

Do Governments Matter in Industrialization through FDI in Developing Countries?

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Abstract: While theories predict a positive role of foreign direct investment (FDI) in industrialization (INDU) of developing countries, empirical evidence is mixed due partly to missing role of government in the FDI-INDU nexus. This study seeks to close the gap by investigating how governments may help domestic firms to gain from FDI. The paper focuses on (a) modelling and estimating the impact of governments on INDU through FDI; (b) constructing measures of governments and adopting recently developed indicators for INDU in estimations; and (c) working with a large sample of 98 developing countries over 2000-2020. We conclude that governments indeed matter in capturing benefits from FDI to INDU. The positive effects of host-governments tend to be larger in promoting industrial capacity than industrial share, and larger in boosting manufactured exports than manufacturing output in domestic markets.

Keywords: Industrialization (INDU), Foreign direct investment (FDI), Governments, Absorptive capacity (AC), and Infrastructure.

JEL Code: F02; F10; F21; and L60.

1. INTRODUCTION

A study of the impact of foreign direct investment (FDI) on industrialization (INDU) in developing countries is important. FDI means tighter links between all markets affecting industrial activities, including final products and inputs such as raw materials, intermediate goods, machinery, finance, and technology (Grossman & Helpman, 2015). While indigenous efforts in skills and technology appear to be critical to INDU of the developing world, FDI has become central to industrial development as global production systems have grown in importance. To obtain rewarding industrial growth, a developing country must build domestic industrial capabilities through connecting external sources of technology and market access. Attracting and utilizing FDI have been viewed as a good means to boost INDU (Markusen & Venables, 1999; Ram & Zhang, 2002; Harrison & Rodriguez-Clare, 2010; Zhang, 2010).

While much theoretical work predicts positive effects of FDI on INDU in developing countries, evidence is mixed due to missing the role of government in the FDI-INDU nexus (Ram, 1986; Girma, 2005; Tang & Zhang, 2016).¹ Governments play a various role in economic activities, including INDU and FDI-INDU linkages. How do governments affect the role of FDI in INDU? Are government interventions nec-

essary to maximize benefits from FDI and minimize its costs?

This paper, focusing on the questions with empirical analyses, is motivated by the following considerations: (a) INDU serves as a catalyst for economic growth in developing countries and FDI flows into developing countries have increased substantially for the last two decades. (b) How to promote INDU with FDI has been a critical challenge to developing countries, and the role of governments has been in debate in academic as well as policy-making circles. (c) While there have been many theoretical studies on the role of governments in the FDI-INDU link, empirical work on the issue has been limited. Particularly, few comprehensive studies with the most recent cross-country data have been conducted yet (Harrison & Rodriguez-Clare, 2010; Zhang, 2010; Grossman & Helpman, 2015; UNCTAD, 2016).

The objective of this paper is to close the gap by investigating the issue with panel data on 98 developing countries over 2000-2020. Besides the focus on the more recent data and the use of a large sample size, this study has several distinctive features. First, it explicitly models and estimates the role of governments in promoting INDU through FDI. Second, it uses INDU indices that probably is the best measure of multidimensional INDU. Third, it measures governments by absorptive capacity in both direct and indirect effects. Finally, it employs a specification that is parsimonious and yet includes most major INDU determinants, along with FDI and governments.

2. THEORETICAL HYPOTHESES OF GOVERNMENTS IN FDI-INDU LINKAGES

There is a large literature on the role of governments, measured by absorptive capacity (AC), in FDI-INDU linkages.

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¹ Several Asian economies (for example, Korea and China) seem to industrialize successfully through FDI, but many countries in Africa and Latin America gain little from FDI for their industrialization (UNCTAD, 2016; Zhang, 2010).

AC refers to a country's ability to identify, assimilate and exploit benefits from FDI, and such the ability reflects multidimensional interaction of many factors, mainly including the country's FDI policy, human capital, and infrastructure quality (Ram, 1986; Markusen & Venables, 1999; Girma, 2005; Tang & Zhang, 2016). Theoretical predictions in the context of governments-FDI-INDU interactions may be summarized along four hypotheses:

H1: Benefits from FDI to INDU depend on governments in terms of AC.

H2: A country's AC may reduce negative effects of FDI on INDU.

H3: FDI may promote INDU only if a host country achieves threshold of AC.

