

LABOR MARKET IMPLICATIONS OF MULTINATIONAL ENTERPRISES

A Ph.D. Dissertation

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September 2007

To my family

LABOR MARKET IMPLICATIONS OF MULTINATIONAL ENTERPRISES

The Institute of Economics and Social Sciences
of
Bilkent University

by

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In Partial Fulfilment of the Requirements for the Degree of
DOCTOR OF PHILOSOPHY

in

THE DEPARTMENT OF
ECONOMICS
BİLKENT UNIVERSITY
ANKARA

September 2007

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ABSTRACT

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September 2007

In this dissertation, the labor market implications of increased foreign firm activity in the local economy are studied by using a heterogeneous matching model framework. There are a number of unskilled and skilled job seekers, and a number of job vacancies posted by local and foreign firms. In this set up, where all workers can engage in on-the-job search, equilibrium conditions and Nash bargaining approach allows derivation of wages for different types of workers and firms. Results suggest that wages are a weighted average of labor productivity and unemployment benefit, where the weight depends on the bargaining power of the workers, labor market tightness and the mass of local and foreign vacancies. Results suggest that levels of wages paid by the foreign firm need not always be greater than that paid by the local firm. In fact, the wage differential is found to depend on relative costs, skill endowment and the technological gap between local and foreign firms. An increase in the foreign presence, measured as an increase in the extent of foreign firm vacancy creation, can occur because of an exogenous change in cost of job creation- public policy, technological improvements and skill upgrading. In this context, depending on the cause of an increase in foreign presence we end up with differential relative wage effects. On the other hand, skill intensity of the foreign firms and restrictions

on labor mobility from foreign to local firms play a crucial role in explaining wage differentials and unemployment.

Keywords: Foreign investment, skill premium, relative wages, matching models, labor markets.

ÖZET

ÇOKULUSLU ŞİRKETLERİN İŞ GÜCÜ PİYASALARINA ETKİLERİ

Sağlam, Bahar

Doktora, Ekonomi Bölümü

Tez Yöneticisi: Asst. Prof. Selin Sayek Böke

Eylül 2007

Bu tezde, artan yabancı firma aktivitelerinin yerel iş gücü piyasalarına etkileri heterojen eşleşme modelleri kullanılarak çalışılmıştır. Yerel iş gücü piyasasında iş arayan vasıflı ve vasıfsız işçiler yerel ve yabancı firmalarda açılan iş olanaklarını doldururlar. Bu model içerisinde sadece işsizler değil vasıflı ya da vasıfsız iş sahibi olanlarda yeni açılan iş olanaklarını değerlendirmek isterler. Denge şartları ve Nash pazarlık bakış açısıyla yerel ve yabancı firmadaki vasıflı ve vasıfsız işçi ücretleri belirlenir. Modelin bulguları ücretlerin işsizlik maaşı ve verimliliğin ağırlıklı ortalaması olduğunu gösterir. Bu ağırlıklar ise işçilerin pazarlık gücüne, yerel ve yabancı firmaların açtığı iş olanaklarının miktarına göre değişir. Bunu yanı sıra modelin nümerik ve analitik çözümü her zaman yabancı firmaların daha çok ücret ödediğinin doğru olmadığını söyler. Firmalar arasındaki ücret farklılıkları yabancı ve yerel firmada iş olanakları açabilme maliyetine, yerel ekonomideki vasıflı vasıfsız işçilerin dağılımına, firmalar arasındaki teknolojik farklılıklara bağlıdır. Yabancı firmaların yerel ekonomideki varlıkları açtıkları iş olanaklarıyla ölçülmüştür. Düşen iş yaratma maliyetleri, teknolojik ilerleme ve vasıflı işgünü artışı sebepleriyle artan yabancı firma iş olanakları vasıflı vasıfsız ücretleri, yerli ve yabancı ücret farklılıklarını, vasıflı vasıfsız ücret farklılıklarını ve işsizlik oranlarını etkiler. Ama bu etki yabancı

firmanın iş olanaklarını artırmasına neden olan etkenlere göre farklılıklar gösterir. Bunun yanı sıra, yabancı firmaların girdiği sektöre göre iş gücü piyasasında yarattığı etkilerin farklılıkları incelenmiştir. Aynı zamanda, yabancı firmadan yerel firmaya giden işçilere getirilen kısıtlamaların firmalar arasındaki bilgi akımına etkilerine çalışılmıştır.

Anahtar Kelimeler: Yabancı yatırımlar, nisbi ücretler, eşleşme modelleri, işgücü piyasaları.

ACKNOWLEDGMENTS

I would like to thank my advisor, Assit. Prof. Selin Sayek Böke who supported me patiently, and guided me through my whole study.

I am also grateful for the support of my Ph.D. committee members, Assit. Prof. Taner Yiğit, Assoc. Prof. Hakan Ercan, Assoc. Prof. Fatma Taşkın and Assoc. Prof. Süheyla Özyıldım for their comments, time and effort.

Many people on the faculty assisted and encouraged me in various ways during my course of studies. I am especially grateful to them.

My sincere gratitude goes to my family and my friends for their love, support, and patience.

To all of you, thank you.

TABLE OF CONTENTS

ABSTRACT.....	iii
ÖZET.....	v
ACKNOWLEDGMENTS	vii
TABLE OF CONTENTS.....	viii
LIST OF TABLES.....	x
LIST OF FIGURES.....	xii
CHAPTER 1 INTRODUCTION AND MOTIVATION.....	1
CHAPTER 2 LABOR MARKET IMPLICATIONS OF MNEs: AN ANALYSIS USING HETEROGENEOUS MATCHING MODELS	12
2.1 Introduction	12
2.1.1 Basic Assumptions.....	13
2.1.2 Matching,.....	17
2.1.3 Bargaining and Wages.....	20
2.1.4 Asset Values.....	21
2.2 Equilibrium	25
2.2.1 Wages.....	26
2.2.2 Explaining the Relative Weights and Absolute Wages.....	31
2.3 Numerical Example	40
2.3.1 Benchmark Case	41
2.3.2 Changes in the Cost Structure.....	42
2.3.3 Sensitivity Analysis.....	47
2.4 Conclusion.....	52
CHAPTER 3 DOES THE TECHNOLOGY INTENSITY OF THE FIRM MATTER?.....	61
3.1 Introduction.....	61

3.2 High-Tech Foreign Firms	68
3.2.1 Model.....	68
3.2.2. Equilibrium.....	72
3.2.3. Wages.....	73
3.2.4. Numerical Example: High-Tech Foreign Firms.....	80
3.3 Low-Tech Foreign Firms.....	101
3.3.1 Model.....	101
3.3.2. Equilibrium.....	105
3.3.3. Wages.....	105
3.3.4 Numerical Example: Low-Tech Foreign Firms.....	111
3.4 Comparison Across Models.....	128
CHAPTER 4 MNEs AND WORKERS' MOBILITY: LABOR MARKET	
IMPLICATIONS.....	132
4.1 Introduction.....	132
4.2 The Model.....	141
4.2.1 Matching.....	144
4.2.2 Equilibrium.....	152
4.3 Numerical Example.....	153
4.4 Conclusion.....	173
CHAPTER 5 CONCLUSION.....	175
NOTE 1.....	178
BIBLIOGRAPHY.....	180
APPENDIX	190

LIST OF TABLES

1 Main Indicators of Foreign Affiliates, 1982-2004.....	2
2 Baseline Solution.....	54
3 Decrease in the Job Creation Cost of Foreign Firm and its Labor Market Implications.....	54
4 Decrease in the Job Creation Cost of Foreign and Local Firms and its Labor Market Implications.....	55
5 Gap Between Job Creation Cost of Foreign and Local Firms and its Labor Market Implications.....	55
6 Cost Elasticity of Vacancies, Wages and Unemployment.....	56
7 Technological Upgrading and its impact on the Labor Market.....	57
8 Decrease in the Job Creation Cost of Foreign Firm and its Impact on Vacancies and Wages (Technological Upgrading).....	58
9 Skill Upgrading and its Impact on Labor Market.....	59
10 Decrease in the Job Creation Cost of Foreign Firm and its Impact on Vacancies and Wages (Skill Upgrading).....	60
11 Sectoral Composition of Inward FDI Stock, billions of dollar.....	63
12 Baseline Solution for High-Tech Foreign Firms.....	94
13 Decrease in the Job Creation Cost of Foreign Firm and its Labor Market Implications.....	94
14 Decrease in the Job Creation Cost of Foreign and Local Firms and its Labor Market Implications.....	95
15 Gap Between Job Creation Cost of Foreign and Local Firms and its Labor Market Implications.....	95
16 Cost Elasticity of Vacancies, Wages and Unemployment.....	96

17 Technological Upgrading and its impact on the Labor Market.....	97
18 Decrease in the Job Creation Cost of Foreign Firm and its Impact on Vacancies and Wages (Technological Upgrading).....	98
19 Skill Upgrading and its Impact on Labor Market	99
20 Decrease in the Job Creation Cost of Foreign Firm and its Impact on Vacancies and Wages (Skill Upgrading).....	100
21 Baseline Solution for Low-Tech Foreign Firms.....	121
22 Decrease in the Job Creation Cost of Foreign Firm and its Labor Market Implications.....	121
23 Decrease in the Job Creation Cost of Foreign Firm and its Labor Market Implications.....	122
24 Gap Between Job Creation Cost of Foreign and Local Firms and its Labor Market Implications.....	122
25 Cost Elasticity of Vacancies, Wages and Unemployment.....	123
26 Technological Upgrading and its impact on the Labor Market	124
27 Decrease in the Job Creation Cost of Foreign Firm and its Impact on Vacancies and Wages (Technological Upgrading).....	125
28 Skill Upgrading and its Impact on Labor Market.....	126
29 Decrease in the Job Creation Cost of Foreign Firm and its Impact on Vacancies and Wages (Skill Upgrading).....	127
30 Numerical versus Real Figures.....	178
31. Job Creation and Employment by Foreign Firms in Ireland.....	178
32 Employment of foreign affiliates in the host economy, 1980-2004.....	179

LIST OF FIGURES

1 Workers' Mobility.....	18
2 Unskilled workers' wage in the local firm.....	27
3 Unskilled workers' wage in the foreign firm.....	28
4 Skilled workers' wage in the local firm.....	29
5 Skilled workers' wage in the foreign firm.....	31
6 Skill Premium.....	39
7 Firm Premium.....	40
8 Workers' Mobility under High-tech Foreign Firms.....	69
9 Skilled workers' wage in the local firm.....	76
10 Skilled workers' wage in the foreign firm.....	77
11 Skill Premium.....	86
12 Firm Premium.....	87
13 Workers' Mobility under Low-tech Foreign Firms.....	102
14 Unskilled workers' wage in the local firm.....	107
15 Unskilled workers' wage in the foreign firm.....	108
16 Skill Premium.....	115
17 Firm Premium.....	116
18 Labor Market: Job Opportunities, Unemployment and Wages, $cL = 0 : 5; cF = 0.7$	155
19 Labor Market: Job Opportunities, Unemployment and Wages, $cL = 0 : 5; cF = 0.5$	157
20 Labor Market: Job Opportunities, Unemployment, Technological Gap.....	159
21 Labor Market: Job Opportunities, foreign versus average local wages, Technological Gap.....	161

22 Labor Market Opportunities: wages in the local firm, technological gap.....	162
23 Labor Market Opportunities: relative wages in the local firm, technological gap.....	163
24 Labor Market Opportunities: different functional form for g	165
25 Labor Market Opportunities: different functional form for ϵ	167
26 Labor Market Opportunities: restrictions on workers' mobility by both firms, $g = m$	169
27 Labor Market: Reduction in the job creation costs, $cL = 0.5$; $cF = 0.5$	171
28 Labor Market Opportunities: restrictions on workers' mobility by both firms, $g > m$	172

CHAPTER 1

INTRODUCTION AND MOTIVATION

The rapid growth in international trade, investment and financial flows over the past two decades has been the most remarkable change in the world economy. Increased activities of multinational enterprises (MNEs), due to the reductions in trade and investment barriers and the cost of moving goods and information, has led to relocation of capital and jobs, and re-determination of factor prices. The scale and scope of MNE activities are best gauged by looking at their shares in economic activity. Table 1 points out the MNEs' critical role in the global economy with their 690391 affiliates abroad. Over the past two decades, there has been a drastic increase in the total sales, assets and exports of foreign affiliates. Gross product of foreign affiliates increased from \$1.4 trillion in 1990 to \$4 trillion in 2004. In 2004, foreign affiliates of MNEs, with total sales, assets and exports amounting to \$19 trillion, \$36 trillion and \$4 trillion, respectively, generated 57 million jobs. MNEs have become one of the key players in extensively integrated economies since they have gained an important ground in transmitting new technologies, managerial techniques, skills and capital across borders.¹

¹See Caves (1996); Markusen and Venables, (1999); Navaratti and Venables (2004); among others, for a discussion of the role of MNEs and their effects.

In this context, to benefit from new technology, knowledge and market opportunities, domestic policy makers (as well as firms) encourage foreign firms to establish local subsidiaries². Alongside its effect on local firm productivity through technology transfers, investments by foreign firms also have important implications for the local labor market conditions. If one envisages the world production along a continuum of factor intensities, the differing labor requirements among the local firm, the foreign affiliate and foreign parent firms would become evident³. As such, the increasing extent of foreign firms (affiliates) would have important effects on the skill composition of the local labor market; the relative demand for skilled and unskilled worker, hence their unemployment rates and the relative wages of skilled and unskilled worker.

Table 1: Main Indicators of Foreign Affiliates, 1982-2004

	Value at Current Prices (Billion \$)			
	1982	1990	2003	2004
Sales of Foreign Affiliates	2765	5727	16963	18677
Gross Product of Foreign Affiliates	647	1476	3573	3911
Total Assets of Foreign Affiliates	2113	5937	32186	36008
Exports of Foreign Affiliates	730	1498	3073	3690
Employment of Foreign Affiliates (thousands)	19579	24471	53196	57394
Number of Foreign Affiliates Located in Economy		170000	690391	

Source: UNCTAD, World Investment Report, 2005

Accordingly, empirical and theoretical debate about the impact of the MNEs' production activities on labor markets, particularly wage differentials and employment, is lively and growing. While the theoretical models that investigate the effect

²Throughout the text terms foreign firms and multinationals are used interchangeably.

³A foreign affiliate is an incorporated or unincorporated enterprise in which an investor, who is a resident in another economy, owns a stake that permits a lasting interest in the management of that enterprise (an equity stake of 10% for an incorporated enterprise, or its equivalent for an unincorporated enterprise) (World Investment Report, 2006).

of FDI on employment and the wage structures in both the source and host countries have mostly incorporated the MNEs into the microeconomic – general equilibrium theory of international trade, such as the Heckscher-Ohlin model, a substantial body of empirical work is based on ad hoc observations and surveys, as well as a number of studies using econometric methods. These studies document two fundamental issues:⁴ First, as the structure of the domestic production changes upon the entry of foreign firms, the wage gap between skilled and unskilled workers changes (Gopinath and Chen, 2003, Ghosh, 2003, and Markusen and Venables, 1997). Second, foreign firms tend to pay different wages than domestic firms (Aitken et al., 1996, Feenstra and Hanson, 1996, and Lipsey and Sjöholm, 2004).

The literature is dominated by theoretical studies that explore the first issue regarding the relative wages between the skilled and unskilled labor, i.e. the skill premium, and by empirical studies exploring the second issue regarding the relative wages paid by foreign and domestic firms, i.e. foreign firm premium. The two issues are rarely discussed simultaneously in both the theoretical and empirical studies on the effects of MNEs, which this dissertation does. This dissertation tries to fill the void in the literature, building a framework that explains the two observations synchronously and allows for a detailed identification of the absolute and relative wage implications of increased MNE activities in the host country. Furthermore, while the literature has so far been relatively silent on the unemployment effects of foreign investment, a third issue that could be studied in this context is the effect

⁴See Brown et al., 2002; Ghosh, 2003; Moran, 2002; Hatzius, 1998; and Eckel, 2003 for a detailed discussion.

of MNEs on unemployment rates. As such, the below model allows for a discussion of not only the price effects of foreign firms in the local labor markets but also their impact on the unemployment rates.

The theoretical explorations of the skill premia effects of increased MNE activities yields ambiguous results, where the common theme is that the effects of foreign direct investment (FDI) on relative wages in the source and the host countries *depends* on the characteristics of the investment and the conditions in the invested environment. Markusen and Venables (1997), Feenstra and Hanson (1996) and Ghosh (2003) find that the relative return to skilled labor increases in both the host and source country upon increased MNE activities. On the other hand, Das (2002), Wu (2001) and Sayek and Sener (2006) find that the relative wage effects depend on the competing domestic entrepreneurs' skill level and the technology gap between the host and the source country; the technology intensity and the type of the foreign investment; and the skill intensity of the foreign production, respectively. Lall (1995) provides an extensive list of conditions which affect the labor market effects of foreign investment. In summary, Lall (1995) suggests these conditions to include the size and the mode of entry (greenfield or acquisition), the nature and flexibility of technology in the foreign firm, level and speed of technology upgrading, the sophistication of the technologies used, trade orientation, the place of the affiliate in the global production, the levels and types of skills needed for the operation of the affiliate, the extent of local design or R&D activity, and the economic and market conditions in the host country and the competitive capability of local firms. The important message to be taken from this strand of the literature is that the *local conditions* as well as the *investment*

characteristics, which we will lump in the term "absorptive capacities" matters in the determination of the wage effects of increased foreign presence⁵.

Empirical evidence, documenting the two fundamental issues enlisted above, points to the role of absorptive capacities by finding different results among developing countries. Regarding the former observation, Robbins (1994) and Wood (1994) find that Malaysia, Philippines, Singapore and Taiwan have experienced a fall in the skilled-unskilled wage differential, while Beyer et al. (1999) and Cragg and Epelbaum (1996) find that Chile and Mexico experienced the opposite after MNEs increased their activities. As noted above, such differential effects could be on account of the different local conditions and investment characteristics discussed in the theoretical models, i.e absorptive capacities.

Studies on the second observation, regarding the differential wages across domestic and foreign firms, tend to echo a similar *absorptive capacity* story; though the studies mostly document higher wages being paid by foreign firms. For example, Driffield and Girma (2003) and Conyon et al. (2002) demonstrate that even after controlling for industry and firm effects there is a significant wage difference between foreign and domestic firms in the UK. Martins (2004) shows a positive relationship between foreign ownership and wages, though the results suggest a negative effect of foreign acquisition on the *growth rate* of these wages. Aitken, Harrison and Lipsey (1996) also document such wage differences, and find that in Mexico and Venezuela wage differentials between domestic and foreign firms persist, and in fact foreign

⁵The literature uses the term absorptive capacity to capture both the local market conditions such as the availability of skilled labor (Borenstein et al., 1998), the availability of financial market services (Alfaro et al., 2004 and Durham and Lensink, 2004), as well as the technology capacity of the local firm, which we labeled as the investment characteristic above.

firms pay higher wages than domestic firms. The authors further show that this wage gap between the local and foreign firms widens as the foreign firms presence increases, mostly on account of the reduction in wages paid by domestic firms.

On the contrary, studying the Indonesian manufacturing industry Lipsey and Sjöholm (2002) conclude that though foreign-owned enterprises pay higher wages than domestic enterprises, a higher foreign presence in an industry is associated with higher level of wages in locally owned enterprises. Furthermore, Almedia (2004) finds only small alterations in the skill composition and wage structure of Portuguese domestic firms upon foreign acquisition. Such evidence can be interpreted as suggesting that the relative wages between domestic and foreign firms might also differ depending on the *absorptive capacities*, either of the local market or of the firm. In fact, Barry et al. (2005) find that, since foreign firms use different combinations of skilled and unskilled workers in their production depending on their sector of operation, the wage effects of increased foreign presence may differ across sectors. Providing evidence from Ireland, they find that while increased foreign presence in a sector has a negative effect on wages paid by domestic firms who are *exporters* it has no effect on wages paid by firms who are *non-exporters*. In similar fashion Girma et al. (2001) find no evidence of a positive relationship between foreign presence and wage levels in domestic enterprises, with some weak evidence of a negative effect of foreign presence on domestic enterprises' wage growth.

Ruane and Ugur (2002) suggest several reasons for why MNEs may indeed offer higher wages. Firstly, since MNEs are less familiar with local labor market conditions, they may offer higher wages in order to attract better quality labor. Second,

MNEs pay higher wages to minimize technology spillovers to other firms via labor mobility, that is to reduce worker turnover. Thirdly, since MNEs' skill requirements may differ from those of local firms, they have to pay more for those skills. Fourth, they pay higher wages than local firms since MNEs are larger than local enterprises. Actually, due to the productivity advantage, MNEs can afford to do so. To sum up, these conditions can all be included under the absorptive capacity that defines the evolution of several relative wages, i.e. those between firms and those between different types of labor.

As is detailed above, while these explanations support the empirical evidence provided by several studies there is no formal model that explores these relationships. This dissertation fills this gap in the literature, formalizing the explanations suggested by Ruane and Ugur (2002), among others. Furthermore, the model allows identifying a range of *absorptive capacities* that affect not only the magnitude of the skill and firm premia, and within firms relative wage effects of increased foreign firm presence but also, the direction of these effects.

In summary, although there have been many empirical studies investigating the labor market implications of the entry of foreign firms, evidence on labor mobility in a theoretical set-up is scarce and far from conclusive. The purpose of this dissertation is to fill this theoretical void, by constructing models allowing for wage differences across skilled and unskilled labor, as well as wage differences across domestic and foreign firms. As such the dissertation adds value to the literature by combining two well-documented wage effects of foreign firm activity, those on different *types of labor* and those paid by different *types of firms*. Furthermore, models also allow

for studying the unemployment effects alongside the wage effects, providing a broad perspective on the labor market.

Specifically, effects of the workers' mobility by means of search models and the matching functions are evaluated. Search and matching models have a crucial role in explaining the labor market transitions, they provide a very suitable framework to study the labor market fluctuations following the entry of foreign firms. The first chapter of the dissertation is also a novelty in studying the labor market implications of foreign firm activity; which, to the best of our knowledge, has not been studied using matching models so far. Chapter 2 models the foreign firm working with both skilled and unskilled workers and Chapter 3 further looks into the corner solutions, where either skilled or unskilled labor is used in production, instead of both labor being used in combination. In Chapter 4, examines the effect of labor mobility restrictions from foreign to local firms on wage and unemployment rate of the workers. Models and main findings of these models will be discussed shortly below.

Although the basic structure of Gautier (2002), Albrecht and Vroman (2002) and Dolado et al. (2003) is adopted to study this question, the dissertation also contributes to the modeling of labor market implications of international factor movements by allowing for two sided on-the-job-search.⁶ The model can be summarized as follows: there are a number of unskilled and skilled job seekers, who are either unemployed or employed. Vacancies are posted by local and foreign firms looking for skilled and unskilled workers. However, job creation through vacancy posting is not a costless

⁶The literature on matching models with heterogenous agents has developed over the last decade, dating back to the influential contributions by Pissarides (1994), McKenna (1996), Acemoglu (1999), Mortensen and Pissarides (1999), Burdett and Coles (1999) and Shimer and Smith (2000).

procedure. In fact, the structure of job creation costs, which differs between local and foreign firms, plays a major role in the extent of vacancy creation by the foreign firms and has an important effect on the labor market. Job seekers and firms meet according to the matching function.

When a worker and firm meets, the wage is set in accordance with the Nash bargaining approach. In this matching process, skilled and unskilled workers – both in the foreign and local firms – can engage in on-the-job-search. By allowing on-the-job-search, it is possible that skilled and unskilled workers in local (foreign) firms switch into foreign (local) firms. In addition, different productivities across firms and workers are also allowed for. Particularly, the model presented in Chapter 2 provides a complete picture to study the effects of foreign job creation on employment and wage differences and it also allows studying the effects of technology and skill upgrading on employment and the wage differentials.

Accordingly, skilled and unskilled workers' wage in the local and foreign firms are found to be a weighted average of labor productivity and the workers' unemployment benefits. Particularly, skilled and unskilled workers' wages depend on job opportunities provided by the firms, which are mainly determined by the cost of job creation and the labor productivity. Results show that foreign firms need not always pay more than local firms, which is supportive of the mixed evidence provided in the empirical literature. The relative wage between the local and foreign firms is found to depend on the share of posted vacancies by the local and foreign firms and the technology gap between foreign and local firms; and the share of posted vacancies, which depends on the cost of job-creation for the firms and the labor productivity,

i.e. the absorptive capacities (as discussed in Chapter 2) and the sector of production (as discussed in Chapter 3- where technology intensities matter) and the flexibility of labor (as discussed in Chapter 4- where the extent of labor mobility matters).

If the share of foreign vacancies increase due to the decrease in the foreign job creation cost, then the wages in the local firm tend to decline while wages in the foreign firm are likely to increase. This leads to a decrease in the overall skill premium and an increase in the firm premium, given the costs of the local firm and the productivity gap are above a certain threshold. However, when different skill requirements of the firms are considered, increased foreign firm presence create different wage and unemployment outcomes. If the foreign firm is relatively more skill intensive than local firm, increased foreign firm presence decreases the wage of unskilled workers and increases their unemployment rate. On the other hand, if the foreign firm is relatively less skill intensive than local firm, the wage gap between skilled and unskilled workers in the local firm increases. Furthermore, restrictions on labor mobility have important implications on the job creation, wage and unemployment patterns. Results point out that labor mobility from foreign to local firms decreases the skill premium in the local firm and also puts a downward pressure on the firm premium. Findings of the model point out that the technological gap between foreign and local firms plays a vital role in the job creation and determination of wages and unemployment.

These results are supported by a wide range of numerical exercises we complete, to both quantify the analytic results found and to identify the effects that are not obtained in explicit form in the analytic solution. The numerical exercise shows

that the relative wage effects (both between different skill levels and between firms) depend on the job-creation costs, the productivity levels of labor, and the imperfections in the labor market (which are mainly captured by the bargaining power of the labor in this model). In summary, within this framework, it can be concluded that wage dispersion across foreign and local firms stems from not only productivity differentials but also from the extent of job creation; skill intensity and the labor mobility influence the direction and magnitude of the wage effects of increased foreign presence. The model also allows for a detailed discussion of the unemployment effect, across different skill level of MNE activities.

Accordingly, the chapter 2 examines the labor market implications of foreign firms and chapter 3 studies the effect of different types of foreign firms on local labor markets and Chapter 4 deals with restrictions on labor mobility and their effects on explaining wage differentials and unemployment rate.

CHAPTER 2

LABOR MARKET IMPLICATIONS OF MNEs: AN ANALYSIS USING HETEROGENEOUS MATCHING MODEL

2.1. Introduction

As is discussed above, the increased presence of foreign firms have important impacts on the labor markets. Foreign firms create various job opportunities depending on their activities in the host country⁷. Actually, to compete and prosper, both foreign and local firms need to restructure their activities, facilities and skills, and tailor them to the changing technologies (Ismail and Yussof, 2003). In this context, both firms offer various job opportunities for skilled and unskilled workers while restructuring their activities. Foreign owned enterprises are the most dynamic ones in terms of job creation since being free from political and social constraints, they are able to fire unproductive workers and hire new ones, destroy inefficient jobs and create efficient ones, close down plants and establish new ones (Faggio and Koning, 2001). Thus, they are able to undertake the fundamental changes necessary for restructuring. In this context, it will be beneficial to discuss the role played by the foreign firms in job creation by utilizing a heterogeneous matching model. This chapter is

⁷We consider the foreign and local firms in the manufacturing sector.

organized as follows: the following section presents the main characteristics of the model, section three provides an equilibrium analysis and displays wages. This is followed by a numerical example. The final section summarizes and concludes.

2.1.1. Basic Assumptions

Consider a continuous time model in which workers are infinitely lived and risk neutral. In addition, the measure of workers is normalized to one. We assume that the distribution of skills across workers is exogenous: $\mu \in (0, 1)$ of the workers are unskilled (l) while the remaining fraction, $1 - \mu$, are skilled (s). There are two types of jobs: local (L) and foreign jobs (F). These jobs can be performed by both types of workers. Let y_j^i denote the flow output of a job of type i ($= L, F$) that is filled by a worker of type j ($= l, s$).

Assumptions on production technology can be summarized as follows⁸:

$$y_s^F > y_s^L \text{ and } y_t^F > y_t^L \quad (1)$$

That is, the flow output that would result from a match between a skilled worker and a foreign firm is higher than the flow output from a match between a skilled worker and a local firm. A similar situation applies to unskilled workers. This follows the empirical evidence that foreign firms are more productive than local firms, which is widely accepted in the literature (Dunning, 1993; Caves, 1996; Doms and Jensen, 1998 and Conyon et al., 2002). Clearly, as foreign firms act as a source of new

⁸It is important to note that any re-ordering of y_s^F and y_s^L has an important implications, which are captured in the numerical simulations.

technology, production process, managerial technique or a new organizational form (Fosfuri et al., 2001), workers are more productive in foreign firms.

Job destruction is exogenous at rate δ . Whenever a job is destroyed the worker becomes unemployed, while the job becomes vacant. During unemployment workers receive an unemployment benefit b .

On the other hand, restructuring in the labor market by means of job creation is not a costless procedure. Firms must create a vacancy to hire new workers. Particularly, vacancies are a form of investment and firms must incur a cost to reach job seekers and to acquire information on the characteristics of applicants. Due to the informational frictions in the labor market, firms experience difficulties in matching with suitable job seekers. To overcome the informational hurdle and to make vacancies visible, firms spread information about the characteristics of their vacancies by using various recruitment methods such as public employment services, advertisement and private employment agencies (Russo et al., 2005). In this context, to hire a suitable worker, firms need to incur the cost of recruiting including the cost of posting, advertising and screening, and the cost of initial training at all stages of production (Fonseca et al., 2001; Hammermesh, 1993; and Russo et al., 2005). Actually, firms use different search strategies and use different recruitment methods, thus, they follow different job creation policies depending on the cost structures. In this regard, when investing in a new market by means of posting job opportunities, foreign firms need to exert additional effort to locating better matching opportunities and they have to incur a cost which includes all expenses associated with operating

in an unfamiliar foreign environment (Fosfuri et al., 2001)⁹ In this respect, denoting the costs of job creation in the local and foreign firms as c_L and c_F , respectively, we assume $c_F > c_L$ ¹⁰.

Carlson et al. (2006), Vanhala (2004), Faggio and Koning (2001) state that assumptions on job creation costs have a crucial role in terms of job reallocation and change the potential policy recommendations of the models. As such it is crucial to capture such costs in the model. Cost of job creation generates important fluctuations in the mass of vacancies, therefore, it has a crucial role on explaining labor market dynamics, wages and unemployment rates (Booth et al., 2002). Mortensen and Pissarides (1994) and Shimer (2003) state that the cost of vacancy creation has an inevitable role in the Beveridge curve. Empirically, Kugler and Saint-Paul (2000) note that job creation and job creation costs helps to explain the functioning of European and North American labor markets.

A recent research on labor market implications of foreign firms mainly interested on the different job creation patterns of the firm. Empirically, foreign firms in Japan have different job creation patterns as compared to domestic firms (Kiyota and Matsuura, 2006). Görg and Strobl (2005b) investigate the driving factors behind the diverse employment performances of domestic and foreign plants in Ireland by examining job creation and job destruction rates. An econometric investigation reveals

⁹Evidence shows that MNEs offer more training to workers than do local firms and undertake substantial efforts in the training of local workers (Chen, 1983; Gerschenberg, 1987; ILO, 1981; and Lindsey, 1986). In fact, Fosfuri et al. (2001) note that MNEs can use a superior technology in a foreign subsidiary only after training a local worker. Training also has costs and these costs are those incurred not only for recruitment but until labor becomes of any use to the firm. Thus, the cost of job generation is higher than that of the local firms, that is, they incur higher costs to generate jobs.

¹⁰If the cost is incurred by the workers, that is, searching workers incur the search cost, then the wage that firms need to pay the worker increases.

that the net gain of the foreign sector in Irish manufacturing employment was due to a slightly higher job creation rate.

Moreover, we also allow for on-the-job-search by skilled and unskilled workers performing local and foreign jobs. Increased heterogeneity of posted vacancies, due to the increased activities of foreign firms, encourages on-the-job-search. Better matching opportunities arise to workers through on-the-job-search. As in Wolinsky (1987), workers can commit to search when they realize that there are better partners out there in the market place. Actually, employed workers search either because of a deterioration of the satisfaction with their job or an improvement in outside options (Krause and Lubik, 2006). In fact, this change in satisfaction could induce the workers to voluntarily take a wage-cut while changing jobs, as noted by Postel-Vinay and Robin (2002). Empirical evidence on the mobility of workers in an environment with both local and MNEs states that foreign firms try to overcome their lack of information about the local market by attracting experienced skilled and unskilled workers currently performing local jobs. In turn, local firms may hire the workers doing foreign jobs to benefit from technological spillovers. For instance, Gerschenberg (1987), Bloom (1992) and Pack (1993) find evidence of labor movement from MNEs to local firms in Kenya, South Korea and Taiwan, respectively. This evidence is suggestive of the importance of allowing two-sided on-the-job search option in the

theoretical analysis.

2.1.2 Matching

Suppose that there are vacancies posted by local and foreign firms looking for skilled and unskilled workers. Workers and vacancies meet according to the matching function $q_i(.)$ and $q_s(.)$, which is increasing in the relevant amount of job seekers and vacancies. Specifically, the total number of matches between a worker and a firm is determined by the standard Cobb-Douglas matching function,

$$q_i[v_L + v_F, u_l + e_{iL} + e_{iF}] = (u_l + e_{iL} + e_{iF})^\alpha (v_L + v_F)^{1-\alpha}$$

$$q_s[v_L + v_F, u_s + e_{sL} + e_{sF}] = (u_s + e_{sL} + e_{sF})^\alpha (v_L + v_F)^{1-\alpha}$$

where v_L denotes the mass of local vacancies and v_F is the mass of foreign vacancies; u_l is the mass of unemployed unskilled workers; u_s is the mass of unemployed skilled workers, e_{iL} and e_{sL} stand for the number of unskilled and skilled workers performing local jobs, e_{iF} and e_{sF} are number of unskilled and skilled workers in the foreign firm; and α corresponds to the elasticity of matching with respect to the mass of job seekers. The number of unemployed workers in the host country is denoted by u which is the sum of u_l and u_s .

The labor market tightness for unskilled and skilled workers is represented by $\theta_i = \frac{v_L + v_F}{u_l + e_{iL} + e_{iF}}$ and $\theta_s = \frac{v_L + v_F}{u_s + e_{sL} + e_{sF}}$, which is the ratio of total job vacancies to total unskilled and skilled job seekers, respectively. In tight (slack) labor markets the pool of job seekers shrinks (enlarges) and the degree of competition among firms intensifies

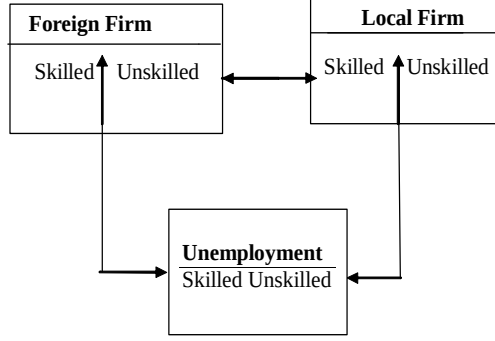


Figure 1: Workers' Mobility

(lessens) (Russo et al., 2005; Burgess, 1993; and Blanchard and Diamond, 1994). In summary, an increase in θ_i or θ_s implies increased job market tightness; which is from the perspective of the employer. Accordingly, the rate at which firms meet an unskilled job seeker is equal to $q_i(\theta_i) = q_i(1, \frac{1}{\theta_i}) = \theta_i^{-\alpha}$ and the matching rate at which firms meet a skilled worker is equal to $q_s(\theta_s) = q_s(1, \frac{1}{\theta_s}) = \theta_s^{-\alpha}$ while the rate at which unskilled and skilled workers meet a vacant job is equal to $\theta_i q_i(\theta_i) = \theta_i^{1-\alpha}$ and $\theta_s q_s(\theta_s) = \theta_s^{1-\alpha}$, respectively. Given the properties of the matching function, the matching rate of firms $q_i(\theta_i)$ and $q_s(\theta_s)$ is decreasing in θ_i and θ_s , that is, $q_i'(\theta_i) \leq 0$ and $q_s'(\theta_s) \leq 0$, while the matching rate of workers $\theta_i q_i(\theta_i)$ and $\theta_s q_s(\theta_s)$ is increasing in θ_i and θ_s , respectively. In tight labor markets, the matching rate of firms decreases while the matching rate of workers increases. It is also convenient to define a variable $\eta \left(\eta = \frac{v_L}{v_L + v_F} \right)$, which represents the share of local vacancies in total vacancies.

