The impact of the UK national minimum wage on productivity by low-paying sectors and firm-size groups

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Executive summary

This report examines the longitudinal impact of the UK national minimum wage (NMW) on firm productivity. We use the FAME dataset which contains firm level micro data to estimate firm-specific productivity measures and then aggregate them to the level of the low-paying sectors as identified by the Low Pay Commission (LPC). The firm-specific productivity is estimated from production functions within disaggregate 4-digit industries, comprising the low-paying LPC sectors, by employing a modified semi-parametric estimation algorithm proposed by Olley and Pakes (1996). In the estimation algorithm we control for supply and demand factors affecting firms and explicitly build into the model of the unobservable productivity a measure of the 'bite' of the NMW on the average wage distribution. Thus, we model explicitly the impact of the NMW on firm productivity through this input price channel.

Given our analytical strategy of building into the estimated model of (unobservable) productivity all relevant factors affecting it, to demonstrating the NMW effects on productivity of the low-paying (LPC) sectors we follow Draca et al. (2010) unconditional difference-in-differences approach. Our results from difference-in-differences analysis show that, with notable exceptions, aggregate LPC sector productivity has been significantly positively affected by the NMW over a ten year period as the effects' magnitudes vary by sector. In most of the sectors the impact is statistically significant and positive with the exception of hairdressing, leisure and agriculture where the impact is not statistically significant even though positive. Furthermore, we analyse productivity by firm-size groups, according to the LPC classification and find substantial heterogeneity in responses to NMW over time as the increases are more marked in larger firms. We obtain similar results using alternative labour productivity measure(s).

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1 Introduction

This report examines the longitudinal impact of the UK national minimum wage (NMW) on firm productivity. While there is a large body of research examining the impact of minimum wages on employment and (wage) inequality, minimum wage effects on firm and industry performance is a significantly understudied area. A consensus has emerged that the overall effect of NMW on the level of employment in the UK is broadly neutral (see Stewart, 2004 or Metcalf, 2008 for a survey of the literature). Therefore, the research has shifted to exploring other possible margins of adjustment. Wadsworth (2010), following several previous studies, analyses a channel through which the effect of minimum wage could be directed. Firms that employ minimum-wage workers could have passed on any higher labour cost resulting from the increases in minimum wage in the form of higher output prices. Further research on the NMW's impact on firm behaviour seems to be a promising area as firms' operations and productivity could also be affected. Galindo-Rueda and Pereira (2004) and Draca et al. (2005; 2008; 2010) are among the few studies that have attempted to analyse the NMW's impact on the UK firms. They generate indirect evidence to suggest that productivity may have risen more in firms that employ more low-wage workers while profitability has fallen in such firms after the NMW introduction. The findings call for further research given the fact that previous studies did not have an explicit focus on estimating firm productivity.

Thus, in this report we set out to estimate consistent measures of productivity by explicitly modelling its link with the introduction of the NMW and then document the relationship. [1] We use the FAME dataset which contains firm level micro data to estimate firm-specific productivity measures and then aggregate them to the level of the low-paying sectors as identified by the Low Pay Commission (LPC). These include several service industries, agriculture, and food processing, textiles and clothing manufacturing. The sectors, their overall position in the economy and employers' estimates of the impact of the NMW on them are described in Table 1. These low-paying sectors are clearly those most affected by the NMW's introduction.

- Table 1 about here -

We estimate production functions within disaggregate 4-digit industries, comprising the low-paying LPC sectors, by employing a modified semi-parametric estimation algorithm proposed by Olley and Pakes (1996). Previous studies attempting to link productivity and factors affecting it apply a two-stage approach. In the first stage authors estimate firm productivity, and in a second stage they proceed to link productivity to various factors such as, for example, the NMW. In our view testing for a relationship between (unobserved) productivity and factors affecting it, *ex-post*, is admitting that there is information that should have been used in the structural model of the unobservable while estimating the production function in the first instance. Therefore, in our modified algorithm following recent advancements in productivity estimation (Ackerberg et al., 2007; Katayama et al., 2009), we control for supply and demand factors affecting firms and explicitly build into the model of the unobservable productivity a measure of the effects (the 'bite') of the NMW on the wage distribution. Thus, we model explicitly the impact of the NMW on firm productivity through this input price channel.

[1] Forth and O'Mahony (2003) analyse the impact of NMW on labour productivity using industry rather than firm level data. They decompose their measure of labour productivity growth into capital deepening and TFP growth. For the period around the introduction of the NMW (1998-2000) the authors find evidence of labour productivity increases in the larger low-paying sectors, retail and hospitality as well as in hairdressing. The labour productivity growth is mostly attributed to capital deepening.

Our results from difference-in-differences analysis show that, with notable exceptions, aggregate LPC sector productivity has been significantly positively affected by the NMW but the effects' magnitudes vary by sector. In most of the sectors the impact is statistically significant and positive with the exception of hairdressing, leisure and agriculture where the impact is not statistically significant even though positive. Furthermore, we analyse productivity by firm-size groups, according to the LPC classification, and find substantial heterogeneity in responses to NMW over time as the increases are more marked in larger firms. We obtain similar results using alternative productivity measures.

The report is organised as follows. In section 2 we outline a theoretical framework specifying a model of unobservable firm productivity. The model recognises the effects of various supply and demand factors and provides a basis for explicitly accounting for the impact of minimum wages on productivity. In section 3 we discuss econometric problems and introduce our algorithm for estimating productivity. In section 4 we describe the data and report the estimated coefficients of production functions for each of the LPC sectors and our counterfactuals. We also perform difference-in-differences analysis and present, graphically, results of firm productivity by aggregate LPC sectors and firm-size groups. In section 5 we discuss the results in the context of relevant literature on the effects of NMW and conclude.

2 Theoretical framework: minimum wage and firm productivity

2.1 Toward a model of firm productivity

We recognise several problems with measures of firm productivity and try to address them in the context of the effects of minimum wages on firms. Productivity can be estimated from a Cobb-Douglas production function, $Q_{jt} = e^{\omega_{jt}} f(X_{jt})$, where Q_{jt} is a physical output of the j^{th} firm in period t, ω_{jt} is its true productivity (efficiency) measure and $f(X_{jt})$ is an increasing differentiable function of a scalar input index, which in turn is a constant returns function of the vector of inputs employed by the firm. When Q_{jt} and X_{jt} are observable and $f(.)$ is correctly estimated, the productivity measure is recovered as the (Solow) residual $\omega_{jt} = lnQ_{jt} - lnf(X_{jt})$.

However, usually, information on output and inputs is imperfect. When information on physical output is not available Q_{jt} is replaced with $\tilde{Q}_{jt} = Y_{jt}/\bar{P}_t$, where Y_{jt} is a nominal value of sales (or value added) of j^{th} firm and $\bar{P}_t$ is an industry-wide output price deflator.[2] Thus, the productivity measure is calculated as

$$\widetilde{\omega}_{jt} = \left(lnY_{jt} - ln\bar{P}_t\right) - lnf(X_{jt}).^{3} \qquad (1)$$

In equation (1) revenues (value added) depend on demand conditions and the competition in the market. This fact requires introducing a demand system describing consumer and producer behaviour. Following Foster et al. (2008) and Katayama et al. (2009) the demand for the j^{th} firm product is specified as $Q_{jt} = q^j(\vec{P}_t, \vec{\theta}_t, D_t)$, where $\vec{P}_t$ is the vector of product prices charged by all active firms, $\vec{\theta}_t$ is a vector of quality indices for all products sold by active firms, and D_t is total market size.[4] Assume that current prices and product quality indices are common knowledge, firms are price takers in factor markets, and they apply Bertrand-Nash pricing in the product market. Further assume that firm j equates its marginal revenue product at input level X_{jt}, $\left(1 - \frac{1}{\eta_{jt}}\right)\gamma_{jt}\frac{Y_{jt}}{X_{jt}}$ to its unit price, W_{jt}; $\eta_{jt} = \frac{-\partial ln\, q^j(\vec{P}_t, \vec{\theta}_t, D_t)}{\partial ln\, P_{jt}}$ is the firm j perceived elasticity of demand and $\gamma_{jt} = \frac{dlnf\,(X_{jt})}{dln\,X_{jt}}$ is the firm's returns to scale at

[2] The link between value added and sales is established via the multiplier $\left(\frac{1}{1-S^m_{jt}/Y_{jt}}\right)$, where S^m_{jt} is the value of materials and Y_{jt} is the value of total sales.

[3] When input quantities are not observed a deflated measure of expenditure $\tilde{X}_{jt} = \left(\frac{W_{jt}}{\bar{W}_t}\right)X_{jt}$ can be used where W_{jt} is the price of a unit bundle of inputs for the j^{th} firm and $\bar{W}_t$ is a industry-wide input price deflator. Because our focus is on labour input which is usually measured in number of employees we do not use the expenditure notation here.

[4] Klette and Griliches (1996) is an example of an earlier study where a demand system is introduced to deal with the aggregation problem when output is measured in revenue terms. Recent applications of this approach are De Loecker (2007) and Abraham et al. (2010).

the margin. Then the first order condition for profit maximisation can be written as $Y_{jt} = \left(\frac{\eta_{jt}}{\eta_{jt}-1}\right)\left(\frac{W_{jt}}{\gamma_{jt}}\right)X_{jt}$. Substituting this first order condition in equation (1) gives:

$$\widetilde{\omega}_{jt} = ln\left(\frac{X_{jt}}{f(X_{jt})}\right) + ln\left(\frac{\eta_{jt}}{(\eta_{jt}-1)}.\frac{1}{\gamma_{jt}}\right) + ln\left(\frac{W_{jt}}{\bar{P}_t}\right). \quad (2)$$[5]

Equation (2) demonstrates that $\widetilde{\omega}_{jt}$ depends on scale economies (the first and second term), mark-ups and demand elasticities (the second term) and deflated input prices (the third term). There are several channels through which the revenue-based productivity measure may be affected by demand and/or supply factors.[6] Factor prices matter because firms burdened with high factor costs pass some fraction of them, depending on the nature of demand, on to consumers as higher output prices, driving up revenues per unit input bundle and creating a *pass-through effect*. On the other hand, productivity shocks that are common across firms are likely to reduce $\bar{P}_t$ and thus average $\widetilde{\omega}_{jt}$ values will positively respond to general improvements in technical efficiency. If quality of *heterogeneous inputs* is not explicitly taken into account in cross section, $\widetilde{\omega}_{jt}$ is likely to be positively correlated with true technical efficiency ω_{jt} or higher quality θ_{jt} given that factor prices reflect factor productivity (Jorgenson and Griliches, 1967). Further, if the production function *f*(.) is homogenous of degree higher than 1 (increasing returns to scale), from equation (2), relatively larger firms will appear less productive if (which is likely) they charge lower prices which represents a *scale effect*. Finally, it is reasonable to assume that firms with high efficiency or high product quality face relatively low demand elasticity η_{jt} because they possess relatively large market shares (Berry, 1994). Such efficient firms will be able to charge high mark-ups and, unless

[5] Note that $f(X_{jt}) = \frac{Q_{jt}}{e^{\omega_{jt}}}$; thus, the link between the revenue-based productivity measure and the 'true' technical efficiency measure is obvious.
[6] Recent studies, notably Foster et al (2008) find that ω_{jt}-type measures are correlated with $\widetilde{\omega}_{jt}$-type measures. The key assumptions behind this result are: (i) firms engage in pure Bertrand competition (limit pricing); (ii) each product can be produced by multiple firms; (iii) products are homogenous with respect to quality; (iv) all producers face the same input costs; (v) all producers face the same elasticity of demand; and (vi) productivity shocks are drawn from an extreme value distribution.

this effect is offset by a strong scale effect, they will appear relatively more productive which constitutes a *mark-up effect*.

It is important to point out that factor prices, and particularly wages in our analysis, besides the pass-through effect may also induce a mark-up effect through the second term in equation (2) because positive shocks to input prices have the same effect on marginal cost as negative productivity shocks. Thus, wage increases will drive up firms' marginal costs and induce them to reduce their mark-ups (Draca et al., 2010) which will make these firms appear less productive. Thus, the overall effect of increases in wages due to the introduction of NMW on productivity will be determined by the interaction of at least two opposite effects - the pass-through and the mark-up effects - and is ultimately an empirical question about the magnitudes of the effects.

2.2 The impact of NMW on firm productivity

In equation (2) the impact of the input price W_{jt} on the productivity measure is of special interest, as our focus of analysis is on the effect of the introduction of NMW on productivity. Clearly, increases in the real value of the NMW will affect the price of labour and the wage distribution. The effects of minimum wages on wage distribution and employment has been extensively studied in the U.S. (Katz and Krueger, 1992; Card, 1992; Card and Krueger, 1994; DiNardo et al., 1996; Lee, 1999; Aaronson, 2001); for the case of the UK important studies are by Machin and Manning (1994), Dickens et al. (1999), Metcalf (2002), Stewart (2002), Machin et al. (2003), Machin and Wilson (2004). Most minimum wage models predict that as the minimum wage rises, the distribution of earnings will become more compressed. Findings on employment changes are more mixed but in general a weak positive or no association of minimum wage and employment is suggested. In the UK NMW case, no adverse employment effects have been detected in any demographic group (Stewart, 2004).

Studies of minimum wage effects on the wage distribution and employment provide a basis for us to hypothesise a positive link between the NMW and productivity. Such a hypothesis is consistent with findings that increases in the NMW are associated with a decline in dispersion of the wage distribution and often with an increase in employment. Machin and Manning (1994), Card and Krueger (1995), and Dickens et al. (1999) explain these effects by employing dynamic monopsony models of the labour market. From a different perspective, Hall (1988) shows that when an exogenous (instrumental) variable, such as minimum wage regulation, is correlated with the productivity (Solow residual) measure this provides evidence that the joint hypothesis of competition and constant returns is untenable. Furthermore, for the case of an instrumental variable that is positively correlated with output and employment, a positive correlation with the productivity measure will be a sign of market power or increasing returns. Conditions of competition with constant or decreasing returns to scale will be incompatible with a positive correlation of the productivity measure and the instrument.[7]

The extent of labour market competition also has important implications for prices and thus for productivity (Card and Krueger, 1995). Under perfect competition, the wage equals marginal cost of labour. The rise in wages due to minimum wage regulation will result in a rise in marginal cost of production and ultimately prices. Under monopsony, the minimum wage can reduce marginal cost, since the firm no longer has to raise wages to attract marginal workers. Lower marginal cost will lead to a rise in demand for labour and hence an increase in output. Higher output should act to lower prices and, by equation (2), increase measured productivity, other things equal.

[7] In a recent study Wadsworth (2010) provides evidence for the NMW's impact on prices, for the case of the UK. His findings are consistent with our model of productivity specified in equation (2) and the non-competitive markets argument. Evidence suggests that firms that employ NMW workers could have passed on some proportion of the higher labour cost in the form of higher output prices. This effect is stronger in several NMW domestic service sectors such as security, retail, hospitality and catering. A further finding and evidence is that firms do not appear to change prices immediately when the new NMW level is announced; rather the effect on prices appears to accumulate gradually over time.

To sum up, in the case of a cost increase due to the introduction of the NMW, all domestic firms producing the same product will experience a degree of cost pressure, which will depend on their exposure to the NMW, usually defined as the share of NMW labour in their productive effort (Draca et al., 2010). If spillover effects occur from the NMW, putting upward pressure on wages further along the wage distribution, as found in some cases by previous UK research (LPC, 2010) then the effects on costs will be magnified. Firms operating in competitive industries will be unable to pass on cost increases if substitute products do not face similar cost increases. Labour-for-capital substitution may also be an effective adjustment mechanism if labour is a substitute for capital, thus reducing the number of employees and encouraging productivity improvements. However, in service industries, the scope of labour-for-capital substitution is typically limited. Thus, service industries should be expected to experience greater upward pressure on costs. Further, the more a good competes with potential substitutes produced abroad not affected by the UK NMW, the harder it will be for UK firms to pass on cost increases and maintain market share, other things equal. Thus, firms exposed to international trade may be less able to pass on cost increases. At the same time many service industries, which typically are not internationally traded may be able to pass on cost increases and thus appear more productive.

3 Econometric framework

3.1 Empirical specification of productivity

Equation (2) demonstrates that measured (revenue-based) productivity mixes idiosyncratic demand and factor price effects with efficiency and product quality differences. Producers can show high productivity because they are efficient, but it can also be driven by high producer-specific demand and/or idiosyncratic cost advantage. Thus, our estimation strategy is to directly build into the model of the unobservable productivity a set of variables controlling for both demand and supply factors. Moreover as our aim is to estimate the impact of the NMW on productivity, we directly build into the model of productivity the 'bite' of the NMW using information from the observed wage distribution.

We specify productivity of a firm *j* at a period *t* following Olley and Pakes (1996) and extensions outlined in Ackerberg et al. (2007) as a function $\omega_{jt} = h\ (i_{jt}, k_{jt}, a_{jt}, l_{jt}, e_t)$ of the firm's capital k_{jt}, labour l_{jt}, age a_{jt}, investment i_{jt}, and the market environment that the firm faces every period e_t, and treat the function non-parametrically in our estimation algorithm. Olley and Pakes (1996) derive the function for productivity by inverting the investment demand function of the firm which itself is a solution to the firm's maximization problem.[8] The economic environment control e_t could capture characteristics of the input markets, characteristics of the output market, and industry characteristics such as the current distribution of the states of firms operating in the industry and the impact of industry (or national) regulations such as the NMW. The Olley-Pakes formulation allows all these factors to change over time, although they are assumed constant across firms within an industry and in a given period.

In this analysis we extend the Olley-Pakes model of (unobservable) productivity in two ways. First, we extend the information content of the market environment control, at 4-digit industry level, to vary by firm size and location and denote this by $\vec{e}_{ji}$, where a subscript index *j* is added and vector notation is adopted. Introducing a narrowly-defined group-specific market structure in the state space allows some of the competitive richness of the Markov-perfect dynamic oligopoly model of Ericson and Pakes (1995). Note that introducing richer market structure in the productivity model does minimise the deviations from the

[8] The invertability of the investment function requires the presence of only one unobservable which Olley and Pakes (1996) refer to as the scalar unobservable assumption. This assumption means that there can be no measurement error in the investment function, no unobserved differences in investment prices across firms, and no unobserved separate factors that affect investment but not production. Note also that the monotonicity needed for invertability in Olley and Pakes (1996) to work does not depend on the degree of competition in the output market; it just needs the marginal product of capital to be increasing in productivity.

original Olley-Pakes scalar unobservable assumption, necessary to invert the investment function, and thus it may help with the precision of the estimates. The evolution of productivity through time is modelled here by a first-order Markov process, $p(\omega_{jt} \mid \omega_{jt-1})$ as in the original Olley-Pakes paper.

The impact of the NMW 'bite' is introduced by a measure of wage dispersion, which is constructed as the difference between log(wage) at the tenth and at the fiftieth percentiles following Lee (1999) who formally models the relationship between the 'bite' of the minimum wage and the observed wage distribution. He uses various log(wage) percentile differentials to measure wage dispersion. There are three cases of minimum wage impact on the wage distribution to be considered. First, there may be no spillovers and no disemployment which represents the case of *censoring*. The only effect of the minimum wage is to raise the wages of those initially making less than the minimum to the level of the wage floor. The second case is characterised by *spillovers* but no disemployment. This case occurs when minimum wage has an effect on higher percentiles. A third possible case represents the situation of *truncation* with no spillovers but full disemployment. In this case the minimum wage has no impact on workers with wages already above the minimum, and causes job losses for all workers with wages below the minimum. Lee (1999) demonstrates that in each of the three cases there is a nonlinear but monotonic relation between the (relative) minimum wage measure and the observed tenth-fiftieth percentile differential.

