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Editor-in-Chief’s introductory note

Marina Sheresheva,
Lomonosov Moscow State University
(Russia)

Our contemporary world is highly interconnected. There are multiple interactions between states, businesses, and people. In such circumstances, long-term goals of sustainable economic development cannot be achieved by a single actor, even a major one. A combination of diverse resources and competencies plays a crucial role in the making of the winners of the future. That’s why partnerships at all levels, including collaborative alliances of countries, are just as important as competition.

Strengthening coordination and cooperation among the BRICS countries (China, Russia, Brazil, India, and South Africa) is one of the most impressive examples. These five countries together are the largest emerging markets in the world. BRICS is now taking on a constantly growing geopolitical role that stimulates a global shift in power, both politically and economically.

BRICS countries, which are transforming from regional leaders into the major players on the global arena, vary greatly, ranging from their size and population to their institutional environment. At the same time, many aspects of their economic development are not familiar to academics and practitioners from other countries, even to those from the five BRICS countries themselves. The world economic and business society needs a deeper understanding of the BRICS countries’ specifics and a more broad knowledge about prospects that emerge in these economies.

The BRICS Journal of Economics (BJoE) starts its work in the year of the Russian BRICS Chairmanship — 2020, in which the main emphasis is on the five countries’ cooperation in the field of digital transformation, as well as on boosting the role of sustainable and inclusive development agenda. It is a quarterly peer-reviewed journal that serves as a platform for encouraging research on internationally significant economic issues of middle-income developing countries, primarily BRICS countries. It was founded by the Faculty of Economics of Lomonosov Moscow State University, which holds high positions in the world ratings and has extremely broad partnerships with many leading universities all over the world.

The journal’s objectives are to expand knowledge about contemporary economic trends in the BRICS countries, theoretical approaches and relevant academic studies that shed light on economic developments within the BRICS countries, their joint economic activities, and the role and position of BRICS in the world economy. It welcomes original
research papers that present outcomes of initiatives and findings in all fields of economy and management in these countries. The scope of research includes, but is not limited to, the following:

- conceptual/practical approaches and methodologies of revealing characteristics of developing economies
- clarification of particular features intrinsic to developing economies, especially the BRICS countries
- development of approaches to boosting entrepreneurship, innovations, as well as cooperative behavior in and between developing economies
- assessing and determining the impact of economic policies on developing countries.

Independent quality control of our editorial policy is guaranteed by the International Editorial Board composed of eminent professors from different countries engaged in research in middle-income developing economies, primarily in the BRICS countries.

The first issue of BJoE contains five manuscripts written by ten authors located in different countries and affiliated with five different universities.
The quality of competition law institutions and enforcement
(Some comparative empirical evidence from BRICS and other countries)

Vasiliki Bageri,
Athens University of Economics and Business (Greece)

Yannis Katsoulacos*,
Visiting Professor, ESSEC Business School; Full Professor, Dept. of Economics,
Athens University of Economics and Business (Greece)


Abstract
Empirical work on the influence of competition policy relies on the construction of indicators for measuring certain attributes of the relevant laws and institutions that can be hypothesized to influence the “quality” of these laws and institutions and hence their effect on competition and economic performance. This paper contributes to the methodological literature on indicators of the quality of Competition Law Institutions & Enforcement (CLI&E) and to the empirical literature relating to the measurement of these indicators in different countries. It presents the results of a recent empirical study, which objective has been to measure indicators of the quality of CLI&E, using data collected through a Questionnaire based survey of competition authorities in a large number of countries and data available from international organisations for these countries. The measurement of the indicators relies on a new methodology that focuses on the factors influencing the extent to which CLI&E improves competition and so enhances economic performance.

The overall conclusion is that the three BRICS countries included in our survey (Brazil, Russia and South Africa) are coming closer to the advanced jurisdictions in terms of the specific features of the countries’ institutional and legislative set-up relating to CLI&E but still lag far behind in terms of the general conditions (economic, political, institutional, and socio-cultural) influencing the intensity of competition in a country.

Keywords: competition law, institutions, comparative empirical analysis.

JEL: L4, K21, L12.

* E-mail of the corresponding author: yanniskatsoulacos@gmail.com
1. Introduction

Competitive conditions in a country are fundamental for a more efficient resource allocation, lower prices, higher product quality, higher levels of innovation, increased productivity, ultimately higher growth, and social welfare. Furthermore, improved competition may favourably affect poverty reduction and redistribution of income and resources.

Several policies contribute to improving competition. Among these, competition law and specific regulators empowered to take measures that deter, identify, and prosecute anti-competitive conducts (such as cartels or abuses of dominance) and approve or prohibit notified concentrations can play a major role. A substantial amount of theoretical and empirical studies of the influence of both competition and competition policy on various dimensions of economic performance has already been undertaken.

Overall, the empirical literature shows that there is a statistically significant positive influence of various measures of competition intensity on innovation\(^1\), though the relationship may be inverse U-shaped (Aghion et al., 2005, 2009, 2014). Furthermore, it shows a positive influence of the quality of CLI&E on productivity growth. The former relationship is reviewed in Benetatou et al. (2018) and in Katsoulacos, Genakos and Houpis (2018)\(^2\). For discussions about and evidence on the latter relationship see Buccirrossi et al. (2011, 2013), Benetatou et al. (2018), Voigt (2013), Baker (2003, 2007), Borrell et al. (2008), Bradford Anu et al. (2015), Clauherty (2010) and Crandall et al. (2003), Dutz and Vagliasindi (2000), Howitt (2004), Kee and Hoekman (2007), Krokowski (2005), Ma (2011), Shelanski and Katz (2007), Winston (1993).

The empirical work on the influence of competition policy generally relies on the construction of indicators for measuring certain attributes of the relevant laws and institutions that can be hypothesized to influence the “quality” of these laws and institutions and hence their effect on competition and economic performance\(^3\).

Bradford et al. (2015) review a number of attempts of constructing indicators for measuring certain attributes of competition policy (or antitrust law) that can be hypothesized to influence economic performance (productivity growth or innovation). Apart from the attempts by Bradford herself and her co-researchers (see, for example, Bradford, Adam, 2018), one should mention here the articles by Buccirrossi et al. (2011, 2013), those of Voigt (2007, 2013), that of OECD (2013), Clauherty (2010), Guttman and Voigt (2014), and that by Hylton and Deng (2007). Our approach to constructing an indicator of the quality of Competition Law Institutions and Enforcement, which we describe in detail below, encompasses many of the features of the existing literature.

\(^1\) Nickel (1996) and Blundell et al. (1995, 1999) find a positive relationship between competition and innovative activity at the industry level. Aghion et al. (2005) present evidence that supports the existence of a bell-shaped relationship between competition and innovation at the firm level.


\(^3\) These indicators are also useful for providing a guide for the diagnostic work of international organisations needed in designing and in better tailoring their technical cooperation work that aims to improve competition conditions according to the needs of their counterparts.
We believe that it represents the most comprehensive up to date approach in terms of the extensiveness of factors taken into account that can have a potential influence on the effectiveness of CLI&E in improving competition and economic performance⁴.

More specifically, this paper adds to the methodological literature on indicators of the quality of CLI&E and to the empirical literature related to the measurement of such indicators. With regard to the latter, it presents the results of a recent empirical study, the objective of which has been to measure indicators of the quality of Competition Law Institutions and Enforcement (CLI&E) using the data collected through a Questionnaire based survey⁵ of Competition Authorities (CAs) in a large number of countries, as well as the data concerning these countries available from international organisations. The measurement of the indicators relies on a new methodology⁶ that focuses on the factors influencing the extent to which CLI&E improves competition and enhances economic performance (EP). Thus, the quality of CLI&E is thought of as measuring the effectiveness of CLI&E in enhancing EP⁷.

Another well-known recent attempt to construct CL indicators belongs to Bradford Anu and her collaborators (see article in Journal of Competition Law and Economics (2018). Their CL indicator (CLI) has different objectives, as is obvious from the approach used in its construction. Specifically, the goal of CLI is to provide a measure of the intensity or stringency of competition regulation by coding the elements of countries’ competition laws (so the indicator focuses on “law on the books”). The more types of behaviour the law prohibits or the more extensive remedies the law entails, the higher the CLI. At the same time, the more defences and exemptions the law provides, the lower the CLI. Researchers capture these elements by coding all laws containing competition provisions. Our methodology also contains a measure of stringency captured by one category of questions to which CAs are asked to respond in our survey under our Special Features indicator. But our indicators, along with much broader objectives, also capture a large number of other factors (they are more comprehensive).

It is worth reminding ourselves here that different jurisdictions are characterised by different degrees to which competition would be workable in products and services markets in the absence of CLI&E. The degree to which competition is workable depends on the anticompetitive conduct of firms, which CLI&E seeks to eliminate, and at the same time (may be even primarily) on the more general economic, political and socio-cultural conditions and characteristics in any given country, on its government’s policies that

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⁴ For example, unlike the Bradford and Chilton indicator, our indicator takes into account resources or efforts countries put into enforcing their competition laws and their ability to do so. Indeed, relying simply on a country’s law on the books we may overstate the stringency of the country’s competition law regime.

⁵ The study was commissioned and funded by EBRD. The author of this paper was the scientist in charge of the Questionnaire-based survey and the construction of the indicators utilizing the survey’s results.

⁶ Professor Frederic Jenny has participated in the EBRD study and contributed to the development of the methodology, and was responsible for the implementation of the construction of the General Conditions (GC) indicators (see below).

⁷ As Kovacic (2009) notes, an appropriate assessment of quality should focus on the extent to which CLI&E improves economic performance (EP). Thus, Q should be thought of as measuring the effectiveness of CLI&E in improving EP.
The quality of competition law institutions and enforcement

influence entry, trade and foreign direct investment barriers in the markets, on the degree of market concentration, on the quality of physical infrastructure, and on the provision of public goods, as well as on the levels of education and health care (which determine the availability and quality of human resources), and on the extent to which there are missing institutions and underdeveloped financial markets. This implies that the extent to which there is a need for CLI&E, the type of enforcement that should be applied when there is, and, ultimately, the quality of CLI&E in different jurisdictions depends on these “other” conditions and characteristics in each jurisdiction. And in some cases, it is relatively more important to have effective CLI&E in less developed countries (LDCs) as compared to DCs, while in other cases it is relatively more important to have effective CLI&E in DCs as compared to LDCs.

Consider, for example, the case of an anticompetitive conduct (e.g. refusal to sell or give access) that on its own can limit entry into markets and thus can create harm. In this case, in jurisdictions with low “other” entry barriers, CLI&E stops these conducts and thus increases welfare more effectively than in jurisdictions with high “other” entry barriers. In the latter case, eliminating the anticompetitive conduct and hence one barrier will not have much impact on EP (that is, removing CLI&E will not matter much because the counterfactual price that would prevail without the anticompetitive conduct is much higher in these latter jurisdictions). Thus, for this type of conducts, CLI&E is more important in advanced jurisdictions with low “other” barriers.

Consider, in turn, an anticompetitive conduct (such as some predatory pricing or rebate schemes) that on their own would not be able to limit entry into markets but can do so (and will be used in order to do so) when some other entry barriers or market failures are present. In this case, in jurisdictions with few “other” entry barriers or market failures, CLI&E will not be needed much, while in jurisdictions with many “other” entry barriers the value of CLI&E will be relatively very high. Also, we can say that if CAs do remain involved in enforcing Competition Law (CL) for such conducts, they should be using effects-based assessment procedures or legal standards in jurisdictions in which other barriers are relatively low, but should use per se legal standards (which are administratively less costly) in jurisdictions in which other barriers are relatively high (since in the latter case, the presumption of illegality of these conducts — i.e. presumption that they create harm — is much higher).

The next section describes the proposed methodology for the construction of aggregate indicators of the quality of CLI&E. In Section 3, we describe some results of the survey we undertook of the 38 EBRD countries of operation (including Russia), as well as of Germany, France, Sweden, UK, South Africa, and Brazil. Finally, section 4 offers concluding remarks.

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8 See, for example, Gal and Fox (2014), pp. 14–18. Also Nicholson (2008), who notes that: “(...) a significant gap exists between ‘laws on the books’ and the ‘rule of law’ in the realm of competition policy”.

9 This justifies our approach to break down the factors that influence the effectiveness of CLI&E in IEP in terms of general economic, political, institutional and socio-cultural conditions, and specific features of the institutional and legislative set-up relating to the CLI&E of each jurisdiction (see below).

10 See Katsoulacos and Ulph (2009, 2016) for a formalization of the notion of the presumption of illegality and how it affects the choice of legal standards.
2. A methodology for constructing indicators of the quality of CLI&E

Our methodology for constructing an indicator of the quality of CLI&E starts from the observation that CLI&E can improve competition by effectively detecting and stopping anticompetitive conduct of firms in a way that maximises benefits in economic performance (EP) (implying decision error minimisation), and by minimising recidivism. In this sense, the more effective is CLI&E, the greater the improvement in EP in terms of lower prices, improved quality of products and services, and enhanced innovation.

However, as already noted in the Introduction above, it is also recognized and taken into account that the extent to which there is a need for CLI&E, the type of enforcement that should be applied when there is, and, ultimately, the quality of CLI&E in improving competition and EP in different jurisdictions depends on many “other” conditions and characteristics in each jurisdiction — other than those associated with the specific institutional and legislative set-up related to CL. To reiterate, these factors include the more general economic, technological, political, and socio-cultural conditions and characteristics in any given country, its government’s policies that influence barriers to entry, trade and foreign direct investment in markets, and, more specifically, factors that contribute to a competitive environment in markets, such as, quality of physical infrastructure and provision of public goods, levels of education and health care (which determine availability and quality of human resources), and existence of missing institutions and underdeveloped financial markets.

Proceeding from this, the methodology we propose recognizes two distinct sets of factors that influence the quality of CLI&E:

1. **General economic, political, institutional, and socio-cultural conditions** (for short, henceforth, General Conditions, GC) of each jurisdiction. These General Conditions can be considered as complementary to CLI&E: the effectiveness of CLI&E depends on whether these conditions are favourable or not.

2. **Specific features of the institutional and legislative set-up relating to the CLI&E of each jurisdiction** (for short, henceforth, Specific Features, SF).

We start with the factors that are taken into account in order to construct the GC indicator (the General economic, political, institutional, and socio-cultural Conditions):

- **Quality of the country’s legal and judicial systems**¹¹
- **Degree of corruption**¹²

¹¹ The completeness of the legal system in terms of having in place property law, contract law, bankruptcy law, public procurement law, and the independence and effectiveness of the system (in terms of being free of influence from the executive, and in terms of the extent to which it is able to produce, without undue delays, error-free decisions) is fundamental for the smooth operation of markets and is a prerequisite for unhindered entry into and exit from markets, incentives to invest and risk-taking by entrepreneurs. Thus, higher quality legal and judicial systems constitute important (necessary, though not sufficient) factors for ensuring that there is high intensity of competition.

¹² Corruption has several deleterious effects on the competitive process. At the general level, the importance of corruption is an indicator of the weakness of respect for the rule of law in general, and of decisions of administrative authorities or courts. At the economic level, corruption means that the winners of the competitive game may not be the most efficient firms but the firms selected following the corrupt practices
• **Macroeconomic Environment** — proxied by FDI & GFCF\textsuperscript{13}
• **Size of the informal sector**\textsuperscript{14}
• **Regulatory burden — government barriers to competition**\textsuperscript{15}
• **Degree of trade liberalisation**\textsuperscript{16}
• **Quality of ICT, infrastructure, and logistics in economy**\textsuperscript{17}
• **Degree of availability of suitable quality human resources and financial resilience**\textsuperscript{18}

Data sources for measuring these factors and constructing an indicator of the favourableness of General Conditions are available in various international organisations, specifically: EBRD, WB, WEF, OECD, UNCTAD, IMF and WTO.

We next turn to the factors that allow us to construct the Specific Features (SF) indicator. These are divided into two sub-sets of factors:

A. Institutional pre-conditions for the effectiveness of the competition authority (CA).

B. Resources, productivity, and quality of enforcement of the CA.

Each of these two sub-indicators (abbreviated below as SFA and SFB) covers a large number of factors. Specifically, we divide these factors into 21 categories — 14 for SFA and 7 for SFB.

(for example, public procurements may not be attributed to the lowest bidders for a given level of quality). Thus, the effectiveness of competition and the efficiency of markets is likely to be weaker in corrupt countries than in others.

13 A stable macroeconomic environment, characterized by low and predictable inflation and sustainable fiscal policy, improves investment incentives or capital accumulation and productivity growth. This suggests enhanced incentives to enter markets to exploit opportunities and implies higher intensity of competitive pressures in markets.

14 The informal sector — the part of the economy, where operators do not rely on enforceable contracts — affects the effectiveness of competition law enforcement in a number of ways. First, within the informal sector, rules in general and competition law rules in particular do not apply. Second, in some industries, the informal sector may be competing with the formal sector, thus creating an uneven playing field with an unfair competition. Third, the informal sector can make competition law enforcement less effective. In particular, the definition of relevant markets and the assessment of the intensity of competition from firms in the informal sector becomes difficult for the competition authority. Thus, we expect that the larger the informal sector, the more limited will be the reach of competition law enforcement and the less effective the enforcement will be.

15 One of the main sources of restrictions to competition is public regulation which either prevents competition by limiting entry, or restricts the freedom of economic actors to freely compete. Thus, regulation induces lower levels of competition intensity in markets and makes competition law enforcement either impossible in the regulated sectors, or less effective than it would be without the restrictions imposed by regulation.

16 Competition law enforcement requires enabling public policies to be fully effective. *Trade liberalization* is thus a necessary complement to competition law enforcement as it allows foreign producers to compete among themselves and with domestic producers on the domestic market. International competition is particularly important in small economies or in developing countries in which there are only very few domestic suppliers.

17 The quality of ICT, infrastructure, and logistics is important for investment and economic growth. The relationship between the quality of ICT and infrastructure and competition is based on the fact that infrastructures allow mobility of goods and services through the economy and contribute to improved competition by allowing entry when the entrants have access to essential facilities.

18 Efficient financial markets and an educated workforce ensuring high quality of human resources facilitate market entry, risk taking, entrepreneurship, and innovation and are an important precondition for effective competition.
These 21 categories are the following:

A.1. Institutional features. These cover issues related to:
(i) Independence (that must be measured by taking into account both formal and factual conditions).
(ii) Powers during investigation.
(iii) Transparency and fairness of the process.
(iv) Accountability.

A.2. Completeness and quality of the competition law and of related statutes. These cover the following factors:
(i) Goals of CL and whether in practice they diverge from the goals of efficiency or protection of consumer welfare.
(ii) Scope of CL (Does the CA have competence in all the main categories of anticompetitive conduct?).
(iii) Advocacy role attributed to the CA (range of advocacy responsibilities assigned to the CA).
(iv) Prioritisation procedures.
(v) Completeness and quality of the secondary legislation.

A.3. Scope of competences:
(i) Compliance with the principle of competitive neutrality.
(ii) Sectors / firms exempted by CL itself or that can be exempted *ex post* by ministerial decree.

A.4. Enforcement tools:
(i) Existence and quality of a sanctioning regime.
(ii) Ability to impose remedies.
(iii) Existence and quality of a leniency program.

Concerning SFB — the indicator measuring the resources, productivity and quality of enforcement of the CA — seven sets of factors are taken into account:

B.1. Resources of the CA

B.2. Experience, learning-by-doing, investment in human capital, and knowledge base.

B.3. Productivity: output of enforcement activity (decisions) relative to resources.

B.4. Length of procedures.

B.5. Other activities that improve the quality of enforcement.

B.6. Quality of decisions.

B.7. Advocacy activities undertaken by the CA in practice and resources devoted to advocacy.

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19 Lack of human and financial resources can lead to underenforcement or to incompetent enforcement efforts that produce many errors and undermine the standing and reputation of the CA. It is widely recognised that while adequate resources are not a sufficient condition for effective antitrust enforcement, they undoubtedly constitute a necessary condition. The CA has to employ suitably educated and experienced economists, lawyers, and administrators and it must be able to offer attractive compensation schemes competing with the rest of the public sector and the private sector.

20 Here, we include activities that aim to reduce recidivism and collaboration of the CA with other regulators and the procurement agency.

21 Captured by the appropriateness of the adopted legal standards and hence the extent to which decision errors are minimized.
3. Some empirical findings

As mentioned above, the data for constructing the General Conditions (GC) indicator are available from a number of international organisations.

3.1. Data for constructing the SF indicator

The data for measuring the SF indicator were collected through the Questionnaire based survey. The Questionnaire consisted of 113 questions covering 21 categories of relevant factors identified above. It turned out that the responses to 94 out of the 113 questions could be finally utilised. The respondents were CAs.

3.2. Coverage

The Questionnaire was sent to the CAs of the 38 EBRD countries of operation. Of these, 30 responded: Albania, Armenia, Belarus, Bosnia, Bulgaria, Croatia, Cyprus, Egypt, Estonia, Georgia, Greece, Hungary, Jordan, Latvia, Lithuania, Moldova, Montenegro, Mongolia, North Macedonia, Poland, Romania, Russia, Serbia, Slovenia, Slovakia, Tunisia, Turkey, Ukraine, Uzbekistan, Kazakhstan. It was also sent to 4 countries with “advanced” jurisdictions: France, Germany, Sweden, the UK. Finally, Brazil and South Africa were included in the survey, ensuring responses from 3/5 BRICS, including Russia (that is also one of the EBRD countries of operation). Thus, a total of 37 countries were included and taken into account in the results presented below.

The responses to most of the questions were in the form of “Yes” or “No” answers, to which we assigned the value “1” or “0” respectively. For some questions a quantitative answer was required and to these an appropriate preliminary normalisation procedure was added (e.g. dividing the CA’s annual budget by a measure of the country’s nominal GDP). The variables (responses to the questions) were all normalised using the min-max procedure, and so all values were expressed as values between 0 and 1.

For filling in missing data (when there was lack of response) the *multivariate imputation by chained equations* (MICE) procedure was used. Finally, a linear aggregation was used to successively obtain more aggregate indicators using weights between 0 and 1 for each variable and then for each sub-indicator, according to which we considered the relative importance that should be assigned to the variable or sub-indicator in constructing a more aggregate indicator.

22 The min-max normalization method is as follows:

\[ x_{\text{norm}} = \frac{x - x_{\text{min}}}{x_{\text{max}} - x_{\text{min}}} \]

where \( x_{\text{min}} \) and \( x_{\text{max}} \) are the lowest and highest values in the sample respectively.

