Research Reports

Kansantaloustieteen laitoksen tutkimuksia, Nro. 120:2009

Dissertationes Oeconomicae

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Essays on Economic Integration and Labour Demand

ISBN 978-952-10-5348-1 (nid)
Essays on Economic Integration and Labour Demand

by

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Academic dissertation to be presented, by the permission of the Faculty of Social Sciences of the University of Helsinki, for public examination in Economicum, Lecture Room, Arkadiankatu 7, on December 4, 2009, at 12 a.m.

Helsinki 2009
To my parents
I cannot fully express my gratitude to my supervisor Professor Erkki Koskela for his guidance and encouragement. Erkki, who was my supervisor already during my Master's Thesis, encouraged me to continue with doctoral studies, and supported me throughout the process providing advice, guidance, and valuable ideas. I am equally indebted to my other supervisor Professor Pekka Ilmakunnas whose comments, suggestions, and ideas have been extremely valuable during the process. Pekka always had time for my questions, especially when I struggled with empirical methods. In addition, I highly appreciate the effort of my pre-examiners of the thesis, Professor Jari Vainiomäki and Dr. Aki Kangasharju, who provided me with valuable advice, suggestions, and corrections. Their contribution has significantly improved the quality of the work.

This thesis has been written partly during my researcher position at the Economics department of the University of Helsinki, and the time I was a graduate school fellow of the Finnish Doctoral Program in Economic (FDPE). I thank the FDPE and Otto Toivanen for giving me the opportunity to concentrate exclusively on my doctoral studies and the department for its hospitality. I would also like to thank all fellow students at Economicum and Professors, in particular, Pertti Haaparanta, Mika Linden, Vesa Kanninen, Heikki Kauppi, Klaus Kultti, Anne Mikkola, Tapio Palokangas, and Mikko Puhakka. The last essay was carried out while I was on leave and working at Statistics Finland in Helsinki. It would not have been possible to complete this academic project, and balance it with work, without the help and support of a number of people. My warmest thanks go to Kaija Hovi, Heli Jeskanen-Sundström and Rami Peltola for giving me this opportunity. In the first and last essays, I use mainly datasets from Statistics Finland. I want to express my special thanks to Mika Maliranta and Satu Nurmi for their help and guidance with the datasets, and Ralf Ramm-Schmidt for providing the data of the Confederation of Finnish Industries and Employers. I would also like to thank the Business Structures Unit for its hospitality and other staff at Statistics Finland for their advice and collaboration. Furthermore, I have also greatly benefited from the valuable comments and suggestions of Petri Böckerman, Rikard Forslid, Ossi Korkeamäki, Reija Lilja, Mika Maliranta, Heikki Pursiainen, Matthew J. Slaughter, Roope Uusitalo and various seminar and conference participants over the years.

This work has been partly funded by the Alfred Kordelin Foundation, the Labour Foundation and the Yrjö Jahnsson Foundation. I am grateful for their generosity. Matthew Billington has checked the language of the thesis.

Finally, I reserve my warmest thanks to my loved ones, family and friends for all their support and empathy I have received during this process.

Helsinki, December 2009

Elisa Riihimäki
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I Introduction

1 BACKGROUND

The most often mentioned economic benefits of the removal of tariffs and other barriers to trade and capital flows are related to the increased international integration of financial and product markets. The earliest arguments for gains from globalisation are based on the idea that international competition promotes economic efficiency. Liberalising product and financial markets is seen as a stimulus for international trade and capital flows which, through more efficient resource allocation, will increase per capita output and ultimately welfare. The recent emphasis on imperfectly competitive markets in international trade creates another argument for economic integration as trade reform would increase competition, which is also important for efficiency. According to recent heterogeneous firm models (see for example Helpman et al. 2003, or Bernard et al. 2003) the benefits of trade accrue to the most productive firms within industry, whereas the costs are felt disproportionately by the least productive. These arguments offer a comprehensive treatment of both the microeconomic and macroeconomic aspects of economic integration.

The progress of integration with wider trade and capital flows has increased competition both within and across industries and countries, which has been reflected in the link between wage formation and unemployment. There are two major channels - product markets and factor substitution - through which economic integration might affect labour markets. International outsourcing, or more specifically the mobility of production, has increased as a consequence of product market integration. The liberalisation of capi-
tal markets has created opportunities for multinational corporations to invest and establish production plants in countries where they are able to obtain labour more cheaply. Generally, it is believed that moving these activities overseas may reduce the relative demand for unskilled labour in the economy in much the same way as by replacing these workers with automated production. There are a growing number of studies that examine whether increased globalisation can be offered as an alternative explanation for the shift in the structure of wages and employment in many countries in recent years. Revenga (1992), Abowd and Lemieux (1993), Borjas and Ramey (1995), Driffill et al. (1998), Burda (1999), Boeri et al. (2000), and Haffner et al. (2000) suggest that changes in the competitiveness of product markets have a significant effect on both employment and negotiated wage settlements. The main idea behind this explanation is that foreign competition reduces firms’ power in product markets and thus drives down labour’s rents. This indicates that employment changes in a small group of trade-impacted concentrated industries can explain not only part of the aggregate rise in wage inequality in the United States, but also some of the trends in wage inequality that have resulted in a clear rise in joblessness in European countries. Rodrik (1997) identifies the elasticities of labour demand as an equally important channel through which an increase in globalisation can affect labour markets, while Slaughter (2001) finds an unclear relationship between the increasing elasticity of labour demand and economic openness. Recently, the issue that has attracted most attention is whether international outsourcing has contributed to a shift in labour demand for different types of workers and consequently a change in wage inequality (e.g., Görg and Hanley 2005, Hijzen et al. 2005, Senses 2006, and Hijzen 2007). The consensus in the empirical literature suggests that international outsourcing has contributed to the upward trend in the elasticities of labour demand with own price, and consequently to a change in the skill structure of labour demand and an increase in the wage differential between high and low skill wages.

Arguments related to the costs of globalisation are typically based on the contention that changes in the degree of product market competition can affect labour practices during the process of integration where firms face aggregate and industry-specific shocks. The loss of national adjustment variables as integration progresses will result in an increased need for alternative flexible mechanisms i.e., flexible wage structures with low labour mobility, to correct possible asymmetric shocks across industries and coun-
tries. Rodrik (1997, 1998) explains that when the shock to the product market is a negative one, there is a larger decrease in employment in more open economies. Consequently, competitive pressure on the labour market towards greater flexibility is expected to increase as a result of lower trade barriers. Haffner et al. (2000) find evidence that both product market competition and labour market flexibility have been fostered by integration. For the adjustment variables of labour markets, one issue is that profit sharing has increased considerably in Finland and in many other European countries. Profit sharing can be seen as a way to introduce wage flexibility into the process of economic integration, generating a link between imperfections in the product market and employment. There is, however, a clear need to understand that the creative destruction caused by export is associated with the reallocation of resources from less efficient to more efficient firms, which may generate more job creation than job destruction.

One macroeconomic aspect of globalisation is that increasing job mobility implies a correction of the distortions arising from the taxes and social security contributions levied on labour with consequent effects on state’s ability to pursue welfare policies, and, more specifically, on the possibility of financing the public sector by general labour taxation without job losses. There have been significant changes associated with the rapid re-structuring of the European economies resulting in increased globalisation of those economies and a clear rise in joblessness. Alesina and Perotti (1997) find that an increase in government expenditure financed by distortionary labour taxation generates a loss of international price competitiveness. The cost of the extended welfare state, especially in Northern European countries, during international integration may be a higher level of unemployment via distortions arising from general labour taxation. Consequently, it can be argued that the ability of the welfare state to improve employment through fiscal activities is progressively reduced when product market competition increases.

The purpose of this dissertation is twofold to investigate the effects of economic integration on labour demand by using theoretical models and by empirical analysis. The dissertation consists of three essays which can be read independently of each other. The goal of the first essay is to provide evidence on how the elasticities of labour demand with own price have changed during the process of economic integration. The second essay deals with the problem of maintaining a welfare state financed by distortionary
labour taxation while closer economic integration affects the impact of welfare policies on employment. The last essay analyzes the impact of profit sharing on employment as a way to introduce wage flexibility into the process of economic integration.

All three essays adopt an intra-industry trade approach to specify a theoretical framework of estimation for determining the effects of economic integration on employment. While the effects of economic integration can work through many different channels, in the first and third essays, a theoretical model captures both effects ranging from product markets, the scale effects, as well as factor substitutions possibilities, and the substitution effects in order to analyze the effects of economic integration. In the second essay, economic integration is mainly associated with market power, which makes it possible to capture the main quality effects in a manageable way. Furthermore, it is supposed, in this essay, that there is another sector - a public sector producing non-tradable goods solely for the domestic market. Intra-industry trade may be defined as the two-way exchange of goods in which neither country seems to have a comparative cost advantage regarding differentiated goods produced by monopolistically competitive firms. As Helpman and Krugman (1989) have pointed out, it is a phenomenon that first attracted attention during the rapid expansion of trade in manufactured goods that followed the creation of the European Common Market.\(^1\) Although the constant elasticity of substitution (CES) functions exhibit constant returns to scale, intra-industry trade is supposed to be characterised by an advantage of economies of scale in production. Together with interaction between the number of firms and the degree of price competition, intra-industry trade and economic integration can be seen as the result of the interaction between product differentiation and economies of scale.

The Finnish case is of broader interest. Since Finland is a small, open EU-country, economic integration can have a more profound effect on employment in Finland than in large countries. The pressures of globalization are also particularly pronounced in Finland because it is one of the Nordic welfare states, with a high level of taxation and benefits. There was global increase in trade before and after the severe recession of the

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\(^1\) The completion of the Single European Market, which was scheduled to have occurred by 1992, was intended to complete the process of removing barriers to trade among the countries of the European Union. The establishment of the European Monetary Union is asserted to strengthen this process of integration further by increasing competition in the international product and capital markets. As Calmfors
early 1990, however, it is noteworthy that trade flows remain concentrated regionally, i.e. the EU was not significantly more open at the beginning of this decade than it was some decades ago. There has been an increase in trade, but most of this growth is concentrated on growth between European countries. However, figure 1.1 shows the total trade share for the manufacturing sector between non-OECD countries (especially China and India) and Finland has been growing rapidly in recent years. Thus, the pattern of EU competition now is dominated by the domestic and East Asian economies.

![Figure 1.1 The Share of Manufacturing Trade (imports and exports) with EU15, OECD and non-OECD of the Total Finnish Manufacturing Trade.](image)

In all the essays the empirical aim is to explore the consequences of European integration while a careful empirical assessment of the labour demand consequences of globalisation will have to wait for the relevant data. The first essay uses plant-level panel data from the Finnish manufacturing sector with European integration measurements at the industry level. The empirical part of this essay examines the impact of European integration on the elasticities of labour demand in Finland during 1975 - 2002. The empirical aim of the second essay is to determine whether European integration has changed

(1998, 2001) argues, a common currency reduces trade barriers, and therefore leads not only to more trade, but also to more foreign direct investment.
the impact of welfare policies on employment. This is tested using panel data from European countries from 1975 to 2004. The last essay utilizes linked employer-employee firm-level panel data from the Finnish manufacturing sector which is linked with European integration indicators from 1996 to 2004. This empirical section focuses on the question of the relationship between the intensity of economic integration and employment in the presence of profit sharing.

2 CONTENTS OF THE DISSERTATION

2.1 Economic Integration and the Elasticities of Labour Demand: Econometric Evidence from Finland

The first essay investigates the effects of economic integration on the elasticity of labour demand with own price. Economic integration, when it is associated with market power, can, in theory, either increase or decrease labour-demand elasticity. With increased integration and competition firms, with access to the wider market are expected to be able to expand sales and production to take better advantage of economies of scale. Thus, market power may arise from specialization in production and differentiation of products in order to establish segmented markets. This might in turn decrease the elasticity of labour demand. In contrast Rodrik (1997) and Slaughter (2001), for instance, have emphasized the possibility, particularly in imperfectly competitive contexts, that the elasticity of demand for labour is higher with greater openness. As Slaughter (2001) has pointed out, the link between factor demand elasticities and product market elasticities is directly established through Hicks-Marshall’s fundamental law of factor demand, which implies that “the demand for anything is likely to be more elastic, the more elastic is the demand for any further thing which it contributes to produce”. Since product market elasticities are likely to rise with integration, this implies that, with greater trade openness, we should see an increase in labour-demand elasticities as well. Furthermore, Senses (2006) suggests that international outsourcing should contribute to the upward trend in the elasticity of labour demand.
In our general theoretical model of intra-industry trade, the purpose is to examine the main channels through which the elasticity of labour demand is affected by international integration. In regard to the demand for labour and capital we can derive the own-price elasticity of labour demand, and derive the substitution and scale effects for the elasticity of labour demand. It is shown that intensified trade competition increases labour-demand elasticity, whereas better advantages from economies of scale decreases labour-demand elasticity by decreasing the elasticity of substitution between differentiated products. Internationalisation can also affect the relative demand for unskilled labour through intermediate input markets, by foreign outsourcing, or by investing. We show that, if integration gives rise to an increase in input-substitutability and/or outsourcing activities, in particular, the demand for unskilled labour will become more elastic.

The empirical work is closely related to tests of the Factor Price Equalization (FPE) theorem, although the theorem does not depend on substitution between inputs and market power with differentiation of products. The theorem, according to which free trade, and accordingly the equalization of relative product prices between countries, implies that relative factor prices also have to be the same between countries, even in the absence of perfect factor mobility. Even when labour mobility is low, product market integration will force product price and factor price convergence for production factors of similar quality. When the mobility of capital increases as consequence of integration, domestic workers can be substituted with other factors, either through trade or through investing. Trade barriers make the movement of labour and capital more costly and more risky, and prevent the complete equalization of factor prices. Empirical research by Slaughter (1997), Faini et al. (1998) and Greenaway et al. (1999) suggests that trade may contribute to increased elasticities, however, they find weak support for the hypothesis that greater globalisation is associated with larger elasticities. However, Jean (2000) finds that openness can indeed have a significant effect on labour-demand elasticities.

In this essay, the empirical aim is to determine whether European integration has changed the own-price elasticities of labour demand in Finland using plant-level panel data from the manufacturing sector with integration indicators at industry level from 1975 to 2002. The analysis provides evidence that, over time, demand for total, produc-
tion and non-production labour has overall become more elastic in manufacturing. However, there is, unexpectedly, more relative growth in elasticities for non-production labour than for production labour. Furthermore, own-price demand elasticities of both labour types are underestimated. Because of the problem of separating inputs which has led to an underestimation of price elasticities for both labour types, only the effects of integration on the elasticities of total labour demand are assessed. If both the constant-output (constant-substitution) and scale-effect (substitution-effect) elasticities of labour demand were consistently estimated then the difference between them would be an estimate of the scale effect (substitution effect). The estimation results show that the difference between the constant-output (constant-substitution) and scale-effect (substitution-effect) elasticities of labour demand actually were more of an estimate of the scale effect (substitution effect) over integration. These main results provide support for the hypothesis that economic integration has contributed to an overall increase in labour demand elasticity.

2.2 Welfare Policies, Labour Taxation, Employment and Economic Integration: Econometric Evidence from European Countries

The second essay investigates how economic integration affects the impact of welfare policies on employment. In regard to empirical studies on the intersection of public finance and labour economics, several contributions have looked at the effects of taxation on unemployment, particularly in closed economies. For example, a paper by Daveri and Tabellini (2000) finds a relationship between rising unemployment and a slowdown in economic growth due to higher taxes on labour. In particular, this essay considers the possibilities of financing public sector through the general taxation of labour in an economy which is becoming more integrated into international product markets. In order to study this issue, the theoretical analysis is divided into two parts. First, the effects of welfare state activities and labour taxation on wage formation and employment are clarified. It is supposed that labour markets are unionized, which generates rigidities in the wage setting process. A permanent increase in labour income taxation leads the union to demand higher real wages to compensate for the decreased post-tax income, and,
as a consequence of higher labour costs, firms demand less labour. Second, we examine how these effects depend on the level of international product market integration.

Using a general theoretical model, we show that the effects of economic integration on the impact of welfare policies and on employment depend conclusively on a trade-off between intensified competition and better advantages from economies of scale. Since product market price competition is likely to rise with integration, this implies that, with greater trade openness, we should see, in turn, an increase in the cost of maintaining welfare systems. Increasing job mobility implies a correction in the distortions arising from taxes and social security contributions levied on labour, which then affects a state’s ability to pursue welfare policies, i.e. to uphold the level of public consumption and social security expenses. On the other hand, market power may arise from specialization in production and the differentiation of products in order to establish segmented markets. This might decrease the cost of maintaining welfare systems. As increased trade competition crowds out better advantages from economies of scale, it becomes more costly to maintain welfare systems financed by labour taxation.

The empirical aim, in this essay, is to determine whether European integration has changed the impact of welfare policies on employment using panel data from European countries for the years 1975 - 2004. The countries which we consider here are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom. During this period these countries went through significant changes associating with a rapid re-structuring of their economies, which reflected increased globalisation in the world economy. This long period offers us an interesting chance to examine the effects of integration on the impact of welfare policies in respect to labour demand. Assuming that integration has influenced the effects of welfare policies, it is also necessary to determine the effects of welfare policies on employment for the periods before and during the process of integration. In addition, labour market institutions are important determinants of employment. Thus, EU-countries have been classified in order of the centralisation of their labour markets.

The estimation results provide some support that the scale effects of international integration strengthen the negative impact of the labour tax rate on employment. However, the scale effects of integration weaken the negative impact of transfers on em-
ployment, although this negative impact increased during integration. Furthermore, it is shown that integration weakens the positive impact of public consumption on employment. Overall, these results provide inconsistent evidence for the hypothesis that economic integration has contributed to the distortionary effects of welfare policies on employment.

2.3 Profit Sharing, Economic Integration and Employment: Econometric Evidence from Finland

The last essay investigates how economic integration affects the impact of profit sharing on employment. The role of profit sharing in changes in net employment is discussed here in reference to profit sharing as method of payment based on a firms’ performance, as opposed to the payments of base wage. Commitment to profit sharing serves as a strategic device for creating a reduction in the negotiated base wage, thereby generating a link between the imperfections in the product market and employment. Empirical studies of the effects of profit sharing have typically focused on its impact on productivity and employment through productivity effects (see for example Cahuc and Dormont 1997, Kruse 1991, and Wadhwani and Wall 1990). Weitzman (1985, 1987) argues that the merit of profit-sharing is that it guarantees stability of employment in the face of economic shocks. The theoretical arguments rely crucially on the assumption that firms use the base wage and not the total level of remuneration as the relevant marginal cost of labour. Wage systems have a negative macroeconomic externality, while profit-sharing systems have favourable externality effects on employment and, indirectly, on price stability. It is argued that if there is a general rise in product market competition, the loss of rents will be shared by firms and workers with no overall impact on employment (see Geroski et al., 1995, for example). In line with their view, intensified competition in product markets could be expected to affect the impact of profit sharing on employment. Furthermore, Bernard et al. (2006) find that economic activity is reallocated towards high-productivity firms as trade costs fall in a given industry. The benefits of economic integration result from access to larger markets, and therefore larger profits and possible economies of scale.
In theory, the impact of profit sharing on employment in the context of economic integration clearly depends on a trade-off between intensified competition and better advantages from economies of scale. A comparatively high degree of product market competition will make labour demand more elastic and shift it outwards. Due to rent sharing behaviour, wage rates can be expected to be inversely related to product market competition. Hence, it can be argued that the ability of profit sharing to improve employment through economic integration is progressively increased when product market competition increases. However, there is case in which firms might choose to pay higher wages when they have market power and are earning higher monopoly rents. This implies that when economic integration leads to greater market power it might in turn decrease the tendency towards profit sharing in terms of higher wages and have a negative effect on employment.

In our theoretical model, it is shown that, if product market competition increases, the ability of profit sharing to improve employment through economic integration increases due to more moderate wages. The main explanation of this result is that with heightened foreign competition unions face a situation where labour demand is more elastic and thus moderate their wage demands. Simultaneously economic integration, when linked together market power, in turn decreases the tendency towards profit sharing in terms of higher wages, thus preventing improvements in employment. In addition, it is shown that, if the elasticity of substitution between labour and capital increases during the process of integration, incentives for using profit sharing decrease with higher relative labour price, which decreases labour demand.

Profit sharing increased considerably in Finland during the late 1990s. In the empirical section of the last essay, the aim is to determine whether European integration has changed the impact of profit sharing on employment in Finland, using employer-employee firm-level panel data from the manufacturing sector linked with European integration indicators for years 1996 - 2004. The datasets used for the analysis consist of two panels: sample from profit-sharing firms and sample from non-profit-sharing firms. One important feature is that profit-sharing firms, which are larger than non-profit-sharing firms, perform better in international product markets. This nearly always leads to the conclusion that profit-sharing firms are subject to greater international competition with access to a wider product market while non-profit-sharing firms are more shel-
tered from economic integration. In addition, labour costs are higher in profit-sharing firms which indicate a higher ratio of skilled workers than in non-profit-sharing firms. To understand the impact of profit-sharing on employment, a useful method is to compare the estimation results of the sample of profit-sharing firms with and without the effects of economic integration. Another practicable method is to use a specification including the interaction term with profit sharing for the total sample of profit-sharing and non-profit-sharing firms.

The estimation results provide support for the view that economic integration strengthens the positive impact of profit-sharing on employment. However, we do not find that profit-sharing firms exhibit greater employment stability during the process of economic integration. These results provide evidence for the hypothesis that profit-sharing improves employment during the process of economic integration, but has an unclear effect on the stability of employment.

REFERENCES


II Economic Integration and the Elasticities of Labour Demand: Econometric Evidence from Finland

Abstract
By using theoretical model and empirical analysis, we investigate the effects of economic integration on the elasticity of labour demand with own price. Using a general theoretical model of intra-industry trade, we analyze how economic integration changes labour-demand elasticity. We show that intensified trade competition increases labour-demand elasticity, whereas better advantage of economies of scale decreases the elasticity of labour demand by decreasing the elasticity of substitution between differentiated products. If integration gives rise to an increase in input-substitutability and/or outsourcing activities, labour demand will become more elastic. We test the idea of whether European integration has changed labour-demand elasticities in Finland using data from the manufacturing sector from 1975 to 2002. Overall, the results provide support for the hypothesis that economic integration has contributed to increased elasticities of total labour demand.
1 INTRODUCTION

Economic integration is a process in which markets for goods and factors of production tend to become perfectly integrated. Competition for the location of capital and production is becoming ever more fiercely as a result of globalization. As Rodrik (1998, 2000) argues, open economies, which are free to trade with each other, differ from closed economies in respect to the fact that, in particular, capital and employers are internationally mobile. The liberalisation of financial markets and the European community programme for liberalising the goods markets throughout Europe have already made considerable progress towards globalizing European economies. Liberalization of the flow of capital in the mid-1980s has, in addiction, effectively created one common market for financial capital. However, local demand for capital is less than perfectly elastic, so capital is neither perfectly mobile nor perfectly immobile. As de Ménil (1999) emphasizes, there do appear to be significant differences in rates of return on capital within EU countries. Liberalising the capital markets in effect created opportunities for multinational corporations furthermore to invest and establish production plants in countries where labour is cheaper. The completion of the Single European Market, which was scheduled to occur by 1992, was intended to complete the process of removing tariff and non-tariff barriers to trade within EU countries. The mobility of production has also increased as a consequence of product market integration. The progress of integration with wider trade and capital flows has strengthened competition between EU countries, which has been reflected in the labour market. On the other hand, greater competition is offset by the fact that firms with access to wider markets should be able to expand sales and production to take better advantage of economies of scale while continuing to cover production costs despite lower price-cost margins.

2 On the other hand, as Osmundsen (1999) discusses, barriers to labour mobility have been lowered by the creation of the EU internal market, and education and language skills have improved, implying enhanced international mobility of the workforce.

3 Wildasin (2000) explains that labour mobility contributing to either lower real wages or higher unemployment worsens especially the welfare of low skilled workers, which are easier to substitute with foreign workers.
It is claimed that the establishment of the European Monetary Union strengthens this process of integration further via increasing competition in international product and capital markets. As Calmfors (1998, 2001) argues, during the process of integration a common currency reduces trade barriers (both in terms of transaction costs and exchange-rate risks with international payments), and therefore leads not only to more trade, but also to more foreign direct investment. The primary objective of European Monetary Union is price stability, which forces countries to adjust to low inflation and to pay attention to firms’ competitiveness. Due to EMU, member-states lose the opportunity of using the exchange rate as an instrument to correct macroeconomic disequilibria. In particular, they cannot devalue their own currency so as to restore international price competitiveness. The loss of national adjustment variables, such as the exchange rate or the interest rate, will result in an increased need for alternative flexible mechanisms to correct possible asymmetric shocks among EMU-countries. Product demand will become more sensitive to price differentials between different countries and firms’ location decisions more responsive to relative labour costs. Burda (1999) speculates that if nominal price rigidity (correlation of nominal wage movements) in Europe increases, then real rigidities (correlation of real wage growth) is likely to decrease, as a consequence of EMU, which calls for labour market flexibility. This adjustment would help the region to improve its competitive position. Therefore, competitiveness will pressurize the need for the labour market towards ever greater flexibility under EMU, and this will result in the further lowering of trade barriers.

Over the past few years, the effects of European economic integration on the labour market have attracted wide interest. While there has been some increase in trade with countries outside the European area, it is a fact that the region remains fairly closed with the consolidated share of trade with non-EU countries remaining about ten percent of total GDP. In contrast, trade within the region has rapidly increased (see OECD 1999).

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4 EMU will eliminate the transaction costs incurred in exchanging currencies, make information less costly, and reduce political risk as the monetary policy is transferred to the European Central Bank (see, e.g., de Ménil 1999, p. 185).
5 Currency devaluation can be used to reduce domestic costs in foreign-currency terms, thereby offsetting the loss in competitiveness (see, e.g., Rodrik 1998, p. 4).
6 In addition, as Andersen et al. (2000) explain, European countries may be affected differently by changes in inter-industry trade, which are more relevant for southern European countries, and intra-industry trade, which are more relevant for northern Europe.
The purpose of this study is to examine, using theoretical models and empirical analysis, the impact of economic integration on the own-price elasticity of labour demand. The empirical aim is to determine whether European integration has increased or decreased own price elasticities in Finland. Economic integration with its corresponding effect on market power can in theory increase or decrease labour-demand elasticity. With increased integration and competition firms with access to the wider market are expected to be able to expand sales and production to take better advantage of economies of scale. Thus, market power may arise from specialization in production and product differentiation in order to establish segmented markets. This might in turn decrease the elasticity of labour demand. In contrast Rodrik (1997) and Slaughter (2001), for instance, have emphasized the possibility, particularly in imperfectly competitive contexts, that labour-demand elasticity is higher with greater openness. As Slaughter (2001) points out, the link between factor demand elasticities and product market elasticities is directly established through Hicks-Marshall’s fundamental law of factor demand, which implies that “the demand for anything is likely to be more elastic, the more elastic is the demand for any further thing which it contributes to produce“. Since product market elasticities are likely to rise with integration, this implies that, with greater trade openness, we should see an increase in labour-demand elasticities as well. However, from a theoretical point of view, as Panagariya (2003) has shown, Rodrik’s conjecture that globalisation has a positive effect on labour-demand elasticity, finds little support. As a consequence, the validity of the relationship has to be determined empirically.

First, the purpose is to examine the main channels through which the elasticity of labour demand is affected by international integration. We focus on how product market integration can, in theory, change the elasticity of labour demand. This general model of intra-industry trade specifies a theoretical framework of estimation for the elasticities of labour demand and the determining of the effects of economic integration on elasticities. Intra-industry trade may be defined as the two-way exchange of goods in which neither country seems to have a comparative cost advantage. As Helpman and Krugman (1989) point out, it is a phenomenon that first drew attention during the rapid expansion of trade in manufactured goods that followed the creation of the European Common Market. There are two major channels through which integration might affect labour
markets: product markets and factor substitution. From the demand for labour and capital we can derive the own-price elasticity of labour demand, and derive the substitution and scale effects for the elasticity of labour demand.

Second, the empirical work focuses on determining the effect of European integration on the elasticities of labour demand. This has been tested using data from the Finnish manufacturing sector from 1975 to 2002. Our empirical work is closely related to tests of the Factor Price Equalization (FPE) theorem, although the theorem does not depend on substitution between inputs and market power with differentiation of products. The theorem, according to which free trade leads to the equalization of relative product prices across countries, implies that relative factor prices also have to be the same across countries, even in the absence of perfect factor mobility. Even when labour mobility is low, product market integration will force product price and factor price convergence for production factors of similar quality. When the mobility of capital increases as consequence of integration, domestic workers can be substituted by other factors, either through trade or through investment. Barriers to trade make the movement of labour and capital more costly and more risky, and prevent the complete equalization of factor prices.

