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labour demand elasticities in multinational  
firms

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## **Headquarter services, skill intensity and labour demand elasticities in multinational firms\***

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### Abstract:

Using information on a panel of multinational firms operating in the United Kingdom from 1996 to 2005, we find that labour demand in domestic multinationals is less sensitive to own labour costs changes than in foreign multinationals. This difference in wage elasticity of labour demand persists even if we allow for a distinct labour elasticity in multinational firms according to their level of skill intensity or their intangible assets. This suggests that the provision of headquarter services in domestic multinational firms shields against strong fluctuations in labour demand. In terms of labour demand elasticity reduction, the estimated shielding role of headquarter services is about 40 percent.

Keywords: labour demand elasticity, headquarter services, multinational firms, skill intensity

JEL classification: F23, J23, J24

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## **1 Introduction**

A general concern about domestic multinational firms in developed countries is that they export activities abroad and substitute employees even in response to small labour cost changes (Horst, 1978; Barba-Navaretti et al., 2003). Such a link between multinational firms and highly wage elastic labour demand is said to contribute to labour market instability which might degenerate into social unrest (Rodrik, 1997; Scheve and Slaughter, 2004). This concern, however, has been criticized because multinationals possess extensive skill intensive activities in domestic headquarters which contribute to multinationals' competitive advantage (Markusen, 2002; Hanson et al., 2003). Thus far, however no empirical analysis has highlighted the specific role of headquarter activities for labour demand elasticity estimations. This is despite the evidence found in the labour demand literature that skill intensity reduces the wage elasticity of labour demand elasticity (Hamermesh, 1993).

As introduced by Helpman (1984, 1985) headquarter services are intangible inputs which are characterized by tradability and some aspects of public goods. Accordingly, headquarter services are the most skill intensive activities of a multinational. Headquarter services might be used by foreign affiliates but are generally assumed to be generated in the home country of a multinational (Davies, 2005). They also include activities associated with control and management that contribute to define a multinational enterprise (Caves, 1996).<sup>1</sup> Foreign affiliates use these inputs and combine them with local factors of production. Examples of headquarter services include patents or trademarks transferred abroad but generated by R&D activities at home, organizational capabilities to plan and

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<sup>1</sup> Caves (1996) writes: "The multinational enterprise (MNE) is defined here as an enterprise that controls and manages production establishments -plants- located in at least two countries." (p.1)

coordinate activities in different markets, or more generally, any skill intensive activity, that contributes to production or distribution in foreign affiliates.

The aim of this paper is to shed some light on the role of headquarter activities, and skill intensity in general, for labour demand elasticities at the firm level. The empirical strategy for quantifying the link between headquarter services and labour demand elasticity is to explore differences in labour demand elasticity coefficients between domestic and foreign multinationals located in the UK. The motivation for this is that, although they are both located in the same country, domestic multinational firms by definition have their headquarters in the UK, while foreign owned multinational firms are likely to be affiliates, with headquarters located abroad. Hence, looking at the difference in labour demand elasticity between domestic and foreign multinationals in the UK may be a proxy for the magnitude of headquarter services and their role for the wage elasticity of labour demand.

The paper contributes to a recent literature investigating the relationship between labour demand, skill intensity and multinational firms. Head and Ries (2002) for Japanese multinationals, and Blonigen and Slaughter (2001) for US industries, explore the relationship between offshoring of activities in foreign affiliates and skill intensity upgrading in home activities. When skill intensity is approximated by the ratio of non-production over production workers and foreign offshoring by affiliates' employment<sup>2</sup>, the effects on skill intensity are small and, at the firm level, depend on the host country of investment. A related literature asks whether within multinationals, an increase in the price of labour in a foreign affiliate abroad affects labour demand in the headquarters at home (Brainard and Riker, 1997; Ekholm and Hakkala, 2006; Harrison and McMillan, 2006). They show that increases in the price of labour abroad slightly increase employment at home. Thus, their results suggest the existence of transnational coordination of employment

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<sup>2</sup> Both papers use a similar definition for the non-production- production ratio although their skill intensity aggregation is different. Blonigen and Slaughter (2001) use industry-level data while Head and Ries (2002) use firm level data.

behaviour within multinationals, but these papers do not explore its connection to the skill intensity of activities at home. Hanson et al. (2003) touch upon this by looking at R&D activity in the headquarters. They find that the number of R&D employees in US domestic multinationals are unaffected by changes in their firms' total labour costs.

