Determinants Of Sectoral Average Wage and Employment Growth Rates in a Specific Factors Model with Production Externalities and International Capital Movements[1]

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February 1999

Abstract

The cost-minimization part of a specific factors model with perfect capital movements and production externalities for both perfect and imperfect competition is used here to explain the growth rate of wages as a function of technical change, terms of trade or import changes, interest rate changes and the growth rate of the labour supply. Our estimation of the perfect competition model for 67 combinations of countries and sectors yields the result that technical change explains a higher percentage of both wage and employment growth than changes in the terms of trade do before the 1980s. From the 1980s onwards international trade is slightly more influential than technical progress. Much more important than these two are changes in the sector specific labour supply in all countries but the UK. In the UK terms of trade changes matter most. However, since we cannot exclude increasing returns, a model with imperfect competition is also estimated. Results support those from perfect competition. Ultimately, as compared to other literature, we identify some more sectors that seem to have been negatively affected by international trade. Finally, we consider policy conclusions.

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1. Introduction

Sectoral wages are the average of the wages for skilled and unskilled labour. Explaining their development has recently led to some controversies (see Freeman 1995). The major problems discussed are why do wages for skilled and unskilled labour diverge in the US and why has unemployment been heavily concentrated on low-skilled workers in Europe? These shifts can also be observed in Newly Industrialized Countries (NICs) (see Richardson 1995). The wage determination question, however, is of broader interest.

Many economists using closed or open economy growth models would explain wage growth mainly as a consequence of technical progress. Labour market economists would tend to emphasize (sectoral) supply and demand with little weight on international aspects (see Richardson 1995). Trade economists would tend to ignore the supply of labour when using the Stolper-Samuelson theorem. However, in a multisectoral world of international trade and capital movements it is tempting to take a broader perspective. Consequently, one may ask the question what the relative importance of the major determinants of (average) wage growth and employment - international trade or factor movements, technological change or labour market developments- are once one integrates all of them into one framework. In this paper we try to answer this question with regard to the US and six European countries (where wage inequality seemingly has changed much less than in the US). The inequality issue will not be addressed in this paper. We analyze average wages.

Lawrence and Slaughter (1993) and Krugman (1994) have argued that international trade would have an impact on wages, if any, via changes in the terms of trade. However, they indicate that the terms of trade of the US are almost unchanged and therefore changes in wages must be due to technical change. This argument leaves us with several open issues:

i) Results may be different for other countries than just the US;

ii) Results may change if we do not argue in terms of a two-sector model but at a more disaggregated level, because some of us will remember that in continental Europe the shipbuilding sector did shrink in the 1970s, automobile business was faced with increased competition from Japan in the early 1980s and the European consumer electronics sector lost grounds in the 1980s and 1990s. Ultimately, protectionists lobby at the sectoral or even the firm level and not at the macro level;

iii) Once international capital movements are taken into account, not only the terms of trade but also interest rates become an exogenous variable for a (model of a) country and their changes should have an impact on wage growth according to economic theory.

How did the literature treat these three issues? The only contribution on average wages so far is Lawrence and Slaughter (1993). Some other insights are gained from the wage inequality debate by:

i) Lücke (1997), who has looked at data for Germany and the UK and Oscarsson (1997) for Sweden. Seemingly, for many other countries this has not been done (within an international trade framework). Oliveira Martins (1994), using an industrial economics rather than an international trade approach also looks at several countries;

ii) Leamer (1996), who sees the point of relevance for single sectors too, mentioning apparel and textiles in the US. Krugman and Lawrence (1993) acknowledge that Japan did threaten US textiles in the 1960s and semiconductors in the 1990s;

iii) Leamer (1993), who takes international capital movements into account when making theoretical scenarios but not when running estimations. Wood (1994), as well as Sachs and Shatz (1994), also look at several sectors and international capital movements. However, they do not have an integrating framework but rather look at all aspects, separately running regressions that give some intuition on their idea that international trade, technology and international capital movements are all important. Thus, it seems to be worthwhile to investigate all of these points more closely.

Most of the wage inequality debate in international economics has been conducted in terms of Heckscher-Ohlin models (see Sachs and Shatz 1994, Baldwin and Cain 1997, Lücke 1997, Oscarsson 1997). Krugman and Obstfeld (1997) give a justification for this choice: although labour may not be mobile between sectors because its skills are specific to one sector only, reschooling could achieve the desired mobility after some time, which would justify the mobility assumption of the Heckscher-Ohlin model. Against this we like to propose that before reschooling, labour is specific to one (or several) sector(s) and after reschooling it is specific to different sectors or just one. We prefer to capture this with a specific factors model that has an exogenously changing labour supply for each sector and allows for sectoral differences in wages, whereas the HO model does not (see Leamer 1994). Also, most of the literature uses the Stolper-Samuelson theorem for the analysis (see Leamer 1994, Richardson 1995, Baldwin and Cain 1997, Lücke 1997, Oscarsson 1997), which makes the latter heavily dependent on the empirical validity of the zero-profit conditions in every sector or period[2]. Using the cost-minimization part of a specific factors model with production externalities for perfect and imperfect competition and international capital movements can avoid this drawback. It provides a simple way to include the supply of labour, technical change, international trade and factor movements in one framework. Yet, it does so at the cost of slightly exaggerating the immobility aspect of labour (which is now restricted to merely one sector). Other alternatives to the Stolper-Samuelson approach are presented in Francois (1996).

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2 . Note that the estimation of Jones' (1970) dynamic version of the zero-profit conditions uses data on factor shares (see Baldwin and Cain 1997), which consist of a cost term in the numerator and revenue terms in the denominator. If we (empirically) have zero-profits on average across time, we might guess from a business cycle perspective that there are losses in recessions and positive profits in booms. This yields higher than average values of cost shares in recessions and lower values in booms. In time series estimates this may bias the results, in particular in view of the possibility that capital and labour shares may be affected unequally because of the irreversibility (or costly reversibility) of the investment of capital which makes it difficult to reduce its cost in a recession.

To allow for the treatment of more sectors motivated under point ii) above we will construct a multisectoral, specific factors model in section 2. The inclusion of international capital movements brings in interest rate changes in accordance with the motivation of point iii) above. In section 3, some remarks on the data and analysis techniques are made. Section 4 contains our main findings, whereafter section 5 will discuss the policy conclusions which may be drawn from them. Finally, section 6 addresses the limitations of our approach and gives some guidelines for further research.

2. Model Description

The details of our model are as follows. For each product i we assume the following production function for n identical firms to be responsible for the generation of variable costs, where Y indicates output, K capital, L labour, A technology and $Q = \Sigma Y^i$ is sectoral output:

$$Y^i = (K^i)^{\alpha^i} (A^i)^{\theta^i} (L^i)^{\beta^i} Q^{\eta^i}$$

α, β and θ are elasticities of the production of capital, labour and technology. η indicates production externalities which can have any sign. If the sum of α and β is smaller, larger than or equal to one, we have decreasing, increasing or constant returns to scale at the firm level and therefore upward or downward sloping or constant cost functions (for given technology A). We do not exclude any of these cases a priori.

From *cost minimization* we get (with w as the wage rate and r as the interest rate):

$$w^i = \lambda^i F^i_{L^i}$$

$$r = \lambda^i F^i_{K^i}$$

λ is the Lagrange multiplier of the technology constraint, whose economic interpretation is marginal costs. Lower indices K or L indicate a partial derivative with respect to K or L. The three equations given above allow us, together with the definition for sectoral output, Q, to find a solution for the value of the Lagrange multiplier λ. We get (dropping the index i) :

$$\lambda = (\frac{r}{\alpha})^a Y^b A^c (\frac{w}{\beta})^d Q^{-\eta b}$$

with

$$a = \frac{\alpha}{\alpha + \beta} , b = \frac{1 - \alpha - \beta}{\alpha + \beta} , c = \frac{-\theta}{\alpha + \beta} , d = \frac{\beta}{\alpha + \beta}$$

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In case of *perfect competition*, marginal costs equal prices given from the world market (under the small country assumption) and marginal productivity conditions can therefore be rewritten as:

$$w^i = p^i F^i_{L^i}$$

$$r = p^i F^i_{K^i}$$

Rewriting the marginal productivity conditions in growth rates, using the Cobb-Douglas form of production functions, and the elimination of the term for capital yields an equation for several sectors in different countries (we do not write down a country index):

$$\hat{w}^i = \gamma_1 \hat{p}^i + \gamma_2 \hat{r} + \gamma_3 \hat{A}^i + \gamma_4 \hat{L}^i$$

with

$$\gamma_1 = \frac{1}{1 - \dfrac{\alpha^i}{1-\eta}} > 0, \gamma_2 = -\frac{\dfrac{\alpha^i}{1-\eta}}{1 - \dfrac{\alpha^i}{1-\eta}} \leq 0,$$

$$\gamma_3 = \frac{\dfrac{\theta^i}{1-\eta}}{1 - \dfrac{\alpha^i}{1-\eta}} \geq 0, \gamma_4 = \frac{\dfrac{\beta^i + \alpha^i}{1-\eta} - 1}{1 - \dfrac{\alpha^i}{1-\eta}}$$

In this model, the terms of trade are exogenous in case of perfect competition and the small country assumption. These assumptions are made in most of the related literature. With perfect capital movements the real interest rate, r, is given from the world market at each moment in time. Technology is exogenous by assumption and so is labour input because of the assumption that it is specific to each sector. Alternatively, we could have had employment as an endogenous variable and wages as an exogenous one. Then the equation would try to explain employment of a sector in a country[3].

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3 . In the standard partial equilibrium labour market diagram an increase in the labour supply would decrease wages. However, the increase in employment has an indirect effect via the marginal productivity of capital, which is increased by higher employment and therefore more capital is attracted from the world market. With the increase in capital, labour demand also increases which would increase wages. Under increasing (decreasing) returns to scale the indirect demand effect is stronger (weaker) than the direct supply effect.

The right hand side of the equation above captures all variables that play a role in the debate on real wages. International trade is captured by changes in the terms of trade, technology is contained and international capital movements are represented by changes in the interest rate. Finally, factor supply is included which could not be done in a Stolper-Samuelson approach using the zero-profit assumption.

An estimate of this equation at the firm level would give us a result for $\alpha/(1-\eta)$, the elasticity of production of capital of a sector in a country corrected for the production externality, from either γ_1 or γ_2. Therefore we have to impose or test the constraint :

$$\gamma_1 + \gamma_2 = 1,$$

when doing the estimation. Having found a value for $\alpha/(1-\eta)$ we can deduct the value of $\beta/(1-\eta)$ from γ_4 and that of $\theta/(1-\eta)$ from γ_3. The question whether or not we have increasing returns to scale can be answered by looking at γ_4. If it is less than, more than or equal to zero, we have decreasing, increasing or constant returns to scale in labour and capital at the sectoral level including the production externalities. However, only if the previous coefficient restriction is accepted we may draw such a conclusion, for then we can suspect that the definitions of the other coefficients hold too. Moreover, the assumption of perfect competition is only justified if we have non-increasing returns to scale at the firm level, which means that $(\alpha+\beta-1) \leq 0$. It will turn out below that the estimations yield a positive sign for the labour variable, although it can have any sign. With non-increasing returns at the firm level this requires a positive externality that is large enough to make the numerator positive but also leaves the denominator positive. With the positive denominator the signs given for all γ–terms in the previous formula follow.

In the case of increasing returns to scale at the firm level we have to resort to imperfect competition and endogenous prices. Therefore we must give up the small country assumption, because price determination by domestic firms and prices given from the world market are mutually exclusive concepts (see Helpman and Krugman 1989). If a sector is faced with a constant-elasticity demand function, $p^i = B^i Y^{i\phi} M_{eu}^{i\delta} M_{neu}^{i\varepsilon}$, with ϕ as an inverse of the price elasticity, M_{eu} as import quantities of competing products from the EU, M_{neu} as their non-European equivalent, B as a shift parameter which captures all other demand effects (such as effects of other imports coming into the country), and each product being produced by only one firm (as it would under monopolistic competition), profit maximization will yield $p^i = \lambda^i /(\phi^i + 1)$. Prices are now an endogenous variable because marginal costs (λ) are endogenous for they depend on output and wages. A division between European and non-European trade is made because competition from the Asian NICs has been of special interest in the recent debate. If trade has an impact we would expect $\delta, \varepsilon < 0$.

Equating prices from the first-order conditions with those of the demand function yields:

$$B^i Y^{i\phi} M_{eu}^{i\delta} M_{neu}^{i\varepsilon} = \lambda^i /(\phi^i + 1)$$

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Taking growth rates of this equation, the marginal productivity conditions and the expression for λ gives us four linear equations for four endogenous variables: the growth rates of wages (w), capital (K), marginal costs (λ) and sectoral output ($Q = n\mathrm{Y}^i$). The exogenous variables are the growth rates of A, B, L, r, M_{eu} and M_{neu}. Parameters are $\alpha, \beta, \theta, \eta, a, b, c, d, \delta, \varepsilon$ and ϕ. Solving the system for the growth rate of wages yields:

$$\hat{w}^i = e_0 + e_2\,\hat{r} + e_{1a}\,\hat{M}^i_{eu} + e_{1b}\,\hat{M}^i_{neu} + e_3\,\hat{A}^i + e_4\,\hat{L}^i$$

with

$$e_0 = \frac{-\hat{B}[\dfrac{\eta(2\alpha + 2\beta)-1}{1-\alpha-\beta}+1]}{\eta[1-\alpha-\dfrac{\beta}{1-\alpha-\beta}]+\alpha(\phi+1)-1},$$

$$e_{1a} = \frac{-\delta[\dfrac{\eta(2\alpha+2\beta)-1}{1-\alpha-\beta}+1]}{\eta[1-\alpha-\dfrac{\beta}{1-\alpha-\beta}]+\alpha(\phi+1)-1},$$

$$e_{1b} = \frac{-\varepsilon[\dfrac{\eta(2\alpha+2\beta)-1}{1-\alpha-\beta}+1]}{\eta[1-\alpha-\dfrac{\beta}{1-\alpha-\beta}]+\alpha(\phi+1)-1},$$

$$e_2 = \frac{\alpha[\eta\dfrac{\alpha+\beta}{1-\alpha+\beta}+(\phi+1)]}{\eta[1-\alpha-\dfrac{\beta}{1-\alpha-\beta}]+\alpha(\phi+1)-1},$$

$$e_3 = \frac{-\theta[\eta\dfrac{\alpha+\beta}{1-\alpha+\beta}+(\phi+1)]}{\eta[1-\alpha-\dfrac{\beta}{1-\alpha-\beta}]+\alpha(\phi+1)-1},$$

$$e_4 = \frac{-\eta(1-\alpha-\beta)+1-(\alpha+\beta)(\phi+1)}{\eta[1-\alpha-\dfrac{\beta}{1-\alpha-\beta}]+\alpha(\phi+1)-1},$$

In this equation, compared to that of the perfect competition case, imports are the exogenous variable that replace prices. The exogenous shift variable *B* can go either

way. If it is decreasing, competition is increased. Then, the demand function is shifted towards lower prices. As these coefficients are anything but easy to overlook, it is useful to consider first the case of no externalities, $\eta=0$. In this case the numerator of e_4 becomes $1-(\alpha+\beta)(\phi+1) > 0$, which must be positive because its negative value is exactly equal to the second order condition of the monoplist. Therefore the denominator with no externalities would have to be negative, leaving us with a negative coefficient. However, the empirics below give us mostly positive coefficients. Therefore it is most easy to keep oversight by making the following assumptions under which the second order conditions are not violated and the empirics can be understood. Let us assume the sufficient conditions that $\eta > 0$, $2(\alpha+\beta)-1 > 0$ and $(1-\alpha-\beta)$ is positive and sufficiently small to make the denominators of all coefficients negative. Then the second order condition of the monopolist is not violated, e_4 is negative for sufficiently small externalities and positive for large externalities and therefore it can have any sign. Moreover, all the terms in squared brackets in the numerators of e_{0-4} are positive if $(\phi+1) > 0$ (as required by the first order condition of the monopolist). The expected coefficients for both import terms (e_{1a} and e_{1b}) and the interest rate (e_2) are non-positive and that of technical change (e_3) is non-negative. e_0 and e_4 can have any sign.

3. Data and Econometric Methods

The estimated equations have been derived from the firms' rules for cost mini-mization and profit maximization and then have been aggregated into sectoral equations under the assumption of a given number of identical firms. We have data at the sectoral level.

Having constructed a model that differs from those of standard international trade models in textbooks by the production externality and the international capital movements, we have to relate a non-monetary model to data that stem from a monetary world. This requires dividing the data for wages and sectoral prices by the GDP price level of the country in question. Moreover, nominal interest rates have to be deflated by subtraction of the growth rate of the GDP deflator. We start from national nominal interest rates, because in spite of our assumptions it is not clear that national capital markets are perfect. Although we have not modelled capital market imperfections explicitly, national rates seem to be the more adequate data.

We will test for structural breaks. The question whether employment drives wages or wages drive employment will be 'answered' using Granger causality tests.

The regression equations will be estimated by OLS[4] without the aforementioned coefficient restrictions (at least initially). This technique is applied so that a hetero-scedasticity-consistent covariance matrix arises[5]. A description of the data can be found

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[4] . Applying NLS or ML (while simultaneously imposing the coefficient restriction derived in the theoretical part) would have been an option, were it not that we would then be implying that the coefficient restriction already holds *a priori*. Thus, given the reservations expressed above, OLS seems to be preferable. Pooling data (across sectors, countries or both) would have been an option too, but it was dropped when relatively little interpretable results emerged. See also footnote 19 and 42.

[5] . White's method (1980) is used to achieve this.

in appendix A1. At this point, only the choice of R&D expenditures as a proxy of technical change will be elaborated upon.

Basically, there are two sets of indicators that can serve as a proxy of technical change: R&D data and patent statistics. However, both have their drawbacks. R&D data are an input measure of the innovation process. Not all R&D inputs lead to innovations, and also the efficiency with which inputs are used influences the amount of successful R&D efforts. Thus, more R&D expenditures do not necessarily imply more innovative activities. On the other hand, patent statistics are an output measure of the innovation process. Not all innovations are patented, and not all patents are put to effective and/or commercial use[6]. Moreover, the propensity to patent differs between countries[7]. In addition, neither R&D expenditures nor patent data refer exclusively to process innovation as our model does. At least product innovations for consumers should be excluded (but cannot). Another problem associated with using R&D statistics as a technology indicator is that series containing labour or capital data will mostly include, to some extent, labour and capital used as an input to R&D. Thus, adding R&D as a separate factor in the analysis could create a sort of 'double-counting'. However, there is mixed evidence on both the question if and how far the consequences hereof reach. For example, while Schankerman (1981) and Hall and Mairesse (1992) state that corrections for double-counting should be made[8], Verspagen (1995) finds only very limited effects. We will not touch upon this issue either, assuming the bias that arises because of double counting to be negligibly small (which seems reasonable, given that the capital variable drops out of the regression equations)[9].

Nevertheless, the decision to use R&D expenditures as a proxy of technical change was mainly motivated by data availability, which was larger for R&D data.

4. Results and Interpretations

In section 4.1 we will discuss the estimation results for the perfect competition model, whereafter in section 4.2 the results for the imperfect competition model are examined.

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6 . Scherer (1983) and Griliches (1990) examine the points in favour and against using either R&D or patent statistics as an indicator of technical change more closely.

7 . Cf. Scherer (1983) and Feldman and Florida (1994). See Caniëls (1998) for European evidence hereof.

8 . With the estimated return to R&D being downward biased.

9 . In appendix A1 additional remarks on this subject are made.

4.1 The Case of Perfect Competition

The basic regression output is shown in appendix B1[10]. At first, a constant term is included in the regressions to capture the mean effect of (possibly) missing variables (like additional productive factors). We expect γ_1 and γ_3 to have a positive sign, γ_2 to have a negative one, whereas γ_4 and γ_0 (which will be used to denote the constant term) can have either sign[11]. As can be seen, the constant term is (statistically) significant at the 5% level for entire Germany, almost all of Italy (except for textiles, footwear and leather products and the basic metals sector), whereas it is only significant for total manufacturing and wood, cork and furniture in France, the French, British and Spanish paper and printing industry and the Spanish chemical industry. For the Netherlands and the US, a rather mixed picture emerges (with chemicals, total manufacturing, stone, clay and glass and paper and printing being the significant sectors for the Netherlands and food, drink and tobacco, basic metals, total manufacturing, wood, cork and furniture and other manufacturing industries for the US). Reasons for this outcome may be that labour market aspects (like changes in union power, falling real values of the minimum wage, an upgrading of skills and compensation policies of firms), incomplete capacity utilization, developments in the non-traded sector, or additional production factors (like land and natural resources) are at work (which are all not present in our model).