23 We wish to thank Prof. Katerina Kyriazidou and Mr. Germanos Hadjiathanasiou for their invaluable help in implementing this procedure. See also Van Buuren et al. (2011).
We present below some results that emerged from the survey of the three BRICS (Brazil, Russia and South Africa) and four advanced jurisdictions (Germany, France, Sweden and the UK), and we compare these to the averages for the 30 EBRD countries that responded to our survey and the averages of three groups of countries that we constructed in order to create “group dummies” for the purposes of imputing missing values. The three groups of countries are the following:

- Developing countries A (Czech Republic, Greece, Latvia, Slovenia, Cyprus, Lithuania, Hungary, Estonia, Slovak Republic, Romania, South Africa, Brazil, Turkey)
- Developing countries B (Georgia, Albania, Bulgaria, Serbia, Poland, Republic of North Macedonia, Croatia, Ukraine)
- Developing countries C (Tunisia, Armenia, Egypt, Jordan, Republic of Moldova, Uzbekistan, Montenegro, Bosnia and Herzegovina, Mongolia, Republic of Belarus, Kazakhstan)

The results are shown in the Tables below. First we show the sub-indicators SFA and SFB, then the aggregate SF indicator, then the GC indicator, and then the overall Aggregate Indicator.

**Table 1. Specific Features A indicator (SFA)**
(Institutional pre-conditions for the effectiveness of the competition authority)

<table>
<thead>
<tr>
<th>Countries</th>
<th>Indicator $SF_A$</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>0.951</td>
</tr>
<tr>
<td>France</td>
<td>0.869</td>
</tr>
<tr>
<td>Russia</td>
<td>0.856</td>
</tr>
<tr>
<td>Brazil</td>
<td>0.821</td>
</tr>
<tr>
<td>South Africa</td>
<td>0.820</td>
</tr>
<tr>
<td>Sweden</td>
<td>0.769</td>
</tr>
<tr>
<td>Germany</td>
<td>0.752</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Averages</th>
<th>Indicator $SF_A$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced</td>
<td>0.835</td>
</tr>
<tr>
<td>BRICS</td>
<td>0.832</td>
</tr>
<tr>
<td>Developing A</td>
<td>0.787</td>
</tr>
<tr>
<td>Developing B</td>
<td>0.673</td>
</tr>
<tr>
<td>Developing C</td>
<td>0.707</td>
</tr>
<tr>
<td>EBRD</td>
<td>0.753</td>
</tr>
</tbody>
</table>

**Table 2. Specific Features B indicator (SFB)**
(Resources, productivity, and quality of enforcement of the CA)

<table>
<thead>
<tr>
<th>Countries</th>
<th>Indicator $SF_B$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>0.713</td>
</tr>
<tr>
<td>UK</td>
<td>0.603</td>
</tr>
<tr>
<td>South Africa</td>
<td>0.566</td>
</tr>
<tr>
<td>France</td>
<td>0.556</td>
</tr>
<tr>
<td>Russia</td>
<td>0.552</td>
</tr>
<tr>
<td>Sweden</td>
<td>0.517</td>
</tr>
<tr>
<td>Brazil</td>
<td>0.418</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Averages</th>
<th>Indicator $SF_B$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced</td>
<td>0.597</td>
</tr>
<tr>
<td>BRICS</td>
<td>0.512</td>
</tr>
<tr>
<td>Developing A</td>
<td>0.360</td>
</tr>
<tr>
<td>Developing B</td>
<td>0.376</td>
</tr>
<tr>
<td>Developing C</td>
<td>0.354</td>
</tr>
<tr>
<td>EBRD</td>
<td>0.380</td>
</tr>
</tbody>
</table>
Table 3 shows the values of the SF indicator that is constructed using sub-indicators SFA and SFB with weights 0.5 each.

**Table 3.** Specific Features indicator, SF  
(Specific features of the institutional and legislative set-up relating to the CLI&E)

<table>
<thead>
<tr>
<th>Countries</th>
<th>Indicator SF</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>0.777</td>
</tr>
<tr>
<td>Germany</td>
<td>0.732</td>
</tr>
<tr>
<td>France</td>
<td>0.711</td>
</tr>
<tr>
<td>Russia</td>
<td>0.704</td>
</tr>
<tr>
<td>South Africa</td>
<td>0.693</td>
</tr>
<tr>
<td>Sweden</td>
<td>0.643</td>
</tr>
<tr>
<td>Brazil</td>
<td>0.619</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Averages</th>
<th>Indicator SF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced</td>
<td>0.716</td>
</tr>
<tr>
<td>BRICS</td>
<td>0.672</td>
</tr>
<tr>
<td>Developing A</td>
<td>0.574</td>
</tr>
<tr>
<td>Developing B</td>
<td>0.524</td>
</tr>
<tr>
<td>Developing C</td>
<td>0.530</td>
</tr>
<tr>
<td>EBRD</td>
<td>0.567</td>
</tr>
</tbody>
</table>

In Table 4, we transform the SF indicator values so that they lie between 1 and 10 in order to make the SF indicator comparable to the GC indicator shown below.

**Table 4.** Specific Features indicator, SF [1–10]  
(Specific features of the institutional and legislative set-up relating to the CLI&E)

<table>
<thead>
<tr>
<th>Countries</th>
<th>Indicator SF [1–10]</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>7.994</td>
</tr>
<tr>
<td>Germany</td>
<td>7.591</td>
</tr>
<tr>
<td>France</td>
<td>7.400</td>
</tr>
<tr>
<td>Russia</td>
<td>7.335</td>
</tr>
<tr>
<td>South Africa</td>
<td>7.238</td>
</tr>
<tr>
<td>Sweden</td>
<td>6.790</td>
</tr>
<tr>
<td>Brazil</td>
<td>6.573</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Averages</th>
<th>Indicator SF [1–10]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced</td>
<td>7.444</td>
</tr>
<tr>
<td>BRICS</td>
<td>7.049</td>
</tr>
<tr>
<td>Developing A</td>
<td>6.162</td>
</tr>
<tr>
<td>Developing B</td>
<td>5.607</td>
</tr>
<tr>
<td>Developing C</td>
<td>5.773</td>
</tr>
<tr>
<td>EBRD</td>
<td>6.099</td>
</tr>
</tbody>
</table>

**Table 5.** General Conditions indicator, GC [1–10]  
(General economic, political, institutional, and socio-cultural conditions)

<table>
<thead>
<tr>
<th>Countries</th>
<th>Indicator GC [1–10]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>8.044</td>
</tr>
<tr>
<td>UK</td>
<td>7.686</td>
</tr>
<tr>
<td>Sweden</td>
<td>7.502</td>
</tr>
<tr>
<td>France</td>
<td>6.826</td>
</tr>
<tr>
<td>South Africa</td>
<td>4.943</td>
</tr>
<tr>
<td>Russia</td>
<td>4.559</td>
</tr>
<tr>
<td>Brazil</td>
<td>3.896</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Averages</th>
<th>Indicator GC [1–10]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced</td>
<td>7.514</td>
</tr>
<tr>
<td>BRICS</td>
<td>4.466</td>
</tr>
<tr>
<td>Developing A</td>
<td>5.330</td>
</tr>
<tr>
<td>Developing B</td>
<td>4.260</td>
</tr>
<tr>
<td>Developing C</td>
<td>4.364</td>
</tr>
<tr>
<td>EBRD</td>
<td>4.824</td>
</tr>
</tbody>
</table>
Table 6 shows the values of the Aggregate Indicator that is constructed using sub-indicators SF and GC (Tables 4, 5) with weights 0.3 and 0.7 respectively. To the extent that this can be considered the minimum weight that can be assigned to GC, for which advanced countries have a significant advantage, our calculation of the Aggregate Indicator may be overestimating the relative performance of BRICS and EBRD countries.

<table>
<thead>
<tr>
<th>Countries</th>
<th>Aggregate indicator [1–10]</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>7.902</td>
</tr>
<tr>
<td>Germany</td>
<td>7.727</td>
</tr>
<tr>
<td>France</td>
<td>7.228</td>
</tr>
<tr>
<td>Sweden</td>
<td>7.004</td>
</tr>
<tr>
<td>South Africa</td>
<td>6.550</td>
</tr>
<tr>
<td>Russia</td>
<td>6.502</td>
</tr>
<tr>
<td>Brazil</td>
<td>5.770</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Averages</th>
<th>Aggregate indicator [1–10]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced</td>
<td>7.465</td>
</tr>
<tr>
<td>BRICS</td>
<td>6.274</td>
</tr>
<tr>
<td>Developing A</td>
<td>5.912</td>
</tr>
<tr>
<td>Developing B</td>
<td>5.203</td>
</tr>
<tr>
<td>Developing C</td>
<td>5.350</td>
</tr>
<tr>
<td>EBRD</td>
<td>5.717</td>
</tr>
</tbody>
</table>

3.3. Discussion of empirical results

1. Our findings indicate that the UK leads the countries in our sample in terms of the SF indicator (Specific features of the institutional and legislative set-up relating to the CLI&E) and in terms of the overall Aggregate Indicator of the quality of CLI&E. Germany leads the countries in our sample in terms of the GC indicator (capturing the general economic, political, institutional, and socio-cultural conditions influencing the intensity of competition in a country).

2. Probably the most interesting empirical finding emerging from our survey concerns the SFA indicator — the Institutional pre-conditions for the effectiveness of the CA (Table 1). The survey findings indicate that BRICS have made substantial improvements and have already reached the levels of the advanced jurisdictions in terms of these Institutional preconditions. Also, the average of the EBRD countries is not very far behind the advanced jurisdictions (0.835 versus 0.755). This may indicate that the work of international organisations such as OECD, the World Bank and the EBRD that were promoting the set-up of the institutional preconditions during the last 3 or so decades has paid-off.

Some important details concerning SFA are worth mentioning:

a) the advanced countries and the BRICS are essentially at the same level as regards A.1 and A.2 (Institutional features and Completeness of CL statutes respectively);

b) BRICS are, very interestingly, ahead of the advanced countries in “exemptions” and in the “sanctioning regime”, but they are far behind in their leniency programs. Thus, we find that the advanced countries have a less “stringent competition policy regime” (in the sense of Bradford et al., 2018) than the BRICS included in our survey;
c) among the three BRICS countries covered by our survey, Russia is slightly ahead as regards SFA, with Brazil and South Africa in second and third place (this ranking is reversed for SFB — see below).

3. Advanced countries are, however, still about 17% ahead of the BRICS as regards the SFB indicator — Resources, productivity and quality of enforcement of the CA (Table 2), and the gap rises to 35,2% for the EBRD countries average. In terms of sub-components, BRICS are ahead of the advanced jurisdictions (but only slightly) in resources, but they are far behind in experience and productivity.

Among the BRICS, the situation is reversed as regards SFB in relation to SFA. As for SFB, it is South Africa that is clearly in the lead, with Russia and Brazil in the second and third place respectively.

4. Overall, as for the SF indicator (Specific features of the institutional and legislative set-up relating to the CLI&E) (Tables 3 or 4), the “other” countries seem to have improved significantly in relation to the advanced countries: the gap between the BRICS and the advanced countries is only 6,4%, and the gap with the EBRD countries average is 13,2%.

5. But as anticipated, the advanced countries still perform much better in terms of the general Conditions (GC) indicator capturing the general economic, political, institutional and socio-cultural conditions which influence the intensity of competition in a country (Table 5). Specifically, they are 78,6% ahead of the BRICS and 94% ahead of the EBRD countries average.

6. Mainly as a result of this, and even with a weight of only 30% in the GC indicator and 70% in the SF indicator, the advanced countries are ahead in terms of the Aggregate Indicator of the quality of CLI&E by 20,5% in regard to the BRICS, and by 30% in relation to the EBRD countries average. As for the BRICS, South Africa tops the list of the Aggregate indicator, while Brazil is generally behind both in the SF sub-indicators and especially in the GC indicator and thus also in the Aggregate indicator (by over 12% in relation to Russia, which ranks second among the BRICS countries).

7. Finally, the three BRICS countries perform better regarding indicators SFA, SFB (and hence SF) than all the sub-groups of the Developing Countries (A, B, and C) and than the EBRD countries average (Tables 1—4). However, they perform worse than some sub-groups of Developing Countries (specifically group A) and than the EBRD countries average as regards the GC indicator (Table 5). But the lower value of the GC indicator is not sufficient to weight the BRICS’ superior performance in terms of the SF indicator and as a result, the BRICS rating on the Aggregate indicator is higher than that of all the sub-groups of the Developing Countries (A, B, C) and than the EBRD countries average.

4. Concluding remarks

This paper contributes to the methodological literature on constructing indicators of the quality of Competition Law Institutions & Enforcement and also to the empirical literature related to the measurement of such indicators. Specifically, it presents
the results of a recent empirical study, which objective has been to measure indicators of the quality of Competition Law Institutions and Enforcement using data collected through the Questionnaire based survey of Competition Authorities and data available from international organisations operating in the 38 EBRD countries (including Russia), four advanced jurisdictions (Germany, France, Sweden, the UK), Brazil and South Africa.

We ascertain that in terms of the Institutional Pre-conditions for the Effectiveness of the Competition Authority (our sub-indicator SFA), the three BRICS countries surveyed have made substantial improvements and have already reached the levels of the advanced jurisdictions in terms of these preconditions, while substantial improvements (on average) have been made by the other developing countries in our sample. However, the advanced countries are still about 17% ahead of the BRICS as regards our SFB indicator (Resources, productivity and quality of enforcement of the Competition Authority). Moreover, they perform significantly better in terms of the General Conditions indicator, being 78.6% ahead of the BRICS and 94% ahead of the EBRD average. Mainly as a result of this, the advanced countries are still significantly ahead in terms of the Aggregate indicator of the quality of Competition Law Institutions & Enforcement — by 20.5% in relation to the BRICS and by 30% in relation to the EBRD countries average.

The overall conclusion is that the three BRICS countries included in our survey are converging to the advanced jurisdictions in terms of the Specific Features of the institutional and legislative set-up relating to the CLI&E (captured by the indicator SF), but still lag far behind in terms of the General Conditions (GC) indicator, capturing the general economic, political, institutional, and socio-cultural conditions influencing the intensity of competition in a country.

References


Schmutzler, Ar. (2010). *The relation between competition and innovation: Why is it such a mess?* Working paper, Socioeconomic Institute, University of Zurich, 0716.


The effect of reverse knowledge spillovers on the total factor productivity in emerging markets

Andrei Panibratov*,
Graduate School of Management, St. Petersburg State University (Russia)

Megan Fitzpatrick,
Research Fellow, Center for the Study of Emerging Market and Russian MNEs, St. Petersburg State University (Russia)


Abstract

The aim of this paper is to shed the light on the phenomenon and mechanisms of knowledge spillovers from developed economies to emerging markets through the lens of productivity effects. We hypothesize on the impact of foreign R&D stocks on the total factor productivity growth in emerging markets and on the moderating effect of R&D stocks on the knowledge spillover effects. We use panel data from 38 countries for the period of 2001–2014. Our findings suggest that firms investing in developed markets are able to improve TFP growth via reverse spillovers. Two important findings having managerial value are that, on average, the effect of OFDI on productivity becomes apparent three years after the initial investment. The study also indicates that investment efforts have a negative effect on TFP growth in the year of investment. This research contributes to the existing literature by analyzing bilateral FDI stocks between emerging and developed markets and the impact of both traditional and reverse spillovers on TFP growth in developing economies.

Keywords: foreign direct investments (FDI), total factor productivity (TFP), multinational enterprises (MNEs), research and development (R&D), emerging markets.


1. Introduction

The birth of emerging market multinational enterprises (EMNEs) occurred during the so-called “second wave” of internationalization in the 1980’s. However, the past two decades

* E-mail of the corresponding author: panibratov@gsom.pu.ru
have witnessed a massive increase in outward foreign direct investments (OFDI) from these firms. Although developed countries’ MNEs still account for the bulk of OFDI flows (UNCTAD, 2015), EMNEs have gone from relatively insignificant in this sphere to formidable world players in an astoundingly short period. According to the 2015 World Investment Report, between 2000 and 2014, the total value of OFDI from developing countries increased from less than $100 billion (about 7% of the world total) to $468 billion (35% of the world total). This rapid and aggressive internationalization patterns of EMNEs seem to defy the classical internationalization theory used to explain the strategies of developing market firms. The subject has therefore recently drawn significant attention from the academic world which seeks to explain the peculiarities of this type of firms.

The tendency of many EMNEs to establish subsidiaries in developed markets (DM) early in the internationalization process is of particular interest. Dunning’s (1977) eclectic paradigm calls for direct investment in a market (as opposed to exports and licensing) in cases when there are clear ownership, location, and internalization advantages for the firm to exploit. For EMNEs operating in developed countries, these advantages, especially ownership-based, are often unclear or non-existent. A compelling explanation of this phenomenon is that the FDI of these firms is knowledge- or strategic asset-seeking (Dunning, 2000). Strategic asset-seeking FDI is less concerned with exploiting existing advantages and more with enhancing firm-specific advantages via acquisition of new, superior knowledge or technology (Dunning, 2000; Chen et al., 2012). Luo and Tung (2007) suggest that EMNEs often use foreign investment as a “springboard” for quick acquisition of resources necessary to compete against more established global market players and to mitigate risks they face in their home markets. In other words, firms from technologically deficient countries invest in technologically advanced countries (Kogut & Chang, 1991; Kuemmerle, 1999) in an attempt to close this technological gap. Accordingly, there is an enhanced performance effects from knowledge spillover mechanisms under industries growth (which is the typical characteristic for dynamic markets, such as BRICS and beyond), and the pace of developments in growth industries increases the importance of access to knowledge (Stanko & Olleros, 2013).

The hypothesis that EMNEs’ investments abroad are motivated by knowledge and strategic asset acquisition is well-supported in the literature (Makino et al., 2002; Deng, 2009). Nonetheless, OFDI remains an extremely high-risk approach to obtaining these technological and knowledge-based assets. A decision to invest as opposed to purchasing the rights to these assets in the form of intellectual property (IP) must be justified. Multiple empirical evidences suggest that R&D investment is positively related to economic growth (see, e.g., Wang et al., 2013). Therefore, while understanding the EMNEs’ motives for investing abroad remains an important research question, it is equally important to understand whether these investments actually result in increased productivity at home.

The limited literature that deals with answering this question reveals a critical mechanism of obtaining effect known as an R&D, technological, or knowledge spillover. In general terms, knowledge spillover is defined as a process by which one party (firm) uses knowledge created by a second party in order to augment its own productivity without
The effect of reverse knowledge spillovers

directly or fully compensating the second party (Javorcik, 2004), due to a “free launch” (Eden, 2009). Knowledge spillovers differ from knowledge transfers in that spillovers are an externality, or unintended diffusion of knowledge from one entity to another. Spillovers from a host market to an investing market are known as “reverse spillovers”.

In this paper, we seek to analyze the knowledge flows from developed markets to emerging markets (EM) in the form of knowledge spillovers in order to ascertain whether the ‘springboard’ strategy of EMNEs results in the desired productivity gains. Specifically, we attempt answering two research questions:

1) Are emerging market firms that invest in DM able to take advantage of knowledge spillovers to increase productivity? If so, to what extent?
2) What factors influence the magnitude, direction, or significance of this effect?

The paper is organized as follows. We begin by reviewing existing literature on the subject, both empirical and theoretical. We then develop an empirical model of relationship between spillovers and total factor productivity growth based on the works of van Pottelsberghe de la Potterie and Lichtenberg (2001), and Armann and Virmai (2014). Next, using country-level panel data from 29 emerging markets and 9 developed markets for 2001–2014, we run a fixed-effects generalized least squares regression to empirically estimate this relationship. We then interpret the empirical results and draw conclusions on their managerial and policy implications. We conclude with a description of the limitations of the study and suggest potential avenues for future research.

2. FDI reverse spillovers

2.1. Knowledge spillover literature

Until recently, the bulk of FDI spillover literature focused on transfer of knowledge from investing firms to a recipient company abroad. Indeed, there is an ample body of work dedicated to the topic. This literature identifies four major channels through which the diffusion of technology and knowledge from foreign subsidiaries to local firms is thought to occur (Hoekman & Mattoo, 2006; Zhang et al., 2010). The first channel is a demonstration effect, wherein local firms observe practices and technologies of their foreign competitors and imitate them in their own operations. The second channel is labor turnover; when employees of foreign firms leave in order to work at local counterparts, they bring with them valuable knowledge from their previous employers. Thirdly, spillovers may occur through domestic linkages (Spencer, 2008) or intentional vertical technology transfer from foreign firms to domestic (local) suppliers or distributors which eventually are diffused to other local firms with the same partnerships (Gallego et al., 2013). Finally, increased competition may force domestic firms to increase productivity by adopting new technologies and managerial practices (Blomstrom & Kokko, 1998; Zhang et al., 2010).

Early studies (Caves, 1974; Globerman, 1979; Blomstrom & Persson, 1983) focus mainly on the internationalization of developed markets (the United States, Canada). They provide some evidence of the spillover effect by showing that industries with higher degrees
of foreign presence (as measured by share of foreign investing enterprises in capital, output, or employment (Tian, 2007)) were relatively more productive than other industries. Aitken and Harrison (1999) challenge the results of these studies pointing out an unaddressed endogeneity problem. The correlation between FDI and productivity could very well occur in the opposite direction: high productivity sectors attract more foreign investment. In order to account for this, many recent studies also investigate firm-level impact rather than industry-level.

Since this shift in the literature occurred, results of empirical studies on spillovers became more mixed and ambiguous (Görg & Strobl, 2001; Tian et al., 2015). Gorg and Greenaway’s (2004) meta-analysis of spillover literature indicate that out of 40 studies, 20 provide evidence of positive knowledge spillovers, 17 show no compelling evidence, and eight studies even suggest significant negative spillover effects. Notably, in a firm-level study in Morocco, Haddad and Harrison (1993) show that while FDI has a positive level effect on local total factor productivity (TFP), it has no effect on TFP growth rate. More bleakly, in a study of Venezuelan firms, Aitken and Harrison (1999) observe that domestic productivity declines as foreign investment increases. They hypothesize that the competition effect of FDI compels local plants to lower output and forgo economies of scale. Tian et al. (2015) discover that although the net effect of FDI on domestic TFP is positive, in the case of wholly owned foreign enterprises, there is strong evidence of skill- and market-stealing that negatively affects local firm productivity.

2.2. Reverse spillovers

In contrast to the vast body of literature addressing knowledge spillovers from foreign subsidiaries to domestic firms, the one that addresses the opposite phenomenon — “reverse spillover” — is relatively scant. Though Driffield and Love coined the term only in 2003, the idea of host-home knowledge flows as a mechanism to improve productivity had been explored earlier in the context of exporting firms in the form of “learning by exporting” (LBE) hypothesis.

