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THE PEOPLE'S REPUBLIC OF CHINA IN THE MIDDLE-INCOME TRAP?

Linda Glawe and
Helmut Wagner

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Linda Glawe is a researcher at the department of macroeconomics, University of Hagen. Helmut Wagner is Chair in Macroeconomics, Faculty of Economics, University of Hagen.

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Please contact the authors for information about this paper.

Email: linda.glawe@fernuni-hagen.de, helmut.wagner@fernuni-hagen.de

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Asian Development Bank Institute
Kasumigaseki Building, 8th Floor
3-2-5 Kasumigaseki, Chiyoda-ku
Tokyo 100-6008, Japan

Tel: +81-3-3593-5500
Fax: +81-3-3593-5571
URL: www.adbi.org
E-mail: info@adbi.org

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 of the growth slowdown of the economy of the People's Republic of China (PRC) in 2011, there has been rising concern that the PRC is, or will also be, confronted with such a trap. This paper analyzes the PRC's 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 the PRC could be caught in an MIT.

Keywords: middle-income trap, People's Republic of China, economic growth, economic development

JEL Classification: O10, O40, O47, O53

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1. INTRODUCTION

Since the beginning of reforms under Deng Xiaoping in 1978, the People's Republic of China (PRC) has undergone remarkable development: For about three decades, the economic performance has been outstanding with even double-digit growth rates. Today, the PRC not only accounts for the world's largest share in world GDP (17.65% versus 15.71% for the United States (US); see World Economic Outlook, WEO, 04-2016) 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 (WTO 2015).[1]

However, in 2011, the PRC's growth rate started to decline and amounted to "only" 6.9% in 2015 according to official figures; many observers have assessed growth in the PRC 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 dealing with the concerns that the PRC's growth strategy is unsustainable, arguing that the PRC economy needs rebalancing[2] (meaning, among other things, a shift from an investment- and export-led to a more consumption- and inward-driven growth path). Hence, the PRC could soon be confronted with a further severe growth slowdown or could even enter a middle-income trap (MIT).[3] The latter term has already emerged in the political debate in the PRC. For example, in his speech at the World Economic Forum in Davos 2015, the PRC premier Li Keqiang mentioned the various reforms the PRC has to undertake in order to "successfully overcome the 'middle-income trap'."[4]

Our paper deals with the question of whether the PRC is in the MIT or will enter the MIT in the future. We discuss the relevant (basic and applied) MIT literature and apply various MIT definitions and triggering factor approaches to discuss the answers to this question.

The previous literature on the MIT and the PRC can be divided into two branches. There is *(A) basic research on the MIT* (i.e., cross-country studies[5] and case studies[6] that try to construct MIT definitions and/or find MIT triggering factors in general), often applying its results to the PRC. Furthermore, there are *(B) applied studies* particularly exploring the development indices (and "MIT triggering factors") in the PRC and attempting to derive policy implications to avoid the MIT.[7] While the papers of *branch (A)* discuss their implications for the PRC rather informally and parenthetically, we focus our attention on the PRC and apply, among others, the consensus results

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[1] In 2014, the PRC's share of the world's trade merchandise exports accounted for 12.33% – the corresponding US level was only 8.53%.

[2] For literature on rebalancing in the PRC, see, for example, Blanchard and Giavazzi (2005), Aziz (2006), Prasad (2009), Kawai and Lee (2015), and Wagner (2015, 2016). See also the 12th and 13th five-year plans of the PRC government.

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

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

[5] For example, Aiyar et al. (2013), Arias and Wen (2016), Eichengreen, Park, and Shin (2014), Bulman, Eden, and Nguyen (2014), Felipe, Abdon, and Kumar (2012), Felipe, Kumar, and Galope (2014), Han and Wei (2015), and Woo et al. (2012).

[6] Examples include Cherif and Hasanov (2015), Daude (2010), Daude and Fernández-Arias (2010), Egawa (2013), Flaaen, Ghani, and Mishra (2013), Hill, Yean, and Zin (2012), Jankowska, Nagengast, and Perea (2012), Jimenez, Nguyen, and Patrinos (2012), Jitsuchon (2012), and Tho (2013).

[7] For example, Cai (2012), Huang (2016), Islam (2014), Lee and Li (2014), Wagner (2015), Wen and Xiong (2014), Wu (2014), Yao (2015), Yiping, Qin, and Xun (2014), Zeng and Fang (2014), Zhang (2014), Zhang et al. (2012), and Zhuang, Vandenberg, and Huang (2012).

of branch (A) for predicting whether the PRC 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 the PRC 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 definition approaches, to analyze whether the PRC 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 the PRC 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 the PRC is or will be confronted with it in Section 3. In the latter section, we first analyze the definitions according to which the PRC is or will be in the MIT (or not) and 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 the PRC for assessing whether the PRC will enter the MIT. Finally, Section 4 briefly summarizes our main findings.

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 2016, 5–6; Glawe and Wagner 2016, 3–4).

There are critical voices that question the existence of the MIT. For example, Barro (2016, 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, the PRC *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 the PRC 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 the PRC 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; Agénor 2016; Glawe and Wagner 2016). As will become apparent in our discussion on the MIT in the PRC, 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 the PRC 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 two mathematical MIT models (Agénor and Canuto 2015 and Dabús, Tohmé, and Carabello 2016).) These problems must be incorporated in a discussion about the PRC's 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. IS THE PRC ALREADY IN THE MIT OR WILL IT BECOME TRAPPED IN THE FUTURE?

This section provides an extensive analysis of the PRC's MIT situation. In subsection 3.1 we first present the most important absolute and relative MIT definitions and apply them to the PRC before we turn to the MIT triggering factors in subsection 3.2 and extensively study their development for the PRC economy.

3.1 Definition Approach

In this section, we apply the majority of the empirical MIT definitions to the PRC. By doing so, we aim to answer several questions: First, according to which definition is the PRC already in the MIT (or, alternatively, has succeeded in surpassing the MIR)? Second, according to which definitions will the PRC 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 the PRC). 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 the PRC in particular) entering the MIT and identifying the most striking weaknesses of the empirical MIT definition approaches.

3.1.1 Empirical MIT Definitions Applied to the PRC

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 the PRC 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, the PRC had already been in the UMIR for two years; and (c) guess that it is very likely that the PRC will overcome the UMIR in less than a total of 14 years (until 2022).

We carry out a similar calculation: We extend the Maddison (2010) data on the PRC 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 the PRC 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 04-2016). Again our calculations show that the PRC had already left the UMIR in 2015, meaning that it only needed 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, the PRC had successfully overcome the LMIT and UMIT by 2016 and thus has avoided the MIT.[8] Of course, it is possible that the PRC 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, 6).

[8] It has to be mentioned that in a subsequent paper, Felipe, Kumar, and Galope (2014) 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. The PRC has to be out of the UMIR in 2023 – 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 2014 paper. In 2013, the PRC's GDP p.c. amounted to (Geary-Khamis) $10,018. According to Felipe, Kumar, and Galope's (2014) definition, the PRC 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, who projects a growth rate of 3.5%). Also, if we use the recent Conference Board Database (2016), the PRC would not be able to make the UMIR-HIR transition within 15 years only if it grew less than 1.19% p.a. between 2017 and 2023. If we use other combination of data (WEO 04-2016 since 2011; 2011–2016 Conference Board (2016) and IMF WEO 04-2016 afterwards; …), in all cases, the PRC would traverse the UMIR within 7 or 8 years. Moreover, in most cases, the PRC passed the upper UMIR threshold in 2015.

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 the PRC 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 series with the growth rate from the WEO (04-2016) until 2015, and discuss different forecast scenarios for the periods after 2015 to assess whether the PRC is already in the MIT.

As a first step, we extend the *PWT time series* with the IMF forecast, which gives us projections until 2021. Thus, we can check the period until 2014 for a growth slowdown in the PRC. If we use the PWT 6.3 and extend the data in the way described above, the PRC satisfies *conditions (1)–(3)* in 2009, and had, thus, experienced a growth slowdown in 2009 according to Eichengreen, Park, and Shin's (2014) definition. However, if we use PWT 7.1 instead of PWT 6.3, the PRC had not experienced a growth slowdown in that period, because condition no. 3 (GDP p.c. > $10,000) was not satisfied. Note, however, that the PRC fails to fulfill condition no. 3 only by a small amount ($478); thus, it seems that the PRC's growth slowdown is a borderline case according to Eichengreen, Park, and Shin's (2014) definition.[9] Moreover, we replace the IMF forecasts with growth projections from other studies (Conference Board 2010, pessimistic scenario; World Bank 2013; Bailliu et al. 2014; Albert, Jude, and Rebillard 2015; Zhang, Xu, and Liu 2015) to test for the cases in which the PRC is or will be in an MIT. Except for Albert, Jude, and Rebillard's (2015) projection, the PRC 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 ($478 in 2014).