Many of the variables do have their expected signs to some degree, but are often not significant, as is typical of the whole literature discussed above. An exception is the labour variable, which is generally both positive and significant (only the British food, drink and tobacco and other manufacturing industries have a negative coefficient). This might point to increasing returns at the sectoral level[12].

It is likely that there are structural breaks underlying the results. Such breaks may especially stem from the movement from negative to positive real interest rates at the beginning of the 1980s[13]. For Great-Britain, Germany, Italy and the Netherlands, such a change in sign occurs in 1981. In France it occurs in 1980, whereas in Spain and the US, a change in sign of the real interest rate takes place in 1976 and 1986 respectively. Moreover, the high dollar value of 1985 may have induced another structural break. To test for these notions, a Chow break test[14] is applied to both the aforementioned year

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10 . Three sectors were excluded because of missing R&D data: the Dutch and Italian wood, cork and furniture sectors and the Dutch other manufacturing industries.

11 . The sign of γ_4 depends on the presence of increasing returns to capital and labour at the sectoral level, cf. section 2. The fact that it can take on either sign is illustrated by Efendioglu and Von Tunzelmann (1998) and Spiezia and Vivarelli (1998).

12 . An alternative interpretation that is somewhat independent of our model could be that the economy is moving along an upward sloping labour supply curve - a view found in the work of Bovenberg (see Bovenberg 1995 for details).

13 . From a model point of view, the period characterized by positive real interest rates is the only one of interest, because only then the model holds. It is assumed however that when no structural breaks are found, the influence of negative real interest rates on the regression results is negligibly small.

14 . See Chow (1960) for details.

of the sign change of the real interest rate and the dollar value[15]. The results hereof are also given in appendix B1.

Only a limited number of breaks is found. They arise for total manufacturing and wood, cork and furniture in France, the chemical industry in France and the UK, fabricated metals products in France and Italy, leather products in Italy and the UK and the German other manufacturing industries. Of these sectors, three seem to have been affected by the dollar value of the mid 1980s: total manufacturing in France and the two British sectors[16]. It is decided to let the estimation period for all the aforementioned sectors start in either 1980, 1981 or 1986 instead of (mostly) 1974 and to redo the estimation. The results of this estimation process (taking into account structural breaks) are depicted in appendix B2.

Given that we only found structural breaks for nine sectors, it does not come as a surprise that, although there are changes to be seen (for example, a wrong change in sign in the price variable for fabricated metals products in France and a correct one for the interest variable of the same sector in Italy), the overall results are not very different from those of appendix B1. Thus, structural breaks do not seem to be at the heart of the unexpected signs and large sizes of some of the variables in our model. Factors that remain are the significance of the constant term (in some equations) and the fact that we have not yet imposed the coefficient restriction derived in the theoretical part. If we leave out the constant term for those sectors for which it is statistically insignificant at the 5% level and then test whether the proposed restriction is in place, we obtain the results of appendix B3[17].

The omission of the constant term alters our results somewhat (leading, among others, to several smaller (yet more significant) values of the labour variable)[18], but the overall results are quite similar to the ones already reached in appendix B2. Besides, we see that at the 5% significance level, the coefficient restriction can be accepted only twice. We find significant results for the British chemical industry and Dutch fabricated metal products. Only for these sectors we may, if we get plausible estimates for $\alpha/(1-\eta)$ and $\beta/(1-\eta)$, say something about the presence of increasing returns. We can do so by checking whether $(\alpha+\beta)/(1-\eta)-1 \leq$ or > 0, holds. It is unlikely that plausible estimates

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15 . It is reckoned that econometrically more sophisticated methods exist to assess points in time at which structural breaks occur (see for example Gallant and Fuller 1973). However, we concentrate on the years which we assume to be the most influential.

16 . The British chemical industry is also affected by the sign switch of the real interest rate at the beginning of the 1980s.

17 . All regressions were also carried out with a time variable included. This variable was always insignificantly different from zero at a 5% significance level (which is not that surprising since we are working with series expressed in first differences).

18 . The technology variable now has the desired sign more often and (especially) becomes more significant. This might point to the fact that R&D expenditures are rather flawed an indicator of technical change. However, putting the technology variable into the residual would then again seem too drastic an action for it would, in a statistical sense, lead to omitted variable bias.

arise for both these sectors, because not all coefficients have the expected sign: for example, for fabricated metals products in the Netherlands, the interest variable turns up with a positive coefficient. In fact, inferring values for $\alpha/(1-\eta)$, $\beta/(1-\eta)$ and $\theta/(1-\eta)$ does lead to estimates for these two sectors ($\alpha/(1-\eta)$ equals either -.010 or .019, $\beta/(1-\eta)$ -.083 or 1.71 and $\theta/(1-\eta)$ -.011 or .430)[19]. Negative values indicate $\eta > 1$, which may seem to be somewhat implausibly high. Together with the theoretical part this may indicate the presence of an aggregation problem (or omitted variables).

Of all variables, labour is for a large part significantly different from zero, whereas especially for the price and interest variables, there are many unexpected entries as far as sign and significance are concerned. However, statements about increasing or decreasing returns to scale cannot be made anymore since the restriction that would give rise to such an outcome is not accepted. It can only be said that a significant and mostly positive relationship exists between sectoral wage growth and employment growth in almost all sectors and countries under consideration[20]. One might suggest that specific factors matter, although the less plausible results for the other variables possibly overstates the importance of such a conclusion.

The question remains in what direction the relationship between employment and wages holds. Do wages determine employment or does employment determine wages instead? Tentatively, this question will be 'answered' by means of Granger causality tests.

Granger causality tests[21] examine whether the occurrence of a certain event (variable) X precedes the occurrence of another event (variable) Y over a certain period of time. Stated differently, it is tested whether variable Y is temporally dependent upon variable X. Thus, it is not causality in a strict sense that is analyzed here: it is the *order* in which events happen that matters[22]. Besides, Granger causality is like a two-way street: only when X Granger causes Y, and Y does not (at the same time) Granger cause X, we may say that there is temporal dependence of Y upon X. More specifically, the following model is estimated:

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19 . If all coefficient definitions given in the theoretical part are substituted into the regression equation and the model is re-estimated by means of NLS, these $\alpha/(1-\eta)$, $\beta/(1-\eta)$ and $\theta/(1-\eta)$ estimates follow. Of course, it would have been preferable to solve the system numerically. This did not yield any result, for then it is implicitly assumed that the imposed coefficient restriction holds *exactly*, whereas our test examines whether it holds *within a certain margin*.

20 . Exceptions (with respect to significance) are all British sectors except textiles, footwear and leather products, stone, clay and glass, paper and printing and wood, cork and furniture, the French food, drink and tobacco, stone, clay and glass and other manufacturing industries, food, drink and tobacco in the Netherlands and Spain and the Dutch basic metals sector.

21 . First introduced by Granger (1969). Sims (1972) and others provided tests (mostly) along the same lines, but the Granger causality test is the one most commonly used.

22 . See Eels (1991) for a more elaborate analysis hereof.

$$Y_t = \delta_0 + \sum_p \alpha_p Y_{t-p} + \sum_q \beta_q X_{t-q} + \varepsilon_t,$$

where p,q = predetermined lag orders;
ε_t = random disturbance term.

The null hypothesis that X does not Granger cause Y is that $\beta_q = 0 \; \forall \; q$ (while simultaneously, Y should not Granger cause X: $\alpha_p = 0 \; \forall \; p$). The size of p and q is mostly agreed upon a priori on theoretical grounds. Here, we will assume, letting Y_t denote sectoral wage growth and X_t the corresponding growth of labour, that p and q range from one to three. Tests were carried out with both one and two lags, but this did not alter our basic results very much[23]. Results are presented in appendix B4.

Employment Granger causes wage growth in a limited number of cases: only for the British fabricated metal products and food, drink and tobacco significant results are found (at a 5% level of significance). However, wages determine employment growth more often: for three British sectors (chemicals, textiles, footwear and leather products and basic metals) this turns out to be the case. Two other significant results emerge, namely for Spanish leather products and the Italian paper and printing industry. For wood, cork and furniture in Germany and total manufacturing in Great-Britain, there are statistically significant relationships in both directions: wages determine employment and by the same token, employment determines wages. Nevertheless, the conclusion in these cases is the same as for all sectors not mentioned: the Granger causality test is inconclusive.

It is quite interesting that when significant results are found, they occur most often for Great-Britain. There seems to be no apparent reason for this outcome though.

In the 5 cases where wages Granger cause employment growth, the estimation is redone, with wage growth now being an explanatory variable and labour growth the dependent one. As far as the value of the coefficients is concerned, this simply means rewriting the equations already shown in appendix B3[24]. However, the fit does change, as does the significance of the coefficients. Tests for structural breaks have to be redone too. Also in the first stage, a constant term is included in the regression equation. For the sectors for which it does not differ significantly from zero at the 5% level of signifi-

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23 . Do note that it is short-run causality that we test for here. If we would have wanted to detect long-run causality, the existence of a cointegration equation between labour and wage growth should have been proven. Given that we found no evidence hereof when doing so (possibly because of the somewhat limited number of observations available) the current approach is chosen.

24 . Note that it is not necessary to test the validity of the derived coefficient restriction again because of the same reason (as long as the estimation period remains the same). Here, we have to perform this test anew for two sectors: chemicals and leather products in the UK. For the latter sector, the coefficient restriction is accepted, so new estimates for $\alpha/(1-\eta)$, $\beta/(1-\eta)$ and $\theta/(1-\eta)$ can be generated. See also footnote 27.

cance[25], it is dropped and the modified model is re-estimated. These 'final' regressions are given in appendix B4.

Note that the desired sign of the explanatory variables switches when moving from wage growth to labour growth as the dependent variable. Only for the relationship between wages and labour it remains the same. Even then, there are many wrong signs to be found[26]. The interest variable does not have the correct sign for any sector. The technology variable has the wrong sign for three sectors: chemicals in the UK and textiles, footwear and leather products in both the UK and Spain. The price variable has the wrong sign for the two non-British sectors. Thus there is no sector for which all variables have the desired sign. Therefore, no new insights on coefficients are created here either[27]. However, below we will report on all reversed causality cases independent of the outcome of the Granger causality analyses.

For those sectors where all coefficients have the expected sign[28], it might be illuminating to examine how far the explanatory variables attribute to the explanation (of variation in) the dependent variable[29]. This means conducting a sort of 'growth accounting' exercise.

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25 . As turned out to be the case for British and Spanish textiles, footwear and leather products and the Italian paper and printing industry.

26 . Which is not surprising since coefficients that already had the wrong sign when wages were taken as the dependent variable, will have so now too (as long as the constant term remains either absent or present and the estimation period remains the same).

27 . This is the reason why we find no reasonable estimates for $\alpha/(1-\eta)$, $\beta/(1-\eta)$, $\theta/(1-\eta)$ in case of leather products in the UK (where we did accept the coefficient restriction): $\alpha/(1-\eta)$ equals $2.93 \cdot 10^{-3}$, $\beta/(1-\eta)$ 1.50 and $\theta/(1-\eta)$ -.128. See also footnote 24.

28 . At first, we will only look at cases where employment determines wage growth. If we had reversed the position of the wage and labour variables in the regression equation and redone the entire analysis up to this point, we would have ended up with 10 sectors to work with (instead of the 17 we have now), cf. table 4.5 below. Compared to the 17 sectors we find here (see table 4.1), we have an overlap for 5 sectors: three American (chemicals, basic metals and wood, cork and furniture), one French (chemicals) and a British one (paper and printing). So if we include both relationships (where labour growth determines wage growth and vice versa), we would have 22 sectors to continue with. Later we will consider the other 5.

29 . Ideally, we would have preferred looking at variables that have both the expected sign and are statistically significant. However, this is not the case for any sector (as in all of the international trade literature). Since we do want to give an indication whether either terms of trade or technology drives wage growth most, the present approach is opted for.

From appendix B3 we see that there are 17 sectors for which we found the expected signs. None of them is located in Germany. All sectors are shown in table 4.1. Except for chemicals, most industries in the table are the more traditional ones.

Table 4.1   Sectors with correct expected signs.

Country	Sector
USA	Chemicals
	Basic metals
	Paper and printing
	Wood, cork and furniture
France	Chemicals
	Stone, clay and glass
	Wood, cork and furniture
Great-Britain	Chemicals
	Food, drink and tobacco
	Paper and printing
	Other manufacturing industries
Netherlands	Total manufacturing
Italy	Textiles, footwear and leather
Spain	Basic metals
	Food, drink and tobacco
	Total manufacturing
	Wood, cork and furniture

The basic procedure we follow for the 17 sectors where all variables have the expected signs is to take the regression coefficients of appendix B3 and to pre-multiply them by the means of the corresponding explanatory variables (calculated as an average of the entire estimation period)[30]. Then, this figure is divided by the mean of the dependent variable over the same period and multiplied by 100 to arrive at percentages. Finally, to obtain country figures, unweighted means of these percentages are taken for all sectors in table 4.1 within a certain country.

If we leave out total manufacturing[31], and check the relative importance of all variables in explaining wage growth in a certain country in the way described above, we reach the results presented in table 4.2. For Italy and the Netherlands no results at the country level are calculated because of the relevance of just one sector.

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30 . Alternatively, we could have taken medians or calculated an average based on just the first and last period. However, given the way in which the OLS estimates are obtained, calculating means over the entire estimation period is to be preferred.

31 . For it is an aggregate across all other sectors and including it would create a bias.

15

Table 4.2   Relative importance of explanatory variables in explaining *per country* wage growth (in percentages)[32].

VARIABLE	Constant (%)	Technology (%)	Capital (%)	Trade (%)	Labour (%)	Residual (%)
COUNTRY						
USA	19.7	16.9	-3.1	-3.5	57.5	12.3
France	0.0	28.8	30.9	-3.0	79.7	-36.4
Great-Britain	40.7	23.8	-18.3	31.8	16.6	5.4
Spain	0.0	22.5	19.8	-6.7	55.8	8.7

Perhaps the first impression table 4.2 gives rise to, is that a large part of the explanation of wage growth is attributed to both the constant term (in the UK) and the residual (in France). This implies that for these countries a significant part of wage behaviour is not captured by our model as discussed above[33].

However, it does not mean that we cannot draw any conclusion from the table (at least, preliminary). It is evident that for most countries, a large part of wage growth is determined by employment growth: labour supply is a dominating factor in 3 countries (all but the UK). In the UK, a substantial part is contributed by terms of trade changes[34]. The UK is also the only country where terms of trade are more influential than technology. Looking at the overall results, we may conclude that technology is a more important factor than trade in determining (national) wages in 3 countries. Labour supply is an even more important factor. Again, specific factors seem to matter. This raises the question what we can see at the sectoral level[35].

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32 . In regressions *without* a constant term the residuals do not necessarily have to sum to zero. Therefore, a certain weight is assigned to them in these cases.

33 . Which was to be expected, given our previous results.

34 . Leaving aside the constant term.

35 . A similar exercise was carried out for the period starting (mostly) from 1980 or 1981 onwards. There, we looked at sectors which had (by and large) falling growth rates of wages. With the *same* regression coefficients (which, in a rough sense, is a valid approach for structural breaks have already been taken into account), we found results that were almost identical to the ones obtained in table 4.2. However, the results for total manufacturing in the Netherlands and food, drink and tobacco in Spain became worse, with respectively -123.9% and -325.1% of wage growth now being attributed to the residual. On the contrary, we found improved results for France, where technology now emerged as the most prominent factor in wage determination. Moreover, in Spain capital became the most important explanatory factor. Yet overall, labour still turned out to be the most influential factor in national wage formation. More results at the sectoral level are discussed (and shown) later on. A similar approach will be followed in case of imperfect competiton.

We can derive from table 4.3a below[36] for the whole period under consideration (and from table 4.3b for the 1980s onwards -the results of which we will indicate between brackets-) that 12 (12) out of the 17 sectors included in the 'growth accounting' exercise have negative terms of trade growth, indicating that there may be an international problem. In 7 (7) sectors we have falling and in 10 (10) we have increasing wages (according to the last column). In only 4 (4) sectors R&D expenditures have a negative growth rate. R&D therefore has a positive effect on wages in both periods. Interest rates have risen in 10 (10) sectors and therefore have decreased wage growth[37]. With 3 (3) exceptions labour supply has fallen and therefore -given the positive sign of the correlation- decreased wage growth[38].

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36 . Of course, the same data can also be found in appendix A2.

37 . The extremely high value for the mean growth rate of the Spanish interest rate is due to an outlier in 1986. Possibly, this outlier is caused by the alliance of Spain to the EU (and it was therefore explicitly taken along in our exercise).

38 . In 7 (7) cases the growth rates of L and w have opposite signs, but have positive regression coefficients. The inclusion of other explanatory variables and interaction effects between them play an important role in this 'switch' in sign.

Table 4.3a   Growth rates of explanatory and dependent variables over the estimation period given by SMPL.

Sector[39]	SMPL	Technology	Capital	Trade	Labour	Wages
USAZ35	74-93	0.0455	0.3643	-0.0019	0.0063	0.0179
USAZMB	74-93	-0.0049	0.3643	0.0015	-0.0286	-0.0222
USAZOP	74-93	0.0522	0.3643	0.0052	0.0108	0.0179
USAZOW	74-93	0.0209	0.3643	-0.0056	0.0000	0.0046
FRAZOG	74-91	0.0215	0.5437	0.0010	-0.0244	-0.0037
FRAZ35	80-91	0.0458	-0.2758	-0.0079	-0.0060	0.0030
FRAZOW	80-91	0.0779	-0.2758	-0.0051	-0.0235	-0.0082
GBRZLF	74-92	-0.0886	0.2590	-0.0047	-0.0212	0.0046
GBRZOO	74-92	-0.0019	0.2590	0.0359	-0.0253	0.0209
GBRZOP	74-92	-0.0022	0.2590	0.0060	-0.0101	0.0107
GBRZ35	86-92	0.0692	0.4908	-0.0210	-0.0070	0.0264
NLDZMT	74-93	0.0187	-0.2920	-0.0095	-0.0123	0.0028
ESPZMB	80-91	0.0173	-9.5446	-0.0339	-0.0399	-0.0323
ESPZMT	80-91	0.1139	-9.5446	-0.0089	-0.0138	-0.0078
ESPZOW	80-91	0.5935	-9.5446	-0.0047	-0.0189	-0.0173
ESPZLF	80-91	0.1110	-9.5446	-0.0188	-0.0085	0.0092
ITAZLX	81-94	0.3001	0.1873	-0.0176	-0.0197	-0.0107

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39 . See the appendix A1 for a list of the abbreviations used.

Table 4.3b   Growth rates of explanatory and dependent variables over the estimation period given by SMPL - from the 1980s onwards.