The study is organized as follows. Section 2 focuses on identifying the main channels through which economic integration affects labour-demand elasticities. It specifies a theoretical framework for empirical analysis. Section 3 formulates the econometric model. The data are described in Section 4. Section 5 presents the estimation strategy, and reports on the empirical results. A few concluding remarks and suggestions for future analysis are given in the last section.

2 THEORETICAL BACKGROUNDS

2.1 Theorems of international trade

The labour market effects of integration running via changes in relative factor supplies are captured by the Heckscher-Ohlin (HO) theorem. The Heckscher-Ohlin theorem of traditional trade models connects trade with factor supplies. The HO model identifies a
mapping from exogenously given factor supplies and exogenously given external product prices determined in the international market place into internal factor prices, output levels and consumption levels, the difference between these last two items being international trade. (See, e.g., Leamer and Levinsohn 1995, p. 1345.) Thus, pressure on factor prices comes from trade with countries with dissimilar relative endowments. The empirical prediction of the HO model is that a country should export the goods in which it has a comparative advantage and import the goods in which it does not. However, Leontief (1953) observed that the US, which was at that time by far the most capital-intensive country in the world, exported relatively labour-intensive products. Another approach to testing the implications HO theorem is to see if the pattern of net exports within an individual country conforms to what would be expected on the basis of the relative factor endowment of that country. For example, using US data, Baldwin and Cain (1997) report estimates of relative comparative advantage as a function of factor shares across industries producing tradable goods. Their results suggest that the US tends to be a net exporter of goods and services that are relatively education-intensive.

The Stolper-Samuelson theorem\(^7\), one of the HO models, connects factor prices with product prices. The theorem describes a mapping from prices determined externally in international markets to prices determined internally in local markets. The result applies if the external markets determine the price of commodities and the internal markets determine the price of factors. An increase in the relative price of a good yields an increase in the real return on the factor used intensively in that good and a decrease in the real return on the other factors. The empirical prediction of the theorem is that under certain conditions\(^8\) the prices of individual factors across different countries - in the absence of tariffs or other impediments to free trade - tend to equalize. Andersen (2005) has emphasized, using the Stolper-Samuelson proposition that the relative wage of unskilled workers in European countries should decline if the integration process is associ-

\(^7\) See, e.g., Leamer and Levinsohn 1995, pp. 1345-1348.
\(^8\) One of these assumptions is that the technology of the production of each good is identical in each country. Several papers (e.g., Trefler, 1993 and 1995; Davis et al., 1997; Harrigan, 1997) have revisited the HO prediction with specifications that allow for the estimation of inter-country differences in technology to be an additional source of comparative advantage. The results of these studies, when technology differences are taken into account, are, at least, qualitatively consistent with the predictions of the HO model: countries tend to be net exporters of the services of the factors in which they are relatively abundant. An interesting aspect of Trefler (1995) is his conclusion that observed trade flows also reflects inter-country technology differences.
ated with a decline in the relative price of commodities intensive in low skilled labour. The weaker position of low skilled workers may more generally appear in the form of lower relative wages or a higher incidence of unemployment for low skilled workers in European countries. Wage dispersion may be rising just as differences in employment prospects are growing between geographical areas and among workers with different levels of education.⁹

If an economy’s relative endowment equals that of the rest of the world, then when economies are more integrated they experience, via the HO theorem, no change in product prices and thus, via the Stolper-Samuelson theorem, no change in wages. But integration can make foreign factors more substitutable with domestic ones. The Rybczynski theorem¹⁰ depends on substitution between inputs within sectors. The theorem connects output levels with factor supplies. It relates changes in endowments to changes in the pattern of production. When product prices are fixed, an increase in the quantity of one factor will give rise to a more than proportional increase in the output of the good which uses that factor intensively and a reduction of the output of other goods. Then, pressure on the elasticity of labour demand comes from dissimilar relative endowments, regardless of international trade. For example, using panel data from two industries Harrigan (1995) explains production levels as functions of national factor endowments. The results suggested that capital was a source of comparative advantage in both industries, while skilled labour was a source of comparative advantage in one industry, and unskilled labour a source of comparative disadvantage in both.

The Factor Price Insensitivity (FPI) theorem¹¹ connects factor prices with factor supplies. Within a country, factor prices are completely insensitive to changes in factor supplies, when product prices are fixed. Johnson and Stafford (1999) explain, according to the FPI-model, that changes in relative factor supplies have no effect on relative factor prices. The empirical study by Slaughter (1997) is close to a direct test of the FPI-theorem. The theorem according to which free trade leads to the equalization of relative product prices across countries implies that relative factor prices also have to be the same across countries, even in the absence of perfect factor mobility. Slaughter con-

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⁹ This depends on a trend towards more decentralized wage formation giving a larger role for wage setting at the firm level.

¹⁰ See, e.g., Leamer and Levinsohn 1995, pp. 1345-1346.
ducted his test to demonstrate whether, as the U.S. economy became more open, there was a corresponding increase in the absolute elasticity of labour demand. Although, as Andersen and Sørensen (2000) summarize, the theorem relies on a number of crucial assumptions, one of which is that there is perfect competition in product markets. This assumption is counterfactual for a number of products and nor does factor price equalization necessarily follow from free trade. Market power arises, among other things, from specialization in production and the differentiation of products in order to establish segmented markets. Another assumption is that the demand for labour during integration is infinitely elastic. This requires a factor supply variation that is too small to lead a country into a different range of specialization. In addition, neither the FPI-theorem with the HO theorem nor the Stolper-Samuelson theorem depends at all on substitution between inputs within sectors.

2.2 A Model of the Elasticity of Labour Demand and Product Market Integration

We will formulate a general theoretical model of intra-industry trade in order to capture the effects of product market integration on the elasticities of labour demand. The focus is on how the process of integration is reflected, via the removal of barriers to international trade, substitution, and outsourcing, in labour-demand elasticities. We consider an open economy where there are many firms at industry level producing differentiated good $Y_j$ with capital $K_j$, skilled labour $L_{jS}$ and unskilled labour $L_{jU}$ as inputs. Capital and skilled labour are mobile between countries, while unskilled labour is immobile. Adapting the model of Dixit and Stiglitz (1977), where there is assumed to be no strategic (Bertrand or Cournot) interaction between firms, when product markets are imperfectly competitive, there is monopolistic competition in good markets. The structure of this general model is such that consumers demand a variety of differentiated products.

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12 The integration process is implying more integration across product markets.
We suppose for simplicity that all industries produce only differentiated products.\(^{14}\) Representative consumer’s tastes are represented by the utility function

\[
V = \sum_j b_j \frac{1}{\theta_j} D_j^{\theta_j} \tag{2.1}
\]

where \(D_j = \sum_{i=1}^n D_{ji}\) is an index of the consumption of differentiated products in industry \(j\), and \(b_j\) is the positive constant. By imposing the symmetry assumption\(^ {15}\) consumer maximization\(^ {16}\) will set

\[
D_j = \left( \frac{P_j^*}{b_j} \right)^{-1} \tag{2.2}
\]

where \(\epsilon_j = \frac{1}{1-\theta_j} > 1\) is the product-demand elasticity, and \(P_j^*\) represents an index of the price level in terms of international integration. Product-demand elasticity can be thought of as an increasing function of the number of products \(\epsilon_j = \epsilon_j(n_j)\), where \(\epsilon_j'(n_j) > 0\), and \(n_j\) is the number of products/firms in industry \(j\). An increase in the number of firms leads to an increase in the degree of competition. The demand of products type \(i\) is given as

\[
D_{ji} = D_j \left( \frac{p_{ji}}{P_j} \right)^{-\phi_j} = a_j P_{ji}^{-\phi_j} P_j^{\epsilon_j - \phi_j} \tag{2.3}
\]

\(^{13}\) This approximates a situation in which there are a large number of varieties and each firm has some power over the pricing of its product.

\(^{14}\) It is possible to suppose that there is a sector producing the outside good only for domestic market.

\(^{15}\) We imagine an economy that is able to produce a large number of products, all of which enter symmetrically into demand.

\(^{16}\) Each consumer maximises their utility function (2.1) subject to the budget constraint. The budget constraint simply requires that the value of expenditure is not more than value of the income.
where \( p_j \) represents the price of variety \( i \) with \( \phi_j > 1 \) denoting the elasticity of substitution between any two products types (see Helpman and Krugman 1989). An industry’s elasticity of substitution among differentiated goods can be thought of as a decreasing function of the advantage of economies of scale \( \phi_j = \phi_j(a_j) \), where \( \phi'_j(a_j) < 0 \), and

\[
a_j \equiv \frac{A_j}{A_j^*}
\]

is an exogenous comparative productivity for domestic industry relative to foreign industries. A growth in the advantage of economies of scale in a given industry leads to a decrease in the degree of substitution among differentiated goods within that industry.\(^{17}\)

Consider now the impact of a reduction in marginal trade costs on product markets. Let \( \tau_j \) denote a trade cost due to transaction costs and other trade barriers related to foreign trade\(^{18}\) in industry \( j \). The effects on imperfectly competitive product markets of increased integration via declining trade costs are basically of two counteracting sorts. Hence, integration turns out to vary competition by varying both advantages of economies of scale holding \( \varepsilon_j \) constant, and the number of firms holding \( \phi_j \) constant. First, individual producers with access to the wider market are expected to be able to expand production to take better advantage of economies of scale \( (a_j) \). This is associated with reduced market imperfection and the increased incentive of product-differentiation. Hence, we assume that

\[
(2.4) \quad \frac{\partial \phi_j}{\partial a_j} \frac{\partial a_j}{\partial \tau_j} > 0 .
\]

Second, market entry becomes easier and/or less costly implying that more goods become traded goods \( (n_j) \). With increased integration and competition, an industry’s mar-

\(^{17}\) Together with interaction between the number of products/firms and the degree of price competition, intra-industry trade and economic integration can be seen as the result of the interaction between product differentiation and economies of scale. Each industry contains a large, but limited because of economies of scale, number of potential differentiated products that consumers regard as imperfect substitutes. Given the opportunity to trade, industries will specialize in the production of different ranges, while the degree of price competition will increase.

\(^{18}\) For simplicity, we assume that the trade costs of import and export outputs are equal.
ket share becomes increasingly sensitive to price changes, raising the elasticity of the consumption price. Thus, we have

\[ (2.5) \quad \frac{\partial \epsilon_j}{\partial n_j} \frac{\partial n_j}{\partial \tau_j} < 0. \]

The higher the degree of price competition, i.e. the closer substitutes the good sale on the world market is, the more elastic with respect to the own price output demand becomes. On the other hand, if the initial competitiveness of a domestic industry is much better than the competitiveness of a foreign industry, an increase in the degree of competition tends to give rise to higher supply by taking better advantage of economies of scale.

The relative price \( \frac{p_{ji}}{P_j} \) is chosen by the firm. In imperfect competition, we have then the condition of a pricing rule for product types in industry \( j \)

\[ (2.6) \quad P_j^* \geq \left[ \sum_{i=1}^{a} \left( 1 + \tau_j \right) \frac{p_{ji}^{1-\phi}}{a_j} \right]^{\frac{1}{1-\phi}}. \]

A given variety \( i \) within industry \( j \) is offered by firms at a price \( p_{ji} \) in terms of the overall price index \( P_j^* \), in terms of various trade costs \( \tau_j \) related to foreign trade in industry \( j \), and in terms of the comparative productivity of a domestic industry relative to a foreign \( a_j \). At the optimum, price equals the marginal revenue from exporting, and the relative trade cost equals the mark-up factor i.e. \( \frac{1 + \tau_j}{a_j} = \frac{\phi_j + \epsilon_j}{\phi_j + \epsilon_j - 1} \) (see, e.g., Helpman and Krugman 1989, p. 18). We summarize the characterization of the optimal pricing rule in

**Proposition 1** Lower trade costs with increased integration, a higher number of firms and, in consequence, a higher elasticity of product demand will reduce the mark-up
price, whereas better advantage of economies of scale and, in consequence, a lower elasticity of substitution between differentiated products will raise it, ceteris paribus.

Furthermore, international integration gives access to foreign factors of production as well as domestic ones, either directly through foreign affiliates or indirectly through intermediate inputs. As Burda and Dluhosch (2000) discuss, the removal of barriers to trade and mobility between countries will increase incentives for firms to economize on variable costs by outsourcing or fragmenting the production process. In this sense, an enlarged market can drive an endogenous evolution of technology, which in turn affects the factor markets by imported intermediate inputs. Together with labour costs, a change in capital costs affects firms’ price setting. A firm considers the gross interest rate of industry \( \hat{r}_j \) as given. It is given by the net-of-tax interest rate plus a capital tax, i.e. \( \hat{r}_j = (1 + t_r) r_j \) with \( t_r \) denoting the capital tax rate.\(^{19}\) The gross wage of industry \( \hat{w}_j \) consists of net-of-tax wages\(^{20}\) plus social security contributions \( t_w \), so that we have \( \hat{w}_j = (1 + t_w) w_j \). Let the unit costs of international outsourcing for industry \( j \) be denoted \( \lambda_j \), and assume that these costs have a cumulative distribution function given by \( \psi_j \). There are monitoring, switching and friction costs involved in letting an activity be outsourced.\(^{21}\) Then it is profitable for the firm to outsource activities if

\[
(2.7) \quad \frac{\hat{w}_j}{\hat{r}_j} > \lambda_j
\]

which applies for a fraction

\(^{19}\) Other capital costs are mainly the depreciation of capital.

\(^{20}\) A rise in income tax increases labour costs when the rise in income tax is compensated for by an increase in negotiated wages.

\(^{21}\) As Wildasin (2000) argues, capital and labour are not actually homogeneous factors of production, but rather aggregates of many specific types of inputs. Firms cannot without costs alter their stocks of capital and labour. The adjustment of production in response to shocks in the product market incurs costs because it is costly to replace plant and equipment, and to hire new workers.
\[ \psi_j(\lambda_j, \tau_j) = \Pr \left( \frac{w_j}{r_j} < \lambda_j \right) \]

The cumulative distribution function \( \psi_j(\lambda_j, \tau_j) \) is also parameterized on trade costs \((\tau_j)\) reflecting the effect of increased integration on the switching costs of outsourcing. Integration may lower the switching costs involved in outsourcing activities. Hence, we have

\[ \frac{\partial \psi_j}{\partial \lambda_j} > 0, \]

\[ \frac{\partial \psi_j}{\partial \tau_j} > 0. \]

The first inequality implies that the input-share becomes more sensitive to the relative input-price when the switching costs of outsourcing are decreased. The second inequality says that more integration (lower trade costs) for a given relative input-price (switching costs) increases the share of firms which choose outsourcing.

Assuming that linear-homogenous technology can be represented by CES (constant elasticity of substitution)\(^\text{22}\) cost function form and a strong separable between unskilled and skilled labour\(^\text{23}\), the total cost function

\[ C_j = \sum_h C_{jg} \]

\(^{22}\) The CES function exhibits constant returns to scale. However, intra-industry trade may give rise to take advantage of economies of scale in production.

\(^{23}\) Empirical studies usually point to a lower degree of substitution between skilled labour and capital than between unskilled labour and capital. Integration forces changing labour substitutability by making labour less/more easily substituted for foreign factors of production depending on complementarity between human capital and physical capital (see, e.g., Skaksen and Sørensen 2002, or Feenstra and Hanson 2001). However, as Hamermesh (1993) discuss, the difficulty with the production function \( Y = F(H(L_h, L_g), K) \) is that the aggregation of labour inputs by the function \( H \) is an arbitrary description of technology. If labour sub-aggregates are not separable from capital, one will underestimate own-price demand elasticities, and infer that the types of labour are greater price-substitutes that in fact they are. Because of this problem of the separable of inputs I also estimate the elasticities of total labour demand.
can be specified as the sum of sub-CES cost functions of the form

\[
C_{jg} = Y_j \left[ \psi_{jg} \left( \frac{W_{jg}}{W_{jg}} \right)^{1-\sigma_{jg}} + (1-\psi_{jg}) \left( \frac{W_{jg}}{W_{jg}} \right)^{1-\sigma_{jg}} \right]^{\frac{1}{1-\sigma_{jg}}}
\]

where \(j\) and \(g\) refer to industry and input groups, respectively. Industry \(j\)’s elasticities of substitution between capital and unskilled or skilled labour are denoted \(\sigma_{jg}\). The elasticity of substitution is defined as the effect of a change in relative factor prices on the relative inputs of these two factors, holding output constant (see Allen 1938, or Hamermesh 1993). The distribution parameter \(\psi_{jg}\) can be defined an index of augmenting technological change, which is related to international outsourcing. In particular, increased imported intermediate inputs should mainly affect unskilled workers who find it more difficult to adjust to this imported technological change. The CES function allows values \(\sigma_{jg} \geq 0\), which can be thought as parameterized on trade costs \(\tau_j\), to reflect the fact that integration expands the set of factors by increasing the mobility of capital.\(^{24}\) Thus, firms can substitute other factors of production for immobile workers more easily by investing. If the elasticity of substitution is great, as labour costs rise relative to capital costs, labour will be substituted for capital.\(^{25}\)

We assume imperfect competition in the product market i.e., each single firm at industry \(j\)’s level faces a downward sloping demand curve

\[
Y_j = D_j(p_j) = p_j^{-(\theta_j + \varepsilon_j)}.
\]

\(^{24}\) Kauppi et al. (2004) establish the useful relationship between capital and labour markets. They show that, since employment is negatively related to the wages and capital is negatively related to the rate of interest, labour demand and the capital price are either positively or negatively related as well, if the elasticity of substitution between labour and capital is different from one. Hence, there is a negative (positive) relationship between labour demand and the capital price if the elasticity of substitution is below (above) one. Juselius (2005) finds a negative long-run relationship between unemployment and the interest rate using Finnish manufacturing data which is consistent with an elasticity of substitution above one.

\(^{25}\) When there is a rise in labour costs, the relative price of capital in terms of labour in a given industry will decline i.e. capital here will be relatively cheap. As a result, competitive forces will lead to the adoption of more capital-intensive techniques of production than elsewhere. In case of the unitary elasticity of substitution, the capital/labour ratio will also change by equal percentages as the factor-price ratio. If the elasticity of substitution is less than one, an increase in the price of labour must induce firms to use more capital, but the increase in the use of capital is not equal relative to an increase in labour-price.
The closer substitutes for output $Y_j$ on the international market are, the more elastic output demand becomes. Profit maximization implies that firms will set a price which exceeds the marginal cost by a constant mark-up factor, i.e. $\frac{\phi_j + \varepsilon_j}{\phi_j + \varepsilon_j - 1} > 1$. During the process of integration, there are pressures for mark-ups to fall along the increasing elasticity of product demand. On the other hand, a decrease in product-substitution elasticity may compensate for this effect. A firm maximizes profits, which are given by

$$ (2.14) \quad \Pi_j = p_j(Y_j)Y_j - \tilde{w}_j L_j - \tilde{r}_j K_j. $$

Profit maximization, with respect to labour, yields the conditional labour demand function

$$ (2.15) \quad L_{jg} = \psi_{jg} Y_j \left[ \psi_{jg} \tilde{w}_{jg}^{1-\sigma_u} + (1 - \psi_{jg}) \tilde{r}_{jg}^{1-\sigma_u} \right] \tilde{w}_{jg}^{-\sigma_u} \tilde{w}_{jg}^{\sigma_u}.$$

Group $g$’s cost function can be written as $C_{jg}(\tilde{w}_{jg}, \tilde{r}_{jg}, Y_j) = c_{jg}(\tilde{w}_{jg}, \tilde{r}_{jg}) Y_j$ in industry $j$. The share of labour and capital costs in total costs is defined for group $g$ $s_{jg} = \frac{\tilde{w}_{jg} L_{jg}}{c_{jg} Y_j}$ and $(1-s_{jg}) = \frac{\tilde{r}_{jg} K_{jg}}{c_{jg} Y_j}$, respectively, with $c_{jg} = c_{jg}(\tilde{w}_{jg}, \tilde{r}_{jg})$ denoting group $g$’s unit and marginal cost of production in industry $j$. Marginal cost solely depends on gross factor prices. Labour demand is affected by the share of labour in total costs. If this share is low, then a percentage increase in labour costs will have a smaller impact on total costs.

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26 Applying one of the four Hicks-Marshall laws of derived demand, the demand for anything is likely to be more elastic, the more elastic is the demand for any further thing which it contributes to produce (Hicks 1966, p. 242).

27 Whenever an economy faces a larger number of firms in an integrated world market, trade itself leads to a decline in mark-ups. Hence, the degree of competition tends to increase when more goods become traded. When individual firms face increased competition in product markets, it is intended that they should lower their mark-ups of prices over marginal costs. For instance, Hoon (2001) has affirmed that as domestic and foreign firms compete in the markets for traded goods, there are pressures for mark-ups to decline.
than, if the share of labour is large (see, e.g., Booth 1995, p. 58). The own-price elasticity of labour demand can be derived (see Allen 1938, or Hamermesh 1993) as

\[
\eta_{LL,jg} = \frac{-s_{jg}}{1-\psi_{jg}} \sigma_{LL,jg} - s_{jg} (\phi_j + \epsilon_j) - \eta_{\psi_{jg}}
\]

where \( \eta_{\psi_{jg}} \) is the elasticity of outsourcing for industry \( j \) with the price of labour type \( g \). In equation (2.16), \( \eta_{LL,jg} \) is the elasticity of labour demand for industry \( j \) with the own price for group \( g \); \( \sigma_{LL,jg} \) is group \( g \)'s elasticity of substitution between labour and capital in industry \( j \); \( \phi_j \) is the elasticity of product substitution, and \( \epsilon_j \) the elasticity of product demand for industry \( j \)'s output market. Equation (2.16) consists of three parts. The first part shows, for a given level of output, how much firms substitute away from labour type towards capital when labour costs rise. For example, an increase in social security contributions shifts the labour demand curve inward by increasing the cost of labour (see, e.g., Pissarides 1997, p. 5). As Holmlund et al. (1989) explain if there is complete nominal wage rigidity, employment takes the whole burden of adjustment.28 The second part of equation (2.16) shows how much an industry's labour demand changes after a labour cost change in response to a change in the industry’s output. For example, higher (lower) wages imply higher (lower) costs and thus, moving along the product-market demand schedule, lower (higher) industry output. The third part shows how much an increase in wage costs gives rise to a switch towards more outsourcing. In summary, when labour costs have risen, an industry will substitute away from labour towards capital or switch towards more outsourcing, and with higher costs the industry produces less output such that it demands less all factors.29

28 If there is, correspondingly, complete nominal wage flexibility, the increase in social security contributions is completely shifted back on to wages.

29 Similarly, a cut in social security contributions shifts the labour demand curve to the right. Both real wages and employment rise, but how much does the impact on wages and employment depend on the own-price elasticity of labour demand?
In theory, economic integration can change the elasticities of labour demand without changing labour prices. Differentiating of equation (2.16) with respect to trade costs it gives the effect of increased product market integration on labour-demand elasticity

\[
\frac{\partial \eta_{\text{LL},g,j}}{\partial \tau_j} = \frac{-(1-s_{\text{g},j})}{(1-\psi_{\text{g},j})} \frac{\partial \sigma_{\text{g},j}}{\partial \tau_j} - \frac{s_{\text{g},j}}{\psi_{\text{g},j}} \left( \frac{\partial \phi_j}{\partial \sigma_{\text{g},j}} + \frac{\partial \epsilon_j}{\partial \sigma_{\text{g},j}} \right) \frac{\partial \eta_{\text{g},j}}{\partial \sigma_{\text{g},j}},
\]

(2.17)

During the process of integration, international trade can increase the elasticity of labour demand through the elasticity of substitution between labour and capital, which is captured by the first term on the right hand side of equation (2.17). As a consequence of decreased trade costs \((\tau_j)\) as industry \(j\)’s substitutability increases (i.e., \(\sigma_{\text{LL},j}\) rises), labour demand becomes more elastic (i.e., \(\eta_{\text{LL},j}\) falls). The smaller labour costs are as a share of a firm’s total costs \((s_{\text{g},j})\), the stronger the pass-through from the elasticity of substitution to the elasticity of labour demand is. In other words, the higher the wages the larger the drop in the quantity of labour demanded and the less important labour is in total costs. As Rodrik (1997) argues, the increasing mobility of capital means that the demand for labour will generally be more responsive to changes in factor prices. Firms can substitute other factors of production for immobile workers more easily by investing.\(^{30}\) However, if an industry is specialized in a skill-intensive sector, the own-price elasticity of labour demand should be lower in that industry than in an industry that spe-

\(^{30}\) Generally, the demand for any factor of production becomes more elastic when the others can respond to changes in the economic environment with greater ease (Rodrik 1997, p. 17). As the costs of capital mobility fall via the removal of both exchange rate risks and the costs of transaction, capital owners are more responsive to move their capital to a country where it earns a higher return. As Rodrik and van Ypersele (2001) explain, in the process of integration, real and financial capital is more sensitive to shocks such as changes in productivity or the terms of trade. A negative shock at home may induce a capital outflow abroad. A capital outflow is also liable to affect the marginal productivity of labour, in turn leading to effects on wages (see, e.g., Keen and Marchand, 1997). An increase in capital productivity tends to increase relative labour costs, which may encourage shifting production determining by higher productivity. Particularly in production with low-skill workers, employers can react sensitively to changes in prevailing wages by investing.
cializes in a low skilled labour intensive good.\textsuperscript{31} In addition, shifts in production technology or an increase in the use of physical capital also requires workers to obtain new skills, which increases the demand for human capital (i.e. $\frac{\partial \sigma_{LL,j}^{\tau}}{\partial \tau_j} > 0$) and thus decreases the elasticity of skilled labour demand.

Another substitution effect is the incentive to outsource, which is captured by the third and last terms on the right hand side of equation (2.17). By using equation (2.10), as a consequence of decreased trade costs ($\tau_j$) it follows that as industry $j$’s outsourcing becomes more elastic (i.e., $\eta_{\psi_{gj}}$ rises) and the probability of outsourcing increase, (i.e., $\psi_{jg}$ falls) labour demand becomes more elastic (i.e., $\eta_{LL,j}$ falls). The smaller the share of labour-input costs is the stronger the pass-through from the probability of outsourcing to the elasticity of labour demand is. Integration thus expands the set of factors industries can substitute indirectly towards in response to higher domestic wages beyond domestic non-labour factors to include foreign factors.\textsuperscript{32} Whereas, in a skill-intensive industry, when the elasticity of substitution between skilled labour and capital is small ($\sigma_{LL,j}^{\sigma} < 1$) with a high share of labour-input costs ($s_{jg}$) and an initially low outsourcing-probability ($\psi_{jg}$) the effect of increased outsourcing-elasticity on labour-demand elasticity can be compensated for partly by the effect of the increased probability of outsourcing. Intuition says of the counteracting effect of outsourcing that labour costs will become a relatively more important cost-component when a larger proportion of activities are outsourced. We summarize the substitution effects of integration in

\textsuperscript{31} In the case of labour demand with several inputs, adopting more capital-intensive production will decrease the demand for low-skilled workers and increase the demand for educated workers. As a result, a rise in the cost to employers of using physical capital will decrease the demand for educated workers used at each level of production. In the case of complements, the elasticity of substitution is low so a rise in the price of capital also leads to a decrease in employment.

\textsuperscript{32} Slaughter (2001) emphasizes that industries need not actually access foreign factors, the ability to do so is sufficient to increase the elasticity of labour demand.
Proposition 2 Lower trade costs with increased integration, higher elasticity of substitution between labour and capital and/or higher elasticity of outsourcing with the higher probability of outsourcing will increase the elasticity of labour demand.

So the integration process should increase substitution, directly or indirectly, and economic integration should tend to further increase the elasticity of labour demand, especially that of unskilled labour.