Figure 1 illustrates the labor market mobility– from unemployment to employment, from job to job and back to unemployment. That is, unemployed unskilled and skilled workers move into local and foreign firms and workers in local and foreign

firms may fall into the unemployment pool and the workers in the local (foreign) firms may switch into the foreign (local) firms. The steady state conditions require that the flows into and out of unemployment for both types of workers be equal. Accordingly, the steady state conditions are given as follows:

$$\theta_i^{1-\alpha} u_i = \delta (\mu - u_i) \quad (2)$$

$$\theta_s^{1-\alpha} u_s = \delta (1 - \mu - u_s) \quad (3)$$

where equation (1) reflects the flow conditions for the unskilled labor. That is, a flow $\theta_i^{1-\alpha}$ of unskilled unemployed workers find employment in firms, which equals to the flow of unskilled workers into unemployment due to the job destruction, $\delta (\mu - u_i)$. Similarly, the latter equation, equation (2), is the flow condition for the skilled workers. The same flow conditions for the movement in and out of the local and foreign firms are depicted in equations (3) through (6).

$$\theta_i^{1-\alpha} \eta (u_i + e_{iF}) = (\delta + \theta_i^{1-\alpha} (1 - \eta)) e_{iL} \quad (4)$$

$$\theta_i^{1-\alpha} (1 - \eta) (u_i + e_{iL}) = (\delta + \theta_i^{1-\alpha} \eta) e_{iF} \quad (5)$$

Since we allow for on-the-job-search for both workers in the local and foreign firms, we have equations for local and foreign firms stating that in the steady state the flow of unskilled workers into local firms, $\theta_i^{1-\alpha} \eta (u_i + e_{iF})$ is equal to the flow of unskilled workers out of local firm, $(\delta + \theta_i^{1-\alpha} (1 - \eta)) e_{iL}$. The flow $\theta_i^{1-\alpha} (1 - \eta) (u_i + e_{iL})$ of currently employed unskilled workers into the foreign firm equals the flow out of foreign firms, $(\delta + \theta_i^{1-\alpha} \eta) e_{iF}$. The same is valid for the skilled workers, which are captured in equations (5) and (6).

$$\theta_s^{1-\alpha} \eta (u_s + e_{sF}) = (\delta + \theta_s^{1-\alpha} (1 - \eta)) e_{sL} \quad (6)$$

$$\theta_s^{1-\alpha} (1 - \eta) (u_s + e_{sL}) = (\delta + \theta_s^{1-\alpha} \eta) e_{sF} \quad (7)$$

2.1.3 Bargaining and Wages

The Nash wage bargaining model is widely used in matching models of the labor market (Albrecht and Vroman, 2002; Dolado et al., 2003; Gautier, 2002; Pissarides, 2000 and Mortensen and Pissarides, 1999). As such, the wage is determined by using the Nash bargaining framework. When a worker and firm meet, the wage is set in accordance with the Nash bargaining solution; that is, workers explicitly negotiate over wages with their employers. Wage offers are treated as endogenous outcomes of job movement decisions made by the workers and firms, who populate the models (Mortensen and Pissarides, 1999).

In equilibrium, we consider four types of matching: skilled workers in foreign and local jobs and unskilled workers in local and foreign jobs, respectively. The surplus of the match between firms and workers is shared according to the asymmetric Nash bargaining solution. The surplus of a match, $S(i, j)$, between a job of type i ($= L, F$) and a worker of type j ($= l, s$) is given as follows:

$$S(i, j) = W(i, j) + J(i, j) - V(i) - U(j)$$

where $W(i, j)$ denotes the value of employment for a worker of type j in a job of type i , $J(i, j)$ is the value for the firm of filling a job of type i by a worker of type j , $V(i)$ is the value of the vacant job and $U(j)$ denotes the value of unemployment. Matches are consumated whenever the joint surplus $S(i, j)$ is nonnegative, that is,

$$W(i, j) + J(i, j) \geq V(i) + U(j)$$

When a match is formed, the wage w_j^i is given by the Nash bargaining condition

$$W(i, j) - U(j) = \beta [W(i, j) + J(i, j) - V(i) - U(j)] \quad (8)$$

where $\beta \in (0, 1)$ is the exogenous surplus share of workers¹¹.

2.1.4 Asset Values

We next develop expressions for the various value functions. In doing this, let r denote the discount rate, which is assumed to be the same for both individuals and firms.

Workers

The asset value of an unskilled unemployed worker, $U(l)$, satisfies

$$rU(l) = b + \theta_i^{1-\alpha} \eta (W(L, l) - U(l)) + \theta_i^{1-\alpha} (1 - \eta) (W(F, l) - U(l)) \quad (9)$$

where the first term on the right hand side is the unemployment benefit, b , and the second term refers to the change in the value of unskilled unemployed worker when (s)he becomes employed in the local firm. The third term is the value gained by being employed in the foreign firm.

Similarly, given the assumption that skilled workers accept both types of jobs, local and foreign, the asset value of unemployed skilled workers, $U(s)$, verifies

¹¹ β reflects the bargaining power of workers.

$$rU(s) = b + \theta_s^{1-\alpha}\eta(W(L, s) - U(s)) + \theta_s^{1-\alpha}(1 - \eta)(W(F, s) - U(s)) \quad (10)$$

The second and third terms in equation (9) denote the change in the value of skilled worker if (s)he is employed in local and foreign firms, respectively.

The value of an unskilled worker employed in local and foreign firms satisfies the following equations

$$rW(L, l) = w_l^L + \delta(U(l) - W(L, l)) + \theta_l^{1-\alpha}(1 - \eta)(W(F, l) - W(L, l)) \quad (11)$$

$$rW(F, l) = w_l^F + \delta(U(l) - W(F, l)) + \theta_l^{1-\alpha}\eta(W(L, l) - W(F, l)) \quad (12)$$

where the first terms in equations (10) and (11) are the unskilled workers' wage in the local and foreign firms, respectively, and the second terms are the value loss of becoming unemployed, and the third terms are the expected return from being successful in on-the-job search for unskilled workers.

The asset values of skilled workers in local and foreign firms, respectively, verify the following conditions:

$$rW(L, s) = w_s^L + \delta(U(s) - W(L, s)) + \theta_s^{1-\alpha}(1 - \eta)(W(F, s) - W(L, s)) \quad (13)$$

$$rW(F, s) = w_s^F + \delta(U(s) - W(F, s)) + \theta_s^{1-\alpha}\eta(W(L, s) - W(F, s)) \quad (14)$$

where w_s^L and w_s^F denote the skilled workers' wage in the local and foreign firms, respectively and the second terms are the value loss of becoming unemployed, and the last terms correspond to the expected return for the skilled workers from being successful in on-the-job search.

Firms

The values of local and foreign vacancies are given, respectively, by

$$rV(L) = -c_L + \theta_i^{-\alpha} A(J(L, l) - V(L)) + \theta_s^{-\alpha} B(J(L, s) - V(L)) \quad (15)$$

$$rV(F) = -c_F + \theta_i^{-\alpha} C(J(F, l) - V(F)) + \theta_s^{-\alpha} D(J(F, s) - V(F)) \quad (16)$$

where $A\left(= \frac{u_l + e_{iF}}{u_l + e_{iL} + e_{iF}}\right)$ stands for the share of unskilled workers applying for a local job in the total job seekers, $B\left(= \frac{u_s + e_{sF}}{u_s + e_{sL} + e_{sF}}\right)$ stands for the share of skilled workers applying for local job in the total job seekers, $C\left(= \frac{u_l + e_{iL}}{u_l + e_{iL} + e_{iF}}\right)$ and $D\left(= \frac{u_s + e_{sL}}{u_s + e_{sL} + e_{sF}}\right)$ are the share of unskilled and skilled workers applying for a foreign job in the total job seekers, respectively. Values, given in equations (14) and (15), of local and foreign vacancies reflect the assumption that both worker types are capable of performing the local and foreign jobs, but the value of filling the local or a foreign job with a skilled or an unskilled worker differs. A firm who posts a vacancy must pay a recruitment cost of c_i , where $i = L, F$. Given free entry, all profit opportunities from posting vacancies are exploited, hence, in equilibrium, $V(L) = V(F) = 0$.

The values to the firm of filling these vacancies with unskilled and skilled workers verify

$$rJ(L, l) = y_l^L - w_l^L + (\delta + \theta_i^{1-\alpha}(1 - \eta))(V(L) - J(L, l)) \quad (17)$$

$$rJ(F, l) = y_l^F - w_l^F + (\delta + \theta_i^{1-\alpha}\eta)(V(F) - J(F, l)) \quad (18)$$

$$rJ(L, s) = y_s^L - w_s^L + (\delta + \theta_s^{1-\alpha}(1 - \eta))(V(L) - J(L, s)) \quad (19)$$

$$rJ(F, s) = y_s^F - w_s^F + (\delta + \theta_s^{1-\alpha}\eta)(V(F) - J(F, s)) \quad (20)$$

where the terms, $y_l^L - w_l^L$, $y_l^F - w_l^F$, $y_s^L - w_s^L$ and $y_s^F - w_s^F$ represent the output of a worker minus the wage paid to the worker. The last term in each equation captures the value loss in case of exogenous job destruction or transferring into local/foreign firms.

Next, we concentrate on the steady state equilibrium which satisfies the following conditions:

1. Match formation is mutually advantageous relative to the alternative of continuing search. In other words, the workers' and firms' choices constitute a Nash equilibrium in the sense that they are value maximizing, taking as given the actions of the other agents (Albrecht and Vroman, 2002).
2. Firm vacancy creation satisfies zero value conditions. That is, the values of maintaining local and foreign vacancies are zero in the steady state.
3. The appropriate steady state labor market flow conditions are satisfied. That is, flow into and out of unemployment, local and foreign firms will be equal, respectively. In addition, the share of local vacancies in total vacancies, η , should fall within the range $[0, 1]$ and labor market tightness should satisfy $\theta_i > 0$, $\theta_s > 0$.

2.2 Equilibrium

Equilibrium is determined by two job creation conditions, plus, steady state conditions equalizing the flows into and out of unemployment, local and foreign firms, for both types of workers are satisfied. Given exogenous variables that capture the productivity of labor (y_j^i), the bargaining and matching environment (α, β), the job destruction rate (δ) and job creation costs (c_L, c_F), the share of unskilled workers in total population (μ) and the interest rate (r), we will solve for the mass of vacancies, v_L and v_F ; wages, i.e. w_l^L, w_l^F, w_s^L and w_s^F ; the labor market tightness θ_i and θ_s ; and unemployment rates; u_i and u_s .

Recall equations (1) and (2) captured the flow conditions of workers. We can solve for the unemployment rate of unskilled and skilled workers, u_i and u_s , as a function of labor market tightness (θ_i) and (θ_s), and the exogenous variables, μ and δ . This yields

$$u_i = \frac{\delta \mu}{(\delta + \theta_i^{1-\alpha})} \quad (21)$$

$$u_s = \frac{\delta (1 - \mu)}{(\delta + \theta_s^{1-\alpha})} \quad (22)$$

The unemployment rate of skilled workers $\frac{u_s}{1-\mu} = \frac{\delta}{(\delta + \theta_s^{1-\alpha})}$ and unskilled workers $\frac{u_i}{\mu} = \frac{\delta}{(\delta + \theta_i^{1-\alpha})}$ are derived by re-arranging the terms in equations (20) and (21). Given μ and δ , unemployment rate of skilled workers is decreasing in the labor market tightness of the skilled workers, θ_s , while the unemployment rate of unskilled workers is decreasing in the labor market tightness of the unskilled workers θ_i .

Since equilibrium requires that $V(L) = 0$ and $V(F) = 0$, equations (14) and

(15) could be written as follows

$$\frac{c_L}{\theta_i^{-\alpha}} = A \left(\frac{y_l^L - w_i^L}{r + \delta + \theta_i^{1-\alpha}(1-\eta)} \right) + \left(\frac{\mu}{1-\mu} \right)^{-\alpha} B \left(\frac{y_s^L - w_s^L}{r + \delta + \theta_s^{1-\alpha}(1-\eta)} \right) \quad (23)$$

$$\frac{c_F}{\theta_i^{-\alpha}} = C \left(\frac{y_l^F - w_i^F}{r + \delta + \theta_i^{1-\alpha}\eta} \right) + \left(\frac{\mu}{1-\mu} \right)^{-\alpha} D \left(\frac{y_s^F - w_s^F}{r + \delta + \theta_s^{1-\alpha}\eta} \right) \quad (24)$$

The total amount of vacancies and their allocation across markets are determined by these conditions given above. Actually equations (22) and (23) are defined as job creation conditions. These conditions equate the benefit to the firm of filling vacant positions with the suitable candidate and the cost of opening vacancies. In other words, both equations relate the expected cost of a posted vacancy to the expected benefit of a filled job. For instance, if the left hand side of either equation is smaller than the right hand side, then entry to labor market by opening a vacant position is profitable, so that the number of vacancies posted increases. This leads to a rise in the labor market tightness of unskilled and skilled workers until the benefits of job creation are consumed.

2.2.1 Wages

A Nash bargaining approach to wage setting is used to derive equilibrium wages. Substituting (8), (10), (14), (16) into (7) and imposing the free-entry condition for local vacancies, $V(L) = 0$, we obtain the wage rate from matching of an unskilled worker with a local firm:

$$w_i^L = \varpi_{ib}^L b + \varpi_{iy}^L y_i^L \quad (25)$$

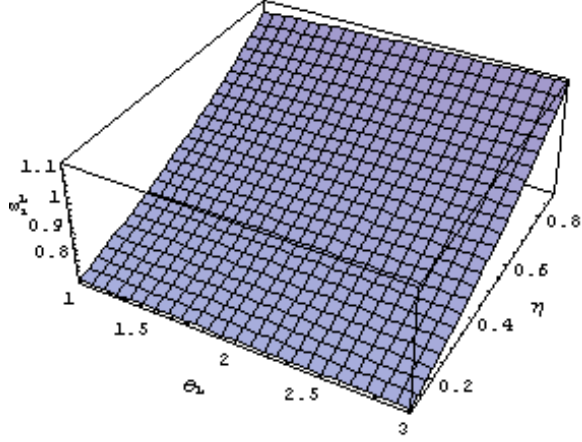


Figure 2: Unskilled workers' wage in the local firm

where $\varpi_{ib}^L = \frac{(1-\beta)(r+\delta+\theta_i^{1-\alpha}(1-\eta))}{r+\delta+\theta_i^{1-\alpha}(1-\eta+\beta\eta)}$ and $\varpi_{iy}^L = \frac{\beta(r+\delta+\theta_i^{1-\alpha})}{r+\delta+\theta_i^{1-\alpha}(1-\eta+\beta\eta)}$, are the weights attached to the unemployment benefit and labor productivity, respectively. The wage of unskilled workers' employed in the local firm is determined by the weighted average of the unemployment benefit, b and the output of unskilled worker in the local firm, y_t^L . Particularly, w_i^L depends on the bargaining power of workers, β , share of local vacancies, η and the labor market tightness of the unskilled workers, θ_i . Figure 2 presents w_i^L as a function of θ_i and η . It is clear that unskilled wages in the local firm increase as the share of local vacancies rises in total, but falls as the share of foreign firms in total vacancies increases. Although we plot wages against η , we are aware that η is endogenous, so in the numerical exercises we will look into a change in the exogenous parameters, i.e. the cost of opening local and foreign vacancies, c_L and c_F on η . Here, for simplicity, we ignore the reason behind the change in η , and indirectly on the wages.

Substituting (8), (11), (15), (17) into (7) and imposing the free-entry condition

for foreign vacancies, $V(F) = 0$, we obtain the wage from a matching of an unskilled worker with a foreign firm:

$$w_i^F = \varpi_{ib}^F b + \varpi_{iy}^F y_i^F \quad (26)$$

where $\varpi_{ib}^F = \frac{(1-\beta)(r+\delta+\theta_i^{1-\alpha}\eta)}{r+\delta+\theta_i^{1-\alpha}(\eta+\beta-\beta\eta)}$ and $\varpi_{iy}^F = \frac{\beta(r+\delta+\theta_i^{1-\alpha})}{r+\delta+\theta_i^{1-\alpha}(\eta+\beta-\beta\eta)}$ are the weights attached to unemployment benefit and labor productivity, respectively. Similarly, the wage of unskilled workers' working in the foreign firm is determined by the weighted average of unemployment benefit, b and the output of unskilled worker in the foreign firm, y_i^F . Specifically, bargaining power of workers, β , the share of local vacancies, η and the labor market tightness of the unskilled workers, θ_i , play a vital role in the determination of unskilled workers' wage in foreign firm. As pointed out in Figure 3, w_i^F , as a function of θ_i and η , increases as the share of foreign vacancies rises.

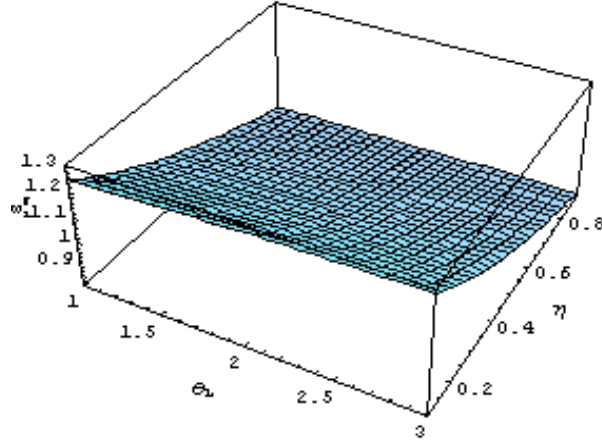


Figure 3: Unskilled workers' wage in the foreign firm

Substituting (9), (12), (14), (18) into (7) and imposing the free-entry condition for local vacancies, $V(L) = 0$, we obtain the wage of a skilled worker in the local firm, which is given as follows

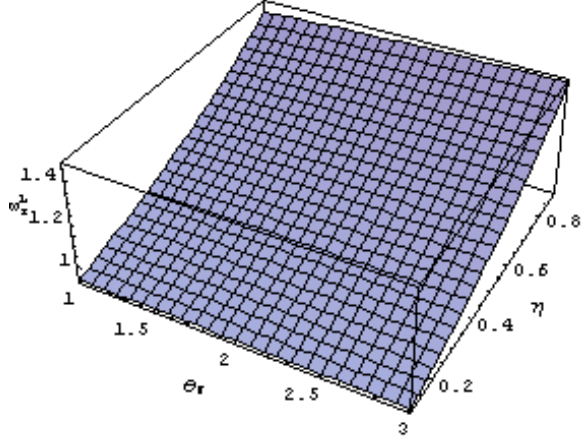


Figure 4: Skilled workers' wage in the local firm

$$w_s^L = \varpi_{sb}^L b + \varpi_{sy}^L y_s^L \quad (27)$$

where $\varpi_{sb}^L = \frac{(1-\beta)(r+\delta+\theta_s^{1-\alpha}(1-\eta))}{r+\delta+\theta_s^{1-\alpha}(1-\eta+\beta\eta)}$ and $\varpi_{sy}^L = \frac{\beta(r+\delta+\theta_s^{1-\alpha})}{r+\delta+\theta_s^{1-\alpha}(1-\eta+\beta\eta)}$ are the weights attached to unemployment benefit and labor productivity, respectively. Skilled workers' wage in the local firm mainly depends on the share of local and foreign vacancies, bargaining power of workers and the labor market tightness of the skilled worker. Figure 4 presents w_s^L as a function of θ_s and η . It is clear that wages of the skilled workers in the local firm increase as the share of local vacancies rises, but falls as the share of foreign firms in total vacancies increase.

Substituting (9), (13), (15), (19) into (7) and imposing the free-entry condition for foreign vacancies, $V(F) = 0$, yields a wage of a skilled worker in the foreign firm, which is expressed as follows:

$$w_s^F = \varpi_{sb}^F b + \varpi_{sy}^F y_s^F \quad (28)$$

where $\varpi_{sb}^F = \frac{(1-\beta)(r+\delta+\theta_s^{1-\alpha}\eta)}{r+\delta+\theta_s^{1-\alpha}(\eta+\beta-\beta\eta)}$ and $\varpi_{sy}^F = \frac{\beta(r+\delta+\theta_s^{1-\alpha})}{r+\delta+\theta_s^{1-\alpha}(\eta+\beta-\beta\eta)}$ are the weights attached to

unemployment benefit and labor productivity, respectively. Skilled workers' wage in foreign firm depends on the share of local vacancies, η , bargaining power of workers, β , unemployment benefit, b and the flow output of skilled worker in foreign firm, y_s^F . Figure 5 shows that w_s^F increases as foreign firms provide more job opportunities.

In the essence of equations (24)-(27), the mass of local and foreign vacancies and the productivity of workers play a vital role in the wage determination. Actually, wages of both unskilled and skilled workers in the local and foreign firms depend on labor market tightness, share of local (foreign) vacancies and the bargaining power of the workers, but to a different extent. This is due to the fact that the values to the firms of filling those vacancies with the suitable worker depends on the mass of vacancies created by the firms and the productivity of workers, which differs across workers and firms.

Given its central role in wage-determination it is important to identify factors that affect the mass of vacancies created by both types of firms. The mass of vacancies created by local and foreign firms are determined by the job creation conditions, which are obtained by substituting wage equations given in (24)-(27) into the equilibrium conditions given in (22)-(23):

$$c_L = (1 - \beta) \left(\frac{u_i + e_{iF}}{\mu} \right) \theta_i^{-\alpha} \left(\frac{y_i^L - b}{r + \delta + \theta_i^{1-\alpha}(1 - \eta + \beta\eta)} \right) + (1 - \beta) (\theta_s / \theta_i)^{-\alpha} \left(\frac{u_s + e_{sF}}{1 - \mu} \right) \frac{y_s^L - b}{r + \delta + \theta_s^{1-\alpha}(1 - \eta + \beta\eta)} \quad (29)$$

$$c_F = (1 - \beta) \left(\frac{u_i + e_{iL}}{\mu} \right) \theta_i^{-\alpha} \left(\frac{y_i^F - b}{r + \delta + \theta_i^{1-\alpha}(\eta + \beta - \eta\beta)} \right) + (1 - \beta) (\theta_s / \theta_i)^{-\alpha} \left(\frac{u_s + e_{sL}}{1 - \mu} \right) \left(\frac{y_s^F - b}{r + \delta + \theta_s^{1-\alpha}(\eta + \beta - \eta\beta)} \right) \quad (30)$$

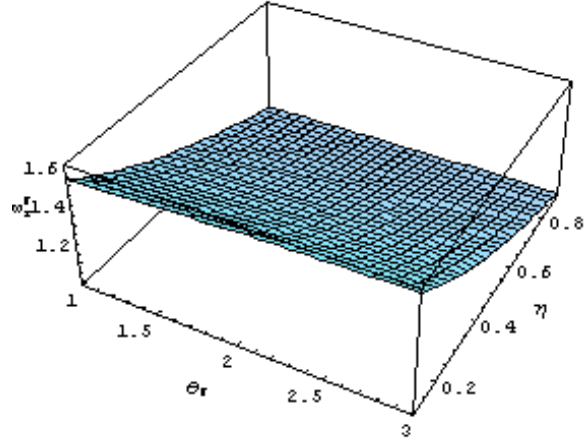


Figure 5: Skilled workers' wage in the foreign firm

Job creation conditions for foreign and local firms differ according to *the costs of creating new jobs* and *productivities of the workers* and this gives rise to equilibrium wage differentials in the presence of labor market frictions. Equations (28) and (29) can infact be rewritten as two equations with two unknowns, v_F and v_L , since both θ_j 's and η are function of v_F and v_L , as are u_j and e_{ij} .

2.2.2 Explaining the Relative Weights and Absolute Wages

In summary, wages of the skilled and unskilled workers in the local and foreign firms, equations (24)-(27), are a weighted average of the worker's reservation value (or unemployment benefit), b , which is treated as a constant and the output in the current match. To understand the overall story behind the wage determination and to realize the effect of the entry of foreign firm (by creating vacancies) on wages, the corresponding weights for unemployment benefit $(\varpi_{ib}^L, \varpi_{ib}^F, \varpi_{sb}^L, \varpi_{sb}^F)$ and the output

produced by the match between a worker and a firm $(\varpi_{iy}^L, \varpi_{iy}^F, \varpi_{sy}^L, \varpi_{sy}^F)$ need to be examined. Weights of unemployment benefit and the output in determining local and foreign wages depend on the bargaining power of the workers¹² and the mass of local and foreign vacancies, which are captured in the labor market tightness measures (θ_L, θ_F) and the share of local vacancies (η) . Most importantly, the mass of vacant positions offered by local and foreign firms play a key role in explaining wage differentials. Also, wage differentials arise since we assumed an asymmetric technology— the output from a match between a worker and a local job is not the same as the output that would result from a match between a worker and a foreign job. Furthermore, the share of unskilled and skilled workers in the population and the job creation costs also play an important role in the wage gap between unskilled and skilled workers both in the local and foreign firms through their effect on vacancy creation. In fact, if one were able to analytically solve the model, the wages would be found to be pure functions of the cost of job creation and the respective productivities of workers, i.e. both exogenous factors.

The bargaining power of the workers raises the weight of the respective labor productivity, while decreasing the weight assigned to the unemployment benefit. As workers become more powerful in the negotiation process, the effect of the return to unemployment on wages will be marginal since workers are willing to end up with higher wages. Particularly, they are likely to widen the gap between unemployment benefit and the wage by demanding higher wages in the bargaining process. On

¹²Bargaining power of workers has an important role in wage determination. Thus, one also needs to devote a special attention to bargaining power of workers.

the other hand, due to an increase in the bargaining power of the workers, the link between output and the wages will be stronger. That is, the weight of the output produced by a worker tends to increase as workers become more powerful in the bargaining process. Within this set up, it is clear that better bargaining position of the workers puts an upward pressure on wages, i.e.

$$\frac{d\varpi_{sb}^L}{d\beta} < 0, \frac{d\varpi_{sy}^L}{d\beta} > 0, \frac{d\varpi_{sb}^F}{d\beta} < 0, \frac{d\varpi_{sy}^F}{d\beta} > 0 \text{ and therefore}$$

$$\frac{dw_i^L}{d\beta} > 0, \frac{dw_s^L}{d\beta} > 0, \frac{dw_i^F}{d\beta} > 0, \frac{dw_s^F}{d\beta} > 0.$$

The mass of vacancies created by local and foreign firms play a major role in wage determination. Actually, job creation acts a source of competition between local and foreign firms. Once firms offer job opportunities, they try to pay more than the average wage level to fill that position with the appropriate worker. Also, a rise in job opportunities increases labor market tightness, that is, it makes it difficult for the firms to fill the job while job seekers are better off due to the new vacant positions in the firms. In our model, since we allow for on-the-job-search in both local and foreign firms, vacant positions created by foreign (local) firms also have an important impact on the local (foreign) wages. In this context, it becomes clear that wage differentials between local and foreign firms are extensively dependent upon the job creation by both firms, where job creation is strictly linked to available technologies to the firms and the cost of creating vacant positions. Below, we analyze the effect of increased foreign (local) firm activity through provision of new job opportunities on absolute wages. An increase in the mass of local vacancies raises the wages of both skilled and unskilled labor in the local firm. This could be explained by the fact that as the

value of filling the vacant positions increases, local firms are willing to pay more to fill the position ¹³.

The relative weights assigned to the unemployment benefit and the output of the match are extensively influenced from new job opportunities offered by local and foreign firms. Particularly, since the probability of being matched with a local firm increases for the unemployed workers, the weight assigned to the return to unemployment decreases, thus the effect of unemployment benefit on local wages is likely to become weaker in this case. An increase in the mass of local vacancies strengthens the weight assigned to output produced by the worker in the local firm and this puts an upward pressures on local wages. Moreover, the new positions offered by local firms decrease the wages in the foreign firm since they improve the outside option value of workers, that is, the probability of being successful in the on-the-job-search increases for the workers employed in the foreign firm. In other words, foreign firms anticipate that workers will quit job whenever local firms start to post new vacancies, so they tend to pay less¹⁴. Contrary to the case of wages paid by local firms, in this case, the weight of the unemployment benefit increased due to a rise in the local job opportunities. In this context, the effect of unemployment benefit on wages, which is positive, will be more powerful. On the other hand, the weight of the output produced in the foreign firm is likely to decline in response to a rise in

¹³As the mass of vacancies increase, firms pay more than they need to in order to fill that position. Following the Carmichael (1990), this is due to the fact that a higher wage attracts applicants of higher quality- the selection theory.

¹⁴In the search literature, wage is a function of the outside option of the workers, where the outside option of the workers depends on the mass of vacancies posted by an other firm. Thus, increased likelihood of leaving the firm requires workers to accept lower wage and since firms anticipate their higher quit rate, reducing the match surplus, they tend to pay less (See Gautier, 2002 and Krause and Lubik, 2006).

the local job opportunities. The extent of the effect of output on foreign wages will become negligible as the number of vacancies offered by local firms increase. Thus, we end up with two opposite effects on the wage of the workers, that is, a rise in local job opportunities tends to raise the wage of local workers, while reducing the wage of the workers in the foreign firm.

$$\frac{d\varpi_{sb}^L}{dvl} < 0, \frac{d\varpi_{sy}^L}{dvl} > 0, \frac{d\varpi_{sb}^F}{dvl} > 0, \frac{d\varpi_{sy}^F}{dvl} < 0 \text{ and therefore}$$

$$\frac{dw_i^L}{dvl} > 0, \frac{dw_s^L}{dvl} > 0, \frac{dw_i^F}{dvl} < 0, \frac{dw_s^F}{dvl} < 0$$

Earnings of the workers in the foreign firm increase due to the job opportunities created by the foreign firm since they have to pay enough to fill those vacant positions. Also, as more foreign vacancies are posted, the matching rates of workers increases and the increased availability of foreign jobs decrease the weight assigned to the unemployment benefit. In addition, the weight of the output produced by the worker in the foreign firm increases due to an increase in foreign job creation, and therefore the impact of productivity of workers in a foreign firm on wages will be more powerful. On the other hand, new job opportunities created by the foreign firm increases the outside option of unemployed and employed workers. Thus, since local firms anticipate that workers' probability of being successful in on-the-job search increases, which reduces the match surplus, they tend to pay less for the workers. In this context, the effect of unemployment benefits on local wages, which is positive, will be more powerful, due to a rise in the foreign job opportunities. Unemployed workers can accept the local job since they know that they are allowed to change their employee if the foreign firm offers new positions. Also, the weight assigned to output

produced from a match between a local firm and a worker decreases, this makes the effect of productivity on wages negligible since local firms anticipate that the worker may benefit from the foreign job opportunities. In short, wages of the local workers decrease while the earnings of the workers of the foreign firm increase due to the increased foreign firm activity which is captured by foreign job creation.

$$\frac{d\varpi_{sb}^L}{dvf} > 0, \frac{d\varpi_{sy}^L}{dvf} < 0, \frac{d\varpi_{sb}^F}{dvf} < 0, \frac{d\varpi_{sy}^F}{dvf} > 0 \text{ and therefore}$$

$$\frac{dw_t^L}{dvf} < 0, \frac{dw_s^L}{dvf} < 0, \frac{dw_t^F}{dvf} > 0, \frac{dw_s^F}{dvf} > 0$$

Within this framework, wage differentials arise mainly due to the job distribution. If the mass of local (foreign) vacancies increase, the wages of both unskilled and skilled workers are likely to rise in local (foreign) firms, but new jobs available in foreign (local) firms reduce the wages of both workers in the local (foreign) firm. Briefly, as in Krause and Lubik (2006), fluctuations in vacancies offered by local and foreign firms become a key component in explaining labor market dynamics, particularly, wage differentials. In addition, however, productivity differentials across firms play a basic role in explaining wage dispersion and the extent of creation of vacant positions. In this regard, we are in the line with the literature in which a vast amount of studies note that higher wages paid by MNEs is largely attributable to productivity differences. On the other hand, we are able to show that wage differentials arise in part due to the on-the-job-search. That is, as the likelihood of finding a foreign job increases (the number of vacancies posted by foreign firms increase), wages paid to the workers in the local firm decreases since the increased likelihood of leaving the firm requires workers to accept a lower wage as a compensating differential for

workers.

Determination of the absolute wages paid to both the skilled and unskilled labor by both the local and foreign firms allows a discussion regarding the skill as well as firm premia. Skill premium in local and foreign firms is captured by (w_s^L/w_i^L) and (w_s^F/w_i^F) and firm premium for the skilled and unskilled labor, which stands for the wage gap between foreign and local firms are denoted by (w_s^F/w_s^L) and (w_i^F/w_i^L) , respectively. The first insight in this framework allows a discussion regarding the extent of firm premia in wages. We are able to discuss whether the foreign firm premia is greater than one; i.e. whether foreign firm always pay more than local firms for a skilled or unskilled labor. This leads to proposition 1.

Proposition 1 *Skilled (unskilled) workers in the foreign firm are not always paid more than skilled (unskilled) workers in local firm. The firm premium depends on the mass of vacancies created by the firms and the labor productivity.*¹⁵

Proof. Skilled and unskilled workers in foreign firms may earn more than that of the local firms, that is, $\frac{w_s^F}{w_s^L} > 1$ and $\frac{w_i^F}{w_i^L} > 1$ depending on the labor market frictions, in terms of posted vacancies, and the productivity of the workers in different firms.

$$\begin{aligned} \frac{(1-\beta)(r+\delta+\theta_s^{1-\alpha}\eta)b+\beta(r+\delta+\theta_s^{1-\alpha})y_s^F}{(r+\delta+\theta_s^{1-\alpha}(\eta+\beta-\beta\eta))} &\stackrel{\geq}{\leq} \frac{(1-\beta)(r+\delta+\theta_s^{1-\alpha}(1-\eta))b+\beta(r+\delta+\theta_s^{1-\alpha})y_s^L}{(r+\delta+\theta_s^{1-\alpha}(1-\eta+\beta\eta))} \\ (1-\beta)\theta_s^{1-\alpha}(2\eta-1)b+(r+\delta+\theta_s^{1-\alpha}(1-\eta+\beta\eta))y_s^F - \\ (r+\delta+\theta_s^{1-\alpha}(\eta+\beta-\beta\eta))y_s^L &\stackrel{\geq}{\leq} 0 \end{aligned}$$

Since $y_s^F > y_s^L$, it is clear that the second term in the above inequality is positive and the sign of the first term is determined by the share of vacancies created by the

¹⁵Here, we provide the proof for skilled workers, the one for unskilled workers could be easily replicated.

firms. Clearly, if the productivity gap between foreign and local firms is sufficiently large, foreign firms end up with higher wages even when labor market imperfections are taken into account. ■

In the empirical literature, it is argued that foreign firms pay more since they are more productive than local firms (Aitken et al., 1996; Feenstra and Hanson 1996; Lipsey and Sjöholm, 2002; and Ruane and Uğur, 2002). Furthermore, these studies also point out that MNEs pay more to minimize labor mobility and to attract better workers. While these stylized facts are supported by our model, we are able to show the range of conditions that could alter the foreign firm premium. Specifically, we show that if the productivity gap is negligible, foreign firms do not pay more than local firms. In this framework, the wage gap between local and foreign firms also depends on the allocation of vacancies created by the firms, which are implicitly determined by the job creation conditions. This is in line with Matsuoka (2001), who argues that wage differentials between foreign and local firms should be explained by labor market imperfections.

Determination of the absolute wages also allows discussion of both the economy-wide skill premium and firm premium. It furthermore allows a discussion of within firm and within skilled/unskilled labor-groups relative wages. While the model suggests that the two factors mainly contributing to the evolution of wages upon the entry of foreign firm or domestic firm are the imperfections in the local labor market and the relative labor productivity of the foreign and local firms, we can not analytically show the effect of foreign (local) vacancies on alternative relative wages.

The literature denotes relative wages as the gap between skilled and unskilled

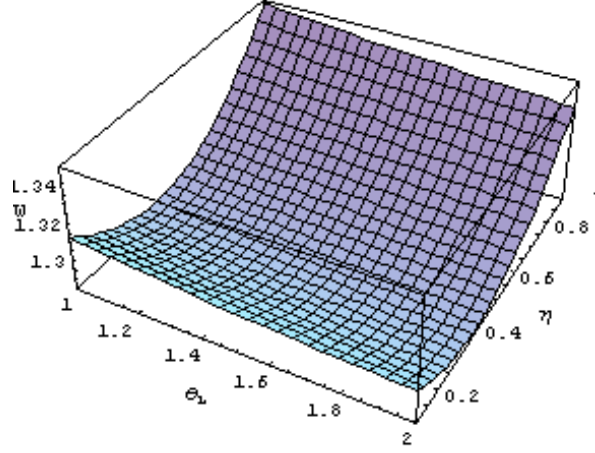


Figure 6: Skill Premium

wages. Here, the model allows us to examine the wages both within firm and between firm. W^{sp} represents the overall skill premium which is calculated as the ratio of the weighted average of skilled workers' wage in the foreign and local firms to unskilled workers' wage in the local and foreign firms whereas W^{fp} is the overall firm premium which is calculated as the ratio of weighted average of wages paid by the foreign firm to wages paid by the local firm. Since the signs of the derivatives of skill premium and firm premium with respect to local and foreign vacancies is ambiguous, numerical solution is needed to see the effects of increased foreign firm activities on these relative wages. Accordingly, we study the absolute and relative wage effects of increased foreign firm activities in detail by providing a numerical example. In the next section, that is the numerical example, it will also be possible to see the effects of change in the productivity levels and job creation cost and on both absolute and relative wages.

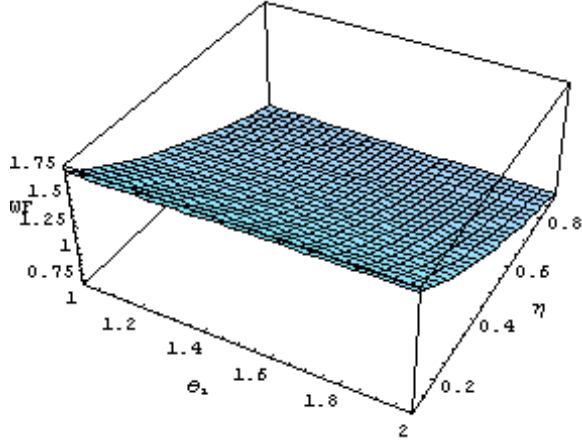


Figure 7: Firm Premium

2.3 Numerical Example

In this section, we provide a numerical example to illustrate the properties of the model. Numerical example allows us to capture effects of an exogenous increase in the cost of job creation on the extent of foreign firm activity in the local economy, and in turn its effects on absolute and relative wages, and unemployment. It furthermore allows a discussion of the relationship between skill upgrading and technological progress and absolute and relative wages, and unemployment. The example uses the matching function, $q(\theta_i) = \theta_i^{-\alpha}$ and $q(\theta_s) = \theta_s^{-\alpha}$ together with the baseline parameter values, $r = 0.05$, $\beta = 0.5$, $\delta = 0.1$, $b = 0.1$, $c_L = 0.5$, $c_F = 0.7$, $\mu = 0.8$, $\alpha = 0.5$, $y_s^F = 1.9$, $y_s^L = 1.7$, $y_i^F = 1.5$, $y_l^L = 1.3$. All these parameter values are reasonable and in line with the other studies including Albrecht and Vroman (2002), Gautier (2002) and Dolado et al. (2003). In the baseline example, the share

of unskilled workers in the population, μ , is assumed to compose the 80 percent of the total population and the productivity gap between foreign and local firms, $\frac{y_j^F}{y_j^L}$ is assumed to be 10%¹⁶ Also, skilled and unskilled workers in the foreign firm are more productive than the ones in local firm and skilled workers are more productive than the unskilled workers (Caves, 1996; Conyon et al., 2002; Dunning, 1993; Doms and Jensen, 1998; and Fosfuri et al., 2001). The interest rate is 5 percent and job destruction rate is 0.1. It seems reasonable to assume that foreign jobs are more costly to create than local jobs, where $c_L = 0.5$ and $c_F = 0.7$ (Carlson et al, 2006; Faggio and Koning, 2001; Fonseca, 2001; Hammermesh, 1993; Russo et al., 2005; and Vanhala, 2004). The unemployment benefit level is set at 0.1. Under this choice of parameters, Table 2 presents the baseline solutions.