We compute the dispersion measure at 4-digit SIC2003 industry level and by LPC firm size category.[9] Table 2 summarises the dispersion measures for the ten LPC sectors with high incidence of NMW and for manufacturing and services composite counterfactuals, defined in the data section. Since its introduction in the UK in April 1999, the NMW has

[9] LPC firm size classification is based on number of employees and distinguishes four categories: very small firms with up to 10 employees; small firms with 10 - 49 employees; medium firms with 50 - 249 employees and large firms with more than 250 employees. In the analysis we use a simplified version of the classification where the very small and small firm categories are aggregated into one small firm category.

increased in real terms and previous literature has found this to be associated with a decline in the wage dispersion measure throughout the period. Location information, following Rizov and Walsh (2010), to control for geographical differences and agglomeration effects is also incorporated in the model of the unobservable as three categories of areas according to the DEFRA classification are distinguished (DEFRA, 2005): urban, rural less sparse and rural sparse locations. To control for business cycle effects a time trend is included in the model as well.

- Table 2 about here -

Next, we relax the scalar unobservable assumption all together following modelling ideas in Ackerberg et al. (2007) and an application to firm productivity and trade orientation by Rizov and Walsh (2009). We adjust the model of productivity to allow for exporting status to be an additional (endogenous) control variable in the state space $\vec{e}_{ji}$ that is driven by lagged productivity as in Melitz (2003). This formulation leads to modelling the evolution of productivity as a controlled second-order Markov process $p(\omega_{jt} \mid \omega_{jt-1}, \omega_{jt-2})$, where firms operate through time forming expectations of future ω_{jt} s on the basis of information from two preceding periods.[10] Thus, the model of productivity is specified as the function

$$\omega_{jt} = h\ (i_{jt}, k_{jt}, a_{jt}, l_{jt}, \vec{e}_{ji}). \qquad (3)$$

Selection to exporting can reveal better productivity due to higher quality products, know-how, and distribution networks that are needed to overcome sunk costs to get into foreign markets. Furthermore, exporting firms are more likely to employ a higher quality labour force and pay higher wages (Bernard and Jensen, 1999). We specify the propensity to export as a non-parametric function of $i_{jt-1}, k_{jt-1}, a_{jt-1}, l_{jt-1}$ and a vector of other firm-specific characteristics such as type of ownership, corporate governance, and industry groupings as

[10] Note that the fixed effects estimator can be seen as a special case of the Markov process *p*(.) where productivity, ω_{jt} is set to ω_j and does not change over time.

well as a time trend. In equation (3), we add in the market environment vector $\vec{e}_{ji}$ the propensity to export, estimated from a Probit model, rather than the observed export indicator. This allows us to treat the exporting decision as an endogenous control.[11]

3.2 Estimation algorithm

To compute unbiased and consistent firm-level (Solow-residual) productivity measures, we need to generate first unbiased and consistent estimates of production function parameters. However, estimating production function parameters is complicated due to the fact that productivity is not observed directly in the data and due to imperfect information about the supply and demand factors affecting the unobservable. The first complication arises because productivity determines input levels which is the classic simultaneity problem formulated by Marshak and Andrews (1944). The second complication arises out of the fact that firms survive based on productivity type, amongst other factors. If an OLS estimator is used, simultaneity means that estimates for variable inputs such as labour, when considered a non-dynamic input, will be upward biased, assuming a positive correlation with unobservable productivity. Exit will depend on productivity types as well. Thus, the coefficient on capital is likely to be underestimated by OLS as higher capital stocks induce firms to survive at low productivity levels as far as the capital stock represents sunk cost (Olley and Pakes, 1996). Besides the two biases, a potential problem afflicting the productivity measure is associated with the spatial dependency of observations within a geo-space. Special dependency leads to the spatial autocorrelation problem since – like temporal autocorrelation – it violates standard statistical techniques that assume independence between observations (Anselin and Kelejian,

[11] Results from estimating propensities to export are available from the authors. Given the availability of three extra controls (propensity to export, location information and wage dispersion), besides the investment variable, we experimented also with a third-order Markov process but the estimation results were very similar to the second-order Markov process results reported in the paper. Thus, we conclude that a second-order Markov process approximates our model of productivity well.

1997). Furthermore, spatial dependency is a source of special heterogeneity which means that overall parameters estimated for the entire system may not adequately describe the process at any given location.

To deal with the estimation problems outlined above we employ a semi-parametric estimation algorithm in the spirit of Olley and Pakes (1996) following extensions in Ackerberg et al. (2007) and an application by Rizov and Walsh (2009). As in Olley and Pakes (1996) we specify a log-linear production function,

$$y_{jt} = \beta_0 + \beta_k k_{jt} + \beta_a a_{jt} + \beta_l l_{jt} + \omega_{jt} + v_{jt}, \qquad (4)$$

where the log of firm j value added at period t, y_{jt} is modelled as a function of the logs of the firm's state variables at t, namely age, a_{jt}, capital k_{jt}, and labour, l_{jt}. Investment demand, i_{jt} determines the capital stock at the beginning of each period. The law of capital accumulation is given by $k_{jt+1} = (1-\delta)k_{jt} + i_{jt}$, while age evolves as $a_{jt+1} = a_{jt} + 1$. The error structure comprises a stochastic component, v_{jt}, with zero expected mean, and a component that represents unobserved productivity, ω_{jt} as specified in equation (3). Both ω_{jt} and v_{jt} are unobserved, but ω_{jt} is a state variable, and thus affects firm's choice variables – decision to exit and investment demand, while v_{jt} has zero expected mean given current information, and hence does not affect decisions.

Substituting equation (3) into the production function (4) and combining the constant, k_{jt}, a_{jt}, and l_{jt} terms into function $\phi\,(i_{jt}, k_{jt}, a_{jt}, l_{jt}, \vec{e}_{jt})$ gives

$$y_{jt} = \phi\,(i_{jt}, k_{jt}, a_{jt}, l_{jt}, r_{jt}, \vec{e}_{jt}) + v_{jt}. \qquad (5)$$

Equation (5) is the first step of our estimation algorithm and can be estimated as in Olley and Pakes (1996) with OLS and applying semi-parametric methods that treat the function ϕ (.) non-parametrically, using a polynomial.[12] Even though the first stage does not directly

[12] Olley and Pakes (1996) show that kernel and polynomial approximations of the unobservable produce very similar results therefore in our estimations everywhere we use a computationally easier 4th-order polynomial.

identify any of the parameters of the production function, it generates estimates of $\phi(.)$. $\hat{\phi}_{jt}$ is needed in the second stage, where we can write unobservable productivity as

$$\hat{\omega}_{jt}(\beta_0, \beta_k, \beta_a, \beta_l) = \hat{\phi}_{jt} - \beta_0 - \beta_k k_{jt} - \beta_a a_{jt} - \beta_l l_{jt}. \quad (6)$$

Next, to clarify timing of production decisions we decompose ω_{jt} into its conditional expectation given the information known by the firm in two prior periods, *t*-2 and *t*-1, and a residual $\omega_{jt} = E[\omega_{jt} \mid \omega_{jt-2}, \omega_{jt-1}] + \xi_{jt} = g(\omega_{jt-2}, \omega_{jt-1}) + \xi_{jt}$. By construction ξ_{jt} is uncorrelated with information in *t*-2 and *t*-1 and thus with k_{jt}, a_{jt}, and l_{jt} which are chosen prior to time, *t*. The specification of the *g*(.) function is determined by the fact that productivity follows a second-order Markov process as discussed in section 3.1. Note that the firm's exit decision in period *t* depends directly on ω_{jt} and thus the exit decision will be correlated with ξ_{jt}. This correlation relies on the assumption that firms exit the market quickly, in the same period when the decision is made. If exit is decided in the period before actual exit occurred, then even though there is a selection per-se, exit would be uncorrelated with ξ_{jt}.[13] To account for endogenous selection on productivity we extend the *g*(.) function following Ackerberg et al. (2007) and Rizov and Walsh (2009) as follows:

$$\omega_{jt} = g'(\omega_{jt-2}, \omega_{jt-1}, \hat{P}_{jt}) + \xi_{jt}, \quad (7)$$

where $\hat{P}_{jt}$ is propensity score which controls for the impact of selection on the expectation of ω_{jt}, i.e., firms with lower survival probabilities which do survive to time, *t*, are likely to have higher ω_{jt}s than those with higher survival probabilities. We estimate $\hat{P}_{jt}$ non-parametrically using Probit model with a polynomial approximation. Note that we extend the state variable

[13] Note that the first stage of the estimation algorithm is not affected by selection because by construction, v_{jt}, the residual in equation (4) is not correlated with firm decisions as it is not observed by firm managers.

set with location and trade status information which are important determinants of the firm's exit decision; a time trend is also included.

The capital, age, and labour coefficients are identified in the second step of our estimation algorithm. We substitute equations (7) and (6) into equation (4) using expressions for the estimated values, $\hat{\phi}_{jt-1}$, $\hat{\phi}_{jt-2}$ which gives us

$$y_{jt} = \beta_k k_{jt} + \beta_a a_{jt} + \beta_l l_{jt} + g'(.) + \varepsilon_{jt}, \tag{8}$$

where $g'(.) = g'(\hat{\phi}_{jt-1} - \beta_k k_{jt-1} - \beta_a a_{jt-1} - \beta_l l_{jt-1}, \hat{\phi}_{jt-2} - \beta_k k_{jt-2} - \beta_a a_{jt-2} - \beta_l l_{jt-2}, \widehat{P}_{jt})$ encompasses the two β_0 terms and ε_{jt} is a composite error term comprised of v_{jt} and ξ_{jt}. The lagged $\hat{\phi}$ variables are obtained from the first step estimates at *t*-2 and *t*-1 periods. Because the conditional expectation of ω_{jt}, given information in *t*-2 and *t*-1 periods, depends on ω_{jt-2} and ω_{jt-1}, we need to use estimates of $\hat{\phi}$ from two prior periods. Equation (8) is estimated with non-linear least squares (NLLS) estimator, approximating *g'*(.) with a polynomial.[14]

Finally, having estimated unbiased and consistent production function parameters we are able to back out a consistent (Solow residual) productivity measure, which we call total factor productivity (TFP), as $TFP_{jt} = y_{jt} - \hat{\beta}_k k_{jt} - \hat{\beta}_l l_{jt}$.[15] In the model of unobservable productivity we have explicitly incorporated spatial and time dependencies by merging spatial interactions with disaggregated modelling of productivity at firm level. We also explicitly incorporated in the model a measure of the 'bite' of the NMW on narrowly-defined groups of firms, by firm size within 4-digit industries. In terms of verifying whether variations in the NMW 'bite' and in location and export status make firms more productive,

[14] Woodridge (2009) presents a concise, one-step formulation of the original Olley and Pakes (1996) approach using a GMM estimator, which is more efficient than the standard Olley-Pakes methodology.
[15] Estimating the age coefficient was only used to separate out cohort from selection effects in determining the impact of firm age on productivity and therefore we do not net out the contribution of age from TFP.

we have controlled in our model of productivity for market-structure specific shocks (such as demand conditions, factor markets, exit barrier) that are different by NMW exposure and across locations and export status. We note that these factors remain constant across narrowly defined groups of firms within a given industry and time period.

4 Data and estimation results

4.1 Data, production-function estimates, and productivity measures

We estimate the production functions specified in section 3 using the FAME dataset from the Bureau van Dijk. The dataset covers all firms filed at Companies House in the UK and includes information on detailed unconsolidated firm-level financial statements, wage (remuneration) bill, ownership structure, location by post code, activity description, and direct exports. The data used in our analysis contains annual records on more than 360,000 firms over the period 1994-2009. The coverage of the data compared to the aggregate statistics for the industries analysed as reported by the UK Office for National Statistics (ONS) is highly representative, as for sales it is around 80 per cent and for employment around 82 per cent.[16] The sectors analysed are identified on the bases of the current 2003 UK SIC at the 4-digit level, following the LPC groupings of low-paying industries (see Table A1 in the Appendix). We also create counterfactuals from both manufacturing and service industries. The counterfactuals are composites of a set of 4-digit industries which have been identified on the basis of limited exposure to the NMW using literature and expert opinions.[17] All nominal monetary variables are converted into real values by deflating with the

[16] Harris and Li (2009) argue that FAME is biased towards larger firms, particularly in the non-exporting populations. Even though we size-weight our aggregations over firm productivity we note this caveat.
[17] The industries included in the counterfactual are all 4-digit industry codes comprising the following SIC 2003 2-digit industries: 23, 27, 29, 33, 34, 35, 40 for the manufacturing counterfactual and 64, 65, 66, 67 for the services counterfactual.

appropriate 4-digit UK SIC industry deflators taken from ONS. We use PPI to deflate sales and cost of materials, and asset price deflators for capital and fixed investment variables.[18]

Our goal is to estimate consistent TFP measures at firm level, within 4-digit industries, and to document the evolution of the aggregate (and by firm size) productivity over the period of analysis. The analytical strategy implies that we run regressions within all 4-digit industries classified by LPC as low-paying sectors and in the set of counterfactual industries. The estimated samples for each LPC sector account for between 55 and 70 per cent of industry sales and between 52 and 70 per cent of employment in our data. After lags are applied and observations with missing values deleted, there are in total more than 160,000 remaining observations. The correlations between the ONS aggregate statistics series and the estimated sample series are as follows: sales – between 0.90 and 0.96, employment – between 0.90 and 0.97.

The descriptive statistics calculated from the estimated FAME samples for the LPC sectors and the counterfactuals are reported in Table 3. We can compare average firm characteristics across the LPC sectors. The average value added is highest in food processing, security and retail while it is lowest in agriculture, hairdressing and social care. The value of fixed capital assets is highest in food processing, retail and hospitality. With respect to the rate of investment though, over the period of analysis, social care is leading with hairdressing and leisure sectors also relatively high. The largest firms by average number of employees are found in the security and cleaning sectors while the smallest exist in agriculture, hairdressing and leisure. In all sectors, except agriculture, a large proportion of firms are

[18] In section 2 we explicitly discuss the implications of using industry wide price deflators. We note, however, that allowing for endogenous trade orientation in the unobservable and introducing location information in the state space will control for a persistent exchange rate adjusted pricing gap across locations and between exporters and non-exporters in their use of inputs and their outputs within 4-digit industries. In addition, the inclusion of wage dispersion information to account for the NMW ‘bite’ will further control for price shocks. Moreover, Foster et al. (2008) find that productivity estimates from quantity and deflated revenue data are highly correlated and that the bias vanishes on average, while estimated average productivity is unaffected when aggregate deflators are used.

located in urban areas. The highest share of exporters is in the textile and food processing manufacturing industries. Exits are highest, especially at the end of the period of analysis, in 2008, amongst retail, cleaning and security firms, as the latter are also characterised by the lowest average age.

- Table 3 about here -

A summary of the aggregated coefficients from Olley-Pakes second-order Markov process (OP2) and Olley-Pakes first-order Markov process (OP1) models, for the LPC sectors, over the estimated 4-digit industries is reported in Table 4. The aggregated coefficients on labour, capital and age reported are weighted averages, weighted by number of employees. Both coefficient sets from OP2 and OP1 models are broadly similar.

We now discuss the coefficients from our preferred OP2 model. They demonstrate some differences across LPC sectors, especially between manufacturing and services with respect to the capital and labour elasticities. The coefficient on labour ranges between 0.50 and 0.96 and is highest in service industries such as leisure and social care. The capital coefficient ranges between 0.06 and 0.28 and is lowest in the social care and leisure industries. The coefficient on age shows an interesting pattern; besides cohort effects it seems to capture variations in product quality across sectors associated with age and experience. Industries where the age coefficient has the largest magnitude are leisure, hairdressing and security. In Table 4 we also report aggregate means of the productivity measures calculated from OP2 and OP1 models as well as a labour productivity measure (LP); the three measures appear broadly comparable. The sectors with highest aggregate productivity using the OP2 measure are security and retail while social care shows the lowest productivity.

- Table 4 about here -

Next we illustrate graphically our productivity results for the aggregate of all the LPC sectors and for aggregates of manufacturing and service sectors. The graphs in the first column of Figure 1 show results from our preferred estimated model of unobservable productivity (OP2) for all the LPC sectors in aggregate while in the second column results for the aggregate counterfactual industries (manufacturing and services) are presented.[19] Figure 2 and Figure 3 similarly report results for the aggregate manufacturing and service industries respectively. The main message from Figures 1 to 3 is that the NMW seems to have had a clear and positive impact on aggregate productivity of the UK's low-paying sectors over the ten-year period since its introduction. The elasticity of aggregate productivity with respect to NMW is around 1, with the productivity of service sectors being twice as sensitive as that of manufacturing to increases in the NMW. Thus, our graphical analysis suggests that there is indeed an interesting relationship between NMW and productivity which is worth more detailed investigation.

- Figure 1 about here –

- Figure 2 about here -

- Figure 3 about here –

4.2 NMW and aggregate productivity: difference-in-differences analysis

Given our analytical strategy to build into the estimated model of (unobservable) productivity all relevant factors affecting it, to demonstrate the NMW's effects on (LPC) low-paying productivity, we follow Draca et al.'s (2010) unconditional difference-in-differences approach. We identify a group of firms within an industry sector that are more affected by the NMW introduction than a control group. In the treatment group of firms, wages are expected to rise more due to the introduction of the NMW and thus the effect of NMW on productivity is expected to be larger. A treatment indicator variable is defined as T=1 for below - NMW

[19] We also present as a robustness check the graphical results for the labour productivity (LP) measure in Appendix 1, Figure A1 to Figure A3. The results presented are quite similar to ones presented in the main text but the statistical significance of the correlations is lower and the trends are weaker. The results with the OP1 measure lie somewhere in between the OP2 and LP results and can be obtained from the authors.

firms in the pre-policy period and T=0 for a set of firms whose pre-policy wage exceeds a threshold equal to the NMW at introduction. Thus, the unconditional difference-in-differences estimate of the impact of the NMW on average productivity (TFP) is

$$(TFP^{T=1}_{NMW=1} - TFP^{T=1}_{NMW=0}) - (TFP^{T=0}_{NMW=1} - TFP^{T=0}_{NMW=0}). \qquad (9)$$

In a similar manner, we estimate difference-in-differences for average wages to verify the impact of NMW on the wage distribution and difference-in-differences for average capital-labour (K/L) ratios to aid our attempt to shed light on the possible sources of productivity changes. We evaluate the effects before (NMW=0) and after (NMW=1) NMW introduction in all LPC sectors, aggregates of the manufacturing and services sectors, and by individual low-paying (LPC) sectors.

Empirically, we define our treatment groups as in Draca et al. (2010), based upon average remuneration information from FAME.[20] We divide the total remuneration figure for each firm by the (full-time equivalent) average number of employees to calculate an average wage. The treatment group (T=1) includes low-wage firms, with an average wage of less than £12,000 prior to the introduction of the NMW.[21] The comparison group (T=0) contains firms similar to the treatment group firms but with an average wage between £12,000 and £24,000, a level close to the median firm wage in our samples. The key goal of the identification strategy is that the wages of firms below the threshold will experience a significant boost from the NMW introduction relative to the higher wage firms.

The results of the difference-in-differences analysis are reported in Tables 5 to 8. In the upper panel of each table we verify for all samples that wages rise by more in the T=1

[20] Draca et al. (2010) use information from FAME, the Labour Force Survey (LFS) and the Workplace Employment Relations Survey (WERS) both to construct and validate their treatment group indicators. Specifically, they use within-establishment information from matched worker-establishment data in WERS to investigate the association between low pay incidence and average wages and to verify the effectiveness of their empirical strategy.

[21] For the results reported we identify as low-wage the firms with average remuneration of less than £12,000 over the three years prior to the introduction of the NMW in April 1999. This allows the elimination of outliers and also the more consistent identification of genuinely low-wage firms.

firms as compared to the T=0 firms after the introduction of the NMW in 1999. As expected, we identify stronger wage effects for the treatment groups. Thus, potential effects on productivity of the treatment group firms can be attributed to the 'bite' of the NMW after its introduction. Our definition is further enhanced by the fact that the comparison group contains firms with average wages not exceeding £24,000. Firms with much higher average wages are likely to be quite different in terms of their characteristics and therefore subject to different unobservable trends compared to the treatment group. To further check the robustness of our results we also create counterfactuals which contain firms from industries where the NMW's 'bite' is expected to be weak. We select the industries based on literature evidence and expert opinions from both manufacturing and service sectors to roughly approximate the composition of the aggregate low-paying LPC sectors. We expect that in the counterfactuals NMW effects on wages and productivity will be much less pronounced. The empirical findings confirm our expectations.