H4: A strong AC helps the host country capture spillovers from FDI.

While potential benefits of FDI to INDU exist, they do not automatically accrue and tapping the potentials depends on the host country's AC (Harrison & Rodriguez-Clare, 2010; Girma, 2005). To boost INDU through FDI, host countries must make great efforts for AC. First, proactive FDI policies are needed to strengthen AC. Such policies include selective liberalization, incentives for FDI conducive to industrial capacity and upgrading; and incentives for domestic firms in enhancing their competitiveness. Second, AC would be stronger with more human capital. Human capital increases and productivity of domestic firms through helping technological progress, which enables domestic firms to learn from foreign-invested enterprises and to acquire FDI spillovers. Third, both capability and technology of domestic firms depend critically on the availability and quality of infrastructure (INFR), ranging from roads and ports to energy and telecommunication. Better infrastructure helps domestic firms gain from FDI (Rodriguez-Clare, 1996; Limao and Venables, 2001; Tang & Zhang, 2016).

FDI has negative as well as positive impact on INDU, and its net effects depend on AC or the role of governments (Ram, 1986; Ram & Zhang, 2002; Harrison & Rodriguez-Clare, 2010). Contributions of FDI to INDU may derive from additional capital, technology, and managerial know-how; training for the local workforce; and access to global. It is argued, however, that FDI may lead to negative effects on INDU as well: replacing domestic investment for indigenous exporting firms; transferring technologies that are low level or inappropriate for the host country's factor proportions; targeting primarily the host country's domestic market and thus not increase exports; inhibiting the expansion of indigenous firms that might become exporters; and not transferring technology but focusing solely on local cheap labor and raw materials. Whether or not a host country ends up with gains from FDI depends on the country's AC, since it is AC with which the host country could maximize benefits from FDI and minimize FDI costs.

While FDI may influence INDU in a variety of ways, its direct contribution lies in expanding industrial capacity, especially in labor-intensive activities (Zhang & Markusen, 1999; UNCTAD, 2016). FDI may raise industrial capacity by following four mechanisms: processing and assembling; converting import-substituting products; market access pro-

vided by foreign-invested firms; and local raw materials processing. Attracting such export-seeking FDI, however, is itself an intensely competitive business and even the countries that have succeeded would find it difficult to achieve rapid industrial development without incentive policies and good infrastructure, or hard to sustain industrial capacity as their wages rise and market conditions change.

Theories suggest that there are several mechanisms of spillovers from FDI to local firms' industrial activities. First, domestic firms may grow by observing foreign affiliates' activities (so called "learning by watching"). The second spillover effect involves market competition and diffusions of new technologies. The third spillovers are related to the forward and backward linkages between foreign and local firms. If foreign subsidiaries increase their purchase of inputs from local firms, host exports increase (Rodriguez-Clare, 1996; Ram & Zhang, 2002; Javorcik, 2004). While host countries can boost INDU through the spillovers, capturing the spillovers is a long, costly, and risky process, as it calls for not only high-quality infrastructure and well-designed and effective implement of FDI policy, but also substantial investment in human capital and infrastructure. The magnitude and extent of technological benefits from FDI therefore are conditional on AC (Tang & Zhang, 2016).

3. EMPIRICAL SPECIFICATIONS AND DATA

The previous discussions suggest that FDI, governments (GOV), and their interactive terms (FDI×GOV and FDI×INFR) may affect industrialization (INDU). Therefore, FDI, GOV, and FDI×GOV, and FDI×INFR can be treated as additional factors to the conventional framework of INDU determination, resulting in the following equation for country i in year t :²

$$INDU_{it} = f\{\beta X, FDI_{it}, GOV_{it}, (FDI \times GOV)_{it}, (FDI \times INFR)_{it}\} \quad (1)$$

where X is a vector of conventional determinants of INDU, including physical capital (K), human capital (HK), and infrastructure ($INFR$), as suggested in the literature (Grossman & Helpman, 2015).³ Several empirical specifications can be considered in a study of INDU determinants. The focus of this work on the interaction of FDI-INDU-GOV, however, necessitates the use of a model that could capture and isolate the basics of the FDI-INDU-GOV interplay.

² It is possible that other determinants may exist but are excluded from the specifications. This work, therefore, should not be treated as an exhaustive study of industrialization, rather, as a narrowly focused investigation of the merits of government in the FDI-INDU nexus.