Sector	SMPL	Technology	Capital	Trade	Labour	Wages
USAZ35	81-93	0.0508	0.1435	-0.0153	0.0037	0.0143
USAZMB	81-93	-0.0311	0.1435	-0.0244	-0.0377	-0.0371
USAZOP	81-93	0.0500	0.1435	0.0083	0.0108	0.0214
USAZOW	81-93	0.0179	0.1435	-0.0023	0.0052	0.0091
FRAZOG	80-91	0.0234	-0.2758	-0.0023	-0.0279	-0.0129
FRAZ35	80-91	0.0458	-0.2758	-0.0079	-0.0060	0.0030
FRAZOW	80-91	0.0779	-0.2758	-0.0051	-0.0235	-0.0082
GBRZLF	81-92	-0.0581	0.1612	0.0040	-0.0276	0.0052
GBRZOO	81-92	-0.0646	0.1612	0.0546	-0.0285	0.0417
GBRZOP	81-92	-0.0018	0.1612	0.0034	-0.0138	0.0153
GBRZ35	86-92	0.0692	0.4908	-0.0210	-0.0070	0.0264
NLDZMT	81-93	0.0209	0.0287	0.0030	-0.0072	0.0034
ESPZMB	81-91	0.0116	-10.2546	-0.0367	-0.0449	-0.0410
ESPZMT	81-91	0.1085	-10.2546	-0.0162	-0.0138	-0.0134
ESPZOW	81-91	0.6157	-10.2546	-0.0124	-0.0182	-0.0265
ESPZLF	81-91	0.0940	-10.2546	-0.0200	-0.0063	0.0016
ITAZLX	81-94	0.3001	0.1873	-0.0176	-0.0197	-0.0107

From table 4.4a below (and table 4.4b for the more recent period of the 1980s -the results of which are again given between brackets-), containing a similar table as table 4.2 but then at the sectoral level, it follows that in 4 (7) out of the 17 combination of countries and sectors the terms of trade have a larger impact than technology. This means that technology matters more often over the whole period but terms of trade changes are more influential in the recent period. Out of these 4 (7) sectors, 2 (4) have falling terms of trade. Thus at the sectoral level international trade is quite important. These 2 sectors are located in Spain (basic metals) and the US (wood, cork and furniture). In the 1980s more Spanish sectors have terms of trade losses but also one additional sector in the US (basic metals). However, of the 2 (4) sectors 1 (4) have falling wages.

The more recent period therefore is (much) less favourable (in terms of losses) than the whole period and the terms of trade are catching up with technology in importance[40].

In 11 (12) of the 17 national sectors labour has the strongest impact; in only 4 (4) cases it is technology and in 2 (1) it is trade. In the more recent period labour has become even more important than it already was over the entire period. When counting variables that rank second we find 6 (6) times technology, 2 (6) times trade, 3 (2) times labour and 6 (3) times capital movements by interest changes. The overall impression therefore is that labour supply matters most, technology second and trade and interest rates last (in that order), but in the more recent period terms of trade have completely caught up with technology. All evaluations have been made without taking the constant term or the residual into account.

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40 . This conclusion is independent of the fact that the residual sometimes explains a large part of wage growth (for example for wood, cork and furniture in France) a large part of wage growth. Even if we had included a constant term in the regressions for these sectors anyway (and checked whether all variables had the correct signs), the economic interpretation of the results would have remained virtually the same.

Table 4.4a　　Relative importance of dependent and explanatory variables in explaining *per sector* wage growth (in percentages).

Sector	Constant (%)	Technology (%)	Capital (%)	Trade (%)	Labour (%)	Residual (%)
USAZ35	0.0	53.3	-2.5	-0.4	30.0	19.7
USAZMB	-38.8	1.0	2.8	-0.4	135.4	0.0
USAZOP	0.0	4.7	-2.5	3.0	65.1	29.6
USAZOW	117.7	8.8	-10.0	-16.0	-0.5	0.0
FRAZOG	0.0	-72.8	86.4	-13.6	251.7	-151.7
FRAZ35	0.0	198.8	49.5	-6.4	-121.7	-20.1
FRAZOW	0.0	-10.8	-12.3	8.1	188.8	-73.7
GBRZLF	0.0	-17.7	-6.5	-5.9	107.4	22.7
GBRZOO	0.0	-0.9	-6.4	120.4	7.6	-20.8
GBRZOP	162.8	-2.0	-12.2	24.0	-72.5	0.0
GBRZ35	0.0	115.8	-48.2	-11.2	23.8	19.9
NLDZMT	422.7	64.4	8.7	-6.3	-389.5	0.0
ESPZMB	0.0	-1.6	-3.5	7.3	109.9	-12.2
ESPZMT	0.0	-67.4	-3.4	42.8	151.4	-23.4
ESPZOW	0.0	-12.5	-1.1	8.0	90.4	15.2
ESPZLF	0.0	81.5	63.9	-35.5	-32.8	23.0
ITAZLX	0.0	-5.3	3.2	4.8	109.0	-11.8

Table 4.4b   Relative importance of dependent and explanatory variables in explaining *per sector* wage growth (in percentages) - from the 1980s onwards.

Sector	Constant (%)	Technology (%)	Capital (%)	Trade (%)	Labour (%)	Residual (%)
USAZ35	0.0	74.4	-1.3	-4.1	21.9	9.0
USAZMB	-23.2	3.7	0.7	4.1	106.5	8.2
USAZOP	0.0	3.8	-0.8	4.0	54.4	38.7
USAZOW	59.2	3.8	-2.0	-3.4	56.9	-14.5
FRAZOG	0.0	-22.8	-12.6	8.8	83.0	43.6
FRAZ35	0.0	198.8	49.5	-6.4	-121.7	-20.1
FRAZOW	0.0	-10.8	-12.3	8.1	188.8	-73.7
GBRZLF	0.0	-10.3	-3.6	4.4	124.2	-14.7
GBRZOO	0.0	-14.7	-2.0	91.8	4.3	20.6
GBRZOP	113.9	-1.2	-5.3	9.6	-69.4	52.4
GBRZ35	0.0	115.8	-48.2	-11.2	23.8	19.9
NLDZMT	353.2	60.0	-0.7	1.7	-190.3	-123.9
ESPZMB	0.0	-0.8	-2.9	6.3	97.6	-0.2
ESPZMT	0.0	-37.6	-2.1	45.6	88.7	5.4
ESPZOW	0.0	-8.5	-0.7	13.8	56.8	38.6
ESPZLF	0.0	387.6	385.6	-212.0	-136.2	-325.1
ITAZLX	0.0	-5.3	3.2	4.8	109.0	-11.8

A similar exercise can be carried out by *switching the roles of wage and labour growth* in the regression equation and redoing the entire analysis up to this point[41]. Then we would find 10 sectors where all variables have the expected signs (5 of which had not been included before), as shown in table 4.5 below. Note that the majority of the sectors (7 out of 10) is located in the US.

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41 . No regression outputs or intermediate results for the reversed relationship are included in the main text. However, they can be obtained from the authors upon request. One may claim that since wages (which now appear as an explanatory variable) are determined endogenously, the use of instrumental variables is advisable in order to reach more accurate regression results. Since the outcome of instrumental variables techniques is highly dependent on the number and quality of the instruments included in the analysis, we feel that the present approach has certain advantages. A pooling exercise was carried out here too, finally sustaining this feeling. The fact that no definite answer could be given to the question of the existence of a long-run relationship between wage and labour growth, makes using this 'reversed causality' equation for *all* sectors an interesting route to follow (to consider all possible relationships). See also footnote 23.

Table 4.5   Sectors with correct expected signs when the roles of labour and wages are interchanged.

Country	Sector
USA	Chemicals
	Fabricated metal products
	Food, drink and tobacco
	Textiles, footwear and leather products
	Basic metals
	Total manufacturing
	Wood, cork and furniture
France	Wood, cork and furniture
Great-Britain	Paper and printing
Spain	Other manufacturing industries

It is interesting to see what proportion of labour growth is explained by the other variables, like we did before. At the national level a result can only be presented for the US, for there is too limited an amount of sectors available for the other countries. Table 4.6 lists the relevant statistics.

Table 4.6   Relative importance of explanatory variables in explaining *per country* wage growth (in percentages).

VARIABLE	Constant (%)	Technology (%)	Capital (%)	Trade (%)	Wages (%)	Residual (%)
COUNTRY						
USA	71.1	523.1	-209.9	-167.1	-3251.2	3133.9
USA (excl. ZOW)	85.3	-9.1	-2.3	-16.4	20.1	22.5

Looking at table 4.6, the large percentages we find for all variables besides the constant term indicate that there may be an outlier between the sectors at hand. This is indeed the case for wood, cork and furniture. Dropping this sector yields the result that the most important variable in determining labour growth in the US is wage growth (leaving aside the constant term and the residual). Trade, technology and capital all play a less important role (in that order).

Again, at the sectoral level some insights can be gained by analyzing both the periods starting from the 1970s and the 1980s. Therefore, in table 4.7a and 4.7b the growth rates for the variables under consideration are shown for these periods.

Table 4.7a   Growth rates of explanatory and dependent variables over the estimation period given by SMPL.

Sector	SMPL	Technology	Capital	Trade	Labour	Wages
GBRZOP	74-92	-0.0022	0.2590	0.0060	-0.0101	0.0107
USAZ38	74-93	0.0126	0.3643	-0.0157	-0.0036	0.0062
USAZLX	74-93	0.0320	0.3643	-0.0265	-0.0199	-0.0145
USAZMB	74-93	-0.0049	0.3643	0.0015	-0.0286	-0.0222
USAZMT	74-93	0.0187	0.3643	-0.0085	-0.0045	0.0047
FRAZOW	80-91	0.0779	-0.2758	-0.0051	-0.0235	-0.0082
USAZ35	74-93	0.0455	0.3643	-0.0019	0.0063	0.0179
USAZLF	74-93	0.0294	0.3643	0.0023	-0.0020	0.0048
USAZOW	74-93	0.0209	0.3643	-0.0056	0.0000	0.0046
ESPZOO	80-91	0.5407	-9.5446	-0.0489	-0.0129	0.0017

Table 4.7b   Growth rates of explanatory and dependent variables over the estimation period given by SMPL - from the 1980s onwards.

Sector	SMPL	Technology	Capital	Trade	Labour	Wages
GBRZOP	81-92	-0.0018	0.1612	0.0034	-0.0138	0.0153
USAZ38	81-93	0.0081	0.1435	-0.0216	-0.0123	0.0001
USAZLX	81-93	0.0470	0.1435	-0.0207	-0.0197	-0.0104
USAZMB	81-93	-0.0311	0.1435	-0.0244	-0.0377	-0.0371
USAZMT	81-93	0.0158	0.1435	-0.0137	-0.0083	0.0013
FRAZOW	80-91	0.0779	-0.2758	-0.0051	-0.0235	-0.0082
USAZ35	81-93	0.0508	0.1435	-0.0153	0.0037	0.0143
USAZLF	81-93	0.0241	0.1435	0.0102	-0.0019	0.0033
USAZOW	81-93	0.0179	0.1435	-0.0023	0.0052	0.0091
ESPZOO	81-91	0.5679	-10.2546	-0.0707	-0.0107	-0.0067

A general conclusion that can be drawn when comparing the two tables is that the period of the 1980s is less favourable in many respects: for example, more sectors suffer from adverse terms of trade (8 instead of 7) and wage growth (4 instead of 3). Although R&D growth is larger in the 1980s than in the 1970s for some sectors (paper and printing in the UK, chemicals in the US and other manufacturing industries in Spain), it mostly is smaller than in the earlier period.

Table 4.8a   Relative importance of dependent and explanatory variables in explaining *per sector* labour growth (in percentages).

Sector	Constant (%)	Technology (%)	Capital (%)	Trade (%)	Wages (%)	Residual (%)
GBRZOP	112.9	-0.6	-1.6	20.1	-30.8	0.0
USAZ38	337.3	8.0	-14.7	-62.8	-167.9	0.0
USAZLX	54.9	5.1	-0.7	-22.3	63.1	0.0
USAZMB	34.5	-0.8	-1.8	0.2	67.9	0.0
USAZMT	205.8	11.6	-8.5	-9.1	-99.8	0.0
FRAZOW	0.0	8.7	3.8	-0.1	38.9	48.8
USAZ35	0.0	-120.0	5.8	1.7	256.0	-43.5
USAZLF	0.0	62.1	-0.2	1.0	-118.9	155.9
USAZOW	0.0	3184.2	-1247.8	-920.2	-19607.3	18691.2
ESPZOO	0.0	45.4	5.3	-44.5	-12.4	106.3

Table 4.8b   Relative importance of dependent and explanatory variables in explaining *per sector* labour growth (in percentages) - from the 1980s onwards.

Sector	Constant (%)	Technology (%)	Capital (%)	Trade (%)	Wages (%)	Residual (%)
GBRZOP	82.6	-0.4	-0.7	8.4	-32.2	42.3
USAZ38	99.7	1.5	-1.7	-25.6	-0.7	26.9
USAZLX	55.6	7.5	-0.3	-17.7	45.6	9.2
USAZMB	26.2	-4.0	-0.5	-2.1	86.4	-6.0
USAZMT	110.7	5.2	-1.8	-7.8	-14.8	8.5
FRAZOW	0.0	8.7	3.8	-0.1	38.9	48.8
USAZ35	0.0	-229.0	3.9	23.8	349.8	-48.5
USAZLF	0.0	53.6	-0.1	4.8	-86.1	127.8
USAZOW	0.0	-11.4	2.1	1.6	163.5	-55.7
ESPZOO	0.0	57.7	6.8	-77.8	59.0	54.3

Table 4.8a (and table 4.8b for the 1980s - the results of which we will again present between brackets) is a sectoral version of table 4.6 (but now for all countries). We can derive that in 3 (5) of the 10 sectors terms of trade have a larger influence on labour growth than technology. Technology thus matters more over the whole period, but

since the 1980s the terms of trade have caught up in importance. This conclusion is in accordance with the one we obtained above.

In 9 (8) of the sectors wages have the largest impact. Technology comes first 1 (0) times, whereas capital and terms of trade hold the first position 0 (0) and 0 (2) times respectively. The influence of the terms of trade on labour growth thus has grown over time. When counting the variables that rank second, we get 5 (5) times technology, 4 (3) times trade, 1 (1) time capital movements and 0 (1) times wages. It will by now not come as a surprise that similar results as above are reached. Wage growth is the most dominant factor in explaining labour growth, with technology in second place, trade third and capital last. The roles of technology and trade switch when looking at the more recent period of the 1980s.

We already stated that the perfect competition version of our model leaves something to be desired for increasing returns at the firm level cannot be excluded from consideration. Yet, despite its deficiencies, it is clear that its results are quite robust: specific factors do indeed seem to matter for wage and/or labour growth, whereas the influence of the terms of trade on the results has risen over time (when set against the role of technology). Nevertheless, it is equally clear that there still is a need to analyze an imperfect competition version of the model.

4.2 The Case of Imperfect Competition

The approach that is followed in case of imperfect competition is very similar to the one followed in the perfect competition case. We first ran OLS regressions[42] on the basic model, which -from a theoretical point of view- now already contains a constant term. As explained in section 2 we expect e_{1a} and e_{1b} to have a negative sign, while e_0 and e_4 can have either sign. e_3 is highly likely to be positive. The results of the estimations are shown in appendix B5.

We see that the constant term (e_0) differs significantly from zero at the 5% significance level only 19 times. These are all positive entries. Negative entries turn up only 10 times. A similar conclusion holds with respect to the coefficients of the import variables (e_{1a} and e_{1b}): the coefficient for EU-imports differs significantly from zero 5 times, which are all positive entries but two. It has the desired sign 29 times. Non-European imports turn up significantly 9 times (of which three entries are negative), with a total of 27 negative signs. Thus, non-European imports, including those of the Asian NICs, (may) have a substantial impact on wage growth in some sectors. Given the construction of e_{1a} and e_{1b}, they should have the same sign. This happens only 22 times (with 5 cases in which they are both negative)[43].

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42 . NLS and ML regressions were also tried (with either the results from the OLS regressions or zero as starting values), but this yielded hardly any result (convergence only occurred when running NLS regressions from zero. If we had continued with these figures, the results presented below would remain roughly the same).

43 . The 'conflict' in sign between the two import variables may lead us to the conclusion that even the current specification leaves something to be desired. Do note however, that this sign 'conflict' may be due to multicollinearity: the two import variables have a correlation that is mostly larger than .60 (and often exceeds .80). Although there are solutions to multicollinearity (for example, dropping one of the collinear variables), this is not an option in the present context for it would imply an explicit change of the theoretical model.

Technology is significant only 5 times (of which two entries are negative), and has a positive sign 46 times. The interest rate turns up significantly 11 times too, with seven negative coefficients. Negative signs occur 29 times in total.

Labour again is by far the most significant variable. It turns up so 51 times this time. All significant entries are positive ones; negative entries occur only 4 times.

As compared to the results presented in appendix B1, it is striking that for many sectors the fit improves: the imperfect-competition version of our model thus picks up some factors that were (unjustly) left out at the perfect competition stage. To see whether the fit can be improved even further, we tested if there are structural breaks underlying the results. Thus, Chow structural break tests were applied for (mostly) the years 1981 and 1986 and it was checked whether such breaks were indeed present[44].

Structural breaks were found for 9 sectors: four British (chemicals, food, drink and tobacco, leather products and total manufacturing), one American (basic metals), two Italian (chemicals and fabricated metal products) and two Dutch ones (basic metals and total manufacturing). For only three of them, we also found structural breaks in the perfect competition case[45]. The estimation for these sectors was redone, with the estimation period now mostly starting in 1986[46]. The revised regression results are presented in appendix B6. Note that the results are split into two groups: the cases where employment growth determines wage growth and the cases where wage growth determines employment growth[47].

Some changes occur for the aforementioned sectors. We find both correct sign switches (for example in case of the interest variable for Italian chemicals, the European import variable for total manufacturing in the Netherlands and its non-European counterpart for basic metals in the US and the Netherlands), coupled with incorrect ones - sometimes even within the same sectors (for example in case of the interest and non-European import variable for total manufacturing in the Netherlands and the latter variable for total manufacturing in the UK). So overall, no very new insights on coefficients are created here either.

Nevertheless, it remains quite difficult to be more specific about the results without actually knowing the values of the parameters $\alpha, \beta, \delta, \varepsilon, \eta, \theta, \phi$ and $\hat{B}$. This would be

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44 . Why these years were chosen has been set out in section 4.1.

45 . These sectors are the British chemical and leather products industries and fabricated metal products in Italy.

46 . Exceptions are the British food, drink and tobacco sector and the Italian chemical and Dutch basic metal industries. For these sectors the estimation period started in 1981 instead of 1986.

47 . The results of Granger causality tests in appendix B4 are still valid. For the sectors where we found structural breaks, this implies that in two British cases (chemicals and leather products) labour is taken as the independent variable and wages as an explanatory one, and the entire estimation procedure has to be redone (including testing for structural breaks). So in effect, the structural break tests that were carried out change the results for only seven sectors instead of nine.

possible if we could solve the system of equations we get for e_{0-4} numerically. We then start with a system of six equations for eight unknowns, which only can be solved if we could take some variables together in a handy way. We found no way of doing so. Therefore, the only thing we can do is to perform another 'growth accounting' exercise using the estimates of appendix B6. First however, we have to determine which sectors should be included in such an exercise.

We may recall from section 2 that there are several conditions which have to hold in order to fulfill the requirements of the model. Most of them are about (combinations of) single parameters (like $\eta > 0$ and $2(\alpha+\beta)-1 > 0$), which cannot be checked so easily. By looking at the coefficients of the two import variables (e_{1a} and e_{1b}) however, we can indirectly see whether $\delta, \varepsilon < 0$. If we take the 62 sectors for which labour growth explains wage growth, we find negative coefficients for e_{1a} and e_{1b} on only 5 occasions (cf. appendix B6). Furthermore, we can impose certain constraints on the parameter values so that e_3 is non-negative, e_2 is non-positive and e_0 and e_4 can take on any value (cf. section 2). Of the 5 sectors we got when checking the sign of the import variables, we then have three sectors left: total manufacturing in the US, fabricated metals products in the Netherlands and food, drink and tobacco in Spain. For these three sectors a similar 'growth accounting' exercise as in the previous section can be conducted. No such exercise will be conducted at the national level, since we have too little observations available within each country to do so.

Growth rates at the sectoral level are presented in table 4.9a (for the whole period) and 4.9b (for the period starting from the 1980s). Again, they yield the same conclusion reached in the perfect competition case: the period of the 1980s is less favourable in many respects. Most variables have smaller growth rates in the later period (except for fabricated metal products in the Netherlands, where 5 out of the 6 variables have larger growth rates).

Table 4.9a   Growth rates of explanatory and dependent variables over the estimation period given by SMPL.

Sector	SMPL	Technology	Capital	EU trade	Non-EU trade	Labour	Wages
USAZMT	74-92	0.0227	0.3942	0.0434	0.0671	-0.0047	0.0041
NLDZ38	74-92	0.0153	-0.2976	0.0354	0.0677	-0.0099	0.0037
ESPZLF	80-91	0.1110	-9.5446	0.1244	0.0275	-0.0085	0.0092

Table 4.9b   Growth rates of explanatory and dependent variables over the estimation period given by SMPL - from the 1980s onwards.