We repeat the whole analysis with IMF data (*WEO (04-2016)*), 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 (04-2016) data into 2005 PPP constant international dollars to ensure the comparability of the following calculations with our results above. Our new results imply that the PRC experienced growth slowdowns in 2013 and 2014. No matter which growth forecasts we use (Conference Board 2010, pessimistic scenario; World Bank 2013; Bailliu et al. 2014; Albert, Jude, and Rebillard 2015; Zhang, Xu, and Liu 2015), the PRC 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 the PRC, mainly because the lower MIR bound associated with this definition is relatively close to the PRC's present-day p.c. GDP.[10]

[9] The IMF growth rate forecast (WEO, 04-2016) for the PRC for 2018–2021 is 5.47% p.a. If we assume in our calculations that the PRC grows at the same rate (5.47%) in 2022, then our calculations imply that the PRC was in the MIT in 2015 according to Eichengreen, Park, and Shin's (2014) MIT definition.

[10] We also extend the PWT 6.3, PWT 7.1, and WEO 04-2016 time series with the five-year plan growth rate for 2016–2020. Again, when using PWT 6.3 and WEO 04-2016 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.

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).

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, the PRC 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 (04-2016), World Bank (2013), and Albert, Jude, and Rebillard (2015). According to the OECD (2012) projection, the PRC's 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, the PRC will leave the MIR in 2022. If we use the forecast of the WEO (04-2016), the PRC will still be in the MIR by 2021 (37.26% of the US income) and will, at this point in time, still be more than 7 percentage points below the upper MIR threshold. Our calculations on the basis of the World Bank (2013) growth rate projections imply that the PRC will leave the MIR between 2021 and 2025 depending on the US performance.[11] If we base our calculations on more pessimistic growth forecasts (e.g. Albert, Jude, and Rebillard 2015), the PRC will stay in the MIR until 2024 (if the US grows at an average rate of 1.5% p.a.) or until 2030 (if the US grows on average at 2.4% p.a.). Overall, according to the World Bank's (2013) MIT definition, the PRC definitely *is* in the MIT and, according to our extensions, *it will stay* in the MIR/MIT for at least four 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 the PRC 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 the PRC was already in the MIR in 1960). Again, to assess how long the PRC 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 (04-2016) data (for the period 2011–2015) and projections (for the period 2016–2021). Our calculations on the basis of these data imply that, in 2021, the PRC will have been in the MIR for 14 years and will be more than 17 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 the PRC 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 the PRC avoids the MIT. Finally, we can also calculate some critical values for US and PRC growth rates for which the PRC escapes the MIT. Here are some examples: (1) If the US grows at an average of 2% p.a. over the period 2016–2058, the PRC must grow at a rate of at least 3.27% 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 2016–2058, the PRC must grow at an average rate of at least 3.78% (4.29%) 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 the PRC are close to the PRC's growth rates that are required in our

[11] In our calculations, we assume US growth rates of between 1% and 3% p.a.

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 the PRC 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 the PRC, we calculate that the PRC 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 the PRC 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 the PRC would just escape an MIT: If the US grew at an average rate of 2% p.a., the PRC would need a growth rate of at least 4.22% 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.), the PRC would need an average growth rate of at least 4.73% (5.24%). These minimum growth rates, which are required to overcome the MIT, are higher than those calculated in our application of Woo et al.'s definition; they are also higher than several growth forecasts for the PRC's economy. Thus, Bulman, Eden, and Nguyen's (2014) definition implies a higher probability of an MIT in the PRC than Woo et al.'s 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: The PRC 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)	2.77%	3.78%	4.29%
World Bank (2013)	before 1960*	before 2010*	57*	2021 (62)*	–	–	–
Bulman, Eden, and Nguyen (2014)	2005	2055	12	2042 (38)	3.71%	4.73%	5.24%

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

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

Our calculations reveal that most definitions do not imply an unambiguous result, because it strongly depends on the database and growth projections that are used. Only the World Bank (2013) study provides us with a clear result by stating that the PRC 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 (2014) and Woo et al.'s (2012) definitions imply that it is relatively unlikely that the PRC will face an

MIT; the former analysis also provides strong evidence that the PRC has already succeeded in overcoming the MIR without experiencing an MIT (or slower middle-income transition).[12] 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 the PRC's GDP per capita is a bit (around $480) bigger or not, the PRC 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 (the PRC is in the MIT, the PRC has successfully avoided the MIT, the PRC will face an MIT, the PRC will not face an MIT) are supported by the evidence/literature. Therefore, it makes sense to discuss the main weaknesses of the empirical definitions (in Section 3.1.2).

3.1.2 Weaknesses of the Empirical Definitions

As already pointed out in Section 3.1.1, the empirical definitions have various weaknesses. First, since most empirical MIT analyses are based on cross-country growth regressions, the empirical MIT definitions inherit the standard problems associated with these, e.g., measurement and specification errors, simultaneity bias, endogeneity problems, pooling, and sample selection bias (see Agénor 2016; and also Maddala and Woo 2000; Caselli, Esquivel, and Lefort 1996; Brunetti 1997; Agénor 2004; Durlauf 2009; Acemoglu 2009). Second, there are several other (rather conceptual) problems with empirical MIT definitions. In this section, we focus on the problems 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 3.1.1.

Different Definitions of MIR (Point I)

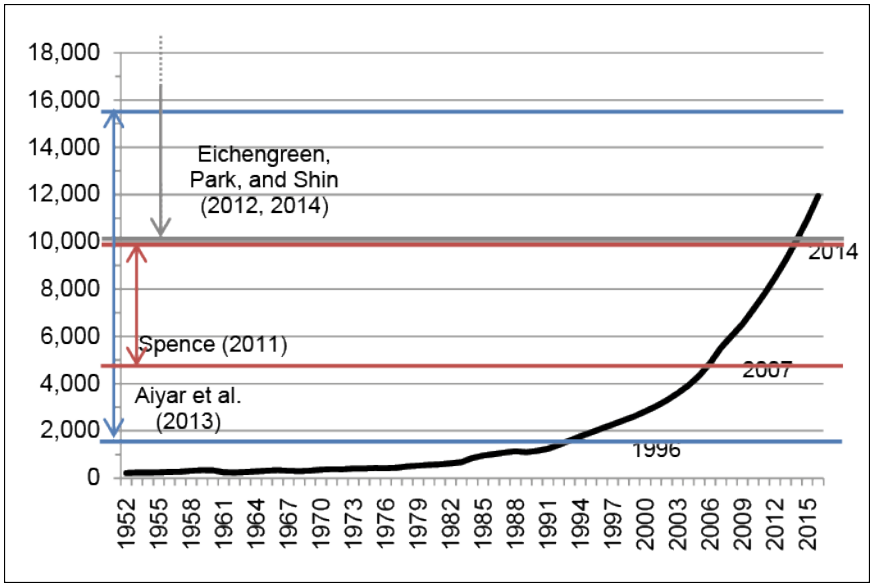
The main point of criticism relates to the *definition of the MIR* (point I). The middle-income thresholds *differ significantly across studies*. These differences, among others, generate the aforementioned (cf. end of Section 3.1.1) ambiguity of the results of the definition approaches regarding the question of whether the PRC 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.

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 The PRC. This fact is elucidated by Figure 1, where we depict the absolute thresholds mentioned above and the GDP development in The PRC (solid black line). We can see that: (1) Aiyar et al.'s (2013) MIR definition implies that The PRC has entered the MIR in 1996; (2) according to Spence's (2011) definition, The PRC hit the MIR in 2007; (3) Eichengreen, Park, and Shin's definition implies that The PRC has only been an MIC since 2014; (4) moreover, according to the definition by Spence (2011), The PRC

[12] 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 the PRC 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 3.1.2).

has already left the MIR; in particular, The PRC's output exceeds the upper MIR bound ($10,000) in 2014. Note that these MIR entrance dates are sensitive to database choice (for the PRC's GDP data), a problem which we discuss later (database discrepancy).