2.3.1. Benchmark case

<Insert Table 2>

The examination of the baseline solution shows that the share of foreign vacancies is 42% of the total vacancies. The unemployment rate of unskilled workers and skilled workers are 9.6% and 5%, respectively and the overall unemployment rate is 8%. The wage of skilled (unskilled) workers in the local firm is lower than the skilled (unskilled) workers wage in the foreign firm. Unskilled workers get paid less than skilled workers both in the local and foreign firms. Table 2 shows that the wage gap between skilled and unskilled workers in the local firm is higher than the wage

¹⁶The productivity gap between foreign firm and local firm fluctuates between 10% to 100%. (Aitken and Harrison, 1998; Karpaty, 2005, Doms and Jensen, 1998; Kimura and Kiyota, 2004; Conyon et al., 2002 and Davies and Lyons, 1991)

gap between skilled and unskilled workers in the foreign firm. In other words, the skill premium in the local firm is higher than the skill premium in the foreign firm. Results also show that firm premium of unskilled workers is higher than that of the skilled workers. While these within-group relative values allow for identification of important differences between labor-types and firms, it is important to talk about an overall skill and firm premium. The benchmark findings suggest that economy-wide skill premium is more than the overall firm premium. One should also note that, at these parameter values, we find that the firm premium is greater than one¹⁷.

< Insert Table 3 >

2.3.2 Changes in the Cost Structure

Job creation costs play a vital role in explaining wage dynamics and unemployment. Actually, governments lower job creation costs to encourage foreign firm entry and to benefit from increased foreign firm activity. However, while in some cases, government could lower the costs for both local and foreign firms, in other cases, the reduction in costs only applies to foreign firms. We undertake exercises regarding both possibilities. Results presented in Table 3 study the latter public policy environment where only the costs incurred by the foreign firm are altered, while results in Table 4 show the former case where a symmetric cost change occurs for both the local and foreign firms.

¹⁷The higher wages offered by firms also devoted to the efficiency wage argument. The efficiency wage hypothesis argues that wages are not only determined by supply and demand, but also, firms may pay more than the market-clearing wage to increase productivity or efficiency.

Panel A and panel B in Table 4 shows the effects of an exogenous decrease in the job creation cost of foreign firms on vacancy creation and relative wages, keeping the cost incurred by the local firm constant. As the job creation cost of foreign firms' falls, the cost gap between local and foreign firms melt down and this stimulates foreign job creation leading to changes in wages paid by the foreign firm and the local firm.¹⁸

The skill premium in the local firm decreases from 1.33 to 1.31 and the skill premium in the foreign firm increases from 1.26 to 1.28, when the foreign job creation costs fall from 0.9 to 0.5. While the skill premium within firms move in opposite directions, the increase in foreign presence by 160% (from 0.18 to 0.47) leads to a 6% fall in the economy-wide skill premium.

The premium of working for a foreign firm increases for both skilled and unskilled workers and the economy-wide firm premium rises from 0.94 to 1.21 in response to increased foreign firm presence. This phenomenon could be explained by the fact that as foreign firms offer more vacant positions, the outside options of the workers performing local jobs increases, decreasing the value of filling local jobs with a suitable worker, thereby reducing all wages paid by the local firm. In this context, foreign firms pay more to attract skilled and unskilled workers from both the unemployment pool and the local firms since filling new vacant positions will increase the value of filling a foreign job with suitable workers. Briefly, as the cost differential for creating foreign and local jobs becomes lower, the wage gap between

¹⁸Note that the reduction in costs are by increment of 01, which one could easily convert into those in %.

skilled and unskilled workers in the local firm falls and the premium of working in a foreign firm increases. The overall skill premium tends to decrease in response to the fall in the cost of job creation in the foreign firm. The results also show supporting evidence for proposition 1. At levels of foreign vacancy job creation cost that exceeds 0.7, the foreign firm pays less than the local firm, i.e. the firm premium is less than 1 for both skilled and unskilled labor, as well as economy-wide. This is reversed when the foreign job creation cost falls to and below 0.7. One should keep in mind that the threshold level we find foreign job creation cost, 0.7, depends on the parameter values. However, regardless of the parameter values the results show support for proposition 1, which suggests that the labor market conditions (costs of vacancy creation and productivity differentials) determine the size of the wage premia.

Panel C in Table 3 shows the effects of an exogenous increase in the share of foreign firm vacancies on unemployment. Increased availability of foreign vacancies decreases the unemployment rate of unskilled workers from 10% to 8% and the skilled workers from 5% to 4%. Overall unemployment rate decreases from 9% to 7% following the new job opportunities, particularly, in response to 160% increase in the mass of foreign vacancies. This result is suggestive that the increased presence of foreign firms could indeed contribute to reducing unemployment rates for both unskilled and skilled workers, under certain conditions.

<Insert Table 4>

We next study a change in job creation cost with no change in the playing field, i.e. no special treatment to foreign firms. Table 4 shows the effects of an exogenous

decrease in the job creation cost of both foreign and local vacancies. When the job creation costs of foreign and local firms fall by the same absolute amount and the cost gap between local and foreign firms stays same, the share of foreign vacancies in total vacancies does not increase, it even decreases. In this case, the share of local vacancies tends to increase leading to a rise in local and a fall in the foreign firm wages paid. If the cost of job creation in local and foreign firms becomes 0.3 and 0.5, respectively, then the share of local vacancies form 65% of the total and thereby, local firms start to pay more than foreign firms. Once again, this is in line with proposition 1 noting that foreign firms do not always pay more as the wage difference between local and foreign firms depends on the job opportunities provided by local and foreign firms, which are extensively determined by the cost of job creation and productivity of workers.

As opposed to the findings where the playing field was changed, such that the costs of foreign firms were reduced keeping those of local firm constant, the skill premium in the local firm increases from 1.32 to 1.33 and the skill premium in the foreign firm decreases from 1.27 to 1.25 in response to the fall in the cost of job creation in both firms. Overall, this leads to a rise in the economy-wide skill premium.

As the share of local vacancies in total vacancies rises, the premium of working for a foreign firm decreases for both skilled and unskilled workers, and the economy wide firm premium falls due the reduction of job creation costs for both local and foreign firms. One should therefore note that labor market effect of foreign firms, particularly those on wages, are influenced by the cost decision of the policy makers.

If the cost gap between foreign and local firms are kept constant, than the skill premium increases and firm premium decreases. On the contrary, when the cost gap between foreign firm and local firm narrows, the skill premium falls and firm premium rises.

Panel C in Table 4 shows the effects of an exogenous increase in the share of local firm vacancies due to the decrease in the job creation cost of both firms on unemployment. The unemployment rate of unskilled workers decreases from 11% to 5% and the unemployment rate of skilled workers decreases from 5% to 3%. Overall unemployment rate decreases from 10% to 5% following the new foreign and local job opportunities, given both c_L and c_F decreases.

To sum up, it is clear that the numerical example results supports our theoretical predictions that the response of the overall skill and firm premium as well as the response of the absolute wages to changes in the extent of labor market imperfections and foreign presence depends on several conditions in the market. Briefly, this experiment reveals that, the labor market imperfections and foreigners' share in the labor market have important non-linear effects on the wages of unskilled and skilled workers ¹⁹.

In the above case, we examine the labor market implications of the change in the cost structure of firms. An alternative way of interpreting those results would be through imputations of elasticities of relative wages and unemployment rates.

In this respect, Table 6 presents these elasticities -calculated by the help of the

¹⁹Note that when we consider the case where the ratio of foreign and local job creations costs are constant, there will be no change in the findings of the model.

Table 3- with respect to the cost of foreign job creation²⁰. While the signs of the elasticities suggest that increased foreign presence in the economy decreases the skill premium and increases the firm premium, there are differences in the direction of impact on the within firm skill premia. Increased foreign presence decreases the skill premium paid by local firms, while increasing the skill premium paid by foreign firms. The foreign firm premium however changes in the same direction for both skilled and unskilled labor. However, this table not only reiterates the results regarding the direction of changes but also allows for a discussion regarding the magnitude of changes. The elasticity of skill premium is lower than the elasticity of foreign firm premium with respect to the increased foreign firm activity. Particularly, a 60% increase in the foreign vacant positions leads to a 1% decrease in the economy-wide skill premium, while an 11% increase in the economy-wide firm premium. Furthermore, the mass of foreign vacancies is highly elastic to the cost of foreign job creation. In other words, foreign job generation is highly sensitive to the cost.

< Insert Table 6 >

2.3.3 Sensitivity Analysis

Absolute wages, skill premium and firm premium extensively depend on the rate of vacancy creation of the firms, which are influenced directly by the job creation cost and the labor productivity of the firms and indirectly by the skill endowment of the

²⁰Elasticity is measured by the percentage change in vacancies (wages, unemployment) divided by the percentage change in the cost of job creation.

population. If their respective cost of job creation decreases, foreign firms increase their activity by offering various job opportunities for skilled and unskilled workers and they pay more for skilled and unskilled workers than the domestic firm pays. Yet, note that the productivity gap between local and foreign firms also play a crucial role in explaining wage differentials as mentioned in proposition 1. Therefore, we next analyze the impact of a rise in the output gap between foreign and local firms (which in part could be due to technological progress) and evaluate the effect of the consecutive decrease in job creation cost on absolute and relative wages when the output of foreign job is sufficiently higher than that of the local job. Along the same lines, we also test the sensitivity of the results to the skill endowment parameter.

< Insert Table 7 >

Technological Upgrading

Due to the technological upgrading, foreign firms become more productive, increasing the gap between y_j^F and y_j^L . As the output gap between foreign and local firms increases, foreign firms start to offer more positions for workers, hence, the share of vacancies posted by foreign firms increase. While foreign jobs are relatively scarce to start with, in particular, because the cost of opening foreign vacancies is higher than the cost of opening local vacancies, the supply of foreign jobs exceeds the local jobs due to the technological upgrading. In this context, in response to a rise in the foreign job opportunities, wages of the local firm decrease and wages of

the foreign firm increase (the results are compared to our benchmark case, where the technology gap²¹ is given as 10%).

Here, we should also note that an increase in the share of foreign vacancies due to the improvement in foreign firm technology puts an upward pressure on the overall skill premium and firm premium. While an increase in the share of foreign job offerings due to the technological progress (i.e., productivity advantage of the foreign firm rises) lowers the skill premium in the local firm, it raises the skill premium in the foreign firm. Actually, Panel B in the Table 7 reveals that technological progress in the foreign firm increases the premium of working for a foreign firm for both unskilled and skilled workers. This is due to the fact that an increase in the productivity advantage of the foreign firms directly generates an increase in the foreign wages, in particular for the skilled wages, but also its effect on wages become more powerful since it increases the jobs created by foreign firms.

According to Panel C in Table 7, overall unemployment decreases in response to technological progress (technology gap increases from 10% to 25%). This could be explained by the fact that the technological progress facilitates job creation and to this end foreign firms provide new job opportunities.

< Insert Table 8 >

We re-examine the effects of a fall in the job creation cost of foreign firms on wages and unemployment by assuming the productivity gap between foreign and local firms is sufficiently large ($y_j^F/y_j^L = 2.00$). As is shown in Panel A and Panel B

²¹ y_j^F/y_j^L is technology gap, which is defined as the productivity advantage of the foreign firm.

in Table 8, a decrease in the cost gap between local and foreign firms and increase in the productivity gap between foreign and local firms makes it profitable to create foreign jobs and search for the appropriate candidates. Due to the decrease in the cost gap and the improvement in technology not only are more jobs created, but the job composition shifts towards more productive foreign jobs. As such both the skill and firm premium tend to increase. In other words, an increase in the share of foreign jobs due to the widened productivity differentials and narrowed cost gap puts an upward pressure on foreign wages and overall relative wages while lowering the wages of the workers in the local firm. However, results presented in Table 3 where the $\frac{y_j^F}{y_j^L}$ is assumed to be 10% suggest that a decrease in the job creation cost of the foreign firm leads to a fall in the economy-wide skill premium and a rise in the economy-wide firm premium. Further, when Panel C of Tables 3 and 8 are compared, increased foreign presence, in response to a decline in the job creation cost, leads to a decrease in the unemployment rates, both for the skilled and unskilled workers. But if technological upgrading accompanies declining costs, the decrease in unemployment rates will be higher than the case presented in Panel C of the Table 3.

Skill Upgrading

Given the baseline parameter values, we focus on the skill upgrading and the case where the share of skilled workers increase from 20% to 40%, that is, $\mu = 0.6$. Table 9 presents the effect of skill upgrading on vacancy creation, wages and unemployment.

< Insert Table 9 >

When skilled work force constitutes 40% of the total population, the mass of local and foreign vacancies record a significant rise. According to the Panel B in Table 9, skill premium in the local firm fall from 1.32 to 1.30 and skill premium in the foreign firm decrease slightly from 1.30 to 1.28 due to the skill upgrading when the results are compared to the Table 2. Earnings of the skilled workers fall slightly in the foreign and local firms. Also, both the skill and firm premium decreases due to the skill upgrading. Acemoglu (1998) notes that skill upgrading decreases the skill premium. He suggests that the rapid increase in the proportion of college graduates in the United States may be the one of the reasons behind the decline in the college premium during the 1970s. Panel C in Table 9 notes that while unemployment rate for skilled workers increase and unemployment rate for unskilled workers decrease.

< Insert Table 10>

Table 10 examines the effect of a decrease in the cost of foreign job creation when one considers the skill upgrading. Given the share of skilled workers as 40 % of the population, foreign firms create new job opportunities in response to a fall in the foreign job creation cost. This leads to a decline in the economy-wide skill premium and a rise in the economy-wide firm premium. Particularly, an increase in the share of skilled workers does not change results presented in Table 3 as in the case of technological upgrading, specifically for the economy-wide skill premium and firm premium. Particularly, Panel C in Table 10 shows that overall unemployment rate decreases due to a fall in the cost gap between foreign and local firms. Further,

when the Panel C of the Tables 3 and 10 are compared, increased foreign presence, in response to a decline in the job creation cost, leads to a decrease in the unemployment rates, both for the skilled and unskilled workers. But if skill upgrading accompanied declining costs, the decrease in unemployment rate for the skilled workers will be higher than the case presented in Panel C of the Table 3. Table 8 and Table 10 reveal that impact of a decrease in the cost of foreign job creation on overall relative wages depends on the technology available in the foreign firm and the share of skilled workers in the local labor market

2.4 Conclusion

In this chapter, we examined the role of foreign firms in job creation as well as their role in changing the structure of employment and explaining wage inequalities in the local market by using a heterogenous matching model. There are a number of skilled and unskilled workers both in the unemployment pool and in the local and foreign firm looking for jobs posted by firms. Given this framework, wages are determined by the Nash bargaining approach and equilibrium conditions. In particular, the model not only presents absolute wages but it also allows us to study within firm (local and foreign) and within group (skilled and unskilled) relative wages.

Our results suggest that wages are a weighted average of labor productivity and unemployment benefit, where the weight depends on the bargaining power of the workers, labor market tightness and the mass of local and foreign vacancies. In fact,

the mass of vacant positions in the foreign firm depends on the job-creation costs and relative labor productivities. This model allows us to find:

1. Levels of wages paid by foreign firms need not always be greater than that paid by local firms. We call this the firm premium, so results suggest that the foreign firm premium could be greater or smaller than one depending on relative costs of job creation, skill endowment and the technological gap between local and foreign firm.
2. An increase in foreign presence, defined as the share of foreign vacancies in total vacancy, can occur because of:

(a) an exogenous change in cost of job creation (a public policy exercise)

which could be of the following nature:

(i) level field change making it worse for both local and foreign firms,

leading to a rise in economy-wide skill and a fall in the firm premium.

(ii) special treatment to the foreign firm, leading to a decline in economy-

wide skill premium and increase in firm premium.

(b) technological improvements (foreign firm biased) increases both economy-

wide skill and firm premium.

(c) skill upgrading decreases economy-wide skill premium and firm pre-

mium.

Therefore, depending on the cause of an increase in foreign presence we end up with differential relative wage effects, both of the skill and firm premia.

Table 2: Baseline Solution

Benchmark Parameters									
$r = 0.05, \beta = 0.5, \delta = 0.1, b = 0.1, c_L = 0.5, c_F = 0.7$									
$\mu = 0.8, \alpha = 0.5, y_s^F = 1.9, y_s^L = 1.7, y_i^F = 1.5, y_i^L = 1.3$									
Labor Market: Job Opportunities and Unemployment									
v_L		v_F		η		u	u_l	u_s	
0.41		0.29		0.58		0.08	0.09	0.05	
Wages									
w_i^L	w_i^F	w_s^L	w_s^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_i^F}$	$\frac{\mathbf{w}_i^F}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_s^L}$	W^{sp}	W^{fp}
0.90	0.95	1.19	1.21	1.32	1.27	1.05	1.01	1.30	1.04

Table 3: Decrease in the Job Creation Cost of Foreign Firm and its Labor Market Implications

Panel A: Vacancies										
	vl		vf		η					
$c_L=0.5$										
$c_F=0.9$	0.408		0.18		0.68					
$c_F=0.8$	0.413		0.23		0.64					
$c_F=0.7$	0.410		0.29		0.58					
$c_F=0.6$	0.397		0.37		0.51					
$c_F=0.5$	0.367		0.47		0.43					
Panel B: Wages										
	w_i^L	w_i^F	w_s^L	w_s^F	$\frac{w_s^L}{w_i^L}$	$\frac{w_s^F}{w_i^F}$	$\frac{w_i^F}{w_i^L}$	$\frac{w_s^F}{w_s^L}$	W^{sp}	W^{fp}
$c_F=0.9$	0.94	0.90	1.27	1.14	1.339	1.268	0.95	0.90	1.318	0.94
$c_F=0.8$	0.92	0.92	1.23	1.17	1.333	1.271	0.99	0.95	1.310	0.98
$c_F=0.7$	0.90	0.95	1.19	1.21	1.326	1.274	1.05	1.01	1.304	1.04
$c_F=0.6$	0.87	0.98	1.15	1.26	1.320	1.278	1.12	1.09	1.298	1.11
$c_F=0.5$	0.84	1.02	1.10	1.32	1.312	1.284	1.22	1.19	1.295	1.21
Panel C: Unemployment										
	u		u_i		u_s					
$c_F=0.9$	0.094		0.104		0.054					
$c_F=0.8$	0.090		0.100		0.052					
$c_F=0.7$	0.086		0.096		0.050					
$c_F=0.6$	0.083		0.092		0.048					
$c_F=0.5$	0.079		0.088		0.046					

Table 4: Decrease in the Job Creation Cost of Foreign and Local Firms and its Labor Market Implications

Panel A: Vacancies										
	vl		vf		η					
$c_L=0.7; c_F=0.9$	0.28		0.23		0.54					
$c_L=0.5; c_F=0.7$	0.41		0.29		0.58					
$c_L=0.3; c_F=0.5$	0.69		0.37		0.65					
$c_L=0.1; c_F=0.3$	1.71		0.36		0.82					
Panel B: Wages										
	w_i^L	w_i^F	w_s^L	w_s^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_i^F}$	$\frac{\mathbf{w}_i^F}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_s^L}$	W^{sp}	W^{fp}
$c_L=0.7; c_F=0.9$	0.88	0.96	1.16	1.23	1.326	1.279	1.09	1.05	1.304	1.08
$c_L=0.5; c_F=0.7$	0.90	0.95	1.19	1.21	1.326	1.274	1.05	1.01	1.304	1.04
$c_L=0.3; c_F=0.5$	0.94	0.92	1.25	1.17	1.328	1.267	0.98	0.93	1.307	0.97
$c_L=0.1; c_F=0.3$	1.06	0.86	1.42	1.08	1.335	1.256	0.80	0.76	1.324	0.79
Panel C: Unemployment										
	u		u_i		u_s					
$c_L=0.7; c_F=0.9$	0.099		0.11		0.058					
$c_L=0.5; c_F=0.7$	0.082		0.09		0.050					
$c_L=0.3; c_F=0.5$	0.064		0.07		0.041					
$c_L=0.1; c_F=0.3$	0.046		0.05		0.030					

Table 5: Gap Between Job Creation Cost of Foreign and Local Firms and its Labor Market Implications

Panel A: Vacancies										
	vl			vf			η			
$c_L/c_F=1$	0.36			0.47			0.43			
$c_L/c_F=2$	0.39			0.14			0.73			
$c_L/c_F=3$	0.33			0.05			0.86			
Panel B: Wages										
	w_i^L	w_i^F	w_s^L	w_s^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_i^F}$	$\frac{\mathbf{w}_i^F}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_s^L}$	W^{sp}	W^{fp}
$c_L/c_F=1$	0.84	1.02	1.10	1.32	1.31	1.28	1.22	1.19	1.29	1.21
$c_L/c_F=2$	0.96	0.89	1.30	1.12	1.345	1.26	0.91	0.86	1.32	0.90
$c_L/c_F=3$	1.03	0.84	1.41	1.05	1.369	1.25	0.81	0.74	1.35	0.79
Panel C: Unemployment										
	u			u_i			u_s			
$c_L/c_F=1$	0.072			0.08			0.04			
$c_L/c_F=2$	0.09			0.10			0.05			
$c_L/c_F=3$	0.108			0.12			0.06			

Table 6: Cost Elasticity of Vacancies, Wages and Unemployment

Panel A: Vacancies										
	vl			vf			η			
Baseline $c_F = 0.9$										
%11 decrease in c_F	−0.10			−2.30			0.63			
%22 decrease in c_F	−0.02			−2.65			0.69			
%33 decrease in c_F	0.08			−3.06			0.75			
%44 decrease in c_F	0.23			−3.54			0.82			
Panel B: Wages										
	w_i^L	w_i^F	w_s^L	w_s^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_i^F}$	$\frac{\mathbf{w}_i^F}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_s^L}$	W^{sp}	W^{fp}
Baseline $c_F = 0.9$										
%11 decrease in c_F	0.21	−0.20	0.25	−0.22	0.04	−0.08	−0.47	−0.49	0.05	−0.46
%22 decrease in c_F	0.23	−0.23	0.27	−0.25	0.04	−0.05	−0.50	−0.55	0.05	−0.51
%33 decrease in c_F	0.24	−0.26	0.28	−0.29	0.04	−0.04	−0.56	−0.63	0.04	−0.57
%44 decrease in c_F	0.26	−0.30	0.30	−0.33	0.04	−0.04	−0.64	−0.72	0.04	−0.66
Panel C: Unemployment										
	u			u_i			u_s			
Baseline $c_F = 0.9$										
%11 decrease in c_F	0.33			0.33			0.33			
%22 decrease in c_F	0.33			0.33			0.33			
%33 decrease in c_F	0.33			0.33			0.33			
%44 decrease in c_F	0.34			0.33			0.35			

Table 7: Technological Upgrading and its impact on the Labor Market

Panel A: Vacancies										
	vl			vf			η			
Baseline technology gap (%10)	0.41			0.29			0.58			
Changes from baseline										
technology gap %25	0.40			0.33			0.54			
technology gap %50	0.38			0.43			0.46			
technology gap %75	0.35			0.51			0.40			
technology gap %100	0.31			0.61			0.33			
Panel B: Wages										
	w_i^L	w_i^F	w_s^L	w_s^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_i^F}$	$\frac{\mathbf{w}_i^F}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_s^L}$	W^{sp}	W^{fp}
Baseline technology gap (%10)	0.90	0.95	1.19	1.21	1.32	1.27	1.05	1.01	1.30	1.04
Changes from Baseline										
technology gap %25	0.88	1.03	1.17	1.36	1.32	1.33	1.16	1.17	1.32	1.16
technology gap %50	0.85	1.27	1.12	1.69	1.31	1.33	1.48	1.50	1.32	1.49
technology gap %75	0.82	1.52	1.08	2.03	1.31	1.34	1.83	1.87	1.33	1.84
technology gap %100	0.80	1.86	1.04	2.49	1.30	1.33	2.32	2.37	1.33	2.33
Panel C: Unemployment										
	u			u_i			u_s			
Baseline technology gap (%10)	0.086			0.096			0.05			
Changes from Baseline										
technology gap %25	0.083			0.094			0.04			
technology gap %50	0.080			0.090			0.04			
technology gap %75	0.077			0.087			0.04			
technology gap %100	0.076			0.085			0.04			

Table 8: Decrease in the Job Creation Cost of Foreign Firm and its Impact on Vacancies and Wages (Technological Upgrading)

Panel A: Vacancies										
	vl			vf			η			
$c_L=0.5$										
$c_F=0.9$	0.36			0.47			0.43			
$c_F=0.8$	0.34			0.54			0.38			
$c_F=0.7$	0.31			0.61			0.33			
$c_F=0.6$	0.27			0.69			0.27			
$c_F=0.5$	0.22			0.78			0.22			
Panel B: Wages										
	w_i^L	w_i^F	w_s^L	w_s^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_i^F}$	$\frac{\mathbf{w}_i^F}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_s^L}$	W^{sp}	W^{fp}
$c_L=0.5$										
$c_F=0.9$	0.84	1.75	1.10	2.33	1.31	1.33	2.08	2.11	1.32	2.09
$c_F=0.8$	0.82	1.80	1.07	2.40	1.30	1.33	2.19	2.23	1.32	2.20
$c_F=0.7$	0.80	1.86	1.04	2.49	1.30	1.33	2.32	2.37	1.33	2.33
$c_F=0.6$	0.78	1.93	1.02	2.59	1.30	1.34	2.46	2.53	1.33	2.48
$c_F=0.5$	0.76	2.00	0.99	2.69	1.29	1.34	2.62	2.72	1.34	2.64
Panel C: Unemployment										
$c_L=0.5$										
	u			u_l			u_s			
$c_F=0.9$	0.079			0.088			0.046			
$c_F=0.8$	0.077			0.086			0.045			
$c_F=0.7$	0.076			0.085			0.044			
$c_F=0.6$	0.075			0.083			0.043			
$c_F=0.5$	0.073			0.081			0.042			

Table 9: Skill Upgrading and its Impact on Labor Market

Panel A: Vacancies										
	vl		vf			η				
$\mu = 0.6$	0.4402		0.3109			0.5860				
Panel B: Wages										
	w_i^L	w_i^F	w_s^L	w_s^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_i^F}$	$\frac{\mathbf{w}_i^F}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_s^L}$	W^{sp}	W^{fp}
$\mu = 0.6$	0.90	0.95	1.18	1.20	1.30	1.26	1.05	1.01	1.28	1.03
Panel C: Unemployment										
	u		u_i			u_s				
$\mu = 0.6$	0.076		0.08			0.06				
Panel D: Baseline Solution										
Job Opportunities and Unemployment										
	v_L	v_F	η	u		u_l		u_s		
$\mu = 0.8$	0.41	0.29	0.58	0.086		0.09		0.05		
Wages										
	w_i^L	w_i^F	w_s^L	w_s^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_i^F}$	$\frac{\mathbf{w}_i^F}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_s^L}$	W^{sp}	W^{fp}
$\mu = 0.8$	0.90	0.95	1.19	1.21	1.32	1.27	1.05	1.01	1.30	1.04

Table 10: Decrease in the Job Creation Cost of Foreign Firm and its Impact on Vacancies and Wages (Skill Upgrading)

Panel A: Vacancies										
	vl			vf			η			
$c_L=0.5$										
$c_F=0.9$	0.43			0.19			0.68			
$c_F=0.8$	0.44			0.24			0.64			
$c_F=0.7$	0.44			0.31			0.58			
$c_F=0.6$	0.42			0.39			0.51			
$c_F=0.5$	0.39			0.50			0.44			
Panel B: Wages										
	w_i^L	w_i^F	w_s^L	w_s^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_i^F}$	$\frac{\mathbf{w}_i^F}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_s^L}$	W^{sp}	W^{fp}
$c_L=0.5$										
$c_F=0.9$	0.95	0.90	1.25	1.14	1.31	1.25	0.94	0.91	1.29	0.93
$c_F=0.8$	0.93	0.93	1.22	1.17	1.30	1.25	0.99	0.95	1.29	0.97
$c_F=0.7$	0.90	0.95	1.18	1.20	1.30	1.26	1.05	1.01	1.28	1.03
$c_F=0.6$	0.87	0.98	1.14	1.25	1.30	1.26	1.12	1.09	1.28	1.10
$c_F=0.5$	0.84	1.03	1.10	1.30	1.29	1.26	1.21	1.18	1.27	1.20
Panel C: Unemployment										
$c_L=0.5$										
	u			u_l			u_s			
$c_F=0.9$	0.082			0.088			0.073			
$c_F=0.8$	0.079			0.085			0.070			
$c_F=0.7$	0.076			0.082			0.068			
$c_F=0.6$	0.072			0.078			0.065			
$c_F=0.5$	0.070			0.075			0.062			

CHAPTER 3

DOES THE TECHNOLOGY INTENSITY OF THE FIRM MATTER?

This chapter analyzes the labor market effects of the presence of MNEs for low-technology and high-technology industries separately.

3.1 Introduction

This chapter examines the unemployment and wage implications of increased foreign firm activity by considering different skill requirements of foreign and local firms. Particularly, it investigates that whether the different skill intensities generate different labor market outcomes. As is evidenced in Chapter 2, increased activities of foreign firms, which is modeled as the number of vacancies opened by foreign firms, have important impact on employment and relative wages. But, one needs to note that foreign firms may have different skill intensities from local firms and they may employ different technologies, therefore they may hire different types of workers by posting different vacancies (Te Velde and Morrissey, 2004 and Yeaple, 2005). On the other hand, it should be considered that foreign firms create various job oppor-

tunities depending on the sector they locate in the host country. To this end, this chapter extends the previous analysis (Chapter 2) by focusing on the different skill requirements of the firms and it adds a new flavour to the analysis of labor market implications of the foreign firms. Chapter 3 allows us to understand unemployment and wage patterns of unskilled and skilled workers in the local economy when the foreign firm hires only skilled (unskilled) workers as it is more (less) skill intensive than the local firm. So that, this chapter points out the role of sector of production, in particular different technology intensity of the firms even in the same sector, on the labor market implications of the increased foreign firm presence.

The sectoral distribution of MNEs differs across countries and, therefore, the impact of MNEs on local economies depend on the sectoral characteristics. According to the UNCTAD (2005), the sectoral distribution of FDI has followed different patterns for different countries. In 2004, Table 11 reveals that \$4625 billion is devoted to service sector in developed countries, while approximately one fourth of this is devoted to service sector in developing countries. Actually the role of manufacturing sector in developed countries is greater than that of the developing countries. The most noticeable trend in the sectoral distribution of FDI inward stocks is the increase in the service sector. Since the sectoral distribution of FDI is different across countries, a number of studies examine the effect of FDI on local economies for different sectors. On the other hand, another strand of the literature demonstrates that even in the same sector the technology intensity of foreign and local firms differs.

Several empirical studies have shown differing wage and employment effects across different sectors. Girma and Görg (2003), Wu (2001) and Driffield and Girma (2003),

Table 11: Sectoral Composition of Inward FDI Stock, billions of dollar

	1990			2004		
	Developed Countries	Developing Countries	World	Developed Countries	Developing Countries	World
Primary	140	24	164	268	152	440
Manufacturing	586	144	730	2406	614	3020
Services	717	152	868	4625	1224	5883

Source: UNCTAD, World Investment Report, 2005

takeovers by MNEs from different industries should be expected to have differential effects on employment and wages across different sectors²². Girma and Görg (2003) find that high wages are positively related to outsourcing, particularly, in the chemical and engineering sectors. Wu (2001) notes that FDI in different sectors have different impacts on the relative return to skill and finds that FDI with relatively labor biased technology will decrease the wage gap between skilled and unskilled workers, while FDI with relatively skilled biased technology will increase the wage gap between skilled and unskilled workers. Driffield and Girma (2003) examine the impact of FDI on both skilled and unskilled workers' wages in domestically owned establishments by focusing on the UK electronics industry. They find that entry by foreign firms, paying on average higher wages, generates spillovers causing wages in the domestic sector to be bid up, but spillovers are largely confined to skilled rather than unskilled workers, implying that benefits of FDI are unevenly distributed.

Girma and Görg (2007) examine the wage effects in the two broad sectors: the skill-intensive electronics sector and the low-tech food sector. They find that in both

²²In the case of Czech Republic by using a panel dataset disaggregated on 18 sectors, Kippenberg (2005) finds that sectoral composition of FDI- whether it is capital-intensive or labor-intensive- plays a crucial role in explaining the impact of FDI on domestic economy. Sayek and Aykut (2007) find empirical evidence that sectoral composition of FDI plays a key role in growth. They note that FDI in the primary sector is expected to generate negative effects while manufacturing sector generates positive effects.

sectors unskilled workers receive on average higher wages as a result of their plant's newfound status as a subsidiary of a multinational company and note that the absence of a robust statistically significant effect of foreign ownership on skilled wages within both sectors which is due to lower test power when dividing the observations into subsamples. Barry et al. (2005) estimate the effects of FDI on wages and productivity in domestic firms in Ireland both theoretically and empirically (using plant level data for 1990 to 1998). They assumed that foreign firms employ only skilled labor, while domestic exporters employ a mix of skilled and unskilled labor to capture the skill differences across firms. The use of different types of workers in different proportions in foreign and domestic firms lead to negative labor market crowding out effects. They find that foreign presence has a negative effect on productivity and wages in domestic exporters, but no effect on domestic non-exporters in the same sector, where domestic non-exporters employ only unskilled workers. Das (2002) demonstrates that FDI in skill intensive sectors lowers the relative wage and points out that the greater the technology gap the higher the magnitude of the negative impact of FDI on the relative wage. Feliciano and Lipsey (2006) for the US, Girma et al. (2001) for the UK and Lipsey and Sjöholm (2004) for Indonesia control for some observable firm and industry characteristics.

On the other hand, in addition to the sectoral differences, different technology intensities between foreign and local firms within a sector play a key role in explaining the labor market implications of foreign presence. Even in the same sector, foreign and local firms have different techniques in production. Actually, a number of studies seeks to examine differences in technological intensities between foreign and local

firms and they note that depending on the differences on the machinery and equipment, improved inventory control systems, training methods and R&D strategies, foreign firms enjoyed higher technological intensities than local firms (Rasiah, 2005; Te Velde and Morrissey, 2004 and Yeaple, 2005). Therefore, one needs to consider the technology gap between the foreign and local firms within a sector. Some part of the empirical work reveals that the different technology intensities across firms have important effects on the wage and productivity spillovers in the host countries in response to increased foreign firm presence (Aitken et al., 1996; Sayek and Şener, 2006; Feenstra and Hanson, 1996; Markusen and Venables, 1997; Girma, 2001; Larudee and Koechlin, 1999; Conyon et al., 2002). Therefore, this chapter not only studies the sectoral differences but also different technology intensities between foreign and local firms in the same sector.

In this context, chapter 3 captures such differing effects by modelling the defining characteristic of the sector as its "skilled labor intensity". Two extreme sectoral classifications can be thought of in this sense, one which is skilled labor intensive; such as the electronic or auto industry, while the other is unskilled labor intensive, such as the textile or food industry etc. We focus on these two particular industries for two reasons. First, foreign-owned firms are important players in both sectors, accounting for about 19% of employment in electronics and 10% of employment in the food industry in 1996 (Griffith and Simpson, 2003, Table 4). Second, the two sectors could be different in their technology usage, and hence, there may be differences on their effects on skilled and unskilled wages and unemployment rates. In addition, foreign and local firms pay different wages for textiles and electronic

sectors (Barry et al., 2005, Table 1).

As foreign firms may have different skill intensities from domestic firms, this chapter asks whether the skill intensity matters in examining the labor market implications of MNEs, particularly, wage and unemployment rates for different types of workers. Rather than the sectoral differences, this chapter implicitly focuses on the different technology intensities across foreign and local firms within the same sector. The main purpose of this chapter is to evaluate, theoretically, the effect of different skill requirements of the foreign firms on wages and unemployment rates of unskilled and skilled workers by the help of search model. Even though empirical studies have recently stressed the importance of the different skill requirements of the foreign firms depending on the sector they are located, theoretical work on this issue is scarce. Therefore, this study constitutes an attempt to fill this gap in the literature. The main difference between the Chapter 2 and Chapter 3 is that foreign firms offer positions only for skilled workers if it is more skill intensive than the local firm while foreign firms create vacancies for only unskilled workers if it is less skill intensive than the local firm. To this end, it is possible to capture different skill intensities of the firms. In other words, Chapter 2 models the foreign firm working with both skilled and unskilled workers and Chapter 3 further looks into the corner solutions, where either skilled or unskilled labor is used in production, instead of both labor being used in combination.