Sector	SMPL	Technology	Capital	EU trade	Non-EU trade	Labour	Wages
USAZMT	81-92	0.0218	0.1724	0.0395	0.0551	-0.0090	0.0001

NLDZ38	81-92	0.0177	0.0464	0.0440	0.0778	-0.0061	0.0033
ESPZLF	81-91	0.0940	-10.2546	0.1363	0.0556	-0.0063	0.0016

The final growth accounting results for both periods are given in table 4.10a and 4.10b. What we see (indicating the results for the 1980s between brackets), is that wage growth is dominated by labour growth in all but one sector (food, drink and tobacco in Spain in both periods). There, EU-trade (non-EU trade) is the most important. In answering the question whether technology or trade (EU and non-EU) drives wage growth most, we find 1 (1) times technology and 2 (2) times trade. When looking at variables that rank in second place, we find 1 (1) time technology, 1 (2) times trade and 1 (0) times capital movements. Overall, the importance of technology seems to have been rather steady over time, the influence of trade has increased slightly whereas labour matters most here too. Again, the constant term and the residual have not been taken into consideration.

Table 4.10a   Relative importance of dependent and explanatory variables in explaining *per sector* wage growth (in percentages).

Sector	SMPL	Constant (%)	Technology (%)	Capital (%)	EU trade (%)	Non-EU trade (%)	Labour (%)	Residual (%)
USAZMT	74-92	200.5	50.2	-14.6	-13.7	-9.8	-112.7	0.0
NLDZ38	74-92	544.7	19.8	21.0	-74.4	-116.5	-294.6	0.0
ESPZLF	80-91	125.5	64.3	99.8	-99.9	-66.8	-22.9	0.0

Table 4.10b   Relative importance of dependent and explanatory variables in explaining *per sector* wage growth (in percentages) - from the 1980s onwards.

Sector	SMPL	Constant (%)	Technology (%)	Capital (%)	EU trade (%)	Non-EU trade (%)	Labour (%)	Residual (%)
USAZMT	81-92	9514.0	2287.5	-302.2	-589.7	-384.0	-1022-6.1	-199.5
NLDZ38	81-92	625.4	26.3	-3.8	-106.0	-153.6	-206.5	-81.8
ESPZLF	81-91	705.2	306.1	602.7	-614.8	-760.5	-95.3	-43.3

The results for the 5 sectors for which the role of labour and wages has been interchanged on the basis of Granger causality tests do not change the conclusions reached above. No sector fulfills all the previous requirements. Although the small number of sectors for which all requirements are met may cast some doubt on the validity of our entire model, we should not forget the fact that we are still -and always will be- faced with an aggregation problem from the assumption of identical firms

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within one sector which clearly can have distorted our results (even if the model were correct in itself).

Yet, *altering the role of wage and labour growth* in *all* equations may be an interesting route to follow for in that way we can check the robustness of some of the conclusions reached previously[48]. In doing so, we find expected signs of the parameters for 8 sectors: fabricated metal products in the US, the UK and the Netherlands, food, drink and tobacco in Spain and the US, total manufacturing in the US, chemicals in Italy and stone, clay and glass in Spain. We will perform another 'growth accounting' exercise for these sectors. Table 4.11a and 4.11b list the relevant growth rates.

Table 4.11a   Growth rates of explanatory and dependent variables over the estimation period given by SMPL.

Sector	SMPL	Technology	Capital	EU trade	Non-EU trade	Labour	Wages
USAZ38	74-92	0.0193	0.3942	0.0531	0.0850	-0.0031	0.0063
USAZLF	74-92	0.0339	0.3942	0.0172	0.0053	-0.0026	0.0040
USAZMT	74-92	0.0227	0.3942	0.0434	0.0671	-0.0047	0.0041
GBRZ38	86-92	-0.0537	0.4908	0.0241	0.0315	-0.0150	-0.0024
ITAZ35	74-92	0.0520	0.6333	0.0442	0.0773	-0.0018	0.0156
NLDZ38	74-92	0.0153	-0.2976	0.0354	0.0677	-0.0099	0.0037
ESPZLF	80-92	0.1110	-9.5446	0.1244	0.0275	-0.0085	0.0092
ESPZOG	80-92	0.0470	-9.5446	0.0675	0.1094	-0.0221	-0.0159

Table 4.11b   Growth rates of explanatory and dependent variables over the estimation period given by SMPL - from the 1980s onwards.

Sector	SMPL	Technology	Capital	EU trade	Non-EU trade	Labour	Wages
USAZ38	81-92	0.0183	0.1724	0.0461	0.0799	-0.0121	-0.0003
USAZLF	81-92	0.0308	0.1724	0.0118	-0.0011	-0.0028	0.0020
USAZMT	81-92	0.0218	0.1724	0.0395	0.0551	-0.0090	0.0001
GBRZ38	86-92	-0.0537	0.4908	0.0241	0.0315	-0.0150	-0.0024
ITAZ35	80-92	0.0487	0.2304	0.0003	-0.0164	-0.0066	0.0108
NLDZ38	80-92	0.0177	0.0464	0.0440	0.0778	-0.0061	0.0033

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48 . No intermediate results will be shown here either, but they are available from one of the authors upon request. See also footnotes 35 and 41.

ESPZLF	81-91	0.0940	-10.2546	0.1363	0.0556	-0.0063	0.0016
ESPZOG	81-91	0.0341	-10.2546	0.0728	0.1121	-0.0219	-0.0200

From the above growth rates we can derive that for the 8 sectors included the recent period of the 1980s is less favourable for most variables: they have smaller growth rates more often than over the entire period (with the exception perhaps of the two trade variables). Especially the mean wage growth rate has fallen for all sectors except fabricated metal products in the UK in the last period (where we considered the same sample period). Thus we can reinforce the conclusions already made before. This raises the question what we find when analyzing the impact of all variables on wage growth (in percentages). Table 4.12a and 4.12b give an indication hereof.

Table 4.12a   Relative importance of dependent and explanatory variables in explaining *per sector* labour growth (in percentages).

Sector	SMPL	Constant (%)	Technology (%)	Capital (%)	EU trade (%)	Non-EU trade (%)	Wages (%)	Residual (%)
USAZ38	74-92	480.2	114.4	-44.4	-54.4	-215.9	-179.9	0.0
USAZLF	74-92	136.1	66.7	-6.5	-28.6	-7.6	-60.1	0.0
USAZMT	74-92	264.4	52.0	-20.3	-28.0	-101.0	-67.1	0.0
GBRZ38	86-92	663.5	-407.5	-102.1	-27.3	-34.4	7.9	0.0
ITAZ35	74-92	499.7	124.4	-6.5	-1.6	-46.3	-469.8	0.0
NLDZ38	74-92	164.5	3.9	6.5	-35.6	-14.9	-24.4	0.0
ESPZLF	80-92	262.9	79.5	62.5	-191.7	-35.4	-77.8	0.0
ESPZOG	80-92	63.6	16.9	15.3	-62.3	-0.3	66.8	0.0

Table 4.12b   Relative importance of dependent and explanatory variables in explaining *per sector* labour growth (in percentages) - from the 1980s onwards.

Sector	SMPL	Constant (%)	Technology (%)	Capital (%)	EU trade (%)	Non-EU trade (%)	Wages (%)	Residual (%)
USAZ38	81-92	121.9	27.5	-4.9	-12.0	-51.5	2.4	16.6
USAZLF	81-92	125.0	55.6	-2.6	-18.2	1.4	-27.1	-34.2
USAZMT	81-92	138.2	26.1	-4.6	-13.3	-43.4	-0.7	-2.2
GBRZ38	86-92	663.5	-407.5	-102.1	-27.3	-34.4	7.9	0.0
ITAZ35	80-92	133.8	31.2	-0.6	0.0	2.6	-87.4	20.4
NLDZ38	80-92	269.4	7.3	-1.7	-72.3	-28.0	-34.8	-40.0
ESPZLF	81-91	355.2	91.0	90.7	-283.8	-96.7	-18.7	-37.7

ESPZOG	81-91	64.4	12.4	16.6	-68.0	-0.3	85.2	-10.4

Wage growth has the largest impact on labour growth in 2 (2) out of 8 sectors. Trade explains a larger percentage of labour growth than technology in 5 (5) sectors. Given that non-EU trade sometimes even exhibits the most explanatory power (in 3 (3) cases during both periods), we may sustain the hypothesis that competition from the Asian NICs may have had a substantial impact over the years. There are not much differences when comparing the period of the 1970s and that of the 1980s as far as shifts in variables and their explanatory power with regard to labour growth are concerned.

Combining the sectors we worked with above with the 22 non-overlapping sectors we found in the perfect competition case, we have a group of 26 sectors (excluding overlap) for which either a perfect or an imperfect competition approach gives expected signs. The evidence that can be obtained from the imperfect competition model is that the main conclusions of the perfect competition model are endorsed. Specific factors are important and the role of both technology and trade in explaining wage and/or labour growth changes (with trade being influential in both periods) has clearly come forward.

5. Policy Conclusions

Protectionism or compensation mechanisms are probably the first policy instruments firms and sectoral institutions point to when trying to counterbalance the (financial) effects from losses from trade. From a model point of view, the effects of such measures are difficult to determine, for under perfect competition and the small country assumption protectionism is damaging. However, even from a theoretical perspective mechanisms like protectionism do seem somewhat short-sightened, for firms are not (enough) encouraged to strengthen their international competitive position over time, which may easily find them falling behind more and more (leading to rising compensations from governments). Case study evidence also indicates that protectionism may have adverse effects. For example, one policy action has been the Trade Adjustment Assistance Program in the US. Sachs and Shatz (1994) show that the sectoral distribution of compensations from that program are strongly correlated with the underlying sectoral distribution of employment losses (so that losing sectors are compensated adequately - which might make losing more attractive). Moreover, in our analysis of both the perfect and imperfect competition cases we found a total of 9 sectors that have a negative effect from adverse terms of trade or import movements and decreasing wages. These sectors are listed in table 5.1.

Table 5.1   Sectors that have adverse effects from trade and decreasing wage growth.

Country	Sector
USA	Textiles, footwear and leather products Basic metals

France	Stone, clay and glass
	Wood, cork and furniture
Italy	Textiles, footwear and leather products
Spain	Basic metals
	Total manufacturing
	Other manufacturing industries
	Wood, cork and furniture

Given the aforementioned policy measures and looking at these 9 sectors, one could ask the crucial question whether income policies for the short run and R&D subsidies for the long run would be a better means to help sectors coping with negative trade effects than protectionism. As international trade has gained in importance since the 1980s this question has become more urgent for several sectors (especially for leather products in the US and other manufacturing industries in Spain). Yet, note that one should also study the forces playing within each of these sectors separately before reaching a definite conclusion.

Of course, tax reductions for the less skilled or low income brackets are one variation on income policies that would invoke a problem at the household level rather than at the firm level.

However, it should be clear that behind the given interest rate there is a critical issue of interest rate determination and behind the given sectoral labour supply and wages there are labour market imperfections. Given the dominance of the labour supply variable in both the perfect and the imperfect competition version of our model, it seems reasonable to search for a diagnosis and a solution to trade problems in the labour market sphere (for example by ensuring a better match between the skills necessary to perform a certain job and the skills workers have or by loosening the hiring and firing conditions of workers). There, specific factors have turned out to be a robust variable that is more important than both technology and trade.

6. Limitations and Suggestions for Further Research

The major drawback of a trade-theoretic approach is that international trade models are not related to models explaining unemployment and vice versa. This is the reason why economists currently have to choose between a closed economy labour market imperfections approach and a trade approach. The integration of the two must be left for further research (provided that major intertemporal changes in the labour market situation occur). Moreover, due to the simplifying assumption of constant price elasticities of demand and therefore of mark-ups over marginal costs, we cannot include their change across the business cycle without considerably complicating the model.

An incentive for further research from our analysis follows from three results. First, in the perfect competition case the constant term in our model was absent but the empirics tell us we should have one (thus indicating that there are possibly other explanatory variables that should have been included in the model). Second, the model would predict relations between the coefficients, but the corresponding constraint has been rejected by statistical tests. Third, we could move from the firm level to the sectoral level only under the assumption of identical firms, which in all likelihood is

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fairly unrealistic. This aggregation problem will (probably) remain even when switching to different types of production functions with constant or variable elasticities of substitution. Yet, even if our model and estimation results are rather crude to give a 'robust' answer to the question what factor drives sectoral wage growth most strongly (technology or trade), our results do have their relevance. In particular, the supply of specific factors turned out to matter in both models (with the results being very robust in that respect) and the changing role of international trade (becoming more important than technology in the 1980s according to the perfect competition model) has been clearly illustrated.

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APPENDIX A1

Data Description

All data except the Spanish, data on long-term interest rates and data on technical change are taken from the OECD's ISDB database. Employment data contain the number of employees, excluding the self-employed. Wages include all payments made to wage and salary earners[1], including social security payments. Both sectoral and national prices are also calculated from the ISDB database, via value added at market prices (with 1985 as a base year). Technically speaking, it would have been preferable to use value added at factor costs to construct price levels for this would exclude taxes and subsidies which may differ between countries. Only for Great-Britain value added was available at factor costs in the database (and subsequently used). All variables are expressed in national price levels.

Interest data are taken from the International Financial Statistics Yearbook published by the IMF (from 1990 and 1995 publications). The long-term government bond yield was taken as a proxy for the long-term interest rate[2].

As a proxy of technical change, R&D expenditures are used[3]. These data are taken from the OECD's ANBERD database.

For Spain, employment, wage and sectoral price levels are calculated from the OECD's STAN database. Spanish employment figures do include the self-employed. R&D data are again taken from ANBERD, whereas both national price levels (the GDP deflator) and the interest rate data are taken from the International Financial Statistics Yearbook. All import data (for all countries) come from the OECD's BITRA database.

The sectors included in the analysis are the 2-digit ISIC sectors 31 through 39, which define total manufacturing (ISIC sector 30). In the remainder, we will denote these sectors by means of an abbreviation. These abbreviations are:

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1 . Which also do not include the self-employed.

2 . As suggested by the IMF itself, cf. the *International Financial Statistics Yearbook 1995* (1995), pp. *xv-xvi*.

3 . One may claim that because R&D personnel is included in the labour variable our regression results are biased (since we are also using R&D expenditures as a separate variable). However, this only means that there may be some collinearity between the technology and labour variable (which is justified from a theoretical point of view). Regression results do not become biased because of collinearity. See also section 3 of the main text.

Table A.1.1   Sector classification and abbreviations.

ISIC code	Abbreviation	Sector description
30	ZMT	Total manufacturing
31	ZLF	Food, drink and tobacco
32	ZLX	Textiles, footwear and leather
33	ZOW	Wood, cork and furniture
34	ZOP	Paper and printing
35	Z35	Chemicals
36	ZOG	Stone, clay and glass
37	ZMB	Basic metals
38	Z38	Fabricated metal products, machinery and equipment
39	ZOO	Other manufacturing industries

Furthermore, the following country codes will be used from here onwards:

Table A.1.2   Country codes.

Country	Country code
USA	USA
Former West-Germany	DEU
France	FRA
Great-Britain	GBR
Netherlands	NLD
Italy	ITA
Spain	ESP

In the regression analyses three sectors were dropped because of missing R&D data: the Dutch and Italian wood, cork and furniture sector and the Dutch other manufacturing industries.

APPENDIX A2

Growth Rates

Below, an overview of mean growth rates of the variables included in our model can be found. The period over which means are taken is motivated by the estimation periods of the 'final' regressions depicted in appendix B3. The table is divided into two parts: first, the results for the US, Germany, France and Great-Britain are shown, whereafter the results for the Netherlands, Spain and Italy follow.

Table A.2.1 Mean growth rates for the US, Germany, France and Great-Britain (sample period according to appendix B3, variable definitions according to the regression equation and appendix B1).

Sector	L	W	P	A
USAZ35	0.0063	0.0179	-0.0019	0.0455
USAZ38	-0.0036	0.0062	-0.0156	0.0126
USAZLX	-0.0199	-0.0145	-0.0265	0.032
USAZOG	-0.0134	-0.008	-0.0076	0.0105
USAZOP	0.0108	0.0179	0.0052	0.0522
USAZLF	-0.002	0.0048	0.0023	0.0294
USAZMB	-0.0286	-0.0222	0.0015	-0.0049
USAZMT	-0.0045	0.0047	-0.0085	0.0187
USAZOO	-0.0067	0.0018	-0.0048	0.0041
USAZOW	0	0.0046	-0.0056	0.0209
DEUZMT	-0.008	0.0138	-0.0026	0.042
DEUZ35	0.0034	0.0248	0.0026	0.0308
DEUZ38	0.0018	0.026	-0.0012	0.0519
DEUZLF	-0.0034	0.0099	-0.0038	0.0651
DEUZLX	-0.0435	-0.0222	-0.008	0.0583
DEUZMB	-0.0157	-0.0003	-0.0135	0.0026
DEUZOG	-0.0178	0.0009	-0.0064	0.0684
DEUZOP	-0.0031	0.0153	0.0025	0.0789
DEUZOW	-0.006	0.0091	0.0086	0.4281
FRAZLF	0.0037	0.017	-0.0049	0.073
FRAZLX	-0.0393	-0.0195	-0.0019	-0.0056
FRAZMB	-0.0257	-0.0219	-0.0196	0.0791
FRAZOG	-0.0244	-0.0037	0.001	0.0215

Sector	L	W	P	A
FRAZOO	-0.0053	0.0034	0.0008	0.0752
FRAZOP	-0.0016	0.018	0.0087	0.0227
GBRZ38	-0.0244	-0.0067	-0.0073	-0.1341
GBRZLF	-0.0212	0.0046	-0.0047	-0.0886
GBRZMT	-0.0283	-0.0047	-0.0061	0.0127
GBRZOG	-0.0333	-0.009	0.0032	-0.0369
GBRZOO	-0.0253	0.0209	0.0359	-0.0019
GBRZOW	-0.0152	-0.0077	-0.0007	-0.0019
GBRZOP	-0.0101	0.0107	0.006	-0.0022
GBRZMB	-0.0571	-0.0457	-0.0206	-0.0914
FRAZ35	-0.006	0.003	-0.0079	0.0458
FRAZ38	-0.0149	0.0004	-0.0035	0.0507
FRAZOW	-0.0235	-0.0082	-0.0051	0.0779
DEUZOO	-0.0216	0.0013	-0.0002	0.0243
FRAZMT	-0.0095	-0.0005	-0.0007	0.044
GBRZ35	-0.007	0.0264	-0.021	0.0692
GBRZLX	-0.0376	-0.0053	0	-0.0537
DEURATE1	0.0696	**SMPL:** 74-93		
USARATE	0.3643	74-93		
DEURATE2	0.0734	74-92		
GBRRATE1	0.259	74-92		
FRARATE1	0.5437	74-91		
GBRRATE2	0.0303	74-89		
FRARATE2	-0.2758	80-91		
DEURATE3	0.0447	81-92		
GBRRATE3	0.4908	86-92		
FRARATE3	0.1147	86-91		

Table A.2.2 Mean growth rates for the Netherlands, Spain and Italy (sample period according to appendix B3, variable definitions according to the regression equation and appendix B1).