If product markets are imperfectly competitive, integration can also make product markets more competitive via international trade. Several models of imperfect competition predict that trade liberalization makes demand more elastic, but not infinitely so.\(^{33}\) The market shares of a domestic supplier and a foreign supplier become more sensitive to relative price when economies are more integrated. International integration which reduces trade frictions and therefore makes it easier to shift supplier, can have potentially large effects on product-elasticities. Rodrik (1997) argues that since the demand for labour is a derived demand which varies proportionately with the elasticity of demand for goods, the integration of goods markets alone makes the demand for domestic labour more elastic because of declining mark-ups.\(^{34}\) Trade flattens the demand curve for labour and increases the elasticity of demand for labour.\(^{35}\) However, by using (2.4) and (2.5), differentiation (2.17) shows that as a consequence of decreased trade costs \((\tau)\) as the number of products/firms rise \((n)\) industry \(j\)’s product demand becomes more elastic (i.e. \(\varepsilon\) rises), as does labour demand (i.e., \(\eta_{LL}\) falls), while as advantage from economies of scale rise \((a)\) product substitution becomes less elastic (i.e. \(\phi\)

\(^{33}\) In a perfectly competitive international market, output price decreases as demand decreases, and firms take the market price of an output as given. Supposing decreasing returns to scale, each firm decreases labour demand to the level where price equals marginal cost (see, e.g., Varian 1992, pp. 215-216). The models of international trade (e.g., Heckscher-Ohlin model) with perfectly-competitive product markets have the extreme result of infinitely-elastic product demand and thus infinitely-elastic labour demand.

\(^{34}\) Also increased information allows firms to respond more effectively to cost differences. Increased comparability means that the labour market impact of changes in profits increases and thus the elasticity of labour demand increases. (See Rauch and Trindade 2000, p. 7.)

\(^{35}\) Rodrik (1997, 1998) explains that when the shock of product market is a negative one, there is a larger decrease in employment in more open economies. A consequence of integration is greater instability in labour-market outcomes when openness magnifies the effects of shocks on labour demand. An inward shift and a flattening of the demand curve for labour reduce average earnings. Increased trade and investment opportunities for employers make it more costly for workers to achieve a high level of labour stan-
falls), as does labour demand (i.e. $\eta_{LL}$ rises). The larger labour’s share of total costs, the stronger the pass-through from the elasticities of product to the elasticities of labour demand. The number of firms (both domestic and foreign) competing in this kind of industry can arise as a result of the integration process, which shifts the foreign output mix towards this kind of industry. The integration process can force domestic firms to face heightened foreign competition. An increase in the elasticity of product demand triggered by there being more firms increases the elasticity of labour demand. Product demand becomes more price elastic when product markets are more integrated, but is the effect of product market integration on the price sensitivity of market share larger than its direct effect on market share? For example, an individual industry with access to the wider market might be able to expand sales and production taking better advantage of economies scale, which can be associated to decreased market imperfections and thus decreased labour demand elasticities. Because of these counteracting effects we cannot conclude that the scale effects of integration tend to increase labour-demand elasticity. We summarize the scale effects of integration in

**Proposition 3** Lower trade costs with increased integration, a higher number of firms and, in consequence, higher elasticity of product demand will increase the elasticity of labour demand, whereas better advantage of economies of scale and, in consequence, lower elasticity of substitution between differentiated products will decrease it.

Finally (2.17) reveals the following result

**Corollary 1** If $\frac{\partial \phi_j}{\partial a_j} \frac{\partial a_j}{\partial \tau_j} < \frac{\partial \varepsilon_j}{\partial n_j} \frac{\partial n_j}{\partial \tau_j}$ and $\frac{\partial \sigma_{LL,j}}{\partial \tau_j} < 0$, then $\frac{\partial \eta_{LL,j}}{\partial \tau_j} > 0$.

36 Tefler (1995) suggests that when consumers regard home and foreign product varieties as imperfect substitutes, overall industry product-demand elasticity depends on the elasticity of substitution between home and foreign varieties. If the integration process eases substitution, it increases the overall industry elasticity of demand and thus the derived elasticity of demand for labour.
which implies that economic integration makes labour demand more elastic, if increased trade competition crowds out better advantages from economies of scale and input-substitutability increases.

In summary, labour-demand elasticity involves two different effects of an increase in the degree of integration, the substitution and scale effects. In the present set-up, economic integration can change the own-price elasticity of labour demand by increasing/decreasing either both of the product elasticities, (demand and substitution), or the elasticity of direct substitution between factors of production and outsourcing activities. The process of integration reduces trade barriers, and therefore leads not only to more trade, but also to more foreign investment. Increased trade, outsourcing, and investment opportunities make firms more sensitive to changes in such costs. When unskilled labour is immobile, and the mobility of other factors is increasing as consequence of integration, workers can be substituted with other workers abroad, either through trade or through outsourcing. Then integration can make labour demand more elastic either by making output markets more competitive or by making domestic labour more substitutable with foreign factors. However, the effect of integration on the price sensitivity of market share may be compensated by its direct effect on market share, i.e. an industry’s market power can arise from specialization in production and differentiation of products, which allows better economies scale. In addition, if an industry is specialized in a skill-intensive sector, shifts in production technology or an increase in the use of physical capital also requires workers to acquire new skills, which increases the demand for human capital, making labour demand less elastic. Thus, the effect on labour-demand elasticities of increased integration is more of an empirical question.

3 ECONOMETRIC MODEL

The elasticities of labour demand are estimated, as Hamermesh proposes, using a log-linear specification where the quantity of factor employment is regressed on real factor prices and real production. In response to the logarithmic form of the conditional labour demand equation (2.15), the parameters correspond to the own-price elasticities of labour demand, enabling the described integration effects to be determined on the elastic-
entities. In the short run, a change in the price of labour will induce a change in output, i.e. elasticities include the scale effect. The short run elasticities would be estimated without production, or with production as constant. (Hamermesh 1986, p. 449.) Assuming that the scale returns are constant we estimate the constant-output elasticities of labour demand using restricted least squares procedure. For each year, this suggests the following regression equation for estimating constant-output elasticities:\(^{37}\)

\[
\Delta \ln(L_i) = \alpha_i \Delta \ln(\omega_{it}) + \mu_i \Delta \ln(\Psi_{it}) + \beta_i \Delta \ln(Y_{it}) + e_{it}
\]

where \(L\) is the quantity of labour employed (either both types of workers or total workers), \(\omega\) real labour costs, \(\Psi\) real capital costs, \(Y\) real output, and \(\beta = 1\) with constant output. \(i\) indexes plants, and \(t\) the year. The individual parameter \(\alpha\) is the estimate of the elasticity of labour demand with respect to own price when production is constant. Hamermesh (1983) argues that the measurement error introduced by average wage measures biases elasticity estimates up towards zero; but with this measurement error in other factor prices as well the net bias is unclear. However, if the measurement-error bias is relatively constant over time, the true pattern in elasticity time trends is relatively unaffected. Thus, as Slaughter (2001) argues, the primary concern should be trends over time in elasticities rather than their levels. It is assumed that there are no significant time lags between changes in factor prices and a plant’s labour demand responses. Hamermesh (1983) reports that typical adjustment lags are six months to one year, so, in the annual data, lags should not be too important at the plant level.

If both scale and constant-output elasticities are consistently estimated, the difference between them is the estimate of the scale effect, and it would provide indirect evidence on the competitiveness of product markets; and thus the impact of integration’s scale effects on labour-demand elasticities can be determined. To estimate the scale effect elasticities of labour demand for each year suggests the following regression equation:

\[
\Delta \ln(L_{it}) = \Phi \Delta \ln(\omega_{it}) + \mu_i \Delta \ln(\Psi_{it}) + \beta_i \Delta \ln(Y_{it}) + u_{it}
\]

\(^{37}\)Taking logarithms in conditional labour demand, equation (2.15) yields to a form which is very useful for estimation.
The individual parameter $\Phi$ is the estimate of scale effect labour-demand elasticity when scale returns are not constant. Scale effect $\beta$ measures the impact of an international demand shock on labour demand. This estimate of the instruments of the scale effect measures the impact of change in product demand on labour demand. If demand for the products of an industry were to increase, more outputs could be sold at the same price, and thus the production level would rise as firms in the industry maximize profits, and this effect would increase labour demand. We use two different instrument variables: the share of Finland’s exports to EU-countries in manufacturing production and the share of the output of the European Union in manufacturing production, which are deflated by a real competitiveness indicator where euro-country weights are based on Finland’s bilateral exports. Both two instruments vary by industry and year. The first attempts to measure foreign demand for Finland’s products, and the second attempts to measure overall demand in the European Union. Furthermore, a real competitiveness indicator measures international product market competition. If these regressors do not adequately control for shifts in the demand of product markets then estimates of $\Phi$ are likely to be biased upwards. In that case, positive shocks to product-market demand, and thus labour demand would raise plants’ wages, for example, because of rent sharing.

Similarly, for each year, equation, (3.3) can be used to estimate the constant-substitution elasticities of labour demand: \(^{38}\)

\[
(3.3) \quad \Delta \ln(L_t) = \rho \Delta \ln(o_t) + \chi \Delta \ln(K_t) + e_t
\]

where $K$ is capital stock, and $\chi = 1$ with constant investment. The individual parameter $\rho$ is the estimate of the elasticity of labour demand with respect to own price when capital stock is constant. If both substitution and constant-substitution elasticities are consistently estimated, then the difference between them is an estimate of the substitution effect, and it would provide indirect evidence on international outsourcing activities; and thus the impact of integration’s substitution effects on the labour-demand elasticities
can be determined. To estimate the substitution effect elasticities of labour demand for each year suggests the following regression equation:

\[(3.4) \quad \Delta \ln(L_{it}) = \Gamma_t \Delta \ln(o_{it}) + \chi \Delta \ln(K_{it}) + u_{it}\]

The individual parameter \(\Gamma\) is the estimate of the substitution effect elasticity of labour demand when capital stock is not constant. The substitution effect \(\chi\) measures the impact of an international outsourcing shock on labour demand. This estimate of the instruments of substitution effect measures the impact of a change in the demand for non-labour inputs on labour demand. If demand for non-labour inputs were to increase, induced by increased demand for outputs and an increased production level, this effect would increase labour demand. We use two different instruments: the share of intermediate inputs that are imported from EU-countries in production, and the share of the investment of other EU countries in Finland’s domestic investment, which are deflated by a real competitiveness indicator. Both instruments vary by industry and year. The first attempts to measure foreign intermediate input outsourcing, and the second attempts to measure overall substitution between labour and investment.

4 DATA

The elasticities of labour demand are estimated using assembled panel data from the manufacturing sector based on a diversity of sources: Statistics Finland’s Longitudinal Database on Plants in Finnish Manufacturing (LDPM), the Bank of Finland’s Financial Market Statistics, the National Board of Customs’ Foreign Trade Statistics, and the OECD STAN Database’s Industrial Structure Statistics. The panel data covers the period from 1975 to 2002. Table 4.1 reports the summary statistics of the observations. The ideal data here, as Slaughter (1997) argues, would be firm-level data because firms

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38 Profit maximization with respect to capital yields the conditional capital demand function, substituting this conditional capital demand into equation (2.15), and taking logarithms yields to a form which is very useful for estimation.

39 Unfortunately there are no comparable data for the service sector.
are the relevant units that actually demand factors. However, plant-level data sets do not contain firm-level trade-prices and measurements of foreign demand (supply) for firm-level products (non-labour inputs), so the next best alternative for these integration measurements is the use of industry-level (2-digit ISIC manufacturing industries) data. Demand estimation requires figures for employment, real factor prices, real investment and real output for all plant-year observations. The deflating variable is a producer price index for (3-digit ISIC) the manufacturing industry maintained by Statistics Finland. The National Accounts Statistics include annual data from 1975 to 2002 for manufacturing plants, covering variables such as production, investment, the price of investment, employment (production and non-production workers), and nominal wages and employer social security payments for production and non-production workers. Labour demand is supposed to have a negative correlation with labour costs. The higher the labour costs, the lower the labour demand. Employment comes directly from the data set as the number of production and non-production workers. For each worker type and for total employment I construct real labour costs as nominal annual wages and social security payments deflated by the producer price index and divided by the number of workers. For investment, the price index comes directly from the LDPM panel. In the case of substitution, when capital costs rise, an industry substitutes away from capital towards labour. Then labour demand is supposed to depend on the capital costs positively.

For equations (3.2) and (3.4), I calculate the real competitiveness indicator as the nominal competitiveness indicator multiplied by the trade ratio of export and import prices. The constructed nominal competitiveness indicator for the period 1975 - 2002 is based on Financial Market Statistics maintained by the Bank of Finland. The industrial prices of exports and imports are based on the Producer Price Indices of Statistics Finland. An increase in the real competitiveness indicator means that an industry’s price competitive ability decreases, therefore decreasing product demand and thus labour demand. Thus, a declining competitiveness indicator should mean that the international

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40 Manufacturing industries are included using the standard ISIC classification, i.e. excluding petroleum, energy, and quarrying. For the 2-digit ISIC classification there are all 27 manufacturing industries.

41 Empirical studies reviewed by Hamermesh (1993) usually point to a lower degree of substitution between skilled labour and capital than between unskilled labour and capital (see, e.g., Griliches 1969, Bergström and Panas 1992, Biscourp and Gianella 2001).
product markets are more competitive, and that all factor demands are more elastic via the scale effect.

Table 4.1 Variable summary statistics.

<table>
<thead>
<tr>
<th>Variable (logarithm)</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production (real)</td>
<td>158181</td>
<td>7.611</td>
<td>1.652</td>
<td>-2.669</td>
<td>15.49</td>
</tr>
<tr>
<td>Capital stock (real)</td>
<td>141142</td>
<td>6.116</td>
<td>2.265</td>
<td>-5.433</td>
<td>13.69</td>
</tr>
<tr>
<td>Price index of investment</td>
<td>153406</td>
<td>-0.491</td>
<td>0.373</td>
<td>-1.320</td>
<td>0.233</td>
</tr>
<tr>
<td>Number of total workers</td>
<td>160203</td>
<td>3.373</td>
<td>1.290</td>
<td>0.000</td>
<td>8.715</td>
</tr>
<tr>
<td>Number of production workers</td>
<td>152698</td>
<td>3.123</td>
<td>1.269</td>
<td>0.000</td>
<td>8.402</td>
</tr>
<tr>
<td>Number of non-production workers</td>
<td>141412</td>
<td>2.034</td>
<td>1.392</td>
<td>0.000</td>
<td>8.557</td>
</tr>
<tr>
<td>Real labour price (total)</td>
<td>160194</td>
<td>2.997</td>
<td>0.484</td>
<td>-1.670</td>
<td>7.150</td>
</tr>
<tr>
<td>Real labour price (production)</td>
<td>152688</td>
<td>2.885</td>
<td>0.472</td>
<td>-3.031</td>
<td>6.920</td>
</tr>
<tr>
<td>Real labour price (non-production)</td>
<td>141384</td>
<td>3.259</td>
<td>0.515</td>
<td>-1.612</td>
<td>7.587</td>
</tr>
<tr>
<td>Exports share (real)</td>
<td>155166</td>
<td>11.13</td>
<td>1.759</td>
<td>-2.364</td>
<td>22.97</td>
</tr>
<tr>
<td>EU-output share (real)</td>
<td>155166</td>
<td>17.88</td>
<td>1.738</td>
<td>9.405</td>
<td>28.40</td>
</tr>
<tr>
<td>Intermediate inputs share (real)</td>
<td>155166</td>
<td>10.88</td>
<td>2.034</td>
<td>-0.399</td>
<td>23.01</td>
</tr>
<tr>
<td>EU-investment share (real)</td>
<td>138432</td>
<td>16.64</td>
<td>2.307</td>
<td>8.981</td>
<td>28.93</td>
</tr>
</tbody>
</table>

For the equation (3.2), we use two different instrument variables: the share of Finland’s exports to EU-countries in manufacturing production and the share of the output of the European Union in manufacturing production. Industrial exports to EU-countries are based on Foreign Trade Statistics maintained by the National Board of Customs. Another instrument variable, the production of European Union for each industry, is based on OECD Industrial Structure Statistics. Finally, I construct real output, another endogenous variable, as nominal production divided by the producer price index. A rise in exports increases the production of an industry, which is supposed to increase the labour demand. In theory, labour demand correlates positively with production. If product demand rises and thus production increases, firms’ demand for factors rises. The assumption is that higher exports signal better economies of scale (or less foreign competition). This makes all factor demands less elastic via the scale effect. On the other hand, the more the rest of the EU accounts for the output of an industry, the more competitive that industry is for Finnish firms and thus the more elastic all factor demands will be via the scale manufacturing effect.

42 Conversely, in case of complementarity, labour demand depends on capital costs negatively.
43 Péridy (2004) finds using data of four EU countries over the period 1975 - 2000 that exports unambiguously rise with the degree of scale economies.
For equation (3.4), we use two different instruments: the share of intermediate inputs that are imported from EU-countries in manufacturing production and the share of the investment of other EU countries in domestic investment. Imported intermediate inputs from EU-countries for each industry are based on Foreign Trade Statistics maintained by the National Board of Customs. Another instrument variable, the industrial investment of the European Union, is based on OECD Industrial Structure Statistics. Finally, I calculate real investment, another of the endogenous variables, as nominal investment divided by the producer price index. If demand for non-labour inputs were to increase as a result of increased demand for outputs, thus causing a rise in production level, this effect would increase labour demand. While foreign outsourcing and/or international investment provides an alternative to many production-intensive plants, and thus decreases dependence on production labour, it also increases reliance on human capital and thus non-production labour. Therefore, increased foreign outsourcing and/or international investment is assumed to make demand more elastic, especially for production labour, via the substitution effects.

5 EMPIRICAL ANALYSIS

Concerning studies of Finland, Tuomiaro (2001) focuses on labour demand adjustment by studying what kind of impact the internationalization of firms in the retail and wholesale sector and foreign ownership have on the structure of the employed labour force during the period 1989 - 1996. His dynamic analysis reveals that export intensity correlates positively with labour demand for all age groups and for those not highly educated. Furthermore, changes in output or wages have a greater influence on employment in domestically owned companies than in foreign-owned companies. This result can be explained, in part, by the fact that foreign-owned companies belong normally in Finland to the largest firms where the elasticity of labour demand is smaller than in small and medium-sized firms. Using firm-level data Piekkola (1998) explains labour demand by the firm’s financial position and corporate profitability. The results show that there was no increase in the wage elasticity of labour demand in large firms over the period 1986-1995 and in small and medium-sized firms over the period 1990-1996, aside from that explained by financial distress. The study confirms previous evidence that labour demand is more sensitive to the economic cycle in large firms. On the other hand, labour demand is more flexible in small and medium-sized firms.
demand, but it addresses how the internationalization of firms affects the structure of employed labour force adjustment during a recession. In addition, it only considers the retail and wholesale sector. Also, the period over a deep depression is problematic. A study by Ali-Yrkkö and Ylä-Anttila (1997) looks at the effects of the foreign direct investment of Finnish industrial firms on exports, production, and employment. The data used in the empirical analysis consist of the 30 largest industrial firms over the period 1985 - 1995. The results show that, in the 1980s, foreign direct investment complemented rather than replaced domestic investment, while, in the 1990s, foreign production started to replace domestic production. However, their study does not directly link these international developments to labour markets. In addition, the data only consists of the largest industrial firms, and labour demand is more flexible in small and medium-sized firms than in large firms. This study is, then, the first to estimate labour-demand elasticities using data from the Finnish manufacturing sector and the first to determine the impact of economic integration on labour-demand elasticities.

5.1 Estimation strategy

There are some issues to mention regarding the estimation strategy. One is the exogeneity of the regressors in equations (3.1) - (3.4). As Hamermesh (1986) discusses, some of them might actually be endogenous variables because firms make their output and factor demand decisions jointly. Quandt and Roser (1989) estimated an equilibrium model of the labour market, and used it to test the assumption of production exogeneity. They did not reject the assumption that production is exogenous. Furthermore, for the possibility of the endogeneity of investment the presence of capital market imperfections suggests that firms will find it difficult to adjust investment quickly in response to exogenous shocks that may influence employment decisions. If some regressors are endogenous, then least-squares parameter estimates will suffer an endogeneity bias, the net direction of which is unclear. On the other hand, and not only because of this potential problem, we estimate both of constant-output (constant-substitution) elasticities by using least
squares, and scale effect (substitution effect) elasticities by using controls as instruments and by supposing that production (investment) is endogenous.

A second issue is that both labour demand and labour supply probably depend on wages, which raises the problem of identification when estimating equations (3.1) - (3.4). Therefore, it is not clear what combination of labour-demand and labour-supply elasticities is obtained by regressing labour quantities on labour prices.\textsuperscript{46} Hamermesh (1993) argues that individual firms usually face perfectly-elastic labour supplies. In other words, firms take exogenous wages as given, and choose employment. In contrast, the entire economy faces a perfectly-inelastic labour supply. At the level of the general economy wages are endogenously determined, and exogenous quantities are taken as given.\textsuperscript{47} In addition, Nickell and Symons (1990) have explained that the identification problem does not really exist anyway since labour supply and labour demand really depend upon two quite different real/nominal wages, one deflated labour costs by the producer price and one deflated net wages by the consumer price index. Although people’s decisions take time to respond to changes in industry wages, while firms’ labour-demand decisions do not, corresponding to labour supply at the national level, the labour supply of an industry is supposed to be closer to perfectly elastic than perfectly inelastic. If the identifying assumption of perfectly-elastic labour supply is violated then the estimated labour-demand elasticities will be biased upwards because of the

\textsuperscript{45} Because the endogenous variable is correlated with the disturbance, the least squares estimators of the parameters of equations with endogenous variables on the right-hand side are inconsistent (see, e.g., Greene, 2000).

\textsuperscript{46} Slaughter (2001) argues that industry elasticity and the national elasticity of labour demand are two conceptually distinct ideas. Both elasticities arise from the profit-maximizing input choices of firms. However, industry elasticity describes how the quantity of labour demanded by a single industry responds to a labour cost change which is exogenous to that industry. Leamer (2000) emphasized that national elasticity describes how endogenously determined national wages respond to an exogenous change in labour supply. A sufficiently diversified small, open economy may have a national labour demand that is infinitely elastic. For this economy a change in the national labour supply does not change national wages. Conversely, a large country producing a single product under a very flexible technology could have nearly infinite elasticities of labour demand at the industry level but a rather inelastic national elasticity of labour demand.

\textsuperscript{47} The converse of asking, as we have, what happens to the choice of inputs in response to an exogenous shift in a factor price is to ask what happens to factor prices in response to an exogenous change in factor supply. The elasticity of complementarity measures the percentage responsiveness of relative factor prices to a one percent change in factor supplies in the long run. (See Hamermesh 1986, p. 434.)
positive correlation between wages and labour supply.\textsuperscript{48} In short, we suppose that at the plant level the supply of labour is perfectly elastic.

A third issue is that the calculated unit value of the average product wage is not the true marginal labour price. Because non-wage labour costs (e.g., training) are not incorporated into labour costs, the data contain measurement errors. Different firms employ different skill mixes within each labour group. Thus, different unit values might reflect different skill mixes rather than true differences in labour prices. Time differencing might mitigate the measurement error due to missing non-wage labour costs.

Taking time differences would also control for unobserved time-invariant industry fixed effects which influence the labour-demand level. However, time-differencing can also aggravate regressor measurement errors and result in inconsistent estimates.\textsuperscript{49} To minimize this inconsistency, as Griliches and Hausman (1986) suggest, we estimate equations (3.1) - (3.4) using long differences - three-year and five-year differences. When attention is focused on trends over time in elasticities rather than on their levels, then the measurement bias might not influence decisively. Another advantage of longer differences is that over longer time horizons the maintained identifying assumption of perfectly-elastic labour supplies is more likely to hold.\textsuperscript{50}

Slaughter (2001), adopting a two-stage approach, regresses estimated elasticities on several plausible measures of international trade in the second stage. However, the theoretical model on which we base our empirical analysis has the feature of producing labour-demand elasticities and determining the integration effects on those elasticities in single stage, so avoiding the econometric difficulties of two-stage procedures. One issue

\textsuperscript{48} If more than one theory is consistent with the some data, we have no way of determining which equilibrium of demand and supply is the right one. As a result, it is obvious that there will not be a solution, i.e. reduced form cannot be transformed back into a structure. Thus, the structure underlying the data is under-identified. Because of this identification problem least squares will be biased. One technique is to use instrumental variables to overcome this problem, if there is a valid instrumental variable which is correlated with the exogenous variables, but not with the error term. The data do not contain a valid instrumental variable that is plausibly included in the equation of labour supply, but excluded from the equation of labour demand, that can be used to shift labour supply along labour demand. The model is not estimable without restrictions, i.e. supposing that labour-supply elasticities shift with labour-demand elasticities. (See Greene, 2000, pp. 654-666.)

\textsuperscript{49} Hsiao (1986) argues that if variables are indeed subject to measurement errors, exploiting panel data to control for the effects of unobserved individual characteristics using standard differenced estimators may result in even more biased estimates than simple OLS estimators using cross-sectional data alone.

\textsuperscript{50} As Slaughter (2001) suggests, industry-specific skills obtained on the job might tend to make an industry’s labour supply more inelastic. Longer time horizons should make this supply more elastic by allowing people more opportunity to break these industry attachments.
is the fact that the dependent variable in a stage-two regression equation is estimated, not observed, which means that the error term is heteroskedastic. Supposing that economic integration has influenced own-price labour-demand elasticities, it is necessary to determine elasticities during the process of integration, i.e. supporting the hypothesis of inter-time heterogeneous coefficients. To allow time-variation within elasticities over integration process, we estimate manufacturing-wide elasticities for each year from as far as 1975 through to 2002 using common intercepts over pooled plants. For equations (3.1) and (3.3), in order to estimate constant-output elasticities and constant-substitution elasticities we use a generalized least squares estimation (GLS); and for equations (3.2) and (3.4), in order to estimate scale effect elasticities and substitution effect elasticities we apply an instrumental variables estimation (G2SLS). In fact, we adopt a GLS estimation procedure which allows for heteroscedasticity with cross section correlation.

5.2 Literature survey

An interesting attempt to test for the labour market implications of changes in the degree of openness is Slaughter (1997). Slaughter’s study (1997) is the first to estimate the time patterns for U.S. elasticities of labour demand and then correlate those estimates with measures of international trade. The paper comes close to a direct test of the FPI-theorem. The idea behind the test is that, as the U.S. economy became more open from 1960 to 1991, the absolute elasticity of labour demand in individual industries should have become larger. Richardson and Khripounova (1998) also estimate the time pattern of U.S. labour demand elasticities, but their approach is patterned after Slaughter-

51 By adopting a dynamic approach we also estimated elasticities specifying dynamics in terms of lags of the dependent variable and a distributed lag structure for the independent variables. However, it shown that the estimators for this dynamic approach perform worse than differenced estimators. The difficulty is that the lagged dependent variable is correlated with the disturbance, even if it is assumed that error term is not itself autocorrelated.

52 Heteroskedasticity means that variances of the error terms are not constant across observations, but may arise with the value of observation. Thus, the estimators are not efficient. (See, e.g., Greene, 2000.) Anderson (1993) explains that controlling for heteroskedasticity would require weighting observations which estimated elasticities are relatively imprecise. The logic of weighted least squares (WLS) is that observations with smaller variances receive a larger weight and therefore have greater influence in the estimates; similarly, observations with greater variances receive a smaller weight and therefore have a smaller influence in the estimates (Greene 2000, p. 512).

53 A later version of this paper was published (2001) in the Journal of International Economics.
Slaughter’s empirical work yields three main results. First, demand for production labour became more elastic in manufacturing overall and in five of eight industries. Second, the demand of non-production labour did not become more elastic in either manufacturing overall or in any of the eight industries. Third, the hypothesis that trade contributes to increased elasticities found mixed support, at best. The time series of the elasticities of labour demand are explained largely by a residual, time itself. Richardson and Khripounova (1998) search for linkages between the growing integration of U.S. markets with the global economy (determined by different trade conceptions) and the apparent decline in the market power of American workers (determined by the elasticity of labour demand). Their regressions follow, as closely as possible, the regressions of Slaughter. They consider not only production and non-production workers, but also workers with different levels of education. The conclusion of their research is that from 1984 to 1991 growing global integration weakened the market power of less-skilled workers relative to more-skilled workers, and probably relative to employers. However, they did not find that globalization weakens the market power of more skilled workers. A similar methodology is applied by Faini et al. (1998) to Italy, with labour-demand elasticities estimated from the period 1985-1995, and in which 14 manufacturing industries are distinguished. They find weak support for the hypothesis that greater globalisation is associated with larger elasticities. Greenaway et al. (1999) evaluate the impact of trade volumes on employment through induced productivity changes, and the impact of trade changes on the slope of derived labour demand, introducing a term corresponding to interactions between the wage rate and import and export volumes. Adopting a dynamic labour demand framework for the UK, they find that import and export volumes had only a weak positive impact on labour-demand elasticity in manufacturing industries over the period 1979 to 1991. Adopting a different methodology and focusing on the intersectoral dimension of the scale effect of trade, Jean (2000) finds, for France, that openness can indeed have a significant effect on labour-demand elasticities.

