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OFFSHORING, MULTINATIONALS AND LABOUR MARKET: A REVIEW OF THE EMPIRICAL LITERATURE

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Abstract. This paper reviews the empirical literature on the effects of offshoring and foreign activities of multinational enterprises on developed countries' labour markets. Results suggest that material offshoring worsens wage inequality between skilled and unskilled workers; it also seems to make employment more volatile, by raising the elasticity of labour demand and the risk of job losses. Service offshoring exerts at most small negative effects on total employment, and changes the composition of the workforce in favour of high-skilled white-collar employees. Multinationals tend to substitute domestic and foreign labour in response to changes in relative wages across countries; substitutability is weak, however, and mainly driven by horizontal, market-seeking foreign direct investments.

Keywords. Developed countries; Labour market; Multinational enterprises; Offshoring

1. Introduction

During the last two decades, opponents of globalization have directed harsh protests against offshoring and foreign activities of multinational enterprises (MNEs), arguing that they produce severe deterioration in the economic fortunes of domestic employees and calling for policies that would make it more costly for firms to internationalize their operations. The opposition has exacerbated in the last few years, reaching its height at the onset of the 2004 US presidential election (Amiti and Wei, 2005; Mankiw and Swagel, 2006). It is indeed easy to find examples of firms that have fired domestic employees, or exposed them to wage cuts, after the decision to expand operations abroad. Similar experiences are definitely harsh for the workers involved and should be tackled with effective policy interventions. However, preventing firms from internationalizing their activities is not the solution. Substantial gains can in fact accrue to a country from the offshoring strategies of its firms and from the foreign activities of its MNEs; these gains can take the form of higher productivity, more incentives to innovate, faster economic growth and the like (Mann, 2003; OECD, 2003; Amiti and Wei, 2006b; Olsen, 2006). An effective policy would therefore allow the gains to be realized and spread them

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out more evenly over the national workforce. To this purpose, the policy makers need to know the magnitude and the nature of the labour market effects of these internationalization strategies. The aim of this paper is to draw some conclusions on these issues, by reviewing the vast empirical literature which has focused on the developed countries.

To clarify the terminology, I use the word *offshoring* to describe the situation in which a firm relocates some stages of production *abroad*, to either one of its affiliates or an unaffiliated supplier. I will call the first offshoring mode 'production transfer within MNEs', because the activities remain within the boundaries of the same multinational corporation; I will instead call the second offshoring mode 'international outsourcing', because the activities are moved outside the firm by means of a licence contract.[1] It should be noted that in the business literature offshoring means relocation of activities abroad but within the same MNE, and therefore indicates only the case I define as 'production transfer within MNEs'. In the industrial organization literature, and increasingly more often in the international trade literature, offshoring is instead used to indicate both cases jointly (UNCTAD, 2004; Helpman, 2006; Olsen, 2006; Blinder, 2007b); I therefore prefer to use the word with this broader meaning.[2] I will also specialize the definition of offshoring according to the type of activities that are relocated abroad: *material offshoring* will define the relocation of production activities (e.g. assembly) and *service offshoring* the relocation of service activities (e.g. call centre operations, back office activities, accounting and the like).[3] Turning to MNEs, I will often exploit the standard classification based on the horizontal or vertical nature of foreign direct investments (FDI): vertical FDI are meant to transfer stages of production abroad; horizontal FDI are instead meant to replicate abroad the same activities as those performed domestically, in order to serve local or neighbouring markets while avoiding trade barriers and transportation costs (Brainard, 1997). Clearly, offshoring and foreign activities of MNEs are linked to each other, but the relationship is not exhaustive: neither offshoring takes place only within the boundaries of MNEs, nor do MNEs exist only to pursue offshoring strategies.

As is already well known, offshoring and MNEs' activities have rapidly expanded in recent decades. Figure 1 compares the growth in world FDI outflows and in world GDP between 1975 and 2006; it also reports data on outflows from eight developed countries that accounted for over 50% of the total in 2006. The figure shows that FDI growth has by far exceeded GDP growth since the late 1980s; it also shows that FDI growth has almost entirely been driven by the developed countries, at least until 2000.[4] During the same period, offshoring has become a widespread practice in the industrialized world. The solid line in Figure 2 shows the trend in material offshoring by US manufacturing industries between 1972 and 2002. Following Feenstra and Hanson (1996, 1999), material offshoring is proxied by the share of imported intermediate inputs in total non-energy input purchases.[5] This share has increased from 5.1% in 1972 to 18.1% in 2002. Similar trends have occurred in almost all industrialized economies: for instance, Campa and Goldberg (1997) show that between 1974 and 1993 the above indicator has risen from 15.9% to 20.2% in the Canadian manufacturing sector, and from 13.4% to 21.6% in the

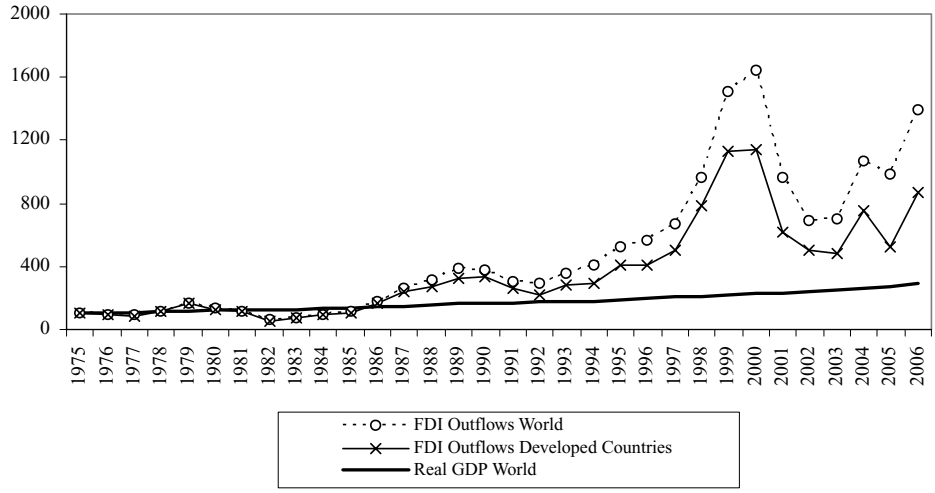

Figure 1. Growth in FDI Outflows Compared to GDP Growth. World and Developed Countries, 1975 = 100.

Source: UNCTAD (Foreign Direct Investment Database) and World Bank (World Development Indicators).

Notes: All variables are in constant 2000 US dollars and PPP. Developed countries include Canada, France, Germany, Italy, Japan, Sweden, the UK and the USA.

UK industrial sector.[6] More recently, thanks to improvements in information and communication technologies that have eased the tradability of services, the practice of offshoring has been extended to service activities (Freund and Weinhold, 2002; Lipsey, 2006). The dashed line in Figure 2 shows a proxy for service offshoring by US manufacturing industries between 1995 and 2002; the proxy is the share of imported private services in total non-energy input purchases. The figure shows that service offshoring was virtually close to zero in 1995 but has grown exponentially since then, gaining roughly 3 percentage points in less than a decade. Similar patterns have occurred in the EU, where service offshoring has increased by more than 50% between 1990 and 2004 (Crinò, 2007b).

The expansion of offshoring and foreign activities of MNEs have raised concerns in the developed countries about the effects that these phenomena may produce on the economic fortunes of domestic employees. A large body of literature has flourished with the aim of studying and quantifying these effects. In what follows, I will distinguish this literature in three segments, which collect, respectively, the studies on material offshoring, those on service offshoring and those on the foreign activities of MNEs.

I will start from material offshoring in Section 2. Numerous studies have analysed its contribution to the strong increase in wage inequality between skilled and unskilled workers experienced by most developed countries during the 1980s and

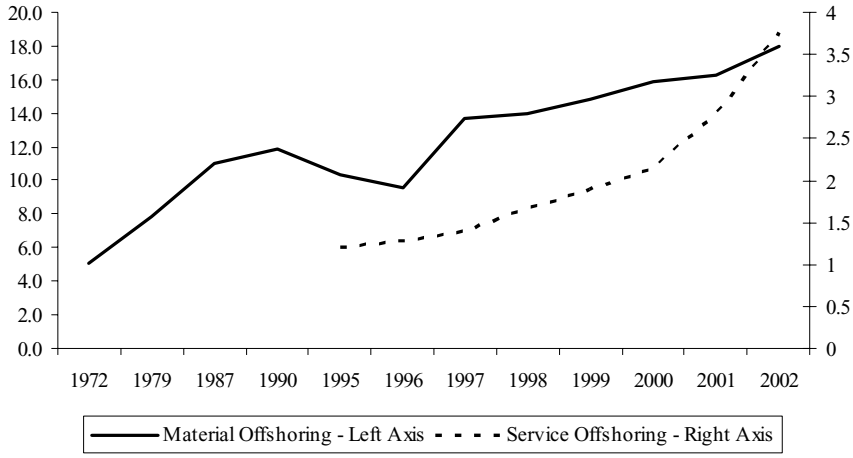

Figure 2. Material and Service Offshoring in US Manufacturing. Imported intermediate goods and services in total non-energy input purchases (%).

Source: Data on material offshoring between 1972 and 1990 come from Feenstra and Hanson (1999). For the period 1995–2002, material offshoring has been constructed by the author using input–output data from BEA (1997 Benchmark Input–Output Data), data on non-energy input purchases from the Bureau of the Census (Annual Survey of Manufactures) and trade data from NBER (US Trade by 1987 – SIC Category). Service offshoring has been constructed by the author using input–output data from BEA (1997 Benchmark Input–Output Data), data on non-energy input purchases from the Bureau of the Census (Annual Survey of Manufactures) and data on service imports from BEA (US International Services: Cross-Border Trade 1986–2004, and Sales Through Affiliates, 1986–2003, Tables 5 and 7).

Notes: Material and service offshoring are constructed as in formula (3) in the main text. The figure reports unweighted manufacturing averages, computed over 450 four-digit SIC industries (material offshoring) and 135 three-digit SIC industries (service offshoring). Service offshoring includes the following categories of 'Private Services': (1) financial services; (2) insurance services; (3) computer and information services; (4) research, development and testing services; (5) business, professional and technical services; (6) advertising; management consulting and public relation services; (7) industrial engineering; (8) installation, maintenance and repair of equipment; (9) legal services; (10) operational leasing and (11) accounting, auditing and bookkeeping.

the first half of the 1990s. These studies suggest that material offshoring has indeed played an important role; they also show that its effects have been qualitatively and quantitatively similar to those of skill-biased technical change (SBTC), another major culprit for the increase in wage inequality. A more limited set of contributions have analysed whether material offshoring raises the volatility of employment, by making labour demand more elastic and by increasing the risk of job losses. While a positive role for material offshoring can probably be detected also in this case, more research is needed to understand the exact magnitude of these effects.

I will turn to service offshoring in Section 3. The weak labour market dynamics experienced by the USA and other developed countries after the dot-com bust of the late 1990s have triggered oppositions to service offshoring, which was simultaneously rising at high rates. Firms have been blamed for contributing to the labour market weakness by relocating service jobs in foreign countries. Empirical evidence does not lend support to this view: the effects of service offshoring on total employment are in fact very small. More recently, service offshoring has been blamed for producing adverse effects on the process of human capital accumulation, by exposing white-collar workers with high skill levels to the risk of relocation. The few studies dealing with this issue have instead shown that service offshoring shifts the composition of white-collar employment in favour of these workers and against those with the lowest skill levels.