Sector	L	W	P	A
NLDZMT	-0.0123	0.0028	-0.0095	0.0187
NLDZOP	-0.0006	0.0134	-0.0064	0.0126
NLDZLF	-0.0115	0.0042	-0.0099	0.0415
NLDZLX	-0.0495	-0.0353	-0.0054	-0.0074
NLDZMB	-0.0139	-0.0015	-0.0083	0.0234
NLDZ35	0.0026	0.0137	-0.0052	0.0223
NLDZ38	-0.0098	-0.0007	0.0007	0.019
NLDZOG	-0.0135	0.0036	0.0084	0.0585
ESPZ35	-0.0184	-0.0056	-0.0019	0.0824
ESPZ38	-0.0001	-0.0026	-0.0026	0.1399
ESPZLF	-0.0085	0.0092	-0.0188	0.111
ESPZLX	-0.0333	-0.0361	-0.0088	0.1199
ESPZMB	-0.0399	-0.0323	-0.0339	0.0173
ESPZMT	-0.0138	-0.0078	-0.0089	0.1139
ESPZOG	-0.0221	-0.0159	0.0005	0.047
ESPZOO	-0.0129	0.0017	-0.0489	0.5407
ESPZOP	0.0099	0.023	0.0089	0.1171
ESPZOW	-0.0189	-0.0173	-0.0047	0.5935
ITAZ35	-0.0051	0.0038	-0.0466	0.0545
ITAZLF	-0.0121	0.0002	-0.0191	0.0967
ITAZMB	-0.0369	-0.0257	-0.0519	0.0418
ITAZMT	-0.0153	-0.0036	-0.0256	0.0752
ITAZOG	-0.0086	0.0059	-0.0037	0.1213
ITAZOP	-0.0094	0.0034	-0.0158	0.0204
ITAZOO	-0.0161	0.0002	0.0044	0.2288
ITAZOW	-0.0211	-0.0102	-0.0148	-0.0148
ITAZ38	-0.025	-0.01	-0.0245	0.056
ITAZLX	-0.0197	-0.0107	-0.0176	0.3001
NLDRATE1	-0.292	**SMPL:** 74-93		
ITARATE1	0.5662	74-94		
ESPRATE	-9.5446	80-91		

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Sector				
ITARATE2	0.1873	**SMPL:** 81-94		
NLDRATE2	0.0287	81-93		

Basic regressions/Testing for structural breaks

Regression equation is:

$$w_{ijt} = \gamma_{0ij} + \gamma_{1ij}\, p_{ijt} + \gamma_{2ij}\, r_{jt} + \gamma_{3ij}\, A_{ijt} + \gamma_{4ij}\, L_{ijt} + \varepsilon_{ijt}\,,$$

where, i = sector subscript;
j = country subscript;
w,p,r,A,L are defined cf. the basic perfect competition model;
ε = random disturbance term.

Sector and country classifications are defined in table A.1.1 and A.1.2 (**SECTOR**). The estimation period is given under **SMPL**. **T** indicates the value of the T-statistic for the null hypothesis that $\gamma_k = 0$ (k = 0..4). Chow tests are carried out in (roughly) 1981 and 1985 (exact dates are given in the main text, pp. 8-9). p_m denotes the p-value of the corresponding F-statistic F_m (m = 81,85). $\overline{R}^2$ denotes the value of the adjusted R² statistic, whereas **DW** contains the value of the Durbin-Watson statistic for (first-order) serial correlation in the disturbance term ε_{ijt}. All regression equations are estimated with a heteroscedasticity-consistent covariance matrix. If an entry cannot be calculated, it is denoted by ***.

SECTOR	SMPL	γ_0	$T_{\gamma 0}$	γ_3	$T_{\gamma 3}$	γ_2	$T_{\gamma 2}$	γ_1	$T_{\gamma 1}$	γ_4	$T_{\gamma 4}$	$\overline{R}^2$	DW	F_{81}	p_{81}	F_{85}	p_{85}
DEUZ35	74-92	0.02	(3.76)	0.13	(1.82)	0.03	(2.37)	0.12	(0.70)	0.74	(3.40)	0.57	1.74	1.1	0.42	0.4	0.84
DEUZ38	74-92	0.02	(3.38)	0.02	(0.35)	0.01	(0.83)	0.19	(0.55)	1.02	(8.01)	0.66	1.29	3.0	0.07	0.3	0.88
DEUZLF	74-92	0.01	(4.80)	0.02	(1.03)	0.00	(0.36)	-0.08	(1.55)	1.25	(12.66)	0.84	1.96	0.8	0.57	0.8	0.57
DEUZLX	74-92	0.02	(3.05)	-0.00	(0.41)	0.01	(0.79)	-0.15	(0.90)	1.01	(7.59)	0.82	1.25	0.9	0.51	0.1	1.00
DEUZMB	74-92	0.02	(3.35)	-0.04	(0.63)	0.03	(2.18)	0.38	(3.61)	1.06	(3.99)	0.63	2.25	0.5	0.79	0.6	0.71
DEUZMT	74-93	0.02	(4.55)	0.08	(1.94)	0.01	(1.06)	-0.22	(1.04)	1.07	(12.12)	0.78	1.40	2.8	0.08	0.2	0.94
DEUZOG	74-92	0.02	(3.41)	0.02	(0.71)	0.02	(1.01)	0.04	(0.20)	1.24	(8.17)	0.77	1.81	1.6	0.24	0.8	0.58
DEUZOO	74-92	0.03	(2.74)	-0.00	(1.70)	-0.01	(0.28)	-0.22	(2.08)	0.98	(5.73)	0.65	1.83	5.6	0.01	0.4	0.85
DEUZOP	74-92	0.02	(3.34)	0.00	(0.17)	0.01	(0.76)	0.14	(0.88)	0.81	(4.04)	0.60	1.52	1.1	0.41	0.3	0.91
DEUZOW	74-92	0.02	(2.83)	0.00	(0.14)	0.02	(0.90)	-0.14	(0.49)	1.29	(11.80)	0.73	2.44	0.7	0.66	0.4	0.83
FRAZ35	74-91	0.03	(1.73)	-0.08	(0.33)	-0.00	(0.53)	-0.09	(0.66)	1.59	(1.64)	0.14	1.14	16.7	0.00	2.8	0.10
FRAZ38	74-91	0.02	(1.20)	0.19	(0.74)	0.00	(0.52)	0.13	(0.23)	1.43	(3.42)	0.49	1.09	12.4	0.00	2.4	0.13
FRAZLF	74-91	0.01	(1.19)	0.04	(0.37)	0.00	(1.13)	-0.27	(0.50)	0.43	(0.47)	-0.20	1.11	3.4	0.06	0.6	0.73
FRAZLX	74-91	0.02	(1.32)	0.01	(0.18)	0.00	(0.87)	-0.22	(1.39)	1.16	(2.67)	0.29	1.50	1.6	0.28	0.3	0.90
FRAZMB	74-91	0.00	(0.02)	0.03	(0.38)	0.00	(0.93)	0.13	(0.71)	0.93	(0.94)	0.21	2.64	0.1	0.99	0.5	0.77
FRAZMT	74-91	0.01	(2.02)	0.20	(1.18)	0.00	(1.83)	-0.54	(2.92)	1.30	(3.42)	0.62	1.05	9.9	0.00	5.7	0.02
FRAZOG	74-91	0.02	(1.40)	0.03	(0.32)	-0.01	(3.43)	0.36	(1.81)	0.72	(3.14)	0.33	2.11	3.4	0.06	0.7	0.64
FRAZOO	74-91	0.00	(0.14)	0.01	(0.54)	0.00	(1.55)	0.04	(0.33)	0.19	(0.42)	-0.19	1.76	1.3	0.36	1.9	0.19
FRAZOP	74-91	0.02	(8.09)	-0.21	(4.10)	-0.00	(6.29)	0.18	(2.29)	0.17	(0.90)	0.81	2.29	2.1	0.17	0.6	0.67
FRAZOW	74-91	0.02	(2.15)	-0.03	(0.82)	0.00	(0.56)	0.44	(2.80)	0.71	(6.05)	0.33	1.83	4.2	0.04	0.3	0.92
GBRZ35	74-92	0.01	(1.00)	0.16	(0.82)	-0.00	(0.23)	0.22	(1.10)	0.47	(2.29)	0.20	2.42	1.6	0.25	3.6	0.05
GBRZ38	74-92	0.00	(0.11)	-0.01	(0.37)	-0.00	(0.33)	0.17	(0.78)	0.33	(1.25)	-0.00	1.64	3.1	0.07	1.7	0.24
GBRZLF	74-92	0.01	(0.34)	0.07	(0.35)	-0.00	(0.17)	0.06	(0.58)	-0.15	(0.42)	-0.21	2.35	1.9	0.20	2.2	0.14
GBRZLX	74-92	0.04	(1.71)	0.30	(1.08)	0.00	(0.29)	0.33	(1.15)	0.67	(2.86)	0.50	2.20	11.1	0.00	4.2	0.03
GBRZMB	74-89	0.03	(0.63)	0.42	(1.01)	0.00	(0.83)	0.12	(0.74)	0.44	(1.57)	-0.09	1.35	1.9	0.23	***	***
GBRZMT	74-92	0.02	(1.18)	0.04	(0.24)	-0.00	(0.06)	0.29	(1.21)	0.67	(3.39)	0.28	2.01	2.9	0.08	2.8	0.08
GBRZOG	74-92	0.01	(1.29)	0.35	(2.85)	0.00	(0.19)	0.25	(2.22)	0.31	(1.01)	0.52	1.12	1.1	0.44	2.0	0.17
GBRZOO	74-92	-0.00	(0.27)	0.10	(1.19)	-0.01	(1.41)	0.71	(4.72)	-0.07	(0.56)	0.59	1.68	1.5	0.29	1.8	0.22
GBRZOP	74-92	0.02	(2.02)	0.10	(1.73)	-0.01	(2.04)	0.43	(2.18)	0.77	(3.22)	0.28	1.83	0.9	0.52	0.7	0.63
GBRZOW	74-92	0.00	(0.47)	0.06	(0.81)	0.00	(0.35)	0.19	(1.41)	0.76	(5.72)	0.53	2.27	1.4	0.32	0.7	0.66
USAZ35	74-93	0.01	(1.85)	0.08	(0.94)	-0.00	(2.12)	0.06	(1.01)	0.82	(6.34)	0.75	2.18	***	***	0.4	0.85
USAZ38	74-93	0.01	(1.73)	0.08	(1.20)	-0.00	(1.19)	0.01	(0.04)	0.88	(9.02)	0.89	1.50	***	***	0.8	0.59

SECTOR	SMPL	γ_0	T_{γ_0}	γ_3	T_{γ_3}	γ_2	T_{γ_2}	γ_1	T_{γ_1}	γ_4	T_{γ_4}	$\bar{R}^2$	DW	F_{81}	p_{81}	F_{85}	p_{85}
USAZLF	74-93	0.01	(2.56)	0.02	(0.62)	-0.00	(1.96)	-0.11	(1.65)	0.77	(4.42)	0.60	2.16	***	***	0.5	0.76
USAZLX	74-93	0.01	(1.86)	0.04	(1.26)	-0.00	(1.01)	0.17	(1.17)	1.11	(31.89)	0.95	1.73	***	***	1.2	0.37
USAZMB	74-93	0.01	(2.01)	0.04	(0.85)	-0.00	(1.97)	0.06	(1.79)	1.05	(16.36)	0.92	1.69	***	***	1.6	0.25
USAZMT	74-93	0.01	(2.55)	0.04	(0.75)	-0.00	(1.37)	-0.03	(0.15)	0.94	(12.60)	0.90	2.04	***	***	0.3	0.88
USAZOG	74-93	0.01	(1.06)	0.04	(1.23)	-0.00	(0.65)	-0.01	(0.07)	1.00	(9.28)	0.88	2.52	***	***	0.1	1.00
USAZOO	74-93	0.01	(2.38)	0.06	(1.39)	-0.00	(0.04)	-0.05	(0.49)	0.94	(7.38)	0.84	2.00	***	***	0.3	0.91
USAZOP	74-93	0.01	(1.92)	-0.02	(0.53)	-0.00	(1.65)	-0.01	(0.04)	1.01	(6.70)	0.69	2.08	***	***	0.2	0.94
USAZOW	74-93	0.01	(2.11)	0.02	(1.00)	-0.00	(1.99)	0.13	(2.05)	0.99	(24.18)	0.98	2.08	***	***	0.4	0.87
ESPZ35	80-91	0.02	(3.21)	-0.03	(3.10)	0.00	(2.67)	0.16	(3.59)	0.96	(9.00)	0.90	1.31	***	***	7.3	0.12
ESPZ38	80-91	-0.01	(0.59)	0.02	(0.31)	0.00	(0.03)	0.06	(0.25)	1.10	(4.34)	0.64	1.59	***	***	10.9	0.09
ESPZLF	80-91	0.01	(1.13)	0.06	(0.66)	-0.00	(3.95)	0.25	(0.71)	0.37	(0.96)	-0.02	1.55	***	***	1.1	0.54
ESPZLX	80-91	-0.00	(0.19)	-0.05	(1.81)	-0.00	(0.73)	-0.02	(0.11)	0.89	(6.06)	0.72	1.90	***	***	2.5	0.31
ESPZMB	80-91	0.01	(0.88)	0.01	(0.40)	-0.00	(1.11)	0.13	(1.18)	1.04	(4.50)	0.75	2.22	***	***	3.0	0.27
ESPZMT	80-91	0.01	(0.72)	0.02	(0.57)	0.00	(0.22)	0.39	(2.35)	0.90	(6.69)	0.78	1.16	***	***	4.4	0.20
ESPZOG	80-91	-0.00	(0.13)	0.05	(1.11)	0.00	(0.02)	0.32	(4.23)	0.79	(9.96)	0.88	2.15	***	***	2.7	0.29
ESPZOO	80-91	0.02	(0.60)	0.01	(1.18)	0.00	(0.52)	0.13	(0.69)	0.80	(6.32)	0.62	0.91	***	***	0.7	0.68
ESPZOP	80-91	0.01	(2.02)	0.01	(0.38)	-0.00	(1.68)	-0.05	(0.41)	0.69	(7.48)	0.85	1.55	***	***	1.0	0.57
ESPZOW	80-91	-0.01	(0.67)	0.01	(0.77)	-0.00	(0.59)	0.32	(1.48)	0.78	(3.48)	0.73	1.50	***	***	15.1	0.06
ITAZ35	74-94	0.02	(2.69)	0.06	(0.93)	0.00	(0.26)	0.11	(0.95)	1.07	(6.56)	0.59	1.83	0.7	0.6	0.7	0.63
ITAZ38	74-94	0.02	(3.49)	0.01	(0.09)	0.00	(2.19)	0.39	(3.66)	1.05	(6.24)	0.78	2.25	4.4	0.02	0.9	0.49
ITAZLF	74-94	0.03	(4.66)	-0.03	(1.20)	0.00	(1.44)	0.45	(2.77)	1.10	(6.82)	0.57	2.34	1.0	0.47	1.6	0.24
ITAZLX	74-94	0.01	(1.29)	-0.00	(0.10)	0.00	(1.09)	0.30	(1.56)	0.76	(2.77)	0.34	2.04	9.2	0.00	0.2	0.97
ITAZMB	74-94	0.01	(1.00)	-0.00	(0.06)	0.00	(0.37)	0.05	(1.07)	0.93	(2.69)	0.59	2.92	2.0	0.15	0.2	0.94
ITAZMT	74-94	0.02	(3.32)	0.04	(0.58)	0.00	(1.07)	0.44	(2.87)	1.00	(5.68)	0.66	1.87	1.4	0.31	0.5	0.74
ITAZOG	74-94	0.02	(2.25)	0.00	(0.38)	0.00	(1.65)	-0.02	(0.32)	0.91	(5.46)	0.66	1.68	2.4	0.10	1.3	0.33
ITAZOO	74-94	0.02	(2.72)	-0.01	(0.69)	0.01	(4.31)	0.06	(2.54)	0.96	(6.65)	0.75	2.22	1.7	0.21	0.6	0.71
ITAZOP	74-94	0.01	(2.49)	0.00	(0.09)	0.00	(3.44)	-0.07	(1.16)	0.81	(7.64)	0.53	1.82	0.3	0.88	0.3	0.88
NLDZ35	81-93	0.01	(2.62)	-0.07	(1.21)	0.01	(0.71)	0.08	(1.60)	1.15	(3.58)	0.53	1.82	***	***	***	***
NLDZ38	81-93	0.01	(1.57)	-0.00	(0.14)	0.01	(0.53)	0.67	(4.24)	0.85	(7.48)	0.86	1.51	***	***	***	***
NLDZLF	74-93	0.01	(1.69)	0.00	(0.08)	0.00	(2.84)	-0.10	(1.24)	0.71	(2.91)	0.05	1.60	0.3	0.89	1.3	0.34
NLDZLX	74-93	-0.00	(0.22)	-0.02	(0.54)	-0.00	(1.19)	0.28	(1.62)	0.66	(5.65)	0.73	1.78	1.8	0.20	1.1	0.42
NLDZMB	74-93	0.01	(0.95)	0.14	(2.25)	0.00	(3.93)	0.09	(1.71)	0.66	(1.91)	0.54	1.38	2.5	0.10	0.3	0.89
NLDZMT	74-93	0.01	(2.22)	0.10	(1.49)	-0.00	(1.20)	0.02	(0.13)	0.89	(5.45)	0.56	1.26	1.7	0.22	0.3	0.89
NLDZOG	81-93	0.01	(2.32)	-0.02	(1.29)	-0.01	(0.75)	0.60	(8.57)	0.60	(7.23)	0.96	1.40	***	***	***	***
NLDZOP	74-93	0.02	(4.29)	-0.01	(0.59)	0.00	(0.88)	0.10	(0.69)	1.03	(5.86)	0.72	2.00	2.0	0.1	2.7	0.08

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Testing the significance of the constant term

Regression equation identical to appendix B1. When found to be significant, structural breaks are taken into account. All equations are estimated with a heteroscedasticity-consistent covariance matrix. All other definitions according to appendix B1.

