

Kurt A. Hafner

Economic Integration and Technology Diffusion

A Theoretical and Empirical Analysis
of How Countries Gain and Lose

Editor of the Series:
Prof. Dr. Heinz-Dieter Wenzel
Director of BERG
Bamberg University
public-finance@sowi.uni-bamberg.de

Author:
Kurt Hafner

ISBN: 3-931052-58-3

BERG-Verlag, Bamberg

Bibliographic information is published by Die Deutsche Bibliothek
Die Deutsche Bibliothek lists this publication in the Deutschen National-
bibliografie; detailed bibliographic data is available in the Internet
<http://dnb.ddb.de>.

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilm or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from BERG-Verlag. Violations are liable for prosecution under the German Copyright Law.

BERG-Verlag Bamberg 2006

Our service provider for printing:
Buch bücher dd ag
www.DD-AG.de

The use of general descriptive names, registered names, trademarks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

Preface

Economic integration of regions and countries is a fascinating topic. I first became aware of it during my stay in Mexico as part of an undergraduate exchange program in 1995-1996. The North American Free Trade Agreement (NAFTA) came barely into effect by the beginning of 1994 Mexico once again struggled with an economic and political crisis. Beside the usual currency devaluation, the Mexican economy passed through an adjustment process of substantial industrial restructuring. Special trade agreements and geographical proximity shifted industries from Mexico City towards the border. For the USA, the economic impact ranged from relocation of industrial activity to outsourcing of low labor cost intensive production to Mexico. Hence, the development of the twin cities on both sides of the US-Mexican border (San Diego-Tijuana; El Paso-Ciudad Juarez) with a high share of Mexican labor-intensive manufacturing (*maquiladora* industry) was one of NAFTA's remarkable outcomes.

I started wondering about the economic forces driving integration of neighbor countries/regions and their impact on domestic economies and daily life. Today we see an ongoing enlargement process in the EU to incorporate Central and Eastern European countries. The US-administration recently signed a free trade agreement with Central American countries and the Dominican Republic making it the second largest US-Export market in Latin America. Asian countries, especially China, push more and more towards free trade and compete for market shares and input factors globally. Economic integration is a big issue nowadays. It deserves sound theoretical and empirical studies to confront people's fears and hopes.

I would like to thank Richard Münch for his efforts in turning the Graduate School "Markets and Social Systems in Europe" at the Otto-Friedrich-Universität Bamberg into an interdisciplinary research place and inspiring aca-

demic debates. My thanks go to Johannes Schwarze and Andreas Oehler, whose comments and guidance improved and encouraged this study a lot. I also wish to thank Christoph Knoppik for offering me to teach students in Macroeconomics at the Otto-Friedrich-Universität Bamberg.

The empirical analysis of the dissertation was partly written at the New York University (NYU)/ New York and Centro de Investigación y Docencia Económicas (CIDE)/ Mexico City. I would like to thank Jonathan Eaton and David Mayer-Foulkes, who offered me the opportunity to work and share ideas with them as a visiting research fellow during summer 2005. The stimulating environment at NYU and CIDE with any kind of support gave me a second home for my research activities. I also wish to thank Cermeño Bazán Rodolfo at the CIDE for the discussions and helpful comments in various occasions. Financial support from the Deutsche Forschungsgemeinschaft as well as the Deutscher Akademischer Austauschdienst is gratefully acknowledged.

Thanks also to Gerhard Rübél and Carsten Eckel for organizing the annual Göttinger Workshop of International Economics providing a fruitful research platform especially for young economists. My thanks go to Jörn Kleinert with whom I always shared and discussed ideas about the New Economic Geography. Gathering and obtaining reliable data is one of the most challenging jobs to do, if one sidesteps from theory and looks at the real world. I therefore would like to thank the UBS in Zürich as well as the Deutsches Patent- und Markenamt in München for providing me international earning statistics and detailed patent data respectively.

Finally, I would like to thank Stefanie Lehner for reading and commenting manuscripts and, of course, my parents for any kind of help.

Contents

1 Motivation.....	1
2 Agglomeration, Research Activity and Economic Development	14
2.1 Introduction	14
2.2 Agglomeration, Research Activity and Technology Spillover.....	17
2.3 A Static Equilibrium Model	21
2.3.1 Assumptions.....	22
2.3.2 General Equilibrium Conditions	28
2.3.3 Steady-State Equilibrium	29
2.4 Equilibrium Analysis: Economic Development and Agglomeration	30
2.4.1 Fundamental Research: R&D	32
2.4.2 Secondary Research: Learning-By-Doing	37
2.5 Conclusion.....	39
3 Agglomeration, Migration and Tax Competition.....	41
3.1 Introduction	41
3.2 Agglomeration, Migration and Tax Competition.....	43
3.3 A Static Equilibrium Model with Tax Competition	46
3.3.1 Assumptions.....	46
3.3.2 General Equilibrium Conditions	49
3.3.3 Steady-State Equilibrium	49
3.4 Government Taxation and Tax Competition	50
3.4.1 Optimal Tax-Setting.....	51
3.4.2 Tax Competition and Symmetric Equilibrium.....	53
3.4.3 Agglomeration and Limited Tax Game	56
3.5 Conclusion.....	64
4 The Pattern of International Patenting and Technology Diffusion	66
4.1 Introduction	66
4.2 Foreign Technology Diffusion and R&D Spillovers.....	68
4.3 Framework.....	71
4.4 Data	76

4.5 Nonstationary Panels and Estimation Techniques.....	78
4.6 Empirical Results.....	82
4.6.1 Patent-Related Spillover Effects	82
4.6.2 Patent-, Trade- and FDI-Related Spillover Effects	90
4.7 Conclusion.....	92
5 Summary and Conclusions.....	93
6 Appendix.....	98
6.1 Appendix for the Theoretical Parts.....	98
(A) Model Calculations.....	98
(B) Numerical Simulation: The Choice of Parameters and the Methodology	117
6.2 Appendix for the Empirical Parts	118
(C) Assumptions and Methods of Calculation	118
(D) Additional Estimation Results and Tables.....	122
6.3 Additional Figures.....	125
References.....	129