³ The rationale for each independent variable is as follows. As the stock of physical capital (K) increases, a country experiences capital deepening that makes more tools, structures, and equipment available to each worker, leading to higher productivity. Human capital (HK) increases the capability and productivity of an industry through helping technological progress. Both capacity and technology of industry depend critically on the availability and quality of physical infrastructure ($INFR$), ranging from roads and ports to energy and telecommunication. Better infrastructure helps complex exports (Limao and Venables, 2001; Ram & Zhang, 2002; UNATCD, 2016).

Table 1. Estimations of GOV-FDI-INDU Linkages: 2000-2020.

Independent Variables	Industrial Capacity				Industry Share			
	$\ln(MVApc)$		$\ln(MEXpc)$		$\ln(MVA/GDP)$		$\ln(MEX/EX)$	
$\ln(K)$	0.11*	0.10	0.20*	0.19	0.15*	0.11	0.20	0.19
	(1.81)	(1.16)	(1.74)	(0.76)	(1.79)	(1.21)	(0.90)	(0.76)
$\ln(HK)$	0.26	-0.20	0.17	0.09	-0.12	0.17	0.12	0.08
	(1.01)	(-0.68)	(0.21)	(0.61)	(-0.54)	(1.05)	(0.11)	(0.74)
$\ln(FDI)$	0.32	0.28*	0.48*	0.37*	0.22	0.14	0.13*	0.08
	(1.56)	(1.83)	(1.75)	(1.82)	(1.02)	(0.30)	(1.76)	(0.87)
$\ln(GOV)$		0.09		0.16		-0.06		0.12
		(1.01)		(0.69)		(-1.31)		(0.69)
$\ln(INFR)$		0.33		0.41*		0.17		0.22*
		(0.77)		(1.80)		(1.55)		(1.74)
$\ln(FDI \times GOV)$		0.24*		0.35*		0.09*		0.36**
		(1.81)		(1.42)		(1.04)		(2.42)
$\ln(FDI \times INFR)$		0.38**		0.55**		0.08		0.37*
		(2.23)		(2.53)		(1.40)		(1.82)
Country Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R ²	0.19	0.38	0.26	0.46	0.15	0.27	0.21	0.39
Observations	2058	2058	2058	2058	2058	2058	2058	2058

Notes: Constant terms are omitted (but available upon request) to save space. Figures in parentheses are t -statistics. The asterisks *, **, and *** indicate significant levels at 10%, 5%, and 1%, respectively.

$$\begin{aligned}
 INDU_{it} = & \alpha_0 + \alpha_1 K_{it} + \alpha_2 HK_{it} + \alpha_3 INFR_{it} + \\
 & \alpha_4 FDI_{it} + \alpha_5 GOV_{it} + \alpha_6 (FDI_{it} \times GOV_{it}) + \\
 & \alpha_7 (FDI_{it} \times INFR_{it}) + \theta_i + \mu_t + \varepsilon_{it}
 \end{aligned} \quad (2)$$

where α_0 is the constant term and ε_{it} as stochastic component. θ_i and μ_t are unobserved region-specific and time-specific effects, respectively. The dependent variable ($INDU$) is measured by four indicators, manufacturing value added per capita ($MVApc$), manufactured exports per capita ($MEXpc$), MVA share in GDP (MVA/GDP), and MX share in total exports (MEX/EX).⁴ Data for all of the four variables are taken from UNIDO Database (UNIDO, 2022).

All independent variables in equation (2) are measured in a way similar to that used in the literature. The share of tertiary enrollments in technical subjects in total population is taken

as a proxy for HK . Infrastructure ($INFR$) is proxied by number of telephone-mainlines per one thousand people. The data on K , HK , GOV , and $INFR$ are taken from World Bank (2022). The data on FDI (defined as the ratio of FDI stock to GDP) are computed based on FDI stock from UNCTAD STAT Database (UNCATD, 2022) and GDP from World Bank (2022). We start our sample with about 160 developing economies in the world over 2000-2120, and the data availability of all relevant variables reduces the sample to 98 countries. Every country for which data on all variables are available in the source cited has been included and there is no direct selection bias in the sample.