SECTOR	SMPL	γ_0	$T_{\gamma 0}$	γ_3	$T_{\gamma 3}$	γ_2	$T_{\gamma 2}$	γ_1	$T_{\gamma 1}$	γ_4	$T_{\gamma 4}$	$\overline{R}^2$	DW
DEUZ35	74-92	0.02	(3.76)	0.13	(1.82)	0.03	(2.37)	0.12	(0.70)	0.74	(3.40)	0.57	1.74
DEUZ38	74-92	0.02	(3.38)	0.02	(0.35)	0.01	(0.83)	0.19	(0.55)	1.02	(8.01)	0.66	1.29
DEUZLF	74-92	0.01	(4.80)	0.02	(1.03)	0.00	(0.36)	-0.08	(1.55)	1.25	(12.66)	0.84	1.96
DEUZLX	74-92	0.02	(3.05)	-0.00	(0.41)	0.01	(0.79)	-0.15	(0.90)	1.01	(7.59)	0.82	1.25
DEUZMB	74-92	0.02	(3.35)	-0.04	(0.63)	0.03	(2.18)	0.38	(3.61)	1.06	(3.99)	0.63	2.25
DEUZMT	74-93	0.02	(4.55)	0.08	(1.94)	0.01	(1.06)	-0.22	(1.04)	1.07	(12.12)	0.78	1.40
DEUZOG	74-92	0.02	(3.41)	0.02	(0.71)	0.02	(1.01)	0.04	(0.20)	1.24	(8.17)	0.77	1.81
DEUZOO	81-92	0.02	(5.40)	0.01	(0.09)	0.01	(1.04)	-0.51	(2.77)	0.71	(5.49)	0.87	2.61
DEUZOP	74-92	0.02	(3.34)	0.00	(0.17)	0.01	(0.76)	0.14	(0.88)	0.81	(4.04)	0.60	1.52
DEUZOW	74-92	0.02	(2.83)	0.00	(0.14)	0.02	(0.90)	-0.14	(0.49)	1.29	(11.80)	0.73	2.44
FRAZ35	80-91	-0.00	(0.33)	0.16	(0.96)	-0.01	(3.83)	0.03	(0.28)	0.58	(2.85)	0.35	2.74
FRAZ38	80-91	-0.01	(1.80)	0.42	(3.41)	-0.00	(1.05)	-0.56	(3.15)	0.73	(3.96)	0.82	2.63
FRAZLF	74-91	0.01	(1.19)	0.04	(0.37)	0.00	(1.13)	-0.27	(0.50)	0.43	(0.47)	-0.20	1.11
FRAZLX	74-91	0.02	(1.32)	0.01	(0.18)	0.00	(0.87)	-0.22	(1.39)	1.16	(2.67)	0.29	1.50
FRAZMB	74-91	0.00	(0.02)	0.03	(0.38)	0.00	(0.93)	0.13	(0.71)	0.93	(0.94)	0.21	2.64
FRAZMT	86-91	0.03	(2.10)	-0.36	(1.42)	0.01	(1.05)	-0.81	(7.27)	1.46	(3.01)	0.92	3.27
FRAZOG	74-91	0.02	(1.40)	0.03	(0.32)	-0.01	(3.43)	0.36	(1.81)	0.72	(3.14)	0.33	2.11
FRAZOO	74-91	0.00	(0.14)	0.01	(0.54)	0.00	(1.55)	0.04	(0.33)	0.19	(0.42)	-0.19	1.76
FRAZOP	74-91	0.02	(8.09)	-0.21	(4.10)	-0.00	(6.29)	0.18	(2.29)	0.17	(0.90)	0.81	2.29
FRAZOW	80-91	0.01	(1.57)	-0.00	(0.03)	-0.00	(1.90)	0.17	(1.22)	0.81	(12.31)	0.75	2.58
GBRZ35	74-92	0.01	(1.00)	0.16	(0.82)	-0.00	(0.23)	0.22	(1.10)	0.47	(2.29)	0.20	2.42
GBRZ35	86-92	0.03	(1.10)	0.20	(0.91)	-0.02	(4.24)	0.45	(2.53)	-0.37	(0.40)	0.44	3.05
GBRZ38	74-92	0.00	(0.11)	-0.01	(0.37)	-0.00	(0.33)	0.17	(0.78)	0.33	(1.25)	-0.00	1.64
GBRZLF	74-92	0.01	(0.34)	0.07	(0.35)	-0.00	(0.17)	0.06	(0.58)	-0.15	(0.42)	-0.21	2.35
GBRZLX	86-92	0.00	(0.06)	-0.16	(0.26)	-0.02	(79.52)	1.84	(3.95)	0.17	(4.34)	0.98	0.72
GBRZMB	74-89	0.03	(0.63)	0.42	(1.01)	0.00	(0.83)	0.12	(0.74)	0.44	(1.57)	-0.09	1.35
GBRZMT	74-92	0.02	(1.18)	0.04	(0.24)	-0.00	(0.06)	0.29	(1.21)	0.67	(3.39)	0.28	2.01
GBRZOG	74-92	0.01	(1.29)	0.35	(2.85)	0.00	(0.19)	0.25	(2.22)	0.31	(1.01)	0.52	1.12
GBRZOO	74-92	-0.00	(0.27)	0.10	(1.19)	-0.01	(1.41)	0.71	(4.72)	-0.07	(0.56)	0.59	1.68
GBRZOP	74-92	0.02	(2.02)	0.10	(1.73)	-0.01	(2.04)	0.43	(2.18)	0.77	(3.22)	0.28	1.83
GBRZOW	74-92	0.00	(0.47)	0.06	(0.81)	0.00	(0.35)	0.19	(1.41)	0.76	(5.72)	0.53	2.27
USAZ35	74-93	0.01	(1.85)	0.08	(0.94)	-0.00	(2.12)	0.06	(1.01)	0.82	(6.34)	0.75	2.18
USAZ38	74-93	0.01	(1.73)	0.08	(1.20)	-0.00	(1.19)	0.01	(0.04)	0.88	(9.02)	0.89	1.50
USAZLF	74-93	0.01	(2.56)	0.02	(0.62)	-0.00	(1.96)	-0.11	(1.65)	0.77	(4.42)	0.60	2.16
USAZLX	74-93	0.01	(1.86)	0.04	(1.26)	-0.00	(1.01)	0.17	(1.17)	1.11	(31.89)	0.95	1.73
USAZMB	74-93	0.01	(2.01)	0.04	(0.85)	-0.00	(1.97)	0.06	(1.79)	1.05	(16.36)	0.92	1.69
USAZMT	74-93	0.01	(2.55)	0.04	(0.75)	-0.00	(1.37)	-0.03	(0.15)	0.94	(12.60)	0.90	2.04
USAZOG	74-93	0.01	(1.06)	0.04	(1.23)	-0.00	(0.65)	-0.01	(0.07)	1.00	(9.28)	0.88	2.52
USAZOO	74-93	0.01	(2.38)	0.06	(1.39)	-0.00	(0.04)	-0.05	(0.49)	0.94	(7.38)	0.84	2.00
USAZOP	74-93	0.01	(1.92)	-0.02	(0.53)	-0.00	(1.65)	-0.01	(0.04)	1.01	(6.70)	0.69	2.08
USAZOW	74-93	0.01	(2.11)	0.02	(1.00)	-0.00	(1.99)	0.13	(2.05)	0.99	(24.18)	0.98	2.08
ESPZ35	80-91	0.02	(3.21)	-0.03	(3.10)	0.00	(2.67)	0.16	(3.59)	0.96	(9.00)	0.90	1.31
ESPZ38	80-91	-0.01	(0.59)	0.02	(0.31)	0.00	(0.03)	0.06	(0.25)	1.10	(4.34)	0.64	1.59
ESPZLF	80-91	0.01	(1.13)	0.06	(0.66)	-0.00	(3.95)	0.25	(0.71)	0.37	(0.96)	-0.02	1.55
ESPZLX	80-91	-0.00	(0.19)	-0.05	(1.81)	-0.00	(0.73)	-0.02	(0.11)	0.89	(6.06)	0.72	1.90
ESPZMB	80-91	0.01	(0.88)	0.01	(0.40)	-0.00	(1.11)	0.13	(1.18)	1.04	(4.50)	0.75	2.22
ESPZMT	80-91	0.01	(0.72)	0.02	(0.57)	0.00	(0.22)	0.39	(2.35)	0.90	(6.69)	0.78	1.16
ESPZOG	80-91	-0.00	(0.13)	0.05	(1.11)	0.00	(0.02)	0.32	(4.23)	0.79	(9.96)	0.88	2.15
ESPZOO	80-91	0.02	(0.60)	0.01	(1.18)	0.00	(0.52)	0.13	(0.69)	0.80	(6.32)	0.62	0.91
ESPZOP	80-91	0.01	(2.02)	0.01	(0.38)	-0.00	(1.68)	-0.05	(0.41)	0.69	(7.48)	0.85	1.55
ESPZOW	80-91	-0.01	(0.67)	0.01	(0.77)	-0.00	(0.59)	0.32	(1.48)	0.78	(3.48)	0.73	1.50

SECTOR	SMPL	γ_0	T_{γ_0}	γ_3	T_{γ_3}	γ_2	T_{γ_2}	γ_1	T_{γ_1}	γ_4	T_{γ_4}	$\overline{R}^2$	DW
ITAZ35	74-94	0.02	(2.69)	0.06	(0.93)	0.00	(0.26)	0.11	(0.95)	1.07	(6.56)	0.59	1.83
ITAZ38	81-94	0.02	(2.33)	0.08	(1.64)	0.00	(0.28)	0.29	(1.34)	1.00	(7.14)	0.77	2.32
ITAZLF	74-94	0.03	(4.66)	-0.03	(1.20)	0.00	(1.44)	0.45	(2.77)	1.10	(6.82)	0.57	2.34
ITAZLX	81-94	0.01	(0.84)	-0.00	(0.20)	-0.00	(0.80)	0.17	(0.72)	0.72	(4.15)	0.34	1.70
ITAZMB	74-94	0.01	(1.00)	-0.00	(0.06)	0.00	(0.37)	0.05	(1.07)	0.93	(2.69)	0.59	2.92
ITAZMT	74-94	0.02	(3.32)	0.04	(0.58)	0.00	(1.07)	0.44	(2.87)	1.00	(5.68)	0.66	1.87
ITAZOG	74-94	0.02	(2.25)	0.00	(0.38)	0.00	(1.65)	-0.02	(0.32)	0.91	(5.46)	0.66	1.68
ITAZOO	74-94	0.02	(2.72)	-0.01	(0.69)	0.01	(4.31)	0.06	(2.54)	0.96	(6.65)	0.75	2.22
ITAZOP	74-94	0.01	(2.49)	0.00	(0.09)	0.00	(3.44)	-0.07	(1.16)	0.81	(7.64)	0.53	1.82
NLDZ35	81-93	0.01	(2.62)	-0.07	(1.21)	0.01	(0.71)	0.08	(1.60)	1.15	(3.58)	0.53	1.82
NLDZ38	81-93	0.01	(1.57)	-0.00	(0.14)	0.01	(0.53)	0.67	(4.24)	0.85	(7.48)	0.86	1.51
NLDZLF	74-93	0.01	(1.69)	0.00	(0.08)	0.00	(2.84)	-0.10	(1.24)	0.71	(2.91)	0.05	1.60
NLDZLX	74-93	-0.00	(0.22)	-0.02	(0.54)	-0.00	(1.19)	0.28	(1.62)	0.66	(5.65)	0.73	1.78
NLDZMB	74-93	0.01	(0.95)	0.14	(2.25)	0.00	(3.93)	0.09	(1.71)	0.66	(1.91)	0.54	1.38
NLDZMT	74-93	0.01	(2.22)	0.10	(1.49)	-0.00	(1.20)	0.02	(0.13)	0.89	(5.45)	0.56	1.26
NLDZOG	81-93	0.01	(2.32)	-0.02	(1.29)	-0.01	(0.75)	0.60	(8.57)	0.60	(7.23)	0.96	1.40
NLDZOP	74-93	0.02	(4.29)	-0.01	(0.59)	0.00	(0.88)	0.10	(0.69)	1.03	(5.86)	0.72	2.00

Including constant term

       Regression equation identical to appendix B1. Whenever present, structural breaks and significant constant terms are taken into account. All equations are estimated with a heteroscedasticity-consistent covariance matrix. F_{rest} is the value of the Wald-statistic when imposing the coefficient restriction put forward in the main text. p_{rest} denotes the corresponding p-value. All other definitions according to appendix B1 and B2.

SECTOR	SMPL	γ_0	T_{γ_0}	γ_3	T_{γ_3}	γ_2	T_{γ_2}	γ_1	T_{γ_1}	γ_4	T_{γ_4}	$\overline{R}^2$	DW	F_{rest}	p_{rest}
DEUZ35	74-92	0.02	(3.76)	0.13	(1.82)	0.03	(2.37)	0.12	(0.70)	0.74	(3.40)	0.57	1.74	25.4	0.00
DEUZ38	74-92	0.02	(3.38)	0.02	(0.35)	0.01	(0.83)	0.19	(0.55)	1.02	(8.01)	0.66	1.29	4.7	0.03
DEUZLF	74-92	0.01	(4.80)	0.02	(1.03)	0.00	(0.36)	-0.08	(1.55)	1.25	(12.66)	0.84	1.96	346.3	0.00
DEUZLX	74-92	0.02	(3.05)	-0.00	(0.41)	0.01	(0.79)	-0.15	(0.90)	1.01	(7.59)	0.82	1.25	43.8	0.00
DEUZMB	74-92	0.02	(3.35)	-0.04	(0.63)	0.03	(2.18)	0.38	(3.61)	1.06	(3.99)	0.63	2.25	29.1	0.00
DEUZMT	74-93	0.02	(4.55)	0.08	(1.94)	0.01	(1.06)	-0.22	(1.04)	1.07	(12.12)	0.78	1.40	31.3	0.00
DEUZOG	74-92	0.02	(3.41)	0.02	(0.71)	0.02	(1.01)	0.04	(0.20)	1.24	(8.17)	0.77	1.81	21.6	0.00
DEUZOO	81-92	0.02	(5.40)	0.01	(0.09)	0.01	(1.04)	-0.51	(2.77)	0.71	(5.49)	0.87	2.61	71.9	0.00
DEUZOP	74-92	0.02	(3.34)	0.00	(0.17)	0.01	(0.76)	0.14	(0.88)	0.81	(4.04)	0.60	1.52	26.4	0.00
DEUZOW	74-92	0.02	(2.83)	0.00	(0.14)	0.02	(0.90)	-0.14	(0.49)	1.29	(11.80)	0.73	2.44	16.4	0.00
FRAZMT	86-91	0.03	(2.10)	-0.36	(1.42)	0.01	(1.05)	-0.81	(7.27)	1.46	(3.01)	0.92	3.27	254.1	0.00
FRAZOP	74-91	0.02	(8.09)	-0.21	(4.10)	-0.00	(6.29)	0.18	(2.29)	0.17	(0.90)	0.81	2.29	108.6	0.00
GBRZOP	74-92	0.02	(2.02)	0.10	(1.73)	-0.01	(2.04)	0.43	(2.18)	0.77	(3.22)	0.28	1.83	8.8	0.00
USAZLF	74-93	0.01	(2.56)	0.02	(0.62)	-0.00	(1.96)	-0.11	(1.65)	0.77	(4.42)	0.60	2.16	264.7	0.00
USAZMB	74-93	0.01	(2.01)	0.04	(0.85)	-0.00	(1.97)	0.06	(1.79)	1.05	(16.36)	0.92	1.69	707.2	0.00
USAZMT	74-93	0.01	(2.55)	0.04	(0.75)	-0.00	(1.37)	-0.03	(0.15)	0.94	(12.60)	0.90	2.04	29.9	0.00
USAZOO	74-93	0.01	(2.38)	0.06	(1.39)	-0.00	(0.04)	-0.05	(0.49)	0.94	(7.38)	0.84	2.00	110.9	0.00
USAZOW	74-93	0.01	(2.11)	0.02	(1.00)	-0.00	(1.99)	0.13	(2.05)	0.99	(24.18)	0.98	2.08	185.7	0.00
ESPZ35	80-91	0.02	(3.21)	-0.03	(3.10)	0.00	(2.67)	0.16	(3.59)	0.96	(9.00)	0.90	1.31	351.2	0.00
ESPZOP	80-91	0.01	(2.02)	0.01	(0.38)	-0.00	(1.68)	-0.05	(0.41)	0.69	(7.48)	0.85	1.55	79.9	0.00
ITAZ35	74-94	0.02	(2.69)	0.06	(0.93)	0.00	(0.26)	0.11	(0.95)	1.07	(6.56)	0.59	1.83	63.8	0.00
ITAZ38	81-94	0.02	(2.33)	0.08	(1.64)	0.00	(0.28)	0.29	(1.34)	1.00	(7.14)	0.77	2.32	321.0	0.00
ITAZLF	74-94	0.03	(4.66)	-0.03	(1.20)	0.00	(1.44)	0.45	(2.77)	1.10	(6.82)	0.57	2.34	11.2	0.00
ITAZMT	74-94	0.02	(3.32)	0.04	(0.58)	0.00	(1.07)	0.44	(5.68)	1.00	(5.68)	0.66	1.87	13.3	0.00
ITAZOG	74-94	0.02	(2.25)	0.00	(0.38)	0.00	(1.65)	-0.02	(0.32)	0.91	(5.46)	0.66	1.68	204.1	0.00
ITAZOP	74-94	0.01	(2.49)	0.00	(0.09)	0.00	(3.44)	-0.07	(1.16)	0.81	(7.64)	0.53	1.82	351.4	0.00
NLDZ35	81-93	0.01	(2.62)	-0.07	(1.21)	0.01	(0.71)	0.08	(1.60)	1.15	(3.58)	0.53	1.82	198.8	0.00
NLDZMT	74-93	0.01	(2.22)	0.10	(1.49)	-0.00	(1.20)	0.02	(0.13)	0.89	(5.45)	0.56	1.26	46.7	0.00
NLDZOG	81-93	0.01	(2.32)	-0.02	(1.29)	-0.01	(0.75)	0.60	(8.57)	0.60	(7.23)	0.96	1.40	36.2	0.00
NLDZOP	74-93	0.02	(4.29)	-0.01	(0.59)	0.00	(0.88)	0.10	(0.69)	1.03	(5.86)	0.72	2.00	35.7	0.00

SECTOR	SMPL	γ_3	T_{γ_3}	γ_2	T_{γ_2}	γ_1	T_{γ_1}	γ_4	T_{γ_4}	$\bar{R}^2$	DW	F_{rest}	P_{rest}
FRAZ35	80-91	0.13	(1.40)	-0.01	(4.22)	0.02	(0.23)	0.60	(2.54)	0.42	2.74	89.9	0.00
FRAZ38	80-91	0.26	(6.44)	-0.00	(0.60)	-0.52	(2.38)	0.89	(7.11)	0.80	2.33	49.1	0.00
FRAZLF	74-91	0.08	(0.93)	0.00	(1.25)	-0.36	(0.74)	0.79	(0.89)	-0.17	1.22	7.7	0.01
FRAZLX	74-91	-0.03	(0.74)	0.00	(0.67)	-0.22	(1.26)	0.57	(5.98)	0.23	1.49	48.3	0.00
FRAZMB	74-91	0.03	(0.90)	0.00	(1.20)	0.13	(0.75)	0.92	(3.36)	0.26	2.64	24.3	0.00
FRAZOG	74-91	0.13	(1.41)	-0.01	(3.33)	0.50	(2.49)	0.38	(1.91)	0.31	1.80	6.5	0.01
FRAZOO	74-91	0.01	(0.81)	0.00	(1.61)	0.04	(0.35)	0.17	(0.47)	-0.11	1.76	73.5	0.00
FRAZOW	80-91	0.01	(0.33)	-0.00	(1.81)	0.13	(0.77)	0.66	(4.90)	0.68	1.61	26.7	0.00
GBRZ35	86-92	0.44	(4.36)	-0.03	(4.99)	0.14	(0.31)	-0.89	(1.70)	0.46	2.48	3.7	0.06
GBRZ38	74-92	-0.01	(0.65)	-0.00	(0.32)	0.17	(0.81)	0.31	(1.85)	0.06	1.61	16.1	0.00
GBRZLF	74-92	0.01	(0.10)	-0.00	(0.41)	0.06	(0.63)	-0.24	(0.86)	-0.14	2.33	100.8	0.00
GBRZLX	86-92	-0.20	(2.93)	-0.02	(38.92)	1.87	(14.68)	0.17	(4.98)	0.99	0.72	44.3	0.00
GBRZMB	74-89	0.19	(1.15)	0.00	(0.61)	0.11	(0.71)	0.31	(1.51)	-0.03	1.20	34.3	0.00
GBRZMT	74-92	0.17	(1.54)	0.00	(0.24)	0.24	(1.05)	0.39	(3.29)	0.23	1.48	11.4	0.00
GBRZOG	74-92	0.36	(3.16)	0.00	(0.02)	0.26	(2.41)	0.14	(0.48)	0.51	1.07	48.9	0.00
GBRZOO	74-92	0.09	(1.22)	-0.01	(1.50)	0.70	(4.85)	-0.06	(0.54)	0.61	1.66	4.5	0.03
GBRZOW	74-92	0.06	(0.86)	0.00	(0.35)	0.19	(1.44)	0.73	(6.44)	0.55	2.20	39.7	0.00
USAZ35	74-93	0.21	(3.59)	-0.00	(1.38)	0.04	(0.60)	0.85	(6.03)	0.71	2.10	227.8	0.00
USAZ38	74-93	0.14	(2.23)	-0.00	(0.86)	-0.21	(1.34)	0.80	(10.63)	0.87	1.28	58.6	0.00
USAZLX	74-93	0.06	(2.35)	-0.00	(3.17)	-0.10	(1.49)	1.05	(22.96)	0.94	1.42	268.7	0.00
USAZOG	74-93	0.05	(1.80)	-0.00	(0.30)	-0.07	(0.54)	0.98	(9.70)	0.88	2.28	70.4	0.00
USAZOP	74-93	0.02	(0.53)	-0.00	(1.21)	0.10	(0.71)	1.08	(8.58)	0.63	1.54	39.0	0.00
ESPZ38	80-91	-0.00	(0.03)	0.00	(0.34)	0.07	(0.30)	1.12	(4.70)	0.68	1.65	16.9	0.00
ESPZLF	80-91	0.07	(0.81)	-0.00	(4.29)	0.17	(0.53)	0.35	(0.96)	0.10	1.60	6.5	0.01
ESPZLX	80-91	-0.05	(2.03)	-0.00	(0.71)	-0.02	(0.15)	0.91	(6.05)	0.75	1.89	50.8	0.00
ESPZMB	80-91	0.03	(1.24)	-0.00	(1.14)	0.07	(0.89)	0.89	(8.00)	0.74	1.98	139.4	0.00
ESPZMT	80-91	0.05	(1.15)	-0.00	(0.41)	0.38	(2.31)	0.86	(5.82)	0.80	1.19	14.6	0.00
ESPZOG	80-91	0.05	(1.76)	0.00	(0.39)	0.32	(4.52)	0.79	(12.48)	0.90	2.16	93.0	0.00
ESPZOO	80-91	0.01	(1.67)	0.00	(0.31)	0.09	(0.55)	0.77	(5.67)	0.63	0.91	29.6	0.00
ESPZOW	80-91	0.00	(0.43)	-0.00	(0.32)	0.29	(1.39)	0.83	(3.45)	0.76	1.43	11.1	0.00
ITAZLX	81-94	0.00	(0.55)	-0.00	(0.59)	0.03	(0.25)	0.59	(3.22)	0.38	1.72	68.5	0.00
ITAZMB	74-94	0.00	(0.07)	0.00	(0.47)	0.06	(1.41)	0.75	(3.45)	0.57	2.75	514.8	0.00
ITAZOO	74-94	0.00	(0.22)	0.01	(5.64)	0.08	(2.40)	0.75	(6.57)	0.66	1.78	686.3	0.00
NLDZ38	81-93	0.00	(0.13)	0.01	(0.80)	0.72	(3.16)	0.76	(8.50)	0.83	1.26	1.4	0.23
NLDZLF	74-93	0.01	(0.56)	0.00	(1.27)	-0.10	(1.00)	0.26	(1.57)	-0.11	1.46	123.4	0.00
NLDZLX	74-93	-0.02	(0.53)	-0.00	(1.17)	0.28	(1.63)	0.68	(7.84)	0.74	1.78	18.3	0.00
NLDZMB	74-93	0.15	(2.42)	0.00	(3.41)	0.09	(1.76)	0.55	(1.83)	0.54	1.21	332.7	0.00

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4 . The Durbin-Watson statistic can, in the absence of a constant term in the regression equation, only be regarded as a crude indication of the presence of (first-order) serial correlation. Tests based on a Lagrange Multiplier (LM) approach gave identical results though.