The results for productivity effects (for the OP2 measure) of NMW introduction are reported in the second panels of Tables 5 to 8.[22] Our findings with respect to the impact of NMW on productivity are quite consistent across LPC sectors. It appears that the firms in the treatment groups where the NMW 'bite' is stronger have experienced relative increases in productivity over the period 1999 - 2009. The effects are statistically significant in all LPC sectors except for hairdressing, leisure and agriculture. When considering productivity effects by firm size groups, the largest relative increases in productivity are observed for large firms in the aggregate (all sectors) sample and in all service sectors. In the manufacturing sectors the relative productivity increases are largest for medium-size firms.

In the third (bottom) panel of Tables 5 to 8 we also report results for the capital-labour (K/L) ratio. Changes in the K/L ratio may reflect technology adjustments in firms as a result

[22] The Appendix, Table A2 to Table A5, contains results with labour productivity (LP) measures. The relative increases in productivity resulting from NMW introduction are very similar to the ones reported for the OP2 measure in the main text.

of the NMW over the ten-year period since its introduction. Such adjustments can be seen as long-term effects of the NMW and a potential source of productivity changes. It seems that in some of the LPC sectors, such as hospitality and social care, productivity improvements resulting from NMW introduction are indeed driven by substitution of labour for capital to a large degree compared with other LPC, mostly manufacturing, sectors. For the aggregate (all sectors) and services samples there is statistical evidence for substitution of labour for capital in the low-paying sectors while in the counterfactual samples such evidence does not occur. An alternative explanation to this long-run adjustment mechanism could be firm exit. In Table 4 we report exit rates by LPC sector for 1998 and 2008, before and ten years after the introduction of the NMW. It seems that in sectors with relative productivity gains where the labour-for-capital substitution is weaker, the exit rates are higher in 2008. This observation seems to support the argument that in the long-run less productive firms may exit under the pressure of increasing costs due to the introduction of the NMW.

5 Discussion and conclusion

Overall, our analyses show an improvement in total factor productivity in low-paying sectors as a result of the introduction of the NMW. Our analyses also reveal evidence of substantial heterogeneity across and within sectors. This also applies across firm size groups, as effects are particularly marked in larger firms while the small-firm group shows the least improvement in productivity. To the best of our knowledge, our results provide the first significant empirical support for the long-standing theoretical argument in favour of a national minimum wage initially and tentatively advanced by the Webbs in the late Nineteenth Century (Webb and Webb, 1897). Their argument was first based on the wider social costs of not having effective minimum wages but later came to include increased productivity as firms sought to compensate for higher wage costs (Webb, 1912).

Documenting the phenomenon and providing contemporary and robust empirical evidence brings us to the limits of the type of analysis conducted here. As Mayhew and Neely (2006) and Keep et al. (2006) argue, in-company processes leading to higher productivity remain a ‘black box’. This tends to suggest a need both for a further in-depth econometric study testing various models, and for detailed case study investigation. Thus, we can only offer tentative hypothetical explanations of our results based on our discussions in previous sections. We attempt this in two areas: market position and internal company changes contributing to productive processes.

Greater productivity gains in larger firms suggest possible pass-through and long-run mark-up effects in firms with more monopoly power who can pass on increases to customers. Their higher public profile is associated with high levels of compliance with the NMW legislation compared with smaller firms which may maintain a strategy to ‘stay underground’, i.e. keep low levels of visibility to all regulatory agencies rather than to move up market and improve (Ram et al., 2007; Croucher and White, 2007). For the larger firms, ‘staying underground’ and seeking to avoid full compliance with NMW requirements is not a viable option. Thus, large firms are likely to experience large increases in labour costs compared with small firms.

The pass-through argument is also supported by our cross-sectoral evidence. Less competitive and mostly domestically-traded sectors such as social care show greater relative increases in productivity. Social care is a very varied sector that includes considerable social work, childcare and welfare segments as well as the residential home segment. Thus, much of it escapes the price-capping common in the latter segment (Machin and Manning, 2004). Even if it is impossible because of price-capping to pass costs on, a context of rising demand may provide incentives to improve productivity. Further, there is evidence in the social care sector of labour-for-capital substitution in the ten year period. Hairdressing on the other hand does not seem to have been able to pass on labour cost increases or to substitute labour for capital. Furthermore, the industry has a long history of the problematic application of minimum rates of pay, suggesting that a non-compliance strategy appears a viable option for adaptation in the industry's context (Druker et al., 2002; White and Croucher, 2007). Druker et al. (2002) show that hairdressing employers prefer to maintain a 'steady state', limiting innovation and maintaining prices. Thus, pay increases cannot be passed on and innovation is ruled out, closing off both of the obvious options.

Internal firm reorganisation, besides long-run technology adjustments through labour-for-capital substitutions, also seems likely to be relevant. Larger firms may have more capacity to reorganise productive processes simply because there is more labour available, making solutions such as increased use of functional and time flexibility more possible. They may be more able to develop adaptive strategies because of more articulated management structures and more sophisticated or 'progressive' Human Resource Management (Delaney and Huselid, 1996) and operations management practices. On the other hand, weak adoption of efficient operations management is characteristic of small British firms and especially 'micro' and family firms employing fewer than twenty workers. They tend to be characterised by fragmented practices that are reactive to the environment (Cagliano et al., 2001). Many of the smaller companies, for example individual nursing homes, are among the type of employers identified as likely to be 'black hole' organisations in terms of their HRM and employment relations (Guest and Conway, 1999). They are unlikely to have a strategic approach to HRM and this may reduce their capacity to introduce and manage functional and time flexibility and hence productivity (Friedrich et al., 1998). Larger firms are more likely to adopt what Rainbird et al. (2009), reporting on the social care sector, called 'pro-active' rather than the 'reactive' approach also found in the industry whereby companies simply react to regulatory pressure. Adam-Smith et al. (2003) reached a similar conclusion in the hospitality industry: there was no evidence for a regulatory ‘shock’ to management practices after the introduction of the NMW, but rather a reinforcement of existing hierarchies and ways of working. This is consistent with the LPC 2008 survey of employers which showed that in hospitality, employers were most likely simply to reduce the numbers employed as a reaction to an increase in the NMW. More sophisticated adaptive responses were not perceived as viable.

Thus, notwithstanding our speculation on its causes, we provide significant evidence that the introduction of NMW led to increases in productivity in all low-paying sectors and the increases are more marked in larger firms. There is also significant evidence of heterogeneity in responses across the low-paying sectors. Formulating specific policies to improve productivity through the NMW would require further research into the mechanisms of productivity improvement on a sector-by-sector basis.

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Table 1 Characteristics of low paying sectors, 2010

Industry	Growth since 1998	Proportion of workers paid NMW	Number of employees	Results of NMW
Retail	Continuous growth until the start of the recession	6.8%	3.2M	The ACS reported that differentials continued to be squeezed as a result of increases to the NMW.
Hospitality and Leisure, Travel and Sport	A substantial fall	18.1% in Hospitality 6.2% in Leisure, Travel and Sport	1.09M in Hospitality 648,000 in Leisure, Travel and Sport	The ALMR said that 82 per cent of members had to let staff go because of increases in the MW.
Social care	Continuous growth	5%	1.2M	Care providers told LPC the squeeze they faced resulting from the level of fees paid by public bodies that purchase care services.
Childcare	The Government continues to increase the provision of childcare	4.8%	373,000	The White Horse Child Care Ltd. said that increases in the NMW had led to increases in the fees charged to parents, which had reduced the size of the market and excluded many of the parents that most needed high quality childcare.
Cleaning and Security	Continuous growth	21.8% in the cleaning sector	472,000 in Cleaning sector; 178,000 in the Security sector	CSSA reported that clients might accept increases of the MW; however, often shorten hours of contract or lower specification.
Hairdressing		10.3%		The NHF stated any compulsory pressure to increase costs would inevitably result in continued job losses.
Agriculture	Falling employment and income	2.8%	242,000	The NFU claimed that it was harder for the producers to compete with competitors in countries with lower MW.
Textiles, Clothing and Food Processing (Manufacturing)	Falling employment and declining output	8.2%	82,000 in textiles and clothing; 348,000 in food processing sector	The FDF said that the industry is tending to pass any increase in wage costs to clients.

Source: National Minimum Wage, Chapter 3, p.p. 54-77, Low Pay Commission Report 2010.

Table 2 NMW and tenth-fiftieth percentiles log(wage) differentials by LPC sectors

Year	NMW, £	Tenth-fiftieth percentile log(wage) differentials											
		Social care	Retail	Hospitality	Cleaning	Security	Hairdressing	Textiles	Agriculture	Food process	Leisure	Counter M	Counter S
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1996	-	-0.76	-0.80	-0.88	-1.01	-0.86	-0.67	-0.90	-1.04	-0.75	-1.02	-0.36	-0.88
1997	-	-0.78	-0.78	-0.84	-1.02	-0.85	-0.66	-0.90	-1.02	-0.76	-1.00	-0.36	-0.92
1998	-	-0.76	-0.77	-0.82	-1.06	-0.84	-0.58	-0.82	-0.96	-0.75	-1.02	-0.42	-0.92
1999	3.90	-0.77	-0.75	-0.75	-1.02	-1.07	-0.59	-0.78	-0.90	-0.67	-0.96	-0.41	-0.94
2000	3.97	-0.75	-0.72	-0.71	-0.96	-0.95	-0.52	-0.70	-0.91	-0.58	-0.92	-0.43	-0.95
2001	4.35	-0.68	-0.64	-0.62	-0.84	-0.74	-0.56	-0.63	-0.90	-0.45	-0.92	-0.45	-0.96
2002	4.40	-0.68	-0.60	-0.57	-0.79	-0.59	-0.54	-0.59	-0.88	-0.38	-0.89	-0.42	-0.95
2003	4.65	-0.67	-0.60	-0.61	-0.77	-0.70	-0.44	-0.52	-0.87	-0.37	-0.88	-0.48	-0.94
2004	4.95	-0.60	-0.61	-0.58	-0.82	-0.70	-0.48	-0.50	-0.87	-0.36	-0.89	-0.46	-0.98
2005	5.05	-0.62	-0.62	-0.60	-0.87	-0.71	-0.54	-0.51	-0.92	-0.40	-0.93	-0.45	-0.97
2006	5.23	-0.64	-0.63	-0.58	-0.86	-0.80	-0.58	-0.51	-0.91	-0.44	-0.92	-0.42	-0.98
2007	5.27	-0.61	-0.65	-0.58	-0.85	-0.84	-0.51	-0.55	-0.85	-0.40	-0.92	-0.45	-1.00
2008	5.28	-0.53	-0.64	-0.61	-0.86	-0.74	-0.51	-0.60	-0.77	-0.37	-0.89	-0.45	-1.00
2009	5.23	-0.58	-0.64	-0.62	-0.93	-0.76	-0.58	-0.68	-0.82	-0.40	-0.87	-0.52	-0.95

Note: Counter M comprises the manufacturing industries counterfactual and Counter S - service industries one.

Table 3 Summary statistics by LPC sector, 1996-2009

Variables	Social care	Retail	Hospitality	Cleaning	Security	Hair-dressing	Textiles	Agriculture	Food process	Leisure	Counter M	Counter S
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Value added,	1615	13045	4449	4971	16011	1255	6052	1097	18836	4583	52946	13256
th£	(7284)	(162869)	(24991)	(36823)	(191088)	(4833)	(30598)	(3957)	(121504)	(25568)	(491646)	(222233)
Fixed assets,	4698	17303	17114	11108	15711	719	4597	2547	26542	8398	140916	39147
th£	(39576)	(278458)	(158836)	(117243)	(172632)	(3253)	(31690)	(10899)	(222056)	(71295)	(1729177)	(1302974)
Investment,	1289	3279	2761	2734	3319	182	965	450	4947	2057	27284	9038
th£	(18887)	(56147)	(37952)	(33480)	(44148)	(1074)	(9980)	(2489)	(53139)	(24281)	(487335)	(173691)
Number of	174	470	336	1305	2872	80	328	55	557	121	659	156
employees	(728)	(5148)	(5030)	(6947)	(34567)	(360)	(2339)	(335)	(3057)	(694)	(3835)	(1483)
Age, years	17	24	19	22	11	11	31	30	26	24	27	14
	(17)	(20)	(19)	(21)	(8)	(10)	(26)	(19)	(23)	(24)	(24)	(13)
Exporters	0.02	0.12	0.03	0.05	0.18	0.06	0.57	0.11	0.40	0.14	0.50	0.19
Exits 1998	0.02	0.01	0.00	0.01	0.01	0.03	0.01	0.01	0.01	0.01	0.01	0.01
Exits 2008	0.02	0.05	0.02	0.04	0.05	0.02	0.02	0.01	0.02	0.02	0.01	0.03
Urban	0.90	0.90	0.88	0.93	0.96	0.90	0.92	0.44	0.82	0.87	0.89	0.93
Rural less sparse	0.09	0.08	0.10	0.05	0.03	0.09	0.06	0.52	0.15	0.12	0.10	0.07
Rural sparse	0.01	0.02	0.02	0.02	0.01	0.01	0.02	0.04	0.03	0.01	0.01	0.00
Number of observations	5156	70668	22019	3491	935	1864	8232	13408	10169	24665	15325	30681

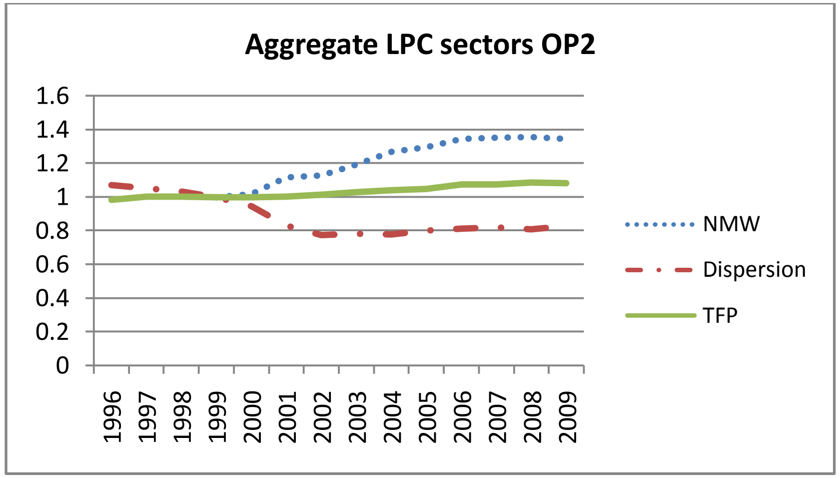
Note: Unweighted means and standard deviations (s.d.) are reported. Counter M comprises the manufacturing industries counterfactual and Counter S - service industries one.

Table 4 Production function OP2 and OP1 coefficients and productivity estimates by LPC sector, 1996-2009

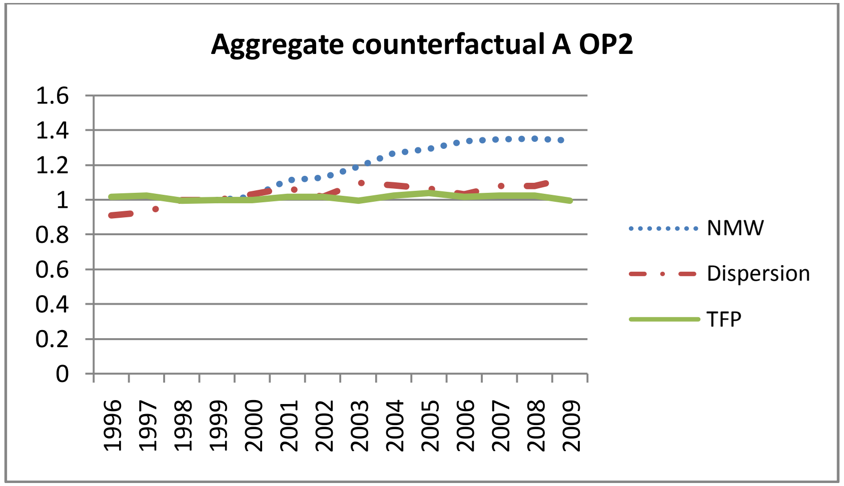
Coefficients	Social care	Retail	Hospitality	Cleaning	Security	Hair-dressing	Textiles	Agriculture	Food process	Leisure	Counter M	Counter S
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
						OP2 coefficients						
Labour	0.94	0.70	0.54	0.50	0.50	0.60	0.56	0.72	0.59	0.96	0.72	0.75
	(0.08)	(0.02)	(0.02)	(0.02)	(0.08)	(0.06)	(0.04)	(0.03)	(0.05)	(0.04)	(0.05)	(0.05)
Capital	0.06	0.08	0.18	0.16	0.12	0.21	0.28	0.17	0.26	0.07	0.20	0.19
	(0.03)	(0.01)	(0.01)	(0.02)	(0.04)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)
Age	0.07	0.25	0.33	0.22	0.38	0.47	0.12	0.08	0.29	0.56	0.14	0.30
	(0.02)	(0.03)	(0.13)	(0.05)	(0.19)	(0.16)	(0.07)	(0.05)	(0.07)	(0.19)	(0.08)	(0.11)
Adj R^2	0.90	0.97	0.96	0.98	0.98	0.97	0.97	0.92	0.97	0.92	0.96	0.92
Aggregate OP2	1.50	3.49	3.12	2.83	4.19	3.14	2.98	2.19	3.13	2.17	3.00	3.34
	(0.37)	(0.47)	(1.32)	(0.46)	(0.59)	(0.42)	(0.15)	(0.39)	(0.26)	(0.32)	(0.28)	(0.19)
						OP1 coefficients						
Labour	0.88	0.66	0.56	0.54	0.58	0.64	0.50	0.65	0.52	0.94	0.65	0.73
	(0.04)	(0.02)	(0.03)	(0.05)	(0.07)	(0.06)	(0.04)	(0.04)	(0.03)	(0.04)	(0.07)	(0.04)
Capital	0.09	0.10	0.14	0.20	0.14	0.22	0.30	0.17	0.30	0.09	0.23	0.23
	(0.02)	(0.01)	(0.01)	(0.03)	(0.03)	(0.03)	(0.02)	(0.03)	(0.02)	(0.01)	(0.04)	(0.02)
Age	0.20	0.19	0.27	0.25	0.18	0.23	0.07	0.18	0.18	0.50	0.10	0.11
	(0.08)	(0.07)	(0.13)	(0.15)	(0.16)	(0.14)	(0.08)	(0.10)	(0.07)	(0.13)	(0.13)	(0.11)
Adj R^2	0.90	0.97	0.96	0.97	0.97	0.97	0.97	0.91	0.97	0.92	0.95	0.92
Aggregate OP1	1.96	4.08	2,83	2.01	3.60	2.20	3.17	2.42	2.78	2.12	3.33	3.14
	(0.29)	(1.32)	(1.42)	(0.67)	(0.41)	(0.50)	(0.40)	(0.34)	(0.27)	(0.33)	(0.52)	(0.47)
Aggregate LP	1.60	3.12	2.32	1.98	2.96	2.24	2.81	2.38	3.12	2.25	3.12	3.08
	(0.37)	(1.17)	(1.28)	(1.02)	(0.74)	(0.64)	(0.23)	(0.60)	(0.17)	(0.19)	(0.31)	(0.73)

Note: The reported coefficients and aggregate productivity are weighted averages, using number of employees as weight, from 4-digit industry regressions on firm level data. The R^2 reported are from the last stage of the estimation algorithm. Standard errors (standard deviations for productivity) are reported in parentheses. Counter M comprises the manufacturing industries counterfactual and Counter S - service industries one.