2.2.1. Learning by exporting

This hypothesis states that export activity facilitates knowledge spillovers and ultimately increases productivity via two main mechanisms. First, exporting firms can benefit from linkages with foreign buyers who may provide technical assistance or specify high quality products. Second, exporting firms are exposed to the competitive pressures of an international marketplace forcing them to adopt new technologies and practices in order to survive (Haidar, 2012). The consensus among the authors on this topic is that exporting firms are, with few exceptions, unequivocally more productive and more often than not higher-growth than non-exporting ones (Wagner, 2007). That being said, evidence that this productivity boost stems from LBE rather than self-selection of more productive firms is less conclusive (Fernandes & Isgut 2008). While some studies show knowledge spillovers between exporting firms and foreign buyers (Salmon & Shaver, 2005), Wagner’s (2007)
a meta-analysis of the extant literature indicates that in most cases, there is no statistically significant post-entry difference in the productivity of exporting and non-exporting firms. However, other authors (Martins & Yang, 2009) suggest and find evidence to support the theory that due to a greater differential in technology between a home country and an export destination, less-developed countries have LBE at a higher incidence.

Over the past decade or so, researchers expanded their understanding of this exploration by examining the impact of OFDI on the TFP of parent companies. Justification of direct investment in order to capture knowledge spillovers is compelling. Physical presence in developed markets is required for EMNEs to access this knowledge for three reasons. First, the authors indicate that the types of networks which foster innovation (comprised of suppliers, competitors, educational centers) are spatially bound and not easily replicable elsewhere (Globerman et al., 2005). Second, technological knowledge tends to be tacit, complex, and highly system dependent (requiring many individuals for knowledge production and adoption) and is thereby not easily transferred in the form of IP (Simonin, 1999). Finally, DM firms are often unwilling to divulge sources of their competitive advantage to their rivals and take great pains to protect those (Feinberg & Gupta, 2009). Therefore, EMNEs must establish themselves within an innovation network to access the knowledge therein.

2.2.2. Reverse FDI spillovers

The sources suggest that mechanisms by which reverse knowledge spillovers can occur are similar to those through which their traditional counterparts occur. First, subsidiaries can access knowledge through local supply chains (Javorcik, 2004). Second, they can acquire technology through interaction with local innovation leaders, such as universities, scientists, and research centers (Chen et al., 2012). Finally, subsidiaries in a foreign market have access to high-quality workers and graduates in the local labor pool (Moen, 2005).

Early empirical studies on reverse spillovers focus on the investment activities of DM MNEs. These studies have yielded mixed results. The inventors of the term, Driffield and Love (2003), were among the first to investigate and find evidence for the knowledge flow that occurred from a subsidiary to a parent firm via outward FDI. In the course of research in the UK, they found that technology generated by the domestic sector spilled over to foreign MNEs. This effect was restricted to R&D-intensive sectors and affected by the spatial concentration of the industry. Castellani and Barba Navaretti (2004) provided more evidence to support the existence of reverse spillovers and established a causal link between OFDI and TFP by showing that Italian MNEs outperformed domestic competitors. Similarly, Iyer, Stevens and Tang (2011) found evidence for reverse vertical knowledge spillovers in New Zealand; specifically, foreign firms were able to absorb knowledge from local suppliers. Kimura and Kyota (2006) examined panel data for Japanese firms in the late 1990s, which suggested that OFDI leads to higher productivity. On the other hand, Iver et al. (2010), along with determining that vertical spillovers may occur through export activity, found no evidence for reverse spillovers facilitated by OFDI in a study of New
Zealand MNEs. In her investigation of managerial knowledge spillovers in the United Kingdom, Fu (2012) did not find any evidence for reverse spillovers despite observing significant practice spillovers between local firms. In a study of 17 OECD countries between 1974 and 2001, Bitzer and Gorg (2009) even found a net negative of OFDI on TFP, albeit with a large degree of country heterogeneity.

Recently, the focus in the literature has shifted from developed markets to emerging and developing ones. In particular, in response to the growing internationalization literature on strategic asset-seeking FDI from the developing world, researchers are beginning to investigate investments from EMNEs into developed economies. Exploration in this field indicates that the “backwardness” principle, which predicts greater increases in productivity being associated with investments in comparatively higher technology intensive countries, is of particular importance for reverse knowledge spillovers (de la Potterie & Lichenberg, 2001; Barba Navaretti et al., 2010). The literature on North-South reverse spillovers, which admittedly is still relatively scarce, is summarized below in Table 1.

### Table 1. Studies on reverse spillovers to emerging markets

<table>
<thead>
<tr>
<th>Author</th>
<th>Investing country</th>
<th>Key findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debaere et al. (2010)</td>
<td>South Korea</td>
<td>Investment in DM has no impact on productivity or employment, investment in EM has a significant negative effect</td>
</tr>
<tr>
<td>Lui and Nunnenkamp (2011)</td>
<td>Taiwan</td>
<td>Foreign investment results in increased domestic production and employment depending on the size of the investment. Larger investments slightly increase the probability of negative outcomes for the firm.</td>
</tr>
<tr>
<td>Franco and Kozovska (2011)</td>
<td>Romania and Poland</td>
<td>There is evidence for reverse spillover effects inside clusters in Poland and Romania, even in low-tech sectors.</td>
</tr>
<tr>
<td>Hertzer (2011)</td>
<td>33 developing countries</td>
<td>Positive correlation between OFDI and TFP with some degree of heterogeneity is explained by labor regulations</td>
</tr>
<tr>
<td>Chen et al. (2012)</td>
<td>34 emerging markets</td>
<td>Investing in technologically advanced markets leads to increased R&amp;D spending and productivity in EM MNEs</td>
</tr>
<tr>
<td>Yang et al. (2017)</td>
<td>Taiwan</td>
<td>OFDI raises firm productivity because it improves technological endowments and efficiency</td>
</tr>
<tr>
<td>Chen and Tang (2014)</td>
<td>China</td>
<td>OFDI positively impacts productivity, employment, and export performance</td>
</tr>
<tr>
<td>Amann and Virmani (2014)</td>
<td>18 emerging markets</td>
<td>OFDI positively impacts TFP in emerging markets, though to a lesser extent than IFDI</td>
</tr>
<tr>
<td>Zamborsky and Jacobs (2016)</td>
<td></td>
<td>Foreign EM subsidiaries in OECD countries experience positive knowledge spillover effects with a possibility of benefits to both home and host countries</td>
</tr>
</tbody>
</table>

*Source: Authors’ compilation.*
Most studies indicate that reverse spillovers between EMNEs and their subsidiaries in developed markets not only exist but also result in positive productivity and other gains. As with traditional spillovers, the magnitude of these gains is potentially influenced by various factors, including absorptive capacity (Amann & Virmani, 2014), regulatory factors (Hertzer, 2011), clusters (Franco & Kozovska, 2011), and various measures of proximity (Chen et al., 2012). However, a consensus does not yet exist as other studies indicate that OFDI results in no significant impact on EM parent enterprises (Debaere et al., 2010). Bitzer and Gorg (2009) even observe a net negative impact of OFDI on productivity indicators. Interestingly, this negative impact only occurs in developing markets, whereas developed markets, such as the US and France, experience productivity gains stemming from outward investment. Lui and Nunnenkamp (2011) provide mixed evidence since their results indicate that negative spillover effects are more probable as investment size increases. Chari et al. (2012), and Bertrand and Bertschinger (2012) provide explanations for the seeming inability of EMNEs to capitalize on knowledge spillovers suggesting that in the case of EM firms lack of international experience and limited ownership advantages significantly hinder a firm’s ability to benefit from knowledge spillovers.

2.2.3. Research gap

The extant literature on reverse knowledge spillovers and their effects on investing firms and economies is sporadic and inconclusive. There is no consensus even on whether degree reverse spillovers impact productivity measures at all, let alone on magnitude and direction of the impact. Most of the few studies that explicitly address North-South knowledge flows of this nature focus on China or Taiwan and hardly any of them use cross-country data for analysis. Moreover, researchers have yet to thoroughly explore variables that determine magnitude or even existence of reverse spillovers. Additionally, the vast majority of the existing studies investigate OFDI impacts up to the exclusion of traditional knowledge spillovers, despite evidence that both may be important determinants of productivity (a notable exception being Amann and Virmani (2014)). We seek to contribute to the existing literature by addressing these gaps through investigating the effect of both traditional and reverse spillovers at the macroeconomic level and by analyzing FDI flows between emerging and developed markets on TFP growth in those emerging markets.

3. Theory and empirical model

In this study, we examine the impact of bilateral North-South FDI on aggregate TFP growth in emerging markets through knowledge spillovers across borders utilizing the methodology proposed by van Pottelsbergh de la Potterie and Lichtenberg (2001) and further developed by Amann and Virmani (2014). In this model, both inward and outward FDI are examined at an aggregate level.
3.1. Basic model

We follow the basic econometric model of van Pottelsbergh de la Potterie and Lichtenberg (2001) (Figure 1) who represent domestic TFP growth as a function of domestic and various forms of foreign R&D capital stock:

$$\ln(TFP_{it}) = \alpha_i + \beta_1 \ln(RD_{it-2}^f) + \beta_2 \ln(RD_{it-2}^d) + \epsilon_{it},$$  \hspace{1cm} (1)

where \(i = 1\ldots29\) is a country index, \(t = 2001\ldots2014\) represents the year; \(\ln(TFP)\) is the natural logarithmic of total factor productivity; \(RD^f\) is the foreign R&D capital stock; \(RD^d\) is the domestic capital stock; \(\alpha_i\) is the country-specific intercept; and \(\epsilon_{it}\) is the error term. The lagged independent variables account for the fact that spillover effects require time to be capitalized upon.

Foreign R&D capital stock is comprised of two terms, expressed as follows. The first term, \(RD^f\), or the OFDI from emerging country \(i\) to developed country \(j\), is given as:

$$RD_{it}^f = \sum_{j=1}^{9} OFDI_{ijt} \cdot \frac{RD_{jt}^d}{GDP_{jt}} + \epsilon_{it},$$  \hspace{1cm} (2)

Here \(i\) represents each emerging economy; \(j = 1\ldots9\) represents each developed economy; \(OFDI_{ijt}\) is the outward stocks from country \(i\) to country \(j\) during each year \((t)\); \(GDP_{jt}\) is the GDP of country \(j\) in year \(t\); and \(RD_{jt}^d\) is the domestic R&D stock of country \(j\) in year \(t\). \(RD_{jt}^f/GDP_{jt}\) can therefore be understood as the R&D intensity of country \(j\) in year \(t\). \(RD^f\) is the reverse knowledge spillover received in country \(i\) expressed as the weighted average of the R&D intensity of the host country \(j\) with OFDI outward stocks in country \(j\) from country \(i\).

Similarly, \(RD^d\), or \(IFDI\) from developed economy \(j\) to emerging economy \(i\), is given as:

$$RD_{it}^d = \sum_{j=1}^{34} IFDI_{ijt} \cdot \frac{RD_{jt}^f}{GDP_{jt}} + \epsilon_{it},$$  \hspace{1cm} (3)

Here \(IFDI_{ijt}\) is the FDI outward stocks from country \(j\) to country \(i\) in year \(t\); thus, \(RD^d\) is the traditional FDI spillover from each country \(j\) into country \(i\) expressed as the weighted average of the R&D intensity of its DM investing partner \(j\) with IFDI flow into country \(i\) from country \(j\).

![Figure 1. Visual representation of the base empirical model](image-url)
Regarding expected signs for each coefficient, that for domestic R&D stock is most likely to be positive. Foreign stock coefficients are less straightforward. Both positive and negative relationship between TFP growth and foreign capital stock is plausible. A positive sign for outward foreign stock suggests that reverse knowledge spillovers were successfully captured and utilized. A negative relationship may indicate either that R&D carried out abroad increased the competitiveness of foreign rivals (Bitzer & Gorg, 2009), or that the firms were unable to offset adverse effects of diverting resources abroad with sufficient spillover gains.

Therefore, we suggest the first hypothesis:

**H1:** Increases in foreign R&D outward stocks positively impact TFP growth in emerging markets.

Inward foreign stock may negatively impact TFP growth as a result of increased competition in the output and input markets (market- and labor stealing). This outcome is more probable when firms are unable to adjust their production process in order to respond to increased competitive pressure (Bitzer & Gorg, 2009). A positive sign indicates that spillover effects predominate over negative factors. The extant literature provides roughly balanced evidence for both scenarios.

Hence, our next hypothesis:

**H2:** Increases in foreign R&D inward stocks positively or negatively impact TFP growth in emerging markets.

### 3.2. Adjusted model

#### 3.2.1. Time lag of the independent variables

In order to account for the fact that firms require time in order to reap benefits of knowledge spillovers, we have lagged the independent variables of interest, foreign R&D stocks. Following Mansfield (1985), who shows that spillovers from MNEs into their host markets take four years on average, we choose a lag period of four years. Time lag has an additional benefit of helping to minimize endogeneity within the model. However, other researchers claim that time required for realizing spillover benefits is highly variable and a definitive statement on appropriate lag cannot be made. Therefore, in our robustness checks we test a series of lag values \( n = 0 – 5 \) for the independent variables.

#### 3.2.2. Moderating variable

The relationship between domestic R&D stocks and TFP growth is clear; firms that invest more in their research and development should be able to reap the benefits of their efforts and increase their productivity. However, we propose that this variable also plays a second, moderating role in the model. The sources believe that direction and magnitude of knowledge spillovers, both traditional and reverse, may depend on various other factors as there is significant empirical evidence for the role of absorptive capacity in spillovers. Firms with higher absorptive capacity theoretically should be better able
to capture and implement new knowledge and technologies as they have a knowledge base for development. Although a perfect measure of absorptive capacity does not exist, the sources provide various useful approximations. These approximations fall into three major categories, with many studies using a combination of factors therein. The first category that pertains to research and development activities is the most commonly used. Domestic R&D stock, proxied here as the expenditure on R&D activities, happens to be a measure that falls into this category. This measure is useful in estimating a country’s ability to absorb knowledge because it captures its total research effort, not just investments that resulted in registered patents or inventions, i.e., codified knowledge (Gornik-Tomaszewski & Millan, 2005).

The level of domestic R&D stock should therefore influence the magnitude of spillover effects. While theory indicates that firms require some basic level of knowledge in order to capture and deploy more advanced technologies, diminishing returns to additional AC past a certain threshold are quite likely. Counteracting effects of backwardness make this scenario more plausible in the case of knowledge spillovers. Therefore, we expect the relationship between these variables and the dependent variable to be generally positive but nonlinear. In short,

\[ H3: \text{Domestic R&D stocks have a positive moderating impact on both kinds of spillover effect.} \]

### 3.2.3. Control variables

To better assess the impact of R&D stocks on TFP growth, we controlled four other variables which, according to the sources, may impact TFP. First, we include the commonly used (i.e., by Escribano et al., 2009) level of R&D employment in the country, which is comprised of both the number of technicians and researchers employed in each market. We also control the number of patents filed by residents in each emerging market, which gives some indication of the country’s aggregate ability to transform tacit knowledge to codified, as well as the general “innovativeness” of the country (Armann & Virmani, 2014). Finally, in our model we include tax burden measured as corporate tax rate, as higher taxation burdens may limit firms’ ability to invest in R&D activity (Chen et al., 2012).

### 3.2.4. Final model

The adjusted model looks like this:

\[
\ln(TFP_{it}) = \alpha_i + \beta_1 \ln(\text{RD}_{it-4}) + \beta_2 \ln(\text{RD}_{it}) + \beta_3 \text{MODOUT}_{it} + \beta_4 \text{MODIN}_{it} +
\beta_5 \ln(\text{HC}_i) + \beta_6 \ln(\text{pat}_i) + \beta_7 \ln(\text{RDemp}_i) + \beta_8 \ln(\text{tax}_i) + \epsilon_{it},
\]

where \( \text{HC}_i \) represents human capital in country \( i \) at time \( t \); \( \text{pat}_i \) denotes number of patents issued to residents; \( \text{RDemp}_i \) denotes the proportion of the population employed in R&D activities; and \( \text{tax}_i \) represents the corporate tax rate. \( \text{MODOUT}_{it} \) and \( \text{MODIN}_{it} \) are interaction terms between the domestic stock term and foreign stock terms that encapsulate the moderation effect of domestic R&D stock (Figure 2).
4. Data description

The data used in this study is comprised of the panel data from 38 different markets for the period from 2001 to 2014. The first step in composing the dataset was to determine which countries belong to which category. The terms emerging market and, to a lesser degree, developed market are quite nebulous and significantly vary in different papers. In order to identify 62 emerging market economies, we follow the EM classification outlined in Chen et al. (2012), which bases on the financial indexes Morgan Stanley Capital International (MSCI) and the Financial Times Stock Exchange (FTSE). We define developed markets as high-income OECD countries as of 2012. Due to lack of data on the dependent variable of interest, FDI stocks, the final dataset includes 29 emerging markets and nine developed markets (See Appendix A for a list of countries analyzed).

Data on the independent variable, TFP growth for 2001–2014, is taken from the 2015 Conference Board Total Economy Database. The values are expressed as a Tornqvist index, a commonly used mechanism in the TFP literature which prevents loss of observations when using growth rates (i.e., ln(X), X<0 is undefined). Data on FDI stocks (defined as aggregate cross-border participation in the capital or voting rights of an enterprise in the amount of at least 10% according to international standards) expressed in millions of USD comes from UNCTAD’s Bilateral FDI Statistics 2014. Data on R&D intensity,

---

1 Albania, Argentina, Armenia, Azerbaijan, Bangladesh, Belarus, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Chile, China, Colombia, Cote d’Ivoire, Croatia, Czech Republic, Ecuador, Egypt, Estonia, Georgia, Ghana, Hungary, India, Indonesia, Israel, Jamaica, Jordan, Kazakhstan, Kenya, Kyrgyzstan, Latvia, Lithuania, Macedonia, Malaysia, Mauritius, Mexico, Moldova, Morocco, Nigeria, Pakistan, Peru, Philippines, Poland, Romania, Russia, Saudi Arabia, Slovenia, Slovak Republic, South Africa, South Korea, Sri Lanka, Taiwan, Tajikistan, Thailand, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Ukraine, Uzbekistan, Venezuela, and Zimbabwe.

2 Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and United States.
as well as absorptive capacity measures, are obtained and constructed from *The World Bank Database*, and data on corporate tax rate comes from the KMPG Global Tax Survey. As is common for statistics on emerging markets, there are some missing data on the control variables. As the proportion of missing observations is relatively small (51 missing values out of 1044 total) and occurs sporadically throughout the dataset, we use the mean of nearby points to replace the missing values and avoid significant reduction of the sample. However, not all the observations can be replaced. Specifically, the data on FDI stocks are only available through 2012. Therefore, the result is an unbalanced panel. However, since the theory indicates that this variable should be lagged, this will not affect the final number of observations.

Table 2 contains summary statistics on the untransformed control variables and the dependent variable.

### 4.1. Dependent variable

The overall trend in the average TFP growth index value is its steady but modest increase in 2001–2007, followed by a significant decline in 2007–2008 due to the financial crisis of that time. The period between 2010 and 2012 is characterized by a year-to-year decline in TFP growth. This measure displays a high degree of variability, with the disparity between the lowest and the highest TFP-growth markets each year reaching up to 19.02 points. In this regard, it should be noted that Azerbaijan had the highest TFP growth in the entire sample in 2005–2007.

### 4.2. Control variables

Trends revealed by these statistics include an overall increase in average R&D expenditure, patent applications by residents and total R&D employment, no major change in education expenditure as a percentage of GDP, and a slight decrease in the average corporate tax rate in 2001–2012. The average number of patent applications in these markets increased from 4505.69 in 2002 to over 5 times this amount — 24,828.10 — in 2012. Meanwhile, the average R&D employment roughly doubled from 85,640.11 workers in 2001 to 161,431.43 in 2012. The increase in the average value appear to be driven by the increase in outliers as opposed to a general increase across countries: while the minimum values for patent applications and R&D employment remain pretty static in this time period, the maximum values (consistently held by China) increased dramatically. Therefore, these statistics also draw attention to increasing time discrepancies between the sample countries. Even more time-consistent variables, such as tax rate and education expenditure levels, demonstrate a high degree of variability. By 2012, corporate tax rates in this sample ranged from 10 to 35%, with the narrow majority of observations clustering at each end of the spectrum.

All control variables, except corporate tax rate, have the same skew in distribution over time. To correct the bias introduced by this, we build on previous literature using the natural log of variables in the estimate. Additionally, as a robustness check, we omit major outliers (China) from the dataset as exceptional cases.
### Table 2. Summary statistics (less FDI variables)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Year</th>
<th>Min.</th>
<th>Max.</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Variable</th>
<th>Year</th>
<th>Min.</th>
<th>Max.</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
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<tr>
<td>R&amp;D Exp. (millions USD)</td>
<td>2001</td>
<td>19.41</td>
<td>12594.81</td>
<td>1736.01</td>
<td>3280.86</td>
<td>Corporate Tax Rate</td>
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<td>36.89%</td>
<td>22.31%</td>
<td>7.21%</td>
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<td></td>
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<td>1905.26</td>
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<td>2002</td>
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<td>36.89%</td>
<td>22.31%</td>
<td>7.16%</td>
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<td>36.89%</td>
<td>22.31%</td>
<td>7.16%</td>
</tr>
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<td>5.43</td>
<td>0.73</td>
<td>2.24</td>
</tr>
<tr>
<td></td>
<td>2007</td>
<td>0.02</td>
<td>0.30</td>
<td>0.08</td>
<td>0.06</td>
<td></td>
<td>2012</td>
<td>-3.54</td>
<td>4.59</td>
<td>-3.52</td>
<td>2.56</td>
</tr>
</tbody>
</table>
4.3. Independent variables

Table 3 summarizes statistics on the cumulative OFDI and IFDI stock, expressed in millions of USD, for each of the 29 emerging markets and 9 developed markets in the sample. In general, the average level of investment between these two groups increased in 2001–2012, with a dramatic jump in OFDI stock from the emerging markets in 2006–2007. Average cumulative IFDI stock quadrupled from $133.4 billion in 2001 to $466.7 billion in 2012, while average cumulative OFDI stock rose 6 times in the same period (from $1.4 billion to $7.97 billion). Also of note is the disparity between levels of FDI inward and outward stocks; in 2001, average inward stocks were 10 times higher than average outward stocks. However, this disparity has somewhat lessened over time. As with the control variables, the rise in stocks seems to be driven by upward outliers. Also of interest are the negative minimum values experienced in some years. According to UNCTAD, a negative FDI stock is typically recorded when continuous losses in the FDI enterprise result in negative reserves.