In Section 4, I will deal with the labour market effects of MNEs' activities. Opponents of globalization have often blamed MNEs for taking advantage of their global presence by substituting domestic and foreign labour in response to changes in relative wages across countries. While some evidence exists in favour of a substitutability relationship between domestic and foreign labour employed by MNEs, this relationship seems too weak for MNEs to pose a serious threat to national employment. In contrast with the common perception, the relationship is mainly driven by horizontal (market seeking) FDI, rather than by vertical (cost-saving) FDI.

In Section 5, I will finally draw some conclusions from the empirical evidence and suggest some possible avenues for future research.

A few other works provide reviews of the literature on the labour market effects of offshoring and foreign activities of MNEs. The most notable examples of such surveys are those by Feenstra and Hanson (2003), Feenstra (2004, chapter 4) and Hijzen (2005) on offshoring, and by Barba Navaretti and Venables (2004, chapter 9) on MNEs.[7] This paper complements those studies, but differs from them in two ways. First, it discusses offshoring and MNEs jointly, rather than focusing on either of them separately: because the two phenomena are not univocally linked, and often affect the labour market independently of each other, this approach may provide a more comprehensive portrait of their effects. Second, the paper pays specific attention to service offshoring, which has started soaring only recently: due to the novelty of the topic and its expected diffusion in the future, reviewing the state of the art in the literature may offer insights for further research.

2. Material Offshoring

A large stream of empirical contributions have analysed the role of material offshoring in explaining the declining fortunes of unskilled workers in the last two decades, as symptomized by the rise in wage inequality between them and the skilled. A smaller set of studies have analysed whether material offshoring raises the volatility of employment, by making labour demand more elastic and by producing adverse short-run employment dynamics.

2.1 *Effects on Relative Skilled Labour Demand and Wage Inequality*

2.1.1 *Setting the Issue*

During the 1980s and the first half of the 1990s, wage inequality between skilled and unskilled workers has worsened in most industrialized countries; at the same time, the composition of employment has shifted in favour of the skilled. In the US manufacturing sector, for instance, the wage ratio between non-production and production workers has increased by 4% over the period 1980–1992, while the employment ratio has risen by 17% (Figure 3). As a consequence of these trends, non-production workers have gained 4% points in total wage bill and 3% points in total employment.[8,9]

The rise in wage inequality and in relative skilled employment has taken place in almost all industrialized countries. In general, economies characterized by flexible labour markets have experienced sharp upsurges in both variables. Instead, economies characterized by relatively more rigid labour markets have seen wage inequality rising at a slower pace, but have still experienced sharp increases in relative skilled employment (Freeman and Katz, 1995; Berman *et al.*, 1998; Katz and Autor, 1999; Krugman, 2000).

There is by now widespread agreement among scholars that the contemporaneous rise in relative wages and employment has been the result of an outward shift in relative skilled labour demand (Bound and Johnson, 1992; Katz and Murphy, 1992; Juhn *et al.*, 1993; Autor *et al.*, 2008). Less consensus exists, however, on

Figure 3. Skilled/Unskilled Employment and Wage Ratios in US Manufacturing.

Source: NBER (Manufacturing Industry Productivity Database) and Bureau of the Census (Annual Survey of Manufactures).

Notes: Unweighted manufacturing averages, computed over 450 four-digit SIC industries. Skilled and unskilled workers are proxied by non-production and production workers, respectively.

the determinants of such a shift. One point is extremely relevant in this respect: in all countries, the shift has occurred *within industry*. This means that relative skilled labour demand has shifted outwards because industries have raised their skill intensity of production, and not because skill-intensive sectors have gained employment shares at the expense of unskill-intensive sectors (Berman *et al.*, 1994, 1998; Machin, 1996; Bernard and Jensen, 1997; Dunne *et al.*, 1997; Osburn, 2001). Therefore, the explanations for the shift have to be searched for among those factors that could have acted within industry. This has initially vindicated international trade: according to the neoclassical redistributional argument based on the Stolper–Samuelson theorem, in fact, trade works between industries, by making developed countries specialize in skill-intensive productions. There are also two other pieces of evidence running against the neoclassical argument for trade: since the early 1980s (1) the relative price of skill-intensive goods has been declining and (2) the skill intensity of production has been increasing (Lawrence and Slaughter, 1993; Bhagwati and Deheja, 1994; Leamer, 1996; Anderton and Brenton, 1999b; Desjonqueres *et al.*, 1999; Krugman, 2000; Lawrence, 2008).[10]

Economists have initially identified in technological progress the main culprit for the outward shift in relative skilled labour demand. Since new technologies tend to complement with skilled workers and substitute for unskilled workers, their labour demand effects can be biased in favour of the skilled (SBTC). For this reason, the fast technological progress occurring since the early 1980s could have explained a substantial fraction of the outward shift in relative skilled labour demand (Acemoglu, 1998, 2002b; Haskel and Slaughter, 2002; Zeira, 2007). Many empirical studies have indeed confirmed this prediction (Berman *et al.*, 1994, 1998; Autor *et al.*, 1998; Machin and Van Reenen, 1998; Haskel and Heden, 1999; Chun, 2003).

The interest in international trade has recently renewed, however. Three streams of theoretical literature have in fact identified new channels through which trade could cause a within-industry outward shift in relative skilled labour demand. According to the first stream, international trade triggers SBTC (Acemoglu, 2002a, 2003; Neary, 2002; Thoenig and Verdier, 2003; Ekholm and Midelfart-Knarvik, 2005). According to the second stream, based on the new trade theories, international trade triggers skill-biased scale effects (Epifani and Gancia, 2006, 2008). Finally, according to the third stream, it is trade in intermediate inputs and material offshoring that matter (Feenstra and Hanson, 1996, 1999, 2003). The latter channel will be the focus of this section.

How can material offshoring induce a within-industry shift in relative skilled labour demand? A by now large number of theoretical studies yield predictions on this topic. Reviewing these contributions is beyond the scope of this paper; I will instead sketch the main intuition that has been tested in the empirical works surveyed below.[11] Suppose that firms have the opportunity to fragment their production process internationally. Following standard factor-proportion considerations, they will tend to relocate unskill-intensive stages of production in less developed economies, where the endowment of unskilled labour is relatively larger. Because the stages of production moved abroad are unskill intensive, the

skill intensity of home production rises and relative skilled labour demand shifts outward; the shift occurs within industry. Hence, material offshoring may produce labour demand effects which are *observationally* equivalent to those of SBTC (Feenstra, 1998).[12]

Empirical tests have confirmed this prediction for a large number of industrialized countries (Table 1, panel A). The next sections explain the empirical methodology used by these studies and summarize their main results.

2.1.2 *Empirical Framework and Measurement of Offshoring*

Assume that, in every period t ($t = 1, \ldots, T$), the representative firm in industry i ($i = 1, \ldots, I$) produces a given amount of output (Y) using capital (K), skilled labour (S) and unskilled labour (U). If the short-run cost function of the firm has the translog form, Shephard's lemma yields the following expression for the relative demand of skilled labour:

$$WSH_{Sit} = \beta_S + \beta_{SU} \ln \left(\frac{w_S}{w_U} \right)_{it} + \beta_{SY} \ln Y_{it} + \beta_{SK} \ln K_{it} + \sum_{z=1}^{Z} \beta_{Sz} \ln z_{it} \qquad (1)$$

where WSH_S is the share of skilled labour in the total wage bill, w stands for wage and $z = 1, \ldots, Z$ are shift factors that can affect total costs and thus optimal skilled labour demand.[13] Among the shift factors, a proxy for the intensity of material offshoring (*mos*) is included. Estimating equation (1) allows the parameters β_{Sz} to be identified. If $\beta_{Smos} > 0$, material offshoring raises the share of skilled labour in the total wage bill; this is tantamount to saying that material offshoring shifts relative skilled labour demand outward.

How can material offshoring be measured? Feenstra and Hanson (1996, 1999) propose to use imports of intermediate inputs as a proxy. The argument is simple: part of the goods whose production is offshored have to be shipped back to the home country, in order to be either assembled into the final product or sold under the brand name of the national firms. Hence, material offshoring is positively correlated with imports of intermediate inputs, and the latter can be used as a proxy. Notice that this definition uses the term 'intermediate inputs' loosely, because it includes both intermediate components of a broader production process that will be completed at home and final goods entirely produced abroad but sold under the brand name of the national firms.

Imported intermediate inputs by industry i at time t (III_{it}) can be estimated by combining input–output tables and final import data as follows:

$$III_{it} = \sum_{h=1}^{H} [\text{input purchases of good } h \text{ by industry } i]_t \times \left[\frac{\text{imports of good } h}{\text{apparent consumption of good } h} \right]_t \qquad (2)$$

where 'input purchases of good h by industry i' can be retrieved from the input–output tables, while 'apparent consumption of good h' is computed as production

Table 1. The Effects of Material Offshoring.

Study	Country	Sample	Measure of offshoring[a]	Effect of offshoring[b]
(A) Material offshoring and relative labour demand: industry-level studies with two labour inputs				
Anderton and Brenton (1999a)	UK	11 industries 1970–1986	Import competition from low-income countries	Positive and significant Explains 40% of rise in WSH and 30% of rise in ESH
Anderton *et al.* (2002a)	Sweden	41 industries 1975–1993	Import competition from non-OECD countries (in real terms)	Positive and significant Explains 25% of rise in WSH and 15% of rise in ESH
Egger and Egger (2005)	Austria	20 industries 1990–1998	Share of imported intermediates from CEECs in industry output (narrow)	Positive and significant An 87% rise in offshoring induces a 17% rise in ESH
Feenstra and Hanson (1996)	USA	435 industries 1972–1992	Share of imported intermediates in total non-energy input purchases (broad)	Positive and significant Explains 31%–51% of rise in WSH
Feenstra and Hanson (1999)	USA	447 industries 1979–1990	Share of imported intermediates in total non-energy input purchases (narrow and broad)	Positive and significant Explains 11%–15% of rise in WSH
Geishecker (2006)	Germany	23 industries 1991–2000	Share of imported intermediates from CEECs in industry output (narrow and broad)	Positive and significant Explains 47%–53% of rise in WSH
Hansson (2000)	Sweden	34 industries 1970–1993	Import competition from non-OECD countries (in nominal terms)	Positive and significant Explains 5% of rise in ESH
Helg and Tajoli (2005)	Italy	20 industries 1988–1996	Share of outward processing trade imports in industry output	Positive and significant in Italy. Not significant in Germany
	Germany	20 industries 1993–1997		(Only ESH analysed)
Hsieh and Woo (2005)	Hong Kong	54 industries 1971–1996	Import competition from China and share of imported intermediates from China in industry consumption	Positive and significant Explains 40%–50% of rise in WSH