In the first part of this chapter, the skill intensive foreign firm employs only skilled workers and offer positions for the skilled workers while local firms still employ both unskilled and skilled workers. This allows us to answer the question that how

the earnings of the skilled and unskilled workers change if the foreign firm is more skill intensive than the local firm- hiring only skilled workers. In the second part of this chapter, foreign firm employs only unskilled workers while local firms still employ both unskilled and skilled workers. Similarly, this allows us to examine the position of skilled and unskilled workers if the low-tech foreign firms open vacancies for only unskilled workers. The main rationale behind this is just to capture the different technology intensities of the firms and to clarify the impact of the different technology intensity of firms on the position of unskilled and skilled workers in the local firm²³. The main contribution of this chapter is to analytically identify the fact that skill intensity matters in examining the response of wage and unemployment effects of increased foreign firm presence. Thus, this chapter provides a support for the recent empirical studies that developed around labor market implications of foreign firms by controlling for the sectoral and skill differences across firms.

In the first part of Chapter 3, the skilled labor intensive sector is introduced. The accompanying part studies the unskilled labor intensive sectors and how the labor

²³In this model, we can not assume that firms use skilled and unskilled workers in different proportions since the employment of skilled and unskilled workers in foreign and local firms is not exogenously given in the model.

market is affected when foreign presence in those sectors.

3.2 High-Tech Foreign Firms

3.2.1 Model

As different skill intensities of firms change the composition of vacancies, one can say that skilled labor intensive foreign firms create job opportunities only for the skilled workers, while local firms still employ both type of workers, thus, creating jobs for both workers. Since the vacancies posted by local and foreign firms are different, the matching function of unskilled workers and skilled workers are given as follows, reflecting that foreign firms offer positions for only skilled workers:

$$q_i[v_L, u_l] = (u_l)^\alpha (v_L)^{1-\alpha}$$

$$q_s[v_L + v_F, u_s + e_{sL} + e_{sF}] = (u_s + e_{sL} + e_{sF})^\alpha (v_L + v_F)^{1-\alpha}$$

The labor market tightness for unskilled and skilled workers is represented by $\theta_i = \frac{v_L}{u_l}$ and $\theta_s = \frac{v_L + v_F}{u_s + e_{sL} + e_{sF}}$, which is the ratio of total job vacancies to total unskilled and skilled job seekers, respectively.

Figure 8 illustrates the labor market mobility– from unemployment to employment, from job to job and back to unemployment– considering the different skill requirements of the firms. Accordingly, the steady state conditions are given as follows:

$$\theta_i^{1-\alpha} \mathbf{u}_i = \delta (\mu - u_i) \tag{31}$$

$$\theta_s^{1-\alpha} \mathbf{u}_s = \delta (1 - \mu - u_s) \tag{32}$$

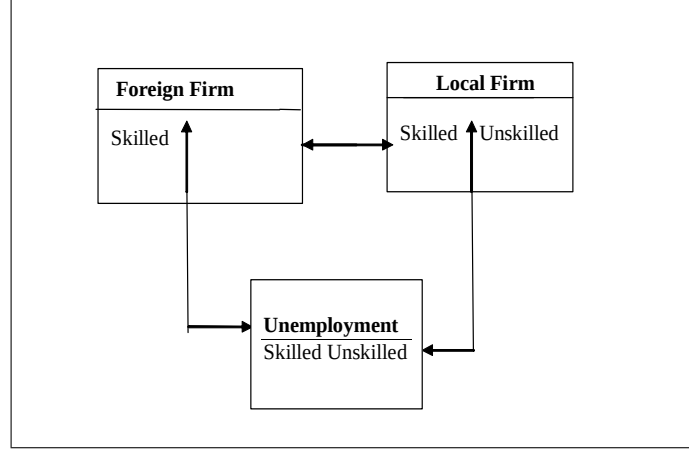


Figure 8: Workers' Mobility under High-tech Foreign Firms

$$\theta_s^{1-\alpha} \eta (u_s + e_{sF}) = (\delta + \theta_s^{1-\alpha} (1 - \eta)) e_{sL} \quad (33)$$

$$\theta_s^{1-\alpha} (1 - \eta) (u_s + e_{sL}) = (\delta + \theta_s^{1-\alpha} \eta) e_{sF} \quad (34)$$

Since we allow for on-the-job-search for both skilled workers in the local and foreign firms, we have equations for local and foreign firms stating that in the steady state the flow of skilled workers into local firms, $\theta_s^{1-\alpha} \eta (u_s + e_{sF})$ is equal to the flow of skilled workers out of local firm, $(\delta + \theta_s^{1-\alpha} (1 - \eta)) e_{sL}$. The flow $\theta_s^{1-\alpha} (1 - \eta) (u_s + e_{sL})$ of currently employed skilled workers into the foreign firm equals the flow out of foreign firms, $(\delta + \theta_s^{1-\alpha} \eta) e_{sF}$.

Workers

The asset value of an unskilled unemployed worker, $U(l)$, satisfies

$$rU(l) = b + \theta_i^{1-\alpha} (W(L, l) - U(l)) \quad (35)$$

where the first term on the right hand side is the unemployment benefit, b , and the second term refers to the change in the value of unskilled unemployed worker when

(s)he becomes employed in the local firm.

Similarly, given the assumption that skilled workers accept both types of jobs, local and foreign, the asset value of unemployed skilled workers, $U(s)$, verifies

$$rU(s) = b + \theta_s^{1-\alpha}\eta(W(L, s) - U(s)) + \theta_s^{1-\alpha}(1 - \eta)(W(F, s) - U(s)) \quad (36)$$

The second and third terms in equation (35) denote the change in the value of skilled worker if (s)he is employed in local and foreign firms, respectively.

The value of an unskilled worker employed in local firm is given in equation (36) capturing the fact that foreign firms do not offer positions for unskilled workers:

$$rW(L, l) = w_l^L + \delta(U(l) - W(L, l)) \quad (37)$$

The value of skilled worker employed in local and foreign firms satisfies the following equations:

$$rW(L, s) = w_s^L + \delta(U(s) - W(L, s)) + \theta_s^{1-\alpha}(1 - \eta)(W(F, s) - W(L, s)) \quad (38)$$

$$rW(F, s) = w_s^F + \delta(U(s) - W(F, s)) + \theta_s^{1-\alpha}\eta(W(L, s) - W(F, s)) \quad (39)$$

where the first terms in equations (37) and (38) are the skilled workers' wage in the local and foreign firms, respectively, and the second terms are the value loss of becoming unemployed, and the third terms, i.e. $\theta_s^{1-\alpha}(1 - \eta)(W(F, s) - W(L, s))$ and $\theta_s^{1-\alpha}\eta(W(L, s) - W(F, s))$ are the expected return from being successful in

on-the-job search for skilled workers.

Firms

The values of local and foreign vacancies are given, respectively, by

$$rV(L) = -c_L + \theta_i^{-\alpha} (J(L, l) - V(L)) + \theta_s^{-\alpha} A (J(L, s) - V(L)) \quad (40)$$

$$rV(F) = -c_F + \theta_s^{-\alpha} B (J(F, s) - V(F)) \quad (41)$$

where $A = \frac{u_s + e_{sF}}{u_s + e_{sL} + e_{sF}}$ and $B = \frac{u_s + e_{sL}}{u_s + e_{sL} + e_{sF}}$ stands for the share of skilled workers applying for a local job and a foreign job in the total job seekers, respectively. Values, given in equations (39) and (40), of local and foreign vacancies reflect the assumption that both worker types are capable of performing the local jobs and but only skilled workers manage to perform foreign jobs. A firm who posts a vacancy must pay a recruitment cost of c_i , where $i = L, F$. Given free entry, all profit opportunities from posting vacancies are exploited, hence, in equilibrium, $V(L) = V(F) = 0$.

The values to the firm of filling these vacancies with unskilled and skilled workers verify

$$rJ(L, l) = y_l^L - w_l^L + \delta (V(L) - J(L, l)) \quad (42)$$

$$rJ(L, s) = y_s^L - w_s^L + (\delta + \theta_s^{1-\alpha} (1 - \eta)) (V(L) - J(L, s)) \quad (43)$$

$$rJ(F, s) = y_s^F - w_s^F + (\delta + \theta_s^{1-\alpha} \eta) (V(F) - J(F, s)) \quad (44)$$

where the terms, $y_l^L - w_l^L$, $y_s^L - w_s^L$ and $y_s^F - w_s^F$ represent the output of a worker minus the wage paid to the worker. The last term in each equation captures the value loss in case of exogenous job destruction or transferring into local/foreign firms.

Next, we concentrate on the steady state equilibrium as in chapter 2.

3.2.2. Equilibrium

Equilibrium is determined by two job creation conditions, plus, steady state conditions equalizing the flows into and out of unemployment, local and foreign firms, for both types of workers are satisfied. Given exogenous variables that capture the productivity of labor (y_j^i), the bargaining and matching environment (α, β), the job destruction rate (δ) and job creation cost (c_L, c_F), the share of unskilled workers in total population (μ) and the interest rate (r). We will solve for the mass of vacancies, v_L and v_F ; wages, i.e. w_l^L, w_s^L and w_s^F ; the labor market tightness θ_i and θ_s ; and unemployment rates; u_i and u_s . The solution follows the steps followed in Chapter 2. This yields

$$u_i = \frac{\delta \mu}{(\delta + \theta_i^{1-\alpha})} \quad (45)$$

$$u_s = \frac{\delta (1 - \mu)}{(\delta + \theta_s^{1-\alpha})} \quad (46)$$

Given μ and δ , unemployment rate of skilled workers is decreasing in the labor market tightness of the skilled workers, θ_s , while the unemployment rate of unskilled workers is decreasing in the labor market tightness of the unskilled workers θ_i .

Since equilibrium requires that $V(L) = 0$ and $V(F) = 0$, equations (39) and (40) which are also known as job creation conditions, could be written as follows:

$$c_L = \theta_i^{-\alpha} \left(\frac{y_l^L - w_i^L}{r + \delta} \right) + \theta_s^{-\alpha} A \left(\frac{y_s^L - w_s^L}{r + \delta + \theta_s^{1-\alpha} (1 - \eta)} \right) \quad (47)$$

$$c_F = \theta_s^{-\alpha} B \left(\frac{y_s^F - w_s^F}{r + \delta + \theta_s^{1-\alpha} \eta} \right) \quad (48)$$

3.2.3. Wages

Wages are determined by the Nash bargaining condition

$$W(i, j) - U(j) = \beta [W(i, j) + J(i, j) - V(i) - U(j)] \quad (49)$$

where $\beta \in (0, 1)$ is the exogenous surplus share of workers.

Substituting (34) (36) (39) (41) into (48) and imposing free entry condition for local vacancies $V(L) = 0$, we obtain the wage rate from matching of an unskilled worker with a local firm:

$$w_i^L = \varpi_{ib}^L b + \varpi_{iy}^L y_i^L \quad (50)$$

where $\varpi_{ib}^L = \frac{(1-\beta)(r+\delta)}{r+\delta+\beta\theta_i^{1-\alpha}}$ and $\varpi_{iy}^L = \frac{\beta(r+\delta+\theta_i^{1-\alpha})}{r+\delta+\beta\theta_i^{1-\alpha}}$, are the weights attached to the unemployment benefit and labor productivity, respectively. The wage of unskilled workers employed in the local firm is determined by the weighted average of the unemployment benefit, b and the output of unskilled worker in the local firm, y_i^L . Particularly, w_i^L depends on the bargaining power of workers, β and the mass of local vacancies, which is captured in the labor market tightness of the unskilled workers, θ_i . Although we examine the effect of the mass of local vacancies on wages, we are aware that the mass of local vacancies is endogenous, so in the numerical exercises we will look into a change in the exogenous parameters, i.e. the cost of opening local and foreign vacancies, c_L and c_F on the mass of local vacancies. Here, for simplicity, we ignore the reason behind the change in the mass of local vacancies.

In this context, it is convenient to argue that unskilled wages in the local firm

increase as the mass of local vacancies rises. That is, if the local vacancies per unemployed unskilled workers, i.e, labor market tightness, is large, then workers' outside options are good and they can ask for a higher wage. Firms are willing to pay this high wage to avoid having to look for another worker as it is costly to wait for a suitable worker. But, if the local vacancies are scarce relative to unemployed unskilled workers, which means workers have limited outside options, then workers may accept lower wages to avoid a long spell of unemployment. Even we can not show analytically, if the share of foreign vacancies for skilled workers increase in part due to the technological upgrading, the outside option of the unskilled workers deteriorates (note that an increase in the foreign vacancies depresses the increase in local vacancies) and, therefore, the earnings of the unskilled workers fall²⁴.

Further, better bargaining position of the workers puts an upward pressure on wages, i.e.

$$\frac{dw_i^L}{dvl} > 0, \frac{dw_i^L}{d\beta} > 0$$

Substituting (35) (37) (39) (42) into (48) and imposing free entry condition for local vacancies $V(L) = 0$, we obtain the wage rate from matching of an skilled worker with a local firm:

$$w_s^L = \varpi_{sb}^L b + \varpi_{sy}^L y_s^L \quad (51)$$

where $\varpi_{sb}^L = \frac{(1-\beta)(r+\delta+\theta_s^{1-\alpha}(1-\eta))}{r+\delta+\theta_s^{1-\alpha}(1-\eta+\beta\eta)}$ and $\varpi_{sy}^L = \frac{\beta(r+\delta+\theta_s^{1-\alpha})}{r+\delta+\theta_s^{1-\alpha}(1-\eta+\beta\eta)}$ are the weights attached

to the unemployment benefit and labor productivity, respectively. Skilled workers'

²⁴On the other hand, job opportunities posted by foreign firms for the skilled workers have an indirect impact on the wage of unskilled workers since there is a link between the mass of local and foreign vacancies given job creation equations. But, it is hard to elaborate this relationship analytically, so the effect of foreign job creation on unskilled workers' wage will be more clear in the numerical example.

wage in the local firm mainly depends on the share of local and foreign vacancies, bargaining power of workers and the labor market tightness of the skilled worker. An increase in the mass of local (foreign) vacancies raises (decreases) the wages in the local firm. This could be explained by the fact that as the value of filling the vacant positions increases, local firms are willing to pay more to fill the position. Due to an increase in the local vacancies, the more likely the worker is matched with a local job and the workers may ask for a higher wage and firms are willing to pay this wage to avoid having to look for another worker and to incur the cost of not to filling the vacancy.

An increase in the new positions offered by foreign firms raises the probability of matching with a foreign job, and the earnings of the workers doing foreign job increases. On the other hand, the probability of being successful in the on-the-job-search increases for the workers employed in the local firm in response to foreign job creation. In this regard, local firms anticipate that workers will quit job whenever foreign firms start to post new vacancies, so they tend to pay less. Actually, the Figure 9 indicates that wages of the skilled workers in the local firm increase as the share of local vacancies rises, but falls as the share of foreign firms in total vacancies increase. Similarly, the bargaining power of workers raises the wages, i.e.

$$\frac{dw_s^L}{dvl} > 0, \frac{dw_s^L}{dvf} < 0, \frac{dw_s^L}{d\beta} > 0$$

Substituting (35) (38) (40) (43) into (48) and imposing free entry condition for foreign vacancies $V(F) = 0$, we obtain the wage rate from matching of an skilled worker with a foreign firm:

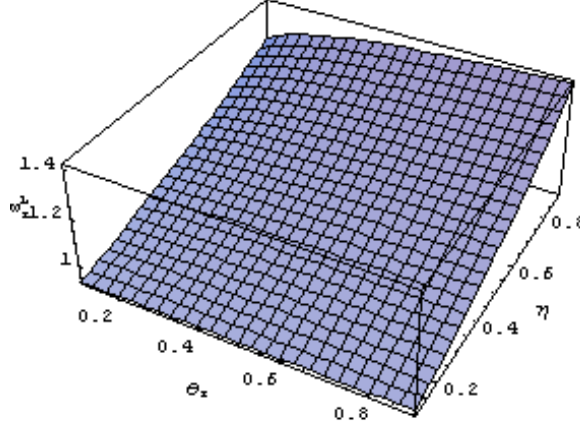


Figure 9: Skilled workers' wage in the local firm

$$w_s^F = \varpi_{sb}^F b + \varpi_{sy}^F y_s^F \quad (52)$$

where $\varpi_{sb}^F = \frac{(1-\beta)(r+\delta+\theta_s^{1-\alpha}\eta)}{r+\delta+\theta_s^{1-\alpha}(\eta+\beta-\beta\eta)}$ and $\varpi_{sy}^F = \frac{\beta(r+\delta+\theta_s^{1-\alpha})}{r+\delta+\theta_s^{1-\alpha}(\eta+\beta-\beta\eta)}$ are the weights attached to unemployment benefit and labor productivity, respectively. Skilled workers' wage in foreign firm depends on the share of local vacancies, η , bargaining power of workers, β , unemployment benefit, b and the flow output of skilled worker in foreign firm, y_s^F . Earnings of the skilled workers in the foreign firm increases as foreign firms provide more job opportunities since they have to pay enough to fill those vacant positions and not to be wait for another match. On the other hand, new job opportunities created by the local firm increases the outside option of the workers who are performing on-the-job search in the foreign firm. Thus, since foreign firms anticipate that workers' probability of being successful in on-the-job search increases, which reduces the match surplus, they tend to pay less for the workers. Also Figure 10 shows that wages of the skilled workers in the foreign firm decrease as the share of

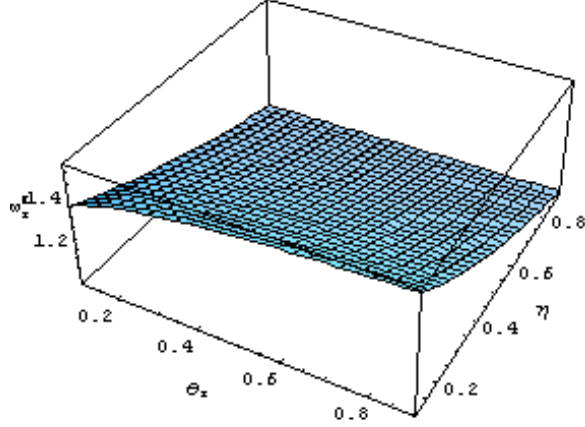


Figure 10: Skilled workers' wage in the foreign firm

local vacancies rises, but increase as the share of foreign firms in total vacancies rises.

$$\frac{dw_s^F}{dvf} > 0, \frac{dw_s^F}{dvt} < 0, \frac{dw_s^F}{d\beta} > 0$$

Equations (49)-(51) reveal that the mass of local and foreign vacancies which are captured in the labor market tightness and the share of local vacancies in total, and the productivity of workers play a crucial role in determination of skilled wages in the foreign and local firms. If the mass of local vacancies increase, the wages of both unskilled and skilled workers are likely to rise in local firms, but new jobs available in foreign firms reduce the wages of skilled workers in the local firm. Also, the earnings of the skilled workers in the foreign firm increase (decrease) in response to a rise in the mass of foreign (local) vacancies. This is the result indicated in Chapter 2. That is, skill intensity does not matter for the skilled workers employed in foreign and local firms.

Due to the skill intensity of the foreign firm, there is no job creation for the unskilled workers. The earnings of the unskilled workers increase in response to a

rise in the mass of local vacancies. But, if the foreign vacancies increase, than this could have implicitly affect the unskilled workers' wages, which will be more clear in the numerical example. Nevertheless, one can say that if the share of local vacancies decrease as foreign firms constitute the greater portion of the jobs, then this will deteriorate the position of unskilled workers. This will decrease the likelihood of matching with a local firm for unskilled workers, if the match takes place between unskilled workers and the local firm, unskilled workers need to accept lower wages offered by local firms not to fall or to wait in the unemployment pool.

The mass of vacancies created by local and foreign firms are determined by the job creation conditions, which is obtained as in the Chapter 2 by substituting (49)-(51) into equations (46)-(47):

$$\mathbf{c}_L = \frac{(1 - \beta) \theta_i^{-\alpha} \left(\frac{y_i^L - b}{r + \delta + \beta \theta_i^{1-\alpha}} \right) + (1 - \beta) (\theta_s)^{-\alpha} \left(\frac{u_s + e_{sF}}{1 - \mu} \right) \frac{y_s^L - b}{r + \delta + \theta_s^{1-\alpha} (1 - \eta + \beta \eta)}}{(1 - \beta) (\theta_s)^{-\alpha} \left(\frac{u_s + e_{sL}}{1 - \mu} \right) \left(\frac{y_s^F - b}{r + \delta + \theta_s^{1-\alpha} (\eta + \beta - \beta \eta)} \right)} \quad (53)$$

$$\mathbf{c}_F = (1 - \beta) (\theta_s)^{-\alpha} \left(\frac{u_s + e_{sL}}{1 - \mu} \right) \left(\frac{y_s^F - b}{r + \delta + \theta_s^{1-\alpha} (\eta + \beta - \beta \eta)} \right) \quad (54)$$

Job creation conditions for foreign and local firms differ according to the costs of creating new jobs and productivities of the workers and this gives rise to equilibrium wage differentials in the presence of labor market frictions. Equations (52) and (53) can in fact be rewritten as two equations with two unknowns, v_F and v_L , since both θ_j 's and η are function of v_F and v_L , as are u_j and e_{ij} .

On the other hand, this framework allows us to examine the wage gap between foreign and local firms for the skilled workers. We are able to discuss whether the foreign firm premia is greater than one; i.e. whether foreign firm always pay more than local firms for a skilled worker. This leads to proposition 2.

Proposition 2 *Skilled workers in the foreign firm are not always paid more than skilled workers in local firm. The firm premium depends on the mass of vacancies created by the firms and the labor productivity.*

Proof. Skilled workers in foreign firms may earn more than that of the local firms, that is, $\frac{w_s^F}{w_s^L} > 1$ depending on the labor market frictions, in terms of posted vacancies, and the productivity of the workers in different firms.

$$\begin{aligned} \frac{(1-\beta)(r+\delta+\theta_s^{1-\alpha}\eta)b+\beta(r+\delta+\theta_s^{1-\alpha})y_s^F}{(r+\delta+\theta_s^{1-\alpha}(\eta+\beta-\beta\eta))} &\stackrel{\geq}{\leq} \frac{(1-\beta)(r+\delta+\theta_s^{1-\alpha}(1-\eta))b+\beta(r+\delta+\theta_s^{1-\alpha})y_s^L}{(r+\delta+\theta_s^{1-\alpha}(1-\eta+\beta\eta))} \\ (1-\beta)\theta_s^{1-\alpha}(2\eta-1)b+(r+\delta+\theta_s^{1-\alpha}(1-\eta+\beta\eta))y_s^F - (r+\delta+\theta_s^{1-\alpha}(\eta+\beta-\beta\eta))y_s^L &\stackrel{\geq}{\leq} \\ 0 \end{aligned}$$

Since $y_s^F > y_s^L$, it is clear that the second term in the above inequality is positive and the sign of the first term is determined by the share of vacancies created by the firms. Clearly, if the productivity gap between foreign and local firms is sufficiently large, foreign firms end up with higher wages even when labor market imperfections are taken into account. ■

The proposition 2 is the same as the proposition 1 and therefore both of these are in line with the empirical literature (Aitken et al., 1996; Feenstra and Hanson 1996; Lipsey and Sjöholm, 2002; and Ruane and Uğur, 2002). While these stylized facts are supported by our model, we are able to show the range of conditions that could alter the foreign firm premium. Thus, regardless of the different skill intensities between foreign and local firms, the wage gap between local and foreign firms depends on the allocation of vacancies created by the firms, which are implicitly determined by the job creation conditions. So, we can argue that wage differentials between

foreign and local firms should be explained by labor market imperfections in terms of job creation and also the productivity of workers. Moreover, since we can not analytically show the effect of foreign (local) vacancies on skill and firm premia, we carry out a numerical example. As a consequence of different skill requirements, i.e. foreign firm is more skill intensive than the local firm, the effect of increased foreign firm presence on skilled workers' earnings does not record a significant change, but its effect on the unskilled workers is ambiguous analytically. To this end, we need a numerical example to examine whether the skill intensity matters.

3.2.4 Numerical Example: High-Tech Foreign Firms

This section presents a numerical example to understand the properties of the model. Numerical example allows us to examine effects of an exogenous increase in the cost of job creation on the extent of foreign firm activity in the local economy, and in turn its effects on absolute and relative wages, and unemployment. It furthermore allows a discussion of the relationship between skill upgrading and technological progress and absolute and relative wages, and unemployment. The example uses the matching function, $q(\theta_i) = \theta_i^{-\alpha}$ and $q(\theta_s) = \theta_s^{-\alpha}$ together with the baseline parameter values given in Chapter 2. Under this choice of parameters, Table 12 presents the baseline solutions²⁵.

< Insert Table 12 >

The examination of the baseline solution reveals that the share of local vacancies

²⁵Real figures from Ireland are presented in note 1.

is 81% of the total vacancies. The unemployment rate of unskilled workers and skilled workers are 4.4% and 9%, respectively and the overall unemployment rate is 5%. Given the job creation costs, the wage of skilled workers in the foreign firm is lower than the skilled workers wage in the local firm. In this benchmark case, given the cost of job creation, the share of skilled workers in the local economy and the technology gap between the foreign and local firms (10%), the share of foreign vacancies in total is 19%. Given the number of vacancies offered by foreign firms, workers who matched with the foreign firm accept the lower wages not to wait to match with an other firm or not to wait in the unemployment pool. On the other hand, unskilled workers get paid less than skilled workers in the local firm since unskilled workers are not productive as skilled workers. In addition, the vacancies posted for unskilled workers is limited as only local firm employs unskilled workers.

Since the foreign firm introduced in this chapter is skill-intensive, the vacancies posted by foreign firms are for the skilled workers. Therefore, the main competition between foreign and local firms takes place in the case of filling the vacant positions for the skilled workers. Given the skill intensity of the foreign firm and the job creation costs, the share of local vacancies is higher in this case compared to the most general case in Chapter 2. Actually, the mass of foreign vacancies is considerably very low when it is compared to the mass of local vacancies and this creates a downward pressure on foreign wages leading to a firm premium which is less than 1.

The main explanation behind the lower wages offered by foreign firms is the lower job creation rates. The mass of foreign vacancies are lower than the vacancies posted by the local firms. Therefore, the greatest portion of the job creation is dominated

by the local firms. In this context, one needs to consider the reasons behind the lower vacancies offered by foreign firms. The vacancy creation is mainly determined by the gap between the value of opening a vacancy and a cost of vacancy creation. Particularly, the share of skilled workers which is given as 20%, the technology gap between the foreign and local firms (10%) and the cost of job creation where $c_L = 0.5$, $c_F = 0.7$ lowers the mass of vacancies offered by the foreign firms. In this context, labor market will be too tight for the foreign jobs. As the foreign vacancies are scarce relative to job seekers, workers who matched with a foreign firm are willing to accept low wages not to fall into the unemployment pool.

On the other hand, one of the explanations for the higher wages offered by foreign firms is that they increase the labor demand but in this case the vacancies posted by foreign vacancies compose only 19% of the total vacancies, indicating that the demand for hiring a worker for the foreign firm is limited. In this context, Martins (2004) for Portugal and Barry et al. (2001) for Ireland note that wages paid by foreign firms are in part depend on the labor market conditions, thus, foreign firms do not always pay more than the local firms.

< Insert Table 13 >

As it is mentioned in Chapter 2, job creation costs have a crucial role in explaining wage dynamics and unemployment. Results presented in Table 13 study the case where the costs incurred by the foreign firm are altered. As the job creation cost of foreign firms' falls, the cost gap between local and foreign firms melt down and this stimulates foreign job creation leading to changes in wages paid by the foreign firm

and the local firm. The skill premium in the local firm decreases from 1.16 to 1.00 when the foreign job creation costs fall from 0.9 to 0.5. In the local firm, while the earnings of the skilled workers fall from 1.42 to 1.23 as the share of local vacancies fall from %91 to %67, wages of the unskilled workers remain slightly same, that is, 1.22. The premium of working for a foreign firm increases for skilled workers in response to increased foreign firm presence. As the share of local vacancies decreases, workers matched with the local firm accept low wages rather than to wait for another match.

This is in the same line with the analytical findings of the previous section. Actually, regardless of the skill intensity of the firms, that is in accord with the second Chapter, skilled wages decrease in the local firm and increase in the foreign firm in response to a rise in foreign vacancies. When we consider the Chapter 2 where both firms offer positions for unskilled and skilled workers, unskilled workers wage in the local firm decreases while there is no considerable improvement in the wages of the unskilled workers when we consider a skill-intensive foreign firm. Since both firms offer job opportunities for skilled workers, skilled workers have relatively better position than unskilled workers. As unskilled workers can not perform on-the-job-search therefore doing only local jobs, there is no significant change on their wages in response to the job creation of firms.

Regardless of the skill intensity of the foreign firms, an increase in foreign presence leads to a fall in the economy-wide skill premium while a rise in the economy-wide firm premium. The results also show supporting evidence for proposition 2, that is, foreign firms do not always pay more than the local firms. On the other hand, in this case productivity gap between foreign and local firm is 10%, so that wages in

the foreign firm are not higher than the wages in the local firm which is in accord with the proposition 2. Actually, proposition 2 says that wage differentials could be extensively explained by the productivity differentials and the mass of local vacancies and the mass of foreign vacancies. In this setup, foreign firms have limited job opportunities given the cost structure, the skill endowment and also foreign firms offer positions for only skilled workers due to their skill-intensity in the production. So that, even though the share of local jobs decreases when the cost gap between local and foreign firms melt down, in absolute terms, the mass of local jobs is higher than the mass of foreign vacancies.

Panel C in Table 13 shows the effects of an exogenous increase in the share of foreign firm vacancies on unemployment. Increased availability of foreign vacancies decreases the overall unemployment rate from 6% to 5%. This result says that the increased presence of foreign firms could reduce unemployment rates for skilled workers regardless of the different skill intensities of firms.

< Insert Table 14 >

Table 14 shows the effects of an exogenous decrease in the job creation cost of both foreign and local vacancies. When the job creation costs of foreign and local firms fall by the same absolute amount and the cost gap between local and foreign firms stays same, the share of local vacancies in total vacancies increases. This leads to a rise in local and a fall in the foreign firm wages paid to the skilled workers. Once again, this is in line with proposition 2 noting that foreign firms do not always pay more as the wage difference between local and foreign firms depends on the job

opportunities provided by local and foreign firms, which are extensively determined by the cost of job creation and productivity of workers.

In contrast to the findings of the Table 13, the skill premium in the local firm increases from 1.10 to 1.15 and the premium of working for a foreign firm decreases from 0.80 to 0.70 in response to the fall in the cost of job creation in both firms. Overall, this leads to a rise in the economy-wide skill premium and a fall in the economy-wide firm premium. On the contrary, when the cost gap between foreign firm and local firm narrows, the economy-wide skill premium falls and economy-wide firm premium rises. The main reason of this opposite effect is that when the job creation costs of foreign and local firms fall by the same absolute amount, local firms will also benefit from cost reduction and post new vacancies and, therefore, the share of local vacancies in total increase so they pay more to fill that vacancies to avoid having to look for other workers and incur the cost of vacant position.

When we consider a foreign firm which is relatively more skill intensive than the local firm, the effect of a decrease in job creation costs has similar implications on wages and unemployment rate of skilled workers, but its effect on the unskilled workers is quite different once we found in the Chapter 2. Actually, skill intensity matters when we are studying the wage gap between skilled workers in the foreign and local firms, that is, firm premium.

Given the job creation costs, productivity gap between foreign and local firms (10%) and the skill endowment (only 20 percent of the population is skilled), the mass of foreign vacancies is very low leading to a decrease in the foreign firm premium. Stated differently, if the presence of skill-intensive firms is limited which is proxied

by the vacancies, we can conclude that foreign firms do not pay more than the local firms.

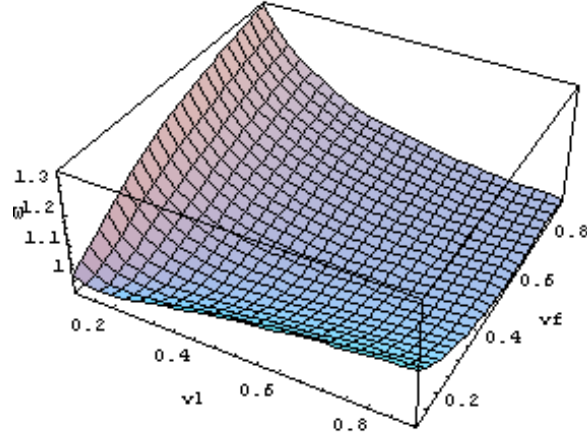


Figure 11: Skill Premium

Particularly, Figures 11 and 12 reveal the fact that how the mass of local and foreign vacancies affect the pattern of skill and firm premia. Briefly, this experiment reveals that, the labor market imperfections and foreigners' share in the labor market have important non-linear effects on the wages of unskilled and skilled workers, specifically on economy-wide skill premium and economy-wide firm premium. Note that the overall skill premium is calculated as the ratio of the weighted average of skilled workers' wage in the foreign and local firms to unskilled workers' wage in the local and foreign firms whereas the overall firm premium is calculated as the ratio of weighted average of wages paid by the foreign firm to wages paid by the local firm. The weightes are formed by the mass of workers employed by the local and foreign firms. The non linearity in the economy-wide skill premium and firm premium arise since the number of unskilled and skilled workers performing local job

and the number of skilled workers doing foreign job are determined by the mass of foreign and local vacancies.

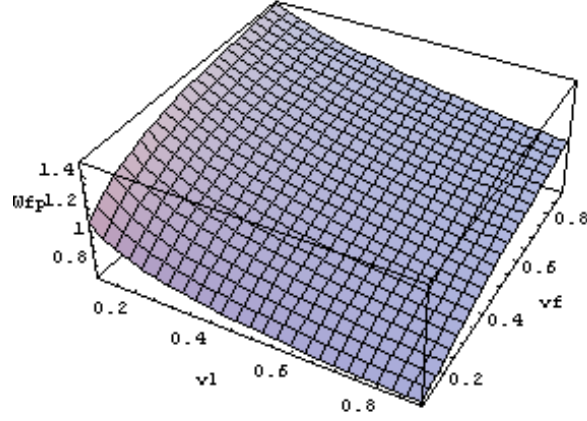


Figure 12: Firm Premium

Table 16 presents these elasticities -calculated by the help of the Table 13- with respect to the cost of foreign job creation²⁶. While the signs of the elasticities suggest that increased foreign presence in the economy decreases the skill premium paid by the local firm and increases the premium of working in the foreign firm, there are differences in the direction of impact on the within firm skill premia. Regardless of the skill intensity, increased foreign presence decreases the economy-wide skill premium, while increasing the economy-wide firm premium. However, wages of the unskilled workers performing local jobs are not sensitive to increased foreign firm presesence if we consider a skill-intensive foreign firm. So that, while the wages of skilled workers in foreign and local firms follow the same pattern in response to increased foreign firm presence in spite of the different skill intensities of the firms,

²⁶Elasticity is measured by the percentage change in vacancies (wages, unemployment) divided by the percentage change in the cost.

skill intensity matters in terms of unskilled workers. That is, increased foreign firm presence has no significant impact on the earnings of the unskilled workers if the foreign firm is more skill intensive than the local firm.

< Insert Table 16 >

Tables 17-20 provide a sensitivity analysis to understand whether the technological gap between foreign and local firms matters and also try to analyze the role of skill distribution in studying labor market implications of foreign firms.

Table 17 analyzes the impact of a rise in the output gap between foreign and local firms (which in part could be due to technological progress) since the productivity gap between local and foreign firms also play a crucial role in explaining wage differentials as mentioned in proposition 2. As the output gap between foreign and local firms increases, foreign firms start to offer more positions for workers, hence, the share of vacancies posted by foreign firms increase. Since foreign firm is relatively more skill intensive than local firm, posted vacancies in the foreign firm for skilled workers increase. In this context, in response to a rise in the foreign job opportunities, wages of the local firm decrease and wages of the foreign firm increase (The results are compared to our benchmark case, where the technology gap²⁷ is given as 10%). Panel B in the Table 17 reveals that technological progress in the skill-intensive foreign firm increases the premium of working for a foreign firm for skilled workers, but lowers the skill premium in the local firm.

The findings of the Table 17 indicates that the productivity gap between the skill intensive foreign firm and the local firm increase, that is 50%, foreign firms pay more

²⁷ y_j^F / y_j^L is technology gap, which is defined as the productivity advantage of the foreign firm.

than the local firms for the skilled workers making foreign firm premium greater than 1. On the other hand, if the productivity gap is larger than the 50%, unskilled workers wage in the local firm decreases in response to increased presence of foreign firms. In this context, one can conclude that skill intensity matters if there is a considerable productivity gap, such as 50%, between foreign and local firms.

An extensive array of studies explain the rising wage inequality and declining trend in the unskilled workers' wage by the skill-biased technological change (SBTC) which confirms our findings. An evidence on this issue says that the adoption of modern technologies in the production process as well as the growth of international flows leads to a rise in the demand for skilled workers and a decrease in the demand for unskilled workers. In this context, skill-biased technological change have emerged as alternative explanations for the increasing wage inequality. Ekholm and Midelfart (2005) finds that technological progress in the skill intensive sector leads to an increase in the relative return to skilled labor, which also supports our findings that the economy-wide skill premium rises (when the technological gap between the foreign and local firms is 50% or over).

According to Panel C in Table 17, overall unemployment decreases in response to technological progress (technology gap increases from 10% to 25%). This could be explained by the fact that the technological progress facilitates job creation and to this end foreign firms provide new job opportunities for the skilled workers. But, since the job opportunities are for the skilled workers, unemployment rate of unskilled workers start to increase slightly if the productivity gap between foreign and local firms is larger than the 50%. That is, skill intensity matters in determining the

unemployment rate of unskilled workers if the technology gap is given as 50%.