Table 3. Summary statistics, cumulative FDI stocks, millions USD, 2001–2012

<table>
<thead>
<tr>
<th>Year</th>
<th>Min.</th>
<th>Max.</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min.</th>
<th>Max.</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>-74.71</td>
<td>17867.27</td>
<td>1390.31</td>
<td>3570.22</td>
<td>6.00</td>
<td>68209.54</td>
<td>13394.06</td>
<td>18004.79</td>
</tr>
<tr>
<td>2002</td>
<td>-0.78</td>
<td>19047.80</td>
<td>1579.91</td>
<td>3888.84</td>
<td>0.00</td>
<td>80190.71</td>
<td>14231.09</td>
<td>19335.86</td>
</tr>
<tr>
<td>2003</td>
<td>0.00</td>
<td>16651.48</td>
<td>1510.72</td>
<td>3526.00</td>
<td>0.00</td>
<td>87950.76</td>
<td>15964.85</td>
<td>20754.63</td>
</tr>
<tr>
<td>2004</td>
<td>0.00</td>
<td>17541.38</td>
<td>1941.45</td>
<td>3853.50</td>
<td>0.00</td>
<td>97024.49</td>
<td>19125.74</td>
<td>23508.16</td>
</tr>
<tr>
<td>2005</td>
<td>1.62</td>
<td>19760.45</td>
<td>2119.55</td>
<td>4279.54</td>
<td>13.00</td>
<td>111752.07</td>
<td>21365.84</td>
<td>26902.79</td>
</tr>
<tr>
<td>2006</td>
<td>-16.11</td>
<td>24591.55</td>
<td>3479.29</td>
<td>6579.11</td>
<td>116.73</td>
<td>126382.50</td>
<td>25210.68</td>
<td>30500.82</td>
</tr>
<tr>
<td>2007</td>
<td>-11.47</td>
<td>48336.00</td>
<td>6014.94</td>
<td>12384.32</td>
<td>169.10</td>
<td>145847.35</td>
<td>31946.74</td>
<td>36026.35</td>
</tr>
<tr>
<td>2008</td>
<td>1.00</td>
<td>67017.88</td>
<td>7098.07</td>
<td>14625.12</td>
<td>367.72</td>
<td>143411.89</td>
<td>32795.55</td>
<td>38441.09</td>
</tr>
<tr>
<td>2009</td>
<td>-1.37</td>
<td>71960.50</td>
<td>7941.15</td>
<td>15632.49</td>
<td>429.21</td>
<td>152195.87</td>
<td>35905.95</td>
<td>41956.85</td>
</tr>
<tr>
<td>2010</td>
<td>-2.00</td>
<td>49239.38</td>
<td>7750.88</td>
<td>13298.00</td>
<td>508.62</td>
<td>177353.34</td>
<td>39738.45</td>
<td>49100.91</td>
</tr>
<tr>
<td>2011</td>
<td>-3.00</td>
<td>53320.67</td>
<td>7150.76</td>
<td>12272.30</td>
<td>387.85</td>
<td>200465.76</td>
<td>43455.88</td>
<td>56136.63</td>
</tr>
<tr>
<td>2012</td>
<td>-4.00</td>
<td>54051.69</td>
<td>7972.53</td>
<td>13493.84</td>
<td>338.84</td>
<td>224904.90</td>
<td>46670.83</td>
<td>59591.38</td>
</tr>
</tbody>
</table>

Note: N = 407.

Figures 3 and 4 disaggregate net FDI inward stocks from the sample EMs in each developed market and net FDI outward stocks from each DM to the sample EMs, respectively. The figures indicate that the recipients of the highest level of EM FDI from this sample are the United States, by a wide margin, followed by the United Kingdom. The most significant investors are the United States, the United Kingdom, and Japan. The charts also indicate a yearly significant decrease in OFDI from EMs to the majority of the developed markets following the global financial crisis of 2008–2011. OFDI from DM to EM in that period is less noticeable and somewhat delayed, with apparent reductions beginning only in 2009 or even in 2010. This is an indication that emerging markets are more susceptible to exogenous macroeconomic shocks than developed markets. In terms of the investment activities of the sample emerging markets, relatively small investors in DMs include Belarus, Colombia, Estonia, and Latvia, while large investors include BRICS economies and Mexico. These countries also represent the economies with the smallest and largest amounts of foreign capital stock, respectively.
6. Findings

6.1. Main results

With the adjustments outlined above, we ran fixed-effects within linear regression to ascertain the effects of traditional and reverse knowledge spillovers on total factor productivity. Table 4 contains the result of the regression analysis.

The relationships between the dependent variable and the independent variables are all statistically significant. A 1% increase in foreign R&D outward stocks is associated with a 3.53 point increase in the TFP growth index value four years later. Meanwhile, a 1% increase in domestic R&D stock and foreign R&D inward stocks corresponds to a 3.5 point increase and a 2.46 point decrease, respectively. These results can be interpreted as evidence in support of the hypothesis (H1) that emerging market firms investing in developed markets are able to benefit from reverse knowledge spillovers to increase their productivity. The negative effect of foreign R&D inward stocks from developed markets suggests that, in general, the negative competition effects
of investments from developed to developing markets prevail and outweigh any positive effects of knowledge spillovers that might be gained by EM firms. As it was identified at the stage of evaluation of the problems of the empirical analysis, domestic R&D stocks have a statistically significant moderating effect on both reverse and traditional spillover channels. According to these results, the direction of this moderation is positive for both variables. Augmenting the knowledge stock of domestic EM firms appears to enhance the ability of those firms to acquire and implement new knowledge and thereby increase productivity.

Table 4. Regression results

<table>
<thead>
<tr>
<th>Independent variables</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>( \ln(\text{FDRO})(\text{lag} = 4) )</td>
<td>3.53***</td>
<td>3.55</td>
</tr>
<tr>
<td>( \ln(\text{FRDI})(\text{lag} = 4) )</td>
<td>(–2.46)***</td>
<td>(–2.86)</td>
</tr>
<tr>
<td>( \ln(\text{DRD}) )</td>
<td>3.5***</td>
<td>3.03</td>
</tr>
<tr>
<td>Moderation effect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \ln(\text{FDRO} \times \text{DRD}) )</td>
<td>0.44***</td>
<td>3.00</td>
</tr>
<tr>
<td>( \ln(\text{FRDI} \times \text{DRD}) )</td>
<td>0.68**</td>
<td>2.98</td>
</tr>
<tr>
<td>Control variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \ln(\text{HC}) )</td>
<td>–1.99</td>
<td>–0.96</td>
</tr>
<tr>
<td>( \ln(\text{pat}) )</td>
<td>–1.27</td>
<td>–1.57</td>
</tr>
<tr>
<td>( \ln(\text{tax}) )</td>
<td>4.23</td>
<td>1.29</td>
</tr>
<tr>
<td>Constant</td>
<td>30.85</td>
<td>1.71</td>
</tr>
</tbody>
</table>

Note: *** significant at 1%, ** significant at 5%.

Table 5 contains the results of this regression analysis. Of the five subgroups included in the analysis, three (Europe, Asia, Africa) indicate that OFDI stocks are positively associated with TFP growth to a statistically significant degree. Asia and Africa exhibit stronger than average effects meaning that reverse spillovers seem to be more beneficial to the productivity of these markets. Regarding foreign R&D inward stocks, African and European countries experience stronger than average negative spillover effects while Asian and Latin American countries experience positive spillover effects. These results may indicate that in Africa and Europe, the negative competitive effect of new
foreign entrants is stronger than positive knowledge spillover benefits. That is, due to lack of required resources or rigid production practices, firms in these countries are unable to adapt enough to compete with foreign-owned enterprises. Meanwhile, Asian and Latin American firms are perhaps better able to respond to the new competition by increasing their own productivity.

**Table 5.** Robustness check, regional disaggregation

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Latin America</th>
<th>Europe</th>
<th>CIS</th>
<th>Asia</th>
<th>Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(FDRO)(lag = 4)</td>
<td>–4.57</td>
<td>3.6**</td>
<td>–2.26</td>
<td>4.88**</td>
<td>5.64**</td>
</tr>
<tr>
<td></td>
<td>–1.52</td>
<td>2.02</td>
<td>–0.45</td>
<td>2.81</td>
<td>2.15</td>
</tr>
<tr>
<td>(FRDI)(lag = 4)</td>
<td>3.34*</td>
<td>(–4.1)**</td>
<td>4.00</td>
<td>1.73***</td>
<td>(–5.81)*</td>
</tr>
<tr>
<td></td>
<td>1.92</td>
<td>–3.56</td>
<td>0.68</td>
<td>3.83</td>
<td>–1.84</td>
</tr>
<tr>
<td>ln(DRD)</td>
<td>1.3*</td>
<td>2.51*</td>
<td>–2.37</td>
<td>0.65**</td>
<td>2.47*</td>
</tr>
<tr>
<td></td>
<td>0.74</td>
<td>1.87</td>
<td>–0.45</td>
<td>2.72</td>
<td>1.77</td>
</tr>
</tbody>
</table>

**Moderation effect**

<table>
<thead>
<tr>
<th></th>
<th>Latin America</th>
<th>Europe</th>
<th>CIS</th>
<th>Asia</th>
<th>Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDROxDRD</td>
<td>0.75</td>
<td>(–0.61)**</td>
<td>0.56</td>
<td>0.59***</td>
<td>–2.02</td>
</tr>
<tr>
<td></td>
<td>1.71</td>
<td>–2.17</td>
<td>0.71</td>
<td>1.91</td>
<td>–1.74</td>
</tr>
<tr>
<td>FDRIxDRD</td>
<td>0.68*</td>
<td>1.34***</td>
<td>–0.33</td>
<td>0.05</td>
<td>1.35</td>
</tr>
<tr>
<td></td>
<td>1.9</td>
<td>3.29</td>
<td>–0.41</td>
<td>0.09</td>
<td>1.66</td>
</tr>
</tbody>
</table>

**Control variables**

<table>
<thead>
<tr>
<th></th>
<th>Latin America</th>
<th>Europe</th>
<th>CIS</th>
<th>Asia</th>
<th>Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(HC)</td>
<td>–13.88</td>
<td>–7.7</td>
<td>18.37</td>
<td>1.05</td>
<td>2.02**</td>
</tr>
<tr>
<td></td>
<td>1.32</td>
<td>–0.46</td>
<td>0.74</td>
<td>0.36</td>
<td>2.80</td>
</tr>
<tr>
<td>ln(pat)</td>
<td>14.5</td>
<td>–2.87</td>
<td>17.79</td>
<td>–1.72</td>
<td>1.75</td>
</tr>
<tr>
<td></td>
<td>1.43</td>
<td>–1.34</td>
<td>1.47</td>
<td>2.41</td>
<td>0.84</td>
</tr>
<tr>
<td>ln(tax)</td>
<td>–0.3</td>
<td>–3.26</td>
<td>9.50</td>
<td>2.77</td>
<td>–1.90</td>
</tr>
<tr>
<td></td>
<td>–0.15</td>
<td>–1.05</td>
<td>0.86</td>
<td>0.24</td>
<td>–0.32</td>
</tr>
<tr>
<td>ln(rdemp)</td>
<td>–0.16</td>
<td>–4.36</td>
<td>–0.94</td>
<td>0.00</td>
<td>0.73***</td>
</tr>
<tr>
<td></td>
<td>–0.03</td>
<td>–1.62</td>
<td>–0.07</td>
<td>0.00</td>
<td>3.40</td>
</tr>
<tr>
<td>Constant</td>
<td>2.3</td>
<td>69.82</td>
<td>–41.66</td>
<td>2.77</td>
<td>45.11***</td>
</tr>
<tr>
<td></td>
<td>1.46</td>
<td>1.62</td>
<td>–0.23</td>
<td>0.11</td>
<td>4.15</td>
</tr>
</tbody>
</table>

**Note:** * significant at 10%, ** significant at 5%, *** significant at 1%.

CIS (abbreviation for the Commonwealth of Independent States, post Soviet Union countries) countries are the only subgroup that apparently does not experience spillover effects at any time. One reason for these results may be a relative economic instability in this region during the period of this study. While all regions suffered from the effects of the 2008 financial crisis (albeit to varying degrees), Russia, the largest economy in the CIS group, survived a financial crisis in the late 1990s and another one in 2014, which probably had lingering consequences throughout the studied period.

The moderating effect of domestic R&D stocks also differed across regions. Of particular interest is the negative moderating effect of this variable on reverse spillovers
observed in Europe. Though this effect seems counterintuitive, it is not outside the scope of theoretical feasibility. As outlined in the literature review, absorptive capacity measures are at odds with the “backwardness” measure that provides greater opportunity for spillover benefits.

In sum, though the robustness checks support the initial findings of the study in general, they highlight the degree of heterogeneity of knowledge spillovers. The magnitude and even direction of the relationship between knowledge spillovers and TFP vary depending on the regions and time — phenomena that require further investigation.

7. Conclusion

The EMNEs’ tendency to establish subsidiaries in developed markets was identified and empirically linked to the strategic asset-seeking motive for FDI. These firms significantly increased their presence on developed markets over the past 20 years. An important consideration in their decision to invest in these markets is the reverse knowledge spillover defined as an unintentional transfer of knowledge or technology from advanced domestic firms to foreign subsidiaries. In this paper, we analyze the effects of these spillovers on the growth of total factor productivity in emerging markets at the aggregate level. We consider spillover effects generated by both outward foreign investment to the DM and inward foreign investment from these markets, as well as the role of several control variables. In order to do so, we employ a model based on the one developed by Van Pottelsberghe de la Potterie and Lichtenberg (2001), and Armann and Virmani (2014). We contribute to the development of this model by considering the impact of FDI stocks instead of flows, including control variables, and introducing a time lag to the dependent variable, which is not only theoretically justified but also addresses, at least in part, the endogeneity problem, which brings bias into the results of spillover studies. We follow our initial regression analysis with a series of robustness checks that generally confirm the original results but add a nuance to their interpretation.

The results of this analysis provide evidence in support of the hypothesis that by investing in developed markets, emerging markets are able to increase their total factor productivity growth over time due to positive reverse spillover effects. Additionally, this paper shows that the net impact of IFDI spillovers on TFP growth is negative. This finding supports the hypothesis in some previous studies that IFDI leads to a negative competition effect that negates any positive gains from potential spillovers. Both of these effects vary over time, with increases in OFDI associated with a decrease in TFP growth in the year of investment, and increases in TFP growth starting only 3 years after the investment. The negative effects of IFDI spillovers similarly begin to accrue only after 3 years. These findings suggest that knowledge spillovers of either type take time to manifest. The effects of FDI in varying geographic subgroups of this sample indicate a large degree of heterogeneity; with some markets (e.g. CIS) apparently experiencing no spillover effects whatsoever.

Our findings have two main implications for emerging market firms’ practices of strategic asset-seeking outward FDI. First, in general, EM firms that wish to enhance
their productivity should invest in economies that are rich in technological and knowledge resources. Our findings indicate that firms that invest in developed markets are able to improve TFP growth via reverse spillovers. However, when making a decision to pursue the “going out” strategy, it is necessary to take into account the fact that positive spillover effects do not occur immediately. On average, the effect of OFDI on productivity becomes apparent only 3 years after the initial investment. Moreover, our findings indicate that OFDI efforts have a negative effect on TFP growth in the year of investment.

Second, in order to maximize the positive effects of reverse spillovers, these firms should also increase investment in their domestic R&D stock. Investing in R&D not only positively affects TFP directly, but also insofar as it augments the firm’s ability to absorb new knowledge. Furthermore, increased R&D stock helps to mitigate the negative influence of IFDI from developed markets.

Though this study makes several constructive contributions to spillover literature, there are several limitations to keep in mind when interpreting these results. First, pertinent data for all emerging and developed markets were not available, so the sample analyzed was not comprehensive. Moreover, available data did not cover all potentially significant variables. Future studies should consider the impact of such measures as industry and the nature of the FDI, i.e., vertical vs. horizontal FDI.

Secondly, the heterogeneity of emerging markets makes it difficult to generalize the findings in this paper. In a sense, we address this heterogeneity by analyzing geographic subgroups within the data set. However, a deeper investigation of emerging market subcategories is needed in order to fully understand the nature of knowledge spillovers. We believe that this is a promising avenue for future research.

Another limitation of this paper is that it does not address the impact of macroeconomic shocks on spillovers. For instance, the findings of this study may no longer be relevant for Russia, Ukraine, and the economies that depend on them given the economic crisis that began in 2014 and sanctions levied since that time by European and other Western countries. This particular situation provides a compelling basis for future investigation.

Appendix 1. Countries included in dataset

<table>
<thead>
<tr>
<th>Emerging markets</th>
<th>Developed markets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina, Azerbaijan, China, Colombia, Czech Republic, Belarus, Brazil, Bulgaria, Egypt, Estonia, Hungary, India, Indonesia, Kazakhstan, Latvia, Lithuania, Malaysia, Mexico, Poland, Romania, Russia, Singapore, Slovakia, Slovenia, South Africa, South Korea, Thailand, Tunisia, Ukraine</td>
<td>Austria, Canada, Denmark, Finland, France, Japan, Norway, the United States, the United Kingdom</td>
</tr>
</tbody>
</table>

References


Towards a new ecological and human type of national accounting for developing economies (The CARE/TDL model)

Jacques Richard*,
University of Paris Dauphine (France)


Abstract
The goal of this article is to show how today’s financial accounting system, notably the IFRS (International Financial Reporting Standards) and the related National accounts (primarily the famous GDP, Gross Domestic Product), are the main causes of today’s human and ecological crisis. This assertion is justified on the basis of an historical survey of the development of capitalist accounting since the end of the Middle Age, the time of its foundation. We prove that, in the form it was invented by big capitalists at that time (and used until today), the concept of capital-debt to be conserved has nothing to do with the one used by economists of either classical, neoclassical, or marxist schools and that it is a very dangerous weapon against the interests of the mankind and ecology.

Keywords: green national accounting, environmental accounting, human accounting, green finance, ecological accounting against IFRS.

JEL: M00, M41, Q56.

1. Introduction: The Environmental Kuznets Curve and the BRICS

In her article “Environmental impact of economic growth in BRICS” (2017), Viviana Tedino tests the existence of the Environmental Kuznets Curve (EKC) in developing economies on the basis of a panel data analysis. The EKC, inspired by Kuznets’
works¹, notably his famous article “Economic growth and income inequality” (1955), states that pollution increases as income goes up and, after reaching a turning point, it starts to decrease. By analyzing the relationship between GDP² per capita and greenhouse gas emissions, she concludes that the EKC curve does exist for China, India, and South Africa whose emissions are now increasing at the same time as the GDP, while the hypothesis does not hold for Brazil and Russia. As far as Russia is concerned, its GDP decreased during some of the years included in the study, so for this country and during those years, the EKC hypothesis cannot really be tested. Brazil, for its part, is the country that pollutes the least despite its growth, and, according to Tedino, one reason for this could be that Brazil uses hydropower and has introduced renewable energy in its industries. Nevertheless, Tedino ascertains that, due to their World Trade Organization membership and, more specifically, trade openness, levels of emission increased in Brazil, Russia, India, China, and South Africa when they opened to trade in 1995, 2012, 1995, 2001, and 1995 respectively. Consequently, the environmental qualities in these countries started deteriorating in the years following these events. One reason for this is that governments of developing economies are encouraged to lower environmental standards to attract foreign investment and capital which leads to divergence of international environmental conditions.

Another explanation is the pollution haven hypothesis. It tends to show how, in order to reduce costs and expenses imposed by higher environmental standards, developed countries relocate production to countries with lower environmental regulations and lower pollution control costs, worsening, most of the time, the developing country’s environment.

The third explanation is the race to the bottom hypothesis. In order to cope with the pressure of international competition for foreign direct investment, developing countries tend to lower environmental standards and regulations.

Finally, in spite of being clearly influenced by all these theories derived from the EKC “philosophy”, Tedino admits that these types of studies are problematic because “GDP per capita fails to represent welfare, so may be other indicators, such as Human Development Index or Green National Income, would better capture the relationship between environment and economic growth” (Tedino, 2017).

We agree with Tedino, but we go further. Knowing whether the solution to ecological or human problems depends on reaching a turning point in economic growth is not the main problem for us. Rather, we examine adequate regulations made in order to have a systematic conservation of human and natural capitals during all phases of economic development. This presents a problem of regulations the dominant economic system imposes (or does not impose), that is, the capitalist system. This system, especially its nowadays’ financial variant, is increasingly accused of destroying the very bases of ecological and social, or human, life at all its stages (Favereau, 2014, 2016). Our thesis is that the fundamental cause for this situation lies in the firms’ private accounting system, reinforced by the national economic system.

¹ Kuznets (1955) showed that during the various economic development stages, income inequalities first increase and then begin to decrease.
² Gross Domestic Product.
accounts system. Today’s capitalist economic model is indeed fundamentally based on a very old and dangerous type of accounting: the famous double-entry accounting developed at the end of the Middle Ages that W. Sombart\(^3\) (1902) and M. Weber (1920) justly described as the pillar of capitalism. These two famous Germans are among the rare authors of their time that understood the importance of accounting as an instrument of (capitalist) calculative rationality. Back then, though, at a time when national accounts were very rare, they only spoke about private accounting, which was essentially business accounting.

In our work we demonstrate that today this kind of private capitalist accounting has not only “infected” firms’ management but also much later, in the 20\(^{th}\) century, it has strongly influenced the theories and practices of national accounting in all countries. In this regard, now we can talk about the domination of the capitalist national accounting system which fortifies and amplifies the dangerousness of the capitalist private accounting system. These two types of accounting systems work hand in hand and lead the planet to catastrophes. The thesis which we defend in this article is that there will be no serious progress in matters of ecological and social affairs without an instauration of a radically new integrated macro-micro system of ecological and human accounting encompassing both business and national accounts — a change that will enable a revolution in the management of firms and nations towards an ecological and social co-management. To be constructive, we do not settle for a mere critique of the actual dominant system of business and national accounts; we also propose a radically new global integrated system of human and ecological accounts for both businesses and nations: the “micro-macro CARE/TDL model”.

To develop these theses and objectives, our plan will be as follows. In the first part, in order to explain the origins of the problem, we dedicate a short historical survey to the birth and main characteristics of the accounting system which is at the heart of today’s ecological and social issues. In the second part, we list the basic principles of a complete reconstruction of business accounts. In the third part, we use these basic principles to deduct corresponding ones for a reconstruction of national accounts aligned with new business accounts. In the fourth part, we show the main past and recent attempts of rebuilding the capitalist national accounting system and compare them with the micro-macro CARE/TDL model.