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Table 1. *Continued.*

Study	Country	Sample	Measure of offshoring[a]	Effect of offshoring[b]
Lorentowicz *et al.* (2005)	Austria	15 industries 1995–2002	Share of imported intermediates in industry value added (narrow)	Negative and significant Lowers WSH by 14% and ESH by 24%
Minondo and Rubert (2006)	Spain	12 industries 1986–1994	Share of imported intermediates in total non-energy input purchases (narrow and broad)	Positive and significant (Only ESH analysed)
Strauss-Kahn (2004)	France	50 industries 1977–1993	Share of imported intermediates in industry output (narrow and broad)	Positive and significant Explains 11% of rise in ESH over 1975–1985 and 25% over 1985–1993
Yan (2006)	Canada	84 industries 1981–1996	Imported intermediates	Positive and significant on both WSH and ESH
(B) Material offshoring and relative labour demand: industry-level studies with more than two labour inputs				
Ekholm and Hakkala (2006)	Sweden	89 industries 1995–2000	Share of imported intermediates in industry output (narrow and broad)	Workers with primary education: not significant Workers with secondary education: negative and significant Workers with tertiary education: positive and significant
Falk and Koebel (2002)	Germany	26 industries 1978–1990	Imported intermediates	Unskilled workers: negative and significant Semi-skilled workers: not significant Skilled workers: not significant
Hijzen *et al.* (2005)	UK	50 industries 1982–1996	Share of imported intermediates in industry value added (narrow)	Unskilled workers: negative and significant Semi-skilled workers: not significant Skilled workers: not significant

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Morrison and Siegel (2001)	USA	450 industries 1959–1989	Ratio of imports to output	Workers with no high-school diploma: negative and significant Workers with high-school diploma: negative and significant Workers with some college: not significant Workers with college degree: positive and significant
(C) Production transfer within MNEs and relative labour demand: firm-level studies				
Becker *et al.* (2007)	Germany	1266 plants in 490 MNEs 1998–2001	Share of affiliate employment in total MNE's employment	Positive and significant Explains 1%–5% of rise in WSH
Hansson (2005)	Sweden	73 MNEs 1990–1997	Share of affiliate employment in non-OECD countries in total MNE's employment	Positive and significant Explains 15% of rise in WSH
Head and Ries (2002)	Japan	1070 MNEs 1965–1989	Share of affiliate employment in total MNE's employment	Positive and significant Explains 9% of rise in WSH
(D) Production transfer within MNEs and relative labour demand: industry-level studies				
Falzoni and Grasseni (2003)	Italy	89 industries 1993, 1995, 1997	Share of affiliate employment in total MNE's employment	Not significant (Only WSH analysed)
Slaughter (2000a)	USA	32 industries 1977–1994	Ratio between affiliate employment and total industry employment	Not significant (Only WSH analysed)
(E) Material offshoring and labour demand elasticity				
Senses (2007)	USA	≈25,000 firms 1980–1995	Share of imported intermediates in total non-energy input purchases (narrow and broad)	Makes unskilled labour demand more elastic. The effect remains significant after including time fixed effects

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Table 1. *Continued.*

Study	Country	Sample	Measure of offshoring[a]	Effect of offshoring[b]
Slaughter (2001)	USA	450 industries 1961–1991	Share of imported intermediates in total non-energy input purchases (narrow and broad)	Not significant when time fixed effects are included in the specification
(F) Material offshoring and short-run employment dynamics				
Egger *et al.* (2007)	Austria	38,349 individuals 1988–2001	Share of intermediates in total industry imports	Reduces the probability of remaining employed in, and of moving into, comparative disadvantage manufacturing industries
Geishecker (2008)	Germany	213,750 individual-level obs. 22 industries 1991–2000	Share of imported intermediates in industry output (narrow and broad)	A 1% increase in offshoring raises the probability of displacement by 7%
Munch (2005)	Denmark	43,447 individuals 55 industries 1992–2001	Share of imported intermediates in industry output (narrow and broad)	A 1% increase in offshoring raises the probability of displacement by 0.48%

Source: Compiled by the author.
[a]Broad offshoring includes imports of all intermediate inputs, whereas narrow offshoring includes only imports of intermediate inputs from the same industry. Studies in panels C and D analyse only offshoring taking place through production transfer within MNEs (see formula (4) in the main text).
[b]WSH, skilled labour share of wage bill; ESH, skilled labour share of employment.

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+ imports – exports of h. The second right-hand-side term in equation (2) is the share of apparent consumption of h accounted for by imports in the economy as a whole. Assuming that this share is constant across industries and applying it to the total purchases of input h by industry i (i.e. the first right-hand-side term), one obtains a proxy for the imports of input h by industry i; repeating the same process for all h and summing throughout yields III_{it}. Notice that, due to the use of aggregate import data in the second right-hand-side term of equation (2), III_{it} includes both offshoring modes (international outsourcing and production transfer within MNEs).

The final step to get mos_{it} consists in normalizing III_{it} with the total (domestic plus foreign) purchases of non-energy inputs by industry i at time t (NE_{it}).[14] Hence,

$$mos_{it} = \frac{III_{it}}{NE_{it}} \tag{3}$$

This indicator proxies a *broad* concept of offshoring, because it includes imports of all intermediate inputs (i.e. $h = 1, \ldots, H$). It can be easily specialized, however, to capture a *narrow* concept of offshoring, which accounts only for imports of intermediate inputs from the same industry (i.e. $h = i$) (Feenstra and Hanson, 1999). In the latter case, the first right-hand-side term in equation (2) will coincide with the diagonal cells of the input–output matrices and the summation will disappear.

Although the indicator in equation (3) is probably the best proxy for material offshoring, data limitation has often prevented researchers from using it. In what follows, I will therefore take the proxy in equation (3) as the ideal measure and describe alternative proxies when reviewing those studies that could not rely on it.

2.1.3 *Results*

Countries with Flexible Labour Markets: USA, Canada, UK and Hong Kong

As I mentioned, in countries with flexible labour markets the outward shift in relative skilled labour demand has brought about sharp upsurges in both relative wages and relative employment of the skilled. Existing literature has focused on four cases: USA, Canada, UK and Hong Kong.

Feenstra and Hanson (1996) compute *broad* material offshoring for 435 US manufacturing industries over the period 1972–1992; Feenstra and Hanson (1999) extend this computation to 447 industries between 1979 and 1990, and calculate also *narrow* material offshoring. In both cases, skilled and unskilled workers are proxied by non-production and production workers, respectively. Coefficient estimates from equation (1) suggest that broad material offshoring has explained 31%–51% of the observed increase in the non-production worker share of the wage bill during the 1980s (Feenstra and Hanson, 1996); narrow material offshoring has accounted instead for 11%–15% of the increase (Feenstra and Hanson, 1999).[15]

Similar evidence is found for Canada by Yan (2006). Using data on 84 manufacturing industries between 1981 and 1996 and proxying broad material offshoring with the log of imported intermediate inputs – i.e. only the numerator of

equation (3) – the author finds that material offshoring has raised the non-production worker share of the wage bill. The author also estimates equation (1) with the non-production worker share of *employment* (ESH) as the dependent variable, a practice often used by studies on European countries (see below). Results show that material offshoring has increased this share also.

An important role for material offshoring in explaining the outward shift in relative skilled labour demand has been detected also in the UK. Anderton and Brenton (1999a) analyse 11 textile and non-electrical machinery industries between 1970 and 1986. The lack of data on imported intermediate inputs for early years prevents the authors from using the indicator in equation (3) as the proxy for material offshoring. As an alternative, they use import competition from low-income countries, defined as the ratio between imports from these economies and total industry consumption: this measure may be a good proxy for the UK, because national firms have generally moved their unskill-intensive stages of production to low-wage locations.[16] Results show that the effects of material offshoring have been particularly strong in the less skill-intensive textile sector: in this case, material offshoring has accounted for about 40% of the rise in the non-production worker share of the wage bill and for about 30% of the rise in the non-production worker share of employment.[17]

Hsieh and Woo (2005) find comparable evidence for Hong Kong, using a panel of 54 manufacturing industries over the period 1971–1996. The authors focus just on offshoring to China, which has sharply increased since 1980, and proxy it by means of two alternative measures: the first is similar to the indicator in equation (3), but with only imported intermediates from China as the numerator; the second is the share of total imports from China in industry consumption – i.e. import competition from China. Results show that material offshoring has been an important determinant of the outward shift in relative skilled labour demand occurring in Hong Kong, explaining as much as 40%–50% of the rise in the non-production worker share of the wage bill during the period.

Summing up, in countries with flexible labour markets material offshoring has explained a large part of the outward shift in relative skilled labour demand and of the increase in wage inequality that occurred during the 1980s.

Countries with Less Flexible Labour Markets: The Case of Europe

In Europe, due to lower wage flexibility, the outward shift in relative skilled labour demand has caused less dramatic increases in wage inequality, accompanied, however, by significant upsurges in relative skilled employment and in unemployment for the unskilled. Several studies have taken into account the higher wage rigidity by slightly modifying the estimating equation in (1) through substitution of the skilled labour share of the wage bill with the skilled labour share of employment. Due to data limitation, moreover, these studies have often been prevented from using the indicator in equation (3) as the proxy for material offshoring, and have thereby been forced to find alternative measures. Notwithstanding these changes in the empirical framework, results for Europe are consistent with those for countries

with more flexible labour markets: also in Europe material offshoring has played a large role in shifting relative skilled labour demand outward.

Two studies focus on Sweden (Hansson, 2000; Anderton *et al.*, 2002a). Both measure material offshoring as import competition from low-income countries, defined as the ratio of imports from non-OECD members and industry consumption; however, while Hansson (2000) uses nominal variables to construct the proxy, Anderton *et al.* (2002a) use variables in real terms. This distinction turns out to be extremely relevant. When constructed in nominal terms, in fact, this offshoring proxy need not increase when import competition rises. For instance, if import prices decreased due to tougher import competition, the proxy for offshoring could either rise or fall, depending on the import demand elasticity; moreover, increasing import competition could lead domestic producers to raise the quality and thus the price of their products, thereby boosting the denominator of the formula and eventually lowering the value of the offshoring proxy. Indeed, using a panel of 34 manufacturing industries over the period 1970–1993, Hansson (2000) finds that the proxy for material offshoring measured in nominal terms has explained only a limited fraction of the outward shift in relative skilled labour demand: precisely, it has determined at most 5% of the observed increase in the skilled labour share of employment.[18] By contrast, using a panel of 41 manufacturing industries over the period 1975–1993, Anderton *et al.* (2002a) find that the proxy for material offshoring measured in real terms has had a larger effect, explaining roughly 25% of the observed increase in the non-production worker share of the wage bill and 15% of the increase in the share of employment.