< Insert Table 17 >

Table 18 re-examines the effects of a fall in the job creation cost of foreign firms on wages and unemployment by assuming the productivity gap between foreign and local firms is sufficiently large ($y_s^F/y_s^L = 2.00$). As is shown in Panel A and Panel B in the Table 18, a decrease in the cost gap between local and foreign firms and increase in the productivity gap between foreign and local firms makes it profitable to create foreign jobs and search for the appropriate skilled candidates. Due to the decrease in the cost gap and the improvement in technology not only are more jobs created, but the job composition shifts towards more productive foreign jobs. As such while the skill premium in the local firm decreases, the premium of performing foreign jobs tend to increase. In other words, an increase in the share of foreign jobs due to the widened productivity differentials and narrowed cost gap puts an upward pressure on foreign wages and economy-wide skill premium and firm premium while lowering the wages of the skilled workers in the local firm. In this case, we have the similar results for the wages of skilled workers in the foreign and local firms. Considering the more intensive use of skilled workers by the foreign firms, increased foreign firm presence leads to a decline in the unskilled workers' wage.

However, skill intensity matters when we are examining unemployment rates. That is, increased foreign presence, in response to a decline in the job creation cost, leads to an increase in the unemployment rate of unskilled workers if the skill intensity of the foreign firm is larger than the local firm. But, in Chapter 2, when

we do not consider the skill intensity of the firms, we find that unemployment rate of unskilled workers decrease in response to increased presence of foreign firms.

< Insert Table 18 >

Table 19 presents the effect of skill upgrading on vacancy creation, wages and unemployment. Given the baseline parameter values, we focus on the skill upgrading and the share of skilled workers increase from 20% to 40%, that is, $\mu = 0.6$. When skilled work force constitutes 40% of the total population, the mass of local and foreign vacancies record a significant rise. According to the Panel B in Table 19, skill premium in the local firm fall from 1.09 to 0.96 and the premium of working for a foreign firm increases from 0.80 to 0.94 due to the skill upgrading when the results are compared to the benchmark case, that is Table 12. Earnings of the skilled workers fall in the local firms and increase in the foreign firm. Skill intensity matter when we consider the skill upgrading. That is, skill upgrading raises the economy-wide firm premium if we consider a skill intensive foreign firm, while reduces the economy-wide firm premium if we do not consider the skill intensity of the foreign firms.

< Insert Table 19 >

Panel C in Table 19 notes that while unemployment rate for skilled workers slightly increase and unemployment rate for unskilled workers decrease, similar to the findings of the Chapter 2.

< Insert Table 20 >

Table 20 examines the effect of a decrease in the cost of foreign job creation when one considers the skill upgrading. Given the share of skilled workers as 40% of the population, foreign firms create new job opportunities in response to a fall in the foreign job creation cost. This leads to a decline in the economy-wide skill premium and a rise in the economy-wide firm premium. Particularly, an increase in the share of skilled workers does not change results specifically for the economy-wide skill premium and firm premium when we consider a skill intensive foreign firm.

Particularly, Panel C in Table 20 shows that overall unemployment rate decreases due to a fall in the cost gap between foreign and local firms. Further, increased foreign presence, in response to a decline in the job creation cost, i.e. if the job creation costs are equalized, leads to an increase in the unemployment rate of unskilled workers when we consider the skill intensity.

In sum, numerical example reveals that impact of an increased foreign firm presence on overall relative wages and unemployment rates depends on the skill intensity of the firm, the technology available in the foreign firm and the share of skilled workers in the local labor market. Depending on the technology available in the foreign firm, increased foreign firm presence decreases the skilled and unskilled wages in the local firm and increases the skilled wages in the foreign firm. Also, increased presence of skill-intensive foreign firm lowers the wage gap between skilled and unskilled workers. On the other hand, most importantly, again considering the technological gap between the foreign and local firm, increased foreign firm presence may increase the unemployment rate of unskilled workers.

Actually, findings of this chapter supports the empirical evidence where Das

(2002) notes that FDI in skill intensive sectors lowers the relative wage and points out that greater the technology gap the higher the magnitude of the negative impact of FDI on the wage gap between skilled and unskilled workers in the local firm. Driffield and Girma (2003) examine the impact of FDI on both skilled and unskilled workers' wages in domestically owned establishments by focusing on the UK electronics industry and find that increased presence of foreign firms in the electronics industry deteriorates the position of unskilled workers.

Table 12: Baseline Solution for High-Tech Foreign Firms

Benchmark Parameters						
$r = 0.05, \beta = 0.5, \delta = 0.1, b = 0.1, c_L = 0.5, c_F = 0.7$						
$\mu = 0.8, \alpha = 0.5, y_s^F = 1.9, y_s^L = 1.7, y_l^L = 1.3$						
Labor Market: Job Opportunities and Unemployment						
v_L	v_F	η	u	u_i	u_s	
0.165	0.037	0.81	0.053	0.044	0.090	
Wages						
w_i^L	w_s^L	w_s^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_i^L}$	W^{sp}	W^{fp}
1.22	1.34	1.07	1.09	1.80	1.053	0.865

Table 13: Decrease in the Job Creation Cost of Foreign Firm and its Labor Market Implications

Panel A: Vacancies							
	vl		vf		η		
$c_L = 0.5$							
$c_F = 0.9$	0.151		0.013		0.91		
$c_F = 0.8$	0.158		0.023		0.87		
$c_F = 0.7$	0.165		0.037		0.81		
$c_F = 0.6$	0.171		0.056		0.75		
$c_F = 0.5$	0.174		0.085		0.67		
Panel B: Wages							
	w_i^L	w_s^L	w_s^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_i^L}$	W^{sp}	W^{fp}
$c_F = 0.9$	1.2213	1.42	1.03	1.163	0.726	1.137	0.805
$c_F = 0.8$	1.2243	1.38	1.05	1.129	0.761	1.095	0.828
$c_F = 0.7$	1.2269	1.34	1.07	1.092	0.804	1.053	0.856
$c_F = 0.6$	1.2289	1.29	1.11	1.051	0.859	1.014	0.891
$c_F = 0.5$	1.2302	1.23	1.15	1.006	0.931	0.983	0.935
Panel C: Unemployment							
	u		u_l		u_s		
$c_F = 0.9$	0.058		0.0478		0.099		
$c_F = 0.8$	0.055		0.0459		0.094		
$c_F = 0.7$	0.053		0.0442		0.090		
$c_F = 0.6$	0.051		0.0428		0.085		
$c_F = 0.5$	0.050		0.0420		0.080		

Table 14: Decrease in the Job Creation Cost of Foreign and Local Firms and its Labor Market Implications

Panel A: Vacancies							
	vl	vf	η				
$c_L=0.7; c_F=0.9$	0.128	0.027	0.826				
$c_L=0.5; c_F=0.7$	0.165	0.037	0.816				
$c_L=0.3; c_F=0.5$	0.239	0.051	0.823				
$c_L=0.1; c_F=0.3$	0.476	0.047	0.909				
Panel B: Wages							
	w_i^L	w_s^L	w_s^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_s^L}$	W^{sp}	W^{fp}
$c_L=0.7; c_F=0.9$	1.21	1.33	1.071	1.104	0.80	1.06	0.86
$c_L=0.5; c_F=0.7$	1.22	1.34	1.0782	1.092	0.80	1.05	0.85
$c_L=0.3; c_F=0.5$	1.24	1.36	1.0768	1.092	0.79	1.05	0.84
$c_L=0.1; c_F=0.3$	1.27	1.46	1.0390	1.155	0.70	1.12	0.78
Panel C: Unemployment							
	u	u_i	u_s				
$c_L=0.7; c_F=0.9$	0.06	0.05	0.10				
$c_L=0.5; c_F=0.7$	0.05	0.04	0.09				
$c_L=0.3; c_F=0.5$	0.04	0.03	0.07				
$c_L=0.1; c_F=0.3$	0.03	0.01	0.05				

Table 15: Gap Between Job Creation Cost of Foreign and Local Firms and its Labor Market Implications

Panel A: Vacancies							
	vl	vf		η			
$c_L/c_F=1$	0.63	0.56		0.53			
$c_L/c_F=2$	0.58	0.15		0.78			
$c_L/c_F=3$	0.47	0.04		0.90			
Panel B: Wages							
	w^L_ι	w^L_s	w^F_s	$\frac{\mathbf{w}^L_s}{\mathbf{w}^L_\iota}$	$\frac{\mathbf{w}^F_s}{\mathbf{w}^L_s}$	W^{sp}	W^{fp}
$c_L/c_F=1$	1.27	1.16	1.25	0.91	1.07	0.94	0.99
$c_L/c_F=2$	1.27	1.36	1.09	1.06	0.80	1.02	0.84
$c_L/c_F=3$	1.27	1.46	1.03	1.15	0.70	1.12	0.78
Panel C: Unemployment							
	u	u_ι		u_s			
$c_L/c_F=1$	0.017	0.012		0.039			
$c_L/c_F=2$	0.020	0.013		0.049			
$c_L/c_F=3$	0.024	0.016		0.058			

Table 16: Cost Elasticity of Vacancies, Wages and Unemployment

Panel A: Vacancies							
	vl	vf		η			
Baseline $c_F = 0.9$							
%11 decrease in c_F	-0.42	-6.77		0.47			
%22 decrease in c_F	-0.41	-8.09		0.50			
%33 decrease in c_F	-0.39	-9.83		0.55			
%44 decrease in c_F	-0.34	-12.16		0.61			
Panel B: Wages							
	w_i^L	w_s^L	w_s^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_s^L}$	W^{sp}	W^{fp}
Baseline $c_F = 0.9$							
%11 decrease in c_F	-0.022	0.24	-0.18	0.26	-0.43	0.34	-0.26
%22 decrease in c_F	-0.021	0.25	-0.20	0.27	-0.48	0.33	-0.28
%33 decrease in c_F	-0.019	0.27	-0.23	0.29	-0.55	0.32	-0.32
%44 decrease in c_F	-0.016	0.29	-0.26	0.30	-0.63	0.31	-0.36
Panel C: Unemployment							
	u	u_i		u_s			
Baseline $c_F = 0.9$							
%11 decrease in c_F	0.39	0.36		0.39			
%22 decrease in c_F	0.38	0.34		0.40			
%33 decrease in c_F	0.38	0.32		0.41			
%44 decrease in c_F	0.37	0.27		0.42			

Table 17: Technological Upgrading and its impact on the Labor Market

Panel A: Vacancies							
	vl	vf	η				
Baseline technology gap (%10)	0.165	0.037	0.81				
Changes from baseline							
technology gap %25	0.169	0.05	0.76				
technology gap %50	0.174	0.08	0.68				
technology gap %75	0.175	0.10	0.61				
technology gap %100	0.174	0.13	0.56				
Panel B: Wages							
	w_i^L	w_s^L	w_s^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_i^L}$	W^{sp}	W^{fp}
Baseline technology gap (%10)	1.2269	1.34	1.07	1.09	0.80	1.05	0.85
Changes from Baseline							
technology gap %25	1.2278	1.30	1.23	1.06	0.94	1.04	0.98
technology gap %50	1.2306	1.24	1.52	1.01	1.22	1.08	1.23
technology gap %75	1.2303	1.20	1.83	0.97	1.52	1.17	1.50
technology gap %100	1.2300	1.16	2.15	0.94	1.84	1.30	1.76
Panel C: Unemployment							
	u	u_i	u_s				
Baseline technology gap (%10)	0.053	0.0442	0.090				
Changes from Baseline							
technology gap %25	0.051	0.0431	0.086				
technology gap %50	0.0498	0.0420	0.081				
technology gap %75	0.0482	0.0430	0.077				
technology gap %100	0.0489	0.0439	0.074				

Table 18: Decrease in the Job Creation Cost of Foreign Firm and its Impact on Vacancies and Wages (Technological Upgrading)

Panel A: Vacancies							
	vl	vf	η				
$c_L = 0.5$							
$c_F = 0.9$	0.174	0.088	0.66				
$c_F = 0.8$	0.175	0.109	0.61				
$c_F = 0.7$	0.174	0.136	0.56				
$c_F = 0.6$	0.171	0.169	0.50				
$c_F = 0.5$	0.167	0.213	0.43				
Panel B: Wages							
	w_i^L	w_s^L	w_s^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_s^L}$	W^{sp}	W^{fp}
$c_L = 0.5$							
$c_F = 0.9$	1.2302	1.23	2.03	1.00	1.65	1.22	1.65
$c_F = 0.8$	1.2303	1.20	2.09	0.97	1.74	1.25	1.70
$c_F = 0.7$	1.2300	1.16	2.15	0.94	1.84	1.30	1.76
$c_F = 0.6$	1.2291	1.13	2.22	0.92	1.96	1.36	1.83
$c_F = 0.5$	1.2276	1.09	2.30	0.89	2.10	1.44	1.91
Panel C: Unemployment							
$c_L = 0.5$							
	u	u_l	u_s				
$c_F = 0.9$	0.0496	0.0420	0.080				
$c_F = 0.8$	0.0489	0.0419	0.077				
$c_F = 0.7$	0.0484	0.0421	0.074				
$c_F = 0.6$	0.483	0.0427	0.071				
$c_F = 0.5$	0.484	0.0437	0.067				

Table 19: Skill Upgrading and its Impact on Labor Market

Panel A: Vacancies							
	vl	vf	η				
$\mu = 0.6$	0.23	0.12	0.65				
Panel B: Wages							
	w_i^L	w_s^L	w_s^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_s^L}$	W^{sp}	W^{fp}
$\mu = 0.6$	1.23	1.21	1.15	0.96	0.94	0.95	0.93
Panel C: Unemployment							
	u	u_i	u_s				
$\mu = 0.6$	0.038	0.024	0.095				
Panel D: Baseline Solution							
Job Opportunities and Unemployment							
	vl	vf	η	u	u_l	u_s	
$\mu = 0.8$	0.165	0.037	0.81	0.05	0.04	0.09	
Wages							
	w_i^L	w_s^L	w_s^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_s^L}$	W^{sp}	W^{fp}
$\mu = 0.8$	1.22	1.34	1.07	1.09	0.80	1.05	0.85

Table 20: Decrease in the Job Creation Cost of Foreign Firm and its Impact on Vacancies and Wages (Skill Upgrading)

Panel A: Vacancies							
	vl	vf	η				
$c_L=0.5$							
$c_F=0.9$	0.228	0.070	0.76				
$c_F=0.8$	0.234	0.092	0.71				
$c_F=0.7$	0.237	0.122	0.65				
$c_F=0.6$	0.237	0.162	0.59				
$c_F=0.5$	0.230	0.215	0.51				
Panel B: Wages							
	w_i^L	w_s^L	w_s^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_s^L}$	W^{sp}	W^{fp}
$c_L=0.5$							
$c_F=0.9$	1.2371	1.28	1.10	1.02	0.85	0.98	0.86
$c_F=0.8$	1.2381	1.25	1.12	0.99	0.89	0.96	0.89
$c_F=0.7$	1.2387	1.21	1.15	0.96	0.94	0.95	0.93
$c_F=0.6$	1.2386	1.17	1.19	0.93	1.01	0.94	0.97
$c_F=0.5$	1.2375	1.13	1.24	0.90	1.09	0.94	1.02
Panel C: Unemployment							
$c_L=0.5$							
	u	u_l	u_s				
$c_F=0.9$	0.040	0.0249	0.103				
$c_F=0.8$	0.039	0.0243	0.099				
$c_F=0.7$	0.038	0.0240	0.095				
$c_F=0.6$	0.037	0.0240	0.090				
$c_F=0.5$	0.036	0.0247	0.086				

3.3 Low-Tech Foreign Firms

This section questions the labor market implications of the presence of low-tech foreign firms, such as textile or food industry. It is worth to study the case where the foreign firm locates in a low-skill intensive sector. Specifically, within the manufacturing sector, low-tech industries such as textiles, clothing, footwear, food, drink and tobacco constitute the 20% of the total FDI flow in the world (UNCTAD, 2006). Runiewicz (2004) note that most of the manufacturing FDI is in low-tech industries in Baltic countries. In particular, low-technology industries, such as textiles, clothing, footwear, food, drink and tobacco have different skill requirements. In this context, to differentiate the impact of different sectors, recent studies start to classify sectors as low-tech and high-tech and, even, they point out that foreign and local firms have different technology intensities within sectors (Girma and Görg, 2007). In this chapter, we also capture technological differences between local and foreign firms within a sector.

3.3.1 Model

Consider a foreign firm locating in an unskill-intensive sector. They create job opportunities only for the unskilled workers, while local firms still employ both type of workers. Since the vacancies posted by local and foreign firms are different, the

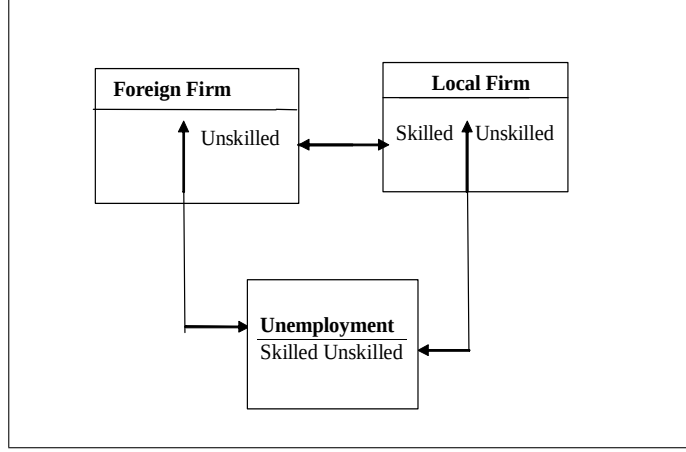


Figure 13: Workers' Mobility under Low-tech Foreign Firms

matching function of unskilled workers and skilled workers are given as follows, reflecting that foreign firms offer positions for only unskilled workers:

$$q_i[v_L, u_s] = (u_s)^\alpha (v_L)^{1-\alpha}$$

$$q_s[v_L + v_F, u_i + e_{iL} + e_{iF}] = (u_i + e_{iL} + e_{iF})^\alpha (v_L + v_F)^{1-\alpha}$$

The labor market tightness for unskilled and skilled workers is represented by $\theta_i = \frac{v_L + v_F}{u_i + e_{iL} + e_{iF}}$ and $\theta_s = \frac{v_L}{u_s}$, which is the ratio of total job vacancies to total unskilled job seekers, respectively.

Figure 13 illustrates the labor market mobility— from unemployment to employment, from job to job and back to unemployment. Accordingly, the steady state conditions are given as follows:

$$\theta_s^{1-\alpha} u_s = \delta (1 - \mu - u_s) \text{ where } 1 - \mu = u_s + e_{sL} \quad (55)$$

$$\theta_i^{1-\alpha} u_i = \delta (\mu - u_i) \text{ where } \mu = u_i + e_{iL} + e_{iF} \quad (56)$$

$$\theta_i^{1-\alpha} \eta (u_i + e_{iF}) = (\delta + \theta_i^{1-\alpha} (1 - \eta)) e_{iL} \quad (57)$$

$$\theta_i^{1-\alpha} (1 - \eta) (u_i + e_{iL}) = (\delta + \theta_i^{1-\alpha} \eta) e_{iF} \quad (58)$$

Since we allow for on-the-job-search for both workers in the local and foreign firms, we have equations for local and foreign firms stating that in the steady

state the flow of unskilled workers into local firms, $\theta_i^{1-\alpha}\eta(u_i + e_{iF})$ is equal to the flow of unskilled workers out of local firm, $(\delta + \theta_i^{1-\alpha}(1 - \eta))e_{iL}$. The flow $\theta_i^{1-\alpha}(1 - \eta)(u_i + e_{iL})$ of currently employed skilled workers into the foreign firm equals the flow out of foreign firms, $(\delta + \theta_i^{1-\alpha}\eta)e_{iF}$.

Workers

The asset value of an unskilled unemployed worker, $U(l)$, satisfies

$$rU(l) = b + \theta_i^{1-\alpha}\eta(W(L, l) - U(l)) + \theta_i^{1-\alpha}(1 - \eta)(W(F, l) - U(l)) \quad (59)$$

where the first term on the right hand side is the unemployment benefit, b , and the second and third terms in equation (58) denote the change in the value of skilled worker if (s)he is employed in local and foreign firms, respectively. and the third term represents the change in the value of unskilled unemployed worker when (s)he becomes employed in the foreign firm.

Similarly, given the assumption that skilled workers accept only local jobs, the asset value of unemployed skilled workers, $U(s)$, verifies

$$rU(s) = b + \theta_s^{1-\alpha}(W(L, s) - U(s)) \quad (60)$$

The second term refers to the change in the value of skilled unemployed worker when (s)he becomes employed in the local firm

The value of an skilled and unskilled workers employed in local and foreign firms satisfies the following equations

$$rW(L, s) = w_s^L + \delta(U(s) - W(L, s)) \quad (61)$$

$$rW(L, l) = w_i^L + \delta(U(l) - W(L, l)) + \theta_i^{1-\alpha}(1 - \eta)(W(F, l) - W(L, l)) \quad (62)$$

$$rW(F, l) = w_i^F + \delta(U(l) - W(F, l)) + \theta_i^{1-\alpha}\eta(W(L, l) - W(F, l)) \quad (63)$$

Firms

The values of local and foreign vacancies are given, respectively, by

$$rV(L) = -c_L + \theta_i^{-\alpha}A(J(L, l) - V(L)) + \theta_s^{-\alpha}(J(L, s) - V(L)) \quad (64)$$

$$rV(F) = -c_F + \theta_i^{-\alpha}B(J(F, l) - V(F)) \quad (65)$$

where $A = \frac{u_i + e_{iF}}{u_i + e_{iL} + e_{iF}}$ and $B = \frac{u_i + e_{iL}}{u_i + e_{iL} + e_{iF}}$ stands for the share of unskilled workers applying for a local job and a foreign job in the total job seekers, respectively. Values, given in equations (63) and (64), of local and foreign vacancies reflect the assumption that both worker types are capable of performing the local jobs and but only unskilled workers manage to perform foreign jobs. Given free entry, all profit opportunities from posting vacancies are exploited, hence, in equilibrium, $V(L) = V(F) = 0$. The values to the firm of filling these vacancies with unskilled and skilled workers verify

$$rJ(L, s) = y_s^L - w_s^L + \delta(V(L) - J(L, s)) \quad (66)$$

$$rJ(L, l) = y_i^L - w_i^L + (\delta + \theta_i(1 - \eta))(V(L) - J(L, l)) \quad (67)$$

$$rJ(F, l) = y_i^F - w_i^F + (\delta + \theta_i^{1-\alpha}\eta)(V(F) - J(F, l)) \quad (68)$$

where the terms, $y_i^L - w_i^L$, $y_s^L - w_s^L$ and $y_i^F - w_i^F$ represent the output of a worker minus the wage paid to the worker. The last term in each equation captures the value

loss in case of exogenous job destruction or transferring into local/foreign firms.

3.3.2. Equilibrium

The steady state equilibrium follows the steps in chapter 2. The unemployment rate of skilled workers $\frac{u_s}{1-\mu} = \frac{\delta}{(\delta+\theta_s^{1-\alpha})}$ and unskilled workers $\frac{u_l}{\mu} = \frac{\delta}{(\delta+\theta_l^{1-\alpha})}$ are derived by re-arranging the terms in equations (54) and (55). Given μ and δ , unemployment rate of skilled workers is decreasing in the labor market tightness of the skilled workers, θ_s , while the unemployment rate of unskilled workers is decreasing in the labor market tightness of the unskilled workers θ_l .

Since equilibrium requires that $V(L) = 0$ and $V(F) = 0$, equations (63) and (64) could be written as follows which are also known as job creation conditions:

$$c_L = \theta_l^{-\alpha} A \left(\frac{y_l^L - w_l^L}{r + \delta + \theta_l^{1-\alpha}(1-\eta)} \right) + \theta_s^{-\alpha} \left(\frac{y_s^L - w_s^L}{r + \delta} \right) \quad (69)$$

$$c_F = \theta_s^{-\alpha} B \left(\frac{y_s^F - w_s^F}{r + \delta + \theta_s^{1-\alpha}\eta} \right) \quad (70)$$

3.3.3. Wages

Wages are determined by the Nash bargaining condition

$$W(i, j) - U(j) = \beta [W(i, j) + J(i, j) - V(i) - U(j)] \quad (71)$$

where $\beta \in (0, 1)$ is the exogenous surplus share of workers.

Substituting (59) (60) (63) (65) into (72) and imposing free entry condition for local vacancies $V(L) = 0$, we obtain the wage rate from matching of an unskilled

worker with a local firm:

$$w_s^L = \varpi_{sb}^L b + \varpi_{sy}^L y_s^L \quad (72)$$

where $\varpi_{sb}^L = \frac{(1-\beta)(r+\delta)}{r+\delta+\beta\theta_s^{1-\alpha}}$ and $\varpi_{sy}^L = \frac{\beta(r+\delta+\theta_s^{1-\alpha})}{r+\delta+\theta_s^{1-\alpha}(1-\eta+\beta\eta)}$ are the weights attached to unemployment benefit and labor productivity, respectively. Skilled workers' wage in the local firm is determined by the weighted average of the unemployment benefit, b and the output of unskilled worker in the local firm, y_s^L . Particularly, w_s^L depends on the bargaining power of workers, β and the mass of local vacancies, which is captured in the labor market tightness of the skilled workers, θ_s . It is convenient to argue analytically that skilled wages in the local firm increase as the share of local vacancies rises in total and better bargaining position of the workers puts an upward pressure on wages.

On the other hand, if the job composition shifts through the unskilled intensive jobs, the outside option of the skilled workers will be limited hence when they match with a local firm, they will accept the lower wages to avoid a long spell of unemployment. Therefore, we can implicitly say that an increase in the presence of unskill intensive foreign firm deteriorates the position of skilled workers.

$$\frac{dw_s^L}{dvl} > 0, \frac{dw_s^L}{d\beta} > 0$$

Substituting (58) (61) (63) (66) into (72) and imposing free entry condition for local vacancies $V(L) = 0$, we obtain the wage rate from matching of an unskilled worker with a local firm:

$$w_i^L = \varpi_{ib}^L b + \varpi_{iy}^L y_i^L \quad (73)$$

where $\varpi_{ib}^L = \frac{(1-\beta)(r+\delta+\theta_i^{1-\alpha}(1-\eta))}{r+\delta+\theta_i^{1-\alpha}(1-\eta+\beta\eta)}$ and $\varpi_{iy}^L = \frac{\beta(r+\delta+\theta_i^{1-\alpha})}{r+\delta+\beta\theta_i^{1-\alpha}}$, are the weights attached to

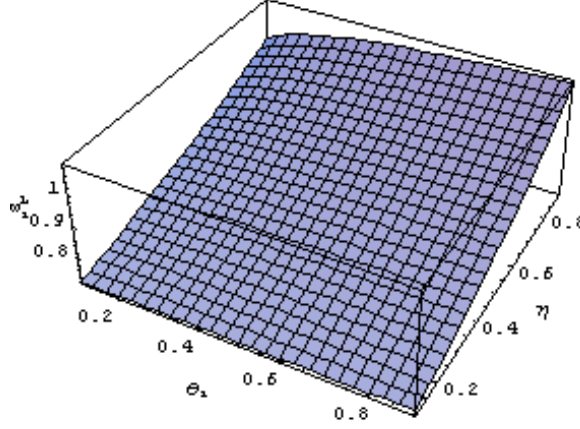


Figure 14: Unskilled workers' wage in the local firm

the unemployment benefit and labor productivity. The wage of unskilled workers' employed in the local firm is determined by the weighted average of the unemployment benefit, b and the output of unskilled worker in the local firm, y_t^L . Particularly, w_i^L depends on the bargaining power of workers, β and the mass of foreign and local firms which is also captured in labor market tightness of the unskilled workers, θ_i and the share of local vacancies in total vacancies, η . An increase in the mass of local (foreign) vacancies raises (decreases) the unskilled wages in the local firm. According to the Figure 14, it is clear that wages of the unskilled workers in the local firm increase as the share of local vacancies rises, but falls as the share of foreign firms in total vacancies increase. Similarly, the bargaining power of workers raises the wages, i.e.

$$\frac{dw_i^L}{d\beta} > 0, \frac{dw_i^L}{d\eta} < 0, \frac{dw_i^L}{d\theta_i} > 0$$

Substituting (58) (62) (64) (67) into (72) and imposing free entry condition for foreign vacancies $V(F) = 0$, we obtain the wage rate from matching of an unskilled

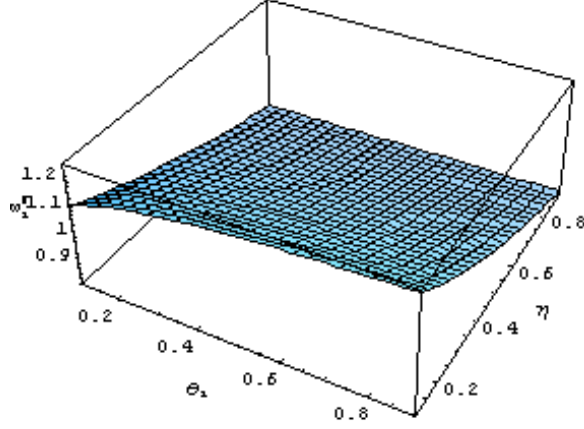


Figure 15: Unskilled workers' wage in the foreign firm

worker with a foreign firm:

$$w_i^F = \varpi_{ib}^F b + \varpi_{iy}^F y_i^F \quad (74)$$

where $\varpi_{ib}^F = \frac{(1-\beta)(r+\delta+\theta_s^{1-\alpha}\eta)}{r+\delta+\theta_s^{1-\alpha}(\eta+\beta-\beta\eta)}$ and $\varpi_{iy}^F = \frac{\beta(r+\delta+\theta_s^{1-\alpha})}{r+\delta+\theta_s^{1-\alpha}(\eta+\beta-\beta\eta)}$ are the weights attached to unemployment benefit and labor productivity, respectively. Unskilled workers' wage in foreign firm depends on the share of local vacancies, η , bargaining power of workers, β , unemployment benefit, b and the flow output of unskilled worker in foreign firm, y_i^F . Figure 15 shows that w_i^F increases as foreign firms provide more job opportunities. Similarly, bargaining power of workers and a rise in the mass of foreign jobs raises wages in the foreign firm whereas an increase in the local vacancies lowers the earnings of the unskilled workers in the foreign firm.

$$\frac{dw_i^F}{d\eta} > 0, \frac{dw_i^F}{d\beta} < 0, \frac{dw_i^F}{dy_i^F} > 0$$

According to equations (71) – (73), the mass of local and foreign vacancies and the productivity of workers have a crucial role in determining the wages of the unskilled workers. Also, the skilled workers wage in the local firm is also determined

by the productivity of workers, yet, the role of the mass of foreign vacancies is negligible. Implicitly, wages of unskilled workers in the local and foreign firms and the earnings of the skilled workers in the local firm are determined by job creation costs, bargaining power of workers, the share of local vacancies in total, but to a different extent. Actually, the behaviour of the unskilled wages in the foreign and local firm does not change if it is compared with the case introduced in Chapter 2. The skill intensity matters in the wages of skilled workers, and this will be reflected to the relative wages, which will be more clear in the numerical example.

The mass of vacancies created by local and foreign firms are determined by the job creation conditions, which are obtained by substituting wage equations given in (71)-(73) into the equilibrium conditions given in (70)-(71):

$$c_L = \frac{(1 - \beta) \theta_s^{-\alpha} \left(\frac{y_s^L - b}{r + \delta + \beta \theta_s^{1-\alpha}} \right) +}{(1 - \beta) (\theta_i)^{-\alpha} \left(\frac{u_i + e_{iF}}{\mu} \right) \frac{y_i^L - b}{r + \delta + \theta_i^{1-\alpha} (1 - \eta + \beta \eta)}} \quad (75)$$

$$c_F = (1 - \beta) (\theta_i)^{-\alpha} \left(\frac{u_i + e_{iL}}{\mu} \right) \left(\frac{y_i^F - b}{r + \delta + \theta_i^{1-\alpha} (\eta + \beta - \beta \eta)} \right) \quad (76)$$

Job creation conditions for foreign and local firms differ according to the costs of creating new jobs and productivities of the workers and this gives rise to equilibrium wage differentials in the presence of labor market frictions. Equations (76) and (77) can be rewritten as two equations with two unknowns, v_F and v_L , since θ_i , θ_s and η are function of v_F and v_L , as are u_i , u_s , e_{iF} , e_{iL} and e_{sL} .

We are able to discuss whether the foreign firm premia for the unskilled workers is greater than one; i.e. whether foreign firm always pay more than local firms for an unskilled labor. This leads to proposition 3.

Proposition 3 *Unskilled workers in the foreign firm are not always paid more than*

unskilled workers in local firm. The firm premium depends on the mass of vacancies created by the firms and the labor productivity.

Proof. Unskilled workers in foreign firms may earn more than that of the local firms, that is, $\frac{w_i^F}{w_i^L} > 1$ depending on the labor market frictions, in terms of posted vacancies, and the productivity of the workers in different firms.

$$\begin{aligned} \frac{(1-\beta)(r+\delta+\theta_i^{1-\alpha}\eta)b+\beta(r+\delta+\theta_i^{1-\alpha})y_i^F}{(r+\delta+\theta_i^{1-\alpha}(\eta+\beta-\beta\eta))} &\geq \frac{(1-\beta)(r+\delta+\theta_i^{1-\alpha}(1-\eta))b+\beta(r+\delta+\theta_i^{1-\alpha})y_i^L}{(r+\delta+\theta_i^{1-\alpha}(1-\eta+\beta\eta))} \\ (1-\beta)\theta_i^{1-\alpha}(2\eta-1)b+(r+\delta+\theta_i^{1-\alpha}(1-\eta+\beta\eta))y_i^F - \\ (r+\delta+\theta_i^{1-\alpha}(\eta+\beta-\beta\eta))y_i^L &\geq 0 \end{aligned}$$

Since $y_i^F > y_i^L$, it is clear that the second term in the above inequality is positive and the sign of the first term is determined by the share of vacancies created by the firms. Clearly, if the productivity gap between foreign and local firms is sufficiently large, foreign firms end up with higher wages even when labor market imperfections are taken into account. ■

As for the unskilled workers, regardless of the skill intensity of the sectors, the wage gap between local and foreign firms depends on the allocation of vacancies created by the firms, which are implicitly determined by the job creation conditions. So, we can argue that wage differentials between foreign and local firms should be explained by labor market imperfections in terms of job creation and also the productivity of workers. Moreover, since we can not analytically show the effect of foreign (local) vacancies on skill and firm premia, the next section provides a

numerical example.

3.3.4 Numerical Example: Low-Tech Foreign Firms

This section presents a numerical example to understand the properties of the model. Numerical example allows us to examine effects of an exogenous increase in the cost of job creation on the extent of foreign firm activity in the local economy, and in turn its effects on absolute and relative wages, and unemployment. It furthermore allows a discussion of the relationship between skill upgrading and technological progress and absolute and relative wages, and unemployment. The example uses the matching function, $q(\theta_i) = \theta_i^{-\alpha}$ and $q(\theta_s) = \theta_s^{-\alpha}$ together with the baseline parameter values given in Chapter 2. Under this choice of parameters, Table 21 presents the baseline solutions.

< Insert Table 21 >

The examination of the baseline solution for the unskill intensive foreign firm- where foreign firm creates job opportunities for the unskilled workers- shows that the share of local vacancies is 59% of the total vacancies. Actually, this means that different skill intensities does not matter in terms of job creation since in the benchmark case of the chapter 2, the share of local vacancies is also 59%. So the skill intensity of the foreign firm does not change the vacancy creation in the local firm. On the other hand, as foreign firms offer more positions for the unskilled workers, the overall unemployment rate decreases. The unemployment rate of unskilled workers

and skilled workers are 10.8% and 0.64%, respectively and the overall unemployment rate is 9%. Unskilled workers get paid less than skilled workers in the local firm as skilled workers are more productive than the unskilled workers. Table 21 shows that the skill premium in the local firm is 1.86.

While these within-group relative values allow for identification of important differences between labor-types and firms, it is important to talk about an overall skill and firm premium. The benchmark findings suggest that economy-wide skill premium is more than the overall firm premium. One should also note that, at these parameter values, we find that the firm premium for the unskilled workers is lower than one, indicating that the wage of unskilled workers in foreign firms is higher than the unskilled workers wage in the local firm. Thus, the benchmark case reveals that regardless of the skill intensity foreign firms pay more than the local firms for the unskilled workers. The main reason behind this is that unskilled workers are more productive in the foreign firm. But, in addition to this, the foreign vacancies constitute the 41% of the total vacancies, and unskilled workers who matched with the foreign firm ask for a higher wage.

< Insert Table 22 >

Table 22 shows the effects of an exogenous decrease in the job creation cost of foreign firms on vacancy creation, relative wages and unemployment rate, keeping the cost incurred by the local firm constant. As the job creation cost of foreign firms' falls, the cost gap between local and foreign firms melt down and this stimulates foreign job creation leading to changes in wages paid by the foreign firm and the local

firm. Skill intensity of the firms does not matter when we consider the unskilled workers' earnings in the local and in the foreign firm. That is, as a response to increased foreign firm presence, unskilled workers wage in the foreign firm increases and unskilled workers wage in the local firm decreases. An increase in the mass of foreign vacancies for unskilled workers decreases the economy-wide skill premium and increases the economy-wide firm premium. The premium of doing a foreign job increases from 0.94 to 1.21, when the foreign job creation costs fall from 0.9 to 0.5.

The mass of vacancies for the unskilled workers in the foreign firm increases the wage gap between skilled and unskilled workers in the local firm. However, if the foreign firm creates job for both types of workers, the wage gap between skilled and unskilled workers in the local firm decreases. Hence, the different skill requirements of the firms have different effects on the skill premium in the local firm.