4. EMPIRICAL RESULTS AND ROBUSTNESS CHECKS

Equation (2) constitutes the basis for our empirical analyses 98 countries/regions in 21 years⁵. Table 1 reports panel estimates of equations (2) for four indicators of industrialization

⁴ Distinctions between domestic and global markets in industrial capacity have economic logics in the increasingly integrated world economy. An import-substituting or inward-looking country, characterized by a more domestic industrial output but less competitive manufactured exports, may have greater $MVApc$ but much smaller $MEXpc$, misleading of industrialization (Zhang, 2010; Tang & Zhang, 2016).

⁵ The likelihood ratio (LR), Lagrange multiplier (LM), and the Hausman test may be applied to determined which method, OLS pooling, fixed effect (FE), or random effects (RE), is better (Baltagi, 2013). In this study, all LR, LM statistics, and Hausman test are significant at the 1% level, indicating that the OLS and RE models are not valid.

in two categories: industrial capacity (MVA_{pc} and MEX_{pc}) and industry shares (MVA/GDP and MEX/MX). All regressions are conducted with fixed effects because assumptions for OLS pooling and random effects are rejected.

For each of the four cases, we run two estimation models: The first one including conventional $INDU$ determinants and FDI only serves as a benchmark for comparisons. The second model includes four government variables: GOV for direct effects of governments, $INFR$ for indirect effects, and two interactive terms ($FDI \times GOV$ and $FDI \times INFR$). In general, the regression estimates are reasonable and plausible, and the explanatory power of the parsimonious models in this highly diverse cross-country sample is fairly good. The fact that relatively large portions of the variance in the four $INDU$ indicators can be accounted for indicates predominant role of the independent variables in the models. Moreover, adjusted R^2 of regressions with government variables in four cases (from 27% to 46%) is much higher than that for the regressions without government variables (15-26%), suggesting that governments indeed play a critical role in helping industrialization through FDI .

Several points are discerned easily from Table 1. First, FDI alone has limited effects on $INDU$, as suggested in the models without government variables. Except the regression for $ln(MEX_{pc})$, coefficients of FDI in all models without government variables are not significant. In other words, the estimates confirm that gains from FDI do not automatically accrue. Second, Governments in terms of absorptive capacity seem to play a critical role in industrializing through FDI . The parameters for government variables, particularly two interactive terms ($FDI \times GOV$ and $FDI \times INFR$), are robustly positive in almost all cases. The finding supports our hypothesis that there is a complementarity between FDI and governments and they reinforce each other in affecting industrialization. Third, the complement effects of FDI - GOV and FDI - $INFR$ seem to be stronger in boosting industrial capacity than industrial share, and the complement effects seem to be greater for manufactured exports than domestic manufacturing performance. Fourth, indirect effects of governments ($INFR$) alone are significantly positive for manufactured exporting performance only, and direct effects of governments in terms of GOV are insignificant or negligible. Lastly, the impact FDI on $INDU$ seems to be greater than that of domestic capital (K). The value of parameters of K in all cases is smaller than that of FDI and interaction terms, and parameters of K are less significant statistically.⁶

In sum, the estimates in Table 1 provide a relatively strong support to our hypotheses. Governments indeed play a positive role in capturing benefits from FDI to $INDU$. The positive effects of host-governments in terms of absorptive capacity tend to be larger in promoting industrial capacity than

industrial share, and larger in boosting manufactured exports than manufacturing output in domestic markets.

To test the robustness of the findings, we conduct several sensitivity and endogeneity checks. Following the standard procedure in the literature (e.g., Levine & Renelt, 1992; Baltagi, 2013), the sensitivity tests are undertaken with alternative measures of dependent and independent variables used in regressions reported in Table 1. For instance, instead of FDI stock per capital for FDI , we employ the ratio of FDI stock to GDP , or annual FDI inflows. Rather than tertiary enrollments, we use secondary enrollments for HK . As regarding with dependent variables, we already use five different measures for export sophistications and upgrading in Table 1. The estimate results with these alternative measures are basically similar, in other words, none of the estimation results is significantly affected by the alternative measure, implying that the observed results seem not to depend on specific measures used to quantify dependent and independent variables in industries with different technologies.⁷

As many studies in the literature (e.g., Lileeva and Trefler, 2010) did, we apply instrumental available (IV) technique to deal with the possible endogeneity bias, in which the lagged values of endogenous variables serve as IVs.⁸ The two-year lagged values of all independent variables are used as instrumental variables due to their high correlation with their current values. The resulting estimations corresponding to Table 1 are presented in Table 2 (not included in the paper, but available upon request) in which only variables in interest (GOV and $INFR$ and their interaction with FDI) are included to save space. The IV estimation results are very similar to those reported in Table 1, suggesting little endogeneity bias in the regressions. The Wu-Hausman test statistics also cannot reject the hypothesis that wages and innovation are exogenously determined. Therefore, the main estimates of Tables 3 and 4 seem to be unlikely to suffer from endogeneity bias.

