foreign technology (via trade and FDI) and to expand its (domestic) innovation activities. That is, the insufficient quality of human capital, and thus, a limited knowledge absorption capacity, can prevent productivity growth, which is crucial to sustain high economic growth rates, and thus, to overcome the MIT. This interconnection between human capital, the knowledge absorption capacity and productivity growth appears to be of special relevance for China: Particularly since the 1990s, FDI-enhancing policies have been implemented in order to generate technology/productivity spillovers. However, as argued above, human capital is a necessary precondition for exploiting the technological progress embodied in FDI. This implies that if China cannot manage to further upgrade its human capital stock, more advanced technologies will be difficult to internalize from FDI in the future. However, if China succeeds in producing the skilled workers that are able to exploit the technological progress embodied in FDI, this could initiate learning-by-doing effects which further boost human capital, and thus, create positive cumulative effects (see also Agénor and Dinh, 2013).[27] Another aspect regarding this interconnection is put forward by Andrianjaka and Rougier (2017), who also focus on the MIT phenomenon. They find that after controlling for innovation and imitation capacities, the growth impact of highly skilled work becomes negative for countries inside the MIT; this tendency worsens with the distance to the frontier. They conclude that the mismatch between an increasing number of highly skilled workers and the innovation capacity dampens the positive effect of human capital for MIT countries. In fact, according to McKinsey (2016), in China, there are more university students than the economy can absorb; however, it is also argued that due to the demographic change and structural shifts, this situation will reverse around 2020. Moreover, in China, this mismatch also has a geographic dimension: Some big cities have more highly-skilled labor than they can absorb, while at the same time, small- and medium-sized cities do not have nearly enough.

Another important interconnection exists between human capital and the export structure. The literature on the determinants of export upgrading agrees that there is a robust positive effect of export sophistication on a country's human capital (Zhu and Fu, 2013). However, especially in the Chinese case, causality seems to run in two directions: Human capital (together with FDI and the building of special economic zones) has also been found to be an important driver of export sophistication in China (Schott, 2008; Wang and Wei, 2010; Xu and Lu, 2009). Thus, to accelerate the catching-up progress regarding the EXPY index (discussed in Section 4.2), China must simultaneously upgrade its human capital; improvements in one single indicator will not be enough to avoid an MIT. However, if China succeeds in doing so, there could again be a positive effect of increasing export sophistication on human capital accumulation, thus presenting another kind of cumulative effect.

When discussing the interrelationships between the MIT triggering factors, it is also important to consider the structural change process. In China, the decrease in productivity growth over the last two decades can be partly attributed to the beginning of de-industrialization. In the coming years, the service sector will become by far the largest sector of China's economy; however, it is generally characterized by slower productivity growth compared to the manufacturing sector (see Baumol, 1965; Glawe and Wagner, 2017a). Improving service sector productivity by moving to higher-value added service activities, however, requires a workforce that possesses the necessary skills. That is, human capital is a necessary condition for a virtuous structural change (see also Gürbüz, 2011).[28]

Besides these interconnections between the main triggering factors (human capital, export structure, TFP) and complementary factors (such as R&D investment and innovation), there are also various *hindering factors* such as credit constraints or lack of private appropriation of returns from investment or innovation (see also Agénor, 2017). Differences in these

[27] China-related empirical research finds that the technical absorption capacity is also a determining factor of the FDI spillover effects in China. Moreover, various studies argue that so far, there have not been strong technology or productivity spillover effects (Ma and Blonigen, 2007; Xu, Wan, and Sun, 2014). Hale and Long (2006) find that in addition, a well-functioning labour market facilitates FDI spillovers in China.
[28] Andrianjaka and Rougier (2017) note that export re-concentration is the crucial dimension of structural change for MICs.

hindering factors might lead to two different growth trajectories inside and outside the MIT for similar characteristics of human capital, export structure or TFP growth. Wang (2014) underlines that in China, private firms face tight financial constraints. He reports that around 60% of investment and the majority of bank loans are diverted to less productive state firms. In addition, Chinese private enterprises are sometimes reported to have limited rights to own the returns of innovation. This could pose additional difficulties for China in overcoming the MIT.