Bruno et al. (2004) test the impact of globalisation on the elasticities of labour demand using an industry-year panel for a number of industrialized countries including major European countries, Japan and the U.S. over the period 1970-1996. They focus on evaluating the substitution effect of trade by estimating a dynamic specification. Overall
they did not find any significant effect of trade on labour demand elasticity. The only exception is France, which seems to confirm the findings of Jean (2000). Andersen et al. (2001) estimate time varying employment relations in the manufacturing sector for EU countries over the period 1970 to 1999. Their empirical analysis of employment takes explicitly into account the fact that international integration changes the elasticity of labour demand. The empirical model is non-structural in the sense that the factors that potentially cause elasticities over time cannot be identified. They suppose that the various channels of integration have qualitatively different effects on the elasticity of employment, i.e. the effects acting via product markets and via possibilities for outsourcing may run in an opposite directions in respect to the level of employment. Their preliminary results support the approach of not treating the parameters of labour demand as constant.

The experience of dramatic changes in trade regimes of a number of developing countries might be thought the appropriate context for investigating the link between openness and the elasticity of labour demand. This approach is followed by Krishna et al. (2001), Fajnzylber and Maloney (2000), Hasan et al. (2007), and Haouas and Yagoubi (2004). Krishna et al. (2001) test the impact of trade liberalization on the elasticities of labour demand using plant-level data from the Turkish manufacturing industry for the years 1983-1986. Turkey’s 1984 import liberalization program significantly reduced both tariff and non-tariff barriers. They use the volume of import, estimates of protection (tariff and non-tariff) change, and Levinsohn’s (1993) estimates of mark-up changes as basic measures of trade liberalization. The results suggest that the linkage between greater trade openness and labour demand elasticities may be empirically quite weak. Furthermore, Fajnzylber and Maloney (2000) found here were no consistent patterns and only very mixed support for the idea that trade liberalization has an impact on own wage elasticities. They use dynamic panel techniques to estimate labour demand functions for manufacturing establishments in Chile, Columbia and Mexico. Hasan et al. (2007) use various specifications, constant-output, constant-capital, and partial-

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54 Levinsohn (1993) and Harrison (1994) use firm-level data to study how trade liberalization affects the competitiveness of the product market in manufacturing. Levinsohn (1993) finds using Turkish data from 1983 to 1986 that after trade liberalization, the demand of product market became more elastic. Using a panel of manufacturing firms in the Ivory Coast, Harrison (1994) presents evidence that the impact of
adjustment labour-demand models, and their various meaningful combinations, using industry-level data disaggregated by states from 1980 to 1997. They find a positive impact of trade liberalization on labour-demand elasticities in the Indian manufacturing sector. Furthermore, they find that these elasticities are not only higher for states with more flexible labour regulations but also larger impacted by trade reforms. Haouas and Yagoubi (2004) investigate the effects of trade liberalization on the elasticities of labour demand using data from 1971 to 1996 for manufacturing industries in Tunisia. Their results show only weak support for the idea that openness will lead to an increase in elasticities. However, the results are more robust to the type of labour, contract and permanent labour, which supports the conclusion that, through liberalization, the labour markets of Tunisia have become more flexible.

Revenga (1992), Abowd and Lemieux (1993), Borjas and Ramey (1995), Driffill et al. (1998), Burda (1999), Boeri et al. (2000), and Haffner et al. (2000) do not focus on the elasticities of labour demand, but they do address how the competitiveness of product markets affect wages and/or employment. Revenga (1992) investigates the effect of increased import competition on U.S. manufacturing employment and wages using data on a panel of manufacturing industries over the period 1977-1987. The empirical analysis uses industry import price data and an instrumental variables estimation strategy. The estimates suggest that changes in import prices have a significant effect on both employment and wages. Abowd and Lemieux (1993) study how international price competition affects negotiated wage settlements and employment. Their data include a sample of Canadian collective bargaining agreements from 1965 to 1983. They conclude that standard estimates of rent-sharing based on contract data seriously underestimate the impact of product market competition on negotiated wage settlements. Borjas and Ramey (1995) study how foreign competition reduces firms’ power in the product market and thus labour rents. They propose that the impact of foreign competition on the relative wages of less skilled workers depends on the market structure of the industry penetrated. Their empirical evidence indicates that employment changes in a small group of trade-impacted concentrated industries can explain not only part of the aggregate rise in wage inequality in the United States, but also some of the differences in the
trends in wage inequality overall. Driffill et al. (1998) investigate how a reduction in non-tariff barriers effects on wages using a cross-section of UK manufacturing data set from the 1990s. They suggest that when economies become more integrated through the removal of tariffs and other barriers to trade - resulting in an increase in competition in product markets - there should be some effect on wage and employment outcomes in the labour market, particularly where unions are active. Their results show that a reduction in non-tariff barriers from a high to a medium level appears to have a negative effect on wages, both for unionized and non-unionized establishments; the effect is particularly pronounced for unskilled workers. Burda (1999) surveys the effects of EMU on the functioning of labour and product markets and the relative importance of real and nominal rigidities using 1961-1996 data. He finds empirical evidence of both increasing nominal rigidities and decreasing real rigidities within EMU countries. The results support the theory that real rigidities in labour markets will come under increasing pressure from integration. Boeri et al. (2000) identify the impact of the changing profile of product and labour market regulations on employment across OECD countries. They construct regulation indicators, such as employment protection and barriers to trade and investment, for the period 1982-1995. They find that countries with restrictive product market regulation and tight employment protection legislation tend to have lower employment rates. In particular, stronger integration in the EU area does not seem to have been associated with convergence in respect to labour market institutional features such as employment protection, collective bargaining, and the size and structure of social benefits. Haffner et al. (2000) investigate whether European market integration, competition policies and EMU provide a sufficient incentive for member countries to introduce greater competition into their economies and thus make labour markets more flexible. They use indicators such as the convergence of price structures, profit margin trends, and the degree of product and labour market regulation using data from the past two decades. They find evidence that both product market competition and labour market flexibility have been fostered by integration. However, there is still considerable scope for increasing competitive pressures within the EU.
5.3 Estimation results

Our estimated elasticities of labour demand, both for total labour and for the two types of labour (production and non-production) are presented in figures 5.1, 5.2, 5.4 and 5.5. The figures plot annual manufacturing-wide elasticities for each specification using three-year and five-year differencing. To represent better the underlying trends, as Slaughter (2001) proposes, the figures plot the three-year moving averages of the estimated elasticities. The estimates seem very plausible and well estimated. For all specifications their estimates lies within the range of [-0.09, -0.80] that Hamermesh (1993) proposes as plausible based on his survey of the literature. Furthermore, all point estimates are negative and statistically significant. Overall, unskilled labour is found, as expected, to have somewhat higher wage elasticities in absolute terms than skilled labour. In addition, these patterns are very consistent across both the three-year and five-year differenced specifications.

Figures 5.1a, 5.1b and 5.1c present estimated constant-scale-return labour-demand elasticities for total labour, production labour and non-production labour. Figures 5.2a, 5.2b and 5.2c present estimated scale effect labour-demand elasticities. The basic result is that labour demand became more elastic during integration. The constant-output elasticities of total labour demand declined steadily - except during the deep depression of the early 1990s in Finland55 - to around -0.75. In addition, by using instruments we see that total labour demand became more elastic during the 1980s and 1990s. Unexpectedly, there is more relative growth in elasticities for non-production labour than for production labour. Furthermore, we see that the own-price demand elasticities of both labour types are underestimated. The difficulty is that the aggregation of labour inputs by the production function is an arbitrary description of technology. If the labour sub-aggregates are not separable from non-labour inputs, one will underestimate own-price demand elasticities and infer that the two types of labour are greater price-substitutes that, in fact, they are.

55 Labour demand is more sensitive to the economic cycle than to the integration process during a deep depression.
Figure 5.1 Estimated constant-output labour-demand elasticity (3-year moving averages of 3-year and 5-year differencing) estimates for total labour (a), production labour (b), and non-production labour (c). The specification is (3.1) $\Delta \ln(L) = \alpha \Delta \ln(w) + \mu \Delta \ln(Y) + \beta \Delta \ln(Y) + \epsilon$. 

50
Figure 5.2 Estimated scale-effect labour-demand elasticity (3-year MA of 3-year and 5-year differencing) estimates for total labour (a), production labour (b), and non-production labour (c). The specification is (3.2).
Because of the problem of the separable of inputs, and thus underestimated elasticities, for both labour types I only assess the effects of integration on the elasticity of total labour demand. The scale-effect labour-demand elasticity estimates express changes in product-market competitiveness working through the scale effect. In comparison to the constant-output elasticity estimates, the scale-effect elasticity estimates seem more plausible and well estimated. According to the correlation squares ($R^2$), the GLS-estimator performs better overall, within and between by using instruments rather by supposing a constant scale return.\textsuperscript{56}

\textbf{Figure 5.3} The extent to which scale-effect estimates do not explain the difference between constant-output and the scale-effect labour-demand elasticity estimates for total labour.

If both constant-output and the scale-effect elasticities of labour demand are consistently estimated then the difference between them is an estimate of the scale effect. Figure 5.3 presents the extent to which estimates of the instruments provide indirect evi-

\textsuperscript{56} For example, the $R$-sq (within) of last year (5-year differencing) for total labour demand is 0.3086 by using instruments and 0.1036 by assuming a constant scale effect. For brevity, not all $R$-sq (overall, within and between) and CHI-sq statistics for each year, each specification, total labour and both labour types, and both differencing are reported. In summary, some statistics for a few years, each specification, total labour, and 3-year differencing are provided in Appendix 1.
dence – i.e. decreasing unexplained differences - on the scale effects of integration on labour demand elasticity during the 1980s and 1990s. Although, our instruments may not adequately control for shifts in product-market demand, we note that the difference between constant-output and the scale-effect elasticities of labour demand closely corresponds to an estimate of the scale effect\(^{57}\) during integration (except during a deep depression). This result provides support for the hypothesis that economic integration has contributed to the increased elasticity of labour demand via scale effects.

In figures 5.4a, 5.4b and 5.4c is presented estimated constant-substitution labour-demand elasticities for total labour, production labour and non-production labour, and figures 5.5a, 5.5b and 5.5c present estimated substitution-effect labour-demand elasticities. We see that there is growth in capital-constrained elasticities for all labour types during integration, although labour demand became less elastic during Finland’s deep depression. Constant-substitution and the substitution effect elasticities of total labour demand declined to around -0.4. Unskilled labour is found, as expected, to have somewhat higher wage elasticities in absolute terms than skilled labour. Empirical studies usually point to a lower degree of substitution between skilled labour and capital than between unskilled labour and capital. The integration forces that change labour substitutability by making labour less/more easily substituted with foreign factors of production depend on complementarity between human capital and physical investment. Surprisingly, and counter-intuitively, there is more relative growth in elasticities for skilled labour than for unskilled labour. Because of the problem of the separable of inputs, as discussed above, in the case of the gross substitution I only assess the substitution effects of integration on the elasticities of total labour demand. Under gross substitution between labour and capital labour demand should have a positive correlation with capital costs.\(^{58}\) For example, in specifications (3.1) and (3.2) the coefficient of gross elasticity mainly has a positive and statistically significant sign for total labour demand. The substitution-effect labour-demand elasticity estimates express changes in international outsourcing working through the substitution effect.

\(^{57}\) For total labour demand the scale-effect estimates lie within the range of \([0.26, 0.55]\), and they all are statistically significant. The positive sign of this coefficient shows that, in the short run, an increase in demand of outputs is associated with an increase in demand for all inputs.
Figure 5.4 Estimated constant-substitution labour-demand elasticity (3-year MA of 3-year and 5-year differencing) estimates for total labour (a), production labour (b), and non-production labour (c). The specification is (3.3) $\Delta \ln(L_t) = \rho \Delta \ln(o_t) + \chi \Delta \ln(K_t) + \epsilon_t$.

58 Conversely, in case of the complementarity, labour demand depends on capital costs negatively.
Figure 5.5 Estimated substitution-effect labour-demand elasticity (3-year MA of 3-year and 5-year differencing) estimates for total labour (a), production labour (b), and non-production labour (c). The specification is (3.4).
In comparison to the constant-substitution elasticity estimates the substitution-effect
elasticity estimates seem more plausible. According to the $R^2$ s, the GLS-estimator per-
forms better overall, within and between by using instruments than supposing constant
capital stock.\textsuperscript{59}

![Graph showing unexplained difference between constant-substitution and substitution-effect elasticities for total labour-demand](image)

**Figure 5.6** The extent to which substitution-effect estimates do not explain the difference between constant-substitution and substitution-effect labour-demand elasticity estimates for total labour.

If both the constant-substitution and substitution-effect elasticities of labour demand
are consistently estimated then the difference between them is an estimate of the substi-
tution effect. Figure 5.6 presents the extent to which estimates of the instruments pro-
vide indirect evidence of the substitution effects of integration on the elasticity of labour
demand. Although our instruments may not adequately control for shifts in international
outsourcing, we note that the difference between the constant-substitution and substitu-
tion-effect elasticities of labour demand closely approximated an estimate of the substi-
tution effect\textsuperscript{60} during integration (except during the late 1980s). This result provides

\textsuperscript{59} For example, the R-sq (within) of last year (5-year differencing) for total labour demand is 0.1078 by
using instruments and 0.0255 by supposing constant capital stock.

\textsuperscript{60} For total labour demand the substitution-effect estimates lie within the range of [0.045, 0.226], and they
all are statistically significant. The positive sign of this coefficient shows that, in the short run, higher
support for the hypothesis that economic integration has contributed to increased elasticities of labour demand via substitution effects.

6 CONCLUSIONS

The purpose of this study was twofold: to investigate the effects of economic integration on the elasticity of labour demand with own price by using a theoretical model, and to undertake the same investigation using empirical analysis. We build the theoretical framework for estimating the elasticities of labour demand and determining the effects of economic integration on those elasticities. Using a general theoretical model of intra-industry trade, we analyzed how economic integration changes labour-demand elasticity. The model captured both effect, running from product markets (the scale effects) and factor substitutions possibilities (the substitution effects), to the elasticity of labour demand. We showed that intensified trade competition increases labour-demand elasticity, whereas better advantage from economies of scale decreases labour-demand elasticity by decreasing the elasticity of substitution between differentiated products. If integration gives rise to an increase in input-substitutability and/or outsourcing activities, labour demand will become more elastic.

We formulated an econometric model in order to determine whether European integration has changed the own-price elasticities of labour demand in Finland using data from the manufacturing sector from 1975 to 2002. We found that, over time, demand for total labour, production labour and non-production labour has become more elastic in manufacturing overall. However, it is shown that, unexpectedly, there has been more relative growth in elasticities for non-production labour than for production labour. Furthermore, we noted that the own-price demand elasticities for both labour types are underestimated. Because of problem of the separable of inputs, and thus underestimated elasticities for both labour types, we only assessed the effect of integration on elasticities for total labour demand. If both the constant-output (constant-substitution) and scale-effect (substitution-effect) elasticities of labour demand were consistently esti-

demand for non-labour inputs induced by increased demand of outputs is associated with higher employment.
mated, then the difference between them is an estimate of the scale effect (substitution effect). We noted that the difference between the constant-output (constant-substitution) and scale-effect (substitution-effect) elasticities of labour demand closely approximated an estimate of the scale effect (substitution effect) during integration. These results provide support for the hypothesis that economic integration has contributed to the increased elasticity of labour demand.

Finally, the study points to a potentially interesting area for future research. One area for further research would be to extend the integration model to capture the effect of increasing labour-demand elasticities on wage formation and thus on structural unemployment. Our findings raise important challenges for policy-making regarding economic integration and the role of profit-sharing and labour productivity.

REFERENCES


APPENDIX 1. Some regression results for total labour demand

<table>
<thead>
<tr>
<th>Method (3-year differencing)</th>
<th>Equation (3.1) GLS</th>
<th>Equation (3.2) G2SLS</th>
<th>Equation (3.3) GLS</th>
<th>Equation (3.4) G2SLS</th>
</tr>
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<tbody>
<tr>
<td>3-year average: 1979 - 1981</td>
<td></td>
<td></td>
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<tr>
<td>Constant</td>
<td>-0.111 (-8.69)</td>
<td>-0.057 (-5.76)</td>
<td>-0.268 (-27.9)</td>
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<td>Production</td>
<td>1</td>
<td>0.476 (72.9)</td>
<td>1</td>
<td>0.096 (18.2)</td>
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<td>Capital stock</td>
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<tr>
<td>Capital costs</td>
<td>0.104 (2.37)</td>
<td>0.211 (6.26)</td>
<td>0.104 (2.37)</td>
<td>0.211 (6.26)</td>
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<tr>
<td>Labour costs</td>
<td>-0.561 (-42.7)</td>
<td>-0.378 (-37.4)</td>
<td>-0.308 (-13.2)</td>
<td>-0.214 (-18.1)</td>
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<tr>
<td>$R^2$ (within)</td>
<td>0.100</td>
<td>0.261</td>
<td>0.011</td>
<td>0.029</td>
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<tr>
<td>Constant</td>
<td>0.003 (0.45)</td>
<td>0.008 (1.60)</td>
<td>-0.253 (-25.2)</td>
<td>-0.040 (-8.53)</td>
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<tr>
<td>Production</td>
<td>1</td>
<td>0.417 (78.3)</td>
<td>1</td>
<td>0.098 (20.8)</td>
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<tr>
<td>Capital stock</td>
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<tr>
<td>Capital costs</td>
<td>0.149 (4.82)</td>
<td>0.058 (2.51)</td>
<td>-0.356 (-14.3)</td>
<td>-0.269 (-20.5)</td>
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<tr>
<td>Labour costs</td>
<td>-0.712 (-47.5)</td>
<td>-0.464 (-42.9)</td>
<td>-0.018</td>
<td>0.065</td>
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<tr>
<td>$R^2$ (within)</td>
<td>0.159</td>
<td>0.377</td>
<td>205.48 [2]</td>
<td>820.54 [3]</td>
</tr>
<tr>
<td>3-year average: 2000 - 2002</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Constant</td>
<td>-0.045 (-3.46)</td>
<td>0.012 (1.40)</td>
<td>-0.047 (-3.76)</td>
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<td>Production</td>
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<td>0.351 (43.4)</td>
<td>1</td>
<td>0.100 (10.6)</td>
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<tr>
<td>Capital stock</td>
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<tr>
<td>Capital costs</td>
<td>0.272 (1.73)</td>
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<td>-0.422 (-11.2)</td>
<td>-0.418 (-17.9)</td>
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<tr>
<td>Labour costs</td>
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<td>-0.418 (-17.9)</td>
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<td>$R^2$ (within)</td>
<td>0.088</td>
<td>0.281</td>
<td>0.025</td>
<td>0.089</td>
</tr>
</tbody>
</table>

Notes: (1) Values of t-ratios are reported in parentheses. (2) Degrees of freedom are presented in square brackets.
III Welfare Policies, Labour Taxation, Employment and Economic Integration: Econometric Evidence from European Countries

Abstract

By using theoretical modelling and empirical analysis, we investigate how economic integration affects the impact of welfare policies on employment. We consider the viability of financing the public sector, i.e. public consumption and social security expenses, by general labour taxation in an economy which has become more integrated into international product markets. Increasing job mobility implies a correction in the distortions arising from taxes and social security contributions levied on labour, which, in turn, affects the options open to policy-makers when pursuing welfare policies. The effects of economic integration on the impact of welfare policies on employment clearly depend on a trade-off between intensified competition and better advantage of economies of scale. As increased trade competition crowds out better economies of scale, it becomes more costly to maintain welfare systems financed by labour taxation. We test the idea of whether economic integration has changed the impact of welfare policies on employment in European countries using data from 1975 to 2004. Overall, the results provide inconsistent evidence for the hypothesis that economic integration has contributed to the distortion effects of welfare policies on employment.
1 INTRODUCTION

Over the past few years, the impact of economic integration both on the viability of maintaining an extended welfare state, especially in Northern European countries and on the labour market has attracted wide interest. One in concern is whether it will become more difficult to maintain a large public sector and an extended social security system financed by general labour taxation. The cost of the extended welfare state in an internationally integrated economy may be a higher level of unemployment, via distortions arising from taxes and social security contributions levied on labour factor. It has been argued that in an open economy set-up equilibrium employment might be affected by demand factors such as fiscal spending (see, e.g., Gatti 2002, p. 7). On the other hand, as Rodrik (1997, 1998a) and Andersen (2002) argue, economic integration may lead to more volatility and thus the increasing need for social insurance arrangements to ensure some income stability in the presence of cross-country shocks, uncertainty and risk-aversion. However, increasing job mobility implies a change in the distortions arising from taxes and social security contributions levied on labour, which affects the possibilities perceive in pursuing welfare policies. Thus, as Andersen (2003) argues, the need for social insurance arrangements may increase at the same time as it becomes more difficult to finance the system. This study addresses the second of these concerns: the problem of maintaining a welfare state financed by distortionary labour taxation while greater economic integration affects the impact of welfare policies on employment.

Economic integration is a process in which the markets for goods and factors of production tend to become perfectly integrated. The mobility of the production increases as a consequence of product market integration. As Rodrik (1998b, 2000) argues, open economies, which are free to trade with each other, differ from closed economies in respect to the fact that, in particular, capital and employers are internationally mobile. However, capital income taxation accounts for a relatively small proportion of total tax revenue in most European countries, which suggests that the mobility of certain tax bases does not play a major role in a country’s ability to finance welfare policies during
economic integration. On the other hand, during integration, product demand will become more sensitive to price differentials between different countries, and firms’ location decisions more responsive to relative labour costs. Therefore, competitiveness pressure on the labour market towards greater flexibility is expected to increase under a regime of diminishing trade barriers. Hence, it is more natural to address the question of how product market integration affects the consequences of a welfare state financed by general labour taxation, although workers are immobile. The impact of welfare policies on employment during a period of economic integration definitely depends on a trade-off between intensified competition and better advantage of economies of scale. The progress of integration with the wider flow of trade and capital has been strengthening competition between EU countries, which has reflected in the link between wage formation and unemployment. With unionized labour markets, a permanent increase in labour income taxation leads unions to demand a higher real wage to compensate for the decreased post-tax income, and as a consequence of higher labour costs firms demand less labour.61 Hence, it can be argued that the ability of the welfare state to improve employment through fiscal activities is progressively reduced when product market competition increases, i.e. the “optimal” level of public spending decreases as a consequence of increased product market competition. On the other hand, with increased integration and competition, firms with access to the wider market are expected to be able to expand sales and production to take better advantage of economies of scale while continuing to cover production costs despite lower price-cost margins. Thus, market power may arise from specialization in production and the differentiation of products in order to establish segmented markets. This might decrease the costs of maintaining welfare systems. Since product market elasticity with product prices is likely to rise with integration, this implies that, with greater trade openness, we should see, in turn, an increase in the cost of maintaining welfare systems. As increased trade competition crowds out better advantages from economies of scale, it becomes more costly to maintain welfare systems financed by labour taxation.

61 In contrast to competitive labour markets, in the presence of unions the burden of labour taxation will be borne, in part, by employers and will therefore increase labour costs even if the labour supply is perfectly inelastic. The strength of the impact of increased labour income taxation on wages depends on how highly centralized union-government negotiations are, so as to internalize the effects of higher taxes on more public goods or higher transfers (see, e.g., Calmfors and Driffill 1988, Alesina and Perotti 1997).
The purpose of this study is to examine, using theoretical model and empirical analysis, how economic integration affects the impact of welfare policies on employment. To consider this issue, we need first of all to clarify the effect of welfare state activities and labour taxation on wage formation and employment. Then we have to examine how these effects depend on how integrated the international product market is. In small open economies during international integration, the general point to stress is that the distorting effects of labour taxes survives during the adjustment, and, in fact, potentially worse distortions arise. In order to study this issue we use a model with three main characteristics. First, we propose an open economy with two sectors: a tradable sector and a public sector. Second, we suppose that labour markets are unionized, which generates rigidities in the wage setting process. The third feature is that we assume that differentiated goods are produced by monopolistically competitive firms. While the effects of economic integration can work through many different channels, product markets and factor substitution, in this study economic integration is mainly associated with market power, which makes it possible to capture the main quality effects in a manageable way. Finally, our empirical aim is to determine whether European integration has changed the impact of welfare policies on employment. This is tested using data from European countries from 1975 to 2004.

The study is organized as follows: section 2 develops a theoretical model for empirical analysis. It specifies some basic mechanisms that determine how increased integration affects the impact of welfare policies on the employment. Section 3 formulates the econometric model while the data are described in Section 4. Section 5 presents the estimation strategy, and reports on the empirical results. The last section concludes the study.

2 THE THEORY

2.1 A Two-sector model

We consider an open economy with two sectors, a trading private sector and non-trading public sector. There are many firms $n$ in the private sector producing tradable differenti-
ated products with capital and labour as inputs. We suppose that there is another sector: a public sector producing non-tradable goods solely for the domestic market. Assuming that product markets are imperfectly competitive, there is monopolistic competition in tradable good markets adapting the model of Dixit and Stiglitz (1977). The structure of this model is such that consumers demand a variety of differentiated tradable products and non-tradable public goods. Representative consumer’s tastes are assumed to be represented by the utility function

\[ V = b \frac{1}{\theta} D^\theta - dL^\tau + G \]

where \( D = \sum_{i=1}^{n} D_i \) is an index of the consumption of differentiated tradable products, \( G \) is the consumption of public sector goods, \( b \) is the positive constant, and \( d \) captures the disutility of work \( L^\tau \). Consumers supply labour from which they receive a wage income if employed, and unemployment benefits if unemployed. Each consumer maximises their utility function (2.1) subject to their budget constraint. The budget constraint simply requires that the value of expenditure is not more than the value of income:

\[ P^*D = I + TR \]

where \( TR \) is lump-sum transfers from the government, \( I \) labour income, and \( P^* \) an index of the price level in terms of international integration. Labour income is \( I = (1 - t_w)w \) if employed, and \( I = s \) if unemployed where \( t_w \) is the wage tax rate, and \( s \) is unemployment benefit.

By imposing the symmetry assumption consumer maximizing will give us

\[ D = \left( \frac{P^*}{b} \right)^{-\frac{1}{\theta}} \]

\[ ^{62} \text{Note that } d \text{ can be interpreted as a reservation wage, i.e. for any after tax wage above } d \text{ the consumer inelastically supplies their working time (normalized to unity), which is a reasonable approximation of the fact that labour supply elasticity is usually found to be small.} \]
where \( \varepsilon = \frac{1}{1-\theta} > 1 \) is the product-demand elasticity in tradable good markets. There is an industry level description of the above solution (equation 2.2) on page 22. The demand for product type \( i \) for the private sector is given as

\[
D_i = D \left( \frac{P_i}{P^*} \right)^{-\phi} = a P_i^{-\phi} P^{*\phi-\varepsilon}
\]

where \( p_i \) represents the price of variety \( i \) with \( \phi > 1 \) denoting the elasticity of substitution between any two product types (see Helpman and Krugman 1989). The above equation (2.3) is explained at the industry level in Chapter 2.2 of essay II.

Based on the theory used in essay II, the effects on imperfectly competitive product markets of increased integration via declining trade costs are basically of two counteracting sorts (see pages 23 and 24). First, individual producers with access to the wider market are expected to be able to expand production to take better advantage of economies of scale, i.e. \( \frac{\partial \phi}{\partial a} \frac{\partial a}{\partial \tau} > 0 \). Second, with increased integration and competition, firm’s market share becomes increasingly sensitive to price changes, raising the elasticity of the consumption price i.e. \( \frac{\partial \varepsilon}{\partial n} \frac{\partial n}{\partial \tau} < 0 \). In the imperfect competition, we then have the condition of the pricing rule for product types

\[
P^* \geq \left[ \sum_{i=1}^n \frac{p_i^*}{a} \right]^{1/(1-\phi)}.
\]

In optimum, price equals marginal revenue from exporting, where relative trade costs equal to mark-up factor, i.e. \( \frac{1+\tau}{a} = \frac{\phi + \varepsilon}{\phi + \varepsilon - 1} \) (see, e.g., Helpman and Krugman 1989, p. 18). For tradable good markets, we summarize the characterization of the optimal pricing rule in
Proposition 1 Lower trade costs with increased integration, a higher number of firms and, in consequence, a higher elasticity of product demand will reduce the mark-up price, whereas better advantage of economies of scale and, in consequence, a lower elasticity of substitution between differentiated products will raise it, ceteris paribus.