A final strand of literature related to our work is introduced by Barba-Navaretti et al. (2003). They consider the contribution of foreign firms to labour demand volatility within different European countries. If foreign firms are more volatile employers then they should be less rigid in their labour demand elasticity when compared to an average domestic firm. They find mixed results. In some countries the hypothesis holds but in others not. They speculate that their results might be driven by skill intensity differences between the treated firms within each country, but are not able to investigate this empirically.<sup>3</sup>

Our study adds to the existing literature in a number of ways: Firstly, our data allows us to distinguish foreign multinationals from domestic multinationals. Using firm-level data for the UK manufacturing sector from 1996 to 2005 we are, thus able us to explore differences in labour demand elasticities between foreign and domestic multinationals. We find that labour demand elasticity in domestic multinationals is significantly lower (in absolute terms) than in foreign multinationals, and we attribute this difference to the role of headquarter services in domestic multinationals. Secondly, we investigate whether this difference in the wage elasticity is driven by differences in measurable skill intensities between firms.<sup>4</sup> Whereas we find that skill intensity is negatively associated with wage elasticity (in absolute terms), it is also the case that even

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<sup>3</sup> Görg et al. (2009) provide a related study using firm level data for Ireland. They focus on the role of linkages between multinationals and domestic suppliers for their labour demand elasticities.

<sup>4</sup> As we will see in the data section, our firm level proxy for skill intensity is measured as the average firm payroll bill normalized by the gross wage paid to a representative employee of the two digit industry in which a multinational is active. It has an important advantage over alternative measures of skill intensity based on grouping according to occupations, tasks or educational achievements of workers. In particular, it considers the relative skill intensity position of a firm with respect to other firms in the same industry.

when controlling for firm-level skill differences, labour demand in domestic multinationals is still less wage sensitive than in foreign multinational firms. Thirdly, this difference in wage elasticity is also robust to the inclusion of the share of intangible assets in total sales. This variable is by nature strongly related to headquarter services and skill intensity. Finally, we are able to quantify indirectly the role of headquarter services for labour demand elasticity in UK domestic multinational firms using our wide range of specifications. Labour demand elasticities are about 40 percent lower in domestic multinationals, which we attribute to the importance of headquarter services.

In the following section, we discuss the framework for our analysis as to why headquarter services may be related to the labour demand elasticity of domestic multinational firms. In section 3, we specify our empirical strategy and then introduce our data in section 4. In section 5, our results are presented and in the last section we provide conclusions.

## **2 Background**

We estimate labour demand elasticities in domestic and foreign multinationals operating in the UK. Our argument for considering only multinational firms is that both types of firms share a number of characteristics that make firms become multinational rather than stay on domestic markets only. In the parlance of the recent heterogeneous firm type models, these firms both have had to overcome sunk costs of FDI and therefore have to be firms that are “better” along a range of characteristics than purely domestic firms (Helpman, Melitz and Yeaple, 2004, Criscuolo and Martin, 2010). While they are similar in terms of firm characteristics, one important difference remains: domestic multinationals have their headquarters in the UK, while foreign multinationals have them abroad. Hence, any observable difference in labour demand elasticity between foreign and domestic

multinationals will unlikely be driven solely by differences in measurable firm characteristics. Rather, if the wage elasticity of labour demand is different in domestic than in foreign multinationals then headquarter services, which are by nature skill intensive activities, may arguably have a role to play.<sup>5</sup>