Similar evidence is found for France by Strauss-Kahn (2004) and for Spain by Minondo and Rubert (2006). Strauss-Kahn (2004) uses a panel of 50 industries (including manufacturing, agriculture and mining) over the period 1977–1993, and computes narrow and broad material offshoring as in equation (3). The estimating equation uses the skilled labour share of employment as the regressand. Results show significant effects of material offshoring: the latter has accounted for 11% of the increase in the non-production worker share of employment between 1977 and 1985 and for 25% over the period 1985–1993. Results are robust to the distinction of material offshoring to non-OECD (low-income) and OECD (high-income) countries, though material offshoring to non-OECD members has exerted somewhat larger effects. Minondo and Rubert (2006) reach similar conclusions for Spain, using a panel of 12 manufacturing industries over the period 1986–1994 and estimating equation (1) with the skilled labour share of employment as the dependent variable.[19]

The effects of material offshoring on relative skilled labour demand have been analysed also in a set of countries in Central Europe: Austria, Italy and Germany. The interest in these countries arose from the sharp increase in material offshoring to many former centrally planned economies in Eastern Europe (CEECs) since 1990. Indeed, results attribute a substantial role to material offshoring to the CEECs. Starting from Austria, Egger and Egger (2005) focus on 20 manufacturing industries between 1990 and 1998 – the period right after the fall of the Communist regime – and compute narrow offshoring as in equation (3),

but with only imported intermediates from the CEECs at the numerator. The estimating equation differs from equation (1) in two respects. First, in order to account for wage rigidities in the Austrian labour market, the skilled labour share of employment is used as the regressand.[20] Second, in order to account for the indirect effects of offshoring through inter-industry spillovers, an additional variable is included among the regressors: the weighted skilled/unskilled employment ratio, with weights constructed from input–output coefficients that gauge the degree of industrial interdependence. Results show that offshoring to the CEECs has raised relative skilled labour demand; this effect has generally been magnified by inter-industry spillovers. A simulation exercise shows that an 87% increase in offshoring to the CEECs would have augmented the skilled labour share of employment by 17%.[21] These findings have been questioned by a recent study by Lorentowicz *et al.* (2005): the authors find that material offshoring alone would have *reduced* wage inequality and relative skilled employment in Austria. The analysis makes use of a panel of 15 industrial sectors between 1995 and 2002 and material offshoring is proxied as in equation (3); crucially, Lorentowicz *et al.* (2005) use total imports of intermediate inputs and not just imports from the CEECs, as Egger and Egger (2005) do instead. Estimation of equation (1) shows that material offshoring would have *lowered* the skilled labour share of employment by 24% and the skilled labour share of the wage bill by 14%. The main explanation for the different results found by these studies on Austria is probably the use of different proxies for material offshoring: since Austrian firms have mainly relocated their unskill-intensive stages of production to the CEECs, the proxy used by Egger and Egger (2005) is more likely to produce positive effects on relative skilled labour demand.[22]

Turning to Italy, Helg and Tajoli (2005) use a panel of 20 manufacturing industries over the 1990s and construct a more conservative measure of material offshoring: the ratio between imports for outward processing trade (OPT) and industry production; OPT imports occur when firms move abroad some intermediate goods for reasons of processing and then import back the processed goods. This measure has the advantage of describing more closely the main feature of material offshoring, which is the choice by the firm of the number of stages and of the amount of processing to perform abroad. The bulk of Italian OPT is done by traditional (unskill-intensive) sectors and takes place in the CEECs. The authors estimate equation (1) with the skilled labour share of employment as the dependent variable, in order to account for wage rigidities in the Italian labour market.[23] Results suggest that material offshoring has contributed to the outward shift in relative skilled labour demand. In the same study, Helg and Tajoli repeat the analysis for Germany. In this case, material offshoring is found to exert no significant effects on relative skilled labour demand. The authors justify these results in the light of the different characteristics of the industries that resort more heavily to OPT in the two countries: while in Italy these are mainly unskill-intensive industries, in Germany they are as skill intensive as the overall manufacturing sector. As a consequence, OPT is likely to have induced some shifts in relative skilled labour demand in Italy, but not in Germany. Another possible explanation is that the OPT proxy captures only a specific facet of the whole offshoring phenomenon and may

underestimate its actual size: if only a small fraction of material offshoring by German firms takes place through OPT, this measure will not produce significant effects on relative skilled labour demand. Furthermore, as in the case of Austria, also in Germany most unskill-intensive stages of production have been relocated to the CEECs; thus an aggregate measure of material offshoring may not capture this specific aspect of the phenomenon. Indeed, Geishecker (2006) finds that, when measured as in equation (3) but with only imported intermediates from the CEECs as the numerator, material offshoring does exert significant effects of relative skilled labour demand in Germany. The author uses a panel of 23 manufacturing industries over the period 1991–2000 and finds that narrow (broad) offshoring to the CEECs has explained more than 47% (53%) of the observed increase in the skilled labour share of the wage bill; as expected, the effect of offshoring to the rest of the EU and to the rest of the world is either insignificant (narrow) or significant but smaller (broad).

All above evidence suggests that material offshoring has been an important determinant of the outward shift in relative skilled labour demand in developed countries, and has thus penalized the economic fortunes of unskilled workers relative to their skilled counterparts. Two questions, however, are left unanswered by this literature. First, what happens within the MNEs? Due to the use of aggregate import data, the above contributions are unable to disentangle production transfer within MNEs from international outsourcing. Second, is a dichotomous classification of labour too restrictive? Classifying workers in just two categories may hide specific effects on subgroups of employees and occupations; understanding these effects may be important for policy reasons. Hence, I will now move to review the contributions that have tried to answer these two questions.

Production Transfer within MNEs

In order to analyse production transfer within MNEs, some studies have replaced the offshoring proxy in equation (3) with an indicator capturing the relative importance of foreign affiliates in the total volume of MNEs' activities. Production transfer within MNEs has thus been proxied by the share of foreign affiliate employment in total MNE's employment:

$$PRODTRANSF = \frac{\sum_a emp_a}{\sum_a emp_a + emp_p} \tag{4}$$

where $a = 1, \ldots, A$ indexes foreign affiliates and p stands for parent. Unlike equation (3), equation (4) excludes international outsourcing; it does include, instead, those cases of production transfer within MNEs which do not give rise to imports of intermediate inputs and are therefore missed by the proxy in equation (3).[24]

The empirical framework used by this stream of studies is the same as in equation (1). Estimation is performed with either MNE data or industry data, obtained by aggregating the proxy for production transfer within MNEs at the industry level. By and large, results show that the effects of production transfer within MNEs have

been fairly small, especially compared to those of more comprehensive indicators of offshoring (Table 1, panels C and D).

Studies with MNE-level data have been conducted by Head and Ries (2002) for Japan, Hansson (2005) for Sweden and Becker *et al.* (2007) for Germany. Head and Ries (2002) use data on 1070 manufacturing MNEs for the period 1965–1989 and find a positive effect of production transfer on the relative demand for skilled workers in the parents. The effect is stronger when production transfer occurs in affiliates located in low-income countries, which is consistent with the idea that Japanese MNEs offshore unskill-intensive stages of production in locations with larger endowments of unskilled labour. The magnitude of the effect, however, is small: production transfer within MNEs has in fact accounted for no more than 9% of the observed rise in the wage bill share of non-production workers. This evidence is confirmed by Hansson (2005) for Sweden. The author computes the indicator in equation (4) using data on affiliate employment in non-OECD countries. The analysis is carried out on an unbalanced panel of 73 MNEs observed between 1990 and 1997; skilled workers are those with post-secondary education. Results show that production transfer within MNEs has exerted positive effects on the skilled labour share of parent wage bill between 1993 and 1997, but not between 1990 and 1993; the reason is that production transfer to non-OECD countries has taken off only in 1993. The magnitude of the effect amounts to roughly 15% of the increase in the skilled labour share of the wage bill. Becker *et al.* (2007) use a panel of 1266 plants belonging to 490 MNEs for the period 1998–2001 and adopt three different dependent variables for estimating equation (1): (1) the share of the wage bill accruing to white-collar workers; (2) the share of the wage bill accruing to workers with upper-secondary education; and (3) the share of the wage bill accruing to workers employed in non-routine and interactive tasks.[25] Depending on the specification, production transfer within MNEs is found to have explained between 1% and 5% of the rise in the skilled labour share of parent wage bill.

To the best of my knowledge, only two studies use industry-level data. These are Slaughter (2000a) for the USA and Falzoni and Grasseni (2003) for Italy. Slaughter (2000a) retrieves information on production transfer within MNEs in 32 manufacturing industries between 1977 and 1994, starting from a panel of about 1500 parents and 8000 affiliates. Results show that production transfer has had no effect on the non-production worker share of parent wage bill. Falzoni and Grasseni (2003) confirm this result for Italy. Starting from a panel of manufacturing MNEs observed in 1993, 1995 and 1997, the authors compute an average measure of production transfer for 89 industries. The data allow the authors to distinguish this measure by region; they therefore separately estimate production transfer in developed economies, less developed economies and the CEECs. Results show that none of the indicators has had effects on the skilled labour share of parent wage bill.[26]

The question that arises is: Why are the effects of production transfer within MNEs more modest than those found for more comprehensive measures of material offshoring? A possible answer is that the indicator in equation (4) captures only part of the offshoring strategies of MNEs. Recent data reported by Bernard *et al.*

(2005) suggest that roughly 50% of MNEs' imports come from foreign affiliates, while the remaining 50% is accounted for by arm's length transactions with unaffiliated suppliers. Under the admittedly crude assumption that imports are only due to offshoring, these figures would imply that the proxy in equation (4) accounts for about half of the offshoring strategies of MNEs. Unfortunately, it is probably impossible to construct a more comprehensive measure of offshoring by multinationals, lacking detailed quantitative information on the unaffiliated transactions carried out by the individual MNEs.

Studies With a More Detailed Disaggregation of Labour

I turn now to the question: Is the skilled/unskilled classification too restrictive? In principle, the answer is 'yes'. Two drawbacks may in fact affect the studies using this classification. The first is due to the fact that workers falling in the two skill groups are generally characterized by significant differences in levels of education, vocational qualification and working experience. Therefore, treating the two groups as homogeneous may be misleading, because it implies aggregating jobs that differ significantly in exactly those characteristics that are most important to capture the skill level. The second drawback is that, in order for aggregation of workers with different skill levels to be consistent, the underlying production technology must satisfy restrictive assumptions. In particular, it must be separable in the labour services provided by skilled and unskilled workers; if this assumption is violated, empirical results will be biased.[27]

For these reasons, a new interest has arisen in recent years in studies employing finer disaggregations of labour. This interest has first been felt by the labour economists (Hamermesh, 1993; Fitzenberger, 1999; Mellander, 1999; Falk and Koebel, 2001), but has recently been expressed also by the trade economists involved in studying the effects of material offshoring on relative skilled labour demand. Recent studies have therefore adopted classifications based on three or more skill levels (Morrison and Siegel, 2001; Falk and Koebel, 2002; Hijzen *et al.*, 2005; Ekholm and Hakkala, 2006).

The general approach used by this literature is similar to the one presented in Section 2.1.2. However, now the short-run translog cost function of the representative firm depends on $L > 2$ labour inputs. As a consequence, Shephard's lemma yields a system of L share equations with the same form as equation (1). Exploiting estimated parameters, labour demand elasticities with respect to material offshoring can be derived as $\varepsilon_{l,mos} = \beta_{l,mos}/WSH_l$, where $l = 1, \ldots, L$ indexes labour inputs and $\beta_{l,mos}$ is the coefficient of *mos* in the lth share equation. If $\varepsilon_{l,mos} < 0$, material offshoring shifts relative demand away from labour type l.[28]

The most robust result from these studies is that material offshoring has negatively affected workers with low and medium skill levels; in a few cases, it has also benefited workers with high skill levels (Table 1, panel B). These findings are in line with those obtained with dichotomous classifications. Hence, although the latter are in principle too restrictive, in practice they perform quite well.