The government provides public goods and social security in the form of transfers related to unemployment, and other lump-sum subsidies. Public demand for product variety $j$ is associated with the price index for the non-tradable domestic market by

$$\bar{P} = \left[ \sum_{j=1}^{m} \frac{1}{\bar{P}_j^j} \right]^{\xi}$$

where the over score “―” indicates the public sector. The government faces a downward sloping public demand curve

$$G = \bar{P}^{-\xi}$$

(2.5)

where $\xi$ is the demand elasticity of public goods, implying that public demand for product variety $j$ can be written

$$G_j = G \left( \frac{\bar{P}_j}{\bar{P}} \right)^{1-\xi}.$$ 

Note that this way of specifying public consumption, as Andersen (2003) argues, rules out relative demand shifts between public and private consumption as a source of relative price changes. We assume, for simplicity, that there is no tax on capital, and that unemployment benefit is non-taxable income. Hence, taxes are only levied on labour, capturing the empirical fact that general labour taxation (wage tax rate $t_w$ and social security contributions $t_p$) accounts for the majority of public sector revenue. Let $N$ be the labour force, $L^T$ total employment (employment in the private and public sectors).
and \([N - L^T]\) the number of unemployed. Then we can write the budget constraint of government as:

\[
(2.7) \quad \tilde{P}(G + TR + S) = t^T w^T L^T
\]

where \(w^T\) refers total wage rates, \(TR\) is the total expense of transfers, and \(S = s(N - L^T)\) is the total expense of unemployment benefits. Consequently, the labour tax rates \(t^T \equiv (t_w + t_p)\) are endogenous, adjusted so as to balance the budget.

In small open economies going through a process of international integration, the general point to stress is that the distorting effects of labour taxes survive during the adjustment, and, in fact, potentially worse distortions arise. In the tradable private sector, a firm considers the gross wage of private sector \(\tilde{w}\) as a given consisting of the net-of-tax wage\(^64\) plus social security contributions \(t_p\), so that \(\tilde{w} = (1 + t_p)w\). For example, an increase in employer’s social security contributions shifts the labour demand curve inward by increasing the cost of labour (see, e.g., Pissarides 1998). As Holmlund et al. (1989) explain, if there is complete nominal wage rigidity, employment takes on the whole burden of adjustment.\(^65\) Assuming that linear-homogenous technology can be represented in the private sector by the CES (constant elasticity of substitution) production function form, it can be specified as

\[
(2.8) \quad Y = \left[ L^\sigma + K^\sigma \right]^{\frac{1}{\sigma}}
\]

where the elasticity of substitution between capital and labour is defined \(\sigma \equiv \frac{1}{1 - \varphi} \geq 0\), and capital is denoted by \(K\). Elasticity of substitution is defined as the effect of a change

\(^63\) Since we are considering the distortion effects of welfare activities, this assumption simplifies to isolate the direct effects, disregarding any relative price effects that may arise if the distribution of income affects aggregate demand.

\(^64\) A rise in wage tax increases labour costs when the rise of wage tax is compensated for by an increase in the negotiated wages.

\(^65\) If there is, correspondingly, complete nominal wage flexibility, the increase in social security contributions is completely shifted back on to wages.
in relative factor prices on the relative inputs of these two factors, holding output con-
stant (see Allen 1938, or Hamermesh 1993). Conditional labour costs can be derived as

\[
(2.9) \quad w = \left(\frac{Y}{L}\right)^{\frac{1}{\sigma}}.
\]

Using (2.3) under the utility maximization of an individual consumer, i.e. set marginal
utility equal to marginal cost, each firm faces a downward sloping demand curve

\[
(2.10) \quad Y = D(p) = p^{-(\varepsilon + \phi)}.
\]

where \( \varepsilon \) is product-demand elasticity, and \( \phi \) the elasticity of substitution between any
two product types. The closer substitutes for output \( Y \) are on the international market
the more elastic output demand becomes. Profit maximization implies that firms will set
a price which exceeds the marginal cost by a constant mark-up factor, i.e. \( \frac{\phi + \varepsilon}{\phi + \varepsilon} > 1 \)
(see page 28). Under the assumption of wage taking behaviour, labour demand can be
written using equations (2.9) and (2.10)

\[
(2.11) \quad L = p^{-(\varepsilon + \phi)} \frac{w^\sigma}{\sigma}.
\]

The labour market is assumed to be imperfectly competitive. It is commonly ac-
cepted that the monopoly union model (see, e.g., Booth 1995) captures, in a simple way,
the qualitative implications of different labour market models, at least in respect to the
generation of unemployment and in the wage response to wage income taxation and the
degree of centralization. Wages are set by trade unions, and it is assumed that a union is
large enough to be able to negotiate over wages, but small enough to take welfare policy
as a given. Unions maximize the income of their members subject to the labour demand
function (2.11). A union’s objective function is given by
The maximization of (2.12) with respect to the wage rate yields the equation for the equilibrium wages

\[ w = \frac{\eta_{ll}}{(\eta_{ll} - 1)(1 - t_w)} \]

where \( \eta_{ll} = \frac{(\partial L w)}{(\partial w L)} \) is the elasticity of labour demand with wages. For simplicity, in the present setting, unemployment benefits are not taxable income. When considering how wages respond to changes in welfare activities, we find that for unemployment benefits there is both a direct effect in terms of raising the reservation wage of workers, \( \frac{\partial w}{\partial s} > 0 \), and an indirect effect in terms of raising the tax rate, \( \frac{\partial w}{\partial t_w} > 0 \). These results return the standard result (see, e.g., Alesina and Perotti, 1997) that an increase in public sector activities leads to wage increases. For simplicity, in the present setting, it is assumed that a trade union will be small enough to take welfare policy as a given. But how weak is the strength of a union’s impact on wages depends on how highly centralized union-government negotiations are to internalize the effects of higher taxes on the volume of public goods or higher transfers (see, e.g., Calmfors and Driffill 1988). As Summers et al. (1993) suggest, one may conjecture that if wage setting is centralised and workers are represented by a very large trade union, they are likely to develop a more moderate attitude in negotiations, and the union will take into account the budgetary implications of unemployment subsidies. Wage increases would thus be set at a

\[ \Omega = L(1 - t_w)w + (N - L)s. \]
lower level. As trade unions are large enough to set wages, but not large enough to negotiate over welfare policy with the government, this implies that when looking at the empirical determinants of employment, countries might be divided into groups according to the pattern of wage negotiations.

A key parameter for wage rates between sectors is the elasticity of labour demand. There is a qualitative difference between the private and public sectors, since the latter has the possibility of partly passing on an increase in wages to prices, while this is not possible in the former case. Hence, we assume that labour demand is less elastic in the public sector, compared with tradable firms in private sector. We have then the condition of wage rule for both sectors

\[
(2.14) \quad w = \frac{\eta_{LL}}{(\eta_{LL} - 1)(1 - t_w)} s \leq \bar{w} = \frac{\bar{\eta}_{LL}}{(\bar{\eta}_{LL} - 1)(1 - t_w)} s.
\]

The condition takes into account the fact that the competitive pressure is higher in traded firms, and therefore wages may not be higher in the private sector than in the public sector. Rodrik (1997) argues that since the demand for labour is a derived demand, which varies proportionately with the elasticity of demand for goods, the integration of goods markets alone makes the demand for domestic labour more elastic because of declining mark-ups. Therefore, with heightened foreign competition the unions face more elastic labour demand relation and thus moderate their wage demands \( \frac{\partial w}{\partial \eta_{LL}} < 0 \).

Huizinga (1993), and Danthine and Hunt (1994), for example, find that the creation of firm level competition increases the elasticity of labour demand, which moderates unions’ wage demands, i.e. increased goods market competition leads to lower wages and thus to higher employment. However, the effect of integration on the price sensitivity of market share may be compensated for by its direct effect on market share, i.e. market power can arise from specialization in production and differentiation of products in order to take better advantage of economies scale with segmented markets. Nickell et al. (1994) and Stewart (1990) find evidence of a positive (time series) relationship between

labour taxation is less distorting with respect to labour supply decisions in countries with more centralised wage bargaining.
wages and market share. This suggests that both the sharing of mark-ups and higher wages are associated with the market. We summarize the effects of integration on wages for private sector in

**Proposition 2** With increased integration lower trade costs, a higher number of firms and, in consequence, an increase in the elasticity of product demand \( \frac{\partial \varepsilon}{\partial n} \frac{\partial n}{\partial \tau} < 0 \) will increase the elasticity of labour demand \( \frac{\partial \eta_{ll}}{\partial \varepsilon} > 0 \) and thus decrease wage pressure \( \frac{\partial w}{\partial \eta_{ll}} < 0 \), whereas better advantage of economies of scale and, in consequence, a lower elasticity of substitution between differentiated products \( \frac{\partial \phi}{\partial a} \frac{\partial a}{\partial \tau} > 0 \) will decrease labour-demand elasticity \( \frac{\partial \eta_{ll}}{\partial \phi} > 0 \) and thus increase wages \( \frac{\partial w}{\partial \eta_{ll}} < 0 \).

Taking the equilibrium wage rate as \( \bar{w} = (1 + t_p)w \), we have equilibrium employment for traded sector using equation (2.11)

\[
L = p^{-(\phi+\varepsilon)} \left[ \frac{\eta_{li}}{\eta_{li} - 1} \frac{(1 + t_p)s}{(1 - t_w)} \right]^{-\sigma}.
\]

We see that an increase in the elasticity of product demand triggered by more firms (i.e. \( \varepsilon \) rises) decreases labour demand \( \frac{\partial L}{\partial \varepsilon} < 0 \). Product demand becomes more price elastic when product markets are more integrated, but is the effect of product market integration on the price sensitivity of market share larger than its direct effect on market share? For example, individual firms with access to the wider market might be able to expand sales and production taking better advantage of economies scale (i.e. \( \phi \) falls), which can be associated with decreased market imperfections and thus increased labour demand \( \frac{\partial L}{\partial \phi} < 0 \). Furthermore, when unions face a more elastic labour demand rela-
tion and thus moderate their wage demands \( \frac{\partial w}{\partial \eta_{LL}} < 0 \), we find that increased labour-demand elasticity increases labour demand \( \frac{\partial L}{\partial \eta_{LL}} > 0 \) due to the reduced market power of unions. Accordingly, if unions are less aggressive in passing on increases in wage tax and unemployment benefits to wages implying better employment, this suggests that economic integration may imply an implicit structural reform of labour markets through its effect on union market power. However, as Andersen (2003) argues, even though international integration may reduce the distortionary effects of unemployment benefits and taxation on wage formation it does not necessarily follow that the distortionary effects on employment are reduced. In addition, during the process of integration, international trade can increase the elasticity of substitution between labour and capital. As Rodrik (1997) argues, the increasing mobility of capital means that the demand for labour will generally be more responsive to changes in factor prices. Firms can substitute other factors of production for immobile workers more easily by investing. We find that, as a consequence of decreased trade costs as substitutability increases (i.e. \( \sigma \) rises), labour demand becomes more sensitive to labour costs. Hence, despite wage moderation, the effect of employment may become larger because tighter integration increases the sensitivity of employment to wage costs. We summarize the characterization of the impact of economic integration on distortionary employment effects in Proposition 3:

**Proposition 3** During the process of economic integration as increased trade competition crowds out better advantage of economies of scale, \( \frac{\partial \phi}{\partial a} \frac{\partial a}{\partial \tau} < \frac{\partial \epsilon}{\partial n} \frac{\partial n}{\partial \tau} \), and the elasticity of substitution between capital and labour increases, \( \frac{\partial \sigma}{\partial \tau} < 0 \), the less centralized the wage formation process is, the larger the distortionary effects of welfare policies on employment are.

Consider now equilibrium employment in the non-traded public sector. Similarly, for public sector it follows
We can see that, in this framework, economic integration does not affect public employment either via the scale effects of integration or through increasing labour-demand elasticity. Furthermore, in the non-traded sector, it is possible partly to pass on an increase in wages to prices, while this is not possible in the traded sector ($\xi < \varepsilon$). However, public consumption, which improves public sector employment\(^{68}\) is able to affect a firm’s competitiveness via labour taxation (the distortion), which finances increased expenditure (using the budget constraint of government (2.7)). The impact of increased public expenditure on international competitiveness results from the negative effects of labour taxes on disposable income. The loss of competitiveness from higher labour costs causes a reduction in the demand for exports and a fall in private employment. This means that if an increase in wage taxes is compensated for by higher wages, or an increase in employers’ social security payments causes an increase in labour costs, economic integration worsens the ability of a government to improve employment through welfare policy when competition crowds out public consumption. Besides, in the non-traded sector, an increase in labour taxation and no cuts in public sector wages partly replace the positive impact of the consumption of public sector goods on public sector employment ($\frac{\partial L}{\partial G} > 0$) through the opposing effect of higher labour costs ($\frac{\partial L}{\partial w} < 0$), depending on how centralized the labour market is. It is less costly to maintain welfare activities, if labour markets are highly centralized.\(^{69}\)

In summary, increasing job mobility implies a correction in the distortions arising from taxes and social security contributions levied on labour, which affects the possibilities perceive in pursuing certain welfare policies, i.e. public spending and social security expenses, in an economy which is becoming more integrated into the international product market. The effects of economic integration on the impact of welfare

\[^{68}\text{The government demands labour to produce public goods. This captures the fact that for most countries, as Andersen (2001) explains, employment constitutes the major part of public consumption, and wage costs are the dominant expenditure item.}\]

\[^{69}\text{Empirical support for the importance of this mechanism has recently been provided by Alesina and Perotti (1997) and Daveri and Tabellini (2000).}\]
policies on employment clearly depend on a trade-off between intensified competition and better advantage of economies of scale. As increased trade competition crowds out better economies of scale, it becomes more costly to maintain welfare systems financed by labour taxation.

3 ECONOMETRIC MODEL

Our empirical aim is to test whether economic integration has changed the impact of welfare policies on employment by looking at a panel of European countries. Our strategy is to take the theoretical model in Section 2 as the basis for econometric identification. In particular, we use the equilibrium conditions for employment in the traded and non-traded sector. Let \( l_{it} \) be the employment rate in country \( i \) and time \( t \). Taking a linear approximation of equations (2.15) and (2.16) aggregate employment for each period can be written as a regression function

\[
(3.1) \quad l_{it} = \alpha(\omega_{it}) + \mu(t_{it}) + \beta(y_{it}) + \rho(tr_{it}) + \chi(g_{it}) + e_{it}
\]

where \( \omega \) is the real price of labour, \( t \) the wage-based tax rate, \( y \) the real GDP index, \( tr \) the ratio of government transfers to GDP, and \( g \) the ratio of government wage-based consumption to GDP. The error terms are denoted \( e \). By supposing that scale returns are constant we estimate the constant-output labour price of employment using a restricted least squares procedure, \( \beta = 1 \) with a constant output.\(^{70}\) By estimating levels, it is assumed that there are no significant time lags between the changes of labour prices and the employment responses. Hamermesh (1983) reports that typical adjustment lags are six months to one year, so in the annual data, lags should not be too important at the country level.

By supposing that scale returns are not constant we estimate the non-constant-output coefficients of the labour price. If both scale and constant-output labour prices are constant.

---

\(^{70}\) In the short run, changes in the costs of labour will induce a change in output, i.e. the estimates of labour price include the scale effects. The short run labour price would be estimated without production measurement or with output as constant. (See, e.g., Hamermesh 1986, p. 449.)
stently estimated, then the difference between them is the estimate of the scale effect, and it would provide indirect evidence on the competitiveness of product markets. Thus, the impact of integration’s scale effects on the impact of welfare policies on employment can be determined by controlling demand factors. To estimate the scale effect labour price of employment for each period suggests the following regression equation

\[ l_i = \Phi(y_i) + \mu(t_{w_i}) + \beta(y_{w_i}) + \rho(t_{w_i}) + \chi(g_{w_i}) + u_i \]

Here \( u \) is the error term. The scale effect \( \beta \) measures the impact of international demand shocks on employment. We use two different instrument variables: the share of country’s \( i \) exports to the other EU-countries in production and the share of the country’s \( i \) output of the European Union in production. These variables are deflated by a price competitiveness indicator. The first attempts to measure foreign demand for a country’s products, and the second attempts to measure the overall demand in the European Union. Furthermore, a price competitiveness indicator measures international product market competition.

To measure the degree of labour markets centralisation, we use indexes constructed by OECD Jobs Study (1994) for coverage ratio, Golden (1996) for union density, and Nickell (1997) for co-ordination. These are reported in Table 4.1. These indexes rank EU-countries in order of centralisation. We partition countries in three groups\(^1\): the NOR-group includes Scandinavian countries and Austria, where trade unions are large and centralised; the CON-group includes countries (except Austria) in continental Europe, where unions play an important role but are decentralised; and the BRIT-group includes Ireland and the United Kingdom, where labour markets are quite competitive. We allow the wage-based tax-rate coefficient to vary across these groups of EU-countries by multiplying \( t_w \) by three dummy variables taking a value of unity if the country belongs to the group and zero otherwise. The focus of the analysis is on the consequences of taxation, not on the composition of spending. Kiander et al. (2004) notice that there is a strong positive correlation between centralization and public con-
sumption: unionization tends to raise public consumption. Using the degree of centralization in wage bargaining in order to classify the countries we proximate general categorization of countries.

Table 4.1 Coverage, density and co-ordination of labour relations in EU-countries.

<table>
<thead>
<tr>
<th>Country</th>
<th>Union Density</th>
<th>Union Coverage Index</th>
<th>Co-ordination: Union</th>
<th>Co-ordination: Employer</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOR-group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Austria</td>
<td>46.2</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Denmark</td>
<td>71.4</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Finland</td>
<td>72.0</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Sweden</td>
<td>82.5</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>CON-group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>51.2</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>France</td>
<td>9.8</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Germany</td>
<td>32.9</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Greece</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>38.8</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Luxembourg</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>25.5</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Portugal</td>
<td>31.8</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Spain</td>
<td>11.0</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>BRIT-group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ireland</td>
<td>49.7</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>39.1</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Notes: (1) Coverage measures the extent to which contracts signed by organised unions extend to the rest of the labour force. (2) Density measures the rates of net union density, i.e., the number of union members net of pensioners divided by the labour force. (3) Co-ordination measures the extent of contracting co-ordination within different union and employers organisations. The index provides a qualitative ranking of countries: 1 = low, 2 = medium, and 3 = high.


71 This classification has been suggested by several previous studies (Blanchard 1997, Bruno and Sachs 1985, Calmfors and Driffl 1988, Cameron 1984, Daveri and Tabellini 2000, Layard et al. 1991, Nickell
4 DATA

The employment equations are estimated using panel data of European countries based on statistics from OECD database sources: the OECD Statistics of International Trade, OECD Taxing Wages Statistics, the OECD Productivity Database, OECD National Accounts Statistics, and the OECD Economic Outlook Database. The panel data covers years from 1975 to 2004. Table 4.2 reports the summary statistics of the observations. Estimation requires measures of employment, the real labour price, labour taxation, government transfers, government consumption and real production for all country-year observations. The deflating variable is a producer price index. The employment rate comes directly from the OECD Economic Outlook Database as the share of workers in the labour force. The real average labour price is constructed as a unit labour cost equalling nominal annual wages plus social security costs paid by employers deflated by the producer price index and divided by the number of workers. Employment is assumed to correlate negatively with labour costs. The higher the labour price is, the slighter labour demand is. The labour tax rate includes direct average taxation plus social security payments paid by employees divided by total wages. We expect real wages to increase with the labour tax rate. This effect will be small, if labour markets are highly centralised, and thus the negative impact of a higher labour tax rate on employment will also be small. If trade unions play an important role in wage negotiations, but are not centralised enough to take into account the repercussions of higher wages, we expect the negative effect on employment to be large. The cross-sectional variation in employment rates is dominated by fixed effects at the country level. Although labour market legislation differs markedly across countries, it has not changed much since the 1970s (Nickell, 1997). Thus, as Daveri and Tabellini (2000) argue, the correlation between labour taxes and employment is only captured by simultaneously exploiting time series and cross-country variations of the data, and by distinguishing among countries on the basis of their labour market institutions.

and Layard 1999).

72 The countries are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom.
The data for government expenditure is based on OECD National Accounts Statistics. The ratio of government transfers to GDP includes public expenditure on unemployment subsidies and other social transfers. It is generally supposed that the unemployment benefits decrease employment. However, the evidence of Nickell and Layard (1999) suggests that unemployment benefits have little impact on overall labour input. While high benefits lead to high unemployment, they also lead to high participation because they make participation in the labour market more attractive because participation is necessary in order to be eligible for high benefits. This is consistent with the weak impact of unemployment benefit on the employment ratio because the higher unemployment effect and higher labour market participation effect tend to cancel each other out. It is not clear whether the size of the net effect also depends on trade union strength and centralisation, since even in competitive labour markets higher replacement rates could have a large effect on employment through individual search or bargaining attitudes. Finally, we also expect that the employment rate depends on ratio of government wage-based consumption to GDP positively. Although public consumption, which improves public employment, is able to affect a country’s competitiveness via the fact that increasing distortions of labour taxation finance increased expenditures.

Table 4.2 Variable summary statistics.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP-index (real)</td>
<td>450</td>
<td>76.12</td>
<td>18.69</td>
<td>28.02</td>
<td>118.2</td>
</tr>
<tr>
<td>Employment rate</td>
<td>450</td>
<td>92.97</td>
<td>3.698</td>
<td>81.56</td>
<td>99.82</td>
</tr>
<tr>
<td>Labour price (real)</td>
<td>450</td>
<td>73.58</td>
<td>28.07</td>
<td>2.670</td>
<td>116.9</td>
</tr>
<tr>
<td>Labour tax rate</td>
<td>450</td>
<td>17.38</td>
<td>10.07</td>
<td>0.040</td>
<td>44.39</td>
</tr>
<tr>
<td>Ratio of transfers (real)</td>
<td>450</td>
<td>0.226</td>
<td>0.112</td>
<td>0.007</td>
<td>0.499</td>
</tr>
<tr>
<td>Ratio of public consumption (real)</td>
<td>450</td>
<td>0.143</td>
<td>0.066</td>
<td>0.009</td>
<td>0.388</td>
</tr>
<tr>
<td>Exports share (real)</td>
<td>450</td>
<td>0.016</td>
<td>0.015</td>
<td>0.0001</td>
<td>0.083</td>
</tr>
<tr>
<td>EU-output share (real)</td>
<td>450</td>
<td>0.067</td>
<td>0.093</td>
<td>0.0003</td>
<td>0.687</td>
</tr>
</tbody>
</table>

For equation (3.2), we use two different instrument variables: the share of country’s exports to other EU-countries in production and the share of the country’s output of European Union in production deflated by that country’s price competitiveness indicator. Both of country’s exports to other EU-countries and the price competitiveness indicator are based on OECD Foreign Trade Statistics. The other instrument variable, the
total production of the European Union, is based on OECD National Accounts Statistics. The real GDP index, another of the endogenous variables, comes directly from the data of productivity. A rise in exports increases a country’s production, which should increase employment. In theory, labour demand is supposed to depend on the output positively. If product demand rises and thus production increases, firms’ demand for factors rises. The assumption is that higher exports signal better economies of scale (or less foreign competition). On the other hand, the more the rest of the EU accounts for the output of country, the more competitive the product market is for that country’s firms. Finally, an increase in the competitiveness indicator means that a country’s price competitive ability decreases, thereby decrease product demand and thus employment.

5 EMPIRICAL ANALYSIS

The empirical study of the effects of fiscal policy in open economies has typically focused on the role of government purchases of goods and services and on its effects on the relative price of non-tradables. Research by Froot and Rogoff (1991), De Gregorio, Giovannini and Krueger (1994), and De Gregorio, Giovannini and Wolf (1994) find empirical support, differing degrees, for the idea that an increase in government spending on goods and services, falling more heavily on labour-intensive non-tradable goods, leads to an appreciation of the relative price of non-tradable goods via an increase in the demand for labour. In regard to empirical studies on the intersection of public finance and labour economics, several contributions have looked at the effects of taxation on unemployment, particularly in closed economies. For example, paper by Daveri and Tabellini (2000) finds that the increase in unemployment and the slowdown in economic growth are related, because of higher taxes on labour. Recent research by Kander et al. (2004) analyses the relationship between unemployment, labour taxation and public spending using a panel data of OECD countries. Their estimation results suggest that countries where wage setting takes place at the firm level have used labour taxes less extensively in financing welfare spending compared to countries with centralised or decentralised bargaining.
The empirical work closest to our study is the one conducted by Alesina and Perotti (1997). They use a model of an open economy to study the effects of government expenditure and distortionary taxation on competitiveness using a panel data of 14 OECD countries from 1960 to 1990. They find that an increase in government transfers financed by labour taxation generates a loss of international price competitiveness. However, their study does not focus on how the competitiveness of product markets affects employment. This study is the first to estimate how economic integration affects the impact of welfare policies on employment using panel data from EU-countries.

5.1 Estimation strategy

There are some issues to mention regarding our estimation strategy. One is the exogeneity of the regressors in equations (3.1) and (3.2). As Hamermesh (1986) discusses, some of them might actually be endogenous variables because firms (government) make their output (wage-based consumption) and employment decisions jointly. Quandt and Roser (1989) estimated an equilibrium model of the labour market, and used it to test the assumption of production exogeneity. They did not reject the assumption that production is exogenous. On the other hand, and not only because of this potential problem, we estimate the constant-output labour price of employment by using least squares, and the scale-effect labour price of employment by using controls as instruments and by supposing that production is endogenous. Furthermore, there is a potential source of spurious correlation due to the possibility of endogeneity of labour tax rates and unemployment benefits.73 For instance, a common EU-wide shock that decreased employment could force an increase in tax rates to pay for increased unemployment benefits. Because of this potential correlation problem, we construct a variable of the government transfer expenditure rate to GDP that includes both unemployment subsidies and other social transfers, and labour tax rate is wage-based. If some regressors are endogenous, then

73 To cope with the possible endogeneity of these variables, we also estimated the specifications by replacing the current values of the labour tax rate and the ratio of transfers with their lagged values, but it shown that lagged estimators result in insignificant estimates. As Kiviet (1995) suggests, when a model for panel data includes lagged dependent explanatory variables, then the estimation procedures are asymptotically valid only when the number of observations in the time dimension gets large. However, our set of data has a restricted sample size both in the cross-section dimension and time dimension.
least-squares parameter estimates will suffer from an endogeneity bias, the net direction of which is not clear.

A third issue is that income tax systems are progressive and income tax brackets are not generally indexed. During periods of high inflation, many taxpayers tend to be pushed up to higher brackets merely because their nominal income increases. As a result, the average tax rate increases. When wage and price inflation are correlated, this effect might bias our estimates of the coefficient of the average tax rate. On the other hand, Alesina and Perotti (1997) find that excluding high-inflation years doesn’t affect the coefficients of the tax variable. A fourth issue is that the positive relationship between the labour tax rate and unit labour costs might be influenced by the fact that two highly correlated variables appear at the denominator and the numerator in estimating equations (3.1) and (3.2). If the variation in wages dominates the behaviour of unit labour costs and the tax rate, one should expect that negative relation between these two will be picked up by our estimates. As Alesina and Perotti (1997) argue, if, instead, the estimated effect of the tax rate is still negative, one can feel confident that the relation being estimated is not caused by the way we constructed the tax variable. Because of this potential correlation problem, we estimate the specifications in the dynamic model with a lagged value of unit labour costs.

Supposing that integration has influenced the effects of welfare policies, it is also necessary to determine the effects of welfare policies on employment both for periods before integration and during the process of integration; therefore we divide the time series into two periods: 1975-1989, and 1990-2004. We first estimate the employment equations in levels by OLS and GLS using common intercepts over countries. Labour market institutions are important determinants of employment. As Daveri and Tabellini (2000) argue, institutions are hard to measure and they differ a lot across countries. They have, however, changed very slowly over time. Hence, the appropriate estimation method is by fixed effects, i.e. with country-specific intercepts which can proxy for institutions. Thus, we estimate the employment equation in levels by OLS with country dummies as intercepts, and with time dummies. Although, taking time differences also controls for unobserved time-invariant country fixed effects influencing the employ-
ment level. However, time-differencing can also aggravate the regressor measurement error and result in inconsistent estimates. Hsiao (1986) argues that if variables are indeed subject to measurement errors, exploiting panel data to control for the effects of unobserved individual characteristics using standard differenced estimators may result in even more biased estimates than simple OLS estimators using cross-sectional data alone. We start by estimating the employment equations in levels. For equation (3.1), in order to estimate the constant-output labour price of employment we use the ordinary least squares estimation with fixed effect (OLS) and the generalized least squares estimation (GLS); and for equation (3.2), in order to estimate the scale-effect labour price of employment we apply an instrumental variables estimation (2SLS and G2SLS). In fact, when we adopt the GLS estimation procedure it allows for heteroscedasticity with cross section correlation. Then we proceed with the generalized method of moments (GMM) estimation, which provides a convenient framework for obtaining consistent, and, at least, asymptotically efficient estimators for the dynamic panel data (Bond, 2002). The GMM method allows us to make different assumptions about the endogeneity of the right hand side variables, without the need to model them explicitly. The specific assumptions on endogeneity can then be easily tested using the Sargan test for over-identifying restrictions. More specifically, equation (3.1) was estimated using the first-differenced GMM method developed by Arellano and Bond (1991). This method estimates the model in first differences but uses lagged variables in levels as instruments. The model has been estimated with lagged employment and labour costs. Equation (3.2) was estimated using first-differenced instrumental variables (IV) estimation, applying FD2SLS to dynamic panel data with a lagged employment rate and a lagged value of unit labour costs.