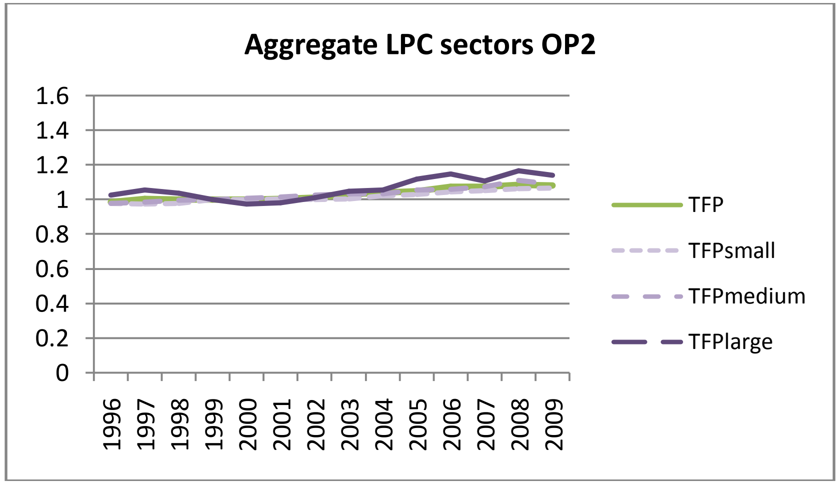
Figure 1 Summary of the results from the OP2 model for aggregate LPC sectors and counterfactual (A)



Elasticity of TFP wrt NMW: 0.94 (t 8.13)



Elasticity of TFP wrt NMW: 0.16 (t 0.58)



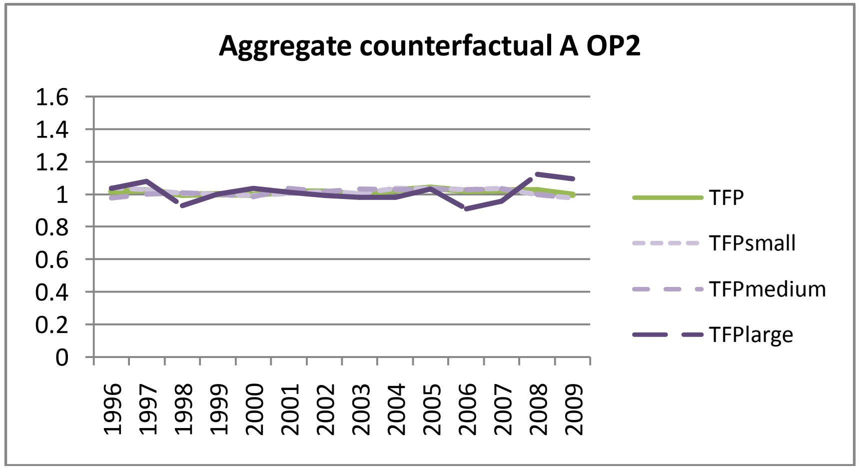
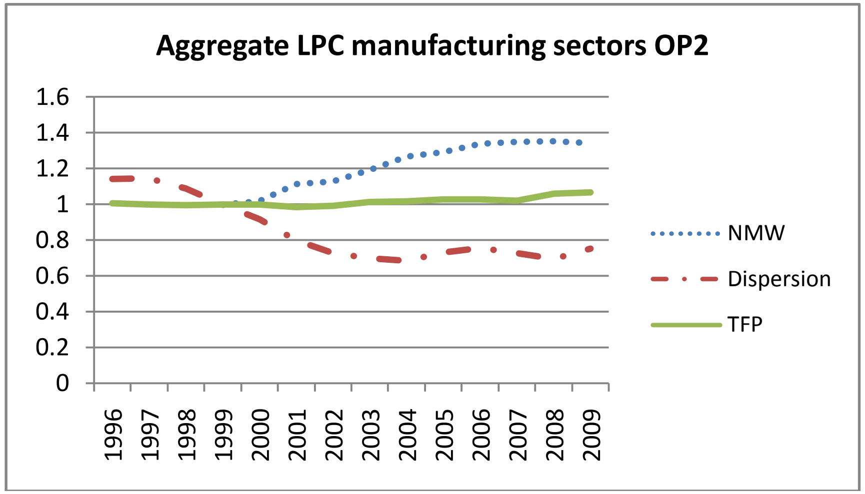
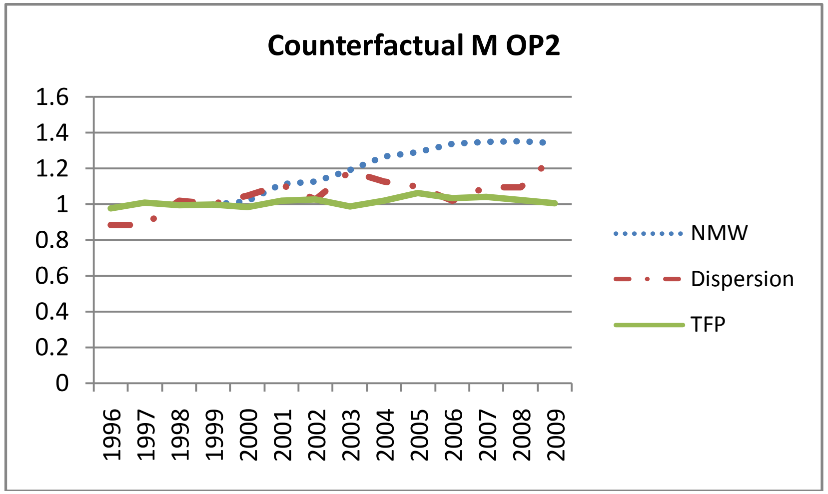


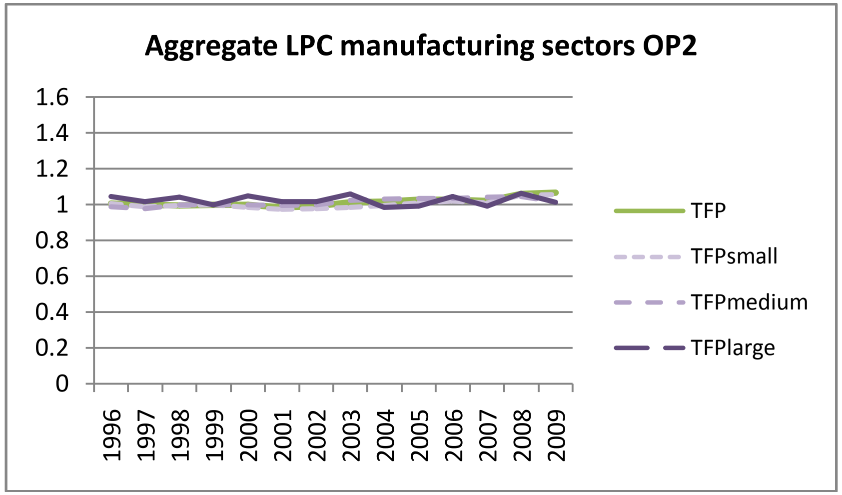
Figure 2 Summary of the results from the OP2 model for aggregate LPC manufacturing sectors and counterfactual (M)





Elasticity of TFP wrt NMW: 0.49 (t 3.47)

Elasticity of TFP wrt NMW: 0.30 (t 1.17)



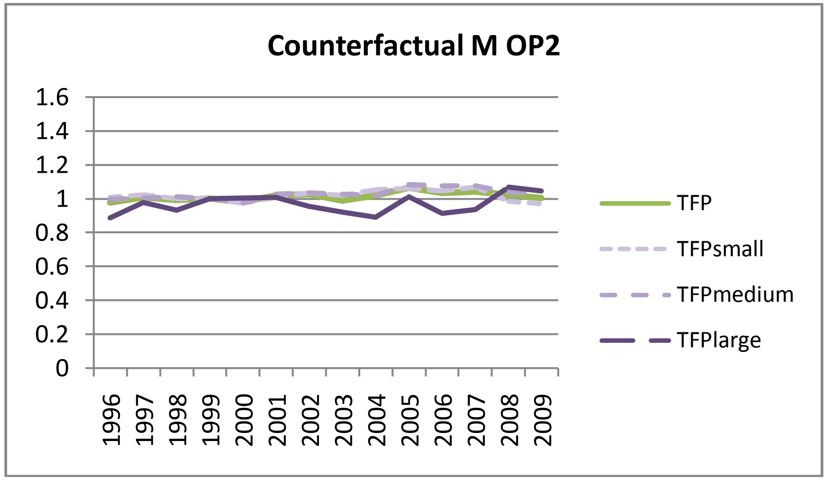
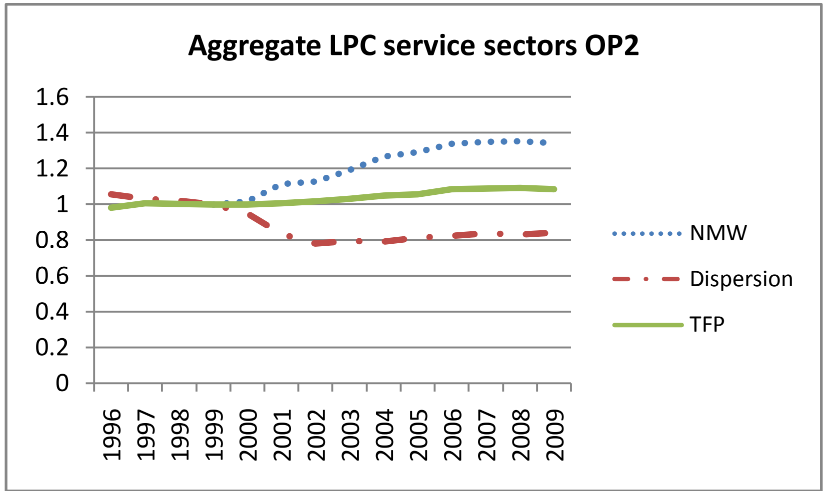
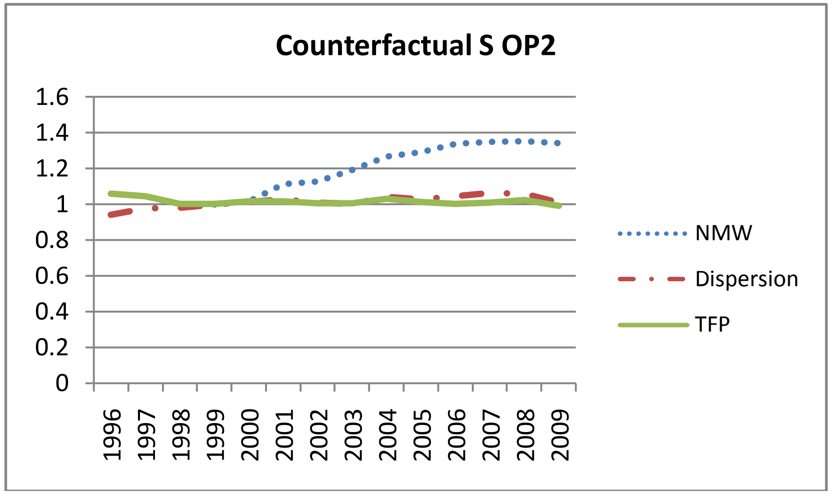


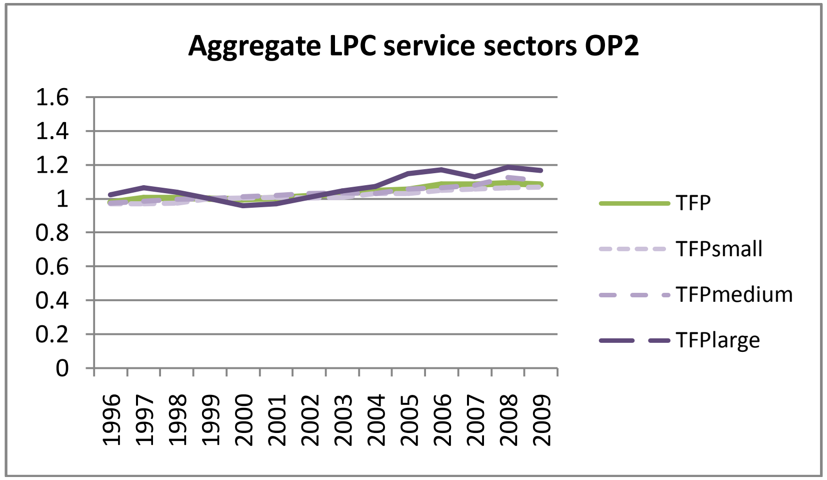
Figure 3 Summary of the results from the OP2 model for aggregate LPC service sectors and counterfactual (S)





Elasticity of TFP wrt NMW: 1.03 (t 8.96)

Elasticity of TFP wrt NMW: 0.01 (t 0.12)



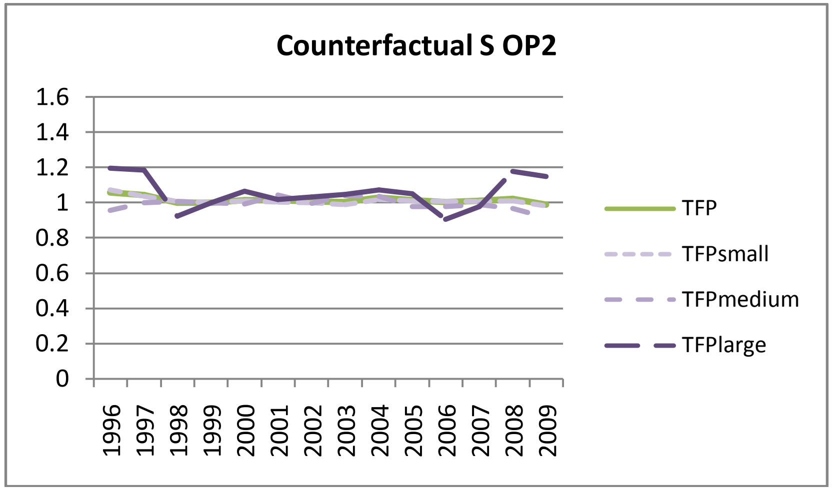


Table 5 Difference-in-differences analysis of wages, OP2, and K/L for the aggregate LPC sectors and counterfactual (A)

Sectors and subsamples	Total sample			Small firms			Medium firms			Large firms		
	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference
Aggregate	1.970	2.106	+0.136	1.916	2.023	+0.107	2.089	2.267	+0.178	1.980	2.140	+0.161
(T) ln(w)	(0.008)	(0.009)	(0.010)	(0.011)	(0.012)	(0.008)	(0.014)	(0.013)	(0.014)	(0.025)	(0.024)	(0.012)
Aggregate	2.802	2.857	+0.055	2.804	2.821	+0.017	2.804	2.882	+0.078	2.790	2.875	+0.085
(C) ln(w)	(0.002)	(0.004)	(0.004)	(0.003)	(0.006)	(0.005)	(0.004)	(0.007)	(0.006)	(0.006)	(0.009)	(0.007)
			+0.081*			***+0.090****			***+0.100****			***+0.076****
			(0.007)			***(0.009)***			***(0.013)***			***(0.013)***
Aggregate	2.834	2.846	+0.012	2.676	2.659	-0.017	2.936	2.968	+0.032	3.371	3.486	+0.116
(T) OP2	(0.015)	(0.016)	(0.008)	(0.018)	(0.019)	(0.009)	(0.030)	(0.031)	(0.015)	(0.043)	(0.042)	(0.020)
Aggregate	3.168	3.136	-0.033	3.113	3.069	-0.044	3.158	3.133	-0.025	3.418	3.421	+0.003
(C) OP2	(0.012)	(0.012)	(0.006)	(0.015)	(0.016)	(0.008)	(0.021)	(0.021)	(0.009)	(0.042)	(0.042)	(0.019)
			+0.044*			***+0.027****			***+0.057****			***+0.113****
			(0.010)			***(0.012)***			***(0.017)***			***(0.027)***
Aggregate	1.929	2.222	+0.293	1.998	2.246	+0.249	1.937	2.297	+0.360	1.533	1.804	+0.271
(T) K/L	(0.024)	(0.025)	(0.012)	(0.030)	(0.032)	(0.016)	(0.042)	(0.045)	(0.025)	(0.072)	(0.074)	(0.030)
Aggregate	2.354	2.615	+0.261	2.240	2.483	+0.244	2.447	2.744	+0.297	2.570	2.800	+0.230
(C) K/L	(0.018)	(0.018)	(0.010)	(0.025)	(0.027)	(0.014)	(0.028)	(0.027)	(0.016)	(0.048)	(0.047)	(0.028)
			+0.032*			*+0.005*			***+0.063****			*+0.041*
			(0.016)			*(0.021)*			***(0.029)***			*(0.042)*

Table 5 Continued

Sectors and subsamples	Total sample			Small firms			Medium firms			Large firms		
	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference
Counterfactual	2.336	2.290	-0.047	2.295	2.222	-0.073	2.637	2.624	-0.013	2.478	2.531	+0.053
A (T) ln(w)	(0.083)	(0.069)	(0.038)	(0.094)	(0.080)	(0.033)	(0.210)	(0.161)	(0.106)	(0.229)	(0.128)	(0.150)
Counterfactual	3.051	2.981	-0.070	3.102	3.015	-0.087	3.032	2.966	-0.066	2.932	2.902	-0.029
A (C) ln(w)	(0.028)	(0.00)	(0.018)	(0.041)	(0.031)	(0.019)	(0.037)	(0.031)	(0.018)	(0.071)	(0.059)	(0.037)
			+0.023			*+0.014*			*+0.053*			*+0.082*
			(0.046)			*(0.040)*			*(0.083)*			*(0.150)*
Counterfactual	2.543	2.551	+0.007	2.546	2.516	-0.029	2.654	2.769	+0.115	2.715	3.021	+0.306
A (T) OP2	(0.074)	(0.076)	(0.062)	(0.072)	(0.075)	(0.062)	(0.299)	(0.266)	(0.177)	(0.924)	(0.375)	(0.661)
Counterfactual	2.849	2.872	+0.023	2.798	2.805	+0.007	2.802	2.860	+0.058	3.139	3.093	-0.046
A (C) OP2	(0.034)	(0.033)	(0.024)	(0.041)	(0.040)	(0.032)	(0.066)	(0.060)	(0.055)	(0.104)	(0.122)	(0.094)
			-0.016			*-0.036*			*+0.057*			*+0.352*
			(0.058)			*(0.065)*			*(0.202)*			*(0.414)*
Counterfactual	1.430	1.842	+0.412	1.285	1.703	+0.418	2.546	2.724	+0.115	2.397	3.333	+0.936
A (T) K/L	(0.111)	(0.119)	(0.057)	(0.114)	(0.125)	(0.059)	(0.495)	(0.473)	(0.177)	(0.369)	(0.442)	(0.225)
Counterfactual	1.646	2.102	+0.456	1.176	1.651	+0.475	2.054	2.398	+0.343	2.599	2.972	+0.373
A (C) K/L	(0.042)	(0.044)	(0.026)	(0.054)	(0.059)	(0.033)	(0.073)	(0.073)	(0.044)	(0.095)	(0.101)	(0.070)
			-0.044			*-0.057*			*-0.166*			***+0.563****
			(0.061)			*(0.065)*			*(0.180)*			***(0.291)***

Note: Figures in italics indicate the difference-in-differences and figures in bold indicate sectors and firm size groups with statistically significant (at 10% or better) difference-in-differences in wages, productivity or K/L ratio after the implementation of the NMW in 1999. The levels of significance are denoted as follows: *** 1% or better; ** 5% or better; * 10% or better. (T) denotes the treatment group and (C) denotes the comparison group. OP2 is productivity measure estimated by the Olley-Pakes modified algorithm based on a 2nd order Markov process. Counterfactual is an aggregate of manufacturing (M) and services (S) counterfactuals.