Institutional and political framework/factors

The above discussion has made clear that innovation, knowledge creation, and R&D investment, which are all crucial for sustained productivity growth, are dependent upon human capital. Moreover, there is also a positive interrelation between human capital and export sophistication, which, in turn, are both interrelated with the structural change process. However, besides these interconnections, the standard growth literature implies that all of these factors are strongly affected by institutional and political factors in various dimensions/ways: First, institutional quality tends to increase the returns to R&D, the absorption from international R&D spillovers, as well as the rate of innovation (see Coe, Helpman, and Hoffmaister, 2009; Seck 2012; Tebaldi and Elmslie, 2013). Second, institutional quality positively affects human capital accumulation, for example, by providing a well-functioning human capital market that increases the returns to education (Dias and Tebaldi, 2012). That is, institutional quality has an additional positive effect on the first-mentioned factors via human capital. At the same time, human capital is found to positively affect political institutions (Glaeser, La Porta, Lopes-de-Silanes, and Shleifer, 2004). Third, institutional quality has a positive effect on export sophistication, especially when a country is moving to a higher-income status (Zhu and Fu, 2013). For example, government policies that encourage high-tech exports can induce an upward shift in the export structure of a country (Lo and Chan, 1998).

Although institutional and political factors are not most frequently analyzed in the existing MIT literature (which is probably partly due to the fact that they are hard to measure and to identify through econometric exercise), we briefly analyses the Chinese situation because these factors are not only strongly interrelated with the other triggering factors (as indicated above) but also present a *fundament/basis* for the development of the other factors.

An extensive discussion on economic and political institutions can be found in Acemolgu and Robinson (2016). Although they do not directly refer to the MIT, Acemoglu and Robinson (2016) draw some important implications for China's future growth. The authors argue that the country has achieved economic growth *despite* its highly authoritarian, extractive ***political*** institutions and that the successful growth experience over the last three decades is due to a radical shift away from extractive ***economic*** institutions and toward significantly more inclusive **economic** institutions. Acemoglu and Robinson (2016) conclude that, so far, China's growth under extractive political institutions is unlikely to translate into sustained economic development unless China transitions to inclusive political institutions before its growth under extractive institutions reaches its limits. In the same vein, Rodrik, McMillan, and Sepúlveda (2016) argue that institutional transformation (particularly regarding political institutions) and human capital have lagged significantly behind China's manufacturing process, which usually implies that growth is episodic.

Within the MIT literature, the study of Doner and Schneider (2016) appears to be noteworthy: The authors argue that the institution-intensive nature of the policies necessary to upgrade productivity (especially in human capital and innovation) and the weak political capacity for building these institutions are the two major institutional and political challenges that countries inside the MIT face. According to the authors, the main political obstacle to institution building is the fragmentation of social groups and the resulting absence of strong upgrading coalitions. Regarding the Chinese performance, they draw a more optimistic picture than Acemoglu and Robinson (2014) and Rodrik, McMillan, and Sepúlveda (2016). In particular, they argue that – in contrast to many other MIT countries – China has (i) a clear connection for political elites between development and the capacity to address geopolitical challenges and (ii) the stability of its authoritarian regime (p. 635).

Although there is no conclusion within the (general and MIT) literature regarding the development of the institutional and political factors in China, sound political and economic institutions that support the further upgrading of human capital and innovation to ensure productivity growth are important for succeeding in the move to high-income status, also in the Chinese case.

5 Conclusion

In this paper, we have analyzed whether China is or will be in a middle-income trap (MIT), and we based our analysis on empirical MIT definitions and MIT triggering factors identified in the literature. Our main findings can be summarized as follows.