The results also show supporting evidence for proposition 3. At levels of foreign vacancy job creation cost exceeds 0.7, the foreign firm pays less than the local firm for the unskilled workers, i.e. the firm premium is less than 1 for both unskilled labor. This is reversed when the foreign job creation cost falls to and below 0.7. One should keep in mind that the threshold level we find foreign job creation cost, 0.7, depends on the parameter values.

Panel C in Table 22 shows the effects of an exogenous increase in the share of foreign firm vacancies on unemployment. Increased availability of foreign vacancies decreases the unemployment rate of unskilled workers from 11% to 10% and the unemployment rate of skilled workers remain 6%. Overall unemployment rate decreases from 10% to 8% following the new job opportunities. This result is sugges-

tive that the increased presence of foreign firms could indeed contribute to reducing unemployment rates regardless of the different skill intensities.

< Insert Table 23 >

Table 23 shows the effects of an exogenous decrease in the job creation cost of both foreign and local vacancies. When the job creation costs of foreign and local firms fall by the same absolute amount and the cost gap between local and foreign firms stays same, the share of foreign vacancies in total vacancies does not increase, it even decreases. The share of local vacancies tends to increase leading to a rise in local wages paid to the skilled and unskilled workers and a fall in the wages of the unskilled workers in the foreign firm. Even though economy-wide skill premium increases in response to an increase in the share of local vacancies in total, economy-wide firm premium decreases. Actually, Table 22 and Table 23 justifies that the different reductions in the costs of foreign and local job creation costs have different implications.

If the cost of job creation in local and foreign firms becomes 0.3 and 0.5, respectively, then the share of local vacancies form 65% of the total and thereby, local firms start to pay more than foreign firms. Once again, this is in line with proposition 3 noting that foreign firms do not always pay more as the wage difference between local and foreign firms depends on the job opportunities provided by local and foreign firms, which are extensively determined by the cost of job creation and productivity of workers.

To sum up, it is clear that the numerical example results supports our theoretical

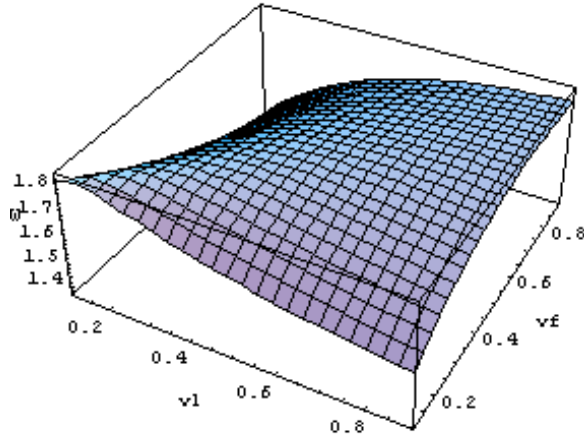


Figure 16: Skill Premium

predictions that the response of the economy-wide skill and firm premium as well as the response of the absolute wages to changes in the extent of labor market imperfections and foreign presence depends on several conditions in the market. Figures 16 and 17 reveal the fact that how the mass of local and foreign vacancies affects the pattern of skill and firm premia.

On the other hand, the pattern of economy-wide skill premium and the economy-wide firm premium differs depending on the sector foreign firms locate. Even though non linear response of economy-wide skill premium and the economy-wide firm premium remains in both high tech and low tech sectors due to the change in the proportion of workers doing local and foreign jobs. If the foreign firm locates in a high tech sector, economy-wide skill premium increases since the job composition shifts towards more productive skilled jobs. However, in a low tech sector economy-wide skill premium decreases as the job composition shifts towards unskilled jobs.

Table 25 presents these elasticities -calculated by the help of the Table 22- with

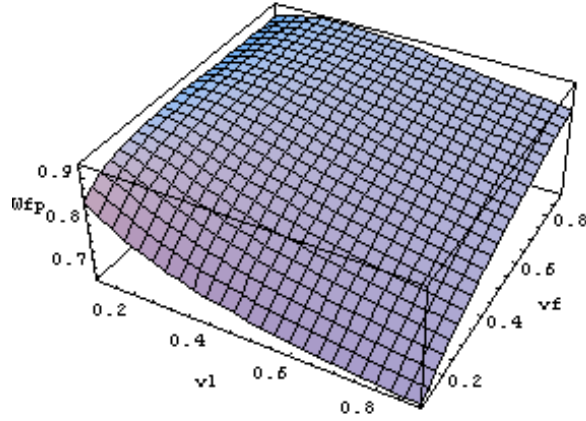


Figure 17: Firm Premium

respect to the cost of foreign job creation²⁸. Signs of the elasticities suggest that increased foreign presence in the economy increases both the skill premium in the local firm and the premium of working in the foreign firm. Increased foreign presence increases the economy-wide skill premium and the firm premium. Wages of the unskilled workers performing local jobs are more sensitive to increased foreign firm presence while the wages of unskilled workers in the foreign firm are not very sensitive. When the foreign and local vacancies are posted for both types of workers, i.e. if both firms have the same skill requirements, the wage gap between skilled and unskilled workers decrease in the local firm. However, if foreign and local firms have different skill requirements, the wage gap between skilled and unskilled workers increase in the local firm.

< Insert Table 25 >

On the other hand, since the productivity gap between local and foreign firms also

²⁸Elasticity is measured by the percentage change in vacancies (wages, unemployment) divided by the percentage change in the cost.

play a crucial role in explaining wage differentials as mentioned in proposition 3, we next analyze the impact of a rise in the output gap between foreign and local firms. As the output gap between foreign and local firms increases, foreign firms start to offer more positions for workers, hence, the share of vacancies posted by foreign firms increase. This leads to a decline in the earnings of the unskilled workers in the local firm and an increase in the unskilled workers wage in the foreign firm and no change in the wages of skilled workers in the local firm (The results are compared to our benchmark case, where the technology gap²⁹ is given as 10%). Panel B in the Table 26 reveals that if the productivity advantage of the foreign firm rises, the premium of working in the foreign firm for unskilled workers increases. This is due to the fact that an increase in the productivity advantage of the foreign firms directly generates an increase in the wages, but also its effect on wages become more powerful since it increases the jobs created by foreign firms.

Panel B in Table 26 reveals that skill intensity of the firms matter since the skill premium in the local firm increases if the foreign firms are unskill intensive whereas the skill premium in the local firm decreases. Note that, regardless of the skill intensity unskilled wages in the foreign firm is greater than that of the local firms once we consider the increasing productivity gap between the foreign and local firms. An increase in the share of foreign vacancies due to the improvement in foreign firm technology puts an upward pressure on the economy-wide firm premium. But, the skill intensity matters since the economy-wide skill premium decrease if the vacancies offered by foreign firms are only for unskilled workers while it increases if both firms

²⁹ y_j^F / y_j^L is technology gap, which is defined as the productivity advantage of the foreign firm.

have different skill requirements.

< Insert Table 26 >

According to Panel C in Table 26, overall unemployment decreases in response to technological progress (technology gap increases from 10% to 25%). This could be explained by the fact that the technological progress facilitates job creation and to this end foreign firms provide new job opportunities. An increased foreign firm presence decreases the overall unemployment rate regardless of the skill intensity.

< Insert Table 27 >

Table 27 re-examines the effects of a fall in the job creation cost of foreign firms on wages and unemployment by assuming the productivity gap between foreign and local firms is sufficiently large ($y_j^F/y_j^L = 2.00$). Similarly, skill intensity matters when we examine the skill premium in the local firm and economy-wide skill premium. Also, an increase in the share of foreign jobs due to the widened production differentials and narrowed cost gap puts an upward pressure on foreign wages while lowering the wages of the workers in the local firm and also putting a upward pressure on economy-wide firm premium.

Table 28 test the sensitivity of the results to the skill endowment parameter. Given the baseline parameter values, we focus on the skill upgrading and the share of skilled workers increase from 20% to 40%, that is, $\mu = 0.6$.

< Insert Table 28 >

When skilled work force constitutes 40% of the total population, the share of local vacancies increase. According to the Panel B in Table 28, skill premium in the local firm decreases and premium of working in the foreign firm decreases due to the skill upgrading when the results are compared to the benchmark case. Also, both the economy-wide skill and firm premium decreases due to the skill upgrading regardless of the skill intensity. Actually, different skill requirements of the firms do not create significant changes in the wage and unemployment patterns.

< Insert Table 29 >

Table 29 examines the effect of a decrease in the cost of foreign job creation when one considers the skill upgrading. Given the share of skilled workers as 40% of the population, foreign firms create new job opportunities in response to a fall in the foreign job creation cost. This leads to a rise in the economy-wide skill premium and firm premium regardless of the skill requirements of the firms. Particularly, the wage gap between foreign and local firms has melt down in response to an increase in the foreign firm presence when both firms have the same skill requirements but the wage gap between foreign and local firms has increased when the foreign firms activities are less skill intensive. Table 27 and Table 29 reveal that impact of a decrease in the cost of foreign job creation on overall relative wages depends on the technology available in the foreign firm and the share of skilled workers in the local labor market, but also on the skill intensity of the firms.

In sum, due to the presence of low-tech foreign firms, the composition of vacancies switch towards unskilled jobs. As the outside option of skilled workers is limited by

the mass of local vacancies, the earnings of the skilled workers follow a different pattern even though they still earn more than the unskilled workers. Earnings of the unskilled workers in the local firm decrease as the foreign firms create more unskilled jobs. Greater the share of foreign vacancies, the more likely the worker is matched with a foreign firm and this raises the outside option of workers and they can ask for a higher wage. The foreign job creation increases in part due to the lowering job creation costs or technological upgrading, thus, they start to pay higher wages to fill the new vacancies. If the local vacancies are scarce, unemployed skilled and unskilled workers matched with the local firm accept lower wages in the local firm not to turn back to unemployment pool.

In this context, increased foreign firm presence in an unskill intensive sector depresses the wages in the local firm and also this widens the wage gap between skilled and unskilled workers in the local firm. Therefore, we conclude that different skill intensities create different labor market outcomes when we compare the findings of this low-tech foreign firms to the figures in high-tech foreign firms.

Table 21: Baseline Solution for Low-Tech Foreign Firms

Benchmark Parameters						
$r = 0.05, \beta = 0.5, \delta = 0.1, b = 0.1, c_L = 0.5, c_F = 0.7$						
$\mu = 0.8, \alpha = 0.5, y_i^F = 1.5, y_s^L = 1.7, y_l^L = 1.3$						
Labor Market: Job Opportunities and Unemployment						
v_L	v_F	η	u	u_i	u_s	
0.32	0.21	0.59	0.089	0.11	0.006	
Wages						
w_i^L	w_s^L	w_i^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_i^F}{\mathbf{w}_i^L}$	W^{sp}	W^{fp}
0.90	1.68	0.94	1.86	1.04	1.83	0.81

Table 22: Decrease in the Job Creation Cost of Foreign Firm and its Labor Market Implications

Panel A: Vacancies							
	vl	vf	η				
$c_L=0.5$							
$c_F=0.9$	0.305	0.129	0.70				
$c_F=0.8$	0.308	0.165	0.65				
$c_F=0.7$	0.324	0.219	0.59				
$c_F=0.6$	0.295	0.272	0.51				
$c_F=0.5$	0.272	0.350	0.43				
Panel B: Wages							
	w_i^L	w_s^L	w_i^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_i^F}{\mathbf{w}_i^L}$	W^{sp}	W^{fp}
$c_F=0.9$	0.94	1.684	0.89	1.77	0.94	1.80	0.77
$c_F=0.8$	0.92	1.684	0.91	1.82	0.99	1.82	0.79
$c_F=0.7$	0.90	1.685	0.94	1.86	1.04	1.83	0.81
$c_F=0.6$	0.86	1.684	0.97	1.93	1.12	1.82	0.84
$c_F=0.5$	0.83	1.682	1.02	2.00	1.22	1.78	0.87
Panel C: Unemployment							
	u	u_i	u_s				
$c_F=0.9$	0.096	0.119	0.0064				
$c_F=0.8$	0.092	0.114	0.0063				
$c_F=0.7$	0.089	0.110	0.0064				
$c_F=0.6$	0.086	0.106	0.0066				
$c_F=0.5$	0.082	0.101	0.0072				

Table 23: Decrease in the Job Creation Cost of Foreign Firm and its Labor Market Implications

Panel A: Vacancies							
	vl	vf	η				
$c_L=0.7; c_F=0.9$	0.21	0.16	0.55				
$c_L=0.5; c_F=0.7$	0.30	0.21	0.59				
$c_L=0.3; c_F=0.5$	0.52	0.26	0.65				
$c_L=0.1; c_F=0.3$	1.28	0.25	0.83				
Panel B: Wages							
	w_i^L	w_s^L	w_i^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_i^F}{\mathbf{w}_i^L}$	W^{sp}	W^{fp}
$c_L=0.7; c_F=0.9$	0.87	1.67	0.95	1.91	1.08	1.83	0.83
$c_L=0.5; c_F=0.7$	0.89	1.68	0.94	1.87	1.05	1.83	0.82
$c_L=0.3; c_F=0.5$	0.94	1.69	0.92	1.79	0.98	1.81	0.79
$c_L=0.1; c_F=0.3$	1.06	1.69	0.85	1.59	0.80	1.64	0.70
Panel C: Unemployment							
	u	u_i	u_s				
$c_L=0.7; c_F=0.9$	0.097	0.12	0.009				
$c_L=0.5; c_F=0.7$	0.089	0.11	0.006				
$c_L=0.3; c_F=0.5$	0.072	0.09	0.003				
$c_L=0.1; c_F=0.3$	0.048	0.06	0.001				

Table 24: Gap Between Job Creation Cost of Foreign and Local Firms and its Labor Market Implications

Panel A: Vacancies							
	vl	vf	η				
$c_L/c_F=1$	1.43	1.84	0.43				
$c_L/c_F=2$	1.53	1.62	0.71				
$c_L/c_F=3$	1.28	0.25	0.83				
Panel B: Wages							
	w_i^L	w_s^L	w_i^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_i^F}{\mathbf{w}_i^L}$	W^{sp}	W^{fp}
$c_L/c_F=1$	0.85	1.696	1.04	1.98	1.22	1.76	0.89
$c_L/c_F=2$	0.99	1.696	0.90	1.71	0.91	1.75	0.76
$c_L/c_F=3$	1.06	1.692	0.85	1.59	0.80	1.64	0.70
Panel C: Unemployment							
	u	u_i	u_s				
$c_L/c_F=1$	0.037	0.047	0.0013				
$c_L/c_F=2$	0.045	0.057	0.0013				
$c_L/c_F=3$	0.053	0.067	0.0015				

Table 25: Cost Elasticity of Vacancies, Wages and Unemployment

Panel A: Vacancies							
	vl	vf		η			
Baseline $c_F = 0.9$							
%11 decrease in c_F	-0.085		-2.49		0.66		
%22 decrease in c_F	-0.002		-2.87		0.72		
%33 decrease in c_F	0.10		-3.32		0.78		
%44 decrease in c_F	0.25		-3.84		0.85		
Panel B: Wages							
	w_i^L	w_i^F	w_s^L	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_i^F}{\mathbf{w}_i^L}$	W^{sp}	W^{fp}
Baseline $c_F = 0.9$							
%11 decrease in c_F	0.22	-0.0005	-0.21	-0.22	-0.44	-0.10	-0.25
%22 decrease in c_F	0.23	0.00	-0.24	-0.24	-0.49	-0.07	-0.27
%33 decrease in c_F	0.25	0.001	-0.27	-0.27	-0.56	-0.03	-0.28
%44 decrease in c_F	0.26	0.002	-0.31	-0.29	-0.64	-0.02	-0.29
Panel C: Unemployment							
	u	u_i		u_s			
Baseline $c_F = 0.9$							
%11 decrease in c_F	0.32		0.33		0.14		
%22 decrease in c_F	0.32		0.33		0.00		
%33 decrease in c_F	0.31		0.34		-0.09		
%44 decrease in c_F	0.30		0.34		-0.28		

Table 26: Technological Upgrading and its impact on the Labor Market

Panel A: Vacancies							
	vl	vf	η				
Baseline technology gap (%10)	0.30	0.21	0.59				
Changes from baseline							
technology gap %25	0.30	0.24	0.54				
technology gap %50	0.28	0.32	0.46				
technology gap %75	0.25	0.39	0.39				
technology gap %100	0.23	0.45	0.33				
Panel B: Wages							
	w_i^L	w_s^L	w_i^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_i^F}{\mathbf{w}_i^L}$	W^{sp}	W^{fp}
Baseline technology gap (%10)	0.89	1.684	0.945	1.87	1.05	1.83	0.82
Changes from Baseline							
technology gap %25	0.88	1.684	1.044	1.90	1.18	1.76	0.90
technology gap %50	0.84	1.683	1.299	1.98	1.53	1.54	1.12
technology gap %75	0.82	1.681	1.575	2.04	1.91	1.31	1.33
technology gap %100	0.80	1.679	1.850	2.09	2.30	1.12	1.54
Panel C: Unemployment							
	u	u_i	u_s				
Baseline technology gap (%10)	0.089	0.110	0.0064				
Changes from Baseline							
technology gap %25	0.086	0.107	0.0065				
technology gap %50	0.083	0.103	0.0070				
technology gap %75	0.080	0.099	0.0077				
technology gap %100	0.080	0.097	0.0085				

Table 27: Decrease in the Job Creation Cost of Foreign Firm and its Impact on Vacancies and Wages (Technological Upgrading)

Panel A: Vacancies							
	vl	vf	η				
$c_L=0.5$							
$c_F=0.9$	0.27	0.34	0.44				
$c_F=0.8$	0.25	0.39	0.38				
$c_F=0.7$	0.23	0.45	0.33				
$c_F=0.6$	0.20	0.52	0.27				
$c_F=0.5$	0.16	0.59	0.22				
Panel B: Wages							
	w_i^L	w_s^L	w_i^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_i^F}{\mathbf{w}_i^L}$	W^{sp}	W^{fp}
$c_L=0.5$							
$c_F=0.9$	0.83	1.68	1.74	2.00	2.07	1.25	1.49
$c_F=0.8$	0.82	1.68	1.79	2.04	2.18	1.18	1.52
$c_F=0.7$	0.80	1.67	1.85	2.09	2.30	1.12	1.54
$c_F=0.6$	0.78	1.67	1.91	2.14	2.44	1.04	1.56
$c_F=0.5$	0.76	1.67	1.98	2.19	2.60	0.97	1.57
Panel C: Unemployment							
$c_L=0.5$							
	u	u_l	u_s				
$c_F=0.9$	0.082	0.101	0.0072				
$c_F=0.8$	0.080	0.099	0.0077				
$c_F=0.7$	0.079	0.097	0.0085				
$c_F=0.6$	0.077	0.094	0.0096				
$c_F=0.5$	0.075	0.092	0.0115				

Table 28: Skill Upgrading and its Impact on Labor Market

Panel A: Vacancies							
	vl	vf		η			
$\mu = 0.6$	0.24	0.15		0.62			
Panel B: Wages							
	w_i^L	w_s^L	w_i^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_i^F}{\mathbf{w}_i^L}$	W^{sp}	W^{fp}
$\mu = 0.6$	0.91	1.66	0.93	1.82	1.02	1.80	0.70
Panel C: Unemployment							
	u	u_i		u_s			
$\mu = 0.6$	0.083	0.10		0.015			
Panel D: Baseline Solution							
Job Opportunities and Unemployment							
	v_L	vf	η	u	u_i	u_s	
$\mu = 0.8$	0.32	0.21	0.59	0.089	0.10	0.006	
Wages							
	w_i^L	w_s^L	w_i^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_s^F}{\mathbf{w}_i^L}$	W^{sp}	W^{fp}
$\mu = 0.8$	0.90	1.68	0.94	1.86	1.04	1.83	0.81

Table 29: Decrease in the Job Creation Cost of Foreign Firm and its Impact on Vacancies and Wages (Skill Upgrading)

Panel A: Vacancies							
	vl	vf	η				
$c_L = 0.5$							
$c_F = 0.9$	0.246	0.09	0.72				
$c_F = 0.8$	0.247	0.11	0.67				
$c_F = 0.7$	0.247	0.15	0.62				
$c_F = 0.6$	0.242	0.19	0.55				
$c_F = 0.5$	0.230	0.25	0.47				
Panel B: Wages							
	w_i^L	w_s^L	w_i^F	$\frac{\mathbf{w}_s^L}{\mathbf{w}_i^L}$	$\frac{\mathbf{w}_i^F}{\mathbf{w}_i^L}$	W^{sp}	W^{fp}
$c_L = 0.5$							
$c_F = 0.9$	0.96	1.662	0.88	1.72	0.92	1.76	0.67
$c_F = 0.8$	0.93	1.663	0.90	1.77	0.96	1.79	0.69
$c_F = 0.7$	0.91	1.663	0.93	1.82	1.02	1.80	0.70
$c_F = 0.6$	0.88	1.662	0.96	1.88	1.09	1.80	0.72
$c_F = 0.5$	0.85	1.661	1.00	1.94	1.17	1.78	0.74
Panel C: Unemployment							
$c_L = 0.5$							
	u	u_l	u_s				
$c_F = 0.9$	0.097	0.118	0.0159				
$c_F = 0.8$	0.093	0.113	0.0156				
$c_F = 0.7$	0.090	0.109	0.0156				
$c_F = 0.6$	0.086	0.104	0.0159				
$c_F = 0.5$	0.083	0.099	0.0167				

3.4 Comparison Across Models

Depending on their activities in the host country, foreign firms create different vacancies for different types of labor. So that one can focus on effects of skill intensive versus unskill intensive sectors on the wages and the unemployment in the local market. A part of the literature believes that FDI is attracted to countries where unskilled labor is cheap, while another strand of the literature notes that foreign firms generally locate in skill intensive sectors. Actually, the sectoral composition of foreign firms is different across countries. In this context, to understand the labor market implications of the foreign firms, one needs to take account the sectoral differences. In the second chapter, we consider the case where firms require both types of workers in the production, but in chapter three, we focus on the corner solutions and try to understand whether the skill intensity matters in studying wages and unemployment or not. On the other hand, rather than the sectoral differences, different technology intensities of the foreign and local firms within the same sector is also considered.

In the high-tech industries, such as computer or auto, foreign firm offers positions only for skilled workers, whereas, in the low-tech industries, such as food and beverages and textiles, they create vacant positions for unskilled workers. For instance, in the most general case, given the benchmark case, the share of foreign vacancies is 0.29, while it was 0.21 and 0.03, in the low-tech and high-tech sectors, respectively. Since the skilled workers constitute the 20% percent of the population, it is

hard to match with a skilled worker for the foreign firms in the skill-intensive sector. When the cost gap between the local and foreign firms has melt down, foreign firms start to open more vacant positions, economy-wide skill premium records a decline in all cases. Also, in all sectors, premium of working in the foreign firm and the economy-wide firm premium increases in response to an increase in the foreign jobs due to the lowering job creation costs. Overall unemployment rates decrease in the all sectors as foreign firms create vacancies, but the impact of increased presence of foreign firms, through foreign job creation, on the unemployment rate of unskilled and skilled workers depends on the fact that at which sector foreign firms locate.

If we consider the case where the decline in job creation costs takes place in both firms, thus, the cost gap between the local and foreign firms stays same, leading to a rise in the share of local vacancies. Within this picture, economy-wide skill premium increases in the most general case and in the high-tech sector, while decreases in the low-tech sector. As for the high-tech sector, the path of economy-wide skill premium follows an ambiguous path. Yet, the response of the economy-wide firm premium is same for all sectors, that is economy-wide firm premium decreases even the mass of foreign vacancies increases since the rise in the mass of local vacancies is greater than the latter which raises the share of local vacancies in total vacancies.

Foreign firms create more jobs due to the technological upgrading. Economy-wide skill premium increase both in the most general case and the high-tech sector, but in the low-tech sectors, economy-wide skill premium decreases. In response to rising presence of foreign firms following the increasing foreign jobs, economy-wide firm premium increases. The overall unemployment rate decreases in all sectors in

response to technological upgrading. On the other hand, skill upgrading decreases the economy-wide skill premium both in the high-tech and low-tech sectors. Economy-wide firm premium increases only in the high-tech sectors and decreases in the low-tech sector and in the most general case.

More intensive use of skilled workers by the foreign firms decreases the wages of the unskilled workers and increases the unemployment rate of unskilled workers, particularly, if the foreign firm has considerable technological advantage. As foreign firms offer positions for only skilled workers as a consequence of an increased specialization in skill intensive production, the vacancies for the unskilled workers will be limited and this will deteriorate the position of unskilled workers both in terms of wages and unemployment. Specifically, if there is skill-biased technological change in the foreign firm which increases the productivity gap between the foreign and local firms, earnings of the unskilled workers decline and the unemployment rate increases. As this leads to a decline in the vacant positions offered by unskilled workers, making tighter labor market for unskilled workers, overall situation of unskilled workers deteriorate. Actually, this is in the same line with the empirical evidence pointing out skill biased technological change emerge as an explanation for declining unskilled wages.

Even though unskill intensive foreign firm presence leads to an increase in the wage gap between skilled and unskilled workers in the local firm, it decreases the wage differential between skilled and unskilled workers in the local firm in Chapter 2, where both firms create vacancies for both type of workers, that is, skill intensity is not considered. As the job opportunities for the skilled workers is limited since

the foreign firm specialized on unskill intensive production in the local economy, increases foreign firm presence has no significant impact on skilled wages in the local firm. Also, results of the numerical example says that skilled workers earn more than unskilled workers in the local firm. However, as the foreign firm presence increases through the vacancy generation, wages of the unskilled workers in the local firm decrease and this leads to a rise in the skill premium in the local firm.

To sum up, the impact of MNEs on absolute and relative wages, but also unemployment, varies between sector and depends on the technology intensity of firms. Allowing different skill requirements reveals that different wage and unemployment effects for both types of workers emerge in response to increased foreign presence. Therefore, the skill intensity plays a key role in studying the labor market implications of the MNEs.

CHAPTER 4

MNEs AND WORKERS' MOBILITY: LABOR MARKET IMPLICATIONS

This chapter considers the diffusion of knowledge that occurs from Multinational Enterprises (MNEs) to domestic firms via worker mobility and to a large extent concentrates on the wage and unemployment implications of this labor mobility in the local labor market.

4.1 Introduction

Many countries attempt to encourage the entry of MNEs by offering substantial fiscal and financial incentives. The main motivation of these policies stems from the belief that advanced technologies introduced by the MNEs may spillover to local firms and increase their productivity. Actually, the existence of spillovers from MNEs to local firms is mainly attributed to the multinational's ownership of firm specific assets implying that they have superior technology and knowledge of marketing and managerial techniques³⁰. In this context, MNEs are considered to be an important

³⁰The existence of an MNE is based on a firm specific advantage (Dunning 1973, Markusen and Venables, 1997).

mechanism for productivity and knowledge diffusion to local markets.

Although the potential positive spillovers arising from the entry of MNEs to host countries draw a considerable amount of attention, the main mechanism that explains the link between the existence of spillovers and the entry of MNEs is not clear. Within this context, an impressive body of empirical evidence has developed around the spillover effects of MNEs and aims to identify the potential channels of spillovers³¹. Empirical work states that there are three main spillover channels: First, vertical spillovers, which are created by the backward and forward linkages, take place between foreign affiliates and local firms (Alfaro and Rodriguez-Clare, 2003; Javorcik, 2003; Lall, 1995; Rodriguez-Clare, 1996; Aitken and Harrison, 1999; Görg and Greenaway, 2004; and Javorcik, 2004). Second, horizontal spillovers arise as a result of imitation, demonstration effects, reverse engineering or competitive pressure exerted by foreign firms (Mansfield and Romeo, 1980; Blömstrom, 1986). Third, spillovers occur through workers' mobility whereby workers working in multinationals join local firms, and take with them all or some part of the technological, marketing, and managerial knowledge that they have acquired in the foreign firms (Fosfuri et al., 2001). Thus, local firms may gain access to the multinational's firm specific knowledge by hiring a former MNE worker with special skills.

In short, labor mobility can serve as a mechanism for a local firm to acquire the externally-developed knowledge. As workers in foreign firms will be exposed, at least partially, to the special assets in MNEs, knowledge diffusion takes place whenever these workers move to the local firms and manage to bring all or some part of the

³¹See the literature surveys on spillovers, Saggi, 2002; Blomström and Kokko, 1998.

knowledge acquired in the foreign firm. The application of this valuable knowledge at local firms may then generate higher productivity. Görg and Greenaway (2001) suggest that the productivity improvement generated by the movement of labor from MNEs to local firms can be realized via two mechanisms. First, a direct spillover to complementary worker is expected, as skilled labor working alongside unskilled labor tends to raise the productivity of the latter. Second, workers that move carry with them knowledge of new technology, new management techniques and consequently can become direct agents of technology transfer. Particularly, when the technology is tacit or embodied in people who develop and use it, it cannot be transferred through passive mechanisms like imitation and reverse engineering or other means and therefore the transfer of workers, formerly employed by foreign firms, could constitute an important channel for spillovers (Lenger and Taymaz, 2006)³².

Consequences of potential labor mobility could damage the firm specific advantages of the multinationals. Hence, they may try to prevent such knowledge diffusion by paying higher wages to the local workers in order to ensure their assets will not be passed to domestic competitors (Fosfuri et al. 2001, Glass and Saggi 2002). Even though an increase in the premium paid by the foreign firms could be indirect evidence of a potential for spillovers through labour mobility³³, premium paid by the foreign firms could be eliminated if the labor turnover and knowledge diffusion raises wages in domestic firms (Aitken et al. 1996; Barry et al. 2001).

³² An extensive literature puts a crucial role on the importance of tacit knowledge in technological activities (see Cowan et al., 2001).

³³ However, many factors (e.g. personal reasons) may imply that, even if foreign firms are able to set wages at an appropriate level, employees would still leave, eventually leading to the generation of spillovers within domestic firms (Martins, 2005).

Furthermore the increased mobility might be dampened not only by the higher wages but also by the existence of binding employment contracts. Many studies model the contracts as a mechanism that deters transmission of knowledge with the aim of protecting the firm specific assets (Ethier and Markusen, 1996; Markusen, 2001; Nicholson, 2002; and Dahl, 2002). For example, clauses in the contracts, health and pension benefits could play a significant role in keeping the workers from changing to a job in a competitor firm and thus carrying the knowledge and prevent the knowledge diffusion (Dahl, 2002)³⁴. Markusen (2001) and Ethier and Markusen (1996) present a model to improve our understanding of how contract enforcement and IPP (Intellectual Property Rights) influence foreign direct investment into host economies, and host-country welfare. They model a firm whose workers learn all the knowledge necessary for production and then decide to move to local firms and to prevent this knowledge diffusion, multinationals offer contracts where existence of binding contracts makes the multinationals better off.

Even though a number of studies have analyzed the spillovers arising from the entry of MNEs, the impact of spillovers- via labor mobility- on the productivity and wages in the host countries has hardly been studied. Particularly, theoretical evidence on spillovers due to the workers' mobility is scarce and far from conclusive. Only few theoretical studies have analyzed productivity transfers via worker mobility. Fosfuri et al. (2001) and Glass and Saggi (2002) develop models of spillovers from multinationals to domestic firms via workers' mobility. They demonstrate that multinationals can pay a wage premium to prevent technology transfer³⁵. Other

³⁴The effects and extent of this type of clauses is still to be investigated in the literature.

³⁵Fosfuri et al. (2001) also state that the MNEs might prefer to export rather than invest to

theoretical models Ethier and Markusen (1996) and Markusen (2001) have analyzed spillovers to foreign markets, although from different perspectives, and they state that productivity transfers arise when workers employed by MNEs move to domestic firms. The recent research on spillovers through labor mobility has provided both theoretical and empirical evidence (Malchow-Møller et al., 2006 and Markusen and Trofimenko, 2007). In both of these studies the effect of foreign experience on wages are documented, yet empirically. This channel for spillovers has been investigated empirically by Gerschenberg (1987), Pack (1993), Görg and Strobl (2005), Martins (2005), Balsvik (2006), Hale and Long (2006), Lenger and Taymaz (2006), Poole (2006), and Pesola (2007). These studies document four fundamental issues:

First, productivity or knowledge spillovers arise via labor mobility. In a study of the Taiwanese economy, Hau and Gee (1993) and Pack (1993) show that labor mobility is the most important channel for technology diffusion. Tsiang and Wu (1985) note that as a result of movement of foreign personnel, technological spillovers occur in Korea, Hong-Kong and Singapore. Lan and Young (1996) and Hale and Long (2006) provide evidence that labor mobility facilitates multinational productivity spillovers in China. Blomström and Persson (1983) state that foreign experience in multinationals play a crucial role in productivity spillovers for Mexico. Lenger and Taymaz (2006) examine the horizontal, vertical and labor spillover in Turkish manufacturing industries and labor turnover is found to be the main channel of spillovers. Poole (2006) investigates multinational spillovers resulting from worker mobility and finds evidence that positive spillovers exist through worker mobility in Brazil by avoid diffusion of superior technology to the local firms or to prevent paying higher wages.

ing a novel matched establishment-worker database³⁶. Martins (2005) seeks to assess the magnitude of productivity spillovers that arise from movement of workers from foreign owned to domestic firms in Portugal and results indicate that there is some evidence that labour mobility is a source of knowledge transfer.

Second, workers learn from watching (working with) foreign workers with a resulting increase in their productivity, or, in other words, workers who have a foreign firm experience have a productivity advantage. Markusen and Trofimenko (2007) assume that working with foreign experts is an alternative to studying as a means of obtaining skills. They state that the use of foreign experts allows the accumulation of skills at a lower cost and faster than if they were self-learnt at home. Balsvik (2006) finds that workers who move from multinational to purely domestically owned firms have a positive effect on total factor productivity in Norway. The findings are consistent with mobility being a channel for knowledge diffusion and note that these transit workers contribute 20% more to productivity than workers without experience from MNEs. Hale and Long (2006) find evidence that the percentage of managers with experience in the foreign firm is positively associated with the firm's total factor productivity by using a sample of 1500 firms in China. Görg and Strobl (2005) focus on the owners of domestic firms who were previously employed in multinationals and investigate whether domestic firms which have entrepreneurs with foreign experience have a productivity advantage compared to other firms by using a detailed firm-level data from a sample of 204 Ghanaian manufacturing firms. Their results suggest that

³⁶The main results suggest that the magnitude of wage spillovers from multinational establishments depends on the sector under consideration.

firms whose owners have foreign experience are more productive than similar domestic firms in the same industry, while firms whose owners worked in MNEs in different industries have no productivity advantage. Poole (2006) shows that former multinational establishment workers are better able to convey information and suggests incumbent production workers learn from former multinational managers. The results are robust to various model specifications, including worker and establishment fixed effects.

Third, foreign firms pay a wage premium. Gerschenberg (1987) analyzes MNEs' activity in Kenya with a survey of 72 top- and middle-level manager from 41 manufacturing firms and concludes that mobility is lower for managers employed by MNEs than for those employed by local firms. He attributes this to the wage premium paid by the MNEs. Yet, Gerschenberg (1987) also notes that the dissemination of managerial know-how is low in Kenya. Malchow-Møller et al. (2006) state that wages in foreign firms are still greater than in domestic firms when controlling for firm size. Also, they find evidence on a significant wage premium for working in a foreign firm by using data on individual Danish workers with firm-level information about size, foreign ownership, and industry.

Fourth, foreign experience is valued in local firms. That is, workers who have experience in multinationals earn more than their colleagues in local firms. This is consistent with the view that these workers gain general skills in foreign firms that are applied in the local firms. Using a matched firm and worker level dataset for Ghanaian manufacturing firms, Görg, Strobl and Walsh (2002) find that workers who are employed by foreign firms experience more rapid wage growth than workers in

domestic firms. Malchow-Møller et al. (2006) provide evidence on the characteristics of the learning processes as well as the degree of transferability of the foreign technology by using data on individual Danish workers with firm-level information about size, foreign ownership, and industry. They find that working for a foreign owned firm significantly increases the worker's wage. So that, current wages are higher for workers previously employed in foreign firms, which is consistent with their theoretical assumption that at least part of a worker's learning in foreign firms can be carried to other firms. Markusen and Trofimenko (2007) develop a dynamic model in which knowledge is transmitted when the workers with foreign experience visit the local firms. Specifically, they demonstrate that workers with foreign experience have substantial positive effects on the wages of domestic workers by using fixed effects and nearest neighbour matching estimators on a panel of plant-level data for Colombia. They find that the use of workers with foreign experience raises wages of unskilled and skilled workers by 5 and 6 percent respectively. For Portugal, Martins (2005) finds that workers that are hired from foreign firms are paid more than similar workers without such prior foreign experience, but that workers suffer sizeable pay cuts when moving from foreign to domestic firms. For Norwegian manufacturing firms, Balsvik (2006) documents the extent of labor mobility from multinationals to local domestic firms (non-MNEs) and finds that workers with experience in multinational firms also earn higher wages than their co-workers. Numerically, in 2000 almost 50% of the non-MNE workers had previous experience from MNEs. These workers earn a wage premium of more than 3% compared to their new colleagues in the non-MNEs. Pesola (2007) shows that prior experience in foreign owned firms has a positive effect

on earnings of the workers by using Finnish linked employer-employee panel data. Findings are consistent with models of knowledge diffusion through labour mobility, where a domestic firm may bid for a worker at a foreign owned firm in order to gain access to her knowledge. Moreover, Pesola (2007) notes that if workers with experience at foreign owned firms have accumulated valuable knowledge, this may show up in not only wages but also in other labor market outcomes, such as employment probabilities.

Within this framework, the main purpose of this study is to develop some answers regarding the functioning of labor markets in response to the knowledge transmission through workers' mobility. What is the impact of increased labor mobility on the foreign and local wages? What will be the response of unemployment rate when the mobility of workers from foreign to local firms is permitted? What will be the role of technological progress in studying labor market implications of labor mobility?