Table 6 Difference-in-differences analysis of wages, OP2, and K/L for the manufacturing LPC sectors and counterfactual (M)

Sectors and subsamples	Total sample			Small firms			Medium firms			Large firms		
	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference
Manufacturing (T) ln(w)	1.953 (0.020)	2.099 (0.022)	+0.146 (0.014)	1.848 (0.026)	1.928 (0.027)	+0.080 (0.016)	2.210 (0.023)	2.460 (0.025)	+0.250 (0.028)	2.102 (0.064)	2.270 (0.068)	+0.168 (0.020)
Manufacturing (C) ln(w)	2.786 (0.005)	2.894 (0.008)	+0.108 (0.007)	2.796 (0.008)	2.843 (0.014)	+0.046 (0.012)	2.783 (0.008)	2.901 (0.011)	+0.118 (0.009)	2.782 (0.010)	2.934 (0.015)	+0.152 (0.010)
			+0.039** (0.014)			***+0.034** (0.020)***			***+0.112*** (0.022)***			*+0.016 (0.021)*
Manufacturing (T) OP2	2.284 (0.032)	2.306 (0.034)	+0.022 (0.019)	2.124 (0.044)	2.116 (0.046)	-0.008 (0.026)	2.530 (0.046)	2.586 (0.052)	+0.056 (0.033)	2.796 (0.069)	2.857 (0.077)	+0.061 (0.039)
Manufacturing (C) OP2	2.927 (0.023)	2.906 (0.024)	-0.021 (0.015)	2.790 (0.042)	2.742 (0.044)	-0.048 (0.024)	2.996 (0.029)	2.943 (0.030)	-0.053 (0.019)	3.115 (0.041)	3.165 (0.046)	+0.050 (0.030)
			+0.043 (0.024)***			*+0.040 (0.035)*			***+0.109*** (0.037)***			*+0.011 (0.053)*
Manufacturing (T) K/L	2.454 (0.048)	2.653 (0.053)	+0.199 (0.026)	2.767 (0.064)	2.931 (0.071)	+0.164 (0.031)	1.849 (0.065)	2.117 (0.078)	+0.268 (0.049)	1.774 (0.077)	1.981 (0.085)	+0.207 (0.054)
Manufacturing (C) K/L	2.829 (0.032)	3.037 (0.033)	+0.208 (0.017)	3.102 (0.059)	3.260 (0.062)	+0.158 (0.026)	2.541 (0.045)	2.827 (0.043)	+0.286 (0.026)	2.805 (0.047)	2.959 (0.055)	+0.154 (0.037)
			-0.009 (0.030)			*+0.006 (0.041)*			*-0.018 (0.052)*			*+0.053 (0.066)*

Table 6 Continued

Sectors and subsamples	Total sample			Small firms			Medium firms			Large firms		
	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference
Counterfactual	2.269	2.266	-0.003	2.157	2.119	-0.037	2.478	2.515	+0.037	2.407	2.618	+0.211
M (T) ln(w)	(0.171)	(0.156)	(0.080)	(0.248)	(0.234)	(0.076)	(0.137)	(0.134)	(0.051)	(0.422)	(0.066)	(0.371)
Counterfactual	2.969	2.930	-0.039	3.070	2.997	-0.073	2.965	2.968	+0.003	2.861	2.897	+0.036
M (C) ln(w)	(0.036)	(0.026)	(0.022)	(0.077)	(0.058)	(0.036)	(0.037)	(0.028)	(0.020)	(0.082)	(0.072)	(0.032)
			+0.036			*+0.035*			*+0.034*			*+0.175*
			(0.082)			*(0.088)*			*(0.102)*			*(0.186)*
Counterfactual	2.695	2.667	-0.028	2.618	2.640	+0.022	2.952	2.843	-0.109	3.370	3.268	-0.102
M (T) OP2	(0.124)	(0.139)	(0.072)	(0.129)	(0.139)	(0.084)	(0.461)	(0.585)	(0.183)	(0.518)	(0.443)	(0.249)
Counterfactual	2.953	2.974	+0.021	2.857	2.881	+0.024	2.890	2.902	+0.012	3.218	3.199	-0.019
M (C) OP2	(0.038)	(0.040)	(0.022)	(0.054)	(0.056)	(0.032)	(0.052)	(0.057)	(0.028)	(0.108)	(0.123)	(0.082)
			-0.049			*-0.002*			*-0.121*			*-0.083*
			(0.066)			*(0.075)*			*(0.137)*			*(0.474)*
Counterfactual	1.962	2.198	+0.236	2.006	2.127	+0.122	1.435	2.048	+0.612	2.346	3.250	+0.904
M (T) K/L	(0.179)	(0.178)	(0.094)	(0.204)	(0.207)	(0.096)	(0.457)	(0.314)	(0.293)	(0.132)	(0.323)	(0.385)
Counterfactual	2.169	2.418	+0.249	1.837	2.043	+0.206	2.202	2.419	+0.218	2.791	3.057	+0.266
M (C) K/L	(0.046)	(0.049)	(0.037)	(0.073)	(0.084)	(0.054)	(0.067)	(0.066)	(0.046)	(0.079)	(0.078)	(0.077)
			-0.013			*-0.084*			***+0.394***			***+0.638**
			(0.107)			*(0.114)*			***(0.228)***			***(0.445)***

Note: Figures in italics indicate the difference-in-differences and figures in bold indicate sectors and firm size groups with statistically significant (at 10% or better) difference-in-differences in wages, productivity or K/L ratio after the implementation of the NMW in 1999. The levels of significance are denoted as follows: *** 1% or better; ** 5% or better; * 10% or better. (T) denotes the treatment group and (C) denotes the comparison group. OP2 is productivity measure estimated by the Olley-Pakes modified algorithm based on a 2nd order Markov process.

Table 7 Difference-in-differences analysis of wages, OP2, and K/L for the service LPC sectors and counterfactual (S)

Sectors and subsamples	Total sample			Small firms			Medium firms			Large firms		
	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference
Services	1.972	2.116	+0.144	1.933	2.050	+0.117	2.055	2.220	+0.165	1.955	2.112	+0.157
(T) ln(w)	(0.009)	(0.09)	(0.008)	(0.013)	(0.012)	(0.010)	(0.017)	(0.015)	(0.016)	(0.027)	(0.025)	(0.014)
Services	2.806	2.842	+0.036	2.806	2.814	+0.008	2.813	2.867	+0.054	2.792	2.843	+0.050
(C) ln(w)	(0.003)	(0.005)	(0.004)	(0.004)	(0.006)	(0.005)	(0.005)	(0.008)	(0.007)	(0.008)	(0.011)	(0.008)
			+0.108*			***+0.109****			***+0.110****			***+0.107****
			(0.008)			***(0.011)***			***(0.016)***			***(0.016)***
Services	2.984	2.993	+0.009	2.823	2.797	-0.026	3.027	3.052	+0.025	3.486	3.611	+0.125
(T) OP2	(0.017)	(0.018)	(0.008)	(0.020)	(0.020)	(0.010)	(0.037)	(0.037)	(0.017)	(0.048)	(0.046)	(0.022)
Services	3.239	3.200	-0.039	3.174	3.134	-0.040	3.216	3.198	-0.018	3.586	3.560	-0.026
(C) OP2	(0.013)	(0.014)	(0.007)	(0.016)	(0.017)	(0.009)	(0.028)	(0.027)	(0.012)	(0.059)	(0.059)	(0.023)
			+0.047*			*+0.014*			***+0.043***			***+0.151****
			(0.010)			*(0.013)*			***(0.021)***			***(0.032)***
Services	1.791	2.110	+0.319	1.790	2.063	+0.273	1.954	2.351	+0.397	1.486	1.771	+0.285
(T) K/L	(0.027)	(0.028)	(0.014)	(0.033)	(0.035)	(0.018)	(0.050)	(0.052)	(0.027)	(0.085)	(0.088)	(0.034)
Services	2.207	2.481	+0.274	2.049	2.313	+0.264	2.407	2.714	+0.306	2.446	2.725	+0.279
(C) K/L	(0.020)	(0.022)	(0.012)	(0.027)	(0.029)	(0.016)	(0.035)	(0.034)	(0.021)	(0.067)	(0.064)	(0.038)
			+0.046*			*+0.009*			***+0.091****			*+0.006*
			(0.019)			*(0.024)*			***(0.034)***			*(0.051)*

Table 7 Continued

Sectors and subsamples	Total sample			Small firms			Medium firms			Large firms		
	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference
Counterfactual	2.365	2.286	-0.079	2.326	2.252	-0.073	2.701	2.657	-0.044	2.444	2.369	-0.076
S (T) ln(w)	(0.094)	(0.077)	(0.043)	(0.102)	(0.086)	(0.036)	(0.369)	(0.279)	(0.186)	(0.328)	(0.289)	(0.157)
Counterfactual	3.150	2.993	-0.157	3.110	3.011	-0.099	3.150	2.998	-0.152	3.108	2.903	-0.205
S (C) ln(w)	(0.041)	(0.028)	(0.024)	(0.049)	(0.037)	(0.022)	(0.086)	(0.076)	(0.032)	(0.144)	(0.109)	(0.101)
			+0.078			*+0.026*			*+0.108*			*+0.129*
			(0.054)			*(0.046)*			*(0.123)*			*(0.291)*
Counterfactual	2.522	2.531	+0.009	2.525	2.478	-0.047	2.703	3.009	+0.306	2.142	2.098	-0.044
S (T) OP2	(0.092)	(0.090)	(0.079)	(0.086)	(0.088)	(0.078)	(0.428)	(0.308)	(0.233)	(0.602)	(0.574)	(0.080)
Counterfactual	2.743	2.773	+0.030	2.775	2.775	-0.000	2.681	2.786	+0.105	2.956	2.848	-0.108
S (C) OP2	(0.054)	(0.050)	(0.039)	(0.054)	(0.056)	(0.044)	(0.157)	(0.137)	(0.143)	(0.216)	(0.271)	(0.219)
			-0.021			*-0.047*			*+0.200*			*+0.064*
			(0.082)			*(0.086)*			*(0.384)*			*(0.630)*
Counterfactual	1.237	1.741	+0.503	1.075	1.592	+0.517	2.849	2.832	-0.017	2.395	3.240	+0.845
S (T) K/L	(0.134)	(0.149)	(0.072)	(0.132)	(0.150)	(0.071)	(0.727)	(0.722)	(0.450)	(0.562)	(0.686)	(0.349)
Counterfactual	1.178	1.812	+0.634	0.876	1.449	+0.572	1.737	2.247	+0.510	2.222	2.771	+0.549
S (C) K/L	(0.064)	(0.068)	(0.037)	(0.067)	(0.074)	(0.040)	(0.158)	(0.165)	(0.087)	(0.236)	(0.263)	(0.142)
			-0.131			*-0.055*			***-0.527***			*+0.296*
			(0.076)			*(0.078)*			***(0.284)***			*(0.425)*

Note: Figures in italics indicate the difference-in-differences and figures in bold indicate sectors and firm size groups with statistically significant (at 10% or better) difference-in-differences in wages, productivity or K/L ratio after the implementation of the NMW in 1999. The levels of significance are denoted as follows: *** 1% or better; ** 5% or better; * 10% or better. (T) denotes the treatment group and (C) denotes the comparison group. OP2 is productivity measure estimated by the Olley-Pakes modified algorithm based on a 2nd order Markov process.

Table 8 Difference-in-differences analysis of wages, OP2, and K/L by LPC sectors and firm size bands

Sectors and subsamples	Total sample			Small firms			Medium firms			Large firms		
	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference
Retail	2.008	2.136	+0.128	1.196	2.072	+0.108	2.089	2.275	+0.186	2.117	2.242	+0.125
(T) ln(w)	(0.012)	(0.011)	(0.010)	(0.016)	(0.015)	(0.013)	(0.028)	(0.021)	(0.025)	(0.019)	(0.018)	(0.020)
Retail	2.813	2.865	+0.052	2.808	2.830	+0.021	2.831	2.910	+0.079	2.805	2.882	+0.076
(C) ln(w)	(0.003)	(0.005)	(0.004)	(0.004)	(0.007)	(0.006)	(0.006)	(0.008)	(0.006)	(0.009)	(0.014)	(0.009)
			+0.079*			***+0.087****			***+0.107****			***+0.048****
			(0.005)			***(0.012)***			***(0.018)***			***(0.020)***
Retail	3.223	3.247	+0.024	2.999	2.999	-0.001	3.438	3.485	+0.047	4.110	4.211	+0.100
(T) OP2	(0.019)	(0.020)	(0.009)	(0.020)	(0.021)	(0.010)	(0.040)	(0.038)	(0.018)	(0.056)	(0.057)	(0.025)
Retail	3.320	3.312	-0.007	3.258	3.244	-0.014	3.287	3.290	+0.004	3.796	3.824	+0.028
(C) OP2	(0.015)	(0.015)	(0.006)	(0.017)	(0.018)	(0.007)	(0.029)	(0.028)	(0.009)	(0.066)	(0.066)	(0.020)
			+0.031*			*+0.013*			***+0.043****			***+0.073****
			(0.010)			*(0.012)*			***(0.019)***			***(0.032)***
Retail	1.766	1.954	+0.188	1.658	1.817	+0.159	1.887	2.132	+0.245	2.256	2.454	+0.198
(T) K/L	(0.032)	(0.034)	(0.018)	(0.041)	(0.044)	(0.022)	(0.059)	(0.067)	(0.040)	(0.068)	(0.077)	(0.045)
Retail	2.208	2.369	+0.160	2.050	2.207	+0.157	2.358	2.551	+0.192	2.563	2.727	+0.164
(C) K/L	(0.021)	(0.023)	(0.014)	(0.029)	(0.032)	(0.018)	(0.034)	(0.034)	(0.024)	(0.062)	(0.055)	(0.047)
			+0.028			*+0.002*			*+0.053*			*+0.034*
			(0.023)			*(0.028)*			*(0.045)*			*(0.067)*

Table 8 Continued

Sectors and subsamples	Total sample			Small firms			Medium firms			Large firms		
	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference
Hospitality	2.016	2.120	+0.104	1.939	2.024	+0.084	2.076	2.195	+0.119	2.046	2.190	+0.144
(T) ln(w)	(0.016)	(0.016)	(0.013)	(0.026)	(0.028)	(0.020)	(0.023)	(0.022)	(0.023)	(0.033)	(0.037)	(0.025)
Hospitality	2.749	2.742	-0.007	2.764	2.728	-0.035	2.731	2.763	+0.031	2.747	2.762	+0.015
(C) ln(w)	(0.008)	(0.013)	(0.011)	(0.012)	(0.020)	(0.016)	(0.013)	(0.016)	(0.013)	(0.019)	(0.026)	(0.018)
			+0.111*			***+0.041****			***+0.087****			***+0.129****
			(0.019)			***(0.014)***			***(0.031)***			***(0.036)***
Hospitality	3.263	3.283	+0.020	3.065	3.054	-0.011	3.363	3.398	+0.035	3.611	3.658	+0.046
(T) OP2	(0.025)	(0.025)	(0.015)	(0.035)	(0.034)	(0.017)	(0.038)	(0.036)	(0.024)	(0.084)	(0.090)	(0.074)
Hospitality	3.745	3.697	-0.048	3.619	3.577	-0.042	3.838	3.787	-0.051	3.871	3.715	-0.156
(C) OP2	(0.032)	(0.033)	(0.018)	(0.043)	(0.044)	(0.027)	(0.043)	(0.042)	(0.025)	(0.137)	(0.158)	(0.100)
			+0.069*			*+0.031*			***+0.087****			***+0.203***
			(0.024)			*(0.031)*			***(0.036)***			***(0.124)***
Hospitality	2.457	2.760	+0.303	2.369	2.600	+0.231	2.629	3.013	+0.384	2.373	2.711	+0.337
(T) K/L	(0.050)	(0.050)	(0.023)	(0.070)	(0.072)	(0.032)	(0.077)	(0.074)	(0.042)	(0.155)	(0.154)	(0.053)
Hospitality	2.971	3.163	+0.192	2.706	2.767	+0.061	3.203	3.567	+0.363	3.035	3.325	+0.291
(C) K/L	(0.072)	(0.073)	(0.033)	(0.107)	(0.111)	(0.057)	(0.105)	(0.103)	(0.041)	(0.234)	(0.220)	(0.084)
			+0.111*			***+0.170****			*+0.021*			*+0.046*
			(0.040)			***(0.061)***			*(0.062)*			*(0.095)*

Table 8 Continued

Sectors	Total sample			Small firms			Medium firms			Large firms		
	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference
Social care	1.982	2.203	+0.221	1.922	2.134	+0.212	2.080	2.358	+0.278			
(T) ln(w)	(0.046)	(0.046)	(0.036)	(0.061)	(0.066)	(0.044)	(0.078)	(0.050)	(0.088)			
Social care	2.832	2.822	-0.010	2.831	2.816	-0.014	2.815	2.848	+0.032			
(C) ln(w)	(0.017)	(0.025)	(0.022)	(0.022)	(0.035)	(0.032)	(0.032)	(0.043)	(0.029)			
			+0.231*			***+0.227****			***+0.246***			
			(0.046)			***(0.058)***			***(0.125)***			
Social care	1.392	1.345	-0.047	1.503	1.371	-0.131	1.170	1.219	+0.049			
(T) OP2	(0.110)	(0.110)	(0.068)	(0.133)	(0.129)	(0.075)	(0.260)	(0.278)	(0.075)			
Social care	1.740	1.541	-0.199	2.143	1.864	-0.279	1.374	1.269	-0.105			
(C) OP2	(0.158)	(0.164)	(0.073)	(0.167)	(0.196)	(0.101)	(0.256)	(0.272)	(0.062)			
			+0.152*			*+0.148*			***+0.154****			
			(0.101)			*(0.123)*			***(0.114)***			
Social care	2.033	2.368	+0.336	2.146	2.478	+0.332	1.671	1.998	+0.327			
(T) K/L	(0.142)	(0.149)	(0.054)	(0.177)	(0.186)	(0.074)	(0.227)	(0.296)	(0.095)			
Social care	2.108	2.229	+0.122	2.090	2.168	+0.078	1.616	1.932	+0.317			
(C) K/L	(0.165)	(0.162)	(0.067)	(0.212)	(0.210)	(0.089)	(0.372)	(0.354)	(0.131)			
			+0.214*			***+0.254****			*+0.010*			
			(0.086)			***(0.116)***			*(0.163)*			

Table 8 Continued

Sectors	Total sample			Small firms			Medium firms			Large firms		
	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference
Cleaning	1.598	1.815	+0.217	1.840	1.933	+0.092	1.530	1.728	+0.119	1.560	1.792	+0.231
(T) ln(w)	(0.047)	(0.041)	(0.050)	(0.128)	(0.146)	(0.078)	(0.135)	(0.103)	(0.127)	(0.053)	(0.050)	(0.028)
Cleaning	2.792	2.731	-0.060	2.781	2.662	-0.119	2.804	2.800	-0.004	2.797	2.722	-0.075
(C) ln(w)	(0.022)	(0.039)	(0.029)	(0.038)	(0.078)	(0.058)	(0.035)	(0.046)	(0.037)	(0.046)	(0.057)	(0.055)
			+0.277*			***+0.211***			***+0.203****			***+0.201****
			(0.056)			***(0.095)***			***(0.138)***			***(0.027)***
Cleaning	2.790	2.900	+0.110	2.654	2.634	-0.020	2.508	2.542	+0.034	2.908	3.080	+0.173
(T) OP2	(0.048)	(0.054)	(0.028)	(0.142)	(0.145)	(0.073)	(0.079)	(0.106)	(0.048)	(0.060)	(0.059)	(0.033)
Cleaning	3.303	3.180	-0.123	3.274	3.219	-0.056	3.204	3.048	-0.157	3.127	2.992	-0.135
(C) OP2	(0.092)	(0.101)	(0.040)	(0.082)	(0.128)	(0.074)	(0.154)	(0.171)	(0.080)	(0.268)	(0.271)	(0.109)
			+0.232*			*+0.035*			***+0.191****			***+0.308***
			(0.048)			*(0.107)*			***(0.074)***			***(0.107)***
Cleaning	0.167	0.505	+0.338	0.436	0.968	+0.532	0.116	0.362	+0.246	0.346	0.622	+0.276
(T) K/L	(0.121)	(0.104)	(0.063)	(0.341)	(0.360)	(0.118)	(0.202)	(0.297)	(0.136)	(0.098)	(0.100)	(0.074)
Cleaning	1.048	1.686	+0.638	1.558	1.735	+0.176	0.779	1.718	+0.940	0.612	1.356	+0.744
(C) K/L	(0.131)	(0.142)	(0.112)	(0.176)	(0.217)	(0.150)	(0.163)	(0.202)	(0.178)	(0.413)	(0.442)	(0.217)
			-0.300*			***+0.356***			***-0.693****			***-0.468***
			(0.121)			***(0.201)***			***(0.222)***			***(0.235)***