In order to capture the potential influence of differences in the skill intensity of production processes, we not only introduce a distinct wage elasticity of labour demand in domestic and foreign multinationals, but also include in the same specification the direct impact of skill intensity on labour demand elasticity. In doing so, we can be more confident that differences between foreign and domestic multinationals are not due to skill differences in production, but may be more likely to reflect the role of headquarter activities. Furthermore, in an attempt to measure the possible replication of headquarter services in foreign affiliates, we also use information on each multinational firm's intangible assets. This variable, among others, is closely linked to headquarter services and thus might affect the wage elasticity in domestic and foreign multinationals. It is, of course, difficult to measure intangible inputs, which is often thought to be a weakness in empirical studies related to MNEs (Lipsey, 2008). Intangible assets, as found in balance sheets are unlikely to measure adequately the intangible nature of headquarter services that flow across borders. Still, allowing multinational firms to differ in their labour demand elasticity

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<sup>5</sup> There are however, reasons not to exaggerate the extent of our interpretation just by looking at wage elasticity differences between domestic and foreign multinationals. In the horizontal FDI literature --where expansion abroad is mainly motivated by market access--, there is at least one theoretical case where foreign affiliates replicate abroad the whole range of activities with local factors of production (Head, 2007). In this setup, headquarter services lose their transferability feature and all intangible inputs are produced where they are used as inputs. Then, any difference in wage elasticity of labour demand found in our data would not only reflect the role of headquarter services for labour demand, but may only reflect general differences in skill intensity of production. Still, it is common to assume that multinationals are composed of upstream and downstream units located in different countries. The downstream units reproduce most of the production activities of the upstream unit in the horizontal multinational case (Markusen, 2002) or specialize in less skill intensive stages of production in the vertical multinational case (Feenstra, 2003). On the whole, however, in both theoretical frameworks, downstream units import headquarter services from their respective upstream unit.

coefficients according to their share of intangible assets in total sales will provide additional information on the role of headquarter services on labour demand elasticity.<sup>6</sup>

To sum up, we would expect a statistically significantly lower (in absolute terms) wage elasticity for domestic multinationals compared to foreign multinationals. This is due to the role of headquarter activities in domestic multinationals. Headquarter services are relatively skill intensive and therefore should have a “shielding role” for multinationals’ labour demand in the sense of reducing the wage elasticity. This interpretation is reinforced if this difference holds even when controlling for the direct effect of skill intensity. And finally, the robustness of this difference is further strengthened if it persists when we permit simultaneously a distinct effect of intangible assets on labour demand elasticity.

### 3 Empirical framework

We study the effects of skills and headquarter services on multinational’s labour demand elasticity using a standard dynamic labour demand framework. In this context, labour demand elasticity is defined as the percentage decrease in the quantity of labour demanded in response to a one percent increase in the price of labour. In order to formalize our estimation, we derive labour demand for a multinational firm based on a generalized cost function, following Hamermesh (1993).<sup>7</sup>

Assume that a firm uses  $n$  factors of production  $X_1 \dots X_n$  including all foreign factors of production. One can write a production function:

$$Y_i = f(X_{1i}, \dots, X_{ni}), f_i \geq 0, f_{ii} \leq 0$$

Then, the related cost function, obtained from the demand of each  $X_1$  to  $X_n$  is:

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<sup>6</sup> Another issue could be that foreign affiliates have a larger share of labour in their variable costs when compared to domestic multinationals as proposed by Görg et al. (2009). Indeed, for a given wage shock, the magnitude of the employment changes would be proportional the labour share in variable costs. While this argument is plausible, regressing a productivity variable on labour and total assets measures does not provide any significant difference between domestic and foreign multinational firms. This argument appears thus not appropriate for our data.