The application of *MIT definition approaches* to Chinese development does not yield unambiguous results. Depending on the MIT definition and database, we can find empirical support for all possible cases (1. China is in an MIT, 2. China is not in an MIT, 3. China will be in an MIT, 4. China will not be in an MIT). This reveals the significant weaknesses of the empirical definition approaches, namely the different definitions of the MIR, data discrepancy across databases and different versions of databases, and the necessity of long-run GDP projections. Nevertheless, some regularities/tendencies become apparent in our application of MIT definition approaches to China. First, most of our scenarios imply that China *is not* (yet) in the MIT; the only exceptions are the scenarios based on the World Bank (2013) study and some of our Eichengreen, Park, and Shin (2012, 2014) scenarios, which are actually borderline cases. Second, the majority of our scenarios imply that China *will soon be in the MIR but not trapped* in an MIT: In most scenarios China enters the MIT only if the Chinese growth rate drops to the levels (3–4 % p.a.) predicted by the most pessimistic growth projections in the literature. However, it is not impossible that China will be confronted with an MIT and the future reforms seem to be decisive for the development of the Chinese economy.

In the second part of our analysis, we focused on MIT triggering factors. We summarized the MIT triggering factors identified in the basic literature on MITs and classified them, analyzing results from both cross-country and case studies. Then we studied the development of the triggering factors that seem to be most accepted in the literature. Since the quality and (regional) coverage of some indicators are restricted, the results of this analysis have to be treated with caution. Nevertheless, the following statements seem to be quite reliable: (1) China performs quite well with respect to its export performance; (2) further improvements with respect to human capital accumulation and education as well as a mitigation of the widening (rural-urban) income inequality seem to be adequate measures for preventing an MIT in China. The picture is less clear regarding productivity because TFP data vary widely across studies. Our paper has also revealed various weaknesses of the MIT triggering factor analysis. First, it is very hard to precisely assess the performance of MICs regarding the MIT triggering factors because there are no defined threshold effects on which researchers or policymakers can rely (e.g. the necessary amount of human capital to switch to an innovation-based growth strategy). Identifying such threshold effects could help to evaluate the success of the various reform policies in MICs. Second, the current literature often neglects the interactions and the cumulative effects between the various MIT determinants. Third, the institutional and political framework is not discussed sufficiently. Fourth, due to the lack of theoretical MIT models, the choice of triggering factors is often intuitive and must rely on the basic growth literature. There is a clear need for future work that systematically investigates the relative importance of the various triggering factors (those analyzed in this paper, as well as others) on the basis of a theoretical model of the Chinese economic growth process that has yet to be developed.[29]

We briefly turn to some policy implications. In our analysis, we have underlined the key role of human capital because it acts as a constraint on productivity growth (by determining the knowledge absorption capacity), and it is strongly interrelated with the other triggering factors. However, in China, higher government spending per se will not be enough; instead, microeconomic reforms should particularly target the educational system. As suggested by Agénor (2017), such reforms could comprise an increase in the teacher-student ratio, improved incentives for teachers and enhanced internet access for schools. However, in the Chinese case, installing short skill-based programmers could also prove useful. These so-called "boot camps" run eight to 12 weeks and convey particular skills that matter the most for the professions required by industry (see McKinsey, 2016 for a detailed overview of such boot camps). One advantage of this measure is that both university graduates who want to gain additional vocational training and low-skilled workers could benefit from such programmers.

However, although policy reforms in China should (particularly) focus on upgrading human capital, this certainly does not mean that they should be entirely/only restricted to educational issues. In fact, the interconnection of the determinants calls for complementary reforms regarding various other determinants: For example, reforms that improve the access to finance and that help to increase the incentives for firms to engage in risky entrepreneurial activities help to foster innovation, and thus, to increase productivity growth. Moreover, improving the institutional framework, such as the protection of (intellectual) property rights and contract enforcement, could prove beneficial in this respect (see Wagner, 2017 for the detailed policy implications in this respect).