APPENDIX B4

Granger causality tests

Regression equation is:

$$Y_{ijt} = \delta_{0ij} + \sum_{pij} \alpha_{pij} Y_{ij,t-p} + \sum_{qij} \beta_{qij} X_{ij,t-q} + \varepsilon_{ijt},$$

where i = sector subscript,
j = country subscript,
p,q = predetermined lag orders ($p,q = 1..3$),
ε = random disturbance term.

First it is tested whether labour growth Granger causes wage growth (F_{LW}, with corresponding p-value p_{LW}), whereafter the reverse situation is tested (denoted by F_{WL}, with corresponding p-value p_{WL}).

SECTOR	SMPL	F_{LW}	p_{LW}	F_{WL}	p_{WL}
USAZ35	74-94	1.67	0.22	1.12	0.38
DEUZ35	74-94	1.20	0.35	3.04	0.07
GBRZ35	74-94	0.49	0.70	5.89	0.01
NLDZ35	74-94	1.01	0.42	0.19	0.90
ESPZ35	74-94	0.84	0.56	0.34	0.80
ITAZ35	74-94	0.56	0.65	1.33	0.30
USAZ38	74-94	0.65	0.60	0.63	0.61
GBRZ38	74-94	6.33	0.01	2.98	0.07
NLDZ38	74-94	2.09	0.15	0.64	0.60
ESPZ38	74-94	0.27	0.85	0.63	0.64
ITAZ38	74-94	0.51	0.68	3.07	0.06
USAZLF	74-94	0.43	0.73	0.32	0.81
DEUZLF	74-94	1.26	0.33	0.16	0.92
GBRZLF	74-94	4.73	0.02	0.42	0.74
NLDZLF	74-94	1.32	0.31	0.66	0.59
ESPZLF	74-94	1.36	0.40	0.33	0.81
ITAZLF	74-94	0.59	0.63	1.06	0.40
USAZLX	74-94	1.70	0.22	0.57	0.64
FRAZLX	74-94	0.40	0.76	0.92	0.46
DEUZLX	74-94	2.02	0.16	0.99	0.43
GBRZLX	74-94	0.59	0.64	8.04	0.00
NLDZLX	74-94	1.08	0.39	0.04	0.99
ESPZLX	74-94	4.19	0.13	10.2	0.04
ITAZLX	74-94	0.40	0.75	0.80	0.51
USAZMB	74-94	0.62	0.61	0.64	0.60
FRAZMB	74-94	1.19	0.36	1.22	0.35
DEUZMB	74-94	0.67	0.59	0.26	0.85
GBRZMB	74-94	0.17	0.92	3.75	0.05
NLDZMB	74-94	0.94	0.45	2.48	0.11
ESPZMB	74-94	0.68	0.62	0.42	0.75
ITAZMB	74-94	1.15	0.36	2.66	0.09
USAZMT	74-94	0.90	0.47	0.85	0.49
GBRZMT	74-94	4.29	0.03	7.87	0.00
NLDZMT	74-94	2.49	0.11	0.40	0.76
ITAZMT	74-94	0.76	0.54	3.21	0.06
USAZOG	74-94	0.54	0.67	1.05	0.41
DEUZOG	74-94	0.38	0.77	0.40	0.75
NLDZOG	74-94	0.67	0.59	0.21	0.89
ESPZOG	74-94	0.80	0.57	2.34	0.25
ITAZOG	74-94	0.32	0.81	0.50	0.69

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SECTOR	SMPL	F_{LW}	P_{LW}	F_{WL}	P_{WL}
USAZOO	74-94	0.46	0.72	1.26	0.33
FRAZOO	74-94	0.95	0.45	0.78	0.53
DEUZOO	74-94	0.64	0.60	2.38	0.12
GBRZOO	74-94	0.41	0.75	1.89	0.18
NLDZOO	74-94	0.99	0.43	1.50	0.26
ESPZOO	74-94	2.26	0.26	0.63	0.64
USAZOP	74-94	1.66	0.22	1.12	0.38
FRAZOP	74-94	2.85	0.09	3.37	0.06
DEUZOP	74-94	0.51	0.68	0.29	0.83
GBRZOP	74-94	1.96	0.17	3.07	0.07
NLDZOP	74-94	3.09	0.06	0.62	0.61
ESPZOP	74-94	6.77	0.08	7.88	0.06
ITAZOP	74-94	1.11	0.38	5.75	0.01
USAZOW	74-94	1.47	0.27	1.59	0.24
DEUZOW	74-94	3.37	0.05	7.88	0.00
GBRZOW	74-94	0.26	0.85	1.19	0.35
NLDZOW	74-94	1.57	0.25	1.30	0.32
ESPZOW	74-94	0.33	0.81	0.43	0.75
ITAZOW	74-94	1.35	0.30	0.52	0.68
FRAZ35	74-94	2.55	0.11	0.97	0.44
FRAZ38	74-94	1.45	0.28	0.77	0.53
DEUZ38	74-94	0.69	0.57	0.78	0.53
FRAZLF	74-94	0.02	1.00	2.19	0.15
FRAZMT	74-94	1.62	0.24	0.15	0.93
DEUZMT	74-94	3.11	0.06	2.54	0.10
ESPZMT	74-94	0.57	0.66	0.77	0.57
FRAZOG	74-94	0.29	0.83	0.24	0.86
ITAZOO	74-94	0.29	0.83	0.22	0.88
GBRZOG	74-94	0.73	0.55	2.43	0.12

Wage growth determines labour growth - final regressions

Regression equation is:

$$L_{ijt} = \delta_{0ij} + \delta_{1ij}\, p_{ijt} + \delta_{2ij}\, r_{jt} + \delta_{3ij}\, A_{ijt} + \delta_{4ij}\, w_{ijt} + \eta_{ijt},$$

where, i = sector;
j = country;
w,p,r,A,L are defined cf. the basic perfect competition model;
η = random disturbance term.

Including constant term

SECTOR	SMPL	δ_0	$T\delta_0$	δ_3	$T\delta_3$	γ_2	$T\delta_2$	δ_1	$T\delta_1$	δ_4	$T\delta_4$	$\overline{R}^2$	DW
GBRZ35	74-92	-0.03	(3.02)	0.17	(1.61)	-0.00	(0.17)	-0.04	(0.27)	0.29	(1.36)	0.21	1.76
GBRZMB	74-89	-0.09	(4.32)	-0.51	(2.39)	-0.00	(0.80)	-0.11	(0.96)	0.34	(1.54)	0.01	1.97

Excluding constant term

Regression equation same as above, with δ_0 = 0.

SECTOR	SMPL	δ_3	$T\delta_3$	γ_2	$T\delta_2$	δ_1	$T\delta_1$	δ_4	$T\delta_4$	$\overline{R}^2$	DW
ESPZLX	80-91	0.04	(1.77)	-0.00	(0.23)	0.06	(0.41)	0.91	(6.28)	0.73	1.45
GBRZLX	74-92	0.31	(3.24)	-0.00	(0.26)	-0.16	(1.10)	0.53	(3.34)	0.21	2.08
ITAZOP	74-94	-0.00	(0.34)	-0.00	(1.49)	0.16	(3.05)	0.56	(3.20)	0.49	1.26

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Basic regressions/Testing for structural breaks

Regression equation is:

$$w_{ijt} = e_{0ij} + e_{1aij}\,M_{euijt} + e_{1bij}\,M_{neuijt} + e_{2ij}\,r_{jt} + e_{3ij}\,A_{ijt} + e_{4ij}\,L_{ijt} + \psi_{ijt},$$

where, i = sector subscript;
j = country subscript;
$w, M_{eu}, M_{neu}, r, A, L$ are defined cf. the imperfect competition model;
ψ = random disturbance term.

All definitions cf. appendix B1. If an entry cannot be calculated, it is denoted by ***.

SECTOR	SMPL	e_0	T_{e0}	e_3	T_{e3}	e_2	T_{e2}	e_{1a}	T_{e1a}	e_{1b}	T_{e1b}	e_4	T_{e4}	$\overline{R}^2$	DW	F_{81}	p_{81}	F_{85}	p_{85}
DEUZ35	74-92	0.01	(2.74)	0.08	(1.05)	0.02	(1.48)	0.05	(0.65)	0.04	(0.40)	0.79	(4.83)	0.65	1.66	1.2	0.42	0.7	0.67
DEUZ38	74-92	0.02	(2.66)	0.03	(0.42)	0.01	(0.58)	0.01	(0.16)	0.05	(0.69)	0.96	(8.41)	0.64	1.54	2.1	0.18	1.0	0.51
DEUZLF	74-92	0.01	(1.42)	0.04	(1.60)	0.00	(0.56)	0.13	(1.79)	-0.00	(0.14)	1.14	(10.81)	0.87	1.85	0.5	0.79	0.9	0.56
DEUZLX	74-92	0.01	(1.44)	0.00	(0.03)	0.01	(0.82)	0.05	(0.51)	0.06	(1.03)	0.87	(8.34)	0.84	1.54	2.3	0.14	1.1	0.47
DEUZMB	74-92	0.01	(2.41)	-0.02	(0.36)	0.02	(1.26)	0.07	(0.56)	0.03	(0.32)	1.11	(3.16)	0.52	2.66	0.7	0.64	0.3	0.93
DEUZMT	74-92	0.01	(2.08)	0.08	(1.54)	0.00	(0.41)	-0.08	(0.74)	0.17	(1.69)	0.92	(7.25)	0.79	1.47	3.4	0.07	2.4	0.14
DEUZOG	74-92	0.01	(0.83)	0.03	(1.45)	0.01	(0.89)	0.24	(2.48)	-0.01	(0.53)	0.87	(4.96)	0.84	2.31	0.6	0.70	1.3	0.38
DEUZOO	74-92	0.03	(1.95)	-0.00	(1.57)	-0.01	(0.26)	0.12	(1.06)	-0.01	(0.27)	0.88	(3.51)	0.59	2.01	3.7	0.06	0.3	0.94
DEUZOP	74-92	0.01	(2.27)	-0.00	(0.03)	0.02	(1.07)	0.37	(4.06)	-0.22	(3.02)	0.60	(3.62)	0.78	1.99	2.8	0.10	1.5	0.30
DEUZOW	74-92	0.01	(1.58)	0.00	(0.13)	0.00	(0.45)	-0.02	(0.22)	0.13	(1.80)	0.99	(8.54)	0.85	2.62	2.1	0.18	1.6	0.26
FRAZ35	74-91	0.01	(1.50)	-0.19	(1.52)	0.00	(3.14)	0.11	(1.83)	0.11	(2.33)	0.74	(1.75)	0.70	1.61	***	***	0.5	0.79
FRAZ38	74-91	0.01	(0.94)	0.06	(0.26)	0.00	(1.10)	0.04	(0.42)	0.08	(0.97)	1.24	(4.77)	0.53	1.05	***	***	0.7	0.64
FRAZLF	74-91	0.01	(0.57)	0.02	(0.21)	0.00	(0.41)	0.20	(1.17)	-0.05	(0.71)	-0.36	(0.41)	-0.22	0.77	***	***	0.3	0.89
FRAZLX	74-91	0.03	(1.22)	0.02	(0.32)	0.00	(0.59)	-0.04	(0.39)	0.02	(0.26)	1.24	(2.33)	0.17	1.23	***	***	0.2	0.98
FRAZMB	74-91	-0.01	(0.26)	0.07	(1.21)	0.00	(0.58)	-0.03	(0.29)	0.03	(0.44)	0.78	(0.81)	0.12	2.75	***	***	1.6	0.28
FRAZMT	74-91	0.01	(1.66)	0.02	(0.14)	0.00	(2.67)	-0.06	(0.67)	0.19	(3.64)	1.08	(5.29)	0.75	1.35	***	***	1.1	0.45
FRAZOG	74-91	0.00	(0.37)	-0.05	(0.50)	-0.00	(0.21)	0.26	(1.51)	-0.03	(0.30)	0.63	(2.47)	0.53	2.53	***	***	1.0	0.48
FRAZOO	74-91	0.00	(0.12)	0.01	(0.48)	-0.00	(1.52)	-0.09	(0.49)	0.04	(0.46)	0.32	(0.32)	-0.26	1.95	***	***	1.6	0.28
FRAZOP	74-91	0.02	(5.68)	-0.16	(3.96)	-0.00	(2.01)	-0.05	(1.54)	0.12	(2.77)	-0.01	(0.02)	0.86	2.53	***	***	0.6	0.72
FRAZOW	74-91	0.01	(0.51)	0.01	(0.38)	0.01	(1.26)	-0.20	(1.02)	0.13	(1.91)	0.51	(2.02)	0.22	1.68	***	***	0.2	0.98
GBRZ35	74-92	0.01	(0.94)	0.16	(0.70)	0.00	(0.00)	-0.01	(0.14)	-0.02	(0.37)	0.51	(2.59)	0.07	2.25	1.2	0.39	3.8	0.05
GBRZ38	74-92	-0.01	(0.58)	-0.01	(0.51)	0.00	(0.76)	0.12	(1.38)	0.02	(0.26)	0.29	(1.12)	0.10	1.93	2.8	0.10	1.8	0.22
GBRZLF	74-92	0.00	(0.03)	0.05	(0.26)	-0.00	(0.24)	0.13	(1.92)	-0.04	(0.41)	-0.22	(0.56)	-0.15	2.45	4.0	0.04	1.8	0.24
GBRZLX	74-92	0.03	(1.79)	0.30	(1.43)	0.00	(0.78)	-0.06	(0.56)	0.22	(3.56)	0.67	(3.27)	0.53	2.21	6.8	0.01	7.8	0.01
GBRZMB	74-89	0.03	(0.44)	0.49	(1.11)	0.01	(1.31)	0.08	(0.76)	-0.06	(0.36)	0.37	(0.94)	-0.20	1.28	3.2	0.14	***	***
GBRZMT	74-92	0.01	(0.45)	0.02	(0.08)	0.00	(0.58)	0.11	(0.93)	-0.01	(0.10)	0.57	(2.47)	0.21	1.87	2.1	0.18	3.9	0.05
GBRZOG	74-92	0.02	(1.49)	0.52	(3.15)	0.00	(1.04)	-0.03	(0.54)	0.03	(4.11)	0.12	(0.56)	0.63	1.99	0.6	0.73	2.5	0.13
GBRZOO	74-92	0.01	(0.45)	-0.12	(0.43)	0.00	(0.08)	0.05	(0.43)	0.11	(0.71)	-0.19	(1.39)	-0.25	1.83	0.6	0.73	0.3	0.92
GBRZOP	74-92	0.02	(1.32)	0.09	(1.36)	-0.00	(0.77)	0.00	(0.02)	0.00	(0.00)	0.44	(1.62)	0.03	1.54	1.3	0.35	0.8	0.57
GBRZOW	74-92	-0.00	(0.27)	0.04	(0.53)	0.00	(0.19)	0.13	(1.02)	-0.08	(0.96)	0.72	(3.99)	0.46	2.27	1.0	0.48	1.1	0.47
USAZ35	74-92	0.01	(1.41)	0.10	(0.83)	-0.00	(0.41)	0.05	(0.93)	-0.02	(0.67)	0.68	(3.87)	0.73	1.76	***	***	0.7	0.67
USAZ38	74-92	0.00	(0.37)	0.10	(0.87)	-0.00	(0.18)	-0.01	(0.33)	0.05	(0.53)	0.80	(4.65)	0.90	1.73	***	***	0.8	0.60
USAZLF	74-92	0.01	(1.99)	0.01	(0.19)	-0.00	(2.00)	0.01	(0.30)	0.03	(0.92)	0.78	(2.66)	0.45	2.13	***	***	0.6	0.73
USAZLX	74-92	0.01	(2.33)	0.06	(1.81)	-0.00	(2.43)	0.00	(0.17)	-0.04	(1.38)	1.19	(14.55)	0.95	1.35	***	***	1.3	0.36
USAZMB	74-92	0.01	(0.91)	0.04	(0.58)	-0.00	(0.46)	0.01	(0.69)	0.02	(0.82)	1.00	(10.11)	0.91	1.38	***	***	3.9	0.05

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SECTOR	SMPL	e_0	T_{e0}	e_3	T_{e3}	e_2	T_{e2}	e_{1a}	T_{e1a}	e_{1b}	T_{e1b}	e_4	T_{e4}	$\overline{R}^2$	DW	F_{81}	p_{81}	F_{85}	p_{85}
USAZMT	74-92	0.01	(1.46)	0.09	(1.08)	-0.00	(1.28)	-0.01	(0.28)	-0.01	(0.11)	0.97	(5.74)	0.90	2.04	***	***	1.7	0.25
USAZOG	74-92	0.00	(0.28)	0.02	(0.58)	-0.00	(0.24)	-0.06	(1.42)	0.09	(1.61)	0.92	(5.41)	0.89	2.97	***	***	0.3	0.90
USAZOO	74-92	0.01	(0.99)	0.05	(1.47)	-0.00	(0.15)	0.00	(0.08)	0.01	(0.22)	0.90	(6.12)	0.81	1.95	***	***	0.4	0.84
USAZOP	74-92	0.01	(1.67)	-0.02	(0.63)	-0.00	(1.83)	0.00	(0.03)	-0.01	(0.20)	1.05	(4.25)	0.67	2.15	***	***	0.7	0.63
USAZOW	74-92	-0.00	(0.20)	0.04	(1.82)	-0.00	(1.94)	0.02	(1.25)	0.06	(3.16)	0.86	(11.93)	0.98	2.24	***	***	0.9	0.56
ESPZ35	80-91	0.00	(0.46)	0.07	(1.28)	0.00	(0.21)	-0.06	(0.62)	0.05	(1.69)	0.96	(6.22)	0.79	2.31	***	***	***	***
ESPZ38	80-91	0.00	(0.12)	0.07	(2.31)	-0.00	(4.39)	-0.44	(4.39)	0.30	(3.44)	0.94	(9.27)	0.89	1.21	***	***	***	***
ESPZLF	80-91	0.01	(1.60)	0.05	(1.39)	-0.00	(7.08)	-0.07	(1.32)	-0.22	(5.84)	0.25	(1.33)	0.80	2.74	***	***	***	***
ESPZLX	80-91	0.01	(0.58)	-0.04	(1.27)	-0.00	(0.65)	-0.07	(1.06)	-0.02	(0.17)	0.99	(4.41)	0.72	1.98	***	***	***	***
ESPZMB	80-91	0.01	(0.78)	0.02	(0.77)	-0.00	(0.96)	-0.05	(0.59)	0.06	(0.91)	1.00	(4.28)	0.72	2.26	***	***	***	***
ESPZMT	80-92	-0.01	(0.67)	0.13	(1.68)	-0.00	(2.32)	-0.15	(2.03)	0.16	(1.94)	0.90	(6.94)	0.73	1.95	***	***	***	***
ESPZOG	80-91	-0.01	(0.70)	0.09	(0.96)	-0.00	(0.32)	-0.14	(1.46)	0.15	(1.59)	0.64	(3.13)	0.83	1.87	***	***	***	***
ESPZOO	80-91	-0.00	(0.10)	0.02	(1.46)	0.00	(0.03)	-0.17	(1.54)	0.11	(0.85)	0.62	(3.10)	0.67	1.07	***	***	***	***
ESPZOP	80-91	0.02	(1.51)	-0.00	(0.07)	-0.00	(1.43)	-0.07	(0.80)	0.08	(1.35)	0.74	(6.94)	0.84	2.06	***	***	***	***
ESPZOW	80-91	-0.01	(0.52)	-0.00	(0.09)	0.00	(1.03)	0.02	(0.13)	0.18	(1.06)	0.80	(3.89)	0.70	0.70	***	***	***	***
ITAZ35	74-92	0.01	(1.72)	0.04	(0.58)	0.00	(0.33)	0.08	(0.78)	-0.04	(0.58)	1.03	(4.99)	0.51	1.59	4.7	0.03	0.8	0.62
ITAZ38	74-92	0.03	(3.37)	-0.19	(2.03)	0.00	(1.21)	-0.06	(0.45)	0.10	(1.25)	0.97	(6.25)	0.74	2.06	5.4	0.02	0.3	0.91
ITAZLF	74-92	0.02	(2.47)	-0.02	(0.46)	-0.00	(0.48)	0.07	(1.46)	-0.00	(0.04)	0.82	(4.35)	0.38	2.24	1.1	0.46	0.7	0.66
ITAZLX	74-92	-0.00	(0.15)	0.00	(0.53)	0.00	(1.35)	-0.07	(0.66)	0.13	(1.68)	0.54	(1.84)	0.35	2.27	3.1	0.08	0.1	0.99
ITAZMB	74-92	0.00	(0.21)	0.05	(1.76)	-0.01	(1.54)	0.19	(2.29)	-0.10	(1.64)	0.63	(1.85)	0.73	2.59	0.7	0.67	0.5	0.78
ITAZMT	74-92	0.02	(2.40)	-0.06	(0.83)	0.00	(0.27)	-0.05	(0.32)	0.10	(0.90)	1.01	(3.93)	0.60	1.93	1.3	0.36	0.2	0.98
ITAZOG	74-92	0.01	(2.45)	-0.01	(0.79)	0.00	(1.04)	0.03	(0.36)	0.06	(0.93)	0.88	(5.22)	0.76	1.63	1.2	0.40	1.4	0.32
ITAZOO	74-92	0.02	(2.29)	-0.01	(0.83)	0.01	(3.89)	-0.10	(1.28)	0.08	(0.95)	0.99	(6.81)	0.71	1.86	1.3	0.36	0.8	0.57
ITAZOP	74-92	0.01	(2.00)	-0.00	(0.03)	0.00	(1.98)	0.02	(0.18)	-0.02	(0.35)	0.77	(5.97)	0.44	1.77	0.9	0.53	0.4	0.88
NLDZ35	74-92	0.01	(2.54)	0.05	(0.55)	-0.00	(0.34)	0.07	(1.28)	-0.02	(0.63)	0.88	(4.67)	0.37	1.39	1.9	0.22	1.3	0.36
NLDZ38	74-92	0.02	(3.23)	0.05	(1.28)	-0.00	(3.38)	-0.08	(0.97)	-0.06	(1.63)	1.11	(7.48)	0.69	1.44	1.6	0.27	0.7	0.69
NLDZLF	74-92	0.01	(0.58)	0.00	(0.00)	0.00	(0.59)	0.08	(0.91)	-0.06	(1.32)	0.44	(1.14)	0.07	2.14	0.9	0.54	1.3	0.38
NLDZLX	74-92	-0.01	(0.58)	-0.02	(0.47)	-0.00	(0.41)	0.12	(0.99)	0.07	(0.95)	0.68	(7.00)	0.72	1.57	0.2	0.96	2.9	0.10
NLDZMB	74-92	0.00	(0.09)	0.18	(4.10)	0.00	(4.55)	0.06	(1.61)	0.05	(1.26)	0.17	(0.66)	0.65	1.51	10.9	0.00	0.5	0.77
NLDZMT	74-92	0.01	(3.20)	0.06	(1.03)	-0.00	(0.84)	0.11	(0.81)	-0.10	(1.50)	0.77	(4.09)	0.55	1.17	2.0	0.19	0.9	0.57
NLDZOG	74-92	0.01	(2.04)	-0.02	(0.48)	-0.00	(0.81)	0.09	(0.92)	-0.00	(0.04)	0.98	(8.26)	0.73	1.55	0.6	0.73	7.4	0.01
NLDZOP	74-92	0.02	(3.35)	-0.00	(0.24)	0.00	(0.91)	-0.02	(0.20)	-0.00	(0.02)	1.03	(4.69)	0.64	1.91	1.8	0.24	1.8	0.23

Taking structural breaks into account

Labour growth determines wage growth

Regression equation identical to appendix B1. All other definitions according to appendix B1 and B5.

SECTOR	SMPL	e_0	T_{e0}	e_3	T_{e3}	e_2	T_{e2}	e_{1a}	T_{e1a}	e_{1b}	T_{e1b}	e_4	T_{e4}	$\overline{R}^2$	DW
DEUZ35	74-92	0.01	(2.74)	0.08	(1.05)	0.02	(1.48)	0.05	(0.65)	0.04	(0.40)	0.79	(4.83)	0.65	1.66
DEUZ38	74-92	0.02	(2.66)	0.03	(0.42)	0.01	(0.58)	0.01	(0.16)	0.05	(0.69)	0.96	(8.41)	0.64	1.54
DEUZLF	74-92	0.01	(1.42)	0.04	(1.60)	0.00	(0.56)	0.13	(1.79)	-0.00	(0.14)	1.14	(10.81)	0.87	1.85
DEUZLX	74-92	0.01	(1.44)	0.00	(0.03)	0.01	(0.82)	0.05	(0.51)	0.06	(1.03)	0.87	(8.34)	0.84	1.54
DEUZMB	74-92	0.01	(2.41)	-0.02	(0.36)	0.02	(1.26)	0.07	(0.56)	0.03	(0.32)	1.11	(3.16)	0.52	2.66
DEUZMT	74-92	0.01	(2.08)	0.08	(1.54)	0.00	(0.41)	-0.08	(0.74)	0.17	(1.69)	0.92	(7.25)	0.79	1.47
DEUZOG	74-92	0.01	(0.83)	0.03	(1.45)	0.01	(0.89)	0.24	(2.48)	-0.01	(0.53)	0.87	(4.96)	0.84	2.31
DEUZOO	74-92	0.03	(1.95)	-0.00	(1.57)	-0.01	(0.26)	0.12	(1.06)	-0.01	(0.27)	0.88	(3.51)	0.59	2.01
DEUZOP	74-92	0.01	(2.27)	-0.00	(0.03)	0.02	(1.07)	0.37	(4.06)	-0.22	(3.02)	0.60	(3.62)	0.78	1.99
DEUZOW	74-92	0.01	(1.58)	0.00	(0.13)	0.00	(0.45)	-0.02	(0.22)	0.13	(1.80)	0.99	(8.54)	0.85	2.62
FRAZ35	74-91	0.01	(1.50)	-0.19	(1.52)	0.00	(3.14)	0.11	(1.83)	0.11	(2.33)	0.74	(1.75)	0.70	1.61
FRAZ38	74-91	0.01	(0.94)	0.06	(0.26)	0.00	(1.10)	0.04	(0.42)	0.08	(0.97)	1.24	(4.77)	0.53	1.05
FRAZLF	74-91	0.01	(0.57)	0.02	(0.21)	0.00	(0.41)	0.20	(1.17)	-0.05	(0.71)	-0.36	(0.41)	-0.22	0.77
FRAZLX	74-91	0.03	(1.22)	0.02	(0.32)	0.00	(0.59)	-0.04	(0.39)	0.02	(0.26)	1.24	(2.33)	0.17	1.23
FRAZMB	74-91	-0.01	(0.26)	0.07	(1.21)	0.00	(0.58)	-0.03	(0.29)	0.03	(0.44)	0.78	(0.81)	0.12	2.75
FRAZMT	74-91	0.01	(1.66)	0.02	(0.14)	0.00	(2.67)	-0.06	(0.67)	0.19	(3.64)	1.08	(5.29)	0.75	1.35
FRAZOG	74-91	0.00	(0.37)	-0.05	(0.50)	-0.00	(0.21)	0.26	(1.51)	-0.03	(0.30)	0.63	(2.47)	0.53	2.53
FRAZOO	74-91	0.00	(0.12)	0.01	(0.48)	0.00	(1.52)	-0.09	(0.49)	0.04	(0.46)	0.32	(0.32)	-0.26	1.95
FRAZOP	74-91	0.02	(5.68)	-0.16	(3.96)	-0.00	(2.01)	-0.05	(1.54)	0.12	(2.77)	-0.01	(0.02)	0.86	2.53
FRAZOW	74-91	0.01	(0.51)	0.01	(0.38)	0.01	(1.26)	-0.20	(1.02)	0.13	(1.91)	0.51	(2.02)	0.22	1.68
GBRZ35	86-92	0.02	(0.72)	0.18	(0.56)	-0.03	(4.69)	0.27	(0.63)	-0.15	(1.06)	-1.26	(1.01)	0.38	1.83
GBRZ38	74-92	-0.01	(0.58)	-0.01	(0.51)	0.00	(0.76)	0.12	(1.38)	0.02	(0.26)	0.29	(1.12)	0.10	1.93
GBRZLF	81-92	0.02	(0.90)	0.16	(0.49)	-0.02	(4.61)	0.67	(2.72)	-0.11	(1.05)	0.83	(1.51)	0.49	1.95
GBRZLX	86-92	0.10	(37.75)	1.92	(57.95)	-0.02	(74.48)	-0.12	(6.16)	0.21	(27.83)	0.19	(7.47)	1.00	1.31
GBRZMB	74-89	0.03	(0.44)	0.49	(1.11)	0.01	(1.31)	0.08	(0.76)	-0.06	(0.36)	0.37	(0.94)	-0.20	1.28
GBRZMT	86-92	-0.01	(2.30)	-0.97	(7.71)	0.00	(1.53)	0.58	(10.59)	0.32	(3.56)	0.08	(0.67)	0.99	3.24
GBRZOG	74-92	0.02	(1.49)	0.52	(3.15)	0.00	(1.04)	-0.03	(0.54)	0.03	(4.11)	0.12	(0.56)	0.63	1.99
GBRZOO	74-92	0.01	(0.45)	-0.12	(0.43)	0.00	(0.08)	0.05	(0.43)	0.11	(0.71)	-0.19	(1.39)	-0.25	1.83
GBRZOP	74-92	0.02	(1.32)	0.09	(1.36)	-0.00	(0.77)	0.00	(0.02)	0.00	(0.00)	0.44	(1.62)	0.03	1.54
GBRZOW	74-92	-0.00	(0.27)	0.04	(0.53)	0.00	(0.19)	0.13	(1.02)	-0.08	(0.96)	0.72	(3.99)	0.46	2.27
USAZ35	74-92	0.01	(1.41)	0.10	(0.83)	-0.00	(0.41)	0.05	(0.93)	-0.02	(0.67)	0.68	(3.87)	0.73	1.76
USAZ38	74-92	0.00	(0.37)	0.10	(0.87)	-0.00	(0.18)	-0.01	(0.33)	0.05	(0.53)	0.80	(4.65)	0.90	1.73
USAZLF	74-92	0.01	(1.99)	0.01	(0.19)	-0.00	(2.00)	0.01	(0.30)	0.03	(0.92)	0.78	(2.66)	0.45	2.13
USAZLX	74-92	0.01	(2.33)	0.06	(1.81)	-0.00	(2.43)	0.00	(0.17)	-0.04	(1.38)	1.19	(14.55)	0.95	1.35
USAZMB	86-92	-0.01	(1.07)	-0.17	(3.46)	-0.12	(1.69)	0.17	(1.64)	-0.16	(1.31)	1.01	(2.67)	0.93	3.01
USAZMT	74-92	0.01	(1.46)	0.09	(1.08)	-0.00	(1.28)	-0.01	(0.28)	-0.01	(0.11)	0.97	(5.74)	0.90	2.04
USAZOG	74-92	0.00	(0.28)	0.02	(0.58)	-0.00	(0.24)	-0.06	(1.42)	0.09	(1.61)	0.92	(5.41)	0.89	2.97
USAZOO	74-92	0.01	(0.99)	0.05	(1.47)	-0.00	(0.15)	0.00	(0.08)	0.01	(0.22)	0.90	(6.12)	0.81	1.95
USAZOP	74-92	0.01	(1.67)	-0.02	(0.63)	-0.00	(1.83)	0.00	(0.03)	-0.01	(0.20)	1.05	(4.25)	0.67	2.15
USAZOW	74-92	-0.00	(0.20)	0.04	(1.82)	-0.00	(1.94)	0.02	(1.25)	0.06	(3.16)	0.86	(11.93)	0.98	2.24
ESPZ35	80-91	0.00	(0.46)	0.07	(1.28)	0.00	(0.21)	-0.06	(0.62)	0.05	(1.69)	0.96	(6.22)	0.79	2.31
ESPZ38	80-91	0.00	(0.12)	0.07	(2.31)	-0.00	(4.39)	-0.44	(4.39)	0.30	(3.44)	0.94	(9.27)	0.89	1.21
ESPZLF	80-91	0.01	(1.60)	0.05	(1.39)	-0.00	(7.08)	-0.07	(1.32)	-0.22	(5.84)	0.25	(1.33)	0.80	2.74
ESPZLX	80-91	0.01	(0.58)	-0.04	(1.27)	-0.00	(0.65)	-0.07	(1.06)	-0.02	(0.17)	0.99	(4.41)	0.72	1.98
ESPZMB	80-91	0.01	(0.78)	0.02	(0.77)	-0.00	(0.96)	-0.05	(0.59)	0.06	(0.91)	1.00	(4.28)	0.72	2.26
ESPZMT	80-92	-0.01	(0.67)	0.13	(1.68)	-0.00	(2.32)	-0.15	(2.03)	0.16	(1.94)	0.90	(6.94)	0.73	1.95
ESPZOG	80-91	-0.01	(0.70)	0.09	(0.96)	-0.00	(0.32)	-0.14	(1.46)	0.15	(1.59)	0.64	(3.13)	0.83	1.87
ESPZOO	80-91	-0.00	(0.10)	0.02	(1.46)	0.00	(0.03)	-0.17	(1.54)	0.11	(0.85)	0.62	(3.10)	0.67	1.07

SECTOR	SMPL	e_0	T_{e0}	e_3	T_{e3}	e_2	T_{e2}	e_{1a}	T_{e1a}	e_{1b}	T_{e1b}	e_4	T_{e4}	$\overline{R}^2$	DW
ESPZOP	80-91	0.02	(1.51)	-0.00	(0.07)	-0.00	(1.43)	-0.07	(0.80)	0.08	(1.35)	0.74	(6.94)	0.84	2.06
ESPZOW	80-91	-0.01	(0.52)	-0.00	(0.09)	0.00	(1.03)	0.02	(0.13)	0.18	(1.06)	0.80	(3.89)	0.70	0.70
ITAZ35	81-92	0.02	(2.57)	-0.01	(0.17)	0.01	(1.09)	0.09	(0.75)	-0.01	(0.10)	0.92	(3.35)	0.70	1.89
ITAZ38	81-92	0.02	(2.86)	-0.12	(1.66)	-0.00	(0.91)	-0.05	(0.64)	0.13	(2.29)	0.96	(6.18)	0.83	3.68
ITAZLF	74-92	0.02	(2.47)	-0.02	(0.46)	-0.00	(0.48)	0.07	(1.46)	-0.00	(0.04)	0.82	(4.35)	0.38	2.24
ITAZLX	74-92	-0.00	(0.15)	0.00	(0.53)	0.00	(1.35)	-0.07	(0.66)	0.13	(1.68)	0.54	(1.84)	0.35	2.27
ITAZMB	74-92	0.00	(0.21)	0.05	(1.76)	-0.01	(1.54)	0.19	(2.29)	-0.10	(1.64)	0.63	(1.85)	0.73	2.59
ITAZMT	74-92	0.02	(2.40)	-0.06	(0.83)	0.00	(0.27)	-0.05	(0.32)	0.10	(0.90)	1.01	(3.93)	0.60	1.93
ITAZOG	74-92	0.01	(2.45)	-0.01	(0.79)	0.00	(1.04)	0.03	(0.36)	0.06	(0.93)	0.88	(5.22)	0.76	1.63
ITAZOO	74-92	0.02	(2.29)	-0.01	(0.83)	0.01	(3.89)	-0.10	(1.28)	0.08	(0.95)	0.99	(6.81)	0.71	1.86
ITAZOP	74-92	0.01	(2.00)	-0.00	(0.03)	0.00	(1.98)	0.02	(0.18)	-0.02	(0.35)	0.77	(5.97)	0.44	1.77
NLDZ35	74-92	0.01	(2.54)	0.05	(0.55)	-0.00	(0.34)	0.07	(1.28)	-0.02	(0.63)	0.88	(4.67)	0.37	1.39
NLDZ38	74-92	0.02	(3.23)	0.05	(1.28)	-0.00	(3.38)	-0.08	(0.97)	-0.06	(1.63)	1.11	(7.48)	0.69	1.44
NLDZLF	74-92	0.01	(0.58)	0.00	(0.00)	0.00	(0.59)	0.08	(0.91)	-0.06	(1.32)	0.44	(1.14)	0.07	2.14
NLDZLX	74-92	-0.01	(0.58)	-0.02	(0.47)	-0.00	(0.41)	0.12	(0.99)	0.07	(0.95)	0.68	(7.00)	0.72	1.57
NLDZMB	81-92	-0.01	(3.24)	0.17	(12.03)	0.01	(1.61)	0.06	(4.35)	-0.02	(1.40)	-0.10	(1.00)	0.85	2.24
NLDZMT	74-92	0.01	(3.20)	0.06	(1.03)	-0.00	(0.84)	0.11	(0.81)	-0.10	(1.50)	0.77	(4.09)	0.55	1.17
NLDZMT	86-92	0.03	(3.11)	0.13	(1.34)	0.06	(1.73)	-0.26	(0.89)	0.03	(0.24)	-0.22	(0.31)	0.66	2.60
NLDZOP	74-92	0.02	(3.35)	-0.00	(0.24)	0.00	(0.91)	-0.02	(0.20)	-0.00	(0.02)	1.03	(4.69)	0.64	1.91

Wage growth determines labour growth - final regressions

Regression equation is:

$$L_{ijt} = g_{0ij} + g_{1aij} M_{euijt} + g_{1bij} M_{neuijt} + g_{2ij} r_{ijt} + g_{3ij} A_{ijt} + g_{4ij} w_{ijt} + \pi_{ijt} \,,$$

where, i = sector;
j = country;
$w, M_{eu}, M_{neu}, r, A, L$ are defined cf. the imperfect competition model;
π = random disturbance term.

SECTOR	SMPL	e_0	T_{e0}	e_3	T_{e3}	e_2	T_{e2}	e_{1a}	T_{e1a}	e_{1b}	T_{e1b}	e_4	T_{e4}	$\overline{R}^2$	DW
ESPZLX	80-91	-0.03	(1.44)	-0.03	(1.44)	-0.03	(1.44)	-0.03	(1.44)	-0.03	(1.44)	-0.03	(1.44)	0.87	2.09
GBRZ35	74-92	-0.03	(2.87)	-0.03	(2.87)	-0.03	(2.87)	-0.03	(2.87)	-0.03	(2.87)	-0.03	(2.87)	0.42	1.81
GBRZLX	86-92	-0.53	(11.51)	-0.53	(11.51)	-0.53	(11.51)	-0.53	(11.51)	-0.53	(11.51)	-0.53	(11.51)	1.00	1.25
GBRZMB	74-89	-0.09	(3.28)	-0.09	(3.28)	-0.09	(3.28)	-0.09	(3.28)	-0.09	(3.28)	-0.09	(3.28)	0.34	2.17

SECTOR	SMPL	e_0	T_{e0}	e_3	T_{e3}	e_2	T_{e2}	e_{1a}	T_{e1a}	e_{1b}	T_{e1b}	e_4	T_{e4}	$\overline{R}^2$	DW
ITAZOP	81-92	-0.01	(2.91)	-0.01	(2.91)	-0.01	(2.91)	-0.01	(2.91)	-0.01	(2.91)	-0.01	(2.91)	0.82	1.62