Hijzen *et al.* (2005) use a panel of 50 UK manufacturing industries over the period 1982–1996 and distinguish labour in three categories: skilled, semi-skilled and unskilled.[29] Estimated elasticities show that material offshoring has exerted negative effects only on the unskilled, thereby shifting relative labour demand away from them and towards the other two groups. Similar results are found by Ekholm and Hakkala (2006) in their study on 89 Swedish industries between 1995 and 2000. Labour is disaggregated in three groups: workers with primary, secondary and tertiary education. Results show that material offshoring has shifted demand away from workers with secondary education and in favour of those with tertiary education. Estimated elasticities imply that a 10% increase in narrow offshoring lowers demand for workers with secondary education by about 6% and raises that for workers with tertiary education by about 7%. The effects are mainly driven by offshoring to low-income countries and are robust to the use of a broad measure of offshoring.

Two additional studies can be included in this section, although they depart somehow from the methodological framework previously discussed. The main departure stays in the use of alternative flexible functional forms for the short-run cost function of the firm. Also these studies are based on the derivation of labour demand elasticities from the full set of demand equations. Morrison and Siegel (2001) use a generalized Leontief short-run cost function and disaggregate labour in four groups: workers with no high-school diploma, workers with high-school diploma, workers with some college, workers with a college degree. The panel includes 450 US manufacturing industries between 1959 and 1989; material offshoring is proxied by the ratio of imports to output. In line with previous studies, estimated elasticities show that material offshoring has reduced the demand for workers without any college education (the two least skilled groups), exerted almost no effects on that for workers with some college, and raised that for college graduates. Finally, Falk and Koebel (2002) use a generalized Box–Cox cost function and a panel of 26 German manufacturing industries between 1978 and 1990. Labour is disaggregated in three skill groups: skilled workers (those with a university or polytechnic degree), semi-skilled workers (those with a vocational degree) and unskilled workers (those without any formal qualification); material offshoring is proxied by imports of intermediate inputs. Consistent with previous results, the authors find negative effects of material offshoring only on unskilled workers.[30]

2.1.4 *A Few Words about SBTC*

Among the principal explanations for the outward shift in relative skilled labour demand, the literature has indicated SBTC along with material offshoring. Indeed, many studies exist that have tested empirically the effect of SBTC in a framework similar to that described in Section 2.1.2; some of these studies have been recalled in Section 2.1.1. While these contributions have focused almost exclusively on SBTC, the widely recognized importance of the diffusion of new technologies for explaining the outward shift in relative skilled labour demand has made it necessary also for the studies on material offshoring to control for SBTC in the empirical

analysis. Hence, almost all previous contributions have included a proxy for SBTC in the estimating equation (1).

How is SBTC measured? As in the case of material offshoring, also for SBTC it is possible to identify an ideal measure. Also in this case, however, many studies have been prevented from using it and have resorted to alternative proxies. Following Berndt and Morrison (1995) and Feenstra and Hanson (1999), the ideal measure of SBTC is represented by the share of high-tech capital in total capital services. Computation of this share requires measuring the rate of return on high-tech capital, which can in turn be distinguished into *ex post* and *ex ante*. The *ex post* rate of return includes the capital gains, whereas the *ex ante* rate excludes them; as such, the *ex ante* rate represents a safer measure of the return on high-tech capital, because it does not consider gains due to price changes. Under a no-arbitrage condition, which states that individuals must be indifferent between investing in productive capital and in financial assets, the rate of return on productive capital must be equal to the prevailing interest rate. Hence, by multiplying the stock of high-tech capital with a measure of the interest rate (usually the rate on Baa bonds), one obtains a proxy for the rate of return on high-tech capital; since this proxy does not account for capital gains, it represents an *ex ante* measure. Finally, by normalizing this measure with the overall stock of capital, one obtains a proxy for the share of high-tech capital in total capital services. A similar computation can be used to obtain the share expressed in *ex post* terms; Hall and Jorgenson (1969) provide a useful formula to compute the *ex post* price of capital, which accounts also for capital gains. The *ex ante* and *ex post* measures of SBTC have generally been used in studies on the USA (Feenstra and Hanson, 1999); due to the lack of data on the stock of high-tech capital, studies on other countries have instead relied on different proxies: the most widely adopted are expenditures in R&D and the fraction of workers employed in R&D or patenting activities.

How important are the effects of SBTC on relative skilled labour demand, as compared to those of material offshoring? Evidence suggests that SBTC has been as important as material offshoring. For example, Feenstra and Hanson (1999) show that SBTC has contributed to about 35% of the observed increase in the skilled labour share of the wage bill in the USA between 1972 and 1992, versus 31%–51% for broad material offshoring and 11%–15% for narrow material offshoring. In the case of Sweden, Anderton *et al.* (2002a) find that 'technological change [. . .] was the dominant factor, accounting for well over half of the average increase in wage and employment inequality' (p. 647).

2.2 *Effects on Labour Demand Elasticities and Short-Run Employment Dynamics*

The studies in the previous section are based on the idea that material offshoring pushes the developed countries towards a new labour market equilibrium, characterized by lower relative wages and employment for the unskilled; this implies a deterioration in the economic fortunes of these workers relative to the skilled.

A smaller literature has analysed two other channels through which material offshoring may affect national workers. First, material offshoring may make labour demand more elastic, by easing the possibility for firms to replace domestic workers with less expensive foreign employees; this can happen even if the current level of offshoring is low, provided that the *threat* of future offshoring is substantial.[31] Second, material offshoring may expose workers to unfavourable short-run employment dynamics, for instance by forcing them to move to low-wage industries and by raising the risk of job losses. Based on the available evidence, material offshoring seems to exert some positive effects along both dimensions, but it is hard to gauge the exact magnitude of these effects.

Rodrik (1997) has been the first to suggest that offshoring (and more in general globalization) may raise the elasticity of labour demand. I will therefore refer to this as the 'Rodrik hypothesis'. The existing empirical studies, based on US data, use a two-stage procedure to test this hypothesis. In the first stage, the conditional (on output) labour demand elasticities are estimated from the following labour demand function:

$$\ln L^q_{ijt} = \beta_0 + \sum_{q=S,U} \beta^q_{wjt} \ln w^q_{ijt} + \beta_{Yjt} \ln Y_{ijt}$$

where L is employment, w is wage and Y is output; q indexes skilled (S) and unskilled (U) workers; t stands for time, i for industries or firms, and j for sectors. Own-wage conditional labour demand elasticities are given by $\varepsilon^q_{jt} \equiv \partial \ln L^q_{ijt} / \partial \ln w^q_{ijt} = \beta^q_{wjt}$; these elasticities can be estimated for each sector j and for each time period t, by exploiting more disaggregated information on wages, employment and output at the industry- or firm-level i. In the second stage, the estimated elasticities are regressed on material offshoring and on a vector of control variables X_{jt}:

$$\varepsilon^q_{jt} = \alpha + \gamma \cdot mos_{jt} + X_{jt}\delta'$$

where δ is a vector of parameters to be estimated. Since $\varepsilon^q_{jt} < 0$ for theoretical consistency (the labour demand function slopes downward), if $\gamma < 0$ material offshoring makes labour demand for input q more elastic.

Studies using industry-level data find little or no support for the Rodrik hypothesis; studies with firm-level data, instead, seem to accept it (Table 1, panel E). Slaughter (2001) uses data on 450 four-digit US manufacturing industries (i) observed between 1961 and 1991 to estimate labour demand elasticities for non-production and production workers in eight aggregated sectors (j). Over time, only labour demand for production workers has become more elastic; this has happened in five of the eight sectors. Yet, results from the second estimation stage show that material offshoring, either broad or narrow, has played almost no role in explaining the rise in the elasticity: when time controls are included in the second-stage regression, in fact, the offshoring coefficients lose significance. The main explanation for the dominance of the time effects is probably statistical: the offshoring variables, like most of the remaining trade and technology controls used by the author, do not show significant variation across the eight sectors,

and therefore time dummies capture the entire effect of these variables on labour demand elasticities.[32]

The lack of cross-sectional variation is addressed by Senses (2007), who uses data on roughly 25,000 US manufacturing firms (*i*) between 1980 and 1995. Thanks to these data, the author estimates labour demand elasticities for the whole set of two-digit manufacturing sectors (*j*), thereby obtaining enough variability for the second estimation stage.[33] Results show that the labour demand for production workers has become substantially more elastic between 1980 and 1992. This trend has been driven by those sectors that have resorted more heavily to offshoring; no significant pattern emerges instead in the remaining sectors.[34] Consistently, second-stage estimates reveal that material offshoring has played a significant role in explaining the rise in the elasticity. This result is robust to the use of broad and narrow measures of offshoring, as well as to the adoption of alternative proxies.[35] More importantly, the result is not affected by the inclusion of time controls; hence, when sufficient cross-sectional variation is allowed for, a positive effect of material offshoring on the elasticity of (unskilled) labour demand does emerge.

I now turn to the second topic of this section: the short-run employment dynamics induced by material offshoring. While several contributions have analysed these effects in the case of trade in final goods and real exchange rate fluctuations, studies on material offshoring are still limited (Table 1, panel F).[36] Egger *et al.* (2007) use an employee-level panel data set consisting of roughly 38,000 Austrian male individuals observed between 1988 and 2001. The possibility of tracking individuals over time allows the authors to compute a full transition probability matrix, with cells containing the fraction of workers moving each year among six different employment states: unemployed, out of the labour force, employed in comparative advantage manufacturing industries, employed in comparative disadvantage manufacturing industries, employed in the service sector and employed in the sales sector. Material offshoring is proxied by the share of intermediate inputs in total industry imports. Estimation of the full transition probability matrix through a dynamic multinomial logit model with fixed effects shows a clear pattern of short-run employment dynamics induced by material offshoring: the latter reduces the probability for workers to remain employed in comparative disadvantage industries; moreover, it also reduces the likelihood for workers to move into these industries when unemployed or out of the labour force in the previous year.

These findings suggest that, in the short run, workers employed in industries exposed to foreign competition may face some risks of being displaced by material offshoring. How strong are these effects? Existing studies have reached conflicting conclusions. Munch (2005) uses a panel of about 44,000 Danish workers employed in 55 manufacturing industries between 1992 and 2001, and estimates a duration model with duration dependence and worker heterogeneity. His findings suggest that material offshoring increases the probability of displacement by a modest amount: in the worst scenario, a 1% rise in broad offshoring augments the likelihood of displacement by 0.48%; this implies that, during the period of analysis, material offshoring has accounted for 10% of the total number of job losses in the

manufacturing sector and for 2% of those in the economy as a whole. Geishecker (2008) finds much larger results for Germany. The analysis is conducted on a panel of individuals employed in 22 manufacturing industries between 1991 and 2000, and makes use of hazard rate models. A 1% increase in narrow material offshoring is found to raise the probability of leaving employment by approximately 7%. Cross-country differences in labour market institutions may be an explanation for these heterogeneous results, but further research is surely needed to better understand the exact size of the effects of material offshoring on job displacement.