Figure 1: Absolute Thresholds and the PRC's GDP p.c. Development

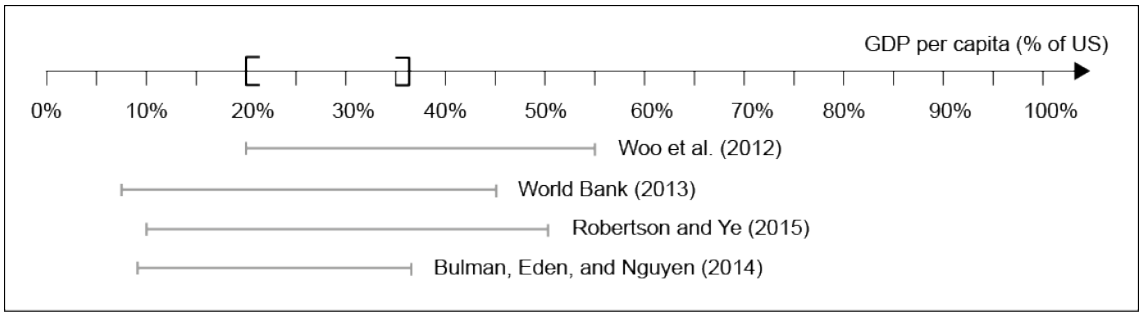


Data Source: PWT Version 7.1, WEO (04-2016), and own calculations. Thresholds are obtained from the authors mentioned above. Note: To obtain the PRC's GDP p.c. series for the period 1952–2016 (solid black line in Figure 1), we extend the PWT Version 7.1 data (PRC GDP per capita, PPP adjusted, at 2005 constant prices, 1952–2010) to 2016 by using growth rates of the PRC's GDP p.c. at constant prices (national currency), which we calculate on the basis of WEO (04-2016) 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., 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[13] 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 PRC's entrance date into the MIT (cf. Table 1).

[13] Note that this minimum range would not increase if we added additional studies to the diagram in Figure 2.

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)

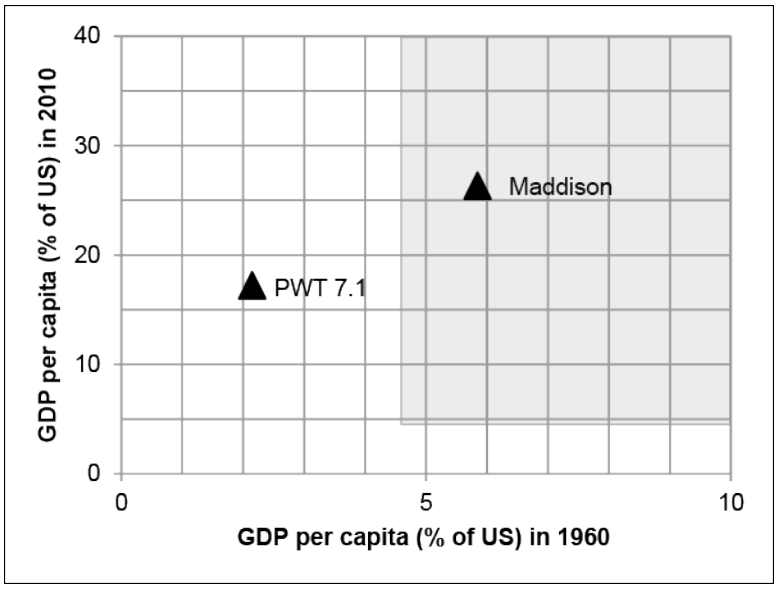
Different MIT studies use *different databases*. In the MIT literature, the most frequently used databases are Maddison (2010), PWT, IMF Database (WEO), and World Bank (WDI). Furthermore, there are different versions of most of these databases (e.g., Versions 6.3, 7, 7.1, and 8 of the PWT are used in 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 PRC's 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 the PRC as an MIT country: If we use Maddison data, the PRC is in the MIT; if we use PWT data, the PRC is not in the MIT.

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 PRC's 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.)[14] 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.

[14] Comparing the WEO Versions 04-2011 and 04-2016 reveals similar discrepancies: The PRC's GDP per capita (PPP, current int. dollar) differences range between $56 and $1,366.

Figure 3: Differences Within and Between Databases and Their Implications



Data Source: Maddison (2013) and PWT 7.1.[15] Thresholds (shaded square) are obtained from the World Bank (2013). The black triangles represent the PRC's GDP per capita (% of the US) plotted for the years 1960 and 2010.

Further Aspects (Point III)

One weakness of definition approaches (in contrast to triggering factor approaches), which has become apparent in their application to the PRC in Section 3.1.1, is the necessity of long-run GDP projections for assessing whether a country (and in particular the PRC) is *today* in the MIT. As we have seen in Section 3.1.1, 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 the PRC, we have to rely on long-run growth projections to assess whether a country/the PRC is in the MIT today, as demonstrated in Section 3.1.1. Thus, the assessment of the current MIT situation of the PRC 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.

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

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 (2016, 8) 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.

3.2 Triggering Factor Approach

As noted in Section 1, there is applied research (branch (B)) that studies the development indices in the PRC and tries to elaborate policy implications for ensuring long-run growth (and thus for avoiding the MIT) in the PRC. 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 the PRC.

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 the PRC and discuss whether these factors will trigger an MIT in the PRC.

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 incorporating all the studies we know. 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.[16]

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 (*).

[16] 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

	Cross-country (CC) or Case Study (CS)	CHN	EXR	CPI	DEB	GR	EXP	OPN	HC	INV
Aiyar et al. (2013)*	CC	X			(X)			(X)		(X)
Arias and Wen (2016)*	CC	(X)						X[i]		X
Bulman, Eden, and Nguyen (2014)*	CC	(X)	X	X	X			X	(X)	
Cherif and Hasanov (2015)	CS (MAL)						X	X	X	
Daude (2010)*	CS (LA/C)								(X)	
Daude and Fernández-Arias (2010)*	CS (LA/C)									
Eichengreen, Park, and Shin (2012)*	CC	X	X			X				X
Eichengreen, Park, and Shin (2014)*	CC	X	X			X	X		X	X
Egawa (2013)*	CS (A)								X	
Flaaen, Ghani, and Mishra (2013)*	CS (MAL)						X	X	X	
Felipe, Abdon, and Kumar (2012)*	CC	X					X			
Han and Wei (2015)*	CC				X					
Hill, Yean, and Zin (2012)	CS (MAL)			X	X		X	X	X	
Jankowska, Nagengast, and Perea (2012)*	CS (A/LA)	X					X			
Jimenez, Nguyen, and Patrinos (2012)	CS (MAL/THA)								X	
Jitsuchon (2012)	CS (THA)								X	X
Tho (2013)	CS (ASEAN)						X		X	
Yilmaz (2014)	CS (TURKEY)						X		X	
			3	2	4	2	**8**	6	**11**	5

