

**EMPIRICAL ESSAYS ON INNOVATION SYSTEMS,
TECHNOLOGY DIFFUSION AND INDUSTRIAL
DYNAMICS**

By

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ABSTRACT

The thesis consists of three connected essays. Each study is an individual paper that asks a related, yet different, research question and answers it by analyzing empirically three diverse datasets. The goal is to reveal various aspects of technology creation and diffusion in an international context, both at the country and firm level, and with a particular focus on developing nations. These countries rely heavily on technology imports and spillovers from industrialized nations, hoping however, to develop in parallel own national capabilities that will ensure good growth perspectives for the future. Geographically, the first two essays are centered on transition countries from Eastern Europe and Central Asia, which provide a nice natural experiment of countries moving from centralized and autarkic economic systems to free market economies, and also increasingly open to the world's economy. The last essay is truly global in scope and looks at the technological agreements between firms from 80 countries, all represented in the tire industry.

Chapter 1 provides a quick introduction to the facts of the transition process in Eastern Europe and Central Asia. Beginning with the symbolic fall of the Berlin Wall and continuing with the events of 1990 and 1991 throughout the region, 27 former communist countries started this process of transition from closed and centralized economic systems to free market economies. Pending on a large variety of factors, such as initial conditions, historical proximity, different endowments and potential, a wide spectrum of economic accomplishments was recorded. Countries from Central and Eastern Europe, that benefitted from milder socialist regimes, historical ties, geographic proximity to the West, and early reintegration in a wider Europe are among the forerunners in this process. The second tier is comprised of countries from South Eastern Europe that have shown significant progress only this decade, while a third tier comprised of former Soviet republics has still a long way to go and different perspectives (no European Union "carrot" to serve as incentive) ahead. This chapter explores also the main trends in terms of trade and foreign direct investments in transition countries by looking at their composition

and evolution over time.

Chapter 2 explores the impact of technology on economic growth. While economic theory predicts developing nations to gain the most from technology spillovers, the empirical work on this topic remains scarce. This study focuses on a panel of 27 transition and 20 developed countries between 1990 and 2006 and uses the latest developments in panel unit root and cointegration techniques to disentangle the effects of international spillovers via inflows of goods and foreign direct investments (FDI). My findings show that imports remain the main channel of diffusion for both sets of countries, while FDI, although statistically significant, has a lower impact on productivity of the recipient countries. The domestic research and development (R&D) capital stock plays an active role in Western Europe while in the Eastern part it is less significant due to lower levels, transitional disinvestment and relative obsolescence. Human capital affects productivity directly as a factor of production, as well as indirectly, by enhancing a country's absorptive capacity. In aggregate, the results show that transition countries from Eastern Europe and Central Asia seem to enjoy bigger productivity gains from the international diffusion process than their Western counterparts.

Chapter 3 examines the creation of high-end innovation activity in developing countries and explores its main determinants by analyzing both national dimensions and external sources. This chapter aims to determine what enables some nations to innovate more than others by analyzing in premiere a panel of sixteen Eastern European transition countries over the period 1990 to 2007. First, it provides a detailed description of innovation identifying regional differences in terms of historical heritage, technological specialization, commitments and main actors involved in this process, before and after the fall of communism. Secondly, it explores empirically the main drivers of their innovative output, proxied by international patents, using a variety of econometric techniques and control variables. The results confirm the crucial role of universities and existing national knowledge base complemented by R&D commitments from both public and private sources. Policy measures, such as intellectual property rights protection or a favorable business climate, increase significantly the propensity to patent, while measures of transitional downturn and

industrial restructuring diminish it. Finally, globalization contributes to developing new innovations in these countries through inflows of foreign investment and trade.

Chapter 4 explores the opposite spectrum of innovation by investigating the determinants of international technological agreements between firms in a low-tech industry (tires) over the period 1985 to 1996. My findings show that, regardless of their size, experienced and more diversified firms that possess relevant technological knowledge are more likely to be providers of technology. These are usually big firms originating from developed countries with high total GDP but relative small population. In terms of recipients, young firms from developing countries that possess the necessary absorptive capacity (high human capital, latest technology) and a good macro- and micro-economic environment (openness to trade, dynamic growth rates, majority private capital, unionized workers, expanding number of plants) have a higher probability to become recipients of foreign technologies. According to the data, most of these agreements are non-equity ones, contradicting previous conjectures in the literature. Furthermore, the evidence points towards a negative relationship between the development level (income per capita) and the propensity of having equity based agreements in the case of the tire industry.

Finally, Chapter 5 synthesizes the conclusions emerging from the above essays and the lessons on the impact of technology creation and absorption on economic development that appeal especially to developing and transition countries.