In this context, it is important to analyse what the employment and wage implications of this knowledge transmission are via worker mobility. The extent of labor mobility will be modeled via the flexibility of binding contracts. As was discussed above, existence of binding contracts could be used as a way of preventing labor mobility, therefore knowledge diffusion. This model considers the restricted access of foreign workers to the local labor market due to the enforcement of contracts³⁷. The effect of labor mobility on wages and unemployment is studied by using a search model where the job to job mobility is allowed for workers, and contract restrictions may be given in the side of foreign firms. Nevertheless, restrictive contracts are also

³⁷Foreign workers means workers employed in foreign firms.

provided by the local firms which is also modelled in this study. In the first step, we examine the case with the contract restrictions in the foreign firm just to solve the model explicitly.

Firms post vacancies at a fixed cost and workers search for the positions offered by local and foreign firms. With a Nash bargaining approach wages are determined and together with the equilibrium conditions, it is convenient to examine the relationship between worker and job characteristics, labor mobility, wages, and unemployment.

This framework allows for a knowledge spillover analysis that differs from the previous papers in three important ways. First, this study allows us to study the absolute and relative wages. Secondly, in contrast to the literature on labor mobility, this study makes it possible to examine the effect of labor mobility— through the channel of binding contracts— on unemployment. Together with this, it is also possible to explore the labor market implications of labor mobility under technological upgrading. Actually, no study up to date, to the best of our knowledge, has attempted to determine theoretically the absolute and relative wages and unemployment by considering the potential extent of labor mobility from foreign to local firms.

The rest of this chapter is organized as follows. Section 2 presents the model, analyzes the equilibrium outcomes and discusses the results obtained. Section 3 displays the numerical example and the next section concludes.

4.2 The Model

Workers could be a source of spillovers if they acquire superior knowledge at a foreign owned firm and bring this knowledge with them to benefit the local firm when they change jobs. However, MNEs may prevent the knowledge diffusion not to lose their firm specific advantage by offering restrictive employment contracts. Thus, existence of such contracts acts as a proxy for labor mobility. This section develops a search model where the job-to-job movements are allowed for workers. Within this context, to draw a complete picture on the workers' mobility, a search model with a matching process is provided.

Consider a continuous time model in which workers are infinitely lived and risk neutral. The measure of workers is normalized to one. There are two types of jobs: local (L) and foreign jobs (F). Let y^i denote the flow output of a job of type i ($= L, F$). Foreign firms are more productive than local firms, which is widely accepted in the literature as foreign firms act as a source of new technology, production process, managerial technique or a new organizational form (Dunning, 1993; Caves, 1996; Doms and Jensen, 1998 and Conyon et al., 2002).

$$y^F > y^L$$

Job destruction is exogenous at rate δ ³⁸. During unemployment workers receive an unemployment benefit b . Denoting the costs of job creation in the local and foreign firms as c_L and c_F , respectively, we assume $c_F > c_L$.³⁹

The mobility from foreign to local workers is restricted by the parameter g , which measures the existence of a restrictive employment contract that deters workers from

³⁸This study could be extended by allowing for endogenous job destruction rate.

³⁹For more information on costs, see Chapter 2. Note that this assumption is relaxed in the numerical example.

moving to local firms, where $g \in [0, 1]$. If employment contracts are binding, $g = 0$, on the other hand if contracts are not binding, $g = 1$. The main interpretation is that if the contracts are binding, it is difficult for foreign workers to switch into local jobs and this leads to lower mobility for foreign workers. Thus, there will be less workers having an experience in the foreign firm. Therefore, the probability of being informed about the technology in the foreign firm will be low in the local firm. Within this framework, it is convenient to assume existence of binding contracts as a proxy for labor mobility, which determines the flow of information between firms. This is due to the fact that in order to gain access to advanced knowledge in the multinationals, workers should have experience in multinationals or work with former MNE workers.

Actually, employment contracts control the mobility of workers, particularly, they are designed to deter workers from moving and taking information with them⁴⁰. Non-portable pension contribution plans and employer provided health insurance coverage reduce worker's incentive to move between jobs (Adnett et al., 2004). In addition, clauses in the contracts of the workers could keep the workers from changing jobs and prevent the knowledge diffusion (Dahl, 2002). Firms try to prevent labor mobility in some circumstances since innovative ideas can hardly be protected, particularly when they are at the development stage (Carnoy et al., 1997; Saxenian, 1994; Hyde, 2000; and Gilson, 2000). The threat of competition due to the information leakage makes firms to avoid labor mobility (Anton and Yao, 1994; Baccara and Razin, 2004 and Gaston and Nelson, 2002). For example, MNEs are subject to the exit threat from

⁴⁰The issue of enforceability of contracts is a common feature of labor markets (Adnett et al., 2004).

their workers hence they put a great effort to design contracts that deter workers from moving to protect their technological advantage over local firms (Markusen, 2001; and Ethier and Markusen, 1996).

The probability of being in the informed state⁴¹ for the local worker is denoted by α , where $\alpha \in [0, 1]$. This depends on the existence of enforcing contracts in the foreign firm, g . If the contracts are binding, the labor mobility will be limited, hence the probability of being informed will be low since there will be less interaction between former foreign firm workers and local workers. Shortly, as it is empirically supported, workers get access to valuable knowledge on the job and the knowledge diffusion occurs when the former MNE workers join local firms. Hence, greater the mobility from foreign to local firms, that is, more flexible contracts, the higher the probability of being in the informed state.

The link between α and g could be formalized as follows⁴²:

$$\alpha = 0 \text{ if } g = 0 \text{ and } 0 < \alpha < 1 \text{ if } g = 1 \text{ and } \alpha'(g) > 0 \quad (77)$$

4.2.1 Matching

Suppose that, the total number of matches between a worker and a firm is determined by a constant returns to scale matching function:

$$q[v_L + v_F, u + e_L + e_F] = (u + e_L + e_F)^p (v_L + v_F)^{1-p}$$

where v_L denotes the mass of local vacancies and v_F is the mass of foreign vacancies;

⁴¹Informed state means the worker is aware of the technology in the foreign firm.

⁴²The first derivative of α with respect to g is positive.

u is the mass of unemployed workers; e_L stands for the number of workers performing local jobs, e_F is the number of workers in the foreign firm; and p corresponds to the elasticity of matching with respect to the mass of job seekers. It is assumed that $q[.,.]$ is strictly increasing in both arguments and θ denotes the labour market tightness, $\theta = \frac{v_L + v_F}{u + e_L + e_F}$. Accordingly, the rate at which firms meet a job-seeker is equal to $q(\theta) = q(1, \frac{1}{\theta})$; similarly, workers may meet a job at rate, $\theta q(\theta) = q(\theta, 1)$. The properties of the matching function imply that the matching rate of workers (firms) is increasing (decreasing) in θ . To define the matching rates of workers, it is also convenient to define a variable $\eta \left(\eta = \frac{v_L}{v_L + v_F} \right)$, which represents the share of local vacancies in total vacancies.

The transmission of knowledge occurs through interactions between individual workers; more precisely, between workers who have an experience in the foreign firm and the local workers who have no experience. Local workers learn from former foreign firms' managers or technicians and become informed about the technology available in the foreign firm. The greater the labor turnover from foreign firm to local firm, the greater the number of possible individual interactions in the local firm and the greater the potential transfer of knowledge (Glass and Saggi, 2002; Ethier and Markusen, 1996; Fosfuri et al., 2001; Markusen, 2001; Markusen and Trofimenko, 2007; and Poole, 2006).

Depending on the transmission of knowledge through worker mobility, it is expected that workers who have an experience in the foreign firm or have a interactions with former foreign firm workers, thus who are informed, will be more productive and earn higher wages (Görg et al., 2002; Malchow-Møller et al., 2006; Markusen

and Trofimenko, 2007; Martins, 2005; Balsvik, 2006; and Pesola, 2007).

The variables u , e_L and e_F should satisfy the appropriate flow conditions:

$$\theta^{1-p}u = \delta(1 - u) \quad (78)$$

where a flow θ^{1-p} of unemployed workers find employment in firms, which equals the flow of workers into unemployment due to the job destruction, $\delta(1 - u)$.

$$(\theta^{1-p}\eta)u + (\theta^{1-p}\eta g)e_F = (\delta + \theta^{1-p}(1 - \eta))e_L \quad (79)$$

As on-the-job-search is allowed for both workers in the local and foreign firms, we have equations for local and foreign firms stating that in the steady state the flow of workers into local firm, $(\theta^{1-p}\eta)u + (\theta^{1-p}\eta g)e_F$, is equal to the flow of workers out of local firm, $(\delta + \theta^{1-p}(1 - \eta))e_L$. The flow $\theta^{1-p}(1 - \eta)(u + e_L)$ of employed workers into the foreign firm equals the flow out of foreign firm, $(\delta + \theta^{1-p}\eta g)e_F$, where g , existence of restrictive contracts, determines the extent of labor mobility.

$$\theta^{1-p}(1 - \eta)(u + e_L) = (\delta + \theta^{1-p}\eta g)e_F \quad (80)$$

Lets consider the problem of workers. The value of unemployment and the value of being employed in local and foreign firms, respectively, are given as follows:

$$rU = b + \theta^{1-p}\eta(W_L - U) + \theta^{1-p}(1 - \eta)(W_F - U) \quad (81)$$

where unemployed workers have the unemployment benefit and the second and the third terms capture the fact that they may have an employment opportunity in local and foreign firms, respectively.

$$rW_L = \alpha(g)(w^F + \epsilon(g)) + (1 - \alpha(g))w^L + \delta(U - W_L) + \theta^{1-p}(1 - \eta)(W_F - W_L) \quad (82)$$

The value of employment in local firm incorporates the assumption that wages

for the workers who have the knowledge of the foreign firm is $w^F + \epsilon(g)$, where the workers, who have no access to available knowledge, earn w^L . Actually, to encourage workers to be in the informed state, the premium at the amount $\epsilon(g)$ is paid, which depends on the restrictions on labor mobility through g ⁴³. The third term refers to the value of job destruction and the fourth term is the value of being successful on-the-job-search.

$$rW_F = w^F + \delta(U - W_F) + \theta^{1-p}\eta g(W_L - W_F) \quad (83)$$

where w^F is the wages in the foreign firm and the second term stands for the value of job destruction and the third term considers the fact that the MNE may prevent the diffusion of knowledge by limiting the labor mobility via enforcement of contracts.

Lets consider the problem of firms. The value of employing a worker for a local firm is J_L and for a foreign firm J_F . Let V_L and V_F be the value of a job when looking for a worker, that is, the value of a vacancy. These values satisfy the following equations:

$$rJ_L = \alpha(g)(y^F - w^F - \epsilon(g)) + (1 - \alpha(g))(y^L - w^L) + (\delta + \theta^{1-p}(1 - \eta))(V_L - J_L) \quad (84)$$

where the first term denotes the benefit to the firm of working with informed worker and second term is the value of working with an uninformed worker. This reveals the fact that the movement of foreign to local jobs— the existence of restrictive contract— have a key role in the value of employment in the local firm.

$$rJ_F = y^F - w^F + (\delta + \theta^{1-p}\eta g)(V_F - J_F) \quad (85)$$

⁴³Note that $\epsilon(g) > 0$. That is, if the restrictions on contracts are binding, local firms have to pay more to attract workers. But, the numerical example is also provided for the case where $\epsilon(g) < 0$.

where the value of employing a worker is $y^F - w^F$ and the third term stands for the job destruction and considers the situation if workers leave the firm to join local firms, which is extensively determined by g . Thus, the extent of potential labor mobility denoted by g plays a crucial role in the value of employment in the foreign firm.

$$rV_L = -c_L + \theta^{-p} \frac{(\theta^{1-p}g + \delta)(\theta^{1-p}(1 - \eta) + \delta)}{(\theta^{1-p}g + \delta)(\theta^{1-p} + \theta^{1-p}(-1 + g)\eta + \delta)} (J_L - V_L) \quad (86)$$

$$rV_F = -c_F + \theta^{-p} \frac{(\theta^{1-p}g\eta + \delta)}{(\theta^{1-p} + \theta^{1-p}(-1 + g)\eta + \delta)} (J_F - V_F) \quad (87)$$

The values of vacant jobs depend on the job creation costs, c_L and c_F , labor market tightness, θ , job destruction rate, δ , and the existence of binding contracts, g , and the value of employing a worker, J_i , where $i = L, F$.

Wages. The wage is chosen so as to split the total surplus in some proportion between the firm and the worker, the generalized Nash bargaining solution, where S_i be the total surplus, given as:

$$S_i = W_i + J_i - V_i - U \text{ where } i = L, F \quad (88)$$

Then, it is convenient to assume that wage is chosen so that the surplus of a match, S_i , between a job of type i ($= L, F$) is given as nonnegative, that is,

$$W_i + J_i \geq V_i + U$$

When a match is formed, the wages are determined by linear sharing rule

$$W_i - U = \beta [W_i + J_i - V_i - U] \quad (89)$$

where $\beta \in (0, 1)$ is the exogenous surplus share of workers.

Substituting (80), (81), (83), (85) into (88) and imposing the free-entry condition

for local vacancies, $V(L) = 0$, we obtain the uninformed workers wage rate from the matching of a worker with a local firm:

$$w^L = \frac{\varpi_{y^L}^L(\alpha y^F + (1 - \alpha)y^L) + b\varpi_b^L - (w^F + \epsilon)\varpi_{w^F}^L}{(1 - \alpha)(r + s + \theta^{1-p}(1 - \eta + \beta\eta))} \quad (90)$$

where $\varpi_b^L = (1 - \beta)(r + s + \theta^{1-p}(1 - \eta))$, $\varpi_{y^L}^L = \beta(r + s + \theta^{1-p})$ and $\varpi_{w^F}^L = \alpha(r + s + \theta^{1-p}(1 - \eta + \beta\eta))$. Uninformed workers wage in the local firm depends on the bargaining power of workers, β , unemployment benefit, b , the mass of local and foreign vacancies, which is captured by the labor market tightness, θ , and the share of local vacancies in total vacancies, η , the weighted average of the productivity of informed and uninformed workers, the wages of informed workers in the local firm, and the existence of binding contracts.

The average wage level in the local firm is also denoted by $\bar{w}^L$

$$\bar{w}^L = (1 - \alpha)w^L + \alpha(w^F + \epsilon) = \frac{\varpi_{y^L}^L(\alpha y^F + (1 - \alpha)y^L) + b\varpi_b^L}{(r + s + \theta^{1-p}(1 - \eta + \beta\eta))} \quad (91)$$

Wages in the local firm depends on whether the worker is in the informed state or not. Particularly, wage in the local firm is a function of the bargaining power of workers, the mass of local and foreign vacancies, weighted average of productivity of informed and uninformed workers, unemployment benefit and the existence of binding contracts. Note that, the weights are implicitly function of costs of job creation which are captured in the term η , the share of local vacancies in total, and the productivity of the workers.

Substituting (80), (82), (84), (86) into (88) and imposing the free-entry condition for foreign vacancies, $V(F) = 0$, we obtain the wage rate from the matching of a worker with a foreign firm:

$$w^F = \frac{\varpi_{w\&b}^F + \varpi_{y^F}^F y^F}{A} \quad (92)$$

$$\begin{aligned} \text{where } A &= \frac{1-\beta}{\theta^{1-p}(1-\eta)+r+s} + \frac{\beta}{\theta^{1-p}\eta g+r+s} - \frac{\theta^{1-p}\eta\alpha(1-\beta)}{(\theta^{1-p}+r+s)(\theta^{1-p}(1-\eta)+r+s)} - \\ &\quad \frac{\theta^{1-p}\eta g(-1+\beta)(-1+\alpha)}{(\theta^{1-p}(1-\eta)+r+s)(\theta^{1-p}+\theta^{1-p}(-1+g)\eta+r+s)} \\ \text{and } \varpi_{w\&b}^F &= \frac{b(1-\beta)}{\theta^{1-p}(1-\eta)+r+s} + \frac{\theta^{1-p}\eta(-1+\beta)(b+wl(-1+\alpha)-\alpha\epsilon)}{(\theta^{1-p}+r+s)(\theta^{1-p}(1-\eta)+r+s)} - \\ &\quad \frac{\theta^{1-p}\eta g(-1+\beta)(wl(-1+\alpha)-\alpha\epsilon)}{(\theta^{1-p}(1-\eta)+r+s)(\theta^{1-p}+\theta^{1-p}(-1+g)\eta+r+s)}, \\ \varpi_{y^F}^F &= \frac{\beta}{\theta^{1-p}\eta g+r+s} \end{aligned}$$

Similarly, wages in the foreign firm are also determined by the bargaining power of workers, the mass of local and foreign vacancies, unemployment benefit, potential labor mobility via the existence of binding contracts and the productivity of informed worker.

In summary, wages of the workers in the local and foreign firms, equations (89)-(91), are mainly the weighted average of the worker's reservation value (or unemployment benefit), b , which is treated as a constant and the productivity in the current match. To understand the overall story behind the wage determination and to realize the effect of the labor mobility on wages, the corresponding weights for wages $\left(\varpi_{y^L}^L, \varpi_b^L, \varpi_{w\&b}^F, \varpi_{y^F}^F\right)$ should be examined. Most importantly, the mass of vacant positions offered by local and foreign firms, bargaining power of workers, labor mobility from foreign to local jobs through the existence of binding contracts, unemployment benefit, the productivity of workers play a key role in explaining wages. Also, wage differentials arise since we assumed an asymmetric technology— the output from a match between a worker and a local job is not the same as the output that would result from a match between a worker and a foreign job. Furthermore, the extent of labor mobility is restricted by the value of g and the job creation costs

also play an important role in the wage gap between workers in the local and foreign firms through their effect on vacancy creation. However, wages for the uninformed worker and wages in the foreign firm are jointly determined. In this context, it is hard to derive analytical solution and to provide comparative statics for these wages. Therefore, we will provide a numerical example. But, it is convenient to understand the average wages in the local firm and to examine the gap between foreign and local firms.

Proposition 4 *Workers in the foreign firm are not always paid more than workers in local firm. The firm premium depends on the mass of vacancies created by the firms, the labor productivity, **the extent of labor mobility**.*

Proof. Workers in foreign firms may earn more than that of the local firms, that is, $\frac{w^F}{\bar{w}^L} > 1$ depending on the labor market frictions, in terms of posted vacancies, and the productivity of the workers in different firms and the existence of binding contracts.

$$(y^F - b)(1 - \eta + \beta\eta) + (y^F - y^L)(1 - \alpha)\beta(r + s) \gtrless \alpha\beta((y^L - b) + \alpha(y^F - y^L))(\beta + g\eta(1 - \beta))$$

Since $y^F > y^L$ and $y^F > b$ and $y^L > b$ it is clear that both sides of the inequality are positive. Clearly, if the productivity gap between foreign and local firms is sufficiently large, foreign firms end up with higher wages even when labor market imperfections are taken into account. Nevertheless, the contract enforcement, a resulting potential labor mobility, and the flow of information from foreign to local jobs add a different flavor to the discussion of the wage gap between foreign and

local wages. Since the analytical solution does provide ambiguous results, numerical solution is needed.

■

4.2.2 Equilibrium

Equilibrium is determined by two job creation conditions and flow conditions given by equations (77) and (79). Given exogenous variables that capture the productivity of labor (y^i), the bargaining power of workers and elasticity of matching with respect to the mass of job seekers (β , p), the job destruction rate (δ) and job creation cost (c_L , c_F), the measure of existence of a restrictive employment contracts (g) and the interest rate (r), we will solve for the mass of vacancies, v_L and v_F ; wages, i.e. w^L , w^F and $\epsilon(g)$; the labor market tightness θ ; and unemployment rate; u .

We can solve for the unemployment rate u , as a function of labor market tightness (θ) and the job destruction rate δ by the help of equations (77) and (78), which gives,

$$u = \frac{\delta}{\delta + \theta^{1-p}} \quad (93)$$

where the unemployment is positively related with the job destruction rate and negatively with the labor market tightness. In other words, as the local and foreign firms offer more positions for job seekers, the unemployment rate will be lower.

Since equilibrium requires that $V_L = 0$ and $V_F = 0$, equations (85) and (86) could be written as follows

$$\frac{c_L}{\theta^{-p}} = E \left(\frac{\alpha(g) (y^F - w^F - \epsilon(g)) + (1 - \alpha(g)) (y^L - w^L)}{r + \delta + \theta^{1-p} (1 - \eta)} \right) \quad (94)$$

$$\frac{c_F}{\theta^{-p}} = F \left(\frac{y^F - w^F}{r + \delta + \theta^{1-p}\eta g} \right) \quad (95)$$

where $E = \frac{(\theta^{1-p}g+\delta)(\theta^{1-p}(1-\eta)+\delta)}{(\theta^{1-p}g+\delta)(\theta^{1-p}+\theta^{1-p}(-1+g)\eta+\delta)}$ and $F = \frac{(\theta^{1-p}g\eta+\delta)}{(\theta^{1-p}+\theta^{1-p}(-1+g)k+\delta)}$ denoting the workers who matched with the local and foreign firms, respectively. The total amount of vacancies is determined by these conditions given above, which are defined as job creation conditions. These conditions equate the benefit to the firm of filling vacant positions with the suitable candidate and the cost of opening vacancies. In other words, both equations relate the expected cost of a posted vacancy to the expected benefit of a filled job. For instance, if the left hand side of either equation is smaller than the right hand side, then entry to labor market by opening a vacant position is profitable, so that the number of vacancies posted increases. This leads to a rise in the labor market tightness of the workers until the benefits of job creation are consumed.

4.3 Numerical Example

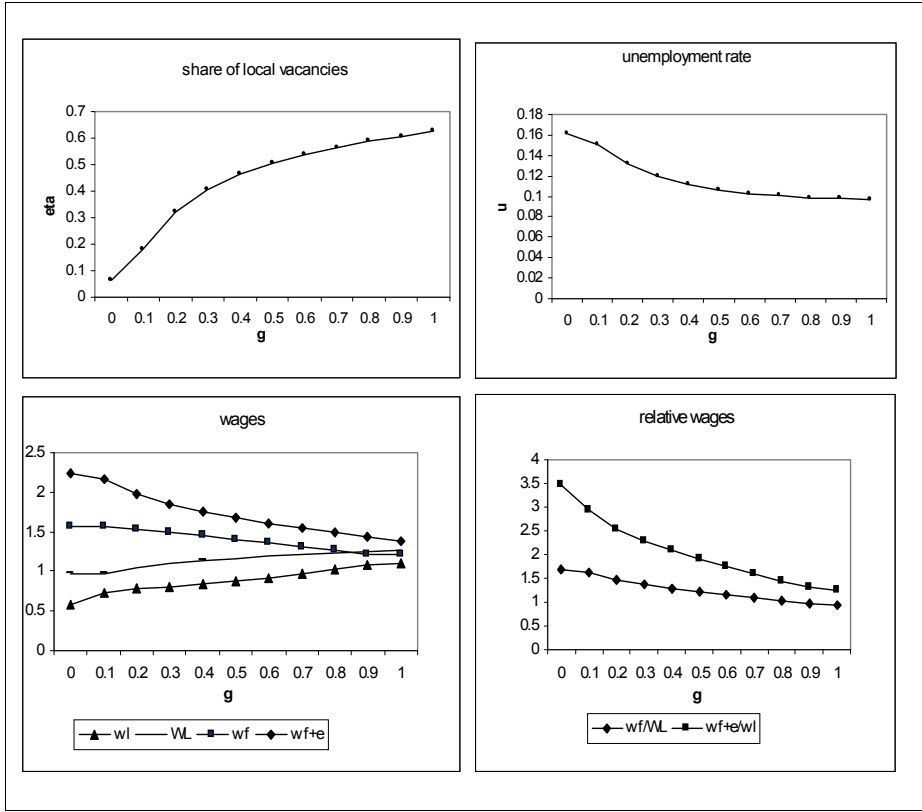
This section provides a numerical example to illustrate the properties of the model. Numerical example allows us to capture effects of a different degree of contract enforcement, that is, labor mobility, on the job creation conditions, wages and unemployment in the local economy. It furthermore allows a discussion of the relationship between technological progress and wages, and unemployment by allowing different degrees of labor mobility through the enforcement of contracts. The example uses the matching function, $q(\theta) = \theta^{-p}$ together with the baseline parameter

values, $r = 0.05$, $\beta = 0.5$, $\delta = 0.1$, $b = 0.1$, $p = 0.5$, $c_L = 0.5$, $c_F = 0.7$, $y^F = 1.9$, $y^L = 1.7$. All these parameter values are reasonable and in line with the other studies including Albrecht and Vroman (2002), Gautier (2002) and Dolado et al. (2003)⁴⁴. Moreover, we assume that $\alpha(g) = \varphi g^{1/2}$ and $\epsilon(g) = \varphi(\frac{1}{g})^{1/2}$, where $0 < \varphi < 1$. In the baseline example, the productivity gap between foreign and local firms, $\frac{y^F}{y^L}$ is assumed to be 10%. The interest rate is 5 percent and job destruction rate is 0.1. It seems reasonable to assume that foreign jobs are more costly to create than local jobs, where $c_L = 0.5$ and $c_F = 0.7$ (Carlson et al., 2006; Faggio and Koning, 2001; Fonseca, 2001; Hammermesh, 1993; Russo et al., 2005; and Vanhala, 2004). The unemployment benefit level is set at 0.1. Under this choice of parameters, Figure 18 presents the baseline solutions. But, robustness check is also available by considering different functional forms of $\alpha(g)$ and $\epsilon(g)$, yet there is no considerable change in the results when we try different functional forms.

Figure 18 presents the share of local vacancies in total vacancies, wages and unemployment rate. Baseline solution says that the share of local vacancies increase as labor becomes more mobile, where the contracts become less binding. The local firm offers more positions to gain access to firm specific knowledge since less binding contracts allows workers to move freely between jobs. Increased mobility of workers leads to a fall in the unemployment rate, approaching to 8%. This is due to the fact that firms offer more positions, thus, labor market becomes more flexible, as the contracts are less binding. On the other hand, when the workers are perfectly mobile,

⁴⁴Numerical simulation results- given these parameter values- point out data relative wages are in the same line with the real data (Blasvik, 2006; Malchow-Møller et al., 2006; Markusen and Trofimenko, 2007).

Figure 18: Labor Market: Job Opportunities, Unemployment and Wages, $c_L = 0.5$, $c_F = 0.7$

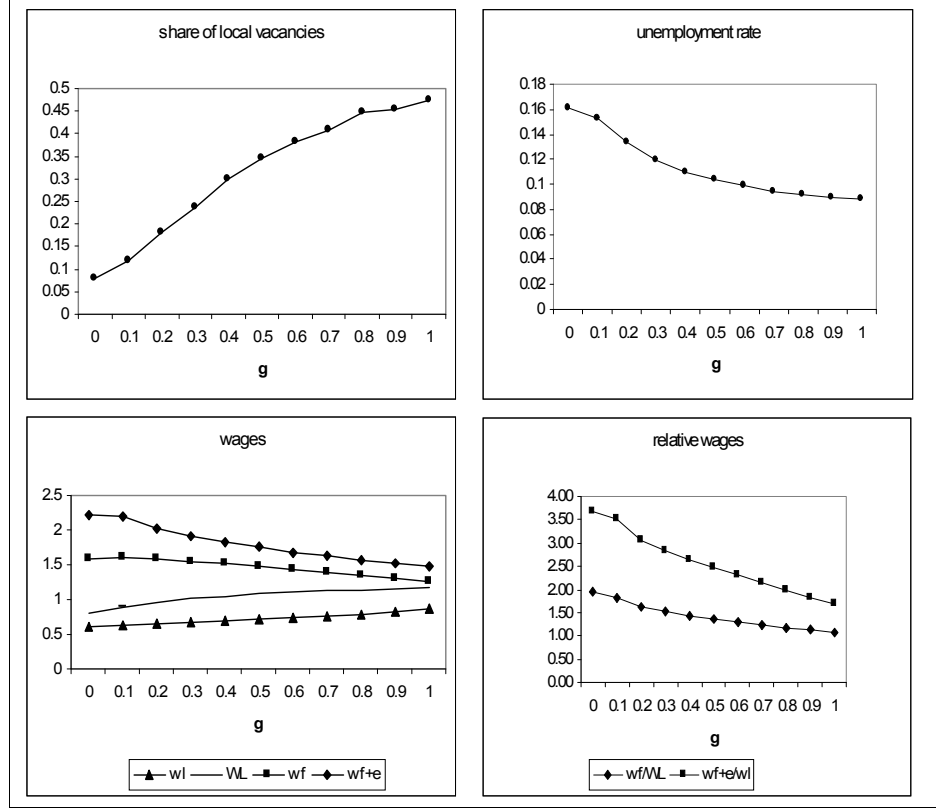


the firm premium, $\frac{w^F}{\bar{w}^L}$, and skill premium, $\frac{w^F + \epsilon}{w^L}$ decrease from 1.6 to 1 to and 3.5 to 2, respectively. In contrast, as contracts become more binding, as g approaches to 0, that is labor turnover from foreign to local is restricted, local firm creates less vacancies. In this case, unemployment will be high, close to 16%, the wage gap between foreign and local firms, $\frac{w^F}{\bar{w}^L}$, increases to 1.9 and relative wages- or skill premium, in the local firm, $\frac{w^F + \epsilon}{w^L}$, is around 3. In this context, one can conclude that less imperfections in the labor market reduces unemployment rate. As the workers' become more mobile via relaxing employment contracts, unemployment rate declines. Stated differently, if the MNEs do not offer binding contracts to protect their firm specific advantage, thus, allow for the mobility of workers, unemployment rate will be low.

Baseline case shows that wages for the informed workers in the local firms decline as the labor mobility from foreign to local firms increase. In other words, wages in the foreign firm (w^F) and wage paid to informed workers in the local firm ($w^F + \epsilon$) fall as the contracts offered by foreign firms become less binding, that is labor becomes perfectly mobile. This could be explained by the fact that firms do not need to pay more to attract the workers since there is no restriction on the job-to job movement. Uninformed wages in the local firm also increase which is due to an increase in vacant positions offered by local firms, so a number of unemployed workers have an opportunity to work in local firms.

In contrast, since highly restrictive contracts deter the movement of workers from foreign to local firm, local firms need to pay more to attract those informed workers in the foreign firm, thereby ϵ increases. On the other hand, average wages ($\bar{w}^L$) in

Figure 19: Labor Market: Job Opportunities, Unemployment and Wages, $c_L = 0.5, c_F = 0.5$



the local firm increase, even after a threshold level at $g = 0.8$, average wages in the local firm may be higher than the wages in the foreign firm. In short, the wage gap between foreign and local firms, firm premium, decreases due to the existence of less binding contracts. The wage difference between informed and uninformed workers in the local firm, skill premium, decreases as the movement of foreign to local jobs accelerates. On the other hand, restrictions on the labor turnover increases the wage gap between informed and uninformed workers, and also leads to a rise in the foreign firm premium.

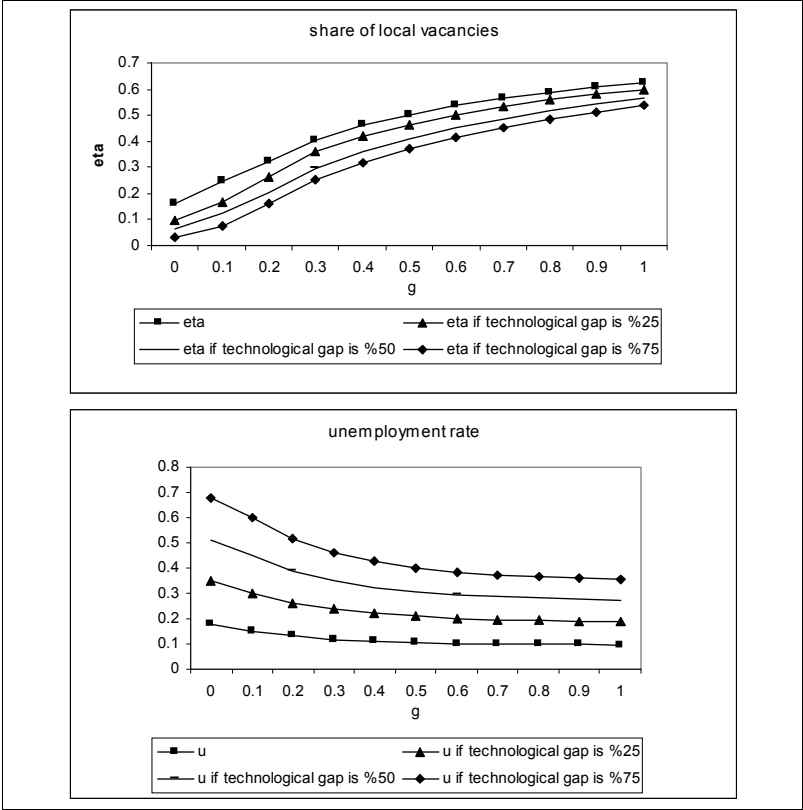
Figure 19 considers the case where both firms face equal job creation costs. The share of local vacancies increase while unemployment rate decreases when the re-

striction on contracts decreases, which is the same as in Figure 18, where $c_F > c_L$. But, due to the low job creation costs, the mass of vacant positions in the foreign firm also increases. This leads to a sharper fall in the unemployment rates. In the case of equal job creation costs, foreign firms always pay more than average local wages, which is the main difference between Figure 18 and Figure 19.

The foreign wages and informed wages fall as g gets higher reflecting more labor turnover from foreign to local firm. Similarly, skill premium and the firm premium decreases as labor becomes more mobile. As for the absolute wages, earnings of the uninformed workers in the local firm increases slightly, while there is a more dramatic rise in the benchmark case. Wages in the local firm increase while wages in the foreign firm decrease as the restrictions on the movement of labor from foreign to local firm relieved.

Figure 20 focuses on the case how the effect of labor mobility on local labor markets changes depending on the technological gap between local and foreign firms. As the technological gap between local and foreign firms increases, foreign firms create more jobs whereas the share of local vacancies tend to decline. Unemployment rate will be higher if the stated gap is 75%. So that, the technological gap between foreign and local firms a crucial role in examining wage and unemployment implications of increased labor mobility. Nevertheless, the share of local vacancies and unemployment rate still follow the same pattern in response to rising mobility through the non-binding employment contracts. On the other hand, it will be important to note that an increase in the technological gap between foreign and local firms raises the unemployment rate and wages in the foreign and local firms, decreases the earnings

Figure 20: Labor Market: Job Opportunities, Unemployment, Technological Gap



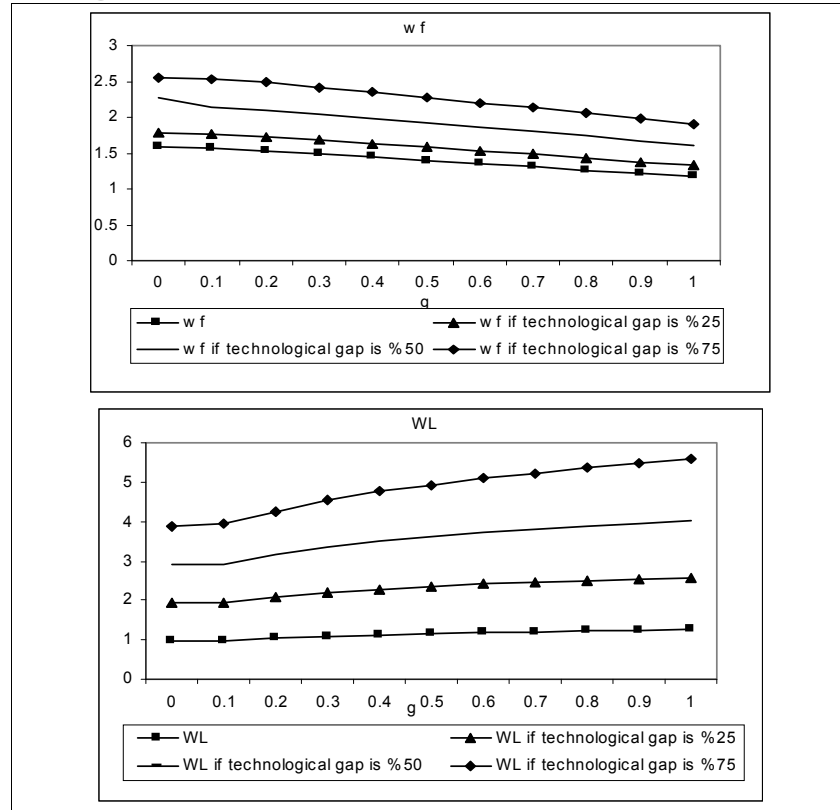
of the uninformed workers in the local firm. In addition, this also leads to an increase in the skill premium and firm premium.

Technological progress raising the productivity gap between the foreign and the local firms leads firms to employ more workers possessing higher skill levels. In this context, local firms need to pay more to transfer informed workers from the foreign firms, which leads to a rise in the wages of informed workers. Technological upgrading, as firms require more informed workers, deteriorates the position of uninformed workers, by decreasing the earnings of the uninformed workers. Also, the wage gap between informed and uninformed workers in the local firm increases. Therefore, one can conclude that technological progress raises the wage inequality and lowers the wages of less informed workers. Actually, there exists a growing body of research focusing on the relationship between technology and wage inequality. In particular, a number of studies has documented that technological change emerges as an explanation for the rise in wage inequality, specifically in the US (Card and Dinardo 2002; Bound and Johnson, 1992; Katz and Murphy, 1992).

Findings of this chapter supports the SBTC hypothesis where new technology, leading to a rise in the demand for highly skilled workers, increases the wage inequality.

On the other hand, the sign of the relationship between technical progress and unemployment is ambiguous. Technological progress reduces unemployment rate in Pissarides (1990), but increases unemployment in Aghion-Howitt (1994). The main findings of this chapter notes that technological progress raising the productivity gap between the foreign and the local firm leads to an increase in the unemployment

Figure 21: Labor Market: Job Opportunities, foreign versus average local wages, Technological Gap



rate.