continued on next page

Table 2 *continued*

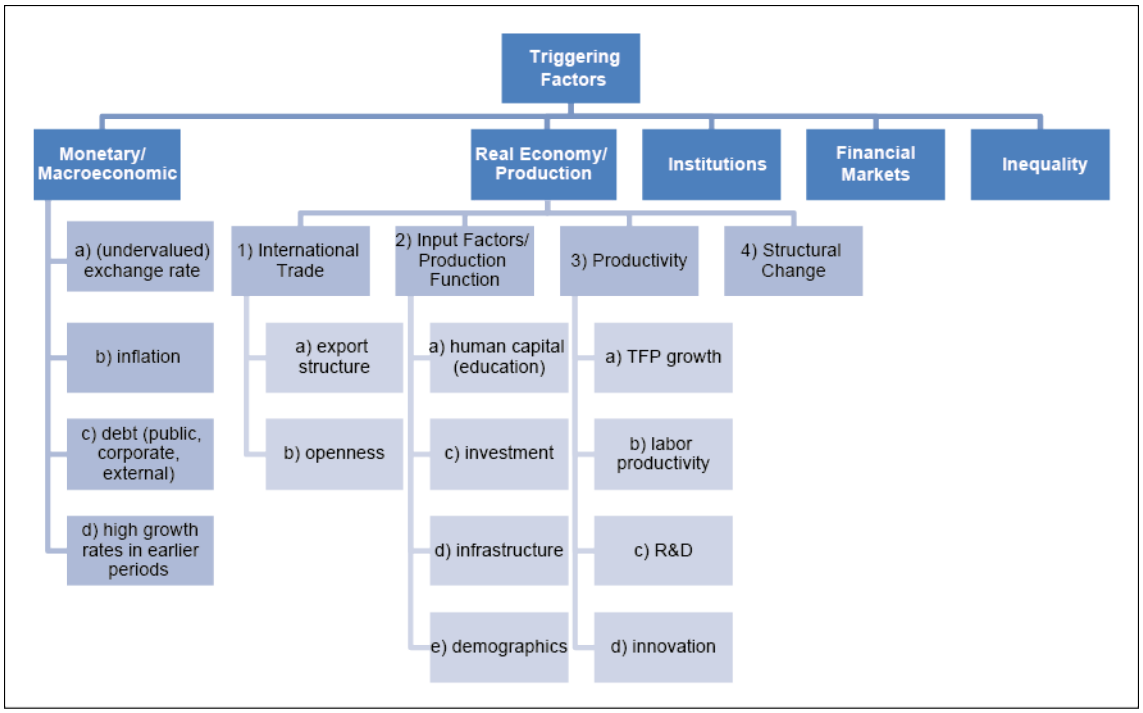
	INF	DEM	TFP	LAP	R&D	INN	SC	INS	FNM	INQ
Aiyar et al. (2013)*	X		X					X		
Arias and Wen (2016)*										
Bulman, Eden, and Nguyen (2014)*		X	(X)				X			X
Cherif and Hasanov (2015)	X		X	X[ii]	X	X				
Daude (2010)*		(X)	X			(X)		(X)	(X)	
Daude and Fernández-Arias (2010)*			X							
Eichengreen, Park, and Shin (2012)*		X	X							
Eichengreen, Park, and Shin (2014)*		X	X							
Egawa (2013)*										X
Flaaen, Ghani, and Mishra (2013)*	X		X	X		X	X			
Felipe, Abdon, and Kumar (2012)*							X			
Han and Wei (2015)*		X							X	
Hill, Yean, and Zin (2012)	X			X	X		X	X	X	X
Jankowska, Nagengast, and Perea (2012)*			X				X			
Jimenez, Nguyen, and Patrinos (2012)										
Jitsuchon (2012)			X		X	X		X		
Tho (2013)			X	X	X			X		
Yilmaz (2014)					X	X	X	X		
	4	5	**11**	4	5	5	6	6	3	3

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, THA = Thailand, ASEAN = Association of Southeast Asian Nations. Baseline studies that refer to the PRC are marked with an "X" in the third column (CHN = the PRC). [i]Arias and Wen (2016) refer to gross trade volume and market orientation. [ii] manufacturing output per worker.

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.[17]

[17] 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.

Figure 4: Triggering Factor Classification



Our analysis (briefly summarized in Table 3) reveals that the triggering factors related to the real economy/production appear to be most important, particularly **human capital** (identified by 11 out of 18 studies), **export structure** (identified by 8 out of 18 studies), and **TFP** (identified by 11 out of 18 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.

Table 3: MIT Triggering Factors – Aggregated Results

Factors	#
Monetary/Macroeconomic	11
Real economy/Production	70
→ international trade	14
→ input factors/production function	25
→ productivity	25
→ structural change	6
Institutions	6
Financial markets	3
Inequality	3

3.2.1 Human Capital

As already mentioned at the end of Section 3.2, 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), the PRC 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, 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).

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 PRC's education situation, we focus on the former.

The PRC's Case

We now take a closer look at the human capital and education situation in the PRC. With the beginning of the reforms in 1978, the PRC's education system [18] 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[19] and achieved significant improvements with respect to *primary education*.[20]

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 PRC's 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). 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 the PRC. In addition, we report data for India because of the similarity in size (geographically and with respect to the population) to the PRC. As the Barro-Lee (2013) data set is used by the majority of empirical studies, we base our analysis on it.

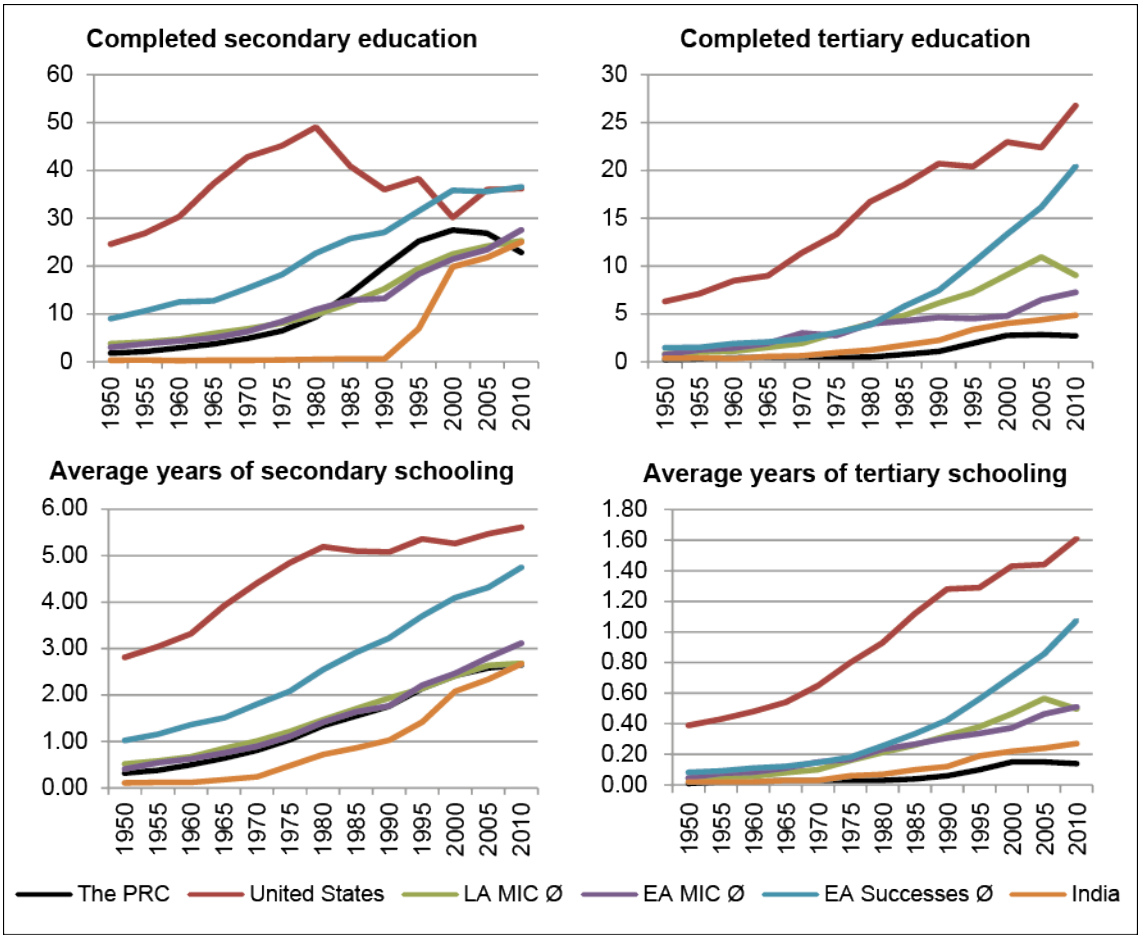
The data in Figure 5 reveal several facts. The *average years of secondary schooling* have increased continuously since the 1950s in the PRC. Over the period 1980–2000, the percentage of people with *completed secondary education* soared from 9.4% to 27.5%, a total increase of 193% and a yearly increase 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.

[18] The PRC's school system encompasses four major stages (neglecting the preschool/kindergarten), namely primary school (lasting 6 years), regular middle and high school (each lasting 3 years), followed by university or vocational college (at the age of 24 a general student will have attained his/her master's degree after 19 years of schooling) (see OECD 2015).

[19] The expenditures on education in % of total government expenditure grew from an average of 7.56% for the period 1976–80 to an average of 11% for the period 1981–85 and then further to 14% and 16.9% for 1986–90 and 1991–95, respectively (China Statistical Yearbook, 1996, own calculations). Despite these efforts, the PRC is still lagging behind in the global comparison. According to the OECD (2011), the PRC's expenditure on educational institutions (as % of GDP) accounted for 3.3% in 2008. This is not only significantly lower than the US level (7.2%) and that of the Asian success countries (e.g., 7.6% for the Republic of Korea) but also lower than the OECD average (5.9%). Even Brazil and Chile, which are often identified as MIT countries in the literature, performed better than the PRC.

[20] In 1986, the Compulsory Education Law, which made nine years of education mandatory for all children in the PRC, was passed. In the following years, the average years of total schooling increased from 5.72 in 1985 to almost 8 years in 2010 (Barro and Lee 2013) and the adult literacy rate climbed from 65.51% in 1982 to 94.29% in 1992. In addition, enrollment rates rose significantly (OECD 2015, 65).

Figure 5: Secondary and Tertiary Education in the PRC



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 MIC Ø stands for Latin American middle-income countries (average), EA MIC Ø for East Asian middle-income countries (average), and EA Successes Ø for East Asian success countries (average).

What does the cross-country comparison show? As we can see in Figure 5, in 2010, the PRC recorded the lowest indicator levels among all the countries in our sample. In particular, with regard to tertiary education, the PRC'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, the PRC 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 the PRC with respect to the secondary education indicators.

To control more clearly for the differences in the development stages between the PRC 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 the PRC had in 2010. According to the PWT 7.1 data, the PRC 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 the PRC's education indicator levels in 2010. Our findings are reported in Table 4.

Table 4: Secondary and Tertiary Education—the PRC and the East Asian Success Economies

	Completed Secondary Education	Completed Tertiary Education	Average Years of Secondary Schooling	Average Years of Tertiary Schooling
The PRC (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 economies average	**21.6**	**3.2**	**2.33**	**0.20**

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

Table 4 reveals that the PRC 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 the PRC. The Republic of Korea's tertiary education indicator values were more than 2.5 times larger than the corresponding PRC figures.

Overall, the education indicators show that the PRC 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 PRC tertiary education indicators in cross-country comparisons) is that the PRC's employment share in agriculture is relatively high,[21] given its development stage (as measured by GDP per capita).[22]

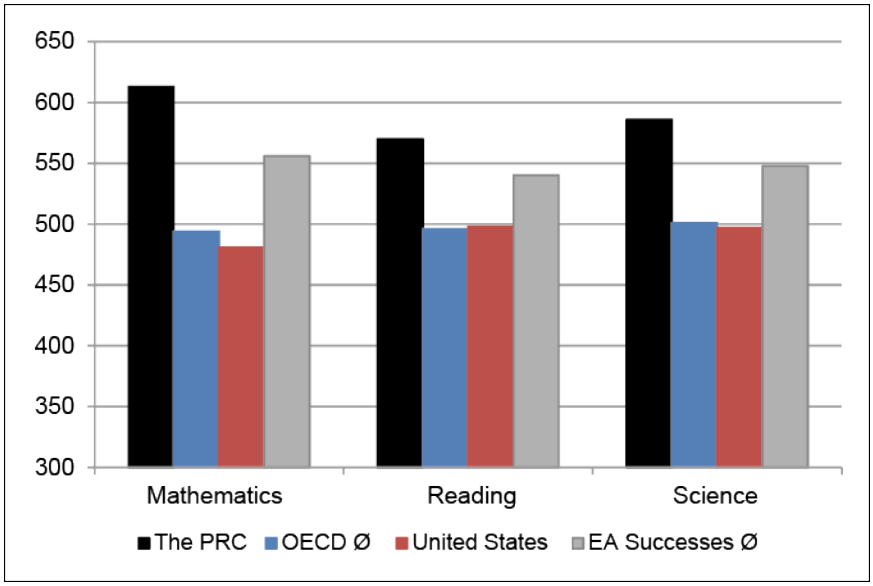
Next, we turn to the quality aspect of education. As mentioned above, the quality of education is much harder to measure than the quantity. One possibility is to analyze test scores. As the PRC did not participate in the TIMSS, we examine the 2012 PISA results. In all three main categories, Shanghai-the PRC'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-the PRC 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 the PRC is quite strong. In general, these results should be

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

[22] While the PRC's 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 the PRC 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 the PRC in 2010, the US employment share in agriculture was 20 percentage points lower than the PRC's share (see Lebergott 1966).

treated with caution since Shanghai's students need not be representative of the PRC's education system as a whole.[23]

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 the PRC (e.g., Zhang, Li, and Xue 2015, 196) and thus a potential triggering factor for an MIT. In 2013, around 46.27% of the PRC's population was located in rural areas and, according to NBS (2015), the rural-urban migrant workforce[24] was 277.47 million, representing 20.19% of the PRC's total population (cf. Yao 2014, 972).[25] 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, 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).[26] 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, 216).

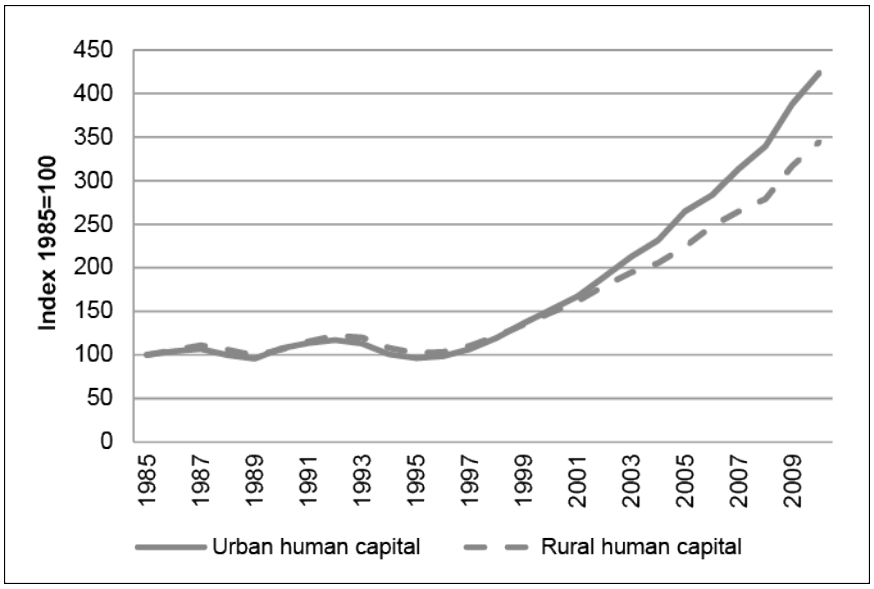
[23] Shanghai's share in the country's total population is small (about 1.78% in 2014, China Statistical Yearbook 2015, own calculation) and the GDP per capita is more than twice the PRC's average.

[24] Included are migrants who work outside their villages and towns for more than half a year and also those who are employed in the nonagricultural sector in their villages and towns, respectively (see NBS 2015).

[25] Especially in the 1990s, the rural-urban migration rose significantly; according to some estimates, the number of migrants exceeded 50 million by the mid- or late 1990s, which was 10% of the rural workforce (see Sicular and Zhao 2002, 6).

[26] Besides rural-urban education inequality there is also significant education inequality across PRC provinces (China Statistical Yearbook 2014, own calculations).

Figure 7: Urban and Rural Human Capital in the PRC



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 the PRC'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 the PRC 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 the PRC to create a well-educated workforce and thus avoid a potential MIT.

3.2.2 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, 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, 6; Paus 2014, 14).[27] 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,

[27] While this literature focuses on industry level data, there are also some more aggregated analyses: For example, Bulman, Eden, and Nguyen (2014, 15) estimate that, especially for UMICs, export orientation is associated with higher growth. Furthermore, Arias and Wen (2016) argue that countries installing policies that promote the export of manufactured goods are more likely to overcome barriers of technology transfer.

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[28] when they were confronted with the challenge that the middle-income transition countries like Argentina, Brazil, and Malaysia are facing today.

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[29] 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, 27).[30]

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, 24).

The PRC's Case

The previous discussion shows that the export structure is a key MIT triggering factor. Before discussing the PRC's export structure, first we focus on an interesting result obtained by Bulman, Eden, and Nguyen (2014). Their analysis shows that countries that avoided the MIT ("escapees") have an average export share in GDP of 60%, whereas "nonescapees" (i.e., MIT countries) have an average share of around 35% (Bulman, Eden, and Nguyen 2014, 12, Figure 7).