3. Service Offshoring

I now turn to review the literature on service offshoring. Two issues have received attention so far: (1) the effects on aggregate labour demand and total employment and (2) the effects on the composition of white-collar employment. Results show that service offshoring exerts at most small negative effects on total employment, and tends to shift the composition of the workforce in favour of high-skilled white-collar employees.

3.1 *Effects on Aggregate Labour Demand and Total Employment*

As I mentioned in the introduction, the first concern arising about service offshoring is that it negatively affects total labour demand in developed countries, leading to substantial job losses. Several consulting firms have indeed estimated that the number of service jobs already moved offshore by US and European enterprises is large; moreover, they have suggested that this number is likely to grow in the near future. Forrester Research (2002, 2004a, b) reports that about 1 million US jobs had been moved overseas by 2005, and that a total of 3.4 million jobs will be offshored by the end of 2015; Goldman Sachs calculates that US firms have relocated 10,000 jobs per month between 2000 and 2004, and will offshore 15,000 to 30,000 jobs per month in the near future (Mankiw and Swagel, 2006); finally, a study of the European Restructuring Monitor finds that European firms have offshored roughly 30,000 jobs in 2005, and that 30% of these jobs were in business and financial services (OECD, 2007b).

These numbers are large in absolute value. But, are they large enough to support the 'fear of service offshoring?' (Amiti and Wei, 2005). Existing studies suggest that the correct answer to this question is 'probably no'. In fact, although sizeable in *absolute* terms, these figures are small in *relative* terms. In the US case, they represent just a tiny fraction of the overall monthly job turnover, which amounts to more than two million jobs (Baily and Farrell, 2004); they also 'seem modest compared to the more than 160 million jobs projected by the Bureau of Labour Statistics to exist by 2015, and small even compared to the 35 million net new jobs gained over the past decade' (Mankiw and Swagel, 2006, p. 1042). Moreover, these figures imply a very small contribution of service offshoring to the total number of job losses. For example, Rishi and Saxena (2004) and Kirkegaard (2007) show that

the layoffs due to offshoring in 2004 were 3%–4% of the total; similarly, in Europe the job losses due to offshoring represented just 6% of the total in 2005.[37] The bulk of recent job losses and, more in general, the recent labour market weaknesses have instead been caused by the dot-com bust and by the macroeconomic downturn of the late 1990s (Baily and Lawrence, 2004; Schultze, 2004).

Consistently, econometric evidence shows that the impact of service offshoring on total labour demand has up to now been very small (Table 2, panel A). The empirical framework used by these studies consists in the estimation of a log-linear demand equation, augmented with a set of shift factors including a proxy for service offshoring (*sos*); the latter is defined as the share of imported private services in total non-energy input purchases and is constructed in the same way as the proxy for material offshoring in equation (3). The final estimating equation is

$$\ln L_{it} = \beta_0 + \beta_w \ln w_{it} + \beta_\pi \ln \pi_{it} + \sum_{z=1}^{Z} \beta_z \ln z_{it} \tag{5}$$

where i and t index industries and time, respectively, L is total employment, w is wage, π is the output price and z is the vector of shift factors including *sos*. The coefficient β_{sos} gives the labour demand elasticity with respect to service offshoring; this is an unconditional elasticity – i.e. it is not conditioned upon any given levels of production – since in equation (5) the level of industry output is replaced by the output price. This allows us to account for the fact that service offshoring may raise the scale of production through positive productivity effects, and indirectly affect employment via this channel.

Amiti and Wei (2006a) estimate equation (5) on two samples of US manufacturing industries between 1992 and 2000; the first sample includes 450 industries, the second 96. The authors use imports of five categories of private services to construct *sos*.[38] Results from the larger sample show only a weak negative impact of service offshoring on labour demand: the estimated coefficient β_{sos} equals 0.3, implying that the observed rise in service offshoring (0.1 percentage points) may have reduced employment by 0.4%. The negative effect is not present, however, in the more aggregated sample of 96 industries: in none of the specifications is the coefficient β_{sos} statistically significant. The authors therefore argue that 'there is sufficient growth in demand in other industries within these broadly defined classifications to offset any negative effect [of service offshoring]' (Amiti and Wei, 2006a, p. 29). Another study by Amiti and Wei confirms these findings for the UK (Amiti and Wei, 2005). The sample covers 69 manufacturing industries between 1995 and 2001. The proxy for service offshoring includes nine categories of private services.[39] The coefficient β_{sos} is never negative and significant. In some specifications, it is actually positive and significant; in these cases, the point estimates range around 0.09, implying that the observed increase in service offshoring (0.3 percentage points) may have raised employment by 0.6%. Gorg and Hanley (2005b), using a panel of about 100 Irish electronics firms between 1990 and 1995, find that service offshoring exerts some negative effects on labour demand; these effects are smaller than those of material offshoring.[40] Finally, a

Table 2. The Effects of Service Offshoring.

Study	Country	Sample	Measure of offshoring	Effect of offshoring
(A) Service offshoring and total employment				
Amiti and Wei (2005)	UK	69 industries 1995–2001	Share of imported private services in total non-energy input purchases	Positive and significant in some specifications Service offshoring may have raised employment by about 0.6%
Amiti and Wei (2006a)	USA	450 or 96 industries 1992–2000	Share of imported private services in total non-energy input purchases	Negative and significant in the 450-industry sample: service offshoring may have reduced employment by about 0.4% Not significant in the 96-industry sample
Gorg and Hanley (2005b)	Ireland	≈100 firms 1990–1995	Share of imported services in firm's wage bill	Negative and significant
OECD (2007a)	17 OECD countries	24 industries 1995, 2000	Share of imported private services in total non-energy input purchases	Positive but not significant
(B) Service offshoring and white-collar employment				
Crinò (2007a)	USA	144 industries 1997–2002	Share of imported private services in total non-energy input purchases	Raised high-skilled white-collar employment by 2%, lowered medium- and low-skilled white-collar employment by 0.1% and 0.4%, respectively
Crinò (2007b)	9 EU countries	20 industries 1990–2004	Share of imported private services in total non-energy input purchases	Positive and significant on high-skilled workers, negative and significant on medium- and low-skilled workers
Liu and Trefler (2008)	USA	≈30,000 workers 1996–2004	Imports of private services from China and India	Not significant on wages. Negative but small on the probability of switching industry and occupation

Source: Compiled by the author.

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recent study by OECD (2007a) extends the analysis to 17 member countries in 1995 and 2000; for each country, 24 industries are included in the sample. The estimated coefficient β_{sos} is positive, although not statistically significant.[41]

Why does service offshoring exert at most small negative effects on labour demand? There are at least two explanations. First, although rapidly growing, service offshoring is still too limited to affect labour demand significantly. Second, while possibly causing some jobs to be moved overseas, service offshoring also contributes to create new jobs at home. This happens through at least three channels. (1) Service offshoring allows for a more efficient allocation of activities across national borders, whereby firms offshore the least productive activities and focus on those they can carry out more efficiently. As a result, firms' productivity increases, average costs fall and firms become more competitive by reducing their average product prices; this, in turn, stimulates additional demand for the firms' products and, through a scale effect, raises domestic employment.[42] (2) Service jobs created abroad stimulate increasing demand for goods and services produced at home, either by the offshoring industry or by other sectors; hence, service offshoring creates new opportunities at home, and through this channel boosts domestic employment. (3) Service offshoring makes financially viable projects that would otherwise be unfeasible for the domestic firms, due to their overall level of costs; starting the projects, in turn, creates domestic jobs that would not exist otherwise (Bhagwati *et al.*, 2004).

Based on this evidence, the first concern about service offshoring seems exaggerated. Nevertheless, this is not enough to relieve all anxieties. Very recently, in fact, people started being concerned that service offshoring will threaten human capital accumulation in developed countries. Is this concern supported by the empirical evidence? This is the topic of the next section.

3.2 *Service Offshoring and the Composition of White-Collar Employment*

Service tasks are on average more skill intensive than production activities. For this reason, service offshoring has recently been blamed for putting downward pressures on *skilled* labour demand, thereby reducing the incentives to accumulate education and on-the-job qualification and eventually hindering the whole process of human capital accumulation.[43]

In order to study the issue empirically, existing contributions have looked at the effects of service offshoring on the composition of white-collar employment. The argument is based on the following consideration. Despite their higher skill intensity compared to production activities, service activities are greatly heterogeneous in terms of required skill levels: some of them are carried out by *low-skilled* white-collar workers (e.g. call centre operations), whereas others are performed by *high-skilled* white-collar workers (e.g. engineering and management consulting). If service offshoring is to threaten human capital accumulation, it has to jeopardize the set of high-skilled activities and shift relative labour demand away from high-skilled white-collar employees.

3.2.1 *Background Theory*

Despite the empirical focus of this paper, the novelty of service offshoring makes it necessary to have a theoretical background from which to draw predictions about its effects on the composition of white-collar employment. I will organize the contributions in two streams. The first stream collects formal models explaining the patterns of offshored activities on the basis of either the interplay between factor endowments and skill intensities or the choice by the firm of its optimal hierarchical structure. The second stream collects less formalized contributions explaining the patterns of offshored activities on the basis of the tradable/non-tradable nature of the latter.

The first stream of studies suggests that the developed countries should specialize in high skill-intensive activities. This prediction comes out fairly straightforwardly from the models based on factor proportions arguments (Bhagwati *et al.*, 2004; Deardorff, 2005; Markusen, 2005; Markusen and Strand, 2007). With some exceptions, it also comes out from the models of firms' hierarchies. The latter show in fact that, under reasonable assumptions, the optimal structure for the firm is one in which high-skilled managers in the North perform problem-solving, non-routine activities, and interact with 'middle managers' and production workers performing routine tasks in the South (Antras *et al.*, 2006, 2008).[44]

The second stream of studies points to the fact that not all service activities are tradable. Hence, what really drives the pattern of offshoring is the distinction between tradable and non-tradable activities: in particular, firms will naturally tend to offshore the activities that can be traded more easily.[45] In principle, there is no clear relationship between the tradability of an activity and its skill intensity. In practice, however, the activities that show tradable features are often characterized by low skill intensities. For example, Garner (2004) suggests that service activities are more likely to be offshored if they are (1) labour-intensive – labour represents a high fraction of total costs; (2) information-based – the output of the activity can be delivered electronically across national borders; (3) codifiable – the activity can be reduced to a set of simple rules and routinized instructions; and (4) highly transparent – the information to be exchanged between the offshoring firm and the related party overseas is clear and easy to measure and to verify. Many other studies argue that activities with similar attributes can be traded more easily than others (Bardhan and Kroll, 2003; Levy and Murname, 2004, 2006; Jensen and Kletzer, 2005, 2008; Kroll, 2005; Van Welsum and Reif, 2005; Van Welsum and Vickery, 2005; Blinder, 2006, 2007a).[46] Based on this argument, therefore, also the second set of studies indirectly suggests that service offshoring works in favour of high-skilled white-collar employees. Are these predictions supported by the data? Although research is still limited, the answer is 'probably yes'.