Table 8 Continued

Sectors	Total sample			Small firms			Medium firms			Large firms		
	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference
Security	1.758	2.523	+0.764				1.564	2.478	+0.914	2.190	2.498	+0.308
(T) ln(w)	(0.404)	(0.07)	(0.427)				(0.690)	(0.006)	(0.697)	(0.202)	(0.172)	(0.197)
Security	2.762	2.848	+0.086				2.771	2.815	+0.044	2.755	2.864	+0.109
(C) ln(w)	(0.030)	(0.035)	(0.024)				(0.073)	(0.071)	(0.050)	(0.033)	(0.046)	(0.033)
			+0.679*						***+0.870****			***+0.199***
			(0.165)						***(0.462)***			***(0.110)***
Security	3.381	3.658	+0.277				3.184	3.353	+0.170	3.457	3.751	+0.295
(T) OP2	(0.331)	(0.312)	(0.093)				(0.267)	(0.147)	(0.169)	(0.542)	(0.551)	(0.070)
Security	3.976	3.961	-0.015				3.962	3.965	+0.004	4.073	4.047	-0.026
(C) OP2	(0.107)	(0.114)	(0.064)				(0.229)	(0.337)	(0.121)	(0.124)	(0.132)	(0.090)
			+0.292						*+0.166*			***+0.321****
			(0.171)						*(0.209)*			***(0.243)***
Security	0.192	0.432	+0.240				0.456	0.752	+0.296	0.116	0.300	+0.184
(T) K/L	(0.420)	(0.430)	(0.146)				(0.221)	(0.163)	(0.246)	(0.746)	(0.769)	(0.114)
Security	0.379	0.549	+0.171				0.594	0.607	+0.013	0.147	0.442	+0.295
(C) K/L	(0.248)	(0.288)	(0.140)				(0.640)	(0.337)	(0.467)	(0.259)	(0.333)	(0.183)
			+0.069						*+0.282*			*-0.111*
			(0.368)						*(0.702)*			*(0.495)*

Table 8 Continued

Sectors	Total sample			Small firms			Medium firms			Large firms		
	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference
Hairdressing (T) ln(w)	2.041 (0.099)	2.099 (0.095)	+0.058 (0.029)	2.012 (0.148)	2.026 (0.135)	+0.014 (0.021)	2.100 (0.066)	2.220 (0.066)	+0.120 (0.045)			
Hairdressing (C) ln(w)	2.802 (0.035)	2.718 (0.047)	-0.083 (0.037)	2.784 (0.035)	2.711 (0.051)	-0.073 (0.043)	3.049 (0.057)	2.986 (0.058)	-0.062 (0.002)			
			+0.141* ***(0.060)***			*+0.087* *(0.073)*			***+0.182**** ***(0.067)***			
Hairdressing (T) OP2	3.184 (0.178)	3.108 (0.172)	-0.075 (0.028)	3.521 (0.121)	3.238 (0.074)	-0.283 (0.142)	3.874 (0.146)	3.743 (0.089)	-0.130 (0.166)			
Hairdressing (C) OP2	3.818 (0.161)	3.569 (0.141)	-0.249 (0.106)	3.645 (0.071)	3.303 (0.033)	-0.341 (0.062)	4.906 (0.399)	4.406 (0.534)	-0.499 (0.135)			
			+0.173 *(0.166)*			*+0.058* *(0.134)*			*+0.369* *(0.263)*			
Hairdressing (T) K/L	0.458 (0.455)	0.906 (0.550)	+0.448 (0.233)	0.391 (0.524)	0.459 (0.585)	+0.068 (0.232)	0.592 (0.994)	1.726 (1.167)	+1.134 (0.250)			
Hairdressing (C) K/L	0.287 (0.229)	1.096 (0.247)	+0.809 (0.191)	0.328 (0.228)	1.313 (0.268)	+0.985 (0.227)	0.128 (0.036)	0.212 (0.068)	+0.084 (0.104)			
			-0.361 *(0.330)*			***-0.917**** ***(0.405)***			***+1.050**** ***(0.380)***			

Table 8 Continued

Sectors	Total sample			Small firms			Medium firms			Large firms		
	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference
Textiles	2.068	2.226	+0.158	1.892	1.988	+0.096	2.272	2.466	+0.193	2.254	2.338	+0.083
(T) ln(w)	(0.027)	(0.036)	(0.026)	(0.043)	(0.050)	(0.031)	(0.024)	(0.052)	(0.050)	(0.034)	(0.056)	(0.034)
Textiles	2.799	2.894	+0.094	2.835	2.868	+0.033	2.790	2.898	+0.108	2.777	2.899	+0.122
(C) ln(w)	(0.009)	(0.015)	(0.012)	(0.016)	(0.030)	(0.024)	(0.013)	(0.018)	(0.040)	(0.018)	(0.028)	(0.020)
			+0.064*			***+0.062***			***+0.085****			*-0.039*
			(0.025)			***(0.039)***			***(0.038)***			*(0.037)*
Textiles	2.671	2.744	+0.073	2.572	2.594	+0.022	2.682	2.776	+0.094	3.069	3.156	+0.173
(T) OP2	(0.046)	(0.052)	(0.035)	(0.068)	(0.074)	(0.075)	(0.078)	(0.094)	(0.061)	(0.066)	(0.090)	(0.033)
Textiles	3.096	3.046	-0.050	3.190	3.144	-0.046	3.016	2.908	-0.107	3.164	3.144	-0.020
(C) OP2	(0.037)	(0.040)	(0.024)	(0.066)	(0.067)	(0.036)	(0.052)	(0.072)	(0.062)	(0.077)	(0.088)	(0.052)
			+0.123*			*+0.069*			***+0.202****			*+0.108*
			(0.041)			*(0.056)*			***(0.061)***			*(0.088)*
Textiles	1.177	1.483	+0.306	1.111	1.306	+0.195	1.281	1.568	+0.287	1.240	1.630	+0.389
(T) K/L	(0.071)	(0.086)	(0.055)	(0.122)	(0.141)	(0.077)	(0.099)	(0.119)	(0.091)	(0.086)	(0.083)	(0.067)
Textiles	2.059	2.309	+0.250	1.727	1.876	+0.149	2.114	2.421	+0.306	2.504	2.656	+0.152
(C) K/L	(0.051)	(0.057)	(0.036)	(0.113)	(0.121)	(0.056)	(0.065)	(0.068)	(0.047)	(0.070)	(0.096)	(0.086)
			+0.056			*+0.046*			*-0.019*			***+0.237***
			(0.063)			*(0.094)*			*(0.095)*			***(0.132)***

Table 8 Continued

Sectors	Total sample			Small firms			Medium firms			Large firms		
	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference
Agriculture	1.833	1.927	+0.094	1.806	1.854	+0.048	2.145	2.359	+0.215	0.853	1.087	+0.234
(T) ln(w)	(0.032)	(0.033)	(0.020)	(0.034)	(0.035)	(0.020)	(0.075)	(0.056)	(0.073)	(0.445)	(0.462)	(0.037)
Agriculture	2.761	2.833	+0.072	2.765	2.802	+0.037	2.756	2.897	+0.141	2.696	2.867	+0.170
(C) ln(w)	(0.008)	(0.017)	(0.016)	(0.010)	(0.018)	(0.058)	(0.016)	(0.031)	(0.026)	(0.033)	(0.048)	(0.041)
			+0.022			*+0.011*			*+0.074*			*+0.064*
			(0.026)			*(0.027)*			*(0.063)*			*(0.057)*
Agriculture	1.949	1.908	-0.041	1.941	1.908	-0.032	2.174	2.272	+0.097	1.248	1.225	-0.023
(T) OP2	(0.053)	(0.057)	(0.032)	(0.057)	(0.060)	(0.035)	(0.159)	(0.134)	(0.129)	(0.376)	(0.297)	(0.033)
Agriculture	2.544	2.500	-0.045	2.476	2.414	-0.062	2.611	2.658	+0.048	2.219	2.339	+0.121
(C) OP2	(0.053)	(0.053)	(0.034)	(0.082)	(0.128)	(0.040)	(0.103)	(0.092)	(0.071)	(0.173)	(0.136)	(0.155)
			+0.004			*+0.029*			*+0.049*			*-0.144*
			(0.046)			*(0.053)*			*(0.135)*			*(0.214)*
Agriculture	3.207	3.378	+0.171	3.332	3.494	+0.162	2.325	2.566	+0.241	1.759	1.796	+0.037
(T) K/L	(0.060)	(0.070)	(0.037)	(0.066)	(0.074)	(0.034)	(0.138)	(0.201)	(0.123)	(0.315)	(0.377)	(0.154)
Agriculture	3.544	3.743	+0.199	3.765	3.934	+0.169	2.886	3.205	+0.319	2.740	2.945	+0.205
(C) K/L	(0.059)	(0.062)	(0.030)	(0.065)	(0.073)	(0.036)	(0.124)	(0.119)	(0.042)	(0.169)	(0.170)	(0.099)
			-0.028			*-0.007*			*-0.078*			*-0.168*
			(0.048)			*(0.051)*			*(0.104)*			*(0.176)*

Table 8 Continued

Sectors	Total sample			Small firms			Medium firms			Large firms		
	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference
Food processing	2.152	2.390	+0.238	2.045	2.179	+0.134	2.204	2.468	+0.263	2.216	2.432	+0.217
(T) ln(w)	(0.025)	(0.030)	(0.026)	(0.062)	(0.057)	(0.046)	(0.028)	(0.028)	(0.031)	(0.033)	(0.045)	(0.028)
Food processing	2.796	2.947	+0.150	2.824	2.898	+0.074	2.793	2.939	+0.146	2.798	2.963	+0.165
(C) ln(w)	(0.008)	(0.012)	(0.010)	(0.017)	(0.030)	(0.023)	(0.011)	(0.015)	(0.011)	(0.015)	(0.019)	(0.012)
			+0.088*			***+0.060****			***+0.117*****			***+0.051*****
			(0.023)			***(0.046)***			***(0.026)***			***(0.027)***
Food processing	2.572	2.683	+0.111	2.458	2.609	+0.151	2.592	2.628	+0.037	2.771	2.866	+0.095
(T) OP2	(0.039)	(0.041)	(0.029)	(0.079)	(0.069)	(0.054)	(0.052)	(0.056)	(0.036)	(0.091)	(0.084)	(0.057)
Food processing	3.090	3.141	+0.051	3.008	3.072	+0.064	3.100	3.087	-0.013	3.164	3.273	+0.110
(C) OP2	(0.026)	(0.025)	(0.017)	(0.063)	(0.064)	(0.026)	(0.035)	(0.034)	(0.023)	(0.048)	(0.051)	(0.039)
			+0.061**			***+0.087*****			*+0.050*			*-0.014*
			(0.033)			***(0.053)***			*(0.045)*			*(0.076)*
Food processing	2.089	2.204	+0.115	2.045	2.083	+0.038	2.078	2.310	+0.232	2.196	2.283	+0.087
(T) K/L	(0.060)	(0.080)	(0.062)	(0.129)	(0.166)	(0.103)	(0.080)	(0.089)	(0.056)	(0.087)	(0.19)	(0.086)
Food processing	2.858	3.057	+0.199	2.927	3.102	+0.175	2.736	2.956	+0.220	3.011	3.180	+0.168
(C) K/L	(0.038)	(0.036)	(0.023)	(0.089)	(0.092)	(0.044)	(0.056)	(0.051)	(0.035)	(0.061)	(0.064)	(0.035)
			-0.084*			***-0.137****			*+0.012*			*-0.081*
			(0.053)			***(0.096)***			*(0.068)*			*(0.079)*

Table 8 Continued

Sectors	Total sample			Small firms			Medium firms			Large firms		
	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference
Leisure	1.905	2.070	+0.166	1.826	1.986	+0.160	2.040	2.187	+0.148	2.093	2.224	+0.131
(T) ln(w)	(0.027)	(0.029)	(0.024)	(0.035)	(0.038)	(0.030)	(0.045)	(0.038)	(0.042)	(0.062)	(0.062)	(0.063)
Leisure	2.818	2.807	-0.011	2.825	2.821	-0.004	2.818	2.781	-0.037	2.773	2.786	+0.012
(C) ln(w)	(0.008)	(0.017)	(0.016)	(0.010)	(0.019)	(0.018)	(0.016)	(0.028)	(0.024)	(0.026)	(0.045)	(0.039)
			+0.177*			***+0.163****			***+0.184****			***+0.119***
			(0.028)			***(0.033)***			***(0.047)***			***(0.071)***
Leisure	1.957	1.890	-0.067	2.127	2.013	-0.114	1.260	1.203	-0.056	1.460	1.652	+0.192
(T) OP2	(0.052)	(0.057)	(0.034)	(0.065)	(0.068)	(0.042)	(0.164)	(0.164)	(0.091)	(0.134)	(0.115)	(0.111)
Leisure	2.446	2.356	-0.090	2.615	2.538	-0.077	1.918	1.903	-0.015	1.950	1.892	-0.057
(C) OP2	(0.045)	(0.045)	(0.033)	(0.050)	(0.051)	(0.035)	(0.142)	(0.128)	(0.092)	(0.145)	(0.132)	(0.087)
			+0.023			*-0.037*			*-0.041*			***+0.249***
			(0.048)			*(0.054)*			*(0.131)*			***(0.139)***
Leisure	1.439	2.337	+0.898	1.436	2.239	+0.803	1.373	2.364	+0.991	1.630	2.504	+0.874
(T) K/L	(0.068)	(0.078)	(0.048)	(0.086)	(0.099)	(0.058)	(0.111)	(0.120)	(0.075)	(0.245)	(0.272)	(0.215)
Leisure	1.863	2.771	+0.908	1.742	2.607	+0.865	2.032	2.952	+0.920	2.420	3.412	+0.992
(C) K/L	(0.065)	(0.067)	(0.035)	(0.078)	(0.085)	(0.042)	(0.134)	(0.120)	(0.070)	(0.170)	(0.158)	(0.107)
			-0.010			*-0.062*			*+0.071*			*-0.118*
			(0.058)			*(0.070)*			*(0.103)*			*(0.228)*

Note: Figures in italics indicate the difference-in-differences and figures in bold indicate sectors and firm size groups with statistically significant (at 10% or better) difference-in-differences in wages, productivity or K/L ratio after the implementation of the NMW in 1999. The levels of significance are denoted as follows: *** 1% or better; ** 5% or better; * 10% or better. (T) denotes the treatment group and (C) denotes the comparison group. OP2 is productivity measure estimated by the Olley-Pakes modified algorithm based on a 2nd order Markov process. Empty sells are due to not enough observations for large firms in the social care and hairdressing sectors and for small firms in the security sector.

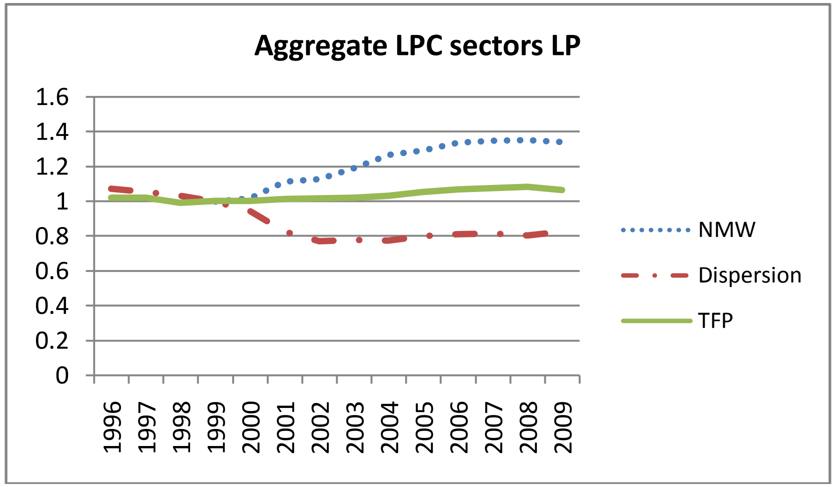
Appendix 1

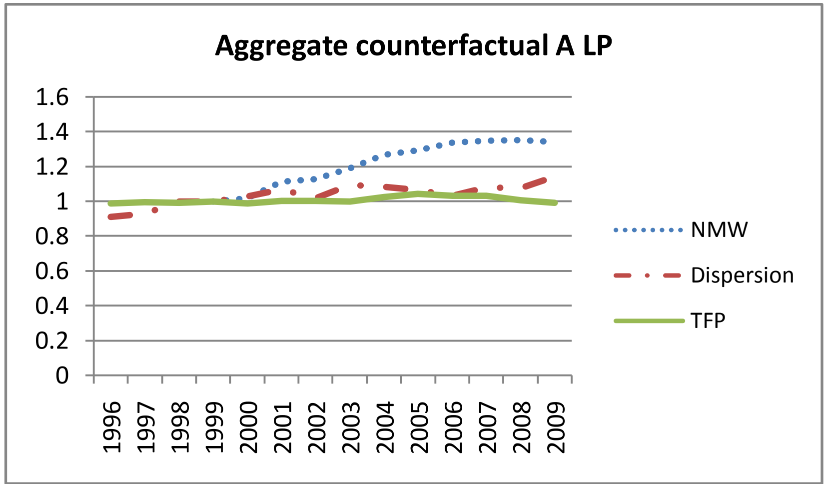
Table A1 SIC and SOC coding of the low-paying sectors defined by industry and occupation

Low-paying sector/occupation	Old industry-based definition (SIC 2003)	New industry-based definition (SIC 2003)	Occupation-based definition (SOC 2000)
Retail	52	50, 52, 71.405	711, 721, 925
Hospitality	55	55	5434, 9222, 9223, 9224, 9225
Social care (residential and non-residential)	n.a.	85.3, 85.113	6115
Cleaning	74.7	74.7, 93.01	6231, 9132, 923
Security	74.6	74.6	9241, 9245, 9249
Hairdressing	93.02, 93.04	93.02, 93.04	622
Textiles and clothing	n.a.	17, 18	5414, 5419, 8113, 8136, 8137
Agriculture	01 – 05	01 – 05	911
Food processing	n.a.	15.1, 15.2, 15.3, 15.4, 15.5, 15.6, 15.7, 15.8	5431, 5432, 5433, 8111
Leisure, travel and sport	n.a.	92.13, 92.3, 92.6, 92.7	6211, 6213, 9226, 9229

Source: LPC

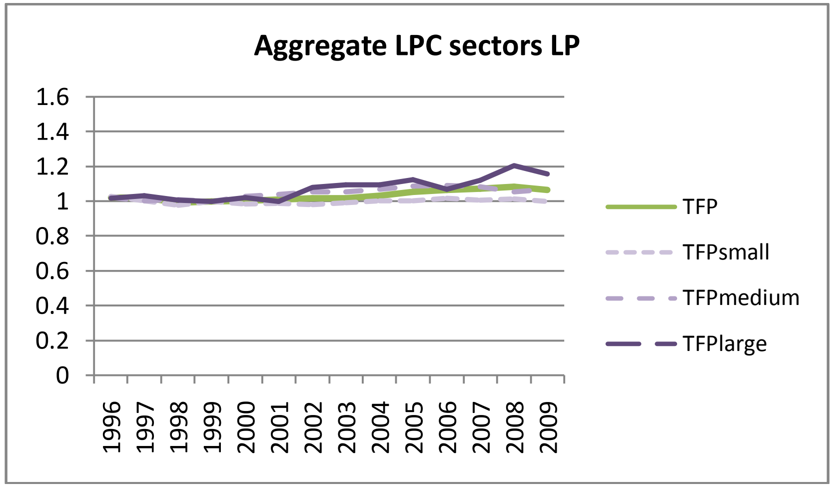
Figure A1 Summary of the results from the OP2 model for aggregate LPC sectors and counterfactual (A)





Elasticity of TFP wrt NMW: 0.58 (t 9.94)

Elasticity of TFP wrt NMW: 0.24 (t 1.15)



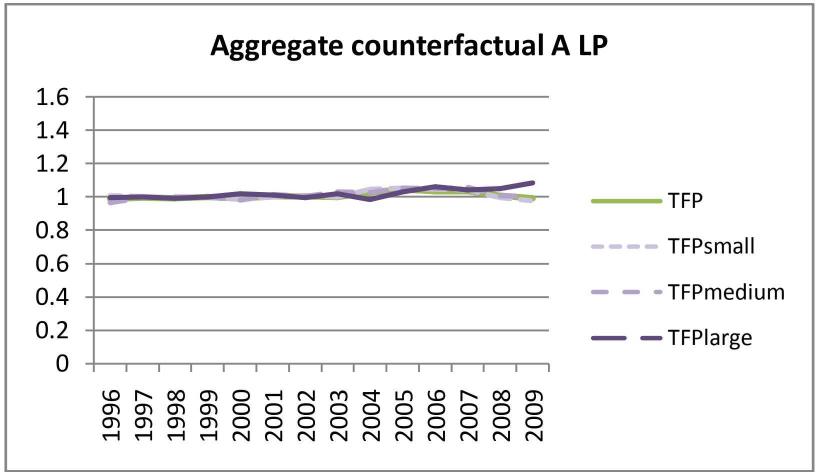
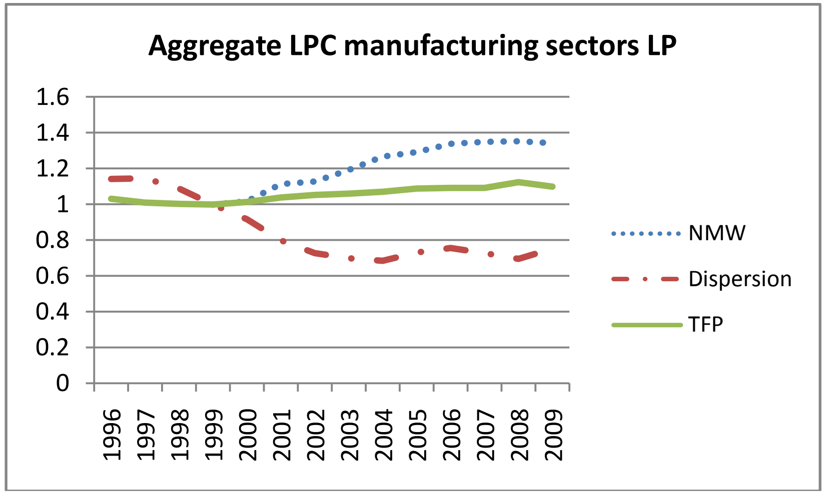
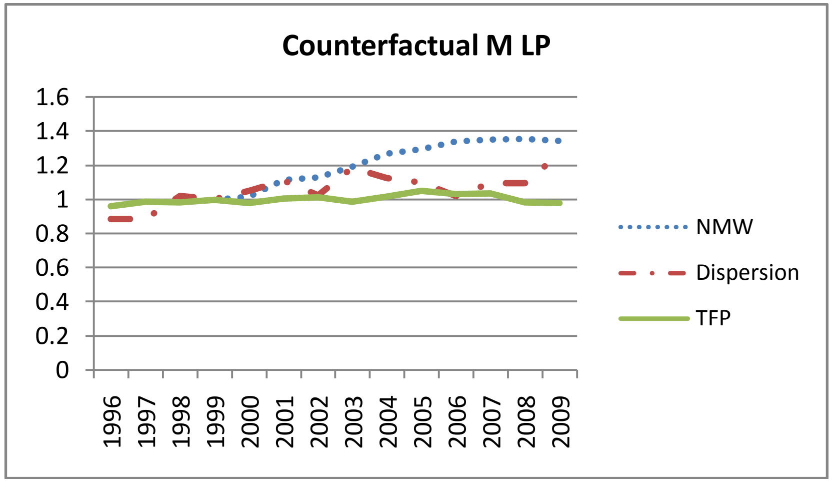


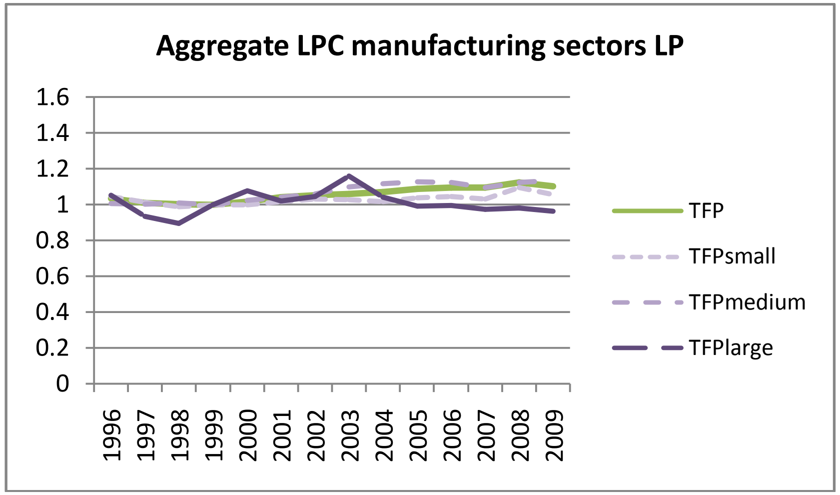
Figure A2 Summary of the results from the OP2 model for aggregate LPC manufacturing sectors and counterfactual



Elasticity of TFP wrt NMW: 0.78 (t 11.20)



Elasticity of TFP wrt NMW: 0.23 (t 1.02)



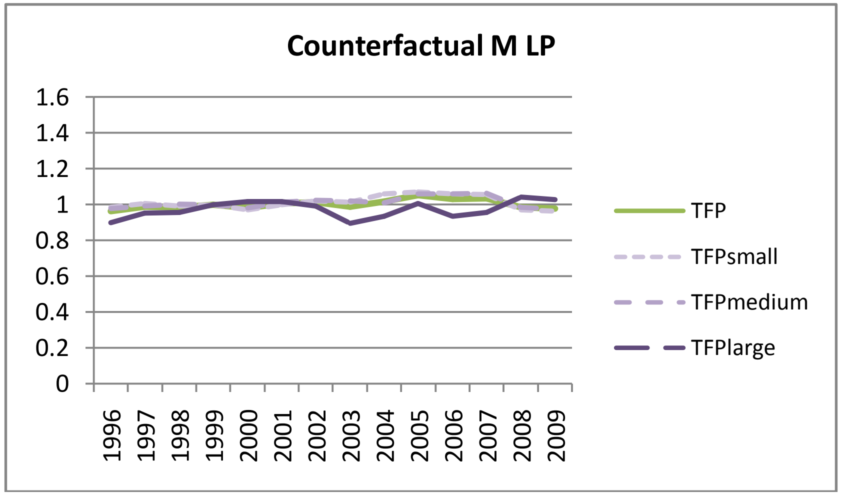
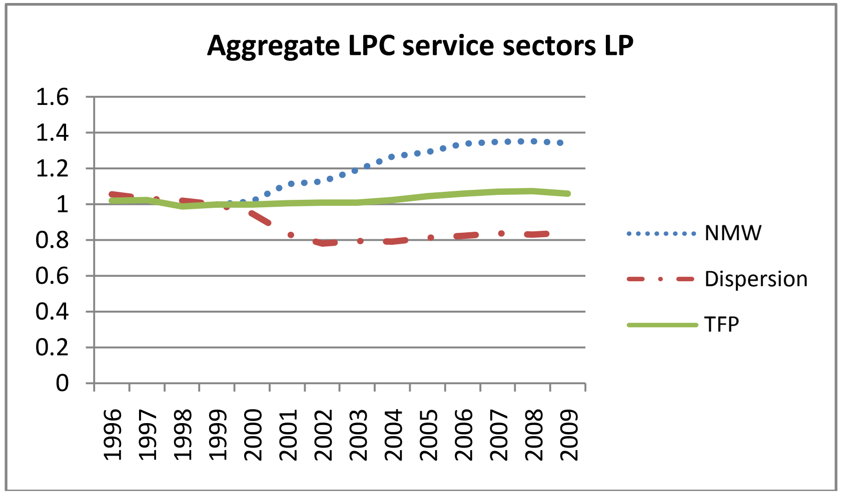
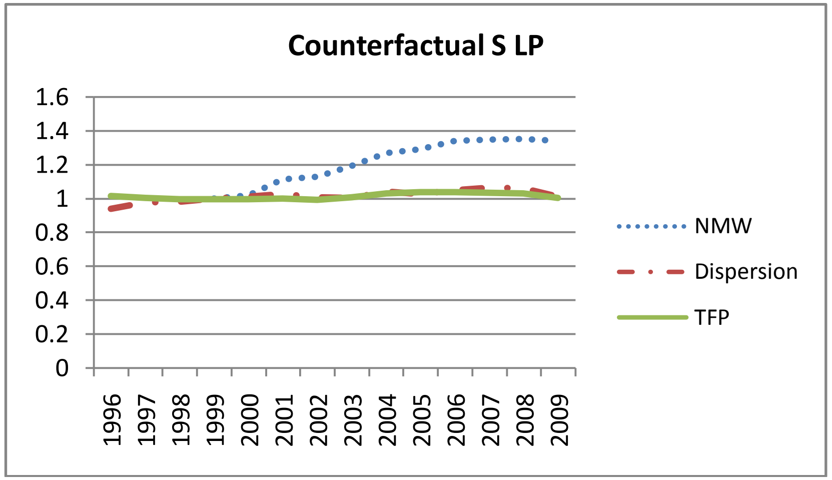


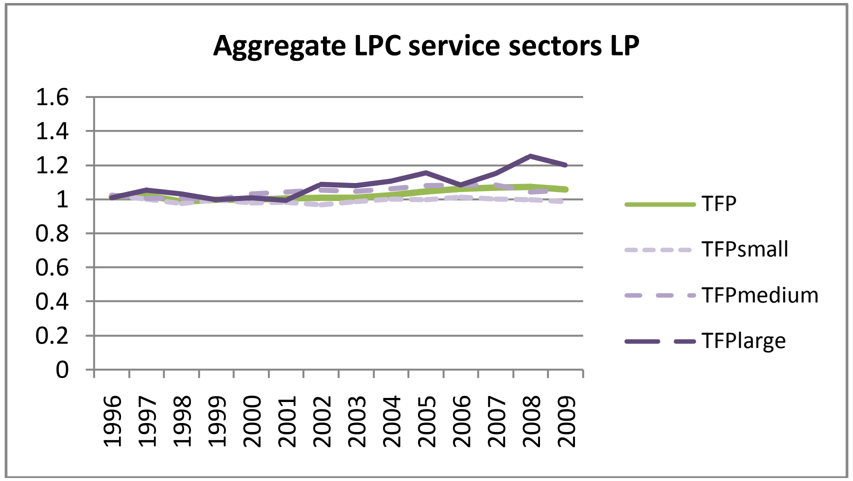
Figure A3 Summary of the results from the OP2 model for aggregate LPC service sectors and counterfactual



Elasticity of TFP wrt NMW: 0.54 (t 8.36)



Elasticity of TFP wrt NMW: 0.25 (t 1.18)



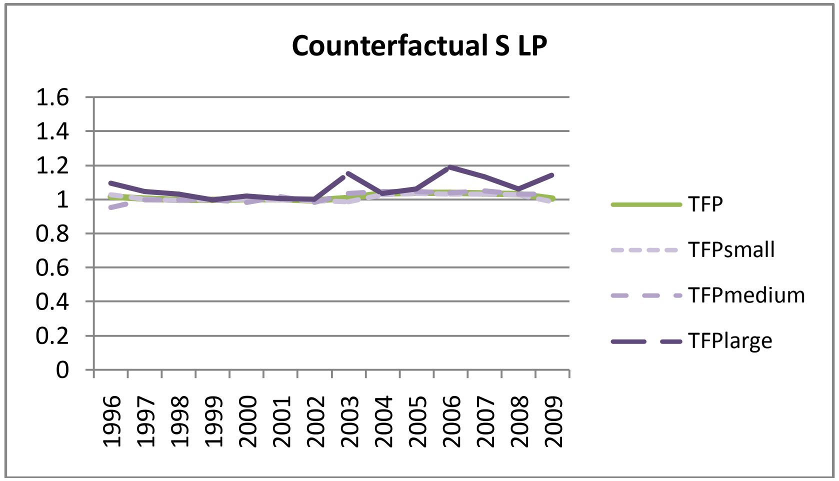


Table A2 Difference-in-differences analysis of wages and LP for the aggregate LPC sectors and counterfactual (A)

Sectors and subsamples	Total sample			Small firms			Medium firms			Large firms		
	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference
Aggregate LPC (T) ln(w)	1.970 (0.008)	2.106 (0.009)	+0.136 (0.010)	1.916 (0.011)	2.023 (0.012)	+0.107 (0.008)	2.089 (0.014)	2.267 (0.013)	+0.178 (0.014)	1.980 (0.025)	2.140 (0.024)	+0.161 (0.012)
Aggregate LPC (C) ln(w)	2.802 (0.002)	2.857 (0.004)	+0.055 (0.004)	2.804 (0.003)	2.821 (0.006)	+0.017 (0.005)	2.804 (0.004)	2.882 (0.007)	+0.078 (0.006)	2.790 (0.006)	2.875 (0.009)	+0.085 (0.007)
			+0.081 (0.007)***			***+0.090*** (0.009)***			***+0.100*** (0.013)***			***+0.076*** (0.013)***
Aggregate LPC (T) LP	2.508 (0.014)	2.548 (0.014)	+0.040 (0.008)	2.635 (0.016)	2.647 (0.017)	+0.012 (0.009)	2.429 (0.026)	2.502 (0.026)	+0.073 (0.016)	2.051 (0.045)	2.159 (0.044)	+0.108 (0.020)
Aggregate LPC (C) LP	3.131 (0.009)	3.124 (0.010)	-0.006 (0.006)	3.182 (0.013)	3.162 (0.014)	-0.020 (0.008)	3.085 (0.016)	3.096 (0.016)	+0.011 (0.010)	2.981 (0.030)	2.996 (0.033)	+0.014 (0.019)
			+0.046 (0.010)***			***+0.032*** (0.012)***			***+0.062*** (0.017)***			***+0.094*** (0.027)***
Counterfactual A (T) ln(w)	2.336 (0.083)	2.290 (0.069)	-0.047 (0.038)	2.295 (0.094)	2.222 (0.080)	-0.073 (0.033)	2.637 (0.210)	2.624 (0.161)	-0.013 (0.106)	2.478 (0.229)	2.531 (0.128)	+0.053 (0.150)
Counterfactual A (C) ln(w)	3.051 (0.028)	2.981 (0.00)	-0.070 (0.018)	3.102 (0.041)	3.015 (0.031)	-0.087 (0.019)	3.032 (0.037)	2.966 (0.031)	-0.066 (0.018)	2.932 (0.071)	2.902 (0.059)	-0.029 (0.037)
			+0.023 (0.046)			*+0.014 (0.040)*			*+0.053 (0.083)*			*+0.082 (0.150)*
Counterfactual A (T) OP2	2.841 (0.070)	2.925 (0.072)	+0.083 (0.059)	2.915 (0.069)	2.955 (0.074)	+0.040 (0.060)	2.740 (0.336)	3.021 (0.274)	+0.281 (0.166)	2.056 (0.806)	2.451 (0.307)	+0.395 (0.636)
Counterfactual A (C) OP2	3.083 (0.029)	3.204 (0.028)	+0.122 (0.023)	3.239 (0.036)	3.341 (0.036)	+0.101 (0.032)	2.988 (0.056)	3.119 (0.052)	+0.131 (0.055)	2.763 (0.074)	2.792 (0.103)	+0.030 (0.093)
			-0.038 (0.055)			*-0.061 (0.064)*			*+0.150 (0.201)*			*+0.365 (0.408)*

Note: Figures in italics indicate the difference-in-differences and figures in bold indicate sectors and firm size groups with statistically significant (at 10% or better) difference-in-differences in wages or productivity after the implementation of the NMW in 1999. The levels of significance are denoted as follows: *** 1% or better; ** 5% or better; * 10% or better. (T) denotes the treatment group and (C) denotes the comparison group. LP is labour productivity measure calculated as log of value added per worker.

Table A3 Difference-in-differences analysis of wages and LP for the manufacturing LPC sectors and counterfactual (M)

Sectors and subsamples	Total sample			Small firms			Medium firms			Large firms		
	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference
Manufacturing	1.963	2.099	+0.136	1.848	1.928	+0.080	2.210	2.460	+0.250	2.102	2.270	+0.168
LPC (T) ln(w)	(0.020)	(0.022)	(0.014)	(0.026)	(0.027)	(0.016)	(0.023)	(0.025)	(0.028)	(0.064)	(0.068)	(0.020)
Manufacturing	2.786	2.894	+0.108	2.796	2.843	+0.046	2.783	2.911	+0.128	2.782	2.934	+0.152
LPC (C) ln(w)	(0.005)	(0.008)	(0.007)	(0.008)	(0.014)	(0.012)	(0.008)	(0.011)	(0.009)	(0.010)	(0.015)	(0.010)
			_+0.029_**			**_+0.034_****			**_+0.122_*****			_+0.016_
			_(0.014)_			**_(0.020)_**			**_(0.022)_**			_(0.021)_
Manufacturing	2.316	2.384	+0.068	2.346	2.373	+0.027	2.286	2.407	+0.122	2.217	2.322	+0.105
LPC (T) LP	(0.031)	(0.033)	(0.020)	(0.043)	(0.045)	(0.026)	(0.047)	(0.051)	(0.036)	(0.074)	(0.084)	(0.042)
Manufacturing	2.995	3.023	+0.028	3.066	3.061	-0.005	2.966	2.976	+0.010	2.881	2.963	+0.082
LPC (C) LP	(0.022)	(0.023)	(0.015)	(0.040)	(0.042)	(0.024)	(0.029)	(0.031)	(0.019)	(0.040)	(0.046)	(0.030)
			_+0.040_**			_+0.032_			**_+0.112_*****			_+0.023_
			_(0.024)_			_(0.035)_			**_(0.038)_**			_(0.053)_
Counterfactual	2.269	2.266	-0.003	2.157	2.119	-0.037	2.478	2.515	+0.037	2.407	2.618	+0.211
M (T) ln(w)	(0.171)	(0.156)	(0.080)	(0.248)	(0.234)	(0.076)	(0.137)	(0.134)	(0.051)	(0.422)	(0.066)	(0.371)
Counterfactual	2.969	2.930	-0.039	3.070	2.997	-0.073	2.965	2.968	+0.003	2.861	2.897	+0.036
M (C) ln(w)	(0.036)	(0.026)	(0.022)	(0.077)	(0.058)	(0.036)	(0.037)	(0.028)	(0.020)	(0.082)	(0.072)	(0.032)
			_+0.036_			_+0.035_			_+0.034_			_+0.175_
			_(0.082)_			_(0.088)_			_(0.102)_			_(0.186)_
Counterfactual	2.712	2.776	+0.064	2.857	2.901	+0.044	2.124	2.222	+0.098	2.135	2.304	+0.168
M (T) LP	(0.118)	(0.126)	(0.072)	(0.130)	(0.136)	(0.086)	(0.328)	(0.396)	(0.140)	(0.175)	(0.210)	(0.136)
Counterfactual	2.918	2.999	+0.081	3.149	3.223	+0.074	2.899	2.959	+0.060	2.619	2.656	+0.036
M (C) LP	(0.030)	(0.032)	(0.021)	(0.050)	(0.052)	(0.029)	(0.042)	(0.044)	(0.026)	(0.065)	(0.100)	(0.082)
			_-0.017_			_-0.030_			_+0.037_			_+0.132_
			_(0.064)_			_(0.071)_			_(0.128)_			_(0.459)_

Note: Figures in italics indicate the difference-in-differences and figures in bold indicate sectors and firm size groups with statistically significant (at 10% or better) difference-in-differences in wages or productivity after the implementation of the NMW in 1999. The levels of significance are denoted as follows: *** 1% or better; ** 5% or better; * 10% or better. (T) denotes the treatment group and (C) denotes the comparison group. LP is labour productivity measure calculated as log of value added per worker.