<sup>7</sup> Barba-Navaretti et al. (2003) and Harrison and McMillan (2006) follow a similar procedure.



$$C_i = g(s_{1i}, \dots, s_{ni}, Y), g_i \geq 0$$

where  $s_i$  to  $s_n$  represent all input prices. Applying Shepard' lemma we derive:

$$X_i = X^d_i (s_i, s_n, Y), i = 1, \dots, N \quad (1)$$

We assume that labour supply is perfectly elastic and that employment changes are small. Thus taking logs on both sides of the equation gives a log-log relationship that may be estimated. In its simplest form, the empirical output constrained labour demand specification with two inputs labour and capital,  $w_{it}$  the wage rate and  $r_{it}$  the cost of capital would take the following form:

$$\ln(l_{it}) = \beta w_{it} + \delta y_{it} + \eta r_{it} + \sigma_{it} \quad (2)$$

Given that labour demand is dynamic in nature (due to, for example, hiring and firing costs that make desired employment adjust only slowly) we introduce different ad-hoc lag structures in this specification. We also introduce a firm fixed effect and time fixed effects. The latter are introduced to account for the fact that capital costs are not trivial to measure at the firm level. Therefore, we assume that the capital market is nation-wide and changes in the cost of capital are captured by the time dummies. Our resulting specification may be written in the following form:

$$\ln(l_{it}) = \lambda l_{it-s} + \beta w_{it} + \alpha y_{it} + v_i + \theta_t + \sigma_{it} \quad (3)$$

where,  $l_{it-s}$  denotes the employment level of firm  $i$  at time  $t$  and  $s$  is the number of lags of the dependent variable (which is determined empirically).  $w_{it}$  denotes the log of the average wage of firm  $i$  at time  $t$  and  $y_{it}$  is the log of total sales. Equation 3 is our starting point. Another three empirical specifications are considered following this baseline

specification. In the first specification conditional on output, we evaluate whether labour demand in domestic and foreign multinationals differs in the magnitude of their wage and output elasticity:

$$l_{it} = \lambda l_{it-s} + \beta_1 w_{it} + \alpha_1 y_{it} + \beta_2 (w_{it} * DMNE_i) + \alpha_2 (y_{it} * DMNE_i) + v_i + \theta_t + \sigma_{it} \quad (4)$$

The two interactions ( $w_{it} * DMNE_i$ ) and ( $y_{it} * DMNE_i$ ) permit the estimates of wage and output elasticity to differ by the nationality of multinational firms. Specifically,  $DMNE_i$  is a dummy equal to 1 if the multinational is British owned; it is time invariant due to the nature of the data. Hence, intercept differences between domestic and foreign multinationals are captured by  $v_i$ , our firm fixed effect.

In order to make sure that the interactions in equation 4 do not merely reflect differences in the skill intensity of production across firm types we add two linear interaction terms ( $w_{it} * skill_{it}$ ) and ( $y_{it} * skill_{it}$ ),

$$l_{it} = \lambda l_{it-s} + \beta_1 wage_{it} + \alpha_1 sales_{it} + \beta_2 (wage_{it} * DDMNE_i) + \alpha_2 (sales_{it} * DMNE_i) + \beta_3 (wage_{it} * Skill_{it}) + \alpha_3 (sales_{it} * Skill_{it}) + v_i + \theta_t + \sigma_{it} \quad (5)$$

where  $skill_{it}$  is our measure of skill intensity in firm  $i$  at time  $t$ , defined in the data section. This enables us to quantify the differences in wage elasticity for domestic and foreign multinational firms over and above a *direct* effect of skill intensity on labour demand elasticity. According to Hamermesh (1993), we expect more skill intensive firms to exhibit lower (in absolute terms) wage elasticities of labour demand.

If the data are consistent with the labour demand impact of headquarter services then we might expect the coefficient on  $w_{it}$  to be negative and the coefficient of the interaction term ( $w_{it} * DMNE_i$ ) to be positive. In short, domestic multinational firms would have a smaller (in absolute terms) wage elasticity of labour demand than foreign multinational firms.

Estimating equations 3 to 5 with OLS would clearly result in endogeneity bias because wages, output and skill intensity may well be affected by employment changes. Also, the lagged dependent variable is related to the error term by construction. Therefore, we use the Systems GMM approach as suggested by Blundell and Bond (1998). This uses all existing lags of the dependent variable in levels and differences to generate additional orthogonality conditions.