3.2.2 *What Do the Data Tell Us?*

To the best of my knowledge, only three econometric studies have so far analysed the effects of service offshoring on the composition of white-collar employment: Liu and Trefler (2008) and Crinò (2007a, b) (Table 2, panel B).

Liu and Trefler (2008) study whether service offshoring raises the risk of wage losses and job insecurity for US white-collar employees. Service offshoring is measured as imports of private services from China and India.[47] The sample includes Current Population Survey data for about 30,000 workers between 1996 and 2004. These data allow the authors to track individual employees over time and to analyse three channels through which service offshoring may potentially affect the white-collar workers: (1) by inducing losses of labour income, (2) by increasing the probability of industry switching and (3) by increasing the probability of occupation switching. The last two channels represent ways in which service offshoring may threaten human capital, since the latter is typically industry and occupation specific. Separate regressions are run for high-school graduates and college graduates, as well as for high-skilled and low-skilled white-collar workers.[48] Fixed-effects results show that for none of the groups has service offshoring caused significant losses of labour income. Turning to the probability of switching industry and occupation, probit results show only very limited effects: a 10% increase in service imports from China and India raises the probability of industry switching by 0.25% for college graduates, by 0.32% for high-school graduates, by 0.27% for high-skilled white-collars and by 0.26% for low-skilled white-collar workers. The same increase in service imports from China and India raises the probability of occupation switching by 0.22% for both college graduates and high-school graduates and by 0.24% for high-skilled white-collar workers, without producing any significant effects on low-skilled white-collar workers.[49]

Crinò (2007a) studies how US firms have changed the skill structure of labour demand in recent years, as a result of service offshoring. The author uses a panel of 144 industries over the period 1997–2002 and includes 14 categories of private services in the proxy for service offshoring.[50] Using the Occupational Employment Statistics of the Bureau of Labour Statistics, Crinò distinguishes industry employment into 112 occupations, 58 of which are white-collar. Thanks to a two-stage translog model, the author estimates the demand elasticity with respect to service offshoring for each occupation, and then uses the estimates to evaluate the impact of service offshoring on broad aggregates of occupations with high, medium and low levels of education. Results show that service offshoring raises relative labour demand for high-skilled white-collar workers. The observed rise in service offshoring (116%) has increased high-skilled white-collar employment by 2%, and reduced medium- and low-skilled white-collar employment by 0.1% and 0.4%, respectively. Crinò (2007b) finds similar results for the EU, using a sample of 20 industries and nine countries for the period 1990–2004.

A large body of stylized facts and projected employment trends for the USA support the main conclusions of these studies. In fact, the composition of white-collar employment has been (and will increasingly be) shifting in favour of high-skilled, high-paid occupations. Figure 3 shows that since 1992 the relative employment of non-production workers has been declining, while their relative wage has kept on rising. Feenstra (2007) argues that these trends are consistent with the foreign relocation of low-skilled white-collar jobs. Forrester Research (2002, 2004a, b) estimates that 57% of the job losses expected in white-collar

occupations by 2015 will occur in 'office and administrative' and 'sales and related' occupations, which represent the least skilled service jobs (Crinò, 2006) and earn wages significantly below the national average (Kirkegaard, 2004). The remaining white-collar occupations have experienced employment increases in recent years, with the only exceptions 'managers' and 'computer and mathematical occupations' (Mann, 2003); the employment decline in the latter group, however, has been concentrated in low-wage jobs, while employment in high-wage jobs has expanded (Kirkegaard, 2004). More generally, service occupations at the lowest end of the skill distribution have experienced negative growth rates of employment, while the remaining ones have benefited from positive growth rates (Jensen and Kletzer, 2005). These trends are confirmed at the level of the single metropolitan area: for instance, Kroll (2005) shows that the San Jose Metro Area (Silicon Valley) has been progressively specializing in high-end IT occupations, while losing the low-end ones; moreover, the definition of high-end occupations has shifted up, in the sense that jobs previously considered high-skilled have been standardized and routinized and are now performed by low-skilled white-collar workers.

4. Multinational Enterprises

The literature surveyed so far pays little or no attention to the effects of outward FDI and MNEs' activities in foreign markets, the only exception being the limited set of studies on production transfer within MNEs. As stated in the introduction, one of the reasons is that MNEs' activities are not necessarily linked to offshoring. Indeed, MNEs very often enter foreign countries to serve local markets, rather than to exploit cross-country cost differentials. This notwithstanding, the effects of foreign activities of MNEs on the domestic labour market may be potentially strong, and have actually been the object of harsh debates between advocates and opponents of globalization in recent years. Therefore, I will devote this section to a separate discussion of these effects.

One issue has probably received the largest attention in the literature. MNEs have often been blamed for taking advantage of their global presence by substituting domestic and foreign labour in response to changes in relative wages across countries. The argument is basically the following. Once an MNE has set up a plant abroad, it can easily shift employment from the parent to the affiliate in response to a relative decline in foreign wages. For a given volume of activities, the MNE would then employ fewer workers in the home country.

Things are more complicated than this simple argument would suggest, however. From a theoretical viewpoint, in fact, it is impossible to predict the behaviour of parent employment in response to a change in affiliate wages. The effect ultimately depends on the relationship between foreign and domestic labour in the MNE's technology: if the two types of labour are substitutes, a fall in foreign wages will lead the MNE to increase foreign employment and to reduce domestic employment; if instead they are complements, a fall in foreign wages will lead the MNE to raise both domestic and foreign employment. The relationship is influenced by the nature of FDI, though not univocally. Under vertical FDI, both complementarity and

substitutability may in principle occur: if the activities transferred abroad require upstream or downstream activities to be performed by the parent, domestic and foreign labour will be complements and domestic employment will rise as foreign wages decline; however, if foreign activities replace domestic activities, parent and affiliate employment will be substitutes. Under horizontal FDI, substitutability is more likely to occur, because foreign production usually replaces both domestic production and exports.

Hence, understanding the response of parent employment to a change in relative wages across countries is ultimately an empirical issue. A large number of studies on this topic find that domestic and foreign labour are indeed substitutes in the MNEs' technology. However, the strength of the relationship is weak. Substitutability is mainly driven by affiliates in other high-income countries, which generally result from horizontal FDI aimed to serve the local market while avoiding trade barriers and transportation costs. Substitutability is much weaker with respect to employment in low-income affiliates, which often result from vertical FDI. Finally, substitutability is likely to switch into complementarity in the long run, due to substantial adjustment costs in achieving the optimal level of employment in foreign locations (Table 3).[51]

4.1 *The Framework*

Suppose that MNEs are multiplant firms, with an overall cost function depending on total output (Y_{MNE}) and on the wages paid by the parent (w_p) and by the affiliates in A locations (w_a, with $a = 1, \ldots, A$):

$$C_{MNE} = f(w_p, w_1, \ldots, w_a, \ldots, w_A, Y_{MNE}) \tag{6}$$

Optimal labour demand by the parent (conditional on Y_{MNE}) can then be derived through Shephard's lemma applied to equation (6):

$$\frac{\partial C_{MNE}(w_p, w_1, \ldots, w_a, \ldots, w_A, Y_{MNE})}{\partial w_p} = L_p(w_p, w_1, \ldots, w_a, \ldots, w_A, Y_{MNE}) \tag{7}$$

Finally, equation (7) can be used to derive cross-wage elasticities of parent labour demand with respect to wages in the affiliates as

$$\varepsilon_{L_p, w_a} = \frac{\partial \ln L_p(w_p, w_1, \ldots, w_a, \ldots, w_A, Y_{MNE})}{\partial \ln w_a}$$

Then, if $\varepsilon_{L_p, w_a} > 0$, parent and affiliate employment in location a will be substitutes; if instead $\varepsilon_{L_p, w_a} < 0$, the two labour inputs will be complements. Assuming a log-linear specification for equation (7), the estimating equation becomes

$$\ln L_p = \beta_0 + \beta_p \ln w_p + \sum_{a=1}^{A} \beta_a \ln w_a + \beta_Y \ln Y_{MNE} \tag{8}$$

Table 3. The Effects of the Foreign Activities of MNEs.

Study	Country	Sample	Affiliates[a]	Relationship between parent and affiliate employment	Effect of a 10% fall in affiliate wages on parent employment[b]
Becker *et al.* (2005)	Germany	463 MNEs 2000	Western Europe	Substitutes	1.37%
			Overseas industrialized countries	Substitutes	0.62%
			CEECs	Substitutes	0.47%
			Developing countries	No relationship	
	Sweden	94 MNEs 1998	Western Europe	Substitutes	2.60%
			Overseas industrialized countries	Substitutes	0.63%
			CEECs	Substitutes	0.93%
			Developing countries	No relationship	
Becker and Muendler (2006)	Germany	1640 MNEs 1998–2001	Western Europe	Substitutes	3.60%
			Overseas industrialized countries	Substitutes	1.50%
			CEECs	Substitutes	0.50%
			Developing countries	No relationship	
Braconier and Ekholm (2000)	Sweden	44 MNEs 1970–1994	High-income countries	Substitutes	8.0%
			Low-income countries	No relationship	
Brainard and Riker (2001)	USA	≈1500 MNEs 1983–1992	High-income countries	Substitutes	N.A.
			Low-income countries	Substitutes	N.A.
			Western hemisphere	Substitutes	N.A.
			Eastern hemisphere	Substitutes	N.A.

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Bruno and Falzoni (2003)	USA	32 industries 1982–1994	Canada	No relationship	N.A.
			Europe	Always substitutes	N.A.
			Latin America	S-R, substitutes L-R, complements	N.A.
			Rest of the world	N.A.	
Hanson *et al.* (2003)	USA	≈600 MNEs 1989–1994	All – skilled labour	Complements	3.0%
			All – unskilled labour	Substitutes	3.0%
		≈500 MNEs 1994–1999	All – skilled labour	No relationship	
			All – unskilled labour	No relationship	
Harrison and McMillan (2006)	USA	≈2000 MNEs 1982–1999	Vertical – low-income countries	Complements	0.10%–0.32%
			Vertical – high-income countries	No relationship	
			Horizontal – low-income countries	Substitutes	0.20%–0.27%
			Horizontal – high-income countries	Substitutes	0.92%–1.25%
Konings and Murphy (2006)	12 EU members	1067 MNEs 1993–1998	North EU	Substitutes	0.32%
			South EU	No relationship	
			CEECs	No relationship	
Slaughter (1995)	USA	32 industries 1977–1989	All affiliates	S-R, substitutes	0.45%–1.13%
				L-R, complements	0.40%–1.39%

Source: Compiled by the author.

[a]This column reports the classification of foreign affiliates adopted by each study. Each group is assigned an average wage, which is used to compute cross-wage elasticities of parent labour demand as explained in Section 4.1.

[b]If parent and affiliate employment are substitutes, a 10% fall in affiliate wages reduces parent employment by the reported amount. If parent and affiliate employment are complements, a 10% fall in affiliate wages increases parent employment by the reported amount. N.A., the information cannot be retrieved from the original study.