According to the Figure 21, wages in the foreign firm is higher than the wages in the local firm as the technological gap between foreign and local firm gets wider. Also, foreign wages tend to fall slightly due to the increase labor mobility as the contracts become less binding. As the technological gap between foreign and local firms increase, that is the technological gap is 75%, wages in the local firm becomes higher than the case where the technological gap is 10%. Similarly, wages in the local firm increase in response to rising mobility from foreign to local firms.

Figure 22 says that earnings of the uninformed workers decrease as the technological gap between foreign and local firms gets wider. Also, wages of the uninformed

Figure 22: Labor Market Opportunities: wages in the local firm, technological gap

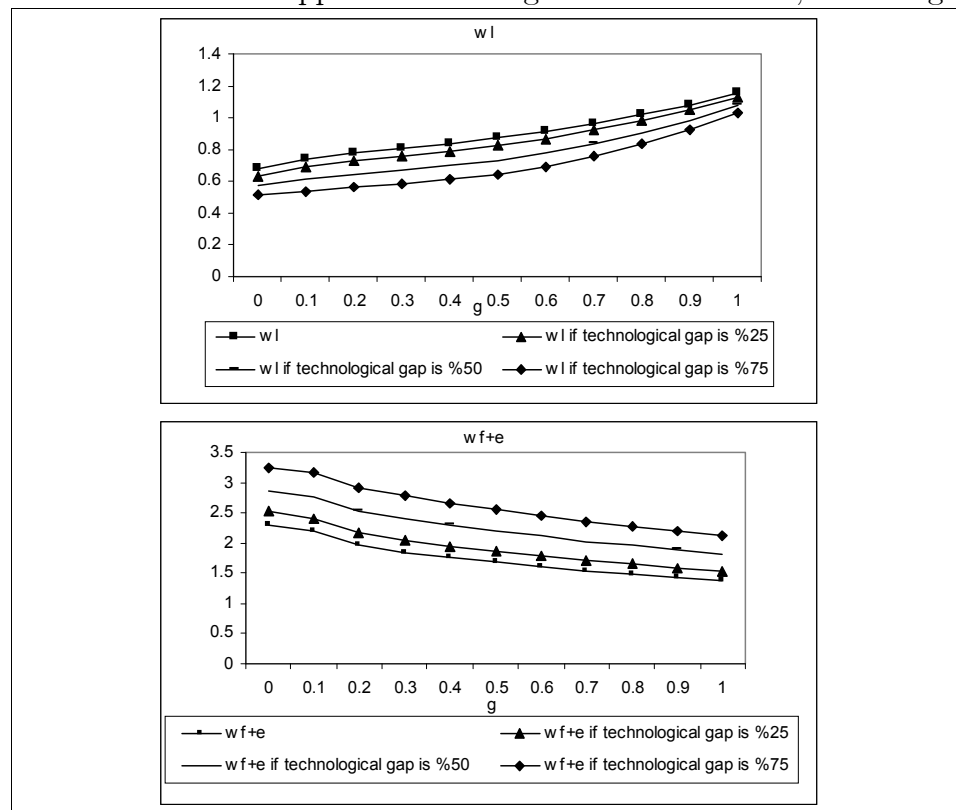
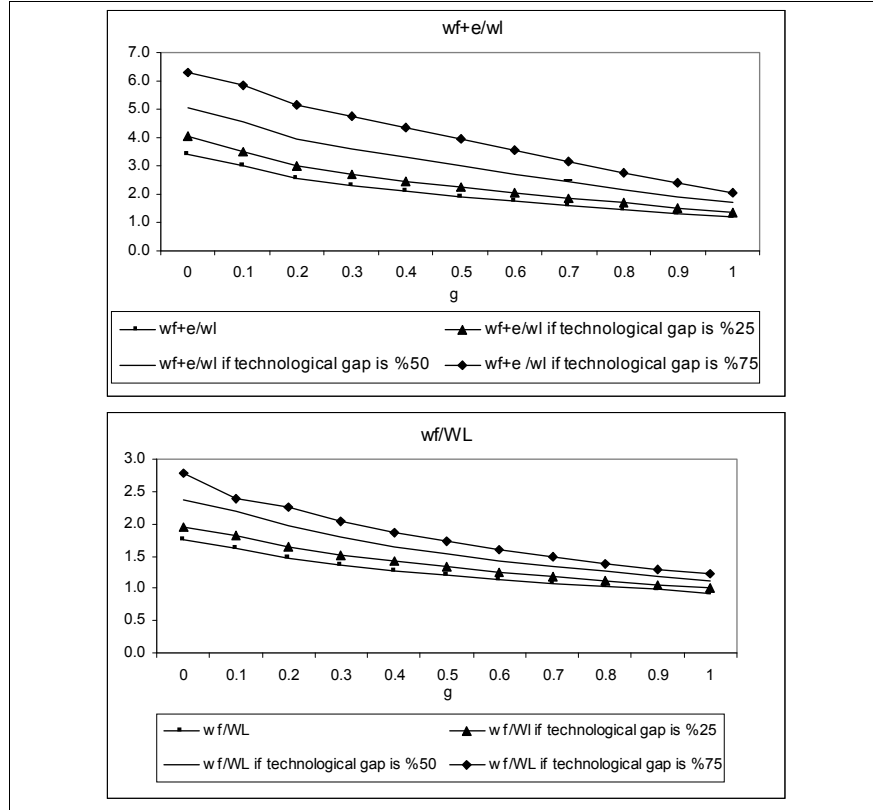


Figure 23: Labor Market Opportunities: relative wages in the local firm, technological gap



workers in the local firm tend to increase as labor becomes more mobile through the introduction of less binding contracts. The wages offered to informed workers in the local firm decrease as the contracts become less mobile, that is, increased labor mobility. Also, note that the $wf + \varepsilon$ rises as the technological gap between foreign and local workers increases. This reveals the fact that as the technological gap between the foreign and local firms is too wide, then local firms have to pay more to be informed on the technology available in the local firm.

Figure 23 shows the firm premium and skill premium in response to existence of restrictive contracts and technological gap. As the technological gap between foreign and local firms increases, both the firm premium and skill premium slightly

melts down due to the rising labor mobility. Actually, greater the technological gap between foreign and local firms, the higher will be the firm premium and the skill premium.

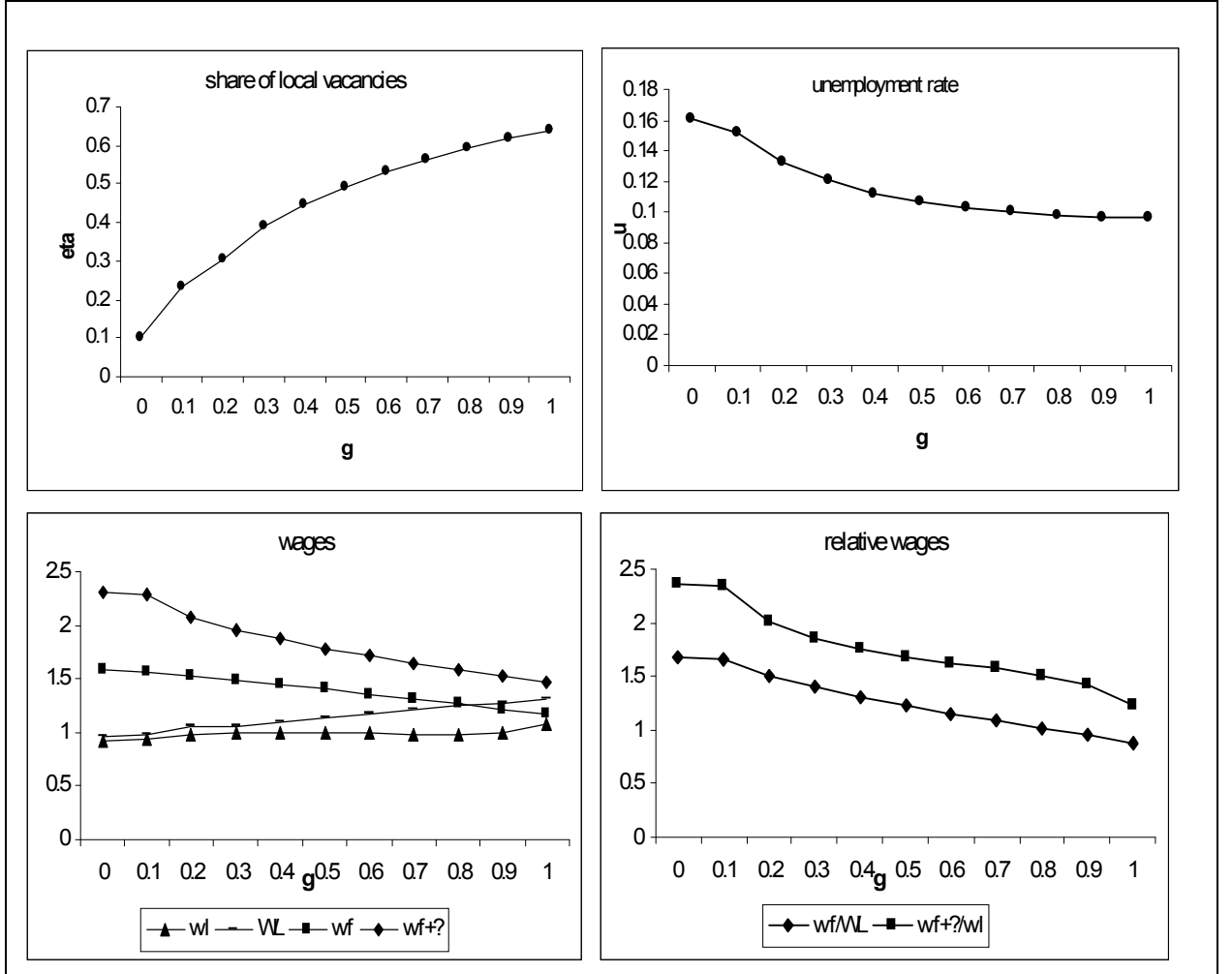
Robustness Check

This section presents the sensitivity of the results to the different functional forms and different contract restriction rates offered by both foreign and local firms.

Different functional forms

Figure 24 presents the case being a informed workers increasingly increase with the relaxing contracts, where $\alpha(g) = \varphi g^2$. Different functional forms of g leads to a no change in the pattern of the vacancies and the unemployment rates, confirming that the share of local vacancies increases and the unemployment rate decreases in response to an increased labor mobility from foreign to local firms via relaxing of employment contracts. Also, the new functional form of g does not change the absolute and the relative wage pattern. The informed wages in the local firm ($w^F + \epsilon$) and average wages ($\bar{w}^L$) in the local firm increase, after a threshold level at $g = 0.8$, average wages in the local firm may be higher than the wages in the foreign firm in response to an increasing labor mobility. Similarly, as it is given in the benchmark case, wages in the foreign firm falls due to the less binding contracts supporting the increased mobility of workers from foreign (local) to local (foreign) firms. Increased

Figure 24: Labor Market Opportunities: different functional form for g



labor turnover ceases the competition on informed wages in the foreign and local firms, reducing the earnings of the informed workers in both firms. In this context, wage gap between informed and uninformed workers in the local firm declines and also firm premium decreases.

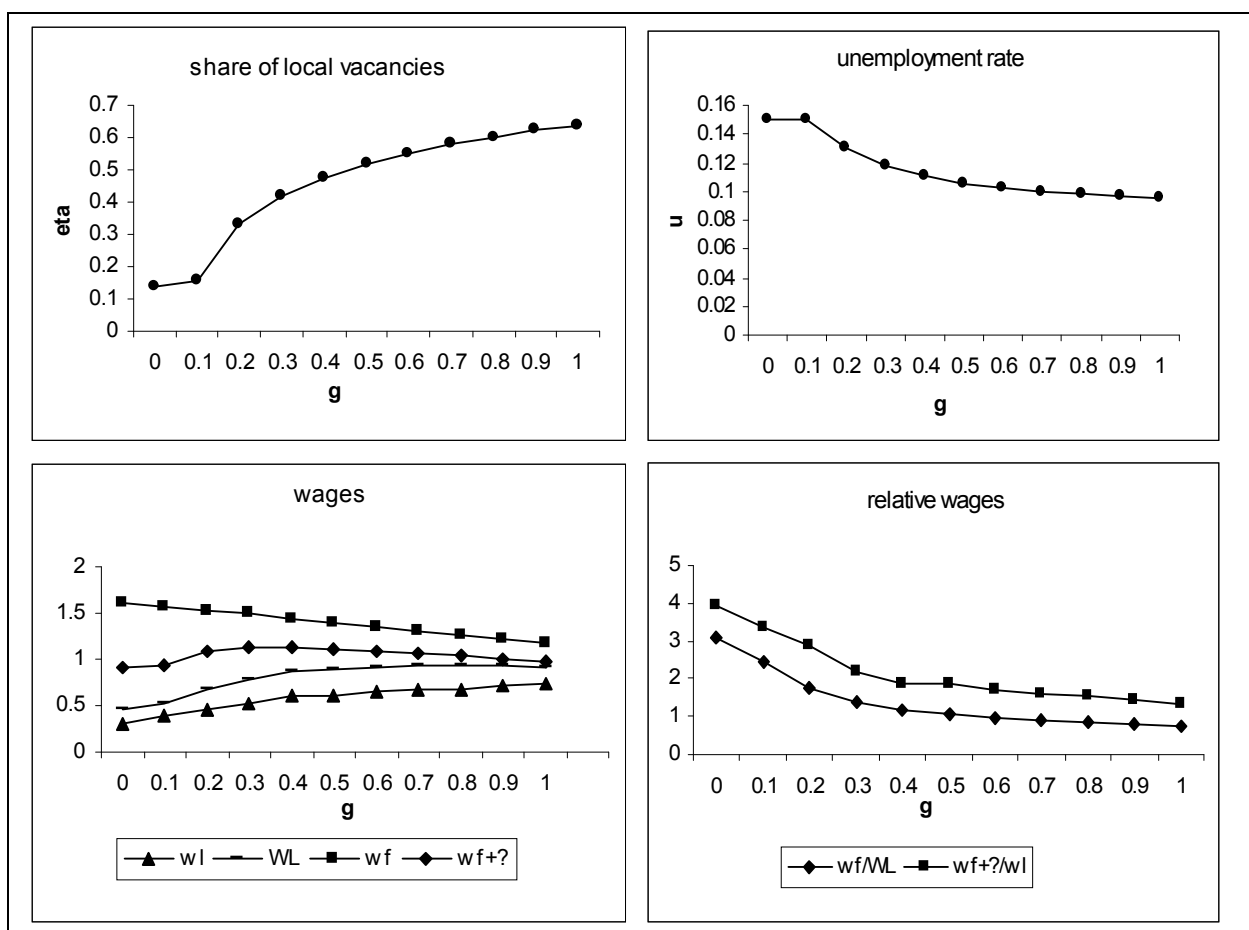
Figure 25 presents the case where restrictions on labor mobility decreases the premium, $\epsilon(g)$, where $\epsilon(g) < 0$. This is along the same line with the argument that voluntary wage cuts are possible when workers move between firms. Yet, this does not

change the main findings where increased labor mobility via relaxing of employment contracts increases the share of local vacancies and decreases the unemployment rate. As for the absolute wages, average wages in the local firm increases as the labor becomes more mobile and also we need to note that foreign firms pay more than local firms regardless of the labor mobility. Even though the share of local vacancies increases and local firms try to match with the informed workers, the premium of being informed does not increase. If the voluntary wage cut is possible, foreign firms always pay more than the local firms. As for the relative wages, skill premium in the local firm and the foreign firm premium decreases in response to increasing labor mobility.

Different contract restriction rates

The Figure 26 examine the case where both firms have labor market restrictions, where m denotes restrictions on labor mobility in the local firm. Analytical steps for this model is given in the Appendix. In the above section, we allowed for fully flexible contracts in the local firm, where there were no restrictions on labor moving from the local firm, in other words, $m = 1$. That is, labor contracts in the local firm were kept unchanged where labor could move flexibly from them, whereas by changing " g " we allowed for labor mobility to vary from the foreign firm. Since we capture the fact that gap between g and m decreases in the benchmark case, now, in this case we ask the question whether the local and foreign firms have the same restrictions on the labor mobility, i.e., $g = m$, and examine the case if both firms

Figure 25: Labor Market Opportunities: different functional form for ϵ



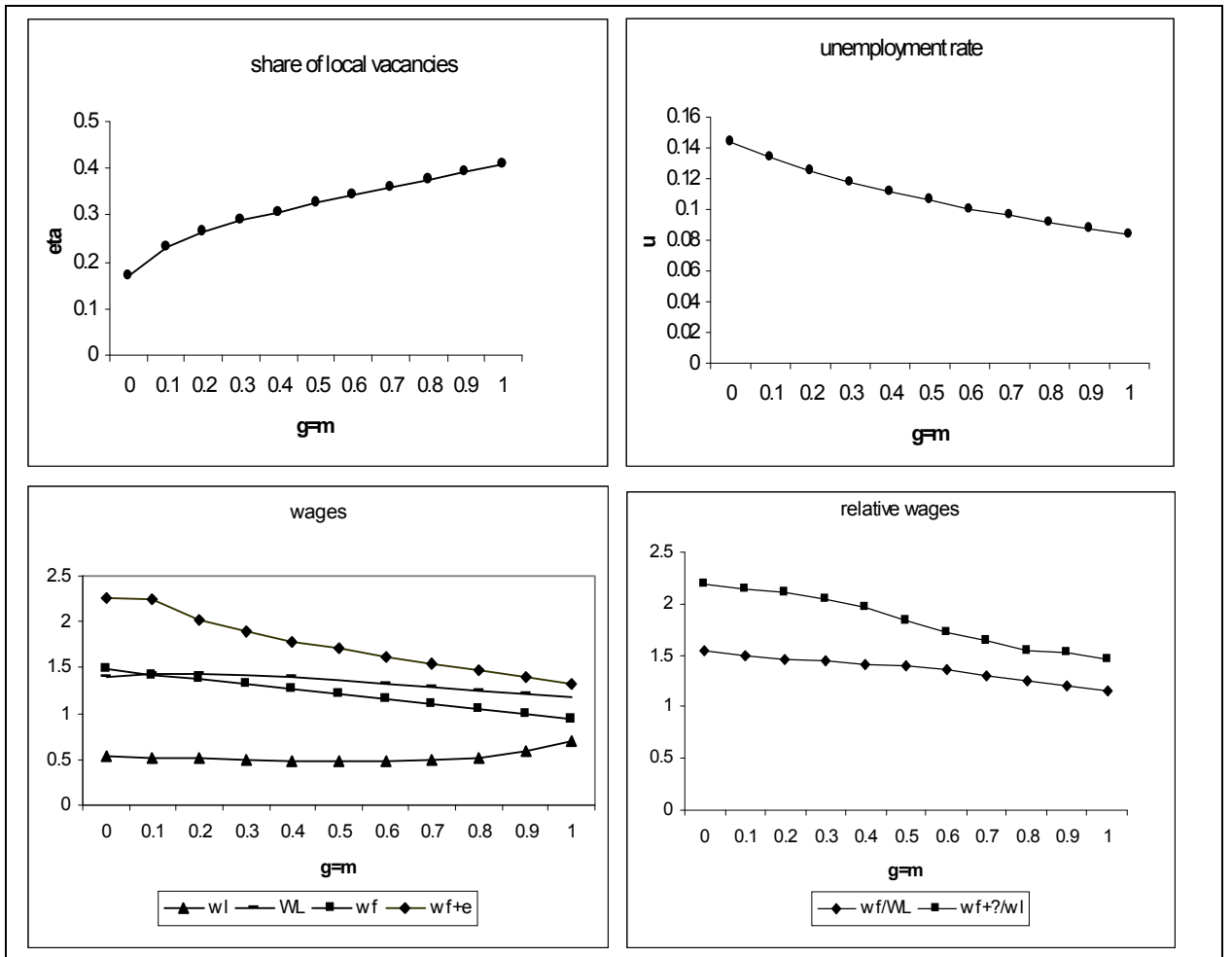
remove the restrictions on labor mobility.

As the labor turnover increases between foreign and local firms, that is perfect labor mobility, the share of local vacancies increases and the unemployment rate decreases. In this context, one can say that in the light of the benchmark case, increasing the gap between g and m or equal restrictions on labor mobility does not change the pattern of vacancy creation or the unemployment rate. Shortly, an increase in labor mobility raises the job creation by the local firm and reduces unemployment rate.

The Figure 26 indicates that uninformed wages in the local firm slightly increase in response to labor turnover where both firms allow for labor mobility. Wage paid to the informed workers by the local firm decreases as both firms remove the labor market restrictions. Most importantly, if both firms give employment contracts that deter the movement of workers, average wages in the local firm may exceeds the wages in the foreign firm. So that, we can not conclude that foreign firms always pay more than that of the local firms: if there are restrictions on labor mobility also in the local firm. If both foreign and local firms remove the restrictions on the labor mobility, the wages in the local firm increases and the wages in the foreign firm decreases. To this end, while the wage gap between informed and uninformed workers in the local firm decreases, firm premium does not record a significant decline.

Further, Figure 27 presents the case where both firms have equal job creation costs, i.e. $c_L = 0.5, c_F = 0.5$. The share of local vacancies increase in response to increase in labor turnover, but there is no sharp rise in the local vacancies as the job creation cost between the foreign and local vacancies melt down. Similarly,

Figure 26: Labor Market Opportunities: restrictions on workers' mobility by both firms, $g = m$.



unemployment rate decreases as the workers' mobility in both firms increases. Figure 27 shows that wage paid by the foreign firm is greater than the wage paid by the local firm. The main reason behind this is the reduction in job creation cost of foreign firms. Nevertheless, the main pattern in the foreign wages remains same: it declines in response to an increase in the job-to job movement of workers as both firms remove the restrictions on labor mobility. Also, both informed and uninformed wages in the local firm falls and average wage in the local firm does not record a significant rise. The firm premium slightly decrease due to the increasing labor turnover and there is a negligible reduction in the wage gap between the informed and uninformed workers in the local firm. Due to the reduction in foreign job creation cost, the mass of foreign vacancies rises. In this case, regardless of the restrictions on labor mobility, foreign firms pay more than the local firm. Therefore, in accord with the findings of the Chapter 2 and the Chapter 3, job creation costs have a vital role in the wage determination.

Figure 28 presents the case where the local firm gives restrictive employment contracts and the foreign firm permits the mobility of workers from foreign to local firm, $g > m$. That is, free movement of workers are allowed in the foreign firm but the mobility of workers from local to foreign firm is restricted. By studying this case in addition to $g < m$ and $g = m$, we have examined the effect of different contracts offered by foreign and local firms on the labor market. different cases: $g < m$, $g = m$ and $g > m$. The share of local vacancies slightly increases as the local firm offers less binding contracts, thus, permitting labor turnover. Similarly, unemployment rate decreases as the workers' mobility from local to foreign firms increases.

Figure 27: Labor Market: Reduction in the job creation costs, $c_L = 0.5, c_F = 0.5$

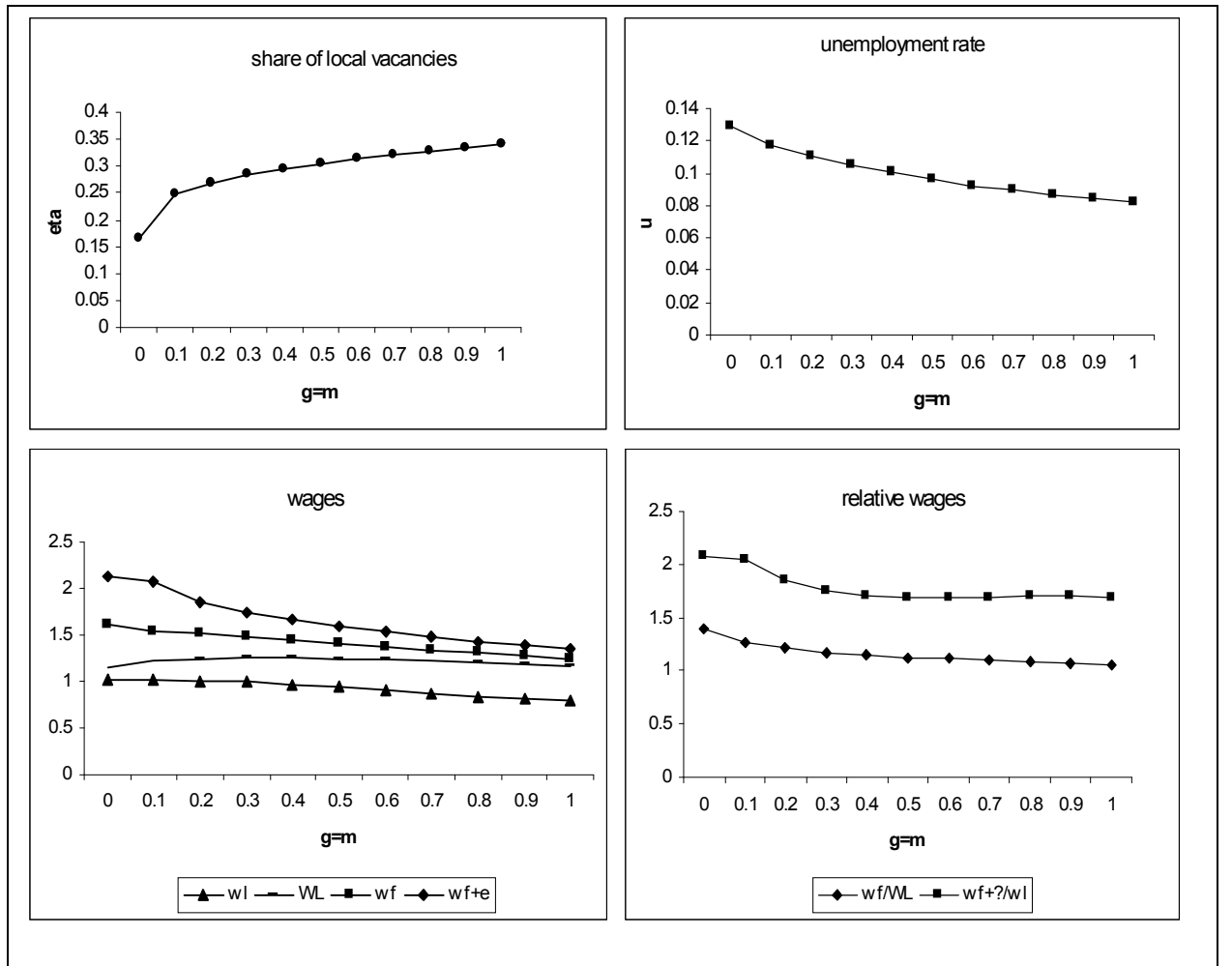
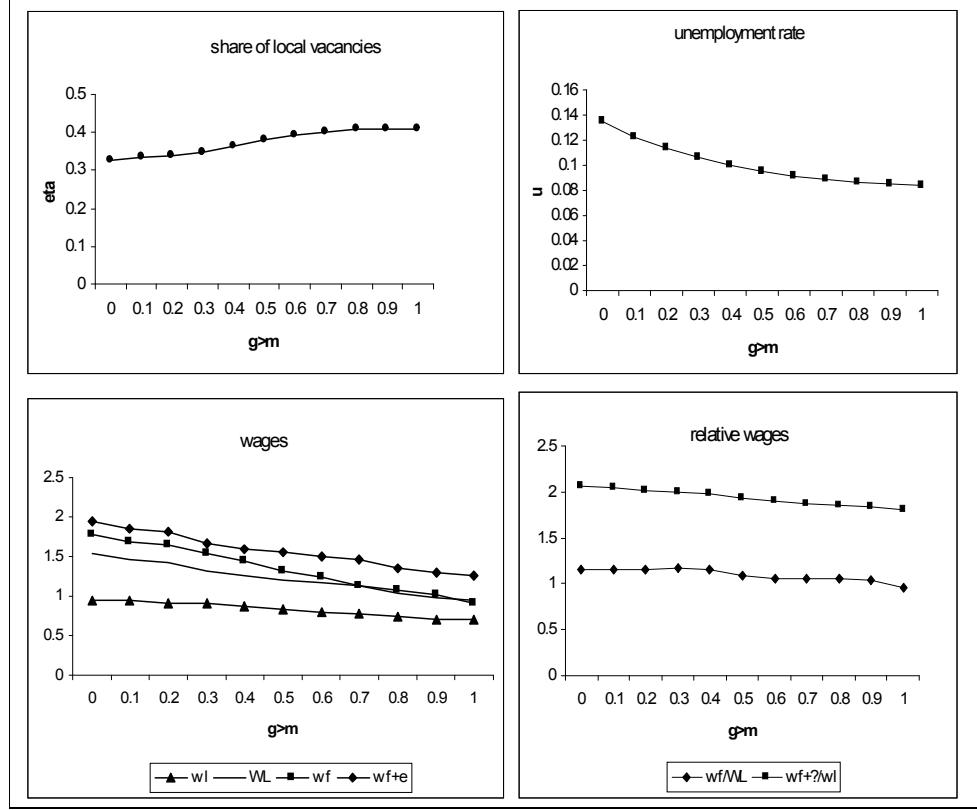


Figure 28: Labor Market Opportunities: restrictions on workers' mobility by both firms, $g > m$.



On the other hand, informed wages in the foreign and local firms decrease as restrictions on labor mobility are removed by the local firm. Earnings of the uninformed workers do not record a significant change. The firm premium slightly decrease due to the increasing labor turnover and the wage gap between the informed and uninformed workers in the local firm declines.

Actually, increased labor mobility- it does not matter whether the restrictive contracts are offered by foreign or local firms, reduces unemployment rate and diminishes the wage gap between informed and uninformed workers in the local firm. Yet, the extent of the effect of labor mobility on labor market depends on the degree of restrictions of employment contracts given in the foreign and local firms.

To sum up, we can conclude that restrictions on labor mobility play a crucial role in examining the effect of foreign presence on wage and unemployment. The main results point out that increased labor mobility reduces the wage gap between informed and uninformed workers and also decreases the wage paid by the foreign firms. Most importantly, unemployment rate falls in response to a rise in the labor turnover.

4.4 Conclusion

Since MNEs are associated with the firm specific asset in the form of advanced technology, local firms aim to reap the benefits of superior knowledge by hiring workers from MNEs. When a former MNE worker moves to a local firm, he can transfer, at least, a part of the technology. Within this context, this chapter focuses on the labor mobility through the channel of binding contracts and examines the job creation, wage and unemployment effects of labor mobility.

Results suggest that wages are a weighted average of labor productivity and the unemployment benefit, where the weight depends on the bargaining power of the workers, labor market tightness, the mass of local and foreign vacancies, the extent of the labor mobility. In fact, the mass of vacant positions in the foreign firm depends on the job-creation costs and relative labor productivities. We find that labor mobility from foreign to local firms decreases the skill premium in the local firm and also puts a downward pressure on the firm premium. Increased labor mobility reduces the unemployment rate. Further, findings of the model point out that the

technological gap between foreign and local firms plays a vital role in the job creation and determination of wages and unemployment. Such that increased technological gap between foreign and local firms decreases the earnings of the uninformed workers while raising the skill premium in the local firm. On the other hand, unemployment rate decreases and firm premium increases in response to widening technological gap between foreign and local firms.

CHAPTER 5

CONCLUSION

This dissertation studies the labor market implications of increased foreign firm activity on local economy by using heterogenous search and matching model. Since search and matching models have a crucial role in explaining the labor market transitions, they provide a very suitable framework to study the labor market fluctuations following the entry of foreign firms. Particularly, this dissertation examines the role of foreign firms in job creation as well as their role in changing the structure of employment and explaining wage inequalities in the local market.

Within this framework, Chapter 2 provides a broad perspective on studying labor market implications of the entry of foreign firms by modeling the foreign firm working with both skilled and unskilled workers. The model allows us to investigate not only the wage differences across skilled and unskilled labor, but also wage differences across domestic and foreign firms. The main findings of this model could be summarized as follows:

1. Wages are a weighted average of labor productivity and unemployment benefit, where the weight depends on the bargaining power of the workers, labor market tightness and the mass of local and foreign vacancies.

2. Foreign firm does not always pay higher wage than that of the local firm.

Particularly, the wage differential between foreign and local firms could be explained by the technological gap between local and foreign firms, relative job creation costs and the skill endowment.

3. An increase in the foreign presence has differential wage effects depending on the cause of an increase in foreign presence (cost reduction, technological progress and skill upgrading).

Following the findings of the Chapter 2, Chapter 3 focuses on the different technology intensities of the local and the foreign firm and also assess the role of sectoral location of foreign firm on the wage and unemployment rate in the local labor market. Results suggest that confirming the above three major findings of the chapter 2:

1. In the high-tech sector, skill bias technological progress in the foreign firm, raising the technological gap between foreign and local firms, decreases the unskilled workers' wage in the local firm, but also increases the unemployment rate of unskilled workers for a certain threshold value of technology gap between the foreign firm and the local firm.
2. In the low tech sector, an increase in the foreign presence raises the wage gap between skilled and unskilled workers in the local firm.
3. Reduction in the job creation costs, skill upgrading and technological progress affecting the vacancy creation by firms have different wage and unemployment

effects if one considers the different skill intensities of the firms and the sector at foreign firm locates.

Even the workers' mobility is allowed in Chapter 2 and in Chapter 3, firms may put restrictions on the labor mobility which could be in part due to the protection of firm specific asset. Chapter 4 examines the effect of labor mobility restrictions from foreign to local firms on wage and unemployment rate of the workers. Main findings could be summarized as follows:

1. Wages are a weighted average of labor productivity and the unemployment benefit, where the weight depends on the bargaining power of the workers, labor market tightness, the mass of local and foreign vacancies, the extent of *the labor mobility*.
2. Increased labor mobility from foreign to local firms decreases the wage gap between informed and uninformed in the local firm.
3. Increased labor mobility from foreign to local firms leads to a reduction in the unemployment rates.
4. Technological progress decreases the wage of the uninformed workers while raising the skill premium in the local firm. The wage gap between foreign and local firms increases in response to widening technological gap between foreign and local firms.

NOTE 1

Table 30: Numerical versus Real Figures

Wage	Local	Foreign	Firm Premium
Sector			
Food, Drink & Tobacco	15.8	29	1.82
Textiles & Leather	10.7	14.3	1.33
Wood, Paper & Printing	22.3	23.6	1.05
Chemicals	27.4	28.7	1.04
Rubber & Plastics	16.9	17.9	1.05
Non-metallic minerals	22.5	23.9	1.05
Metals	14.4	20.1	1.39
Non-electrical machinery	14.1	22.1	1.56
Electrical equipment	14.3	22.3	1.55
Transport equipment	19.2	19.3	1.00
Other manufacturing	15.4	17.3	1.12
Total manufacturing	17.5	21.7	1.23
Unemployment rate (annual)	4.4		
Source: See Barry et al. (2005)			

Table 31: Job Creation and Employment by Foreign Firms in Ireland

	Domestic	Foreign
Employment	120728	97559
Job creation rate	8.8	9.7
Source: See Görg and Strobl (2005b)		

Table 32: Employment of foreign affiliates in the host economy, 1980-2004

Countries	2000-2004
Austria	249
China	6565
Czech Republic	597
Finland	219
France	1056
Germany	2142
Hungary	607
Japan	318
Luxembourg	71
Poland	648
Portugal	154
Singapore	164
Sri Lanka	382
Sweden	514
Switzerland	140
United States	6113
Source: UNCTAD FDI/TNC database.	

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APPENDIX

The Appendix considers the case where both firms have some limitations on the labor mobility. That is, job to job movement between foreign and local firms is restricted. In this context, " m " denotes the extent of labor mobility in the local firm.

Flow equations

$$\theta^{1-p}u = \delta(1 - u) \quad (96)$$

$$(\theta^{1-p}\eta)u + (\theta^{1-p}\eta g)e_F = (\delta + \theta^{1-p}(1 - \eta)m)e_L \quad (97)$$

$$\theta^{1-p}(1 - \eta)u + \theta^{1-p}(1 - \eta)m e_L = (\delta + \theta^{1-p}\eta g)e_F \quad (98)$$

Asset Values

$$rU = b + \theta^{1-p}\eta(W_L - U) + \theta^{1-p}(1 - \eta)(W_F - U) \quad (99)$$

$$rW_L = \alpha(g)(w^F + \epsilon(g)) + (1 - \alpha(g))w^L + \delta(U - W_L) + \theta^{1-p}(1 - \eta)m(W_F - W_L) \quad (100)$$

$$rW_F = w^F + \delta(U - W_F) + \theta^{1-p}\eta g(W_L - W_F) \quad (101)$$

$$rJ_L = \alpha(g)(y^F - w^F - \epsilon(g)) + (1 - \alpha(g))(y^L - w^L) + (\delta + \theta^{1-p}(1 - \eta)m)(V_L - J_L) \quad (102)$$

$$rJ_F = y^F - w^F + (\delta + \theta^{1-p}\eta g)(V_F - J_F) \quad (103)$$

$$rV_L = -c_L + \theta^{-p} \frac{(-(\theta^{1-p})^2(-1 + \eta)m^2 + (\theta^{1-p})(\eta g - 2(-1 + \eta)m)\delta + \delta^2)}{(\theta^{1-p} + \delta)(\theta^{1-p}g\eta + \theta^{1-p}m - \theta^{1-p}m\eta + \delta)}(J_L - V_L) \quad (104)$$

$$rV_F = -c_F + \theta^{-p} \frac{(\theta^{1-p}g\eta - +\delta)/(\theta^{1-p}m + \delta)}{(\theta^{1-p} + \delta)(\theta^{1-p}g\eta + \theta^{1-p}m - \theta^{1-p}m\eta + \delta)}(J_F - V_F) \quad (105)$$

In this case, the solution for wages are implicit, thus, numerical solution is provided.