74 We also estimated the specifications with the rate of wage tax to GDP, but there was no difference in results between the constructed wage tax variables.
75 We also estimated the specifications with all variables measured in first differences, but it shown that differenced estimators result in more biased estimates. Taking into account our data restrictions we didn’t take longer differences.
76 Comparing results of the different estimation methods between Daveri and Tabellini (2000), which estimate the unemployment equation both in levels by OLS and in first difference by OLS and GLS, and Kiander et al. (2004) who estimate the unemployment equation by dynamic method (GMM), suggests that unemployment is positively correlated with labour tax rates in Europe. Their estimated coefficients
5.2 Estimation results

Our results for specifications by estimating levels are presented in table 5.1. In column 1 and 2, the estimated constant-output labour price of employment for the total period 1975-2004, and sub-periods 1975-1989 and 1990-2004 is reported. Furthermore, in column 3 and 4, the estimated scale effect labour price of employment is reported. The results are independent of whether we estimate specifications by OLS with a fixed effect or GLS. In all these regressions, the coefficients of the labour price have the expected sign, and they are statistically significant. The estimated value of the labour price is also relatively stable across different models. If both constant-output and the scale-effect labour price of employment are consistently estimated then the difference between these two is an estimate of the scale effect. It is shown that the difference between constant-output and the scale-effect labour-price of employment doesn’t become nearer an estimate of the scale effect during integration by estimating levels. However, coefficients of scale effects have the expected sign, and they are statistically significant.

Our results for specifications from the use of dynamic panel data estimation are presented in table 5.2. In column 5, is reported the estimated constant-output labour price of employment for the total period and sub-periods, and in column 6, is reported the estimated scale effect labour-price of employment. Contrary to the results in levels, by using the GMM and FD2SLS methods, we find that the difference between constant-output and the scale-effect labour-price of employment becomes nearer an estimate of the scale effect during integration. Comparing the first and last sub-period, we find that the negative impact of labour price on employment increases during integration with constant output, but decreases allowing scale effects appear. This may imply that economic integration has caused an implicit structural reform of labour markets through the effects it has had on union market power, i.e. by moderating wage demands to improve employment.

differ somewhat because the different used sets of countries, classification of countries, sets of variables, and time period.
The basic result is that scale effects strengthen the negative impact of the labour tax rate on employment. Comparing constant-output and scale-effect estimations, the coefficients of the labour tax rate have, in general, an unexpected sign without the integration effect, and the expected sign by using instruments. However, the magnitude of the parameter is not stable across different models. For the total and both sub-periods, there are some coefficients with unexpected sign and/or which are statistically insignificant by using the GMM and FD2SLS methods. By GMM, the model was estimated under the assumption that the tax rate, government consumption and government transfers are exogenous and therefore uncorrelated with the disturbances. However, this model does not seem to be well specified because the Sargan test does not reject the hypothesis of over-identifying restrictions for all periods, and the lack of a first order correlation of the differenced errors as implied by the AR(1) test. There is a potential source of correlation due to the possible endogeneity of tax rates and unemployment benefits. This potential endogeneity could also be reflected in our method of measurement. Furthermore, by using both methods in levels, there are, for first sub-period, some coefficients of unexpected sign which are also statistically insignificant. This negative relationship between the labour tax rate and unit labour costs might be influenced by the fact that two highly correlated variables appear at the denominator and the numerator. If the variation in wages dominates the behaviour of unit labour costs and the tax rate, one should expect that negative relation between these two will be picked up by our estimates.

We note that for the total period, by estimating levels allowing scale effects appear, the negative impact of the labour tax rate on employment is highest in countries where trade unions play an important role but are decentralised. This finding supports the idea that an increase in labour taxation will be most harmful to employment in mid-centralised countries. However, by using the FD2SLS method, the negative impact of the labour tax rate on employment is significant only in countries where wage bargaining is centralised. On the contrary, Daveri and Tabellini (2000) suggest that unemployment is strongly and positively correlated with labour taxation in Europe, but that no
significant relationship exists in countries where bargaining is centralised or co-
ordinated.77

Unexpectedly, scale effects weaken the negative impact of transfers on employment. In general, the coefficients for transfers are higher without the integration effect than by using instruments. However, it is shown that the coefficients of the ratio of transfers become greater during integration with scale effects. The coefficients of the ratio of transfers have the expected sign, and they are statistical significant, with the exception of some coefficients for the sub-periods. This may reflect the fact that international integration leads to a structural change in social security systems, i.e. an increasing need for social insurance arrangements to ensure some income stabilization in the presence of cross-country shocks. While high benefits lead to high unemployment, they also lead to high participation because they make participation in the labour market more attractive, i.e. participation being necessary in order to be eligible for high benefits.

Furthermore, we note that scale effects weaken the positive impact of public consumption on employment. The coefficient of the ratio of wage-based consumption is higher without the integration effect than by using instruments. Although it is shown that the coefficient of consumption has become greater during integration with scale effects and decreases with constant output. The coefficients of the ratio of consumption have the expected sign, and they are statistical significant. The exception is the last sub-period without the integration effect, where this coefficient is statistically insignificant by estimating levels.

Overall, the results provide inconsistent evidence for the hypothesis that economic integration has contributed to the distortion effects of welfare policies on employment. While, the results provide some support for the hypothesis that the scale effects of international integration strengthen the negative impact of the labour tax rate on employment. Although scale effects weaken the negative impact of transfers on employment, this impact increases during integration. On the other hand, integration weakens the positive impact of public consumption on employment.

77 We also estimated the employment equations both in levels and in first-differences without labour costs, which are not reported here. These findings support the idea that an increase in labour taxation should be less harmful to employment in centralised countries.
Table 5.1 Regression results for employment (in levels).

<table>
<thead>
<tr>
<th>Method</th>
<th>Equation (3.1)</th>
<th>Equation (3.1)</th>
<th>Equation (3.2)</th>
<th>Equation (3.2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OLS</td>
<td>GLS</td>
<td>2SLS</td>
<td>G2SLS</td>
</tr>
<tr>
<td></td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
<td>[4]</td>
</tr>
<tr>
<td><strong>Period 1975 - 2004</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>48.33 (26.0)</td>
<td>48.92 (21.1)</td>
<td>91.20 (53.9)</td>
<td>90.80 (49.6)</td>
</tr>
<tr>
<td>GDP</td>
<td>1</td>
<td>1</td>
<td>0.174 (5.65)</td>
<td>0.180 (6.00)</td>
</tr>
<tr>
<td>Labour tax - Nor</td>
<td>0.093 (0.65)</td>
<td>0.096 (0.96)</td>
<td>-0.033 (-1.77)</td>
<td>-0.051 (-2.02)</td>
</tr>
<tr>
<td>Labour tax - Con</td>
<td>0.178 (1.16)</td>
<td>0.471 (3.57)</td>
<td>-0.227 (-4.70)</td>
<td>-0.191 (-4.09)</td>
</tr>
<tr>
<td>Labour tax - Brit</td>
<td>1.875 (9.56)</td>
<td>1.240 (8.10)</td>
<td>-0.211 (-2.17)</td>
<td>-0.186 (-2.22)</td>
</tr>
<tr>
<td>Labour price</td>
<td>-0.623 (-37.7)</td>
<td>-0.645 (-38.0)</td>
<td>-0.135 (-7.15)</td>
<td>-0.139 (-7.41)</td>
</tr>
<tr>
<td>Transfers</td>
<td>-71.05 (-7.38)</td>
<td>-55.97 (-5.99)</td>
<td>-33.28 (-10.4)</td>
<td>-32.32 (-10.3)</td>
</tr>
<tr>
<td>Public consumption</td>
<td>162.1 (11.1)</td>
<td>142.1 (9.25)</td>
<td>59.34 (10.2)</td>
<td>58.17 (10.3)</td>
</tr>
<tr>
<td>Number of obs</td>
<td>450</td>
<td>450</td>
<td>450</td>
<td>450</td>
</tr>
<tr>
<td>R² (within)</td>
<td>0.888</td>
<td>0.885</td>
<td>0.537</td>
<td>0.535</td>
</tr>
<tr>
<td>F-test (p-value)</td>
<td>98.69</td>
<td>0.000</td>
<td>67.78</td>
<td>0.000</td>
</tr>
<tr>
<td><strong>Sub-period 1975 - 1989</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>56.41 (37.9)</td>
<td>55.99 (20.7)</td>
<td>78.82 (6.43)</td>
<td>74.59 (4.96)</td>
</tr>
<tr>
<td>GDP</td>
<td>1</td>
<td>1</td>
<td>0.486 (1.73)</td>
<td>0.562 (1.68)</td>
</tr>
<tr>
<td>Labour tax - Nor</td>
<td>0.314 (2.82)</td>
<td>0.141 (1.40)</td>
<td>0.186 (1.83)</td>
<td>0.028 (0.43)</td>
</tr>
<tr>
<td>Labour tax - Con</td>
<td>-0.274 (-2.33)</td>
<td>-0.176 (-1.46)</td>
<td>-0.250 (-3.20)</td>
<td>-0.104 (-1.08)</td>
</tr>
<tr>
<td>Labour tax - Brit</td>
<td>0.086 (0.32)</td>
<td>0.262 (1.29)</td>
<td>-0.094 (-0.46)</td>
<td>0.096 (0.43)</td>
</tr>
<tr>
<td>Labour price</td>
<td>-0.471 (-25.7)</td>
<td>-0.466 (-23.8)</td>
<td>-0.294 (-3.01)</td>
<td>-0.313 (-2.77)</td>
</tr>
<tr>
<td>Transfers</td>
<td>-40.03 (-3.74)</td>
<td>-37.85 (-3.32)</td>
<td>-19.09 (-1.42)</td>
<td>-18.79 (-1.21)</td>
</tr>
<tr>
<td>Public consumption</td>
<td>51.19 (3.35)</td>
<td>49.60 (3.05)</td>
<td>34.62 (2.57)</td>
<td>34.52 (2.11)</td>
</tr>
<tr>
<td>Number of obs</td>
<td>225</td>
<td>225</td>
<td>225</td>
<td>225</td>
</tr>
<tr>
<td>R² (within)</td>
<td>0.891</td>
<td>0.889</td>
<td>0.473</td>
<td>0.432</td>
</tr>
<tr>
<td>F-test (p-value)</td>
<td>265.6</td>
<td>0.000</td>
<td>31.85</td>
<td>0.000</td>
</tr>
<tr>
<td>CHI²</td>
<td>1358 [6]</td>
<td>121.7 [7]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sub-period 1990 - 2004</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>47.59 (9.86)</td>
<td>50.54 (10.7)</td>
<td>91.68 (35.8)</td>
<td>89.79 (31.3)</td>
</tr>
<tr>
<td>GDP</td>
<td>1</td>
<td>1</td>
<td>0.089 (2.02)</td>
<td>0.124 (2.63)</td>
</tr>
<tr>
<td>Labour tax - Nor</td>
<td>0.211 (0.95)</td>
<td>0.285 (2.32)</td>
<td>-0.336 (-4.71)</td>
<td>-0.216 (-3.61)</td>
</tr>
<tr>
<td>Labour tax - Con</td>
<td>0.372 (1.27)</td>
<td>0.532 (3.02)</td>
<td>-0.008 (-0.90)</td>
<td>-0.082 (-1.02)</td>
</tr>
<tr>
<td>Labour tax - Brit</td>
<td>2.769 (11.3)</td>
<td>1.615 (8.47)</td>
<td>-0.431 (-2.53)</td>
<td>-0.275 (-1.71)</td>
</tr>
<tr>
<td>Labour price</td>
<td>-0.677 (-20.7)</td>
<td>-0.706 (-19.9)</td>
<td>-0.048 (-1.52)</td>
<td>-0.070 (-2.03)</td>
</tr>
<tr>
<td>Transfers</td>
<td>-2.754 (-0.19)</td>
<td>19.18 (1.36)</td>
<td>-26.09 (-5.93)</td>
<td>-23.86 (-5.34)</td>
</tr>
<tr>
<td>Public consumption</td>
<td>50.21 (2.16)</td>
<td>18.75 (0.82)</td>
<td>46.10 (6.63)</td>
<td>43.39 (6.26)</td>
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<td>Number of obs</td>
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<td>225</td>
<td>225</td>
<td>225</td>
</tr>
<tr>
<td>R² (within)</td>
<td>0.813</td>
<td>0.792</td>
<td>0.528</td>
<td>0.517</td>
</tr>
<tr>
<td>F-test (p-value)</td>
<td>31.46</td>
<td>0.000</td>
<td>65.88</td>
<td>0.000</td>
</tr>
<tr>
<td>CHI²</td>
<td>660.9 [6]</td>
<td>181.0 [7]</td>
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<td></td>
</tr>
</tbody>
</table>

Notes: (1) Dependent variable is employment rate. (2) Values of t-ratios are reported in parentheses. (3) Degrees of freedom are presented in square brackets. (4) Column [1]: estimated by OLS with fixed effect. (5) Column [2]: estimated by GLS allowing correlation across countries. (6) Column [3]: estimated by IV with fixed effect. (7) Column [4]: estimated by IV.
Table 5.2 Regression results for employment (dynamic panel data estimation).

<table>
<thead>
<tr>
<th>Method</th>
<th align="right">Equation (3.1) GMM</th>
<th align="right">Equation (3.2) FD2SLS</th>
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</thead>
<tbody>
<tr>
<td></td>
<td align="right">[5]</td>
<td align="right">[6]</td>
</tr>
<tr>
<td><strong>Period 1975 - 2004</strong></td>
<td align="right"></td>
<td align="right"></td>
</tr>
<tr>
<td>Employment</td>
<td align="right">0.970 (110.)</td>
<td align="right">0.417 (7.80)</td>
</tr>
<tr>
<td>GDP</td>
<td align="right">1</td>
<td align="right">0.197 (1.86)</td>
</tr>
<tr>
<td>Labour tax - Nor</td>
<td align="right">0.019 (0.64)</td>
<td align="right">-0.053 (-1.75)</td>
</tr>
<tr>
<td>Labour tax - Con</td>
<td align="right">0.168 (5.01)</td>
<td align="right">-0.024 (-0.57)</td>
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<td>Labour tax - Brit</td>
<td align="right">0.250 (6.15)</td>
<td align="right">-0.056 (-0.50)</td>
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<td>Labour price</td>
<td align="right">-0.023 (-3.65)</td>
<td align="right">-0.136 (-3.60)</td>
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<tr>
<td>Transfers</td>
<td align="right">-6.659 (-3.48)</td>
<td align="right">-4.093 (-1.75)</td>
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<tr>
<td>Public consumption</td>
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<td align="right">10.37 (2.66)</td>
</tr>
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<td>Number of obs</td>
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<tr>
<td>$R^2$ (within)</td>
<td align="right">0.675</td>
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<td>Sargan test (p-value)</td>
<td align="right">510.8 (0.000)</td>
<td align="right">464.7 (0.000)</td>
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<tr>
<td>AR(1)</td>
<td align="right">(0.105)</td>
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</tr>
<tr>
<td>AR(2)</td>
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<td align="right"></td>
</tr>
<tr>
<td><strong>Sub-period 1975 - 1989</strong></td>
<td align="right"></td>
<td align="right"></td>
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<tr>
<td>Employment</td>
<td align="right">0.811 (25.9)</td>
<td align="right">0.397 (7.62)</td>
</tr>
<tr>
<td>GDP</td>
<td align="right">1</td>
<td align="right">0.198 (2.00)</td>
</tr>
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<td>Labour tax - Nor</td>
<td align="right">-0.021 (-0.41)</td>
<td align="right">-0.016 (-0.48)</td>
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<tr>
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<td align="right">-0.224 (-2.73)</td>
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<tr>
<td>Labour price</td>
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<td align="right">-0.131 (-3.99)</td>
</tr>
<tr>
<td>Transfers</td>
<td align="right">-22.68 (-6.04)</td>
<td align="right">-5.548 (-1.30)</td>
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<tr>
<td>Public consumption</td>
<td align="right">30.26 (5.75)</td>
<td align="right">11.82 (2.07)</td>
</tr>
<tr>
<td>Number of obs</td>
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<td align="right">210</td>
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<tr>
<td>$R^2$ (within)</td>
<td align="right">0.826</td>
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<tr>
<td>Sargan test (p-value)</td>
<td align="right">147.9 (0.003)</td>
<td align="right">218.7 (0.000)</td>
</tr>
<tr>
<td>AR(1)</td>
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<tr>
<td>AR(2)</td>
<td align="right">(0.943)</td>
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</tr>
<tr>
<td>CHI² (p-value)</td>
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<td align="right"></td>
</tr>
<tr>
<td><strong>Sub-period 1990 - 2004</strong></td>
<td align="right"></td>
<td align="right"></td>
</tr>
<tr>
<td>Employment</td>
<td align="right">0.947 (70.3)</td>
<td align="right">0.497 (8.22)</td>
</tr>
<tr>
<td>GDP</td>
<td align="right">1</td>
<td align="right">0.067 (2.80)</td>
</tr>
<tr>
<td>Labour tax - Nor</td>
<td align="right">0.027 (0.61)</td>
<td align="right">-0.192 (-2.91)</td>
</tr>
<tr>
<td>Labour tax - Con</td>
<td align="right">0.081 (1.40)</td>
<td align="right">0.019 (0.28)</td>
</tr>
<tr>
<td>Labour tax - Brit</td>
<td align="right">0.315 (5.26)</td>
<td align="right">-0.037 (-0.18)</td>
</tr>
<tr>
<td>Labour price</td>
<td align="right">-0.025 (-2.26)</td>
<td align="right">-0.094 (-3.20)</td>
</tr>
<tr>
<td>Transfers</td>
<td align="right">-4.942 (-1.71)</td>
<td align="right">-6.313 (-1.79)</td>
</tr>
<tr>
<td>Public consumption</td>
<td align="right">15.78 (3.36)</td>
<td align="right">14.11 (2.42)</td>
</tr>
<tr>
<td>Number of obs</td>
<td align="right">210</td>
<td align="right">210</td>
</tr>
<tr>
<td>$R^2$ (within)</td>
<td align="right">0.693</td>
<td align="right"></td>
</tr>
<tr>
<td>Sargan test (p-value)</td>
<td align="right">314.5 (0.271)</td>
<td align="right">240.5 (0.000)</td>
</tr>
<tr>
<td>AR(1)</td>
<td align="right">(0.000)</td>
<td align="right"></td>
</tr>
<tr>
<td>AR(2)</td>
<td align="right">(0.010)</td>
<td align="right"></td>
</tr>
</tbody>
</table>

Notes: (1) Dependent variable is lagged employment rate. (2) Values of t-ratios are reported in parentheses. (3) Column [5]: GMM refers to Arellano and Bond (1991) estimation method. (4) Column [2]: FD2SLS refers to first-differenced IV estimation method. (5) Sargan test for overidentifying restrictions. (6) Arellano-Bond test for first and second order autocorrelation of the differenced errors.
6 CONCLUSIONS

The purpose of this study has been twofold to investigate how economic integration affects the impact of welfare policies on employment by using theoretical model and empirical analysis. We considered the possibilities of financing the public sector by general labour taxation in an economy which is becoming more integrated into the international product market. We built the theoretical framework for estimating employment and determining the impact of economic integration on the effects of welfare policies. Using a general theoretical model of intra-industry trade, we analyzed how economic integration changes the impact of welfare policies on employment. The model captured scale effects running from product markets to the effects of welfare policies on employment. Increasing job mobility implies a change in the distortions arising from taxes and social security contributions levied on labour, which, in turn, affects the ability to pursue welfare policies, i.e. public consumption and social security expenses. We show that the effects of economic integration on the impact of welfare policies on employment clearly depend on a trade-off between intensified competition and better economies of scale. As increased trade competition crowds out better advantage of economies of scale, it becomes more costly to maintain welfare systems financed by labour taxation.

We formulated an econometric model in which the aim is to determine whether European integration has changed the impact of welfare policies on employment using a panel of European countries from 1975 to 2004. Our findings provide some support for the claim that the scale effects of international integration strengthen the negative impact of the labour tax rate on employment. However, scale effects weaken the negative impact of transfers on employment; although this negative impact increased over integration. Furthermore, we noted that integration weakens the positive impact of public consumption on employment. These results provide inconsistent evidence for the hypothesis that economic integration has contributed to the distortionary effects of welfare policies on employment.
Finally, the study raises a potentially interesting area for future research. This would be to extend the integration model to capture the role of international capital flows and, in general, factor substitution possibilities, i.e. the substitution effects of economic integration on the impact of welfare policies on employment. Another point that we left out of the discussion was redistributive welfare policies related, in particular, to fiscal adjustments with redistribution and fiscal reform. Our findings raise important questions for policy-making in a situation of economic integration, in particular in regard to the cost of the more generous European welfare states.

REFERENCES


IV Profit Sharing, Economic Integration and Employment: Econometric Evidence from Finland

Abstract

By using theoretical modelling and empirical analysis, we investigate how economic integration affects the impact of profit sharing on employment. We show that, in theory, the effects of economic integration on the impact of profit sharing on employment clearly depend on a trade-off between intensified competition and better advantage of economies of scale. If product market competition increases, the ability of profit sharing to improve employment through economic integration increases with moderated wages. While, the economic integration associating with market power in turn decrease the possibilities of profit sharing with higher wages to improve employment. As increased trade competition crowds out better advantages from economies of scale, economic integration increases profit sharing with wage-moderating and thus improves labour demand. We test the idea of whether European integration has changed the impact of profit sharing on employment in Finland using data from the manufacturing sector for the years 1996 to 2004. The results show that profit-sharing has a positive impact on employment during the process of economic integration, but can have ambiguous effects on the stability of employment.
1 INTRODUCTION

The earliest arguments of the benefits of economic integration are based on the idea that international competition promotes economic efficiency. Protectionism is costly because resources are not allocated to areas where a country has a comparative advantage. Bernard et al. (2006) find that economic activity is reallocated towards high-productivity firms as trade costs fall in a given industry. The benefits of economic integration result from access to larger markets, and therefore larger profits and possible economies of scale. The recent emphasis on imperfectly competitive markets in international trade creates another argument for gains from integration: in a protected market dominated by only a few firms, trade reform increases competition, which is also important for productive efficiency. Research on productivity often examines the relationship between productivity increases and structural changes such as trade policy reforms in an economy. According to recent heterogeneous firm models (see, for example, Helpman et al. 2003, or Bernard et al. 2003) the benefits of trade accrue to the most productive firms within an industry, whereas the costs are felt disproportionately by the least productive. Bayoumi et al. (2004) conclude that greater competition significantly stimulates macroeconomic performance and that it may improve macroeconomic management by increasing the responsiveness of wages and prices to market conditions. According to this view, intensified competition in product markets could be expected to affect the impact of profit sharing on employment. The relationship between profit-sharing and a firm's performance has been addressed in several empirical studies (see Fitzroy and Kraft 1987, Cable and Wilson 1989 and 1990, Wadhwani and Wall 1990, Kruse 1992, Cahuc and Dormont 1997, Conyon and Freeman 2001). All of these studies show that profit-sharing is correlated with better productivity. This implies that employment might be higher in profit-sharing firms through the productivity effects of economic integration. Gersbach (2000) argues that reductions in product market imperfections might enhance employment through lower mark-ups, higher total productivity and expanded sets of product varieties. If, however, it is supposed that economic integration only strengthens price competition, then the productivity changes associated
with trade reform may be mismeasured. As a result, the impact of liberalization on product markets would lead to biased estimates for the relationship between trade reform and productivity growth. This suggests that changes in both price-cost margins and returns to scale should be used as the measures of competition for estimating the effects of economic integration on the impact of profit-sharing on employment.

There is also the issue of employment stability. One concern is how changes in the degree of product market competition can affect labour practices during the progress of integration where firms face aggregate and industry-specific shocks. Economic integration is a process in which markets for goods and factors of production tend to become perfectly integrated. The mobility of production has been increasing as a consequence of product market integration. As Rodrik (1998, 2000) argues, open economies, which are free to trade with each other, differ from closed economies in the respect that, in particular, capital and employers are internationally mobile. The progress of integration with wider trade and capital flows has been strengthening competition both within and across industries and countries, which has reflected in the labour market. Product demand becomes more sensitive to price differentials between economies and firms’ location decisions more responsive to relative labour costs. Rodrik (1997, 1998) explains that when the shock of product market is a negative one there is a larger decrease in employment in more open economies. A consequence of integration is greater instability in labour-market outcomes when openness magnifies the effects of shocks on labour demand. On the other hand, firms with access to the wider market are expected to be able to expand sales and production to take better advantage of economies of scale while continuing to cover production costs despite lower price-cost margins. This implies that the creative destruction of exporting is associated with the reallocation of resources from less efficient to more efficient firms, which may generate more job creation than job destruction. When discussing the impact of profit sharing on changes to net employment we refer here to profit sharing as a method of payment based on the performance of firms, as opposed to base wage. The loss of national adjustment variables with the progress of integration will result in an increased need for alternative flexible mechanisms to correct possible asymmetric shocks across industries and countries. Therefore, competitiveness pressure on the labour market towards greater flexibility is expected to increase under diminishing trade barriers. Haffner et al. (2000) find
evidence that both product market competition and labour market flexibility have been fostered by integration within EU-countries. Weitzman (1985, 1987) argues that the merit of profit-sharing is that it guarantees stability of employment in the face of shocks. The theoretical arguments rely crucially on the assumption that firms use the base wage and not the total level of remuneration as the relevant marginal cost of labour. A wage system has a negative macroeconomic externality, while a profit-sharing system has favourable externality effects on employment and, indirectly, on price stability. It has been argued that if there is a general rise in product market competition, the corresponding loss of rents would be shared between firms and workers with no overall impact on employment (see Geroski et al., 1995, for example). Kruse (1991) presents evidence suggesting that at the firm level the statistical association between aggregate unemployment and employment is less strong for profit-sharing firms. However, Wadhwani and Wall (1990) present a more formal test of this proposition in the context of a labour demand model, and find no difference in the effect of aggregate demand shocks on employment between profit-sharing and non-profit-sharing firms.

Profit sharing has been extensively used in European countries as part of the compensation scheme in the labour market. Pendleton et al. (2001) present detailed data on the significant proportion of workplaces with financial employee participation, in particular in the form of profit sharing schemes, in EU-countries. Profit sharing has increased considerably in Finland during the late 1990s. Profit sharing has been seen as a way to introduce wage flexibility in a setting where wage levels are determined centralized, as in case of Finland. We consider the hypothesis that profit sharing is introduced not as an incentive mechanism, but as a way to obtain more stable employment in the process of economic integration. The purpose of this study is to examine the effects of economic integration on the impact of profit sharing on employment using theoretical modelling and empirical analysis. The commitment to profit sharing serves as a strategic device inducing a reduction in the negotiated base wage, thereby generating a link between imperfections in the product market and equilibrium employment. In theory, the impact of profit sharing on employment with economic integration depends definitely on a trade-off between intensified competition and better advantages from economies of scale. A comparatively high degree of product market competition will make labour demand more elastic and shift it outwards. Due to rent sharing behaviour,
wage rates can be expected to be inversely related to product market competition. Hence, it can be argued that the ability of profit sharing to improve employment through economic integration is progressively increased when product market competition increases. However, there is a case in which firms might choose to pay higher wages when they have market power and are earning higher monopoly rents. With increased integration and competition, firms with access to the wider market are expected to be able to expand sales and production to take better advantage of economies of scale. Thus, market power may arise from specialization in production and differentiation of products to establish segmented markets. When economic integration is associated with an increase in market power it might, in turn, decrease the ability of profit sharing with higher wages to improve employment. As a consequence, the validity of the relationship has to be determined empirically. The focus of the empirical work is to determine the effect of European integration on the impact of profit sharing on the employment. The question of the relationship between the intensity of economic integration and employment in the presence of profit sharing has not been addressed before. Our study uses data from the Finnish manufacturing sector from 1996 to 2004.