2. Historical survey: Origins of the problem of today’s business and national accounts

Let us pretend we are in Northern Italy in 1300–1400, at the time of the birth of the modern capitalism and creation of double-entry accounting. And let us take a look at how big capitalists of the time, such as the famous Datini, conceived their

\(^3\) According to Sombart (1902): “Capitalism and double-entry bookkeeping are absolutely indissociable: their relationship to each other is that of form to content”. Almost all books on business accounting quote this famous phrase.
accounting system both to conserve their capital and to accumulate profits (see: de Roover (1956) for data on the accounts of Datini; Renouard (1968) for description of life conditions and businessmen’s frame of mind at the time). Knowing the accounting tools the founders of the modern capitalism created and used is crucial to understanding how, even after seven centuries of domination, those tools still give their users tremendous power.

Let’s assume that Datini invests a sum of 1000 in his company. Its opening balance sheet is as follows:

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash money(^4) (to be used)</td>
<td>1000</td>
</tr>
<tr>
<td>Capital</td>
<td>1000</td>
</tr>
</tbody>
</table>

What is fascinating here is that the capital in this accounting system is absolutely not an asset, or wealth, or resource to be used, contrary to a classic economic view\(^5\) (Hodgson, 2014), which is also the view most people share, but money to be refunded: a debt to creditors and therefore a liability of the capitalist firm. In this perspective, cash and assets are means used by the firm while “Datini’s capital” is the particular debt of his company towards him. Extraordinary duplication of the capitalist’s personality: private person Datini lends a sum of money to his company, and the latter, run by capitalist Datini, owes this private person the repayment of this stake! This duplication allows the capitalist to clearly distinguish a “capital” to be used on the assets side and a (true) capital to be kept on the liabilities side — a dualism that will underpin the very power and efficiency of the capitalist system. This perspective stems from medieval capital, the “capitalis pars” (Braudel, 1979; Fetter, 1937), to budding capitalism — the “capitalis pars” being the principal part of a debt disconnected from interest (Wood, 2002).

Let us now assume that Datini then buys goods (G) for a price of 1000, which leads to modification of the balance sheet like that:

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventory (or rather purchase) of G</td>
<td>1000</td>
</tr>
<tr>
<td>Capital</td>
<td>1000</td>
</tr>
</tbody>
</table>

There is a simple change in the assets’ nature but no change in the capital to be maintained. Now suppose the capitalist sells the goods for 1200. Here is his new balance sheet:

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete money</td>
<td>1200</td>
</tr>
<tr>
<td>Capital</td>
<td>1000</td>
</tr>
<tr>
<td>Profit</td>
<td>200</td>
</tr>
</tbody>
</table>

\(^4\) Naturally, concrete money does not appear in the balance sheet, only its amount! But traditionally this asset is called “money”.

\(^5\) This conception of capital as an asset also applies to Adam Smith, Karl Marx (with his famous cycle money — commodity — money), and Stanley Jevons, to cite only three famous economists of very different economic ideologies. Despite all their fundamental clashes, they all agree that capital corresponds to assets!
The profit of 200 results from the surplus after preservation of the capital on the liabilities side; the firm owes the capitalist the profit, and this profit can be consumed entirely to ensure the life of his family without jeopardizing continuity of the company’s activities. So, the capitalist has preserved his capital⁶ well. This entire prudent system is based on a valuation dictated by the capital debt itself which means an abstract amount of money is to be reimbursed. This implies that before they are sold, the assets cannot be registered at their potential market value. They have to be recorded at their cost of purchase (with the money derived from the capital invested) or at their production cost which amounts to the so-called cost or historical cost principle. This was already in conformity with another famous principle of classic accounting — the principle of “realisation”: what is not yet realized cannot be held as acquired⁷. This kind of strict valuation mode which refuses market values (or selling price values) was well adapted to these types of capitalists’ goals: “first of all, preserve my capital and my firm” — a saying completely at odds with today’s financial capitalist philosophy: sell my business (its shares) every day in markets all over the world to earn as much money as possible.

Beyond the owner’s accounts, Datini’s balance sheet liabilities could include other capital-as-money contributions, for example, those of bankers, generally conceived in the common language as “normal” debts. It is crucial to see that these debts do not have the same status as Datini’s capital. The capital-as-money debt owed to Datini is not only related to a strictly repayable “loan”, but also confers power to Datini in his business, particularly over his salaried workers (see below). On the other hand, liabilities towards third parties (banks, suppliers) do not imply any power over profit. In summary, Datini’s capital and suppliers’ debts are all of the same nature, i.e. capital-as-money (money brought to the company and to be refunded in time), but Datini’s capital confers a special right of power on and in the company. In that sense, we can repeat after Nitzan and Bichler (2009) that capital as a debt is also power.

In the context of debts, “employee-related payables” (salary debts) may exist. At first glance, these debts seem to be of the same nature as those mentioned above, i.e. capital debts both for suppliers and Datini. But they are of a special nature and require specific treatment. If Datini hires an employee to help him, there are two possibilities. In the former case, Datini does not record any salary debts at the time of hiring and waits until the date of the wage payment before he records it. In this case, the employee’s cost of use (the wage) does not appear on the assets side of the balance sheet and the accounting is limited to recording an expense, which decreases the expected profit when the wage is paid. If this wage amounts to 100 and is paid at the end of the period, Datini’s profit will pass from 200 to 100. In the second case, Datini does the following:

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⁶ Note that if during that time Datini had brought more capital to increase his activity, this rise of the assets would not have accounted for a profit, which is why the measure of profit cannot be based on a comparison between assets during the period. Capitalists soon understood that they needed a concept of capital as a debt on the liabilities side to correctly calculate their profit. Marx has not seen this fact.

⁷ These capitalists’ prudence was such that at the time and increasingly during the 19th century, some of them would record expected losses in their accounts while refusing to register expected profits. But this is a secondary point: we will stick here to the pure “cost principle”.
1. He records the debt to be paid (i.e. the wage to be paid) as soon as the employees are hired and records the corresponding cost as an asset:

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset related to employees (i.e. purchase of work force)</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Salary debts 100</td>
</tr>
</tbody>
</table>

2. Then, after using the work force and paying off the employee’s debt at the end of the period, he crosses out the human asset and registers this loss of asset as a decrease of his profit.

But this option which seems to make the employee an “investment” and which is very much appreciated by the American school of “human resources”, notably by Becker (1964) and Kendrick (1976), leads to the same situation as before. Finally, the employees’ costs are always an expense of the capital-as-money. Moreover, they are also an expense valued according to the fluctuations of a market. As such, they never appear as a real “capital” to be kept on the liabilities side of the balance sheet, unlike the financial capital, i.e. capital-as-money. The employee is always a simple means which uses and consumes capital-as-money, not an end in itself or “something” to preserve. Therefore the salary debt and all related debts in no way imply an obligation to maintain employees for themselves (Rambaud & Richard, 2017). Even back then, state laws in different cities in Northern Italy already sanctioned employees' status as a simple means without any management power in capitalists firms, such as Datini’s. The workers, including those in the textile industry, were perfectly aware they were simple tools in the labour market and they tried to alter that fate several times, notably during the Ciompi revolution in Florence in 1378 (Piper, 1978).

In conclusion, it can be said that in this system which is one of the first developments of capitalism there is only one type of capital to be systematically maintained, or rather only one “nature” of capital — that of the contribution of capitalists and of various lenders of money. This capital is maintained at the company’s level. An employee whose “debt” is negotiated on a market is always a means and an expense for the capitalist and this is so since Datini’s time. This is what Datini’s simplified income statement shows in 1399 (de Roover, 1956):

<table>
<thead>
<tr>
<th>Expenses</th>
<th>Revenues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase costs of sold goods</td>
<td>+ Goods’ sales</td>
</tr>
<tr>
<td>Salaries expenses</td>
<td></td>
</tr>
<tr>
<td>Depreciation of buildings</td>
<td></td>
</tr>
<tr>
<td>= Datini’s net profit</td>
<td></td>
</tr>
</tbody>
</table>

Employees’ status as a burden to the capitalist (and his capital) is exactly the same today. Take a P&L statement from any current commercial firm: the list of expenses fundamentally remains the same as in Datini’s accounts. The structure of this essential document has not changed and continues to fuel the struggle between employees

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8 In the national balance sheet conceived by Kendrick, human capital is an asset and wages are actual wages (“labor compensation”) as they are negotiated on the labor market, while businesses’ equity is a true capital debt on the liabilities side (Kendrick, 1976).
and capitalists. It makes a wage bill (and therefore employment) a factor to be reduced as much as possible, and the word “expense” indicates it well. Therefore, it cannot solve the problem of unemployment; it creates it (Rambaud & Richard, 2017).

Such is this fascinating system of accounts coming from the time of Datini. It has been somewhat revisited by the IFRS9 (International Financial Reporting Standards) in recent years. Indeed, after the liberal revolution of the 1970s, the tendency is to partially abandon the old “historical cost principle” in order to enable the valuation of some assets (such as financial assets) at their market value with the desire to express their “fair value”. This trend appears at a time when the influence of an “economic” conception of valuation, as opposed to a classic accounting conception inherited from Dantini’s time, is growing. More precisely, it comes from a “Fisherian” conception of valuation which considers that capital is not an amount of money to be preserved but a resource (or wealth) that produces future services (and profits) and that must be valued on the basis of the discounted amount of these future services10. This other conception of capital, which was anticipated by Pacioli (1494)11, is totally different from the classical accounting one and, if applied in a systematic way, would result in totally different principles of valuation and measure of profit. This new kind of accounting has two advantages (at least in times of economic growth) for the world’s stock players: it gives an idea of the value of their portfolio, and, above all, allows them to record anticipated profits in their accounting statements (Richard, 2015a). As suggested by A. Rambaud, the following schedules sum up these two opposed conceptions of the principle of capital in the history of business accounting.

![Figure 1. The “classical” model of capital money debt accounting (model 1)](image)

9 For any question about the IFRS, see Richard et al. (2018).

10 See Fisher (2003 [1906]), p. 52: “capital is a stock of wealth at a moment in time” and p. 202: “the value of that wealth or property ...is the present worth of the future income from the specified capital”.

11 In an inedited article, Rambaud (2018) demonstrated that the Fisherian conception was already at the heart of the conception of capital developed by the famous Luca Pacioli, 15th century author of a mathematical treaty that included a chapter on accounting (Pacioli, 1494). But Pacioli was well ahead of his time and his vanguard conception of the capital had to wait for centuries before it could dominate the scene.
Richard (2012) shows that a similar evolution from model 1 to model 2 also takes place in the matters of national accounting (including environmental national accounting). At the time of the emergence of systems of national accounts (SNA) in the years after World War II, notably with the works of keynesianists Meade and Stone (1941), and during their development between 1945 and 1990, the dominant type of valuation is the cost of factors (Vanoli, 2002). Although most of these national economists who rely on their economic background may regret that these types of accounts cannot give information on the value of the capital (assets in the “normal” understanding of these economists)\textsuperscript{12}, it is only around 2000 that a strong influence of the Fisherian theory of capital begins, notably in 2001, with the publication of “Measuring capital” by the OCDE, and with the elaboration of the SCN in France in 1993. According to Vanoli (2002), it is at this “turning point” that national accountants started to embrace/adopt the positions of economists and reject more traditional accountants’ conceptions. This new trend culminated in multiple publications of the United Nations Organization (UN, 1996, 2003, 2013) and different works of the World Bank (2000, 2006, 2011), especially the famous 2006 book “Where is the wealth of nations?” If we take these examples into consideration, it can be asserted that the influence of the Fisherian ideas is much stronger in the field of national accounting than it is in business accounts. It can also be said that the type of accounting system the World Bank proposed represents an “ideal type” for what could be the development of the IFRS in the future if it were conceived in order to calculate the value (i.e. the Fisherian value) of businesses (Richard, 2012). But it is not the case today because the IFRS enforce the exclusive use of the Fisherian valuation for financial assets and not for assets as a whole. Consequently, this type of business accounting fortunately

\textsuperscript{12} See notably the case of Kendrick, who clearly prefers market values but chooses real costs when market values are not available (1976, p. 18).
remains largely based on the classic conception of accounting\textsuperscript{13}. That is why nowadays, despite many fruitless attempts at destroying it, the classic accounting conception continues to dominate the economic system around the world including the systems of national accounts, as they often remain based on business accounts (see below). As for the subject of national accounts, later we intend to dwell on the influence of the capitalist business accounts upon national accounting, but now we must state that the concept of added value, which is at the heart of most national accounts (used to calculate the famous GDP or NDP), is entirely based on the concepts of profit and wages developed by the first capitalists, such as Datini. In this sense, national accounts are fundamentally a by-product of capitalist business accounts. Beyond this provisory allusion to the problem of national accounts, the main lesson we can draw from this short historic survey is that the only thing the founders of capitalism selfishly treated as a capital to be preserved was financial capital, and they dismissed the so-called “human capital”. As regards the “natural capital”, this kind of capital was obviously not considered an object of registration at the time since the state of its degradation had not yet reached today’s catastrophic level. Of course, it did not appear at all in the capital-debt concept of their balance sheets, which unfortunately remains the case today.

The next part of our article is devoted to correction of serious defects inherited from this obsolete accounting model which is immoral, iniquitous and anti-economic.

3. The principles of business accounts reconstruction

The “strategy” that is used in our attempt of reconstructing business accounts relies on re-appropriation and re-interpretation of the old capitalist system of double-entry accounting, so it can better preserve human and natural capitals, the way some martial arts use the strength of one’s enemy to defeat him! To be short, instead of treating only financial investment as a true capital-debt like Datini does in his accounting system, we enlarge that protection to the human and natural capitals. To develop this method and reach this goal, we lay down twelve basic theses and principles that constitute the foundations of our micro CARE/TDL\textsuperscript{14} model\textsuperscript{15}.

1. First thesis and principle. We define a capital as “a thing”, material or not, offering a possibility of using and recognized as having to be maintained over a certain predetermined period of time. This definition implies that all kinds of (true) capitals are to be considered as liabilities (debts of conservation) and not as assets (or resources) to be used (as it is almost

\textsuperscript{13} It can also be emphasized that even though the IFRS theoretically defines capital in a Fisherian way as (net) assets, they, quite contradictorily, continue to treat new adjunctions of capital as new debts (Richard, 2015b).

\textsuperscript{14} CARE: Comprehensive Accounting in Respect of Ecology. TDL: Triple Depreciation Line.

\textsuperscript{15} During the period between the early versions of the CARE model (in 2008–2012) and the present CARE/TDL one (2015–2017), many important improvements were made, but the fundamentals remain the same: see Richard (2008, 2012), Rambaud and Richard (2015a; 2015b), Rambaud (2015). Experimentation with the CARE/TDL model has been recommended recently in France by different reports to the French government, notably the Notat-Sénard report (2018).
always the case in the economic literature and practice). In more philosophical terms, a capital is not a means but an end in itself. The immediate consequence of this definition is that it is impossible to imagine compensations between different types of capitals that will allow the improvement of some types of capital at the detriment of others. To put it another way, the CARE/TDL method relies on a conception of strong sustainability, not on a conception of weak sustainability that allows compensations between different types of capital, such as financial, natural and human ones. In another thesis (see below) we specify that this sustainability approach is a strict one that does not allow compensations made inside the same type of capital, at least as far as human capital is concerned, and also in the case of natural capitals that are a condition of preserving the biosphere. With this specific definition of capital, firms’ capital will represent the (true) liabilities (or debts) of these entities in relation to different providers of capitals: all these borrowed capitals should be maintained and “reimbursed”. We believe that this conception of capital is at odds with practically all the current models of accounting, even those that proclaim that they are environmental ones.

2. Second thesis and principle. It is the task of a democratic society to determine what things should be considered worthy of being systematically preserved. But in this article, there are at least three types of capitals that should be considered as such: natural, human (encompassing social one) and financial capitals. The natural capital should be understood as the things (living or not) without which human life could potentially be endangered. Several philosophers, e.g. Norton (1991), agree with this position, no matter how anthropocentric it may be. Our enumeration of capitals begins with the natural capital. This is not a random starting point: we consider the natural capital as the basis for the biosphere, which is the basis for the other two capitals, and its conservation must be the priority.

3. Third thesis and principle. We need to use a double-entry accounting system with a new kind of a balance sheet in which the right side is devoted to registration of capitals to be preserved (or liabilities) and the left side to registration of assets (or resources). These assets are defined as “things”, material or otherwise, available to be used to meet certain needs or desires. Our thesis is that without this double view of the capitals to be preserved and the corresponding assets (employment of capitals) to be used it is clearly impossible to effectively protect the different capitals in the frame of an ecological society. As we have seen, this thesis can be defended on behalf of the very historical experience of capitalism which has invented a kind of double-entry accounting to enable the conservation (and hence the accumulation) of its own (and sole) financial capital. Consequently, thanks to this new kind of balance sheet accounting, the two other types of capitals will be placed on an equal footing with financial capital.

4. Fourth thesis and principle. The creation of this new national balance sheet relies on diverse economic and social actors, notably and mainly companies which this article

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16 Dietz and Neumayer (2007, p. 619) give four types of reasons in favour of a strong approach to sustainability on environmental issues: ethical ones, risk and uncertainty, irreversibility, and risk aversion.
considers the main cause for today’s ecological and human situation (see below). As is already the case nowadays all over the world in the matters of financial capital (Richard et al., 2018), accounting laws should bind all these key actors to adopt this new, enlarged conception of capital in their own entities/subsidiaries and hence in their own balance sheets or equivalents (see below). Our thesis is that it is very difficult to achieve effective ecological and human accounting of a good quality without the collaboration of all the entities that constitute a nation as national accounting is, in a sense, essentially the sum of different accounting entities on domestic, local, and regional levels. That is why we use a bottom-up approach rather than research information made by central authorities alone. For instance, in many cases it is impossible to depict conditions in which human and natural capitals are used at the state level. Let us focus on the case of soils to be maintained: their composition and reactions to pollutions are so diverse that only a study at a local level will allow a serious analysis of the ecological problems (Ionescu, 2016; Bicalho, 2006). However, a more pragmatic view is necessary as, in some cases, a problem has to be handled on the national level (see below).

5. Fifth thesis and principle. A guarantee of true preservation of human and natural capitals is impossible without an ontological examination of the nature of these capitals, independently of how useful they may be to those who use them. The goal is to understand what these capitals really are and how they naturally function in the frame of the reproduction of the entire biosphere. In the matters of natural capital, the main task is not to study if and how men can draw economic services from these cycles. On the contrary, the task is to study how permanent renewal of structures and functions of biological cycles are maintained to enable preservation of biodiversity, which is the basis of all life on earth (Griffon & Weber, 1996). If we accept this kind of reasoning which gives the priority to the natural and human capitals in themselves (and not as an economic means) the following step is to understand in what cases and conditions viability of these capitals is endangered (Holling, 1973; Walker et al. (2004); Levrel (2007) and their literature on the concept of ecological resilience17). Issues of human resilience also arise when the workforce’s conditions are threatening their health or, more generally, preventing them from having a good life (see below for practical examples). Two types of people will undertake this complex task: scientists (for instance, ergonomists and doctors will tackle human capital, while ecologists will study natural capital) and also people who have good understanding of these capitals as well as a specific interest in their preservation, notably trade-unions. This has nothing to do with the analysis of “environmental functions” initiated by Hueting (1980) and subsequently defined by de Groot (1992) as “the capacity of natural processes and components to provide goods and services that satisfy human needs”.

6. Sixth thesis and principle. Human and natural capitals are observed here in order to deduct conditions of their resilience and standards for their use so as to enable their

17 It can be defined as the maximum intensity a system can withhold without changing its behavior, therefore keeping intact its structures, functions and responses.
preservation. Scientists’ goal is to define the thresholds where there is a risk of loss of resilience if they are trespassed. Considering how difficult it is to precisely define these thresholds (since they can considerably vary from one place to another, as stated previously), setting prudent limits on the way these capitals should be used sounds like a pragmatic solution. An even better one is to define ranges for their use. These ranges are to be conceived so as to make anticipation of the risks of non-resilience possible and to give the entities those risks may concern a warning, so the risks can be avoided (in this respect, see the interesting works by the Swiss school of eco-points, notably Müller-Wenck (1972) and, more recently, for application in the field of biodiversity accounting, Ionescu’s thesis (2016)). It is impossible to assign a real goal to any ecological and human management unless we want to manage blindly, without any definition of these norms (standards). Their importance for an ecological and human conception of economics was already stressed in the 1950s by initiators such as K. W. Kapp (1950) with his revolutionary proposals to depreciate both human beings and whales (Richard, 2015c), and Ciriacy-Wantrup (1952) with his concept of “the safe minimum standard” (SMS). They were reformulated by Hueting (1989) and developed by Ekins and Simon (1998) who promoted them as a central element of their interesting model of “strong sustainability” (see below). In the context of our bottom-up philosophy, the firms themselves will largely be the ones defining these ranges under supervision of specialized and independent auditors, as is already the case in traditional business accounting for a lot of matters, amongst which are depreciations of financial capital. But this is a flexible rule. In the cases of some worldwide phenomena, such as the emission of greenhouse gases, international and national levels provide a better standpoint to undertake these observations and define the conditions of resilience. More generally, though, cooperation of local, regional, national, and international entities will often be necessary to define these norms. A good example of that cooperation is the case of the definition of norms for the preservation of human capital (and its good life). It is necessary to take the general principles defined by the ILO (International Labor Organization) into account and then adapt them to the national, regional, and local situations.

7. Seventh thesis and principle. A comparison between the current situation in matters of preserving natural and human standards by the constitutive parts of the nations (chiefly businesses) and the defined local, regional, and national or international norms of sustainability allows these “stakeholders” to record gaps between their practices (pollutions, consumptions, employees’ wages...) and the natural and human standards that they are supposed to respect. The philosophy behind this reasoning is the same as the one already initiated by authors such as Ciriacy-Wantrup, Kapp, Hueting, and Ekins, with the specification that, in our conception, the calculation of sustainability gaps is effectively extended, for instance, to the human capital and made within the frame of a true micro-

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18 The concepts of preserving human capital and proper life must not be equated to minimal income or existence income. Moreover, strictly speaking, the pay corresponding to the preservation of human capital is not an income. Income begins beyond the preservation which must already allow for a normal and good existence (see below).
Towards a new ecological and human type of national accounting system. We are systematically dealing with both Ecological Sustainability gaps (ES gaps) and Human Sustainability gaps (HS gaps).

8. Eighth thesis and principle. In the case of the existing human and/or natural Sgaps (or rather of Sgaps’ risks), the entity responsible for these Sgaps (possible Sgaps) has to find what measures it needs to take to return the things that are to be preserved to a resilient state (if it is not too late) or, better, to stop the causes of these possible Sgaps, generally within a certain time frame. Consequently, it also must calculate the budgeted cost of this (these) measure(s) for each concerned component of HC and NC. These different costs are called “budgeted sustainability costs” (BSC). If an entity has an activity that respects conservation of the natural capital without supplementary costs above the pure financial costs, it is considered BSC free. Obviously, this cannot be the case for human capital which must receive at least a pay corresponding to its conservation.