In summary, we come to the conclusion that China definitely has the potential to further catch up with the high-income countries and avoid the MIT. However, the future performance of the Chinese economy depends on further reforms initiated by China's policymakers.[30]

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[29] For such a model, see Glawe and Wagner (2017a).
[30] See in this context, for example, Wagner (2015, 2018).

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Appendix A

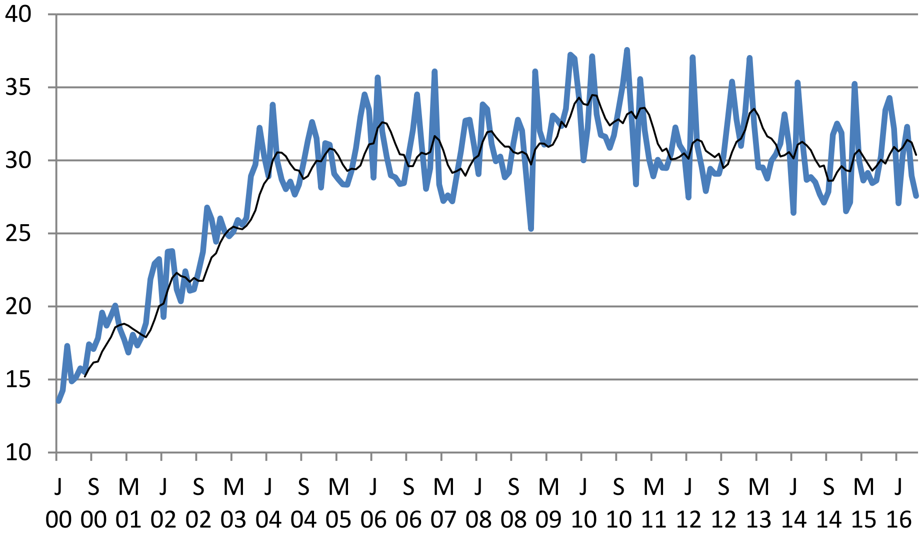
Table A1. MIT triggering factors – applied literature.

Empirical Study	**EXR**	**CPI**	**DEB**	**GR**	**EXP**	**OPN**	**HC**	**INV**	**INF**	**DEM**	**TFP**	**LAP**	**R&D**	**INN**	**SC**	**INS**	**FNM**	**INQ**	**ST**	**HUK**	**POL**
Cai (2012)							X			X	X					X					X
Huang (2016)							X						X	X		X	X				
Islam (2014)																		X			
Lee and Li (2014)														X				X			
Wagner (2015)			X												X	X					
Wen and Xiong (2014)																		X		X	
Wu (2014)											X										
Yao (2015)			X														X				
Yiping, Qin, and Xun (2014)*		X		(X)		(X)	(X)	X								X	X				
Zeng and Fang (2014)													X	X							
Zhang (2014)						X	X							X		X					
Zhang et al. (2012)							X											X			
Zhuang, Vandenberg, and Huang (2012)					X		X			X	X	X	X	X	X		X	X	X		X
Total	-	1	1	1	1	2	6	1	-	2	3	1	3	5	2	5	4	6	1	1	2

Note: The MIT triggering factors are abbreviated as follows: EXR = undervalued exchange rate, CPI = inflation, DEB = debt (public, corporate, external), GR = high growth rates in earlier periods, EXP = export structure, OPN = openness, HC = human capital, INV = investment, INF = infrastructure, DEM = demographics, TFP = total factor productivity, LAP = labor productivity, R&D = research and development, INN = innovation, SC = structural change, INS = institutions, FNM = financial markets/financial institutions, INQ = inequality, ST = social tension, HUK = hukou system, POL = environmental pollution.

Appendix B

Figure B1. High/New-tech. exports (% of total exports) in China.



Data Source: China Customs, own calculation. *Note*: The thin line indicates the seven-year moving average.