#### **4 Data**

The FAME (Financial Analysis Made Easy) dataset provides unique information on UK operations of domestic and foreign multinational firms. It is provided by Bureau van Dijk (BvDEP) and reports longitudinal firm-level information on profit and loss accounts, financial items or profitability ratios. A UK domestic multinational is defined as a firm that has controlling power over at least one affiliate abroad. A foreign subsidiary located in the UK is defined as a UK based firm owned by a foreign investor. An important advantage of studying multinationals located in one country is that any difference in labour demand elasticity between foreign and domestic multinational firms should not be the result of different labour market institutions. Given that data about small firms may be unreliable, we drop observations on firms that report less than 10 employees.<sup>8</sup> We thus extract 18,010

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<sup>8</sup> This procedure reduces the sample only slightly because FAME reports information over firms only if they have fixed assets, current assets, current liabilities or long term liabilities that are greater than £ 150,000.

observations on foreign multinational firms and 1,590 observations on domestic multinationals.<sup>9</sup>

Total sales and wages for each firm are directly extracted from the FAME dataset. Note that labour remunerations in each multinational consist of all salary costs including social security and pension costs. We deflate these raw values using a two-digit SIC level producer price index provided by the Office of National Statistics (ONS).

The skill intensity variable is defined as follows:

$$\text{Skill}_{it} = (\text{AverageLabourCosts}_{it}) / (\text{Median}(\text{wage}_{jt}))$$

where the numerator is average labour costs in firm  $i$  at time  $t$  while the denominator is the median yearly gross wage paid to a full time worker in the firms' 2-digit SIC manufacturing industry  $j$  at time  $t$ . The median wage is calculated using the British Household Panel Survey (BHPS). Thus the denominator might be considered as a "hypothetical" wage for a representative worker in an industry. The numerator accounts for the fact that firms pay a skill premium to the average employee. As a whole, our skill intensity measure reflects firm's total labour costs normalized by a hypothetical total labour costs that would occur if all employees were homogenous within each 2-digit industry.

This skill intensity proxy has two important advantages. First, it is observable at the firm level. Second, it does not rely on grouping of employees according to their occupations, tasks or educational level to proxy a firm level skill intensity measure.<sup>10</sup>

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<sup>9</sup> Unfortunately, our dataset does not allow studying exit and entry behaviour of firms. The role of headquarter services in relation to exit or entry of firms is thus not considered. Instead, our framework is well adapted to studying small changes in employment and to quantify the role of headquarter services on labour demand elasticity in continuously active firms.

<sup>10</sup> Winchester et al. (2006), Hijzen et al. (2005) and Becker et al. (2005) all show that there are large discrepancies between skill measures based on occupation or education. Our measure takes account of the skill intensity relative to other firms in each 2-digit industry and captures strong complementarities between workers across the whole set of activities within each firm as suggested by Kremer (1993).

Despite its qualities it has however to be considered as only an imperfect proxy for skill intensity as it is solely calculated through the lens of wages. We also propose a second complementary skill intensity variable, which differs in the construction of the Median(wage<sub>it</sub>) variable. It is now extracted from the FAME database, using the median two-digit industry wage per firm calculated from a large sample of solely national firms.<sup>11</sup> We prefer our first proxy because the BHPS is a representative sample of the UK population, but use the second as robust check in the estimations.

Table 1 compares both average skill intensity measures for each 2-digit SIC 2003 industry in 1996 and in 2005. We observe first that the median skill intensity in our whole sample of multinationals slightly increased during the time period under study. Furthermore, domestic multinational firms seem in general to be more skill intensive, but not in all industries.