9. Ninth thesis and principle. The BSCs for different elements that constitute the human capital (above all, the sum of the pays for the conservation and proper living conditions during the budgeted period) constitute the global human capital, i.e. the human debt the entity owes for the period considered. This human capital (capital/debt) is registered on the liabilities side of the balance sheet (in the same way as financial capital debt appears on the liabilities’ side under the name “financial capital” on every balance sheet today). Similarly, the BSCs for the different elements that constitute natural capital constitute the global natural capital, i.e. the global, ecological debt of the entity. This global natural capital is registered under the name “natural capital” on the liabilities’ side of the BS. As opposed to the capitalist balance sheet, the new balance sheet thus appears to be divided into three main strictly separate parts, or areas, on its liabilities’ side: financial capital, human capital, and natural capital (all of them capital/debts). We can see that under the hypothesis of a true strong sustainability, compensating is impossible not only within the human capital and the natural capital “areas” but also within the numerous components of each of these two types of capitals. For example, although it is the case today with the traditional GDP, one cannot imagine that high wages and benefits of top managers could compensate for miserable wages of “bottom” workers. Similarly, in the times of a massive and dangerous destruction of the biosphere, one cannot think that destruction of fishes could be compensated by breeding of cattle. In a nutshell, beyond the subdivision into three main capitals, the new balance sheet is actually made of a myriad of new capitals. Thus, within the frame of an extended national balance sheet, some kind of an “explosion” of capitals occurs!

10. Tenth thesis and principle. At the same time, when these three kinds of capitals are registered on the liabilities’ side of the balance sheet, three types of assets (more precisely, these assets’ costs) appear as their counterparts on the assets’ side of this same balance sheet. We show in detail the continuation of the demonstration in the following part. We believe that the use of the three categories of assets gives way to three separate types of depreciations (if admitted that the assets are detained for several years). These (separate) depreciations of the three types of assets classically have three separate types of depreciation expenses (charges) as counterparts that represent the diminutions of the
three types of capital respectively\(^\text{19}\). These expenses as a whole form a true and that has full financial, ecological, and human cost which has nothing to do with the actual financial cost that regulates the fixation of prices on the markets. In this sense, a new type of regulation of the markets will emerge.

11. *Eleventh thesis and principle.* The full cost described in the previous thesis is the basis of a new definition of prices and profit (see below for more information). Let us assume for now that the price is just covering the full cost. Once the products elaborated in the frame of these new conditions are sold, some new resources appear in cash as a counterpart of revenues. Usually, these new resources are allocated to three separate “cash boxes” that are to become means of investment or reinvestment in the three types of assets that are used and must be maintained. Thus, normally, the three types of capitals are preserved, each one separately, as are the numerous capitals they contain. If it is not the case, the CARE/TDL balance sheet immediately shows there is a discrepancy between the cost “value” of the concerned assets and the corresponding “value” of the capitals registered on the liabilities side. It means this type of accounting is a powerful instrument of information on whether the reimbursement of financial, human, and ecological debts is respected (see below for an example).

12. *Twelfth thesis and condition.* Although it is not this article’s main purpose, we have to say a few words on how deeply the appliance of this new kind of micro accounting will affect companies’ governance. Indeed, since each type of capital has its own depreciation expense, salaries (wage expenses) will no longer exist\(^\text{20}\). In today’s capitalist society, “depreciation“of the human capital is depreciation of the financial capital, that is, a payment (expense) which features the use of salaried people by the financial capital. On the contrary, in the new ecological and human CARE/TDL accounting system, each capital has its own expenses. Notably for that reason, the human capital no longer appears as a charge of the financial capital. This new capital appears as a true capital/debt, potentially with the same rights of firm governance as the financial capital. CARE’s conception of equality of treatment of the three types of capitals logically makes these three capitals equally powerful as far as firm governance goes, with the appearance of an ecological and social co-management led by representatives of the three new categories of “capital holders” (Richard, 2012, 2015b). This will be a new “capital holder theory” based on the CARE/TDL model. This new theory of firm governance based on an accounting system is much more precise\(^\text{21}\) and far-reaching than the famous “stakeholder theory”

\(^{19}\) Kendrick (1976, pp. 6–30) taking into account a “depreciation of the human capital” has nothing to do, except for formal resemblance, with the CARE/TDL concept of depreciation of the human capital for two main reasons: first, the wages to be paid are treated as expenses diminishing the profit of the financial capital. Second, the “human capital” is an asset (to be depreciated) made of rearing, non-human intangibles and education costs equally valued in the context of the labour market.

\(^{20}\) This idea of treating the costs of women and men as depreciation costs was anticipated by Kapp (1950) and Perroux (1952), then repeated by Passet (2000). But these forerunners did not integrate it into a system of business and national accounts (see Richard, 2012, 2015c).

\(^{21}\) It is a common place to recognize that the concept of stockholders is so large that it cannot be very helpful in defining a true new type of business co-management.
conceived by Freeman in 1984 (for more details, see Richard, 2015b). Tradition dictates that in order to build a company, one must combine three types of capitals: labor, nature and machinery. In a sense, this new situation is a logical transposition of this tradition. Even disregarding matters of profit and firms’ governance, the CARE/TDL philosophy will also have profound consequences for determining and interpreting some basic concepts of national accounting, notably the concept of added value, which we will discuss in the second part of the paper.

(To be continued)

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The new industrial policy: A chance for the BRICS countries

Alexander Kurdin*,
Faculty of Economics, Lomonosov Moscow State University; Energy Department, Analytical Center for the Government of the Russian Federation (Russia)

Andrey Shastitko,
Faculty of Economics, Lomonosov Moscow State University (Russia)

Abstract

This paper is aimed at investigating the ways of overcoming imbalances concerning competition and industrial policies. The central principles of combining industrial and competition policies have been formulated on the basis of a discussion of challenges and opportunities for interaction in the field of industrial and competition policies in developing countries in general and BRICS in particular. When setting priorities, it is essential to pay attention to those sectors that demand highly qualified resources and that are characterized by relatively strong competition; industrial policy design should be more competition- and innovation-friendly, which, in its turn, means orientation at supporting companies on an equal basis instead of favoring one specific company; industrial policy should be based on a pragmatic approach that involves a cost-benefit analysis of providing assistance to a particular sector.

Keywords: antimonopoly law, Austrian economics, competition policy, economic regulation, industrial policy, mechanisms of governance, new institutional economics, resource abundance.

JEL: B53, D02, L5, O25.

1. Introduction

Economic growth as a consequence of accelerated development of a number of industries is one of the major justifications for the implementation of industrial policy where it is necessary to prove its legitimacy by explaining its importance, necessity, and even

* E-mail of the corresponding author: aakurdin@gmail.com
inevitability. It is expected that anticipated outcomes of industrial policy — the multiplier effect, debottlenecking, creating a favorable business environment — will ensure accelerated growth of the entire economy.

In some cases, providing such a justification for industrial policy is quite easy, for example, when it is presented in the context of economy mobilization. Indeed, introducing a complex of measures to adequately address the clearly defined challenges (mainly, external ones) is an explicit solution. In other cases, it is harder to realize, as there also exists a number of alternative measures based on the same idea of picking specific spheres for accelerated development. Those measures may seem more attractive if they involve less government interference. Anyway, the question is whether the ex ante justification satisfies the ex post results and what follows if there is an obvious inconsistency.

It is assumed that indispensability of industrial policy is especially acute in developing economies which need structural adjustments (Cherif & Hasanov, 2019). At the same time, the changing global conditions and mixed previous outcomes led to a significant revision of industrial policy approaches (Rodrik, 2004, 2009). Competition is regularly proclaimed now as one of the main pillars of the new industrial policy (Tirole, 2017; Aghion et al., 2015). However, the normative consequences of competition policy and its relationship with industrial policy have yet to be specified.

Theoretical justification of competition and competition policy is directly linked to the idea of economic growth, or, being more accurate, to the idea of innovation-based economic growth. In accordance with Schumpeter’s ideas, it can be seen as a search for new combinations: producing new goods, utilizing new resources, and creating new markets, as well as new market organization types (Schumpeter, 1942, 1949). Following this logic, industrial policies may be considered as incentive-distorting activities due to their probable inconsistency with rewarding best combinations. In this scenario, it is almost impossible to give a single and simple answer to the question: What should and can be the relationship between competition and industrial policies?

This paper is aimed at investigating the ways of overcoming imbalances concerning competition and industrial policies. Our research is focused on the identification of balanced industrial policy approaches for developing economies (first and foremost, the BRICS countries with rather big and progressing economies) which face specific challenges on their path of industrial development, as well as on their path to competitive markets.

The first part of the article suggests working versions of industrial and competition policies definitions in the context of industrial policy historical review. The second part is dedicated to the subject of resource endowment when applied to competition policy and industrial policy as separate areas. The third part covers different variants of competition and industrial policy interrelation and interaction in the context of governance structures. In the fourth part of the article, the authors discuss opportunities and ways of shaping industrial policy, especially in the BRICS countries, on a new basis that includes political and economic aspects, whose importance is expressed in one phrase: “Being evident is not equal to being feasible”. The main findings are presented in the conclusion.
2. **Industrial and competition policies: Composition, structure, interrelation**

A constructive discussion of competition and industrial policies involves not just defining differences between the approaches used by various research directions or groups of interests, but reaching an agreement on the following issues: the basis, possibilities, directions, instruments and possible consequences of industrial policy in countries at different stages of development. The discussion is aimed at answering a number of key questions, in particular:

1. What is industrial policy?
2. What is the relationship between industrial and competition policies?
3. What is the best possible combination of industrial and competition policy tools and how to find it?1

Sometimes it seems that it is not worth the time to develop or even establish working definitions used in discussions on economic problems, as the context of the discussion speaks for itself. In most cases, it is true. However, it is not true when it comes to the definition of “industrial policy”, in which economic history and the history of economic thought are closely intertwined.

The definition of industrial policy itself could hardly appear two or three hundred years ago. It was related not so much to the lack of measures that could be interpreted as a part of industrial policy but to the state of economic studies — at that time, economics (as a separate area of research) was only in its infancy. One obvious early historical example is the state’s priorities in the hydraulic societies: construction of complex irrigation systems. At the same time, those systems were one of the key elements of the reproduction of Eastern despotism.

State policy played an important role in the development of the Industrial Revolution, although in its early stages it was more about instruments of foreign trade, whose focus was not so obvious in the context of industrial policy. For example, despite widespread ideas of protecting free trade, England had one of the highest tariffs on manufactured goods in 1820. The country started raising its tariffs back in the 17th century, mainly for fiscal purposes. Though the goal was not to introduce structural economic changes, tariffs escalation had significant consequences in that sphere. In the United States, the industrial development policy (including protectionism) was formulated in 1791 by A. Hamilton in his “Report on Industry and Commerce” that had a great impact on the principles of American industrial policy in the following century. The policy was expected to be based on moderate tariffs (that would be favorable for commodity import, but not for finished goods import) and industrial subsidies. Moreover, sectoral priority criteria had already been formed (Shafaeddin, 1998).

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1 The relationship between industrial and competition policies is especially important. Some of its aspects, as well as the question of finding balance between industrial and competition policies, have been under discussion in Russia for more than 15 years (Avdasheva & Shastitko, 2003, 2004) and for a much longer period in Western economies (Swann, 1983).
One of the striking examples that can be found in Russian history is how Peter the Great (the Emperor of Russia in the early XVIII century) contributed to the development of industrial policy. This is a good example of how complex the nature of the industrial policy is, which combines the participation of both public and private sectors. The Emperor ordered the Collegium of Manufacturing to deal with manufacturers “not only by negotiating, but by forcing them as well, and help producers by providing guidance, equipment, or in any other way…” (Klyuchevsky, 1904, Lecture 64). Klyuchevsky identified 4 directions of Peter the Great’s industrial policy: inviting foreign masters and manufacturers to visit Russia, sending Russian specialists to study abroad, advocating for industrial activity, and providing financial help (loans, benefits, subsidies).

Perkins (2008) identifies two major directions of industrial policy in China in the late XIX century as “construction of pilot industrial plants” under state protection and sponsorship, especially in the textile industry, and educational reform, including sending students abroad and modernizing domestic schools.

These are examples of how broad and diverse the methods of industrial policy were in the distant past. Nowadays, the set of alternative approaches is becoming even more complicated. This is why it is a hard task to define industrial policy as a range of specific instruments.

There are two papers (Aiginger, 2007; White, 2008) that provide various definitions of industrial policy (though the list is far from exhaustive). Finding the right definition may seem to be a word game. However, in practice, lack of a clear definition may turn into a source of serious problems while coordinating different groups and their actions (from politicians to researchers and experts).

Thus, serious difficulties in the formation of special legislation can arise and are already arising: the industrial policy is understood in a vague and broad way (even though there is a formal definition for it), and that is the reason why the adopted rules have a framework nature. Such a framework nature of the highest order rules is being translated to the lower institutional levels where it becomes less noticeable by public. There is no problem in transferring the micro-norms to the meso-level as it is (Shastitko, 2019). Nonetheless, it may lead to considerable distortions, taken into account that the mechanisms of developing such rules, bringing them up for discussion, and adopting them might differ considerably (in particular, there is no parliamentarian filter or any regulatory impact assessment involving representatives of both business and consumers associations).

Addressing the question of industrial policy goals helps to determine what can and what cannot be considered part of such policy. It is difficult to make such an analysis based solely on the policy tools, as they can be very diverse. Unquestionably, instruments of fiscal (subsidies) and foreign trade policies (tariff and non-tariff barriers to trade) are implemented in industrial policy, as well as anti-monopoly measures that control mergers and acquisitions. Popov is right in paying attention to the importance of monetary policy instruments, at least in respect to maintaining rather low exchange rate in order to stimulate export-oriented industries (Popov, 2014b). The enumerated list of instruments is far from embodying all the industrial policy measures, especially, if the complementary institutional reforms are also to be included in it.
The industrial policy goals are not absolutely explicit as well. Nonetheless, they present a good basis for reaching a quasi-consensus and determining the “battlefield” of industrial policy. It always refers to targeted state support of individual enterprises, groups of enterprises, or sectors of the economy as a whole. Attempts to separate the narrower and the broader order of concentration of industrial policy measures have led to the separation of vertical and horizontal industrial policy types. In this regard, Kuznetsov and Simachev note that measures that have a favorable effect on a broad or even undefined number of spheres might lead to structural shifts in economy (2014, p. 156) or, in other words, to an outstripping development of some spheres and enterprises (we would like to add that these structural shifts are usually predictable and can be the goal of the de facto policy). In continuation of this reasoning, we’d like to agree with Polterovich (2014), who denotes it reasonable to use the “degree of selectivity” concept instead of dividing the policy into vertical and horizontal types. It is important to take into account Polterovich’s suggestion when discussing practical aspects of industrial policy implementation, because horizontal industrial policy, which is carried out in accordance with publicly declared intentions, may turn out to be a disguised vertical (selective) one.

In view of the above, we will further use our own definition. Industrial policy is a sequence of government measures aimed at development of certain industries and, accordingly, correction (maintenance)² of industrial structure via ensuring resource endowment of corresponding subjects in order to stimulate economic growth³.

It is worth mentioning that in the context of modern discussions, the coexistence of the narrow and broad definitions of the industrial policy is, in fact, possible (or even inevitable), and it is existing along with the distinction between horizontal and vertical (selective) (Rodrik, 2004), reactive and strategic (proactive) (Warwick, 2013, pp. 28–29) industrial policy types. The definition we have proposed corresponds to the broad policy, whereas the narrow definition requires binding to a specific set of sectors that are united by the term “industry”, namely, mining, manufacturing, and utilities.

In its turn, competition policy is defined as a sequence of government measures aimed at creating new markets and ensuring competition conditions in markets in order to provide economic development⁴. For further discussion it is important to delimit the protective and active competition policies because that will allow to identify the intersection of industrial and competition policy tools (Avdasheva & Shastitko, 2010). Here it should only be

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² We should note that in the framework of the debate on industrial policy, structural changes are usually seen as its goals. However, in practice, industrial policy is usually aimed at avoiding changes, at conservation of a sector’s or the whole economy’s structure. It may refer, for instance, to support of core enterprises, even though it is provided in the short run, as well as done under the pretext of realizing social goals.

³ In reference to the last part of the definition, it is important to recall different economic growth concepts, including those that, for example, address changes in assessment of human impact on the environment. This is the origin of relationship between industrial policy and the “green” economy.

⁴ We should note that this paper is focused on the economic development that has its impact on the quality of economic growth, and on new combinations (according to (Schumpeter, 1942, 1949)) that represent the goals of the economic development.
noted that the instruments of protective competition policy are concentrated mainly in
the framework of antitrust policy, including bans on anticompetitive collusions, abuse of
dominant position, monopolistic activities involving state and local authorities, as well
as control of mergers and acquisitions. However, finding a balance between protecting
competition (primarily in domestic markets) and ensuring effective competition of national
companies worldwide (Korneeva, 2016) is one of the important perspectives of providing
compatibility between competition and industrial policy.

In analytical terms, the fundamental difference between competition policy and
industrial policy is the contrast in resource endowment and incentives adjustment.
Meanwhile, resource endowment influences the incentives itself. What is more, the nature
of its impact largely depends on what was the mechanism that led to the appearance of
the resource endowment.

In particular, if resource abundance is not linked to the efforts aimed at finding new
combinations of resources, it is likely that the distorting effect on incentives cannot be
avoided. According to Schumpeter’s ideas, if the resource endowment arises as a result
of, or in connection with, the incentives to search for new combinations, then contrasting
competition to industrial policies is wrong.

Still, if there were no reservations concerning the use of the above-mentioned
fundamental difference in certain situations (in a particular economy, industry, region,
or market), then there would be no doubts or disappointments related to the future
of the industrial policy. This statement is also relevant to the competition policy: for
instance, the Austrian school sees competition as a process of creating new resources
and identifying new opportunities to use those that are already well known, as a process
that happens through entrepreneurial activities in the market (Hayek, 1989). It may
seem that the main point is that an entrepreneur has incentives to identify these kinds
of opportunities and use them for making profit (Kirzner, 1997). However, even within
the framework of the research area that has negative attitude towards a possibility of
government intervention (including intervention in the form of anti-monopoly policy
(Armentano, 2005; Boudreaux & DiLorenzo, 1993; DiLorenzo, 1990)), it is recognized
that it is almost impossible to create incentives not related to allocation of ownership of
resources (Rothbard, 2009, p. 511; Salerno, 2008). In fact, it is an indirect recognition
that the institutions matter for both economic agents’ incentives and the results of these
agents’ exchanges.

Note that the resource endowment here should be taken in a broader sense. Industrial
policy, which increases resource abundance, is associated not only with distribution of
funds or other material benefits in favor of the supported sectors, but also with human
resource development, with development of information, transport and business
infrastructure, and increase of access to it. In other words, creating resource abundance
effects means introducing measures that reduce the costs of enterprises without quantity
or quality losses of the resources used in production, or that increase the quantity/quality of resources used at a constant cost of enterprises. For example, establishment
of an information system that would provide data on the activities of enterprises or
their products can also be considered an industrial policy measure, since this measure
reduces transaction costs of industrial enterprises. Such measures can cause significant positive externalities which may constitute the basis for choosing specific industrial policies in order to promote Pareto-improving internalization (Popov, 2014). To put it sharply, in a number of cases industrial policy measures may be regarded as an option of positive externalities internalization and, consequently, as a way of reaching Pareto-improvement. However, within the framework of the new institutional economics, firstly, there is no basis for making undisputable conclusions about the necessity of such internalization, and, secondly, if the internalization still takes place, it does not necessarily take the form of subsidies (as an opposite version of Pigouvian tax for negative externalities).

One of the attempts to create a systematic view of the industrial policy is proposed by Naude (2010), where its tools are considered in the context of priority functional areas. Protection of intellectual property rights can be mentioned among the instruments that are used for creating necessary economic signals and incentives. This is the issue that is currently being discussed in Russia and all over the world, partly because of the intellectual property rights abuse (Shastitko & Kurdin, 2012, 2015; Kurdin & Shastitko, 2017; Shastitko, 2013). This issue is becoming more specific in terms of the digital transformation of the economy, outbreak of multi-sided markets, platforms, and big data. That is why the problem of balancing industrial and competition policies will also be further considered in terms of protecting intellectual property rights.

Summing up the discussion in this section, we might stress the following:

1. The concept of industrial policy is not only significantly heterogeneous by meaning but much younger than state’s priorities to be discussed by this evolving concept.
2. There is a wide range of industrial policy instruments specific in time and place.
3. Those instruments can be classified based on wide and narrow definitions of industrial policy.
4. For a better understanding, industrial policy might and should be related to competition policy issues.
5. Sources of resources endowments are important for considering competition and industrial policies as complements or substitutes.

3. Resource endowment

Before discussing in more detail options of relationships between industrial and competition policies, it would be appropriate to clarify the position on the issue of resource endowment that was formulated in the context of industrial policy problems (Shastitko, 2014b). An explanation of resource endowment concept is closely related to the approach of institutional studies that are based on the ubiquity of institutions’ coordination and distribution aspects (Shastitko, 2010, pp. 137–142; 2011, pp. 32–40), as well as on the existence of a meso-level in economic research (Menard, 2017; Shastitko, 2019).

Further we consider the resource endowment issues regarding transaction as a basic unit of research within the framework of transaction costs economics.
In economic research, the meso-level is usually associated with the specifics of an object — regional or industrial one. However, not a long time ago, it was proposed to correct the approach based on Williamson’s three-level (“institutional environment — institutional arrangements — individual”) scheme (Williamson, 1996) focusing on meso-institutions. In general, development of such an approach can be seen as recognition of the fact that “details matter”. On the one hand, adoption of framework rules is not enough and, on the other hand, concretizing rules may not only inhibit macro-level changes, but absolutely distort them as well (Menard, 2017; Menard et al., 2018; Shastitko, 2019, 2020).

Governmental resource endowment of certain market actors as well as their success in reaching the same results because of the regulatory burden reduction is only one of available options of providing resources.

Another option is acquisition of resources based on a company’s competitive advantages that were formed by incentives to look for the best known ways of using resources and to discover new resources. The availability of resources, which is the other side of resource endowment, is an important condition that allows to expand the circle of effective firms as a consequence of making profit and having better access to debt financing.

Nonetheless, in this second case, resource endowment, being a consequence of competition (if it is really a situation of competition), has one important peculiarity: regulators and market participants learn about it post factum. Absence of a predetermined winner is an important characteristic of the competition.