As shown in Figure 8, the PRC's export share has increased over the last four decades (and in particular since the WTO accession in 2001). It peaked in the mid-2000s at ca. 37%; in 2015, it was around 22.62%. (The declining trend since 2008 is due to the financial crisis, which led to a decline in global demand.) These data show that the PRC is somewhat below the 60% average of the escapees and very close to the 35% of the nonescapees reported by Bulman, Eden, and Nguyen (2014). Further evidence supporting this result is presented in Figure 8. We can see that the East

[28] Felipe, Abdon, and Kumar (2012) capture these properties of the export structure (diversification, sophistication, standardness, and potential for structural transformation) by using several indexes, including the export sophistication index (Hausmann, Hwang, and Rodrik 2007), the number of exported products with revealed comparative advantage (Balassa 1965), and the "open forest" index (Hausmann and Klinger 2006). We omit here a detailed discussion of these indexes, since it would be quite lengthy. See Felipe, Abdon, and Kumar (2012) for discussion.

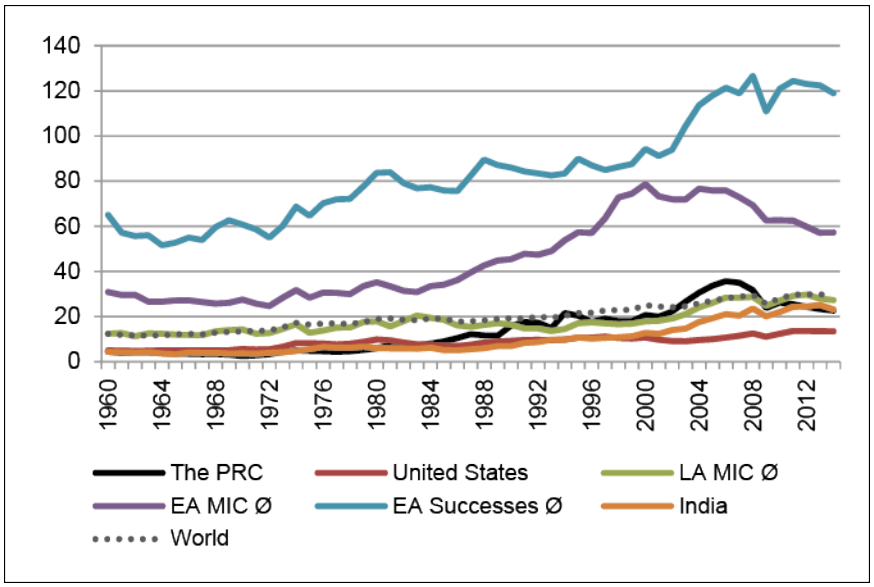
[29] Here, the term "far away" relates to the "proximity" of industries. Simply speaking, "far away" means that industries (e.g., industry A and industry B) use very different resources and skills and thus the (conditional) probability that a country exports the goods of one industry (A) is relatively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

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

Asian success countries and even the East Asian MIT countries have a significantly higher export-to-GDP ratio than the PRC. The GDP share of exports in the Latin American MIT countries is comparable to that in the PRC. Overall, according to these arguments, the PRC's low export share could trigger an MIT.

However, there are several counterarguments. Larger countries like the PRC, India, and the US can rely more on their domestic market than smaller countries. Thus, their import and export shares in GDP need not be as large as those of small countries. We can see that this fact is supported by the empirical evidence in Figure 8, where the US has an even smaller export share than the PRC. Furthermore, there is literature that argues that the strong export orientation of the PRC's economy is "unbalanced" and the PRC should reduce its export share.

Figure 8: Exports of Goods and Services (% of GDP)



Data Source: World Bank (2016). Own calculations.

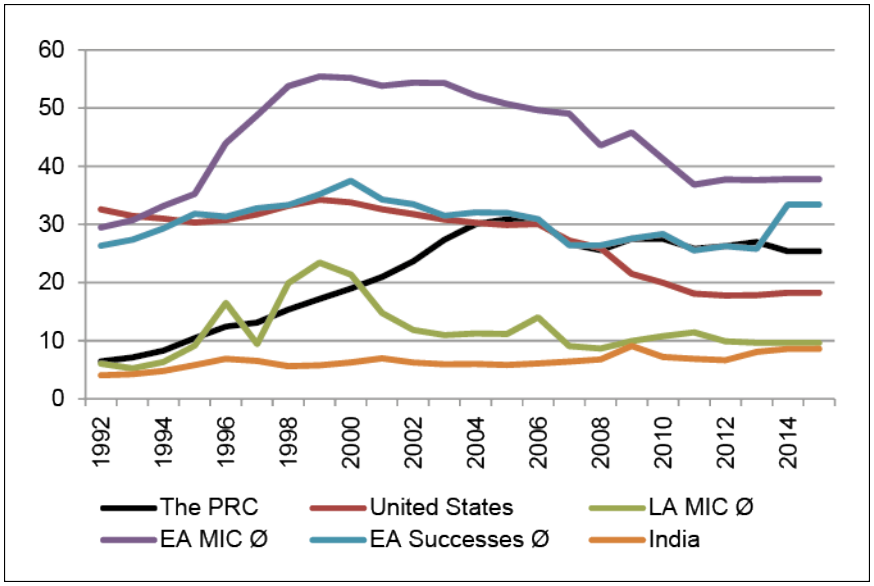
Now we turn to the export structure in the PRC. As mentioned above, several MIT studies, e.g., Eichengreen, Park, and Shin (2014), Jankowska, Nagengast, and Perea (2012, 34), and Flaaen, Ghani, and Mishra (2013, 16, 33), mention the importance of a large share of high-technology exports in total manufacturing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

As we can see in Figure 9, the PRC's 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 PRC's high-tech export share has been ca. 7 percentage points greater than the US share since 2011. It is noteworthy, however, that the domestic value added to most high-tech industries in the PRC is relatively low and the high-tech exports mainly originate from foreign-owned enterprises (see OECD 2008; Ma, Wang, Zhu 2013).

Interestingly, Figure 9 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

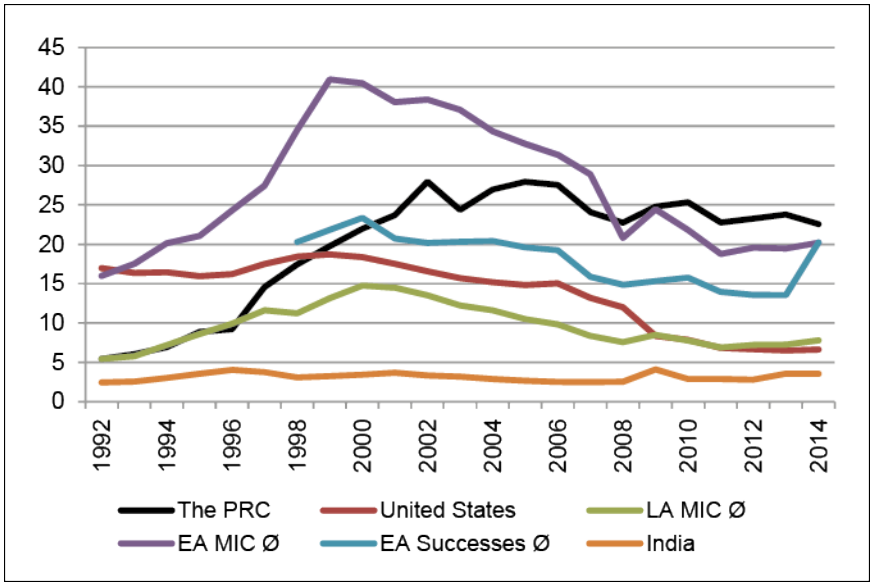
manufacturing exports in total exports (and/or of total exports in GDP). Therefore, we also take a look at the share of high-tech exports in GDP (see Figure 10).[31]

Figure 9: High-tech Exports (as % of Manufacturing Exports)



Data Source: World Bank (2016). Own calculations.

Figure 10: High-tech Exports (% of GDP)



Data Source: World Bank (2016). Own calculations.

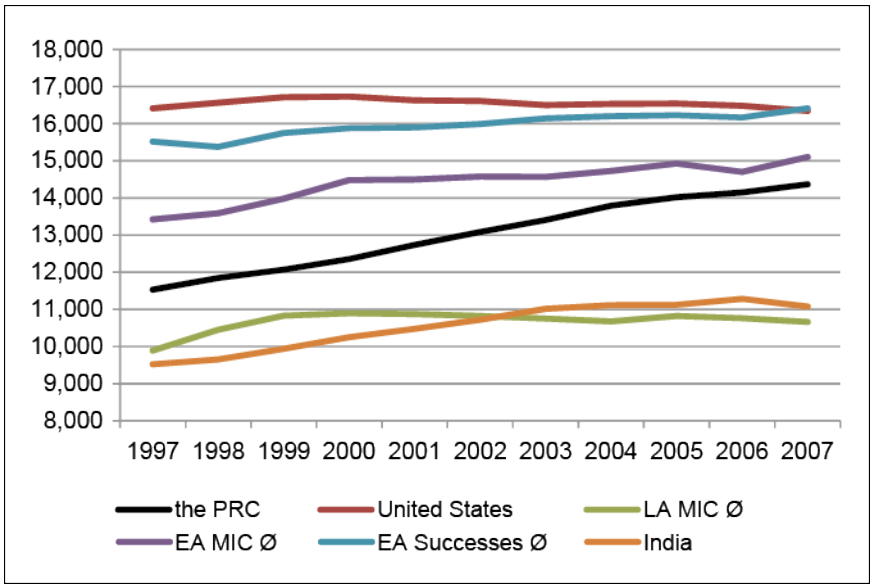
The first striking finding is that since 2008, the PRC has recorded the highest share of high-tech exports in GDP in our sample. This could be a hint that the PRC will be able to avoid an MIT. In general, however, Figures 9 and 10 imply that the high-tech exports share is not a reliable MIT predictor in our case: In Figures 9 and 10, (some) MIT

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

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.

Hausmann, Hwang, and Rodrik (2007, 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 2014) and captures the sophistication of a country's export basket by building the export-weighted average of the productivity levels for each exported good.[32] Various empirical studies argue that the PRC'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 11, the PRC 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.).

Figure 11: EXPY Index

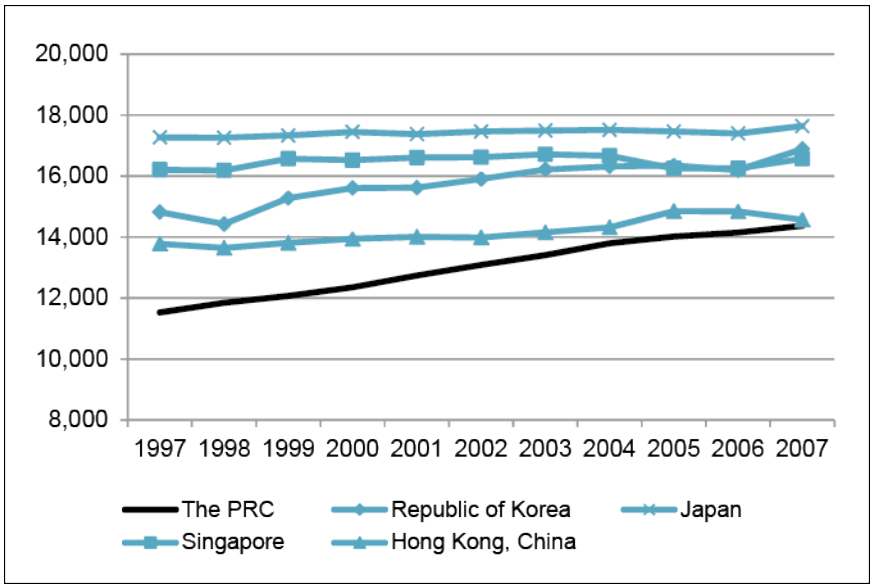


Data Source: Jarreau and Poncet (2009), own calculations.

However, although the PRC'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 East Asian successes (MIT countries) recorded an EXPY level that is 14.2% (5.1%) higher than the PRC's EXPY level. Nevertheless, the gap between the PRC and the East Asian success and MIT countries is closing significantly. Figure 12 reveals that the PRC 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).

[32] 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 12: EXPY Index—the PRC and the East Asian Successes



Data Source: Jarreau and Poncet (2009).

With respect to the PRC's "product space profile," Jankowska, Nagengast, and Perea (2012) argue that the PRC's revealed comparative advantages (RCAs) [33] have expanded significantly over the last few decades. 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. The authors state that by 2009, the PRC's "product space map" was more diversified than that of Latin American countries such as Mexico and Brazil, and even that of the Republic of Korea. Their analysis reveals that the PRC has great potential for further development in various industries and that the PRC's success will depend on how well it uses these advantages in the coming years (Jankowska, Nagengast, and Perea 2012, 42).

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

[33] RCA is an empirical indicator of comparative advantage introduced by Balassa (1965).

3.2.3 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).

Total factor productivity (TFP) indicates how efficiently the available production factors are transformed into final output (see Daude and Fernández-Arias 2010, 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, 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, the PRC, 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.

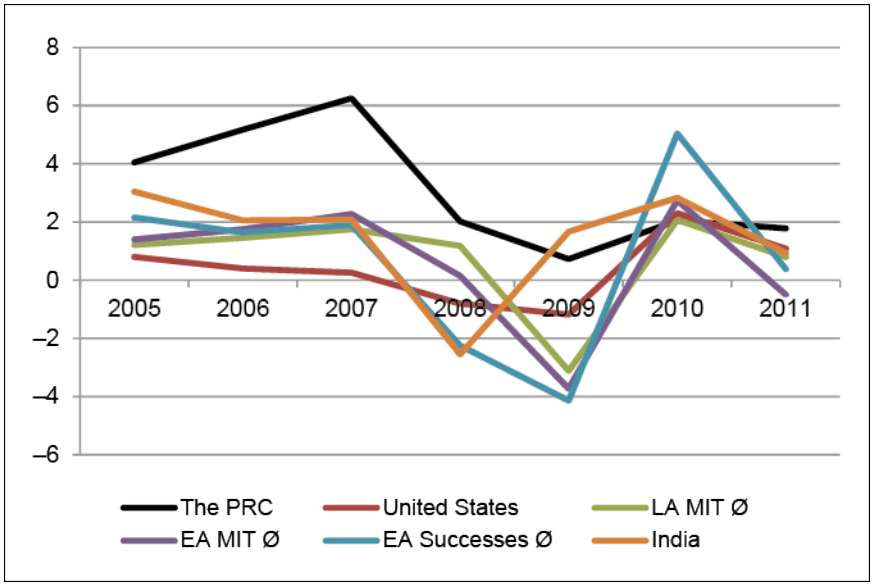
Overall, the literature implies that (i) having a high TFP growth rate in general (i.e., managing the transition from input-driven to TFP-driven growth) may help to avoid an MIT, and (ii) MITs may be associated with TFP growth drops.

The PRC's Case

In the literature, the estimates of TFP growth in the PRC (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 the PRC 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; among others) 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 PRC's 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 8), which depicts the TFP at constant national prices (2005=1), to calculate the TFP growth rates. According to these data, the PRC had an average TFP growth rate of 3.57% between 1978 and 2011, which is rather close to the optimistic estimates from the literature. As can be seen in Figure 13, in the four-year period before the financial crisis of 2007, the PRC had the highest average TFP growth in our selection of countries (4.62% p.a.). The global financial crisis of 2007 initiated a sharp decline in TFP growth for the whole sample. Even though the PRC recorded the highest average TFP growth rate in the post-2007 four-year period (1.64% p.a.), the difference between the PRC and the other countries in our sample has narrowed. In addition, the PRC 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 (with the exception of India) in our sample.