Our summary statistics are presented in Table 2. Domestic multinational firms in our sample do not seem to pay different average wages than foreign firms, in line with Criscuolo and Martin (2009).<sup>12</sup> Furthermore, we observe some differences in the size of the respective firms in terms of average total sales and number of employees at this aggregated level. Domestic multinationals are slightly larger in our sample. Furthermore, the share of intangible assets is only available for fewer observations, which is probably due to the difficulty of evaluating the real value of intangible assets. Nonetheless, the mean of this variable reveals that domestic multinationals have much higher values for the share of intangible assets in their total sales than foreign multinational firms. Additionally, it also shows that some domestic and foreign firms have no intangible assets included in their account data. Hence, these statistics suggest that headquarter services in multinationals are not easy to measure precisely. However, using differences in wage elasticities between

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<sup>11</sup> Solely national firms are neither domestic multinationals nor foreign multinationals.

<sup>12</sup> The averages are also close to the mean wage found in UK firms in 1996 by Griffith and Simpson (2003). Their study ends in 1996 so no possible comparison can be made for subsequent years.

domestic and foreign firms may be an alternative to evaluating the role of headquarter services for labour demand elasticity.

## **4 Empirical results**

### **4.1 Labour demand elasticity and the nationality of multinational firms**

The first step of our econometric analysis is to let the data generation process define which lag dependent variable satisfies best our selection criteria in estimating equation 3. Column 1 of table 3 presents the regression results of equation 3 with  $s$  equal to 1, i.e. the dependent variable enters the specification with one lag. The Arellano Bond AR(2) test ( $p$ -value=0.020) can be rejected and the Hansen test of overidentification of the instruments can also be rejected by our data generation process. In column 2, we add one lag of the wage and output variable, but at the same time, we keep  $s$  equal to 1. As before, our selection criteria are still not satisfied. In particular, the AR(2) test can be rejected by the data. In column 3, we turn to a specification with  $s$  equal to 2. The AR(2) test can be rejected at the 5 percent level ( $p$  value= 0.217). Furthermore, we can reject the hypothesis of overidentification restrictions at the standard level of significance ( $p$ -value=0.59). Hence, according to our selection criterion the dependent variable enters our equation with two lags. The coefficients found in column 3 represent our baseline specification.<sup>13</sup>

Concerning our coefficients, we obtain the expected signs for the variables in the labour demand equations. The coefficient of the logarithm of wages is negative and significant at the 1 per cent level. The logarithm of sales is also highly significant and positive. Turning to our variables of interest, the interaction term ( $y_{it} * DMNE_i$ ) is significant and negative and the coefficient of the interaction term ( $w_{it} * DMNE_i$ ) is also

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<sup>13</sup> In table 8, we also compare different estimators (OLS, fixed effect and difference GMM) to our system GMM estimator. This comparison reinforces the superiority of our specification methodology. In particular, the magnitude of the first lag of the dependent variable is bounded between the coefficient of the fixed effect and OLS specifications. Roodman (2006) suggests that this is a sign of efficiency of the estimator.

highly significant and positive. Thus, domestic multinationals seem to be on average less wage elastic (in absolute terms) than foreign multinational firms in the UK. A one percent increase in labour costs decreases demand for labour by 0.839 percent in foreign multinationals, while a one percent increase in the wage induces a 0.184 percent (calculated as  $-0.839+0.655$ ) decrease in the labour force demanded by domestic multinational. The results reported in table 3 thus appear supportive of our hypothesis that domestic multinationals have lower (in absolute terms) wage elasticity of labour demand. This may, at least be partly, attributable to headquarter services.

The finding that domestic multinationals have a lower wage elasticity (in absolute terms) of labour demand than foreign multinationals is consistent with the idea that domestic multinationals' skill intensive headquarter services drive their employment behaviour in response to labour cost changes. However, it may also be that domestic multinationals are on average more skill intensive than foreign multinational firms, although unrelated to headquarter services. In this case, it would be misleading to interpret the difference between foreign and domestic multinationals' wage elasticity as being due to differences in headquarter activities. Instead it would just pick up a more skill intensive production process.