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and

$$\varepsilon_{L_p,w_a} = \beta_a \quad \forall a$$

Alternatively, assuming a translog specification for equation (6), Shephard's lemma yields a full system of wage-share equations of the form

$$\begin{aligned} WSH_p &= \beta_p + \beta_{pp} \ln w_p + \sum_{a=1}^{A} \beta_{pa} \ln w_a + \beta_{pY} \ln Y_{MNE} \\ WSH_1 &= \beta_1 + \beta_{1p} \ln w_p + \sum_{a=1}^{A} \beta_{1a} \ln w_a + \beta_{1Y} \ln Y_{MNE} \\ &\vdots \\ WSH_A &= \beta_A + \beta_{Ap} \ln w_p + \sum_{a=1}^{A} \beta_{Aa} \ln w_a + \beta_{AY} \ln Y_{MNE} \end{aligned} \tag{9}$$

where WSH_p is the share of parent employment in the total MNE's wage bill, while WSH_a is the wage bill share of labour in affiliates located in a. Standard translog results yield the following formula for the cross-wage elasticities of parent labour demand:

$$\varepsilon_{L_p,w_a} = \frac{\beta_{pa} + WSH_p \cdot WSH_a}{WSH_a} \ \forall a$$

Notice that the translog approach allows also easy derivation of cross-wage elasticities of affiliate employment in the generic location a with respect to a change in affiliate wages in any other location. Indeed, studies using this approach derive the full matrix of cross-wage elasticities, and not only those related to parent employment. However, since the focus of this paper is on the *domestic* labour market effects of offshoring and MNEs, I will mostly focus attention on ε_{L_p,w_a}.[52]

4.2 *Results*

4.2.1 *USA*

Slaughter (1995) applies the translog approach in equation (9) to data on parents and affiliates in 32 industries between 1977 and 1989. The author estimates the cross-wage elasticity of parent labour demand with respect to the average wage across all affiliates; that is, he does not distinguish affiliates according to either the level of development or the geographic location of foreign countries. However, he does make the distinction between short- and long-run adjustments of parent

labour demand, by estimating two different versions of equation (9): the short-run version assumes that affiliate and parent capital are fixed at some pre-existing level, so that the MNEs only choose the optimal demand for labour at home and abroad; the long-run version, instead, treats both types of capital as variable, so that the MNEs also choose the optimal demand for capital in both locations. Results from the former model show that domestic and foreign labour are substitutes in the short run: the estimated cross-wage elasticity is in fact significantly positive, and ranges between 0.045 and 0.113 depending on whether all affiliates, or only majority-owned affiliates, are included in the regression. These figures imply that a 10% decline in affiliate wages reduces parent employment by only 0.45%–1.13% in the short run. By contrast, results from the latter model suggest that domestic and foreign labour become complements in the long run: the estimated cross-wage elasticity is in fact significantly negative and ranges between -0.040 and -0.139, implying that a 10% reduction in affiliate wages increases parent employment by 0.4%–1.39%. Hence, substitutability is weak and mainly concentrated in the short run.

Do these results change if affiliates are distinguished according to host countries' characteristics? This question is addressed by Brainard and Riker (2001), using the translog approach in equation (9) and data on approximately 1500 MNEs between 1983 and 1992. Affiliates are distinguished according to both their geographic location (Western and Eastern hemisphere) and the level of development of the host countries (high and low income); capital is treated as fixed, and thus the analysis is limited to the short run. Starting from the geographic classification of affiliates, estimated cross-wage elasticities suggest the existence of substitutability between parent employment and affiliate employment in both locations; the strength of the relationship is weak, however, moreover, substitutability is stronger with respect to affiliates in the Eastern hemisphere, consistent with a horizontal nature of FDI to those countries. Turning to the second classification, substitutability emerges again between parent employment and affiliate employment in both locations; the relationship, however, is weak also in this case. In order to further explore these results, the authors repeat the analysis with a more detailed classification of affiliates, in which the latter are distinguished over both dimensions at the same time. Estimated cross-wage elasticities show that substitutability is highest with respect to affiliates located in the high-income countries of the Eastern hemisphere, followed by those located in the low-income countries of the Western hemisphere. Hence, substitutability is mostly driven by affiliates in other high-income locations; in the case of low-income countries, substitutability generally arises if the affiliates are sufficiently close to the parent.

None of the above studies exploits an *a priori* classification of affiliates based on their vertical or horizontal nature. This distinction is potentially important, however, because the theoretical predictions change depending on the nature of the affiliates. Harrison and McMillan (2006) account for this consideration by identifying horizontal and vertical affiliates in both high- and low-income countries. Vertical affiliates are those with a high share of intra-firm trade. The empirical test makes use of a panel of about 2000 MNEs observed between 1982 and 1999; both

approaches in equations (8) and (9) are used. In the case of horizontal affiliates, results show that employment in both high- and low-income countries substitutes for parent employment: a 10% fall in affiliate wages in low-income countries reduces parent employment by 0.2%–0.3%; the same wage decline in high-income countries lowers parent employment by 0.9%–1.3%. In the case of vertical affiliates, parent and affiliate employment are either unrelated (high-income countries) or complements (low-income countries): in the latter case, a 10% reduction in affiliate wages raises parent employment by 0.1%–0.3%. Hence, substitutability is prevalent for horizontal affiliates in other high-income countries, whereas complementarity is prevalent for vertical affiliates in low-income countries.

The previous findings may mask different effects on domestic workers, depending on their skill level; moreover, they do not account for differences in skill levels across foreign workers. Hanson *et al.* (2003) focus on these issues, using a firm-level panel data set for the period 1989–1999 and the log-linear approach in equation (8). The authors distinguish foreign employment into skilled and unskilled workers. Elasticities estimated on the sub-period 1989–1994 show that affiliate unskilled labour substitutes for domestic labour, whereas affiliate skilled labour complements with it. A 10% fall in affiliate unskilled wages lowers parent employment by 3%, while the same reduction in affiliate skilled wages raises it by 3%. The results become insignificant, however, when the estimation is performed on the sub-sample 1994–1999.[53] In a second version of the model, the authors use parent employment in R&D, rather than total parent employment, to gauge the effect of relative wage changes on domestic workers with high skill levels. Results show no relationship at all between affiliate and parent employment: estimated elasticities are always insignificant. This finding may be due to the low number of observations available on R&D employment, but may also suggest that the parent demand for skilled labour is less sensitive to relative wage changes, because skilled workers usually generate firm-wide competitive benefits.

Finally, Bruno and Falzoni (2003) contribute to this literature by deepening the analysis of the short- and long-run relationship between parent and affiliate employment. As shown by Slaughter (1995), the relationship may switch from the short to the long run. Bruno and Falzoni confirm this finding by extending the adjustment cost model of Epstein and Denny (1983) to the MNEs and by testing its predictions on data for parents and affiliates in 32 industries between 1982 and 1994. Adjustment costs may be crucial in switching the sign of the relationship: in fact, MNEs usually encounter difficulties in searching and training their foreign labour force, so that the adjustment process towards the desired level of foreign employment may take time to be completed. After dividing affiliates in four regions (Canada, Europe, Latin America and the rest of the world), the authors find that adjustment costs do matter in fact, especially for the relationship between parent employment and affiliate employment in low-income Latin American countries; while in the short run substitutability prevails between the two labour inputs, in the long run the relationship reverses into complementarity. Adjustment costs are instead less severe in Europe: in this case, parent and affiliate employment are found to be substitutes both in the short and in the long run, probably suggesting

that US FDI in Europe is mainly horizontal. Finally, affiliate employment in Canada is largely unrelated to parent employment.

4.2.2 *Europe*

Results on European MNEs are fairly consistent with those on the USA. Substitutability between parent and affiliate employment is weak; the relationship is mainly driven by affiliates in other high-income countries. In countries at the border with the CEECs, affiliate employment in the region substitutes for parent employment; the relationship is weaker, however, than with respect to affiliate employment in other high-income countries.

Braconier and Ekholm (2000) apply the framework in equation (8) to a panel of 44 Swedish MNEs and their 594 affiliates between 1970 and 1994. The authors find evidence of substitutability only between parent employment and affiliate employment in other high-income countries (EU, USA, Canada, Japan and Australia); no significant relationship emerges instead between parent employment and affiliate employment in low-income economies. A 10% fall in high-income affiliate wages leads to an 8% reduction in parent employment. These findings are confirmed by Konings and Murphy (2006) for a panel of 1067 medium and large European MNEs over the period 1993–1998. The authors find evidence of substitutability only between parent employment and employment in Northern European affiliates, but no significant relationship between parent employment and affiliate employment in Southern Europe and in the CEECs. The strength of substitutability is very low also in this case: estimated cross-wage elasticities suggest that a 10% reduction in affiliate wages in Northern Europe leads to a 0.3% decline in parent employment.

The above evidence suggests that employment in European parents faces only limited substitutability in favour of affiliate employment in other high-income countries. Yet, for specific economies substitutability may in principle arise also with respect to employment in low-income CEECs. Boundary countries like Germany have in fact seen their MNEs opening up several production plants in the region, with the main aim of exploiting the larger local endowment of unskilled labour. Hence, average results on the whole set of European MNEs may be misleading if applied to these countries. This is what emerges from two recent studies by Becker *et al.* (2005) and Becker and Muendler (2006) on German MNEs. Both find that employment in German parents is linked by a substitutability relationship with employment in CEEC affiliates. Using the translog approach in equation (9) and a cross-section of 463 German MNEs in 2000, Becker *et al.* (2005) find that a 10% reduction in CEEC affiliate wages leads to a 0.5% reduction in parent employment. These results are confirmed by Becker and Muendler (2006) for a panel of 1640 German MNEs observed between 1998 and 2001: a 10% decline in CEEC affiliate wages lowers parent employment by 0.5%. Substitutability is weaker, however, than with respect to employment in other European countries: in the latter case, a 10% fall in affiliate wages reduces parent employment by a factor ranging from 1.4% (Becker *et al.*, 2005) to 3.6% (Becker and Muendler, 2006).

Becker *et al.* (2005) compare results for Germany with those for 94 Swedish MNEs observed in 1998. Findings are fairly similar. Also in the case of Swedish MNEs, substitutability is strongest between parent employment and affiliate employment in other European countries; substitutability with respect to employment in the CEECs is much weaker.[54]

5. Conclusion and Lines for Further Research

In this paper, I have reviewed the empirical literature on the effects of offshoring and foreign activities of MNEs on developed countries' labour market. The main conclusions of the paper can be summarized as follows.

- Material offshoring has been an important determinant of rising wage inequality during the 1980s. It has mainly worked by lowering relative labour demand for employees with the lowest skill levels. The effects of production transfer within MNEs have been limited, probably because only a fraction of offshoring takes place within the boundaries of these firms.
- Material offshoring seems to raise the volatility of employment, by making labour demand more elastic and by increasing the risk of job losses. However, existing evidence is too limited to draw definite conclusions on the exact magnitude of these effects.
- Service offshoring produces at most small negative effects on total employment. Instead, it noticeably changes the composition of the workforce in favour of high-skilled white-collar employees.
- MNEs tend to substitute domestic and foreign labour in response to changes in relative wages across countries. Substitutability is weak, however, and mainly driven by horizontal, market-seