

# GSAPS THE SUMMARY OF DOCTORAL THESIS

## Innovation in Middle-income Economies

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Innovation is presumed to be an important driver of economic growth when countries move away from the low-income category to the middle-income rank (Solow 1956, Romer 1990). This thesis aims to analyze the role of innovation in the development of middle-income economies (MIEs) and related factors impacting innovation in these MIEs. This study makes the following contributions to the existing literature. First, the study examines the three limitedly analyzed issues, i.e. whether indigenous or foreign innovation efforts matter more to support MIEs in transitioning to the next income category; the innovation-enhancing effect of human capital composition of unskilled, skilled, and high-skilled levels; and the impact of informal competition on innovation of manufacturing firms in MIEs. Second, the thesis extends the empirical findings on MIEs by studying numerous economies at both aggregate and firm levels. The inclusion of both aggregate national-level data (in the first and second research issues) and firm-level data (in the third research issue) might bring comprehensive insights. Third, the use of more innovation measures in the first research issue and the composition of human capital variables in the second research issue bring improvements on previous studies. Fourth, based on empirical findings, policy implications are made focusing on MIEs.

In the first research issue, the role of indigenous vs. foreign innovation efforts in contributing to the transition of MIEs to the next income category is investigated. With limited resources, MIEs need to prioritize whether to invest in innovation domestically or adopt foreign innovation. The origins of innovation that matter to MIEs have not been widely studied. To quantify the impact of innovation efforts on the probability of attaining the next income rank for MIEs, the cloglog link discrete-time hazard model (DTHM) of duration analysis is employed. This is the first attempt to estimate the impact of innovation efforts on the probability of MIEs' moving up the income ladder using DTHM, a useful tool that is often forgotten in innovation studies. Data of 61 countries between 1980 and 2018 is used. Estimation results show that foreign sources of innovation measured by nonresident patents and international R&D spillovers through the FDI channel are more important for the lower middle-income countries (LMICs) to move up the income ladder. For the upper middle-income countries (UMICs), the domestic source of innovation measured by R&D capital stock is the most important, followed by foreign innovation diffused through the import channel.

In the second research issue, the innovation-enhancing effect of the human capital composition of unskilled, skilled, and high-skilled levels in MIEs is examined. Human capital has a dual role in affecting the output growth of an economy. It serves as labor input in the production function and is also utilized to foster the innovation output. The understanding of how human capital composition enhances innovation, especially in MIEs remains limited. Panel data regressions of fixed effect models are applied on the data of 65 countries in LMI, UMI, and high-income (HI) categories from 1985 to 2019. Unobserved country-specific effects and time-invariant effects are controlled for in the regression models. Results of this study suggest that for LMICs, the skilled human capital of the tertiary education completion workforce is the most important one in fostering their innovation outputs while the R&D personnel of high-skilled human capital

is yet to be important. FDI-embodied foreign innovation supplements the skilled human capital to build up innovation capacity for LMICs. In UMICs and HICs, estimation results show innovation output-enhancing effects of high-skilled human capital. High-skilled human capital is supported by foreign innovation diffusion through import channel and by R&D capital stock in UMICs. In HICs, findings highlight the important role of R&D personnel, supported by R&D capital stock, FDI-embodied foreign innovation, and institutional quality. The unskilled human capital of primary and secondary education completion is confirmed not to play any role in innovation development in MIEs and above.

In the third research issue, the impact of informal competition caused by unregistered firms on innovation of formal manufacturing firms in MIEs is examined. Probit regression is employed on the World Bank's Enterprise Survey dataset of 68,568 firms from 92 MIEs (2006–2019). Estimation results demonstrate that informal competition induces innovation activities of formal manufacturing firms in MIEs. It confirms the escape-competition effect in which informal competition incentivizes formal firms to innovate by introducing new products and processes that are also new to the main market of the firms. R&D investment positively affects innovation outputs of formal manufacturing firms. While a firm's age, size, being affiliated to a larger company, and share of foreign ownership are found not to affect innovation activities of formal firms, export and access to finance are important to foster innovation of formal firms. The length of manager's experience, on the contrary, might negatively affect innovation activities of firms covered in this study.

These findings have implications for policymakers that the LMI group should concentrate more on foreign innovation diffused through foreign patents and FDI channels. Policies to attract foreign investment should be focused. For UMICs aiming to attain high-income status, the policy priority should be strengthening indigenous innovation capabilities through investing in R&D. Regarding human capital for innovation, study results imply that policymakers in UMICs and above should concentrate on fostering and enlarging the pool of high-skilled R&D personnel to elevate the innovation output level. LMICs should continue to invest in raising the number of learners completing tertiary education. In terms of informal economy competition and its impact on innovation of formal manufacturing firms in MIEs, findings of this study imply that efforts to formalize the informal sector by policymakers should be carefully considered when targets are to elevate innovation activities of formal firms. It also suggests policymakers to review efforts to eradicate informal firms and to consider them as one component of the national innovation system.

### References

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