Therefore, we estimate variants of equation 5 which allow multinational firms' labour demand elasticity to be heterogeneous according to their skill intensity. As pointed out above, we expect firms to have lower wage elasticities (in absolute terms) as their skill intensity increases. Results of these estimations are presented in columns 1 and 2 of table 4. The first column shows that the coefficient on wages is still negative and highly significant, while the interaction term ( $wage_{it} * Skill_{it}$ ) is positive and significant at the standard level of significance. Hence, more skill intensive multinationals have lower (in absolute terms) wage elasticities of labour demand.

The median skill intensity for a firm in our sample in 2005 in log terms is 0.265. Multiplying this number by the coefficient of the interaction term, 0.524, and adding the coefficient of wage elasticity, -0.99, yields -0.851. Ceteris paribus, a 1 percent increase in wages induces a 0.851 percent decrease in the labour demand of the median multinational firm. For a multinational firm at the 90th percentile, the direct effect of skill intensity on wage elasticity is even stronger with a wage elasticity of -0.634 percent. Thus, the sign and the magnitude of the coefficient of the interaction term ( $wage_{it} * skill_{it}$ ) support strongly the idea that higher skill intensive firms have on average lower (in absolute value) labour demand wage elasticities.

Now the crucial question becomes whether domestic multinationals still have different wage elasticities than foreign multinationals, over and above this observed skill intensity effect on labour demand elasticities. If they did, then we may more confidently attribute this to differences in headquarter services.

To answer this question, we estimate the model including both the interaction terms for skill intensity and for domestic multinationals. Results are shown in column 3 of table 4. The coefficient on ( $w_{it} * DMNE_i$ ) is still positive and significant while that on  $wage_{it}$  is also significant but negative. On the other hand, the interaction term ( $wage_{it} * Skill_{it}$ ) is still positive but becomes insignificant at the 5 percent level. Comparing these results with those found in column 2 of table 3 provides, however some interesting information. Indeed, first, both multinational types' labour demand becomes more wage elastic. Now, the coefficient on  $wage_{it}$  is equal to 1.18. Furthermore, a one percentage point increase in labour costs decreases labour demand by 0.64 percent for domestic multinationals.

We now consider some robustness checks, and start with our alternative measure of skill intensity using the FAME data instead of the BHPS data. Results are presented in column 4 of table 4. Although we prefer the skill intensity measure used thus far, the



alternative firm level skill intensity provides very similar labour demand coefficients and strongly supports our earlier results.

To check further the robustness of our results, we split our sample according to the size of the multinational firms, since Hamermesh and Pfann (1996) show that labour demand elasticities may depend on the size of the firm. Results are presented in table 5. Column 1 restricts our sample to multinational firms with more than 100 employees. In column 2, we consider only the sample of multinational firms with less than 500 employees and finally in column 3 we show results solely for multinational firms that employ between 100 and 500 employees. None of the sample size restrictions change our results in a significant way. However the magnitude of our main coefficients differs slightly as shown in table 5. Most importantly, however, size differences between domestic and foreign multinationals do not seem to drive our results.<sup>14</sup>

As proposed above, intangible assets may also be related to skill intensity and headquarter services. Therefore we replace our skill intensity variable by a measure of intangible assets. Results including the intangible assets variable, measured as the share of total sales, are presented in table 6. In column 1, we observe that the coefficient on  $wage_{it}$  is negative and significant. Its magnitude is similar to the one found in the specification with our skill intensity proxy. However, an important difference is that the elasticity for domestic multinational firms is even more reduced than in the skill intensity case. Domestic multinational firms have now an elasticity of -0.21. Perhaps it suggests that intangible assets, evaluated at book prices, have an influence on the average labour demand by reducing the magnitude of the wage elasticity in domestic multinationals. However, other aspects of headquarter services, not captured by our intangible assets proxy, like

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<sup>14</sup> In an additional robustness check, we allowed a distinct effect of skill intensity for domestic and foreign multinationals by introducing a triple interaction term ( $wage_{it} * DMNE_i * Skill_{it}$ ). This specification does not fit our data well which confirms our presumption that skill intensity and headquarter services are intertwined in domestic multinationals. We therefore favour our specifications without the triple interaction term.

organizational capacities to manage and control foreign affiliates are still driving a persistent significant difference in labour demand elasticities in domestic and foreign multinationals.