Table A4 Difference-in-differences analysis of wages and LP for the service LPC sectors and counterfactual (S)

Sectors and subsamples	Total sample			Small firms			Medium firms			Large firms		
	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference
Service LPC (T) ln(w)	1.972 (0.009)	2.116 (0.09)	+0.144 (0.008)	1.933 (0.013)	2.050 (0.012)	+0.117 (0.010)	2.055 (0.017)	2.220 (0.015)	+0.165 (0.016)	1.955 (0.027)	2.112 (0.025)	+0.157 (0.014)
Service LPC (C) ln(w)	2.806 (0.003)	2.842 (0.005)	+0.036 (0.004)	2.806 (0.004)	2.814 (0.006)	+0.008 (0.005)	2.813 (0.005)	2.867 (0.008)	+0.054 (0.007)	2.792 (0.008)	2.843 (0.011)	+0.050 (0.008)
			+0.108 (0.008)***			***+0.109*** (0.011)***			***+0.110*** (0.016)***			***+0.107*** (0.016)***
Service LPC (T) LP	2.558 (0.015)	2.590 (0.015)	+0.032 (0.008)	2.708 (0.018)	2.709 (0.018)	+0.001 (0.010)	2.460 (0.030)	2.522 (0.031)	+0.063 (0.018)	2.013 (0.052)	2.122 (0.050)	+0.109 (0.023)
Service LPC (C) LP	3.167 (0.010)	3.147 (0.011)	-0.021 (0.007)	3.198 (0.013)	3.179 (0.014)	-0.019 (0.009)	3.126 (0.019)	3.133 (0.019)	+0.007 (0.012)	3.038 (0.041)	3.015 (0.043)	-0.023 (0.023)
			+0.052 (0.010)***			***+0.020* (0.013)***			***+0.055*** (0.021)***			***+0.132*** (0.032)***
Counterfactual S (T) ln(w)	2.365 (0.094)	2.286 (0.077)	-0.079 (0.043)	2.326 (0.102)	2.252 (0.086)	-0.073 (0.036)	2.701 (0.369)	2.657 (0.279)	-0.044 (0.186)	2.444 (0.328)	2.369 (0.289)	-0.076 (0.157)
Counterfactual S (C) ln(w)	3.150 (0.041)	2.983 (0.028)	-0.167 (0.024)	3.110 (0.049)	3.011 (0.037)	-0.099 (0.022)	3.150 (0.086)	2.998 (0.076)	-0.152 (0.032)	3.108 (0.144)	2.903 (0.109)	-0.205 (0.101)
			+0.088** (0.054)			*+0.026 (0.046)*			*+0.108 (0.123)*			*+0.129 (0.291)*
Counterfactual S (T) OP2	2.901 (0.087)	2.995 (0.087)	+0.094 (0.074)	2.938 (0.081)	2.976 (0.088)	+0.038 (0.074)	3.205 (0.468)	3.610 (0.309)	+0.404 (0.230)	1.934 (0.310)	2.008 (0.332)	+0.074 (0.119)
Counterfactual S (C) OP2	3.208 (0.046)	3.367 (0.044)	+0.160 (0.038)	3.280 (0.048)	3.390 (0.047)	+0.110 (0.044)	3.174 (0.130)	3.403 (0.119)	+0.229 (0.143)	3.068 (0.164)	3.068 (0.229)	+0.000 (0.219)
			-0.065 (0.079)			*-0.072 (0.084)*			*+0.175 (0.384)*			*+0.074 (0.630)*

Note: Figures in italics indicate the difference-in-differences and figures in bold indicate sectors and firm size groups with statistically significant (at 10% or better) difference-in-differences in wages or productivity after the implementation of the NMW in 1999. The levels of significance are denoted as follows: *** 1% or better; ** 5% or better; * 10% or better. (T) denotes the treatment group and (C) denotes the comparison group. LP is labour productivity measure calculated as log of value added per worker.

Table A5 Difference-in-differences analysis of wages and LP productivity measure by LPC sectors and firm size bands

Sectors and subsamples	Total sample			Small firms			Medium firms			Large firms		
	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference
Retail	2.008	2.136	+0.128	1.196	2.072	+0.108	2.089	2.275	+0.186	2.117	2.242	+0.125
(T) ln(w)	(0.012)	(0.011)	(0.010)	(0.016)	(0.015)	(0.013)	(0.028)	(0.021)	(0.025)	(0.019)	(0.018)	(0.020)
Retail	2.813	2.865	+0.052	2.808	2.830	+0.021	2.831	2.910	+0.079	2.805	2.882	+0.076
(C) ln(w)	(0.003)	(0.005)	(0.004)	(0.004)	(0.007)	(0.006)	(0.006)	(0.008)	(0.006)	(0.009)	(0.014)	(0.009)
			+0.079*			***+0.087****			***+0.107****			***+0.048****
			(0.005)			***(0.012)***			***(0.018)***			***(0.020)***
Retail	2.801	2.826	+0.025	2.823	2.835	-0.012	2.752	2.805	+0.052	2.695	2.744	+0.049
(T) LP	(0.014)	(0.015)	(0.009)	(0.018)	(0.019)	(0.010)	(0.029)	(0.027)	(0.018)	(0.045)	(0.045)	(0.027)
Retail	3.253	3.252	-0.001	3.243	3.242	-0.001	3.230	3.242	+0.012	3.310	3.329	+0.019
(C) LP	(0.010)	(0.010)	(0.006)	(0.013)	(0.013)	(0.008)	(0.017)	(0.016)	(0.009)	(0.033)	(0.034)	(0.021)
			+0.025*			*+0.013*			***+0.040****			*+0.030*
			(0.010)			*(0.012)*			***(0.019)***			*(0.033)*
Hospitality	2.016	2.120	+0.104	1.939	2.024	+0.084	2.076	2.195	+0.119	2.046	2.190	+0.144
(T) ln(w)	(0.016)	(0.016)	(0.013)	(0.026)	(0.028)	(0.020)	(0.023)	(0.022)	(0.023)	(0.033)	(0.037)	(0.025)
Hospitality	2.749	2.742	-0.007	2.764	2.728	-0.035	2.731	2.763	+0.031	2.747	2.762	+0.015
(C) ln(w)	(0.008)	(0.013)	(0.011)	(0.012)	(0.020)	(0.016)	(0.013)	(0.016)	(0.013)	(0.019)	(0.026)	(0.018)
			+0.111*			***+0.041****			***+0.087****			***+0.129****
			(0.019)			***(0.014)***			***(0.031)***			***(0.036)***
Hospitality	2.554	2.611	+0.057	2.687	2.722	+0.035	2.628	2.540	+0.088	2.160	2.203	+0.042
(T) LP	(0.026)	(0.025)	(0.015)	(0.036)	(0.036)	(0.018)	(0.038)	(0.041)	(0.024)	(0.098)	(0.104)	(0.073)
Hospitality	3.128	3.084	-0.043	3.280	3.237	-0.043	3.113	3.108	-0.006	2.660	2.492	-0.168
(C) LP	(0.032)	(0.034)	(0.017)	(0.040)	(0.043)	(0.025)	(0.044)	(0.045)	(0.024)	(0.157)	(0.174)	(0.095)
			+0.100*			***+0.078****			***+0.094****			***+0.210****
			(0.024)			***(0.031)***			***(0.036)***			***(0.121)***

Table A5 Continued

Sectors	Total sample			Small firms			Medium firms			Large firms		
	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference
Social care	1.982	2.203	+0.221	1.922	2.134	+0.212	2.080	2.358	+0.278			
(T) ln(w)	(0.046)	(0.046)	(0.036)	(0.061)	(0.066)	(0.044)	(0.078)	(0.050)	(0.088)			
Social care	2.832	2.822	-0.010	2.831	2.816	-0.014	2.815	2.848	+0.032			
(C) ln(w)	(0.017)	(0.025)	(0.022)	(0.022)	(0.035)	(0.032)	(0.032)	(0.043)	(0.029)			
			+0.231*			***+0.227****			***+0.246***			
			(0.046)			***(0.058)***			***(0.125)***			
Social care	1.509	1.482	-0.028	1.626	1.524	-0.102	1.267	1.335	+0.068			
(T) LP	(0.111)	(0.111)	(0.068)	(0.134)	(0.130)	(0.075)	(0.262)	(0.281)	(0.075)			
Social care	1.862	1.670	-0.192	2.264	1.989	-0.274	1.468	1.381	-0.086			
(C) LP	(0.157)	(0.165)	(0.073)	(0.166)	(0.196)	(0.102)	(0.263)	(0.272)	(0.062)			
			+0.164			***+0.172**			***+0.154**			
			(0.101)			***(0.124)***			***(0.114)***			
Cleaning	1.598	1.815	+0.217	1.840	1.933	+0.092	1.530	1.728	+0.119	1.560	1.792	+0.231
(T) ln(w)	(0.047)	(0.041)	(0.050)	(0.128)	(0.146)	(0.078)	(0.135)	(0.103)	(0.127)	(0.053)	(0.050)	(0.028)
Cleaning	2.792	2.731	-0.060	2.781	2.662	-0.119	2.804	2.800	-0.004	2.797	2.722	-0.075
(C) ln(w)	(0.022)	(0.039)	(0.029)	(0.038)	(0.078)	(0.058)	(0.035)	(0.046)	(0.037)	(0.046)	(0.057)	(0.055)
			+0.277*			***+0.211***			***+0.203****			***+0.201****
			(0.056)			***(0.095)***			***(0.138)***			***(0.027)***
Cleaning	1.778	1.929	+0.150	2.464	2.400	-0.064	1.948	2.033	+0.084	1.381	1.566	+0.184
(T) LP	(0.079)	(0.077)	(0.030)	(0.191)	(0.224)	(0.073)	(0.144)	(0.168)	(0.056)	(0.070)	(0.063)	(0.034)
Cleaning	2.808	2.791	-0.017	3.030	3.026	-0.004	2.673	2.679	+0.007	2.365	2.355	-0.009
(C) LP	(0.081)	(0.078)	(0.033)	(0.138)	(0.128)	(0.048)	(0.116)	(0.106)	(0.055)	(0.237)	(0.220)	(0.101)
			+0.167*			*-0.060*			*+0.077*			***+0.194***
			(0.050)			*(0.086)*			*(0.079)*			***(0.108)***

Table A5 Continued

Sectors	Total sample			Small firms			Medium firms			Large firms		
	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference
Security	1.758	2.523	+0.764				1.564	2.478	+0.914	2.190	2.498	+0.308
(T) ln(w)	(0.404)	(0.07)	(0.427)				(0.690)	(0.006)	(0.697)	(0.202)	(0.172)	(0.197)
Security	2.762	2.848	+0.086				2.771	2.815	+0.044	2.755	2.864	+0.109
(C) ln(w)	(0.030)	(0.035)	(0.024)				(0.073)	(0.071)	(0.050)	(0.033)	(0.046)	(0.033)
			+0.679*						***+0.870****			***+0.199***
			(0.165)						***(0.462)***			***(0.110)***
Security	1.174	1.436	+0.262				1.172	1.345	+0.173	1.205	1.508	+0.302
(T) LP	(0.363)	(0.335)	(0.068)				(0.257)	(0.169)	(0.122)	(0.615)	(0.599)	(0.027)
Security	1.756	1.673	-0.083				2.086	2.038	-0.048	1.495	1.425	-0.070
(C) LP	(0.131)	(0.140)	(0.065)				(0.351)	(0.426)	(0.121)	(0.101)	(0.124)	(0.091)
			+0.345						*+0.221*			***+0.372**
			(0.170)						*(0.218)*			***(0.245)***
Hairdressing	2.041	2.099	+0.058	2.012	2.026	+0.014	2.100	2.220	+0.120			
(T) ln(w)	(0.099)	(0.095)	(0.029)	(0.148)	(0.135)	(0.021)	(0.066)	(0.066)	(0.045)			
Hairdressing	2.802	2.718	-0.083	2.784	2.711	-0.073	3.049	2.986	-0.062			
(C) ln(w)	(0.035)	(0.047)	(0.037)	(0.035)	(0.051)	(0.043)	(0.057)	(0.058)	(0.002)			
			+0.141*			*+0.087*			***+0.182***			
			(0.060)			*(0.073)*			***(0.067)***			
Hairdressing	2.188	2.209	+0.021	2.245	2.196	-0.049	2.072	2.254	+0.181			
(T) LP	(0.154)	(0.176)	(0.053)	(0.183)	(0.198)	(0.045)	(0.312)	(0.413)	(0.128)			
Hairdressing	2.744	2.654	-0.090	2.695	2.591	-0.104	4.138	3.969	-0.269			
(C) LP	(0.136)	(0.125)	(0.103)	(0.123)	(0.144)	(0.098)	(0.357)	(0.167)	(0.190)			
			+0.111			*+0.055*			***+0.350**			
			(0.162)			*(0.166)*			***(0.225)***			

Table A5 Continued

Sectors	Total sample			Small firms			Medium firms			Large firms		
	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference
Textiles	2.068	2.226	+0.158	1.892	1.988	+0.096	2.272	2.466	+0.193	2.254	2.338	+0.083
(T) ln(w)	(0.027)	(0.036)	(0.026)	(0.043)	(0.050)	(0.031)	(0.024)	(0.052)	(0.050)	(0.034)	(0.056)	(0.034)
Textiles	2.799	2.894	+0.094	2.835	2.868	+0.033	2.790	2.898	+0.108	2.777	2.899	+0.122
(C) ln(w)	(0.009)	(0.015)	(0.012)	(0.016)	(0.030)	(0.024)	(0.013)	(0.018)	(0.040)	(0.018)	(0.028)	(0.020)
			+0.064*			***+0.062***			***+0.085****			*-0.039*
			(0.025)			***(0.039)***			***(0.038)***			*(0.037)*
Textiles	2.290	2.460	+0.169	2.399	2.477	+0.078	2.253	2.441	+0.188	2.204	2.386	+0.182
(T) LP	(0.048)	(0.056)	(0.038)	(0.073)	(0.083)	(0.042)	(0.080)	(0.100)	(0.069)	(0.075)	(0.098)	(0.073)
Textiles	2.982	3.016	+0.034	3.197	3.186	-0.011	2.900	2.885	-0.015	2.890	2.927	+0.037
(C) LP	(0.036)	(0.037)	(0.025)	(0.059)	(0.060)	(0.035)	(0.051)	(0.053)	(0.028)	(0.062)	(0.074)	(0.048)
			+0.135*			***+0.090***			***+0.203****			***+0.145***
			(0.044)			***(0.054)***			***(0.062)***			***(0.086)***
Agriculture	1.833	1.917	+0.084	1.806	1.864	+0.058	2.145	2.459	+0.315	0.853	1.087	+0.234
(T) ln(w)	(0.032)	(0.033)	(0.020)	(0.034)	(0.035)	(0.020)	(0.075)	(0.056)	(0.073)	(0.445)	(0.462)	(0.037)
Agriculture	2.761	2.833	+0.072	2.765	2.802	+0.037	2.756	2.897	+0.141	2.696	2.867	+0.170
(C) ln(w)	(0.008)	(0.017)	(0.016)	(0.010)	(0.018)	(0.058)	(0.016)	(0.031)	(0.026)	(0.033)	(0.048)	(0.041)
			+0.012			*+0.021*			***+0.174****			*+0.064*
			(0.026)			*(0.027)*			***(0.063)***			*(0.057)*
Agriculture	2.237	2.231	-0.006	2.295	2.293	-0.032	2.066	2.203	+0.137	1.051	0.928	-0.122
(T) LP	(0.052)	(0.056)	(0.032)	(0.056)	(0.060)	(0.035)	(0.168)	(0.131)	(0.132)	(0.387)	(0.440)	(0.033)
Agriculture	2.819	2.807	-0.012	2.861	2.829	-0.032	2.608	2.705	+0.097	1.997	2.076	+0.078
(C) LP	(0.052)	(0.052)	(0.033)	(0.065)	(0.065)	(0.039)	(0.101)	(0.090)	(0.071)	(0.463)	(0.150)	(0.410)
			+0.006			*+0.030*			*+0.040*			*-0.201*
			(0.046)			*(0.053)*			*(0.137)*			*(0.472)*

Table A5 Continued

Sectors	Total sample			Small firms			Medium firms			Large firms		
	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference	Pre 1999	Post 1999	Difference
Food processing	2.152	2.390	+0.238	2.045	2.179	+0.134	2.204	2.468	+0.263	2.216	2.432	+0.217
(T) ln(w)	(0.025)	(0.030)	(0.026)	(0.062)	(0.057)	(0.046)	(0.028)	(0.028)	(0.031)	(0.033)	(0.045)	(0.028)
Food processing	2.796	2.947	+0.150	2.824	2.898	+0.074	2.793	2.939	+0.146	2.798	2.963	+0.165
(C) ln(w)	(0.008)	(0.012)	(0.010)	(0.017)	(0.030)	(0.023)	(0.011)	(0.015)	(0.011)	(0.015)	(0.019)	(0.012)
			+0.088***			***+0.060****			***+0.117******			***+0.051*****
			(0.023)			***(0.046)***			***(0.026)***			***(0.027)***
Food processing	2.450	2.582	+0.133	2.530	2.696	+0.167	2.435	2.514	+0.079	2.429	2.532	+0.103
(T) LP	(0.040)	(0.042)	(0.029)	(0.083)	(0.075)	(0.050)	(0.051)	(0.058)	(0.039)	(0.091)	(0.092)	(0.057)
Food processing	3.128	3.215	+0.087	3.298	3.403	+0.105	3.124	3.155	+0.030	2.951	3.084	+0.134
(C) LP	(0.028)	(0.027)	(0.017)	(0.064)	(0.066)	(0.027)	(0.039)	(0.038)	(0.024)	(0.052)	(0.057)	(0.039)
			+0.046*			*+0.062*			*+0.049*			*-0.030*
			(0.034)			*(0.052)*			*(0.048)*			*(0.076)*
Leisure	1.905	2.070	+0.166	1.826	1.986	+0.160	2.040	2.187	+0.148	2.093	2.224	+0.131
(T) ln(w)	(0.027)	(0.029)	(0.024)	(0.035)	(0.038)	(0.030)	(0.045)	(0.038)	(0.042)	(0.062)	(0.062)	(0.063)
Leisure	2.818	2.807	-0.011	2.825	2.821	-0.004	2.818	2.781	-0.037	2.773	2.786	+0.012
(C) ln(w)	(0.008)	(0.017)	(0.016)	(0.010)	(0.019)	(0.018)	(0.016)	(0.028)	(0.024)	(0.026)	(0.045)	(0.039)
			+0.177***			***+0.163******			***+0.184******			***+0.119*****
			(0.028)			***(0.033)***			***(0.047)***			***(0.071)***
Leisure	2.490	2.490	+0.000	2.550	2.490	-0.059	1.976	1.999	+0.023	2.378	2.665	+0.287
(T) LP	(0.051)	(0.056)	(0.034)	(0.064)	(0.068)	(0.042)	(0.166)	(0.166)	(0.091)	(0.139)	(0.119)	(0.113)
Leisure	3.016	3.000	-0.016	3.079	3.067	-0.011	2.675	2.743	+0.067	3.007	3.051	+0.044
(C) LP	(0.044)	(0.044)	(0.033)	(0.049)	(0.050)	(0.035)	(0.144)	(0.131)	(0.093)	(0.139)	(0.126)	(0.082)
			+0.015			*-0.048*			*-0.044*			***+0.243*****
			(0.048)			*(0.054)*			*(0.131)*			***(0.137)***

Note: Figures in italics indicate the difference-in-differences and figures in bold indicate sectors and firm size groups with statistically significant (at 10% or better) difference-in-differences in wages or productivity after the implementation of the NMW in 1999. The levels of significance are denoted as follows: *** 1% or better; ** 5% or better; * 10% or better. (T) denotes the treatment group and (C) denotes the comparison group. LP is labour productivity measure calculated as log of value added per worker.