In this regard, it is important to pay attention to the lack of a straightforward connection between the competition and the effect of resource abundance. We cite two examples to illustrate it.

Firstly, there is the example of “the winner’s curse” problem (Kagel & Levin, 1986; Thaler, 1988). The problem was identified in different areas after organized auctions for the right to use scarce resources (a segment of the radio frequency spectrum, mining areas, etc.) which initially were in state ownership. The auctions were seen as a way to adequately ensure competitive conditions. As a result, the auction winners could lose their opportunity to develop their own business for a while due to the high price paid for a limited resource. Such a situation could have led industries to a slowdown, though the budget could have obtained significantly more funds.

Secondly, there is the example of new measures that concern intellectual property rights (IPR). A company can lower its production costs by means of innovative processes. However, there may be an obstacle that will not let us to conclude that there is an effect of resource abundance. This obstacle is a fixed (and probably very significant) amount of resources that is needed to introduce the innovation. Omitting that fact, it is easy to come to equivocal conclusions regarding the appropriateness of controlling the right holders who play an active role in the markets with intensive use of IPR (Shastitko & Kurdin, 2014; Shastitko, 2015).

Strictly speaking, *ex ante* and *ex post* resource endowment reflects two branches of industrial policy — the selective (vertical) policy and the horizontal policy.
The selective policy implies *a priori* choice of winners (selecting those who will gain support). Those “winners” might be even announced *in advance* as “national champions” (with no championship but the one oriented at determining the most successful rent-oriented agents). Of course, in practice, this selection is not arbitrary and is based on a number of criteria that include government support on the grounds of accomplishing the objectives of state programs or preserving the state control either over industries or over their segments. For example, granting state-controlled oil and gas companies exclusive rights to explore and develop offshore fields of Russia *a priori* increases their resource abundance, but at the same time creates certain guarantees that help prevent opportunism of operators, which can have dangerous consequences in this area.

Horizontal industrial policy does not imply *a priori* selection of a champion and loosens resource constraint on an industry or a range of industries as a whole, which, however, does not mean that all the enterprises are equally endowed with resources. For instance, granting subsidies or preferential loans to enterprises of a certain industry may be done on competitive basis, or be based on the fulfillment of a set of particular requirements (otherwise a company will be obliged to refund the subsidy). Probably, companies’ benefits will be unevenly distributed and some of them will even become “losers”; however, such an allocation is not defined in advance, and there are no enterprises (including those that have been recently established, or those that are being established) that could be left without such support (or, so to say, set aside). Such support makes companies more focused on searching for internal reserves that will help them create value instead of gaining distribution benefits through rent-oriented behavior. There is no doubt that contest design is important, as it determines to what extent the access to resources will be based on competition and what form it will take. Rent-oriented behavior can also be interpreted as competitive. Nonetheless, it will not increase companies’ efficiency from the positive social effects point of view.

In practice, there are cases that are even more difficult to identify: establishment of holdings with state participation consisting of all or most of the companies that function in one area (that enhances their resource endowment due to increased bargaining power in relation to resource providers, as well as buyers of their production); export cartels (or export monopolization); support of enterprises operating in certain territories (in Russia some of them are known as territories of advanced development, monotowns (Shastitko & Fatikhova, 2015; 2016; 2019)).

We do not have a universal normative answer to the question: How exactly should the resource endowment originate? At the same time, it is barely possible to abandon the use of assumptions that define the algorithm for comparative analysis of discrete structural alternatives. In particular, it is possible to state the priority of horizontal policy instruments in a milder form — relying on the presumption of impracticability of selective methods if they are not proved to lead to better results (those that could be obtained with the help of other structural alternatives). This statement is founded on the idea that, *ceteris paribus*, simple mechanisms of governance are preferable. The decisive question is whether we can
trust the comparative analysis measures and, if the answer is yes, under what conditions it should be done.

Discussion of the resource endowment issue and the effects related to it allows to outline one more aspect that shows a possibility to interpret the selective industrial policy in terms of economic regulation. In its turn, this formulation provides a basis for considering different components of industrial policy in comparison with competition policy in the context of governance structures (Williamson, 1996; Shastitko, 2010).

4. Options of the relationship between industrial and competition policies

The relationship between industrial and competition policies is sometimes seen as conflicting or, at least, quite tough (White, 2008, p. 1). It is explained by the fact that both of them are following the same goal: to correct the structure of the national economy. However, both policies see the same goal from different points of view, and their instruments differ distinctly.

Speaking about the structure of a national economy, we focus on the structure of its elements — in particular, its industries and separate enterprises, as well as relationships between them. Indeed, the result of implementing industrial and competition policies instruments is a change in the structure of the economy’s elements (let us assume we are talking about introducing a new industry or removing entry barriers for new firms) or/and a change in relationship between them (for example, creation of a new market or, vice versa, termination of inter-firm relations within one integrated organization). However, from competition policy’s point of view, the structure of the economy can hardly be described in terms of forecasts that give specific parameters and proportions. It is explained by the fact that market equilibrium (as well as comparative statics as a succession of equilibriums) is a side and unpredictable result of economic agents’ interaction (meanwhile, these agents have their own plans and expectations and information about them is hardly accessible or not accessible at all to the regulators).

Studying the structure of economics, Williamson (1998) suggested a well-known four-level system of social analysis which is applicable to the economic policy directions. According to the system, the first (lowest) level represents issues concerning price, as well as production and sales volumes optimization, while the fourth (highest) level deals with traditions and culture.

On the second and the third levels of Williamson’s system, we find optimization of governance mechanisms (i.e. organization of relations between enterprises) and

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5 In this regard, we should think of one more aspect of resource abundance that is related to such occurrence of perverse incentives as corruption. Indeed, it is one of the main arguments against selective policy along with information-founded arguments regarding the basis of sectoral priorities choice. Correlation between resource abundance and publicly announced results is, in fact, the question of institutions’ quality as requirement for achieving the set goals by correcting economic structure. Corruption here appears to be an obstacle that affects the extent to which actual results deviate from the expected results, which estimates (presumably) correspond to the capabilities of resource provision.
distribution of property rights. The structure of national economy is shaped precisely at
these levels, and it is these levels that are influenced by the intervention of structural policy
(represented by industrial and competition policies) that implies intentional government
intervention in the already existing property rights and relations between enterprises.
Herewith, in contrast to the first level, the time gap at the second and the third levels is
measured by many years or even decades, and this requires different decision-making and
projecting conditions, including those that concern institutions.

In recent decades, the reason for the opposition between competition and industrial
policies was that the former had competitive market as the main benchmark, and that
market seemed to form itself, requiring only protection from opportunistic behavior.
The latter was considered as supporting the ideas of market abandonment in favor of
the state hierarchy. Bianchi and Labori note: “Until 1980s, the term (industrial policy)
meant direct government intervention in the economy, direct government control over
most of the production and a set of political measures aimed at market constraint...”

Indeed, in such a context, these two policies may seem controversial. However,
two facts changed the whole paradigm of the industrial policy. The first one was that
competitive markets could not originate on their own and that such markets demanded
active interventions (post-socialist transformation was important for understanding that
fact). The second one was that government interventions, however efficient, had too many
limitations, and one of the most important limitations was lack of incentives.

Bianchi and Labori further note that now the policy of industrial development is the
core of industrial policy. It consists, first, in creating new competition rules (including
both anti-monopoly policy and property rights protection) and, second, in increasing
competitiveness of companies via science and education, innovation policy, development
of inter-company and cross-sectoral relations, and so on (2006, pp. xvi–xvii).

Research in the field of development economics is also focused on convergence and,
if not synthesis, at least close mutual influence of industrial and competition policies. Lin
specifies three “waves” of structural policies development. The first “wave” that emerged
during the first post-war decades was focused on targeted structural changes realized
through government interventions. The second “wave” (1970s — 1980s) declared the
priority of spontaneous structural changes under the impact of market powers. However,
the timely third “wave”, also called “new structural economics”, suggests a new central
role of the market in what concerns resource allocation, with active state interventions in
the structural adjustments. Representatives of the third “wave” are Rodrik, Hausmann,
Spence, Aghion and a number of other leading economists (Lin, 2012).

This modern wave is still based on the idea of “good” and “bad” industrial structures
from the development perspective (Reinert, 2007; Matsuyama, 1992), though now it is
more sophisticated. One of the still influential approaches was developed by Hausmann,
Hwang and Rodrik (2007); they introduced the measure of export sophistication (EXPY)
showing similarity of a country’s export basket to the structure of rich economies’ exports.
Export diversification is another indicator of “good” industrial structure, at least for big
developing economies (Cherif & Hasanov, 2019).
At the same time, the idea of direct structural regulation is irrelevant to this modern direction of industrial policy thinking. As such, the repeated references to the importance of industrial policy are completed by recommended priorities, presumably leading to indirect structural improvements. Protection of competitive environment is considered to be one of such priorities. Tirole (2017) supports it not only due to its contribution to innovative activity and efficiency but also because of its restrictive effects on rent-seeking (often accompanying industrial policies). Aghion et al. (2015) empirically prove that industrial policy instruments are more efficient in industries with more intense competition. Cherif & Hasanov (2019) confirm that so-called Asian economic miracles were underpinned not only by the sound state support of specific export-oriented industries, but also by a fierce domestic competition. However, they emphasize that government failures (including poor institutional basis for competitive markets and, consequently, weak competition) and market failures6 (including the development by the free market of a “wrong” industrial structure without any intervention) should be necessarily compensated together. From our point of view, it means that the combination of competition policy and industrial policy matters.

From a theoretical perspective, it is possible to outline five types of relations between industrial and competition policies:

1. mutual exclusion, including (1a) only industrial policy without competition policy, (1b) only competition policy without industrial one;
2. complementarity based on (2a) one set of transactions, or (2b) different subsets of transactions, (2c) overlapping sets of related transactions.

Depending on how industrial and competition policies are defined, it is possible that option (1b) is not feasible at all, especially in emerging market economies, if two components of competition policy – protective and active – are taken into account. Minakir cites a good example of post-war Japan and comes to an important conclusion that “time matters” for industrial policy (2014, pp. 180–181). It means that industrial policy measures are not invariants of the stages of economic development and external conditions. The same is valid for the relationship between industrial and competition policies.

What is more, the relationship between industrial and competition policies is also not invariant for the economy sector7, in particular, because of numerous transactions with different characteristics – frequency, uncertainty, and degree of resource specificity. In its turn, complementarity of different subsets of transactions reflects the common principle of differentiated attribution of transactions to different governance mechanisms, taking into consideration their comparative advantages (Williamson, 1996; Shastitko, 2010). Complementarity based on one set of transactions implies, for example, that mergers and acquisitions control may combine approval of deals under

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6 This interpretation differs from the conventional definition of market failures.
7 Of course, the characteristics of each economy sector also change over time along with technological development, which, in turn, determines the adjustment of industrial policy. For more information, see (Dementiev, 2014).
the pretext of supporting export-oriented high-concentrated sectors together with corrective conditions designed to protect consumers in local markets. For example, they may take the form of price control in the context of behavioral remedies as part of a regulatory contract between a merging firm and antimonopoly authority, or they may take a broader form — through the design and approval of trade and marketing policy with anti-monopoly regulator.

What is the basis of the industrial and competition policies’ supposed mutual exclusion? First of all, it is the idea of incompatibility of industrial policy with the incentives that are necessary to maintain competition in the markets and that force companies to put their effort in improving the quality of production and in reducing costs by adopting methods allowing them to make profit without breaking any rules.

In this regard, one of the most common arguments against such measures of industrial policy is their negative impact on competition and incentives, including negative impact in the form of regulatory capture, rent-seeking behavior that is supposed to be based on a priori assigning a winner in one form or another (Kuznetsov & Simachev, 2014, pp. 170–171; Motta, 2004; Aghion et al. 2011, p. 2). However, this involves the implementation of vertical (or selective) industrial policy instruments. As already mentioned, under such a policy, resource endowment is provided ex ante in relation to transactions that create value.

Along with the pro-competitive argument that gives reasons to the above mentioned mutual exclusion, there is an essential pro-industrial argument: local enterprises’ need to compete on a global scale in the absence of a global antitrust authority or a coordinated antitrust policy of national (and supranational) antitrust authorities (Avdasheva & Shastitko, 2012; Shastitko & Pavlova, 2019). Imposition of competition policy measures on local companies without any opportunity for the domestic regulator to do the same in relation to foreign companies in the world market or, sometimes, even in the local market (for example, the anti-monopoly authority can prohibit a merger of local companies, but it will be quite difficult to do the same in relation to international ones) might make matters a bit worse for the local enterprises. In perspective such imbalances may only withdraw national companies from the market, which will result in further negative consequences for domestic consumers.

This pro-industrial argument is usually mentioned when advocating for “national champions”, i.e. selective industrial policy. However, a milder form is also possible: national companies in foreign competitive markets create sources of income for market players who are final consumers in other markets.

The internal inconsistency of this argument is related to the fact that creating exceptional conditions for specific companies in one industry can lead to serious negative consequences for other industries whose enterprises are suppliers and consumers of these companies. This problem can only be solved by state regulation of all these relationships, which sooner or later can put a significant part of the national economy out of the scope of the market governance. In addition, the functioning of the economy will be hindered due to the limited abilities of the regulator. In this regard, we should note an underlying danger that is, nonetheless, very real: such a system of state control and regulation will
not let the national economy become more complex in terms of both structure and composition.

The mechanism of resource endowment origination reflects the specific nature of economic regulation — unlike the application of anti-monopoly legislation that is oriented on maintaining the price mechanism as a mode of governance. If, in the first case, transactions include agreement conditions that are somehow pre-determined by the third party, i.e. by government (it may concern not only prices, mechanism of price determination, non-discriminatory rules, but also predetermined preferences, for instance, those concerning taxation or crediting), then, in the second case, all the conditions are determined by the actors themselves accurately following existing general norms and eventual ex post assessment of market participants’ decisions if they are related to monopolistic actions. Thereby, it is possible to make a distinction between the price mechanism and the trilateral mechanism of governance in Williamson’s approach (Williamson, 1996).

Moreover, provision of resource abundance may be so closely linked to increased state control that it would actually mean introduction of a hierarchical governance mechanism into the relationship between the government and the recipient of support, or between two recipients of support (for example, between two “national champions”).

The result of such conditions may be an increase or, conversely, a reduction in the number of transactions related to certain spheres or to certain types of resources. The outcome will depend on how the mechanisms of governance (which appear or are imposed) affect the transaction costs of the interacting parties.

Belief in competition and competition policy’s opportunities generates the belief that even if we see dynamic imperfections in existing economic relations, their correction should be done through eliminating (but not compensating) these imperfections. As a rule, the total cost of eliminating such imperfections is not discussed. Of course, this issue is quite difficult to solve using only theoretical reasoning, and it is also difficult to carry out a decisive experiment (in accordance with the Lakatos methodology) when discussing competing research programs.

Why then should these issues be discussed? Is it because those who have competitive advantages in using resources are not always able to access them? Is it only due to excessive government intervention? If there were enough grounds for claiming that it happens partly (but not solely) due to the government intervention, then it would be possible to avoid the extremes of market fundamentalism. Nonetheless, how should we understand what is the exact situation that constitutes the subject of the study? Does the answer to this question always depend solely on awareness of specific time and circumstances? There are a lot of other similar questions to ask.

Most of the questions raised here by default have neither negative nor positive answers, as they depend on the above-mentioned circumstances of time and place. Such an

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8 A good example is the fierce discussions between Austrian economists and representatives of the Chicago tradition — the closest tradition to the Austrian school in the context of research on such issues (Shastitko, 2008, pp. 107–109).
approach can be explained by the gradual penetration of the new principles of institutional economics in discussions on industrial policy problems (for details, see (Shastitko, 2014)):

1. Perfect institutions are absolutely impossible as well as perfect economic exchanges with no transaction costs. In fact, it is a reflection of humans’ imperfection, of their ability to make decisions and coordinate their will with each other’s desires.
2. The choice is made from a number of available (but not ready for observation) alternatives that are imperfect by definition.
3. It is necessary to take into consideration/identify their comparative advantages and disadvantages.
4. The choice, in its turn, does not exclude the search for the best possible option. In other words, the option that maximizes social welfare is not necessarily the most likely one, for instance, because the Kaldor–Hicks–Zerbe criterion (Zerbe et al., 2006) does not work with regard to compensating influential losing groups.

5. **New industrial policy: Lessons learned**

Analysis of the approach to industrial policy design on the base of comparative analysis of discrete structural alternatives allows us to return to the issues of industrial policy with the lessons already learned and with a new level of understanding of its potential and limitations.

The approach itself is not something unique. In particular, the issues of industrial policy design related to the balance in the field of competition protection were elaborated by Aghion et al. (2011, 2015). The lesson to be drawn from these conclusions is that while government intervention has its disadvantages, it is not sufficient to stop using it (even setting aside relations between different interest groups and political dimension). The same can be applied to market mechanisms: their disadvantages do not constitute enough grounds for government intervention (in contrast to Pigouvian tradition of discussing market imperfections, including externalities internalization)\(^9\).

The situation in developing economies is too diverse to recommend universal policy implications even just for the BRICS economies. Nevertheless, a brief look at some industrial structures and competition indicators (Table 1) confirms that the BRICS countries are lagging behind the group of developed economies in terms of industrial structure, as well as in terms of domestic competition intensity. In this framework, China seems to be the BRICS leader in industrial structure development and simultaneously this country has achieved the best results according to competition indicators (though by a narrow margin). On the contrary, Brazil has unfavorable industrial structure and shows poor results in domestic competition (though a direct question on competition intensity asked in 2016–2017 gave satisfactory results). Russia is somewhere in the middle of the BRICS group.

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\(^9\) Discussion of these questions is related to the problem of type I and II errors in law enacting and law enforcement (Shastitko, 2010, 2013a).
The new industrial policy: A chance for the BRICS countries

Table 1. Competition and industrial structure indicators in BRICS and comparator developed economies

<table>
<thead>
<tr>
<th>Year</th>
<th>Intensity of local competition (WEF inquiry, 1 (least intense) to 7 (most intense))</th>
<th>Domestic competition (WEF aggregate index, 0 — least intense, 100 — most intense)</th>
<th>Distortive effects of taxes and subsidies on competition (WEF inquiry, 1 (most distortive) to 7 (least distortive))</th>
<th>Export sophistication (log EXPY*)</th>
<th>Export concentration (HHI for product groups)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>5.3</td>
<td>45.0</td>
<td>2.5</td>
<td>9.63</td>
<td>0.578</td>
</tr>
<tr>
<td>Russia</td>
<td>5.0</td>
<td>55.2</td>
<td>3.8</td>
<td>9.74**</td>
<td>0.637</td>
</tr>
<tr>
<td>India</td>
<td>4.7</td>
<td>56.9</td>
<td>4.0</td>
<td>9.78</td>
<td>0.471</td>
</tr>
<tr>
<td>China</td>
<td>5.5</td>
<td>57.5</td>
<td>4.1</td>
<td>9.94</td>
<td>0.403</td>
</tr>
<tr>
<td>South Africa</td>
<td>5.4</td>
<td>53.1</td>
<td>3.6</td>
<td>9.73</td>
<td>0.543</td>
</tr>
<tr>
<td>USA</td>
<td>6.0</td>
<td>70.2</td>
<td>4.5</td>
<td>9.97</td>
<td>0.24</td>
</tr>
<tr>
<td>Germany</td>
<td>5.9</td>
<td>69.7</td>
<td>4.7</td>
<td>10.05</td>
<td>0.311</td>
</tr>
<tr>
<td>Sweden</td>
<td>5.5</td>
<td>64.9</td>
<td>4.4</td>
<td>10.03</td>
<td>0.357</td>
</tr>
</tbody>
</table>

* counted by WITS following the methodology by Hausmann, Hwang and Rodrik (2007), usually its values lay between 8 and 10; ** 2017 data.


Anyway, we can conclude that the BRICS countries have neither achieved presumably sustainable and desirable industrial structure, nor established competitive market environment. Consequently, neither competitive nor industrial policy can be set aside. On the contrary, their combined application might bring considerable synergies.

Following the pattern of industrial policy principles formulated by Aghion et al. (2011), Tirole (2017), Cherif and Hasanov (2019) and extending it to the area of competition policy, we suggest following the next basic principles of combining industrial and competition policies in developing economies:

(1) when setting priorities, it is essential to pay attention to those sectors that demand highly qualified human resources and that are also characterized by relatively strong competition;

(2) industrial policy design should be more competition- and innovation-friendly, which in its turn means focusing on the support of companies on an equal basis, rather than favoring one specific company;

(3) industrial policy should be based on a pragmatic approach that involves a cost-benefit analysis of providing assistance to a particular sector.
Thus, consistent implementation of the above principles helps to achieve the set goals without experiencing great difficulties. We should note that the goals and instruments of competition and industrial policies do not contradict one another. Industrial policy almost in all its forms does not necessarily imply competition restriction. Similarly, competition policy by default does not imply access restriction to resources for any sector of economy or company, or introduction of rigid economy for them.

Moreover, in the long run, it is the complementarity of the two policy directions that will allow us to find the optimal balance between type I and type II errors in law enactment and enforcement. As a reminder: errors of type I and type II in law enforcement mean, respectively, wrongful prosecution of an innocent person and evasion from prosecution of a lawbreaker. Regarding the law enactment: a type I error is superfluous prohibition/regulation, while a type II error is the opposite.

In other words, using the instruments of both policies will, on the one hand, prevent resource scarcity in domestic industries that are important for social welfare. For example, applying active competition policy to companies that compete with importers may restrict national enterprises’ development potential, but these enterprises may be supported by industrial policy measures.

On the other hand, combining industrial and competition policies creates enough incentives for those sectors that receive support within the framework of industrial policy. Integrating competition principles into the set of industrial policy instruments (for instance, such measures as competitive selection of companies that will get support) will make business environment more rigid and force companies to look for new incentives to introduce innovations.

In this sense, the new industrial policy resembles a hybrid by analogy with the basic structural alternatives of governance modes proposed by Williamson. If competition policy is analogous to a price mechanism, then traditional (selective) industrial policy is analogous to a hybrid institutional agreement which is known to combine the advantages of strong price mechanism incentives with the benefits of collective adaptation of hierarchies, but remains highly vulnerable to uncertainty (Williamson, 1996; Menard, 2004; Shastitko, 2010). That is why the issue of composing a new industrial policy should be accompanied by the issue of feasibility and effectiveness of this kind of policy.