The study is organized as follows: section 2 focuses on identifying the main channels through which economic integration affects the impact of profit sharing on employment. It specifies a theoretical framework for empirical analysis. Section 3 formulates the econometric model. The data are described in Section 4. Section 5 presents the estimation strategy, and reports on the empirical results. A few concluding remarks are given in the last section.

2 THEORETICAL FRAMEWORK

We construct a general theoretical model of intra-industry trade in order to capture the effects of product market integration on the impact of profit sharing on employment via the removal of barriers. Intra-industry trade may be defined as the two-way exchange of goods in which neither country seems to have a comparative cost advantage. We assume that labour markets are unionized, which generates rigidities in the wage setting process. As Koskela and Stenbacka (2005) emphasize, profit sharing decisions take place within
the framework of an institutional environment where profit-sharing schemes have to be independent of wage agreements. The assumption is that the firms commit themselves to a profit sharing arrangement which specifies the extent to which wage contracts are performance-related. The firm determines the level of employment once the base wage and the profit share have been determined. Wages serve as a commitment that the firm takes as a given when it decides on profit sharing. We consider an open economy where there are many firms in a given industry producing differentiated goods with capital and labour as inputs. Supposing that product markets are imperfectly competitive, there is monopolistic competition in good markets adapting the model of Dixit and Stiglitz (1977), in which there is assumed to be no strategic (Bertrand or Cournot) interaction between firms (see page 21).

Assuming that linear-homogenous technology can be represented for each firm in industry $j$ by the CES (constant elasticity of substitution) production function form, it can be specified as

$$\text{(2.1)} \quad Y_{ji} = \left[ L_{ji}^{\sigma_{ji}} + K_{ji}^{\sigma_{ji}} \right]^{\frac{1}{\sigma_{ji}}}$$

where the elasticity of substitution between capital and labour is defined as $\sigma_{ji} \equiv \frac{1}{1-\phi_{ji}} \geq 0$, and capital is denoted by $K_{ji}$, and labour by $L_{ji}$. The elasticity of substitution is defined as the effect of a change in the relative factor prices on relative inputs of those two factors, holding output constant (see Allen 1938, or Hamermesh 1993). It can be thought as parameterized on trade costs ($\tau_j$) to reflect the fact that integration expands the set of factors by increasing the mobility of capital (see page 27).

Based on our theory from essay II, we suppose, for simplicity, that all industries only produce differentiated products. Firms face in industry $j$ representative consumer’s tastes which are assumed to be represented by the utility function

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78 It is crucial that firms feel able to reduce average total remuneration. If firms feel that they must continue to pay the same amount to each worker as under the existing wage system, introducing profit sharing will not alter hiring behaviour. As a result, as Wadhwa and Wall (1990) argue, if firms feel committed to paying a certain total amount, the manner in which this amount was divided into the two components (base wage and profit linked pay), would become irrelevant.
(2.2) \[ V = \sum_j b_j \frac{1}{\theta_j} D_j^{\theta_j} \]

where \( D_j = \sum_{i=1}^D D_{ji} \) is an index of consumption of the differentiated products in industry \( j \), and \( b_j \) is the positive constant. Firm \( i \) in industry \( j \) is assumed to choose the price and decide on employment so as maximize the following profit function

\[
(2.3) \quad (1 - \Pi_{ji}^w)\Pi_{ji} = (1 - \Pi_{ji}^w)\left[p_{ji}(Y_{ji})Y_{ji} - w_{ji}L_{ji} - r_{ji}K_{ji}\right].
\]

where \( p_{ji} \) represents the price of variety \( i \), and capital costs are denoted by \( r_{ji} \). The firm takes the wage rate \( w_{ji} \) and profit share \( \Pi_{ji}^w \) as a given. Profit share determines what fraction of a firm’s profits will be transferred to employed workers. From the underlying utility function, given by (2.2), by imposing the symmetry assumption, a consumer maximizing\(^{79}\) will set the demand in the product market as

\[
(2.4) \quad D_j = \left(\frac{p_j^*}{b_j}\right)^{-\frac{1}{1-\theta_j}}
\]

where \( \varepsilon_j = \frac{1}{1-\theta_j} > 1 \) is product-demand elasticity, and \( P_j^* \) represents an index of the price level in terms of international integration. The above solution (equation (2.4)) is described on page 22. The demand of product type \( i \) is given as

(2.5) \[ D_{ji} = D_j \left(\frac{p_{ji}}{P_j^*}\right)^{-\theta_j} \]

\(^{79}\) Each consumer maximises their utility function (2.1) subject to the budget constraint. The budget constraint simply requires that the value of expenditure is not more than value of the income.
where \( p_{ji} \) represents the price of variety \( i \) with \( \phi_j > 1 \) denoting the elasticity of substitution between any two product types (see Helpman and Krugman 1989). The above equation (2.5) is explained in Chapter 2.2 of essay II. From utility maximizing of consumer and by using (2.5), we have

\[
D_{ji} = a_j p_{ji}^{-\phi_j} P_j^{*\phi_j - \varepsilon_j}
\]

That is, demand for any product type depends on both its own price in terms of other products and on the overall price index in terms of that product. So long as \( \varepsilon_j < \phi_j \), i.e. the elasticity of substitution within an industry is larger than the price elasticity, the demand for an individual product will depend positively on the overall price index.

Consider now the impact of a reduction in marginal trade costs on product markets. Let \( \tau_j \) denotes a trade cost due to transactions costs and other trade barriers related to foreign trade\(^{80}\) at industry \( j \). The effects on imperfectly competitive product markets of increased integration via declining trade costs are basically of two counteracting sorts (described on pages 23 and 24). First, individual producers with access to the wider market are expected to be able to expand production to take better advantage of economies of scale. Thus, we assume that

\[
\frac{\partial \phi_j}{\partial a_j} \frac{\partial a_j}{\partial \tau_j} > 0.
\]

Second, with increased integration and competition, an industry’s market share becomes increasingly sensitive to price changes, raising the elasticity of the consumption price. Thus, we have

\[
\frac{\partial \varepsilon_j}{\partial n_j} \frac{\partial n_j}{\partial \tau_j} < 0.
\]

\(^{80}\)For simplicity, we assume that the trade costs of import and export outputs are equal.
The relative price \( \frac{p_{ji}}{p_j} \) is chosen by the firm. In the imperfect competition we then have the condition of the pricing rule for product types in industry \( j \)

\[
P_j^* \geq \left[ \sum_{i=1}^{n} \left( \frac{1 + \tau_j}{a_j} \right) p_{ji}^{1-\phi_j} \right]^{\frac{1}{1-\phi_j}}.
\]

The above equation (2.9) is explained in Chapter 2.2 of essay II. Price equals the marginal revenue from exporting, in optimum, in which the relative trade cost must equal the mark-up factor, i.e. \( \frac{1 + \tau_j}{a_j} = \frac{\phi_j + \epsilon_j}{\phi_j + \epsilon_j - 1} \) (see, e.g., Helpman and Krugman 1989, p. 18). We have described the characterization of the optimal pricing rule in the Proposition 1 of Essay II (see pages 24 and 25).

Using (2.6), under the utility maximization of an individual consumer, i.e. marginal utility is equal to marginal cost, each firm \( i \) in industry \( j \) faces a downward sloping demand curve

\[
Y_{ji} = D_{ji}(p_{ji}) = p_{ji}^{-(\phi_j + \epsilon_j)}.
\]

The closer substitutes for output \( Y_{ji} \) on the international market are the more elastic output demand becomes. Profit maximization implies that firms will set a price which exceeds the marginal cost by a constant mark-up factor, i.e. using (2.9) we have, in optimum, \( \frac{1 + \tau_j}{a_j} = \frac{\phi_j + \epsilon_j}{\phi_j + \epsilon_j - 1} > 1 \). During the process of integration, there are pressures for mark-ups to decline along with the increasing elasticity of product demand. On the other hand, a decrease in product-substitution elasticity may compensate for this effect. For example, using Italian firm level data Bottasso and Sembenelli (2001) conclude that the EU Single Market Program has led to a decrease in mark-ups and an increase in produc-
tivity for those firms expected, ex-ante, to be more sensitive to the abolition of external trade barriers.\footnote{Overall, these results are consistent with the long standing view that economic integration reduces firms’ market power and increases productivity via the removal of trade barriers.}

By determining the implicit form of labour demand, conditional labour costs can be derived from (2.1) as

\[(2.11) \quad w_{ji} = \frac{Y_{ji}}{L_{ji}} \frac{1}{\sigma_{ji}}.\]

Capital costs \( r_{ji} \) can be derived in a similar way. Under the assumption of wage-taking and profit-maximizing behaviour, labour demand can be written by using equations (2.10) and (2.11)

\[(2.12) \quad L_{ji} = p_{ji}^{-\sigma_{ji}} w_{ji}^{1-\sigma_{ji}}.\]

Differentiating (2.12) with respect to wages gives

\[(2.13) \quad \frac{\partial L_{ji}}{\partial w_{ji}} = -\sigma_{ji} p_{ji}^{-\sigma_{ji}} w_{ji}^{-\sigma_{ji}-1} < 0.\]

Firms decide on employment to maximize profits for a given wage rate and profit share, constrained by both the elasticity of substitution among differentiated goods and the elasticity of demand in their product market

\[(2.14) \quad (1 - \Pi_{ji}^w)\Pi_{ji} = (1 - \Pi_{ji}^w) p_{ji}^{-\phi - \epsilon_j} \left[ p_{ji} - w_{ji}^{1-\sigma_{ji}} - r_{ji}^{1-\sigma_{ji}} \right].\]

Differentiating (2.14) with respect to the wages gives
Determining wages and profit share, the labour market is assumed to be imperfectly competitive. It is commonly accepted that the monopoly union model, in a simple way (see, e.g., Booth 1995), captures the qualitative implications of different labour market models, at least in respect to generate unemployment and in the wage response to the degree of centralization. The base wage is determined by a trade union under those circumstances where profit share $\Pi_{ji}$ is given. It is assumed that firms commit themselves to a profit sharing arrangement which specifies to what extent the wage contracts are performance-related. The profit sharing decision is made in anticipation of its effects on the base wage and labour demand. Each monopoly union maximizes the income of their members subject to the labour demand function (2.12), and is constrained by both the elasticity of substitution among differentiated goods and the elasticity of demand in the product market. Let $N_{ji}$ be the labour force for each firm $i$ in industry $j$, and thus $[N_{ji} - L_{ji}]$ is unemployment. The union’s utility function is given by

$$\Omega_{ji}(w_{ji}) = L_{ji} \left[ w_{ji} + \frac{\Pi_{ji}^w}{L_{ji} \Pi_{ji}} \right] + [N_{ji} - L_{ji}] s_{ji}$$

(2.16)

where the first term captures the rent to the employed in industry $j$, and $s_{ji}$ captures the outside option, i.e. benefits for an unemployed union member. Some authors (in particular, Weitzman (1987) and Jackman (1988)) have argued that in models where unions keep wages above market-clearing levels, the introduction of profit sharing may reduce unemployment. This will occur essentially because a given reduction in the base wage leads to a less than one-to-one reduction in total remuneration. So, provided that employers only look at the base wage in setting employment, the trade-off between employment and wages becomes more favourable to employment. Using the implicit form of labour demand (2.12) the elasticity of labour demand with wages can be written as

$$\frac{\partial \Pi_{ji}}{\partial w_{ji}} = -p_{ji}^{-(\gamma_i + \epsilon_i)} w_{ji}^{-\epsilon_i} < 0.$$  

(2.15)
That is, the elasticity of labour demand is equal to the elasticity of substitution between capital and labour $\sigma$. The higher the elasticity of substitution, the more elastic labour demand is.

Maximization of (2.16) with respect to the wage rate yields an equation for equilibrium wages

$$w = \frac{s}{1 - \frac{1}{\eta} + \frac{1}{\eta} \Pi_{ij}}.$$ 

According to (2.18) the wage rate is proportional to the outside option. We can see that the integration of product markets has no direct effect on the base wage. However, product market integration affects wages through three indirect mechanisms, namely via profit share, the elasticity of labour demand with own price, and the elasticity of substitution between capital and labour. By using (2.8), if product markets are imperfectly competitive, integration can make product markets more competitive via international trade. Several models of imperfect competition predict that trade liberalization makes demand more elastic, but not infinitely so. The market shares of a domestic supplier and a foreign supplier become more sensitive to relative price when industry is more integrated. International integration reducing trade frictions and therefore making it easier to shift supplier, can potentially have a large effect on product-elasticities. In contrast, by using (2.7), an individual industry with access to the wider market might be able to expand sales and production, thereby taking better advantage of economies of scale, which can be associated with decreased elasticities of product substitution. It is important to emphasize, as Koskela and Stenbacka (2005) argue, that profit sharing has no direct effect on the wage elasticity of labour demand because profit sharing operates like a non-distortionary profit tax. We can conclude that the increased elasticity of labour demand will have a wage-moderating effect:
Since the demand for labour is a derived demand, which varies proportionately with the elasticity of demand for goods, intensified product market competition alone makes the demand for labour more elastic because of declining mark-ups. Intuitively, it seems likely that increased product market competition makes it harder for firms to survive with higher wages, thereby making firms’ employment decisions more sensitive to changes in the wage rate. Then, with heightened foreign competition unions face a more elastic labour demand relation and thus moderate their wage demands. Huizinga (1993), and Danthine and Hunt (1994), for example, find that the creation of firm level competition increases the elasticity of labour demand which moderates unions’ wage demands, i.e. increased goods market competition leads to lower wages and then higher employment. However, the effect of integration on the price sensitivity of market share may be compensated for by its direct effect on market share, i.e. market power can arise from specialization in production and differentiation of products allowing firms to take better advantage of economies scale with segmented markets. Nickell et al. (1994) and Stewart (1990) find evidence of a positive (time series) relationship between wages and market power. This suggests that the sharing of mark-ups and higher wages are associated with market share. From (2.18) we can directly observe that an increased profit share \( \Pi_{\mu} \) will have a wage-moderating effect:

\[
(2.19) \quad \frac{\partial w_{\mu}}{\partial \eta_{\mu}} < 0.
\]

We can assume that intensified product market competition increases a firm's incentive to use profit sharing. This is because with perfect competition in the product market the wage elasticity of labour demand is very high and therefore wage moderation can be achieved with introducing profit sharing. However, market power can arise from specialization in production and differentiation of products, being able to take better advan-
tage of economies scale with segmented markets, which reduces firm’s incentive to use profit sharing because of the higher wage rate.\textsuperscript{82} These findings are summarized in

**Proposition 2** Lower trade costs resulting from increased integration, a higher number of firms and, in consequence, higher elasticity of product demand \( \frac{\partial \varepsilon_j}{\partial n_j} < 0 \) will increase the elasticity of labour demand \( \frac{\partial \eta_{ji}}{\partial \varepsilon_j} > 0 \) and increase incentives for using profit sharing \( \frac{\partial w_{ji}}{\partial \Pi_{ji}} < 0 \) and thus decrease wage pressure \( \frac{\partial w_{ji}}{\partial \eta_{ji}} < 0 \), whereas better advantage of economies of scale and, in consequence, lower elasticity of substitution between differentiated products \( \frac{\partial \phi_j}{\partial a_j} \frac{\partial a_j}{\partial \tau_j} > 0 \) will decrease labour-demand elasticity \( \frac{\partial \eta_{ji}}{\partial \phi_j} > 0 \) and decrease incentives for using profit sharing \( \frac{\partial w_{ji}}{\partial \Pi_{ji}} < 0 \) and thus increase wages \( \frac{\partial w_{ji}}{\partial \eta_{ji}} < 0 \).

Given the equilibrium wage rate (2.18), we arrive at the employment equation by using labour demand (2.12)

\[
L_{ji} = p_{ji}^{-\sigma_{ji}} \left[ \frac{s_{ji}}{1 - \frac{1}{\eta_{ji}} + \frac{1}{\eta_{ji}} \Pi_{ji}} \right]^{-\sigma_{ji}}.
\]

As expected, employment correlates negatively with unemployment benefits \( s_{ji} \). The number of firms (both domestic and foreign) competing in an industry can arise as a result of the integration process, which shifts the foreign output mix towards this indus-

\textsuperscript{82} Nickell (1999) finds some evidence that the sharing of monopoly rents leads to higher wages in the presence of market power in the product market.
try. The integration process can force domestic firms into a state of heightened foreign competition. We see that an increase in the elasticity of product demand triggered by more firms (i.e. \( \mathcal{E}_j \) rises) decreases a firm's labour demand (\( \frac{\partial L_{ji}}{\partial \mathcal{E}_j} < 0 \)). Product demand becomes more price elastic when product markets are more integrated, but is the effect of product market integration on the price sensitivity of market share larger than its direct effect on market share? As a consequence of decreased trade costs, product substitution becomes less elastic (i.e., \( \phi_j \) falls), which can be associated with better advantages from economies of scale, thereby increasing a firm's labour demand (\( \frac{\partial L_{ji}}{\partial \phi_j} < 0 \)).

Because of these counteracting effects we cannot conclude that the scale effects of integration tend to decrease labour demand. We summarize these findings in

**Proposition 3** Lower trade costs with increased integration, a higher number of firms and, in consequence, higher elasticity of product demand will decrease labour demand, whereas better advantage of economies of scale and, in consequence, lower elasticity of substitution between differentiated products will increase it.

By using (2.19) when unions face a more elastic labour demand relation and thus moderate their wage demands, we find that increased labour-demand elasticity increases labour demand due to the reduced market power of unions:

\[
(2.22) \quad \frac{\partial L_{ji}}{\partial \eta_{ji}} > 0.
\]

It is perfectly plausible that in firms where wages are bargained collectively an increase in product market competition will tend to lower wages\(^{83}\) and raise employment in the

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\(^{83}\) Abowd and Lemieux (1993) have studied how product market conditions affect wages through their effects on the financial strength of a firm by using data from collective agreements in Canada and they show that higher foreign competition reduces wages.
presence of profit sharing. From (2.21) we can directly observe that increased profit share will increase employment:

\[ \frac{\partial L_{\mu}}{\partial \Pi_{\mu}} > 0. \]

We can conclude that the effects of economic integration on the impact of profit sharing on employment clearly depend on a trade-off between intensified competition and better advantages from economies of scale. If product market competition increases, the ability of profit sharing to improve employment through economic integration increases as a result of moderated wages. However, when economic integration is associated with increased market power, the incentives for profit-sharing decrease with higher wages, and the effect on employment is negative. As increased trade competition crowds out better advantages from economies of scale, economic integration increases profit sharing through wage-moderating and thus improves labour demand. We summarize the characterization of the scale effects of economic integration on the impact of profit sharing on employment in

**Proposition 4** As increased trade competition crowds out better advantage of economies of scale, \( \frac{\partial \phi}{\partial a_j} \frac{\partial a_j}{\partial \tau_j} < \frac{\partial \epsilon_j}{\partial n_j} \frac{\partial n_j}{\partial \tau_j} \), and the elasticity of labour demand increases, \( \frac{\partial \eta_{\mu}}{\partial \phi_j} < \frac{\partial \eta_{\mu}}{\partial \epsilon_j} \), the process of economic integration increases incentives for using profit sharing \( \frac{\partial w_{\mu_j}}{\partial \Pi_{\mu_j}} < 0 \) and decreases wage pressure \( \frac{\partial w_{\mu_j}}{\partial \eta_{\mu_j}} < 0 \), which improves employment \( \frac{\partial L_{\mu_j}}{\partial \Pi_{\mu_j}} > 0 \).

---

84 Blanchard and Giavazzi (2003) and Spector (2004) developed a monopolistic competition model with collective wage bargaining, but not with profit sharing, to study the effects of product market competition under imperfectly competitive labour markets. They argue that higher product market competition will increase employment.
The process of integration reduces trade barriers, and therefore leads not only to more trade, but also to more foreign investment. Increased investment opportunities make firms more sensitive to changes in such costs. During the process of integration, international trade can increase the elasticity of substitution between labour and capital. As Rodrik and van Ypersele (2001) explain, in the process of integration, real and financial capital are more sensitive to respond to shocks such as changes in productivity or the terms of trade. A negative shock at home may induce a capital outflow abroad. A capital outflow is also liable to affect the marginal productivity of labour, in turn leading to effects on wages (see, e.g., Keen and Marchand, 1997). From (2.17) we can directly observe that the higher the elasticity of substitution is, the more elastic labour demand is. This implies that increased elasticity of substitution between labour and capital increases incentives for using profit sharing, resulting in a lower labour price, which increases labour demand. Particularly where production centres on the use of low-skill workers, employers can react sensitively to changes in prevailing wages by investing. Therefore, when wage compression occurs through union activity, firms are encouraged to invest in technologies that increase the productivity of less-skilled workers. We find that as a consequence of decreased trade costs as substitutability increases (i.e. $\frac{\partial \sigma^{ji}}{\partial \tau} > 0$), labour demand increases:

\[
\frac{\partial L^{ji}}{\partial \sigma^{ji}} > 0 .
\]

In contrast, shifts in production technology or increases in the use of physical capital also require workers acquire to new skills, which increases the demand for human capital (i.e. $\frac{\partial \sigma^{ji}}{\partial \tau} < 0$) and thus decreases the elasticity of substitution between labour and capital. This suggests that decreased incentives to use profit sharing, resulting in higher labour prices, depreciate labour demand. We summarize the substitution effect of integration on the impact of profit sharing on employment in
Proposition 5 Lower trade costs from increased integration, and a higher elasticity of substitution between labour and capital \((\frac{\partial \sigma_{ji}}{\partial \tau_j} > 0)\) will increase incentives for using profit sharing \((\frac{\partial w_{ji}}{\partial \Pi_{ji}} < 0)\) and decrease wages \((\frac{\partial w_{ji}}{\partial \sigma_{ji}} < 0)\), which increases labour demand \((\frac{\partial L_{ji}}{\partial \sigma_{ji}} > 0)\), whereas a lower elasticity of substitution between labour and capital \((\frac{\partial \sigma_{ji}}{\partial \tau_j} < 0)\) will decrease incentives for profit sharing \((\frac{\partial w_{ji}}{\partial \Pi_{ji}} < 0)\) and increase wages \((\frac{\partial w_{ji}}{\partial \sigma_{ji}} < 0)\), which decreases labour demand \((\frac{\partial L_{ji}}{\partial \sigma_{ji}} > 0)\).

In summary, the effects of economic integration on the impact of profit sharing on employment depend definitely on a trade-off between intensified competition and better advantage of economies of scale. If product market competition increases, the ability of profit sharing to improve employment through economic integration increases as a result of moderated wages. In contrast, when economic integration is associated with increased market power, the incentives for profit-sharing decrease with higher wages, and the effect on employment is negative. As increased trade competition crowds out better advantages from economies of scale, economic integration increases profit sharing with wage-moderating and thus improves labour demand. In addition, if the elasticity of substitution between labour and capital increases during the process of integration, incentives to use profit sharing increase with a lower labour price, which increases labour demand.

3 ECONOMETRIC MODEL

In our empirical work, the strategy is to follow the theoretical framework in Section 2 as the basis for econometric identification, using the equilibrium condition for employment. We estimate an employment equation, and attempt to evaluate whether economic integration has changed the effects of profit sharing on employment. To understand the
effects of profit-sharing, a useful method is to compare profit-sharing (PS) with non-profit-sharing (NPS) firms. Taking a log-linear approximation of equation (2.18), employment\textsuperscript{85} can be written as a regression function:

\begin{equation}
\ln(L_{it}) = a_i + \rho(\pi_{it}^w) + \alpha \ln(\omega_{it}) + \psi(p_{jt}^*) + \mu(x_{it}) + \gamma(y_{jt}^*) + \beta(m_{it}) \\
+ \delta(fdi_{jt}^*) + \chi(skill_{it}) + e_{it}
\end{equation}

(3.1)

where \(i\) indexes firms, \(j\) is the industry, and \(t\) the year. \(L\) is the quantity of labour employed, \(skill\) the ratio of skilled workers to total employment, \(\omega\) real labour costs, \(\pi^w\) the ratio of profit-sharing payments to wages; \(a\) denotes the firm-specific fixed effect. We tried to improve the estimated model by adding skilled workers ratio in order to take labour qualification into account. It is assumed that, in general, a high share of highly-skilled workers, with the resulting higher labour price, has a negative impact on total employment. For the scale effects of real output, we use two different variables: the share of Finland’s exports to other EU-countries in manufacturing production (\(x\)) and the share of the output of European Union in manufacturing production (\(y^*\)). The first variable attempts to measure foreign demand for a firm’s products, the second attempts to measure overall demand of European Union. Furthermore, for measuring international product market competition we use a real competitiveness indicator (\(p^*\)) where euro-country weights are based on Finland’s bilateral exports. For the substitution effects, we use two different variables: the share of Finland’s imports from other EU-countries in manufacturing production (\(m\)) and the share of the investment of EU-countries to Finland in domestic investment (\(fdi^*\)). The first variable attempts to measure foreign intermediate input outsourcing, the second attempts to measure overall substitution between labour and investment.\textsuperscript{86}

\textsuperscript{85} Taking logarithms in conditional labour demand, equation (2.18) yields to the form which is very useful for estimation.

\textsuperscript{86} Koskela and König (2007) examine, using a theoretical framework, how strategic international outsourcing influences wage formation, profit sharing and employee effort when firms commit to optimal profit sharing before wage formation or decide for profit sharing after wage formation. They show that the wage elasticity of labour demand depends positively both on the amount of outsourcing and on the base wage, but negatively on the size of profit sharing. Furthermore, they find that committed profit shar-
There is an issue that deserves some discussion here, namely that profit-sharing firms might exhibit greater employment stability - this effect might derive either from Weitzman’s model, where such firms are in a short-run ‘excess demand for labour’ regime, or from the possibility that profit-sharing will cause remuneration to adjust more quickly to international shocks. We can test for this effect by examining the response of employment to international shocks by differencing. The scale effects measure the impact of international demand shocks on labour demand. These estimates test whether the responsiveness of profit-sharing firms to demand shocks differs from that of non-profit-sharing firms. A smaller employment fluctuation requires that the coefficients for the change in industry output are smaller for profit-sharing firms.

4 DATA

Labour demand is estimated using assembled panel data from the manufacturing sector based on a diversity of sources: the surveys of the Confederation of Finnish Industries and Employers, the Longitudinal Database on Plants in Finnish Manufacturing (LDPM) of Statistics Finland, the Financial Market Statistics of Bank of Finland, the Foreign Trade Statistics of National Board of Customs, and the Industrial Structure Statistics of OECD STAN Database. The panel data covers the period from 1996 to 2004. The data from the Confederation of Finnish Industries and Employers includes individual level observations which are linked to the data of the respective firms. This survey gives firm-level information about the number of employees, base wages, bonus payments on the profit-sharing basis, and worker's individual qualifications like education. All the firms in our data set are organized belonging to the data from the Confederation of Finnish Industries and Employers. This means that all unorganized (mainly minor) industry firms are excluded from our analyses. The datasets used for our analysis consist of two panels: the first sample (PS) concerns 981 profit-sharing firms, and the second sample involving strategic outsourcing has a negative effect on wage formation, which is consistent with the assumption of perfect substitutability between outsourcing and effective domestic labour.  

87 The manufacturing industries are included by the standard ISIC classification, i.e. excluding petroleum, energy, and quarrying. 

88 Profit-relating payments are determined here as performance-related payments which do not include benefits in kind, supplements for shift and earnings for overtime hours.
(NPS) concerns 115 non-profit-sharing firms. Each firm of the first sample was engaged in a profit-sharing agreement for at least one year. Demand estimation requires measures of employment, real labour prices, real investment and real output for all firm-year observations. The LDPM panel includes annual data for manufacturing plants covering such variables as production, investment, the price indices for production and investment, employment (production and non-production workers), and nominal wages and employer social security payments for production and non-production workers. The labour demand is supposed to depend on the labour costs negatively. The employment figure comes directly from the data set as the total number of production and non-production workers. For total employment we construct real labour costs as nominal annual wages and social security payments deflated by the producer price index and divided by the number of workers.