5. CONCLUDING REMARKS

In the era of globalization, an important challenge facing developing countries is how to boost industrialization through FDI . While increasing FDI has flowed into the developing world for the last two decades, its impact on host-country industrialization has been mixed. One of reasons for the outcome seems to be related to the role of host-country governments. This paper examines how net effects of FDI on industrialization could be affected by host-country governments. Several interesting features of the paper are worth noting. First, the impact of governments is measured in terms of its size for direct effects and infrastructure for indirect effects to reflect host-country absorptive capacity. Second, industrialization is proxied in four dimensions to capture industrial capacity and industrial share in both domestic and exporting markets. Third, four hypotheses are devel-

⁶ The estimates of K and HK are basically consistent with the theoretical predictions and empirical literature. The parameters for K are significantly positive in most cases. We fail to find any positive and significant effects (even the negative sign) of HK , suggesting that the impact of human capitals on $INDU$ seems to be limited, although they could strengthen industrial capacity and technology in the late stage of industrialization or their impact is hard to be detected.

⁷ Estimate results for alternative measures are not reported here to save space, but they are available upon request.

⁸ The IV approach is used here by adopting predetermined independent variables. The key to this approach is to identify instruments that are highly correlated with independent but not with the error term in these regressions (Baltagi, 2013).

Table 2. Instrument Variable (IV) Estimations of GOV-FDI-INDU Linkages: 2000-2020.

Independent Variables	Industrial Capacity				Industry Share			
	$\ln(MVApc)$		$\ln(MEXpc)$		$\ln(MVA/GDP)$		$\ln(MEX/EX)$	
$\ln(FDI)$	0.17*	0.23	0.27	0.33*	0.10	0.08	0.07*	0.11
	(1.75)	(1.57)	(1.35)	(1.76)	(0.88)	(0.73)	(1.80)	(0.96)
$\ln(GOV)$		0.78		0.08		-0.07		-0.24
		(1.01)		(0.37)		(-0.73)		(-0.37)
$\ln(INFR)$		0.37		0.41**		0.08		0.22*
		(1.07)		(2.39)		(0.81)		(1.83)
$\ln(FDI \times GOV)$		0.19**		0.44		0.11*		0.23
		(2.24)		(0.82)		(1.80)		(1.54)
$\ln(FDI \times INFR)$		0.27**		0.37*		0.10		0.17*
		(2.52)		(1.75)		(0.93)		(1.79)

Notes: same as Table 1. Other independent variables for regressions are omitted to save space.

oped based on theories of government-FDI-industrialization linkages, focusing on governments' efforts in absorptive capacity. Fourth, a specification that is parsimonious and yet includes major determinants in our interests, particularly government variables. Fifth, as many developing countries as possible are included in the regression sample and most recent period is covered in estimations. Finally, robustness checks and endogeneity tests are conducted to make sure the estimation results reliable.

Subject to the caveats appropriate for such cross-country studies, the most basic point we note is that, despite ambiguous effects of FDI alone on INDU, governments seem to help generally capture benefits of FDI to industrialization in developing countries over 2000-2020. Specifically, the main findings may be summarized as follows. (a) despite some differences, the four indicators of INDU yield broadly similar scenarios. (b) the parameters for government variables in term of absorptive capacity are robustly positive in most cases. (c) the positive role of governments seems to be stronger in boosting industrial capacity through FDI than industrial share. (d) Governments seem to have larger interactive effects with FDI on manufactured exports for both industrial capacity and shares. (f) Indirect effects of governments measured by infrastructure (INFR) seem to be greater than direct effects measured by government size (GOV). In view of the possible worry about the omitted variables and feedback from the dependent variable to some of the regressors, some robustness tests are conducted to see if the models have any major specification error. The test statistic indicates absence of such a problem.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding this work.

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