Figure 13: TFP Growth Rates

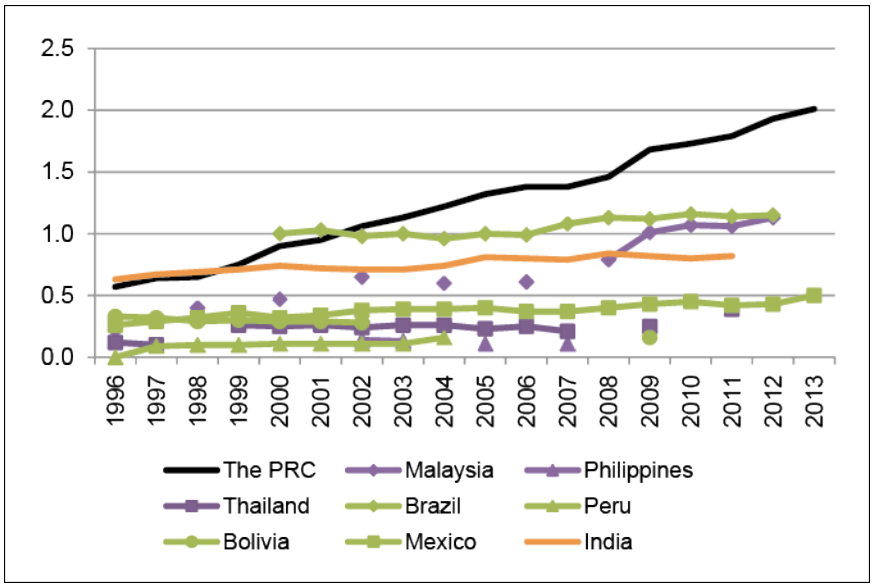


Data Source: PWT 8.0, own calculations.

Overall, the PWT data indicate that the PRC had a relatively high TFP growth rate in cross-country comparison (even in the period after 2007). However, the PRC 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.[34] 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 14, the PRC 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, the PRC 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 15).

Figure 14: R&D Expenditure (% of GDP)**—the PRC, MIT Countries, and India**

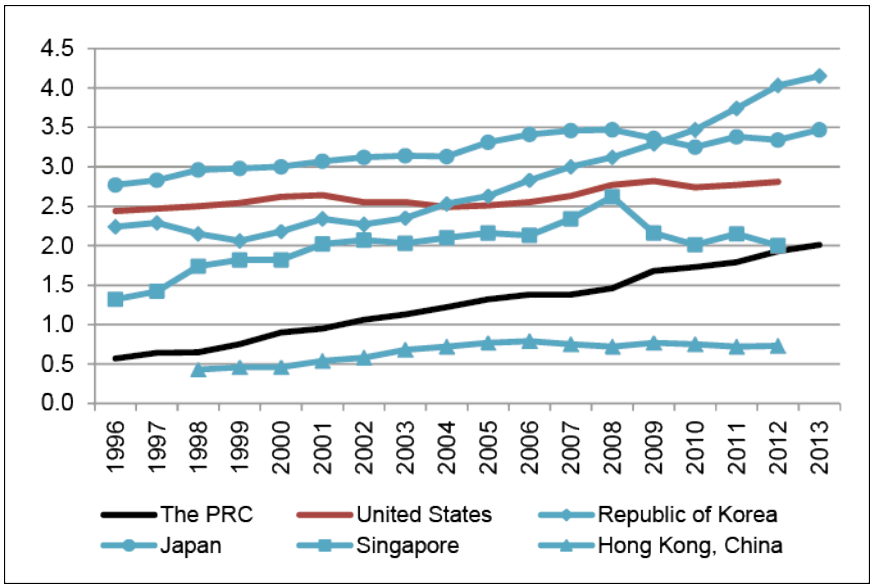


Data Source: World Bank (2016).

We can summarize our discussion as follows. The PWT data on TFP, which belong rather to the optimistic section of TFP estimates on the PRC, indicate that the PRC 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 the PRC. Thus, we cannot postulate here an unambiguous conclusion with respect to TFP as an MIT triggering factor in the PRC. Our results regarding the R&D expenditure, which is a major determinant of TFP growth, show that the PRC 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.

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

Figure 15: R&D Expenditure (% of GDP)**—the PRC, US, and East Asian Success Economies**



Data Source: World Bank (2016).

3.2.4 Summary: Triggering Factors

Table 5 summarizes our main findings with respect to the MIT triggering factors by listing most of the indicators discussed in Section 3.2. "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 the PRC 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 the PRC 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 the PRC and the severe rural-urban divide. We derive less clear results for the PRC's productivity performance due to disagreement on the PRC's TFP growth rate in the literature.

Table 5: Overview Triggering Factors—the PRC's Performance

Triggering Factor	Indicators	The PRC's 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 the PRC?)
Export	High-tech exports (% GDP)	CA
	EXPY Index	CA
	Product space profile	CA
Total Factor Productivity	TFP Index	?
	R&D expenditure (% of GDP)	CA

4. CONCLUDING REMARKS

In this paper, we have analyzed whether the PRC 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 the PRC's development does not yield unambiguous results. Depending on the MIT definition and database, we can find empirical support for all possible cases (1. the PRC is in an MIT, 2. the PRC is not in an MIT, 3. the PRC will be in an MIT, 4. the PRC 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 the PRC. First, most of our scenarios imply that the PRC *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 implies that the PRC *will soon be in the MIR but not trapped* in an MIT: In most scenarios the PRC enters the MIT only if the PRC's 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 the PRC will be confronted with an MIT and the future reforms seem to be decisive for the development of the PRC's 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) The PRC 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 the PRC. The picture is less clear regarding productivity because TFP data vary widely across studies. There is a clear need for future work that systematically investigates the relative importance of the various triggering factors (of those analyzed in this paper as well as others) on the basis of a model of the PRC's economic growth process that is yet to be developed.[35]

In summary, we come to the conclusion that the PRC definitely has the potential to further catch up with the high-income countries and avoid the MIT. However, the future performance of the PRC's economy depends on further reforms initiated by the PRC's policymakers.[36]

[35] For such a model, see Glawe and Wagner (2017).

[36] See in this context, for example, Wagner (2015, 2016).

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APPENDIX A

Table A1: MIT Triggering Factors—Applied Literature

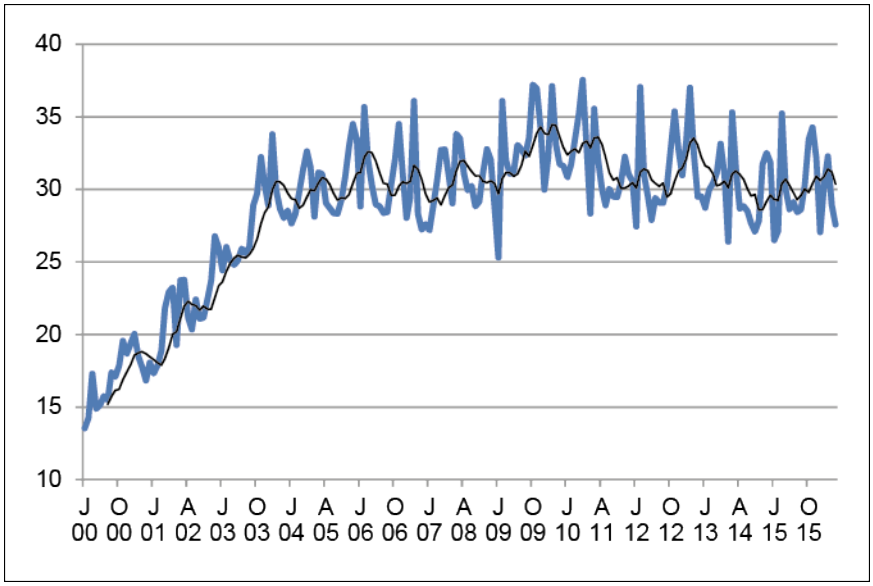
	EXR	CPI	DEB	GR	EXP	OPN	HC	INV	INF	DEM	TFP
Cai (2012)							X			X	X
Huang (2016)							X				
Islam (2014)											
Lee and Li (2014)											
Wagner (2015)			X								
Wen and Xiong (2014)											
Wu (2014)											X
Yao (2015)			X								
Yiping, Qin, and Xun (2014)*		X		(X)		(X)	(X)	X			
Zeng and Fang (2014)											
Zhang (2014)						X	X				
Zhang et al. (2012)							X				
Zhuang, Vandenberg, and Huang (2012)					X		X			X	X
		1	1	1	1	2	6	1		2	3

	LAP	R&D	INN	SC	INS	FNM	INQ	ST	HUK	POL
Cai (2012)					X					X
Huang (2016)		X	X		X	X				
Islam (2014)							X			
Lee and Li (2014)			X				X			
Wagner (2015)				X	X					
Wen and Xiong (2014)							X		X	
Wu (2014)										
Yao (2015)						X				
Yiping, Qin, and Xun (2014)*					X	X				
Zeng and Fang (2014)		X	X							
Zhang (2014)			X		X					
Zhang et al. (2012)							X			
Zhuang, Vandenberg, and Huang (2012)	X	X	X	X		X	X	X		X
	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 the PRC**



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