After establishing the robustness of our results we now turn to compute the quantitative importance of headquarter services with respect to labour demand elasticities in domestic multinationals. We term it the “shielding role” of headquarter services. It is calculated as the difference in the wage elasticity between domestic multinationals and foreign multinationals, divided by the wage elasticity coefficient for foreign multinational firms. In other words, it tells us the percent difference between the elasticity for domestic firms and that for foreign firms. This calculation is presented in table 7 and is based on results extracted from tables 3 to 6.

Using coefficient results from table 3, column 3 to attribute the importance of headquarters services to domestic multinational firms would indicate that the elasticity for domestic multinationals is 22 percent lower than that for foreign firms. However, this may be biased as it does not account for observable skill intensity differences. For this reason, we use the wage elasticities obtained from tables 4 and 5, where the direct skill intensity effect on labour demand elasticity is accounted for.

In table 4, column 3, the wage elasticity for foreign multinationals was -1.183 compared to -0.693 for domestic multinationals. Thus the share attributed to headquarter services for domestic multinationals’ labour demand elasticity would be about 54 percent. The difference (22 versus 54 percent) shows that omitting the direct role of skill intensity underestimates the real contribution of headquarter services for labour demand elasticities. One possible explanation may be that foreign multinationals have a highly skill intensive production process. In column 4 of table 4 we presented an estimation using our alternative

measure of skill intensity. Using these results, we find that the shielding role of headquarter services is 51 percent.

Furthermore, in columns 1 to 3 of the table 5, we calculated labour demand elasticities for the reduced sample by the size of the multinational firms. Using these coefficients, we find small differences in the shielding role of headquarter services according to size. Moreover, we also compute the role of headquarter services using our regression results when accounting for our intangible assets variable (table 6, column 1). As expected, the role of headquarter services is reduced because intangible assets capture partially some headquarter services. Finally, when including both the direct skill intensity effect and the intangible assets effect provides a value of 39 percent. It lies comfortably between the magnitude when accounting for the skill intensity and intangible assets separately. As a result, the quantitative reduction in labour demand elasticity attributable to headquarter services is in a range between 19 and 54 percent. The average "shielding" calculations yield a value of 38 percent.

## **5. Conclusions**

We find that domestic multinationals' labour demand is less sensitive to wage shocks than foreign multinationals'. Our results are based on labour demand elasticities of domestic and foreign UK operations of multinationals during the period from 1996 to 2005. These results hold even when we allow for different skill intensities of the operations of the two types of firms. They are also robust to taking account of intangible assets in the calculation of the role of headquarter services on labour demand elasticity. Together our findings suggest that the economic and quantitative role of skill intensive activities required by foreign direct investment --headquarter services-- is important in shaping domestic multinational's labour demand response to own wage shocks. Headquarter services shield

labour demand elasticity by about 40 percent in UK domestic multinationals compared to foreign multinationals. In other words, the wage elasticity of labour demand is about 40 percent lower in domestic than in foreign multinationals.

Our results point to two areas of concern for policy makers regarding the relationship between labour demand and multinational firms. On the one hand, anecdotal evidence suggests that global firms like IBM have recently increased their R&D and headquarter activities in India (The Economist, 2007). Toyota intends to share more control power and give more independence to its foreign affiliates (IHT, 2008). In a more formal approach, Marin and Verdier (2009) show that headquarter firms have managerial incentives to transfer some power to their foreign affiliates. On the other hand, Klapwijk (1996) advocates that domestic multinationals "...concentrate their efforts on their core competencies..." and are "...`supra' companies, that is on a level of integration above companies". The location of headquarter services, ultimate control of management and firm's competitive advantage have important consequences for labour demand behaviour in multinational firms.

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