The ideal data here would be firm-level data because firms are the relevant units that actually demand factors. Plant-level data sets neither contain firm-level trade-prices nor all the measurements of foreign demand (supply) for firm-level products (non-labour inputs), so the next best alternative for these integration measurements is to use industry-level (2-digit ISIC manufacturing industries) data. We construct the real competitiveness indicator of the industry relevant to ith firm as the nominal competitiveness indicator multiplied by the terms of the trade ratio of export and import prices. The constructed nominal competitiveness indicator for the period 1996 - 2004 is based on Financial Market Statistics maintained by Bank of Finland. The industrial prices of exports and imports are based on the Producer Price Indices of Statistics Finland. An increase in the real competitiveness indicator means that an industry’s price competitive ability decreases which is supposed to decrease product demand and thus labour demand. We construct two different variables for the scale effects of real output: the share of firm’s exports to other EU-countries in manufacturing production at firm level and the share of the industrial output of the European Union in industrial firms' production. Firms' exports to other EU-countries are based on Foreign Trade Statistics maintained by National Board of Customs. Another variable, the production of European Union for each industry relevant to ith firm is based on OECD Industrial Structure Statistics. In theory, labour demand is supposed to depend on production positively. If product demand rises, thereby increasing production, firms’ demand for factors rises. The assump-
tion is that higher exports signal better economies of scale (or less foreign competition). A rise in exports increases the production of industry, which is supposed to increase labour demand. On the other hand, the more the rest of the EU accounts for the output of industry, the more competitive that industry is for domestic firms. We construct two different variables for the substitution effects: the share of a firm’s imports from other EU-countries in firm-level production and the share of the industrial investment of other EU-countries to Finland in industrial firms' investment. Firms' imports from the EU-countries are based on Foreign Trade Statistics maintained by National Board of Customs. Another variable, foreign direct investment for each industry relevant to \( i \)th firm is based on Financial Market Statistics of Bank of Finland. If demand for non-labour inputs were to increase, induced by increased demand for outputs and thus a higher production level, this effect would increase labour demand. While foreign outsourcing and/or international investment provides an alternative for many production-intensive firms and thus decreases dependence on production labour, it also increases reliance on human capital and thus non-production labour.\(^89\) As a result, it is supposed that increased foreign outsourcing and/or international investment decreases, especially, the demand of production labour.

Table 4.1 reports the summary statistics of the observations. \( PS \) firms, which are larger than \( NPS \) firms, perform better in international product markets in regard to the level of exports ratio and EU-output share. This different characteristic between \( PS \) firms and \( NPS \) firms allows us to think that profit-sharing firms are more under international competitiveness pressure with access to the wider product market while \( NPS \) firms are more closed off from economic integration. Another important feature is that the level of labour costs is higher in \( PS \) firms, which indicates a higher skilled-worker ratio than in \( NPS \) firms. Therefore, we cannot conclude whether there is substitution between the base wage and the profit share.\(^90\) Furthermore, although \( PS \) firms perform better internationally, this is not necessarily due to profit-sharing. When exploring the issue of the effects of profit-sharing, a simultaneity bias occurs due to the fact that

\(^89\) Empirical studies reviewed by Hamermesh (1993), usually point to a lower degree of substitution between skilled labour and capital than between unskilled labour and capital (see, e.g., Griliches 1969, Bergström and Panas 1992, Biscourp and Gianella 2001).
profit-sharing payments may be the outcome as well as the cause of better performance in international product markets. Let us underscore that we do not consider the effect of profit-sharing on international performance in this study. In this study we concentrate our econometric work on the aim of determining the effect of economic integration on the impact of profit sharing on employment. As we can see, profit sharing is likely to be more common for firms with a particular observable characteristic. Thus, self-selection of firms is an important characteristic of profit sharing. As we use a parametric method, instead of matching methods, we could not take account of the selection of firms into the conduct of profit sharing.

Table 4.1 Variable summary statistics.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Profit-sharing firms</th>
<th>Non-profit-sharing firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of total workers (logarithm)</td>
<td>Mean 4.920</td>
<td>Mean 4.314</td>
</tr>
<tr>
<td></td>
<td>Std. Dev. 1.213</td>
<td>Std. Dev. 0.853</td>
</tr>
<tr>
<td></td>
<td>Min 0.000</td>
<td>Min 2.708</td>
</tr>
<tr>
<td></td>
<td>Max 10.06</td>
<td>Max 7.090</td>
</tr>
<tr>
<td>Skilled workers ratio</td>
<td>Mean 0.357</td>
<td>Mean 0.259</td>
</tr>
<tr>
<td></td>
<td>Std. Dev. 0.232</td>
<td>Std. Dev. 0.156</td>
</tr>
<tr>
<td></td>
<td>Min 0.000</td>
<td>Min 0.000</td>
</tr>
<tr>
<td></td>
<td>Max 1.000</td>
<td>Max 1.000</td>
</tr>
<tr>
<td>Real labour price (logarithm)</td>
<td>Mean 3.557</td>
<td>Mean 3.383</td>
</tr>
<tr>
<td></td>
<td>Std. Dev. 0.273</td>
<td>Std. Dev. 0.243</td>
</tr>
<tr>
<td></td>
<td>Min -1.670</td>
<td>Min 2.468</td>
</tr>
<tr>
<td></td>
<td>Max 7.610</td>
<td>Max 4.248</td>
</tr>
<tr>
<td>Profit-sharing ratio</td>
<td>Mean 0.011</td>
<td>Mean 0.015</td>
</tr>
<tr>
<td></td>
<td>Std. Dev. 0.021</td>
<td>Std. Dev. 0.015</td>
</tr>
<tr>
<td></td>
<td>Min 0.000</td>
<td>Min 0.000</td>
</tr>
<tr>
<td></td>
<td>Max 0.387</td>
<td>Max 1.414</td>
</tr>
<tr>
<td>Competitiveness index (real)</td>
<td>Mean 0.935</td>
<td>Mean 0.935</td>
</tr>
<tr>
<td></td>
<td>Std. Dev. 0.105</td>
<td>Std. Dev. 0.105</td>
</tr>
<tr>
<td></td>
<td>Min 0.702</td>
<td>Min 0.702</td>
</tr>
<tr>
<td></td>
<td>Max 1.414</td>
<td>Max 1.414</td>
</tr>
<tr>
<td>Exports ratio (real)</td>
<td>Mean 0.194</td>
<td>Mean 0.157</td>
</tr>
<tr>
<td></td>
<td>Std. Dev. 0.272</td>
<td>Std. Dev. 0.210</td>
</tr>
<tr>
<td></td>
<td>Min 0.000</td>
<td>Min 0.000</td>
</tr>
<tr>
<td></td>
<td>Max 6.662</td>
<td>Max 1.002</td>
</tr>
<tr>
<td>EU-output share (real)</td>
<td>Mean 76750</td>
<td>Mean 113622</td>
</tr>
<tr>
<td></td>
<td>Std. Dev. 60165</td>
<td>Std. Dev. 78459</td>
</tr>
<tr>
<td></td>
<td>Min 7732</td>
<td>Min 7732</td>
</tr>
<tr>
<td></td>
<td>Max 323430</td>
<td>Max 323430</td>
</tr>
<tr>
<td>Imports ratio (real)</td>
<td>Mean 525.4</td>
<td>Mean 1073</td>
</tr>
<tr>
<td></td>
<td>Std. Dev. 3788</td>
<td>Std. Dev. 4720</td>
</tr>
<tr>
<td></td>
<td>Min 0.000</td>
<td>Min 0.000</td>
</tr>
<tr>
<td></td>
<td>Max 159793</td>
<td>Max 57124</td>
</tr>
<tr>
<td>EU-investment share (real)</td>
<td>Mean 374.2</td>
<td>Mean 361.5</td>
</tr>
<tr>
<td></td>
<td>Std. Dev. 383.7</td>
<td>Std. Dev. 422.9</td>
</tr>
<tr>
<td></td>
<td>Min 1.273</td>
<td>Min 1.273</td>
</tr>
<tr>
<td></td>
<td>Max 1463</td>
<td>Max 1463</td>
</tr>
</tbody>
</table>

90 The most convincing result would be obtained from the estimation of a wage equation (see Wadhwani and Wall 1990). However, we had no appropriate variable to carry out this regression, i.e. we have no
5 EMPIRICAL ANALYSIS

Empirical studies on the effects of profit sharing have typically focused on its impact on productivity and employment through productivity effects. Cahuc and Dormont (1997) evaluate the consequences to productivity and employment of the large increase in profit-sharing in France. Their datasets used for this analysis consist of two panels of profit-sharing and non-profit-sharing manufacturing firms observed over the period 1986-1989. The estimation of the employment equation in levels and growth rates shows that profit-sharing has ambiguous effects on employment. Kruse (1991) tests an implication of Weitzman's profit-sharing theory, namely that employment will be more stable in profit-sharing firms than in fixed-wage firms, using panel data on manufacturing firms for the years 1971-1985. Adapting a dynamic labour demand framework for the U.S., his results suggest that the statistical association between aggregate unemployment and employment at the firm level is less strong for profit-sharing firms. Wadhwani and Wall (1990) present a more formal test of this proposition in the context of a labour demand model. However, using British micro datasets over the period 1972-1982, they find no difference in the effect of aggregate demand shocks on employment between profit-sharing and non-profit-sharing firms. In contrast to these work, this study is the first to determine the effects of economic integration on the impact of profit-sharing on employment using data from the Finnish manufacturing sector.91

5.1 Estimation strategy

There are some issues to mention regarding the estimation strategy. One is the exogeneity of the regressors in the employment equation. As Hamermesh (1986) discusses, some of them might actually be endogenous variables. Quandt and Roser (1989) estimated an equilibrium model of the labour market, and used it to test the assumption of production exogeneity. They did not reject the assumption that production is exogenous.

91 Kauhanen and Piekola (2002) and Snellman et al. (2003) have examined the effects of profit sharing on earnings and productivity using Finnish linked employer-employee data. Their results suggest that profit-sharing has positive effects on productivity.
Furthermore, for the possibility of the endogeneity of investment, the presence of capital market imperfections suggests that firms will find it difficult to adjust investment quickly in response to exogenous shocks that may influence employment decisions. If some regressors are, in fact, endogenous, then least-squares parameter estimates will suffer from an endogeneity bias, the net direction of which is not clear.

Panel samples offer a number of possibilities for structuring and handling data, which lead to various types of estimators. In the case of a standard linear regression model, if it is well specified, the various estimators should all be consistent. Conversely, the differences of various estimators, when significant, imply some sort of specification error, and this can provide formal specification tests (Hausman and Taylor 1979). Therefore, a useful tack is to present the results of within-firm estimates by relying on deviations to firm-level means and first-difference estimates using yearly growth rates. The typical transformation applied to panel data is that variables are in logs of levels.

A third issue, as is usual with micro data, is that our variables suffer from measurement errors because we have no information, at the firm level, on factor utilization rates, hours of work and prices. However, the main difficulty stems from the lack of an estimate of capital average age at the microeconomic level. Therefore, it was difficult to accurately adjust capital stock for inflation. This measurement problem does not seriously affect the estimates when they are carried out on the level of the production variables of firm \( i \) in year \( t \). In this case, as Cahuc and Dormont (1997) argue, the variance due to differences between firms is largely predominant, and much greater than the variance due to measurement errors of this kind. This is no longer true, as Griliches and Hausman (1986) argue, when regressions use first differences, which give more importance to ‘noises’ due to measurement errors. Taking time differences also controls for unobserved time-invariant industry fixed effects which influence the labour-demand level. However, time-differencing can also aggravate the regressor measurement error and result in inconsistent estimates. Hsiao (1986) argues that if variables are indeed subject to measurement errors, exploiting panel data to control for the effects of unobserved individual characteristics using standard differenced estimators may result in even more biased estimates than simple ordinary least squares (OLS) estimators using cross-

---

92 Capital stock is estimated as the real value of machinery, equipment, transportation equipment, build-
sectional data alone. Thus, we first estimate the employment equation for the levels by OLS with fixed effects including time dummies. Furthermore, to minimize inconsistency, Griliches and Hausman (1986) suggest that employment should be estimated using long differences. When concern focuses on trends over time rather than levels, the bias of measurement might not influence decisively. However, our set of data has a restricted sample size both in the cross-section dimension and the time dimension. One limitation of the data is the short period covered by the profit sharing survey. As a result of our data restrictions we do not take longer differences. In fact, we proceed with the generalized method of moments (GMM) estimation, which provides a convenient framework for obtaining consistent and, at least, asymptotically efficient estimators for the dynamic panel data (Bond, 2002). More specifically, equation (3.1) was estimated using the first-differenced GMM method developed by Arellano and Bond (1991). This method estimates the model in first differences but uses lagged variables in levels as instruments.

A fourth issue is that the profit sharing survey data only tell us the share of a firm’s profit that has been paid out. They do not show those firms that have a profit sharing plan, but have not paid profit shares, as the goals were not achieved. It is very likely that this will influence the estimates.

5.2 Estimation results

In the first instance, we limit the presentation of our results to regressions performed on the profit-sharing sample with and without the effects of economic integration. Every firm in the PS sample does not operate a profit-sharing scheme for each year of the period. Consequently, the number of NPS firms fell to 115 owing any profit-sharing observation during our period. We notice that NPS firms produce more for the domestic market with a higher import penetration, while PS firms produce more for export competing markets. Because of slight performance in international product markets for the non-profit-sharing sample, we also estimate specification including the interaction term with profit sharing for the total sample of PS and NPS firms. We add a profit-sharing
dummy variable for firms that had at least one of the profit-sharing schemes to the equation, and interact it with economic integration measures. The estimations are carried out with and without the variable *skill*. We present here the results with the skilled-worker ratio which do not differ from the results obtained without this variable.

**Table 5.1** Regression results for employment on the profit-sharing sample without the effects of economic integration

<table>
<thead>
<tr>
<th>Method</th>
<th>Fixed effects</th>
<th>First-differences GMM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[1]</td>
<td>[2]</td>
</tr>
<tr>
<td>Employment</td>
<td>0.200</td>
<td>(8.96)</td>
</tr>
<tr>
<td>Labour price</td>
<td>-0.817 (-34.6)</td>
<td>-0.851 (-35.0)</td>
</tr>
<tr>
<td>Profit-sharing</td>
<td>0.008 (0.05)</td>
<td>-0.030 (-0.21)</td>
</tr>
<tr>
<td>Skilled workers</td>
<td>-0.211 (-5.48)</td>
<td>-0.072 (-1.59)</td>
</tr>
<tr>
<td>Price index</td>
<td>-0.333 (-6.94)</td>
<td>-0.397 (-6.73)</td>
</tr>
<tr>
<td>Production</td>
<td>0.671 (84.9)</td>
<td>0.585 (64.5)</td>
</tr>
<tr>
<td>Capital stock</td>
<td>0.057 (10.3)</td>
<td>0.073 (10.3)</td>
</tr>
<tr>
<td>Number of obs</td>
<td>5580</td>
<td>3896</td>
</tr>
<tr>
<td>R² (within)</td>
<td>0.774</td>
<td></td>
</tr>
<tr>
<td>F-test (p-value)</td>
<td>1148.96</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Sargan test (p-value)</td>
<td>59.23 (0.000)</td>
<td></td>
</tr>
<tr>
<td>AR(1)</td>
<td>(0.000)</td>
<td></td>
</tr>
<tr>
<td>AR(2)</td>
<td>(0.706)</td>
<td></td>
</tr>
</tbody>
</table>

Notes: (1) The specification is \( \ln(L_w) = \alpha + \rho \ln(\pi_w) + \alpha \ln(\omega) + \psi(\rho_w) + \gamma \ln(y) + \delta \ln(k) + \chi(\text{skill}) + e \), where \( L \) log of quantity of labour employed, \( \pi \) profit-sharing payments/wages, \( \omega \) log of ((base wage + employer social security payments) / number of workers), \( p \) implicit price index of production, \( y \) log of production, \( k \) log of capital stock, and *skill* skilled workers / total employment. (2) Values of t-ratios are reported in parentheses. (3) Column [1]: estimated by OLS with fixed effects including time dummies. (4) Column [2]: GMM refers to Arellano and Bond (1991) dynamic panel data estimation method. (5) Sargan test for over-identifying restrictions. (6) Arellano-Bond test for first and second order autocorrelation of the differenced errors.

Our estimated labour demand without the effects of economic integration is presented in Table 5.1. And, the results with the effects of economic integration for the employment function estimates are reported in Table 5.2. In our first-difference estimates, we allow for dynamics through a quite simple (given the short period available) partial adjustment mechanism. Moreover, the high dominance of between-firm differences in the levels variability is concomitant with serious autocorrelations of variables and residuals. This leads the estimates to be biased as soon as the model is specified in an autoregressive pattern. These estimates, if only, test whether the responsiveness of
profit-sharing firms to demand shocks differs from the responsiveness of non-profit-sharing firms. Determining the effect of economic integration on the impact of profit-sharing on employment, we keep the static form to estimate labour demand in levels, which is in accordance with the cross-section feature of total regression.

Table 5.2 Regression results for employment on the profit-sharing sample with the effects of economic integration

<table>
<thead>
<tr>
<th>Method</th>
<th>Fixed effects</th>
<th>First-differences GMM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[1]</td>
<td>[2]</td>
</tr>
<tr>
<td>Employment</td>
<td></td>
<td>0.463 (10.9)</td>
</tr>
<tr>
<td>Labour price</td>
<td>-0.444 (-13.8)</td>
<td>-0.680 (-19.1)</td>
</tr>
<tr>
<td>Profit-sharing</td>
<td>1.666 (5.96)</td>
<td>0.210 (0.78)</td>
</tr>
<tr>
<td>Skilled workers</td>
<td>-2.382 (-41.7)</td>
<td>-1.618 (-21.9)</td>
</tr>
<tr>
<td>Competitiveness</td>
<td>-0.117 (-1.69)</td>
<td>-0.132 (-1.98)</td>
</tr>
<tr>
<td>Exports</td>
<td>0.155 (4.92)</td>
<td>0.066 (1.78)</td>
</tr>
<tr>
<td>EU-output</td>
<td>-0.0001 (-1.83)</td>
<td>-0.0001 (-2.39)</td>
</tr>
<tr>
<td>Imports</td>
<td>-0.0001 (-3.38)</td>
<td>-0.0001 (-4.10)</td>
</tr>
<tr>
<td>EU-investment</td>
<td>-0.0001 (-1.46)</td>
<td>-0.0001 (-1.36)</td>
</tr>
<tr>
<td>Number of obs</td>
<td>6595</td>
<td>4576</td>
</tr>
<tr>
<td>R² (within)</td>
<td>0.343</td>
<td></td>
</tr>
<tr>
<td>F-test (p-value)</td>
<td>182.79 (0.000)</td>
<td></td>
</tr>
<tr>
<td>Sargan test (p-value)</td>
<td></td>
<td>70.73 (0.000)</td>
</tr>
<tr>
<td>AR(1)</td>
<td></td>
<td>(0.000)</td>
</tr>
<tr>
<td>AR(2)</td>
<td></td>
<td>(0.668)</td>
</tr>
</tbody>
</table>

Notes: (1) The specification is \( \ln(L) = a + \rho(\pi^*) + \alpha \ln(\omega) + \psi(p^*) + \mu(x) + \gamma(y^*) + \beta(m) + \delta(fdi) + \chi(skill) + e \), where \( L \) log of quantity of labour employed, \( \pi^* \) profit-sharing payments/wages, \( \omega \) log of ((base wage + employer social security payments) / number of workers), \( p^* \) industry international price index, \( x \) firm's exports to EU-countries / firm's production, \( y^* \) EU-countries' industry production / firm's industry production, \( m \) firm's imports from EU-countries / firms' production, \( fdi^* \) EU-countries' industry foreign direct investment / firms' industry capital stock, and \( skill \) skilled workers / total employment. (2) Values of t-ratios are reported in parentheses. (3) Column [1]: estimated by OLS with fixed effects including time dummies. (4) Column [2]: GMM refers to Arellano and Bond (1991) dynamic panel data estimation method. (5) Sargan test for over-identifying restrictions. (6) Arellano-Bond test for first and second order autocorrelation of the differenced errors.

Considering the results without the effects of economic integration in Table 5.1, the estimated coefficients, generally, have the expected effects. The coefficients of production and capital (on logs of levels) are significant and have the expected signs. As expected, the price of production and labour has a negative effect on labour demand. However, the coefficients of labour demand elasticity with own price are unexpected large. These results remain unchanged when introducing a lagged value of employment.
through the use of autoregressive specification. When considering the profit-sharing effect, we notice that these regressions lead to the insignificant effect of profit-sharing on labour demand. This result supports other findings on profit-sharing, which use different samples and techniques (Cahuc and Dormont 1997, Wadhwani and Wall 1990).

With the effects of economic integration, the estimates, generally, seem (in Table 5.2) plausible and well estimated. All the explanatory variables have the expected effect, except that the share of foreign direct investment is not significant. As stressed above, this non-significance may be viewed as the outcome of measurement errors, which mainly affect our investment variable. As the integration process forces firms to face heightened foreign competition, we see that the negative coefficients measuring these effects provide support for the assumption that higher competition decreases labour demand. Whereas, the positive coefficient associated with market power suggests that when economic integration is associated with better advantages from economies scale employment improves. The elasticity of labour demand with own price is increased when first-differences are performed. Turning to the profit-sharing effect, the most noteworthy result is the positive coefficient that we find whatever the estimate performed. The regression of column (1) on levels shows that the estimated parameter equals 1.666. In comparison to the result without the effects of economic integration, these results for levels indicate that economic integration has a significant, positive effect on the impact of profit-sharing on employment. However, the first-difference estimates lead to a non-significant, positive effect for profit-sharing on employment. Therefore, we do not find that profit-sharing firms might exhibit greater employment stability during the process of economic integration.

In table 5.3 we look at how the impact of increased profit sharing varies with economic integration by considering the interaction with foreign comparative advantage, price competition and investing/outsourcing. All the explanatory variables have the expected effect, except that the share of foreign direct investment and the competitiveness indicator are not significant. These results on levels indicate that profit-sharing has a significant, positive effect on employment, while the first-difference estimates lead to a insignificant positive effect. In our hypothesis, weaker advantages from economies of scale will increase incentives for using profit sharing and thus decrease wages, which increases labour demand. As the interaction between profit-sharing and foreign com-
parative advantage measures is negative and significant, the results for levels provide evidence that an increase in profit sharing increases employment less in the presence of a favourable comparative advantage. However, the insignificant interaction coefficient between profit-sharing and competitiveness does not reveal whether an increase in profit sharing increases employment more in the presence of strong trade competition. According to our hypothesis, higher product market competition will increase incentives for using profit sharing and thus decrease wages, which increases labour demand. As the interaction between profit-sharing and foreign outsourcing measure is negative and significant, the result for levels indicates that an increase in profit sharing increases employment less in the presence of intensive outsourcing, while the insignificant interaction coefficient between profit-sharing and investment indicates that profit sharing is not associated with the elasticity of substitution between labour and capital.

Table 5.3 Regression results for employment on the total sample with interaction effects

<table>
<thead>
<tr>
<th>Method</th>
<th>Fixed effects</th>
<th>First-differences GMM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[1]</td>
<td>[2]</td>
</tr>
<tr>
<td>Employment</td>
<td></td>
<td>0.479 (11.3)</td>
</tr>
<tr>
<td>Labour price</td>
<td>-0.449 (-15.1)</td>
<td>-0.680 (-20.4)</td>
</tr>
<tr>
<td>Profit-sharing</td>
<td>3.186 (1.60)</td>
<td>1.893 (0.86)</td>
</tr>
<tr>
<td>Skilled workers</td>
<td>-2.264 (-42.5)</td>
<td>-1.537 (-22.5)</td>
</tr>
<tr>
<td>PS-dummy*Competitiveness</td>
<td>1.325 (0.65)</td>
<td>-0.907 (-1.05)</td>
</tr>
<tr>
<td>PS-dummy*Exports</td>
<td>-2.670 (-3.73)</td>
<td>-0.761 (-0.39)</td>
</tr>
<tr>
<td>PS-dummy*EU-output</td>
<td>-0.0001 (-1.75)</td>
<td>-0.0001 (-1.14)</td>
</tr>
<tr>
<td>PS-dummy*Imports</td>
<td>-0.0006 (-3.66)</td>
<td>-0.0001 (-0.59)</td>
</tr>
<tr>
<td>PS-dummy*EU-investment</td>
<td>0.0002 (0.25)</td>
<td>-0.0008 (-1.05)</td>
</tr>
<tr>
<td>Competitiveness</td>
<td>-0.092 (-1.41)</td>
<td>-0.111 (-1.75)</td>
</tr>
<tr>
<td>Exports</td>
<td>0.247 (6.62)</td>
<td>0.087 (2.22)</td>
</tr>
<tr>
<td>EU-output</td>
<td>-0.0001 (-2.21)</td>
<td>-0.0001 (-2.37)</td>
</tr>
<tr>
<td>Imports</td>
<td>-0.0001 (-2.92)</td>
<td>-0.0001 (-3.94)</td>
</tr>
<tr>
<td>EU-investment</td>
<td>-0.0001 (-1.41)</td>
<td>-0.0001 (-1.31)</td>
</tr>
<tr>
<td>Number of obs</td>
<td>7523</td>
<td>5259</td>
</tr>
<tr>
<td>R² (within)</td>
<td>0.329</td>
<td>(0.000)</td>
</tr>
<tr>
<td>F-test (p-value)</td>
<td>149.75 (0.000)</td>
<td></td>
</tr>
<tr>
<td>Sargan test (p-value)</td>
<td>73.5 (0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>AR(1)</td>
<td></td>
<td>(0.000)</td>
</tr>
<tr>
<td>AR(2)</td>
<td></td>
<td>(0.656)</td>
</tr>
</tbody>
</table>

Notes: (1) PS-dummy=1 for profit-sharing firms. (2) Values of t-ratios are reported in parentheses. (3) Column [1]: estimated by OLS with fixed effects including time dummies. (4) Column [2]: GMM refers to Arellano and Bond (1991) dynamic panel data estimation method. (5) Sargan test for over-identifying restrictions. (6) Arellano-Bond test for first and second order autocorrelation of the differenced errors.
For the dynamic approach, in all Tables, the Arellano-Bond test for first and second-order autocorrelation in the first-differenced residuals is reported. The first-differenced GMM method estimates the model in first differences but uses lagged variables in levels as instruments. By GMM, the model was estimated under the assumption that outputs and inputs are exogenous. Specific assumptions on endogeneity can then be easily tested using the Sargan test for over-identifying restrictions. At first, this model may seem well specified because the Sargan test does not reject the hypothesis of over-identifying restrictions, nor does it reject the null hypothesis of no first order correlation as implied by the AR(1) test. However, as we see, the AR(2) test rejects the null hypothesis of no second-order autocorrelation. The presence of second-order autocorrelation would imply that estimates are inconsistent. Hence, it would show that the estimators of this dynamic approach perform worse than estimators for levels.

For all the reasons stated above, we should believe in results relying on levels that profit-sharing improves employment in the process of economic integration, although there is no evidence that it contributes to the stability of employment.

6 CONCLUSIONS

The purpose of this study was twofold to investigate the effects of economic integration on the impact of profit sharing on employment by using theoretical modelling and empirical analysis. We built the theoretical framework for estimating employment and determining the impact of economic integration on the effects of profit sharing. Using a general theoretical model of intra-industry trade, we examined how economic integration changes the impact of profit sharing on employment. The model captured both effects running from product markets (scale effects) as well as factor substitutions possibilities (substitution effects) to the impact of profit sharing on labour demand. We showed that the scale effects of economic integration on the impact of profit sharing on employment clearly depend on a trade-off between intensified competition and better advantage of economies of scale. If product market competition increases, the ability of
profit sharing to improve employment through economic integration increases due to moderated wages. In contrast, when economic integration is associated with increased market power, in turn, the ability of profit sharing to improve employment decreases due to higher wages. Our theoretical model suggests that as increased trade competition crowds out better advantages from economies of scale, economic integration increases profit sharing through wage-moderating and thus improves labour demand. In addition, if the elasticity of substitution between labour and capital increases during the process of integration, incentives for using profit sharing decrease with higher relative labour price, which decreases labour demand.

We formulated an econometric model which aimed to determine whether European integration has changed the impact of profit sharing on employment in Finland, using data from the manufacturing sector from 1996 to 2004. Our findings provide support for the argument that economic integration strengthens the positive impact of profit-sharing on employment. However, we do not find that profit-sharing firms exhibit greater employment stability during the process of economic integration. These results provide evidence for the hypothesis that profit-sharing improves employment during the process of economic integration, but that it can have ambiguous effects on the stability of employment.

Finally, the study indicates a potentially interesting area for future research. One area for further research would be to extend the integration model to capture the effect of profit-sharing on wage formation and thus on structural unemployment. The most convincing result would be obtained from the estimation of a wage equation determining whether there is substitution between the base wage and profit sharing.

REFERENCES