6. Conclusion

Basic correlation between industrial and competition policies is quite straightforward. While the first policy is described in terms of resources endowment effect, the second is described in terms of incentives to searching for new opportunities to use already known resources and find new resources. However, a detailed analysis shows the following:

- Time (ex ante vs. ex post) and predictability (competition for leadership vs. appointment of champions) of resource abundance matter from the economic development perspective

- Industrial and competition policies have their own structures. Consequently, their interrelation is complicated. The evidence of this complexity is provided,
in particular, by the combination of antimonopoly merger control as an element of protective competition policy, on the one hand, and industrial policy directed on supporting national companies’ competitiveness worldwide, on the other hand
- Time and place should be taken into account to distinguish horizontal and selective industrial policy in practice, although the conceptual difference is almost obvious
- Perspectives of the new industrial policy depend on preventing the transformation of competition policy into economic regulation.

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Demographic situation in China: Convergence or divergence?

Irina Kalabikhina*,
Department of Population, Lomonosov Moscow State University (Russia)

Ekaterina Shatalova,
Data & Analytics Department, LLC Lamoda (Russia)

Lieming Fang,
Shandong Youth University of Political Science (Jinan, China)


Abstract
The purpose of this study is to locate the presence of convergence in the demographic development of Chinese provinces during the end of the demographic transition at the turn of the millennium. We have estimated sigma and beta convergence in fertility, mortality, urbanization, and population ageing basing on the official Chinese statistics for 31 provinces of China. Our results show that the regional convergence in the above indicators has not been sustainable. It was observed only in certain periods, except for the urbanization process. Convergence was accompanied by a catching-up effect in such periods when “lagging” provinces were passing the demographic transition relatively quickly. The paper can serve as a contribution to the regional demographic and economic policy of China, since the issue of the dynamics of the regional demographic development differentiation is the basis for demographic and economic projections and development of local policy measures. The demographic divergence that we discovered in the last decade can determine an obstacle to the sustainable development of the country in the near future.

Keywords: China, China’s regions, demography, convergence, fertility, mortality, urbanization, ageing.

JEL: J11, J13, R12, Y10.

1. Introduction

China has demonstrated a significant differentiation in regional demographic indicators. The differences decreased from the mid-1990s to the late 2000s, then they grew again in
the second decade of the new millennium. For example, maximum value of life expectancy at birth in the provinces exceeded its minimum value 1.23 times in 1995, 1.18 times in 2010 and 1.29 times in 2015. These differences for old dependency ratio were 3.05 (1995), 1.88 (2005) and 2.82 (2018) times.

The purpose of this study is to locate the presence of convergence in the demographic development of Chinese provinces during the end of the demographic transition at the turn of the millennium. We intend to answer the following questions. Was there regional demographic convergence in fertility and mortality in China at the end of the demographic transition at the turn of the millennium? Have the provinces of China become closer in the process of urbanization? Was there convergence in such an important consequence of the demographic transition as population ageing? Was it stable in any processes? Was the convergence of the demographic situation in the provinces of China accompanied by a catching-up effect when “lagging” regions moved faster along the path of demographic transition in the process of convergence with “advanced” regions? If the answers to our questions are negative, and if in the final stage of the demographic transition we still maintain (or increase?) differences, it seems to us that population projections will take into account the slowdown of changes, and population policies will contain a regional component to support sustainable development of the country.

2. Literature review

Extensive literature on convergence in economic development, from the so-called “convergence clubs” according to the Solow model (Solow, 1956) to modern works (Barro & Sala-i-Martin, 1995; Tomljanovich & Vogelsang, 2002), attracted attention of demographers who began to study the issues of convergence in fertility (Dorius, 2008), mortality (Vallin & Meslé, 2004), health (Loi & Hale, 2019), and marriage (Stankuniene et al., 2009) in relation to regional groupings and individual countries.

Convergence analysis is intrinsically integrated into demographic works, since the idea of convergence is embedded in most theories of demographic transitions (Coleman, 2002; Korotayev et al., 2015), from the demographic transition theory (Landry, 1987) to epidemiological transition (Omran, 1971). Demographic variations in development have always been of interest to the authors of articles on demographic trends. Watkins (1990), for instance, pointed at an increase in demographic homogeneity within countries during the 19th and 20th centuries.

The authors show that periods of convergence of fertility are often replaced by periods of divergence or stability (Franklin, 2003; Lanzieri, 2010), and convergence of mortality prevails (Vallin & Meslé, 2004; Corazziari et al., 2014). However, as far as fertility is concerned, its rate of convergence may overtake the rate of convergence in mortality (Wilson, 2011).

Studies are conducted both at the level of regional associations (from formal associations like EU countries (Lanzieri, 2010) and informal associations in terms of development,
pace of economic growth, or socio-economic type (Wilson, 2011; Corazziari et al., 2014) to individual countries (Tomka, 2002; Franklin, 2003). Some works emphasize strengthening of the demographic convergence within associations and the divergence between them.

Economic convergence in China is also taking place within specific “clubs”. The study of industrial and agricultural “clubs” of China (Pääkkönen, 2012) led to the conclusion of convergence with positive consequences within the framework of the industrial club and lack of convergence within and beyond the agricultural club.

In this article we pay attention to the demographic convergence of China.

3. Data and methods

We use official demographic data for 31 provinces of China, data from the World Bank, and some literature sources. In most cases, the period of reviewing the dynamics of the indicators is 1995–2010, but in some cases, we have information on the provinces of China from 1975 to 2018 (due to limited access to long-term regional population data for all the indicators we are interested in, for example, the total fertility rate for provinces is not publicly available after 2010). The article proposes an attempt to look at the dynamics of regional differentiation of demographic development, focusing on the period when the demographic transition in China has entered its final stage, changes in fertility and mortality have become slow, and the issue of convergence has attracted more attention.

We review the regional convergence in the main processes that characterize the demographic transition (that is fertility and mortality of the population); that accompany the demographic transition or are one of its causes (i.e., urbanization); and the inevitable consequence of the demographic transition — the process of population ageing.

The logic of presenting the material is as follows. According to these indicators in the World Bank data set, we analyze the national dynamics from the 1960s to the present. Next, basing on China’s official statistics, we consider the regional differentiation of indicators at two points: in the 1990s and in the 2010s. Mapping of these variables clearly demonstrates the demographic “Balkanization” of China (see also the Appendix on additional maps on regional differentiation of the economy and demography of China’s provinces). Then we estimate the sigma and beta convergence in indicators of demographic development.

The approach of sigma (σ) and beta (β) convergence (Barro & Sala-i-Martin, 1995; Sala-i-Martin, 1996; Lanzieri, 2010) is used to study changes in the level of regional differentiation of separate demographic indicators and its dynamics. The presence of sigma-convergence of demographic indicators between regions is expressed in a decrease in dispersion, coefficient of variation or other statistical measures of variation. Sigma-convergence is observed if the values of these figures in the previous selected period are higher than in the current one. We took the change in the coefficient of variation as a measure of sigma-convergence:
\[ V = \frac{\sigma}{\bar{x}}, \]  

(1)

where \( \sigma \) is the average variation of a random variable, and \( \bar{x} \) is its mean value.

It shows the share of the average variation of the random variable from its mean value, expressed in percentage. Since it does not depend on dimension and scale, it is convenient to use it when simultaneously studying different demographic indicators. A coefficient of variation over 33% indicates heterogeneity.

Beta-convergence studies the catching-up effect and suggests convergence between regions as a result of differences in the average growth rate. It checks for a negative correlation between the growth rate and the initial level of demographic development of the regions. At the end of the demographic transition, demographic processes in the most “advanced” regions are slower, and the “lagging” regions catch up with them at a higher rate of change. We use the Barro regression for empirical verification of absolute beta-convergence of a certain process:

\[
\frac{1}{T} \left( \ln \frac{F_{i,t+T}}{F_{i,t}} \right) = a + b \ln F_{i,t} + \varepsilon_{i,t},
\]

(2)

where \( \frac{1}{T} \left( \ln \frac{F_{i,t+T}}{F_{i,t}} \right) \) is the mean annualized growth rate of variable \( F \) in region \( i \) in the period \( (t, t + T) \); \( F_{i,t} \) is its value at the initial time \( t \). \( \varepsilon_{i,t} \) are the corresponding residuals.

If the coefficient \( b \) is significant and has a negative sign, then the hypothesis of absolute beta-convergence is accepted. A positive sign of \( b \) indicates divergence.

The process of beta-convergence is characterized by two indicators:

- the rate of convergence (\( \beta \)), which shows how many units the gap between regions decreases over a single period of time. It has a sign opposite to that of coefficient \( b \), that is, if the latter is negative, the speed is greater than zero
- the time it takes for regions to get halfway to a sustainable state (\( \tau \))

These figures can be calculated by estimating coefficient \( b \), which can be expressed as (Sala-i-Martin, 1996):

\[ b = -\frac{1 - e^{-\beta \tau}}{T}. \]

(3)

Accordingly, speed and time are as follows:

\[ \beta = -\frac{\ln(1 + bT)}{T}. \]

(4)

\[ \tau = \frac{\ln 2}{\ln(1 + \beta)}. \]

(5)

Hypotheses of beta-convergences and sigma-convergences are interrelated but not equivalent. Absolute beta-convergence also indicates that there is a narrowing tendency in the gap of variables, but given the catching-up effect of the lagging group of regions. Absolute beta-convergence does not directly imply sigma-convergence. Beta-convergence is a necessary but not sufficient condition for the existence of sigma-convergence; in
turn, sigma-convergence is a sufficient but not necessary condition for beta-convergence (Sala-i-Martin, 1995).

Using formulas (1)–(5) and analyzing the dynamics of variation coefficients, we consider the regional convergence (divergence) in fertility, mortality, urbanization, and population ageing processes according to the following indicators: total fertility rate; infant mortality rate; life expectancy at birth; share of urban population; and old dependency ratio.

The Barro regression masks any variation within the period under examination (Lanzieri, 2010). Sometimes the period under examination is broken down into sub-periods to assess breaks for the examined variable.

The econometric calculations were carried out in the GRETl package (GNU Regression, Econometrics and Time-series Library).

4. Findings

4.1. Change of stages of fertility divergence and convergence

Fertility in China was declining dramatically from the mid-1960s to the early 1980s, then, from the late 1980s to the mid-1990s, the decline was slowing down (Figure 1).

Source: World Bank data.

Figure 1. Fertility rate, total (births per woman), China, 1960–2017

Since the 1990s, the total fertility rate (TFR) has declined from replacement to ultra-low fertility. In the relatively stable years 1995–2010, there were also changes at the regional level (Figures 2a, b). Has there been a convergence in the regional fertility during these years? And was there a catching-up effect when the “lagging” West caught up in this process with the Eastern provinces where fertility was already very low by 1995?
Source: Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.

Figure 2a. Total fertility rate by province, China, 1995

Source: Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.

Figure 2b. Total fertility rate by province, China, 2010.
To estimate the dynamics of regional fertility differentiation, we also use total fertility rate (TFR) for a period. Let us consider the sigma-convergence of TFR over the broader period of 1975–2010. After an increase in the regional TFR differentiation in 1985 compared to 1975, there was a convergence in the regions of China from 1985 to 2000, the coefficient of variation decreases from 34% to 21.5% (Figure 3). However, in 2010, we observe an increase in the differentiation in the birth rate again.

Source: Calculated by the authors.

Figure 3. Sigma-convergence in the Total fertility rate (TFR), China, 31 provinces, 1975–2010

We tested the beta-convergence model for the periods 1995–2000 and 1985–2000 when the sigma-convergence in fertility was observed in the regions of China. Over a long period, we recorded an active fertility decline and a relatively stable stage, in short, only a relatively stable stage. The presence of sigma-convergence over the given period could also lead to beta-convergence.

Over the short and long period, we noted the catching-up effect: regions with higher fertility rates have a higher rate of decline than those with originally lower fertility rates (Table 1). However, the pace of convergence changed. Since 1995, the convergence in regional fertility has slowed down. In 1995–2000, the differentiation in the level of regional fertility decreased by 4.3% per year, and in 1985–2000 — by 12% per year. In the short period before the regions fully converged in terms of the overall fertility rate (if the situation remained the same as at that time), there were about 33 years left, and in 1985–2000 there were 10 years left.

Table 1. Indicators of beta-convergence in regional fertility in China

<table>
<thead>
<tr>
<th>Period</th>
<th>b-coefficient</th>
<th>Beta-convergence rate, %</th>
<th>Halfway convergence time τ, years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995–2000</td>
<td>−0.0387</td>
<td>0.0043</td>
<td>16.46</td>
</tr>
<tr>
<td></td>
<td>(meaning at a 1% level)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1985–2000</td>
<td>−0.0316</td>
<td>0.12</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>(meaning at a 1% level)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Calculated by the authors.
In 2000–2010, there was an increase in the coefficient of variation, and as a result, the b coefficient was not relevant when testing the corresponding equation, which confirms the existence of divergence between regions over this period.

Thus, against the background of declining fertility in China from replacement to low fertility rate, there was a convergence in regional fertility, and with a catching-up effect at that. By 2010, the weakening of convergence was replaced by divergence processes.

According to the regional data on sex ratio at birth (Dejian, 2005; Hu et al., 2015), differentiation of Chinese provinces in terms of sex ratio at birth (and violation of biologically determined sex ratio at birth is an acute problem in China) is low, but it increased from 2 to 4% during the period from 2000 to 2015.

4.2. Divergence of regional infant mortality and convergence of life expectancy in China

Infant mortality (IMR) has been steadily declining in China for half a century (Figure 4).

![Figure 4. Mortality rate, infant (per 1,000 live births), China, 1969–2018](source: World Bank data.)

We considered the sigma-convergence of the infant mortality rate (IMR) for both sexes for the period 1990–2010 according to the estimation of regional IMR in (Dejian, 2005; Hu et al., 2015). The coefficient of variation increased from 54 to 82% in 20 years that demonstrates extremely high heterogeneity of regions for this indicator and increasing heterogeneity growth in 2000–2010 (Figure 5).
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Testing of the hypothesis of beta-convergence in the infant mortality rate in the absence of sigma-convergence is not implied. Thus, against the background of the general decrease in infant mortality, there is a divergence (discrepancy) of this variable in a number of regions in the period 1990–2010.

Life expectancy at birth (LE₀) has grown over the past 60 years (Figure 6), which is also evident at the regional level. The obtained data allow us to estimate these changes over a quarter of a century (Figures 7a, b).

Source: Calculated by the authors.

**Figure 5.** Sigma-convergence in the infant mortality rate (IMR), China, 31 provinces, 1990–2010

Source: World Bank data.

**Figure 6.** Life expectancy at birth, total (years), China, 1960–2017
Source: Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.

Figure 7a. Life expectancy at birth by province, China, 1990

Source: Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.

Figure 7b. Life expectancy at birth by province, China, 2010
But in the case of LE₀’s sigma-convergence test, we see very low differentiation values, which declined in 1990–2010, especially sharply between 2000 and 2010, and grew slightly in 2010–2015 (Figure 8).

We also considered the beta-convergence in LE₀ for the period 2000–2010. The coefficient b was significant at the level of 1% with a value of -0.0201, the values of speed and time were β = 0.0224, τ = 31.23 years. Accordingly, if there had been no increase in the coefficient of variation after 2010, it could be assumed that there was convergence between regions at a rate of 2.24% per year, and in 62 years there would be an alignment between regions (while maintaining the convergence).

Thus, while life expectancy has continued to rise in China since the mid-1990s, we have seen very little regional differentiation, with a catching-up effect at least in the first decade of the new millennium.

4.3. Distinctive convergence in China’s regional urbanization

The start of the “One Family-One Child” demographic policy coincides with the beginning of urbanization in China, but only by 2010, half of China’s population did live in cities (Figure 9).

Regional differentiation in urbanization before (less than 50% in 2000) and after (more than 50% in 2015) the urbanization median is presented in Figures 10a, b.

This is the only indicator under consideration which shows constant sigma-convergence in the proportion of urban population in the provinces of China. Over the period 2000–2015, the coefficient of variation decreased almost twofold — from 42 to 23% in 15 years (and continues this trend, for example, to 19.6% by 2018) (Figure 11).
Source: World Bank data.

**Figure 9.** Urban population (% of total population), China, 1960–2018

Source: Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.

**Figure 10a.** Urban population rate by province, China, 1995
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Source: Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.

Figure 10b. Urban population rate by province, China, 2015

Source: Calculated by the authors.

Figure 11. Sigma-convergence in the urban population ratio (UPR), China, 31 provinces, 2000–2018

We also observed beta-convergence over the period 2000–2015 (before and after 50% of urban population). The coefficient $b$ was significant at the level of 1% with a value of $-0.0288$. Accordingly, the rate and time of convergence for this period of pivot was as follows: $\beta = 0.038$ at 3.8% the proportion of urban population between regions became closer for 1 year; $\tau = 19.07$, it will therefore take 38 years before the indicators of urbanization are fully converged (while maintaining the rate of convergence).
4.4. Convergence of population aging at the turn of the century and unstable convergence of new times

As a measure of population ageing, we took a variable of the old dependency ratio, which was growing from the mid-1960s to the present, accelerating in the new millennium (Figure 12).

Source: World Bank data.

Figure 12. Population aged 65 and above, total, China, 1960–2018

The regional variation of this indicator in 1995 and 2015 can be seen in Figures 13a, b.

Source: Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.

Figure 13a. Old dependency ratio by province, China, 1995
Sigma-convergence in the ageing process (old dependency ratio variable) for the period 1995–2018 was observed from the mid-1990s to the mid-2000s (from 23 to 18%). After that, five-year periods of divergence and convergence in ageing replace each other (Figure 14), and the coefficient of variation is generally low (23.5% in 2018).

Source: Calculated by the authors.
Is there a catching-up effect during the last short period of sigma-convergence in the ageing process in 2010–2015? The coefficient \( b \) was significant at the level of 1% with a value of -0.0508, the values of speed and time were \( \beta = 0.058 \), \( \tau = 12.17 \) years, indicating the presence of a catching up effect (if there was no increase in the coefficient of variation after 2015, it would be assumed that there was convergence between regions at a rate of 5.8% per year, and in 24 years there will be an alignment of this indicator between regions).

## 5. Conclusion

We summarize the results of our calculations, including the sub-periods, so as to assess breaks for the examined variable (Table 2).

### Table 2. China’s demographic convergence indicators

<table>
<thead>
<tr>
<th>Sigma-convergence</th>
<th>( V_t )</th>
<th>( V_{t+T} )</th>
<th>Beta-convergence (coefficient ( b ))</th>
<th>Beta-convergence rate, %</th>
<th>Halfway convergence time ( \tau ), years</th>
</tr>
</thead>
<tbody>
<tr>
<td>TFR(_{1975-1985})</td>
<td>no</td>
<td>28.76</td>
<td>34.30</td>
<td>no</td>
<td>-</td>
</tr>
<tr>
<td>TFR(_{1985-2000})</td>
<td>yes</td>
<td>34.30</td>
<td>21.56</td>
<td>-0.0316(^1)</td>
<td>0.120</td>
</tr>
<tr>
<td>TFR(_{1995-2000})</td>
<td>yes</td>
<td>25.17</td>
<td>21.56</td>
<td>-0.0387</td>
<td>0.043</td>
</tr>
<tr>
<td>TFR(_{2000-2010})</td>
<td>no</td>
<td>21.56</td>
<td>24.32</td>
<td>no</td>
<td>-</td>
</tr>
<tr>
<td>SRB(_{2000-2015})</td>
<td>no</td>
<td>2.34</td>
<td>3.91</td>
<td>no</td>
<td>-</td>
</tr>
<tr>
<td>IMR(_{1990-2010})</td>
<td>no</td>
<td>54.34</td>
<td>82.00</td>
<td>no</td>
<td>-</td>
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<tr>
<td>LE(_{0}(1990-2010))</td>
<td>yes</td>
<td>5.25</td>
<td>3.67</td>
<td>-0.0180</td>
<td>0.021</td>
</tr>
<tr>
<td>LE(_{0}(2000-2010))</td>
<td>yes(^2)</td>
<td>4.48</td>
<td>3.67</td>
<td>-0.0201</td>
<td>0.022</td>
</tr>
<tr>
<td>LE(_{0}(2010-2015))</td>
<td>no</td>
<td>3.67</td>
<td>4.77</td>
<td>no</td>
<td>-</td>
</tr>
<tr>
<td>UPR(_{2000-2015})</td>
<td>yes</td>
<td>27.10</td>
<td>15.50</td>
<td>-0.0288</td>
<td>0.038</td>
</tr>
<tr>
<td>ODR(_{1995-2005})</td>
<td>yes</td>
<td>23.13</td>
<td>17.67</td>
<td>-0.0649</td>
<td>0.242</td>
</tr>
<tr>
<td>ODR(_{2010-2015})</td>
<td>yes</td>
<td>22.80</td>
<td>18.97</td>
<td>-0.0508</td>
<td>0.058</td>
</tr>
</tbody>
</table>

**Source:** Calculated by the authors.

**Notes:**
1. TFR — total fertility rate, SRB — sex ratio at birth, IMR — infant mortality rate, LE\(_{0}\) — life expectancy at birth, UPR — urban population ratio, ODR — old dependency ratio.
2. Sex ratio at birth and infant mortality rate convergence were estimated by the data in (Dejian, 2005; Hu et al., 2015).

The following is our brief summary:
1. At the turn of the century and in the first decade of the new millennium, a steady convergence between the provinces of China was observed only in the process of urbanization.

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\(^1\) The coefficient \( b \) hereafter is significant at a the level of 1% if there is convergence.

\(^2\) Sigma-convergence in LE\(_{0}\) was observed for the longer period of 1990–2010 (but was weak in 1990–2000).
2. Convergence in fertility, mortality, and population ageing was not sustainable; convergence was observed only in certain periods (with the exception of infant mortality that showed sustainable growth of divergence).

3. Convergence in such periods was accompanied by a catching-up effect of varying degrees. Using fertility as an example, we observed a decrease in the level of convergence as the natalistic transition and transition to ultra-low fertility were completed.

4. Over the last decade, measured demographic indicators have shown a divergence at the provincial level in China. We believe that the growing degree of differentiation of the regions of China in the key demographic indicators creates new challenges for sustainable development of the country in the near future. An analysis of the impact of the specifics of demographic convergence in the Chinese provinces on economic growth seems to be a promising area of research.
Appendix 1. Regional differentiation of the economy and demography of the Chinese provinces on maps (additional maps)

Source: Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.

Figure A1a. Population density by province, China, 1995

Source: Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.

Figure A1b. Population density by province, China, 2015
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**Source:** Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.

**Figure A2a.** Gross regional product per capita by province, China, 1995

**Source:** Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.

**Figure A2b.** Gross regional product per capita by province, China, 2015
Source: Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.

**Figure A3a.** Gross regional product by province, China, 1995

Source: Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.

**Figure A3b.** Gross regional product by province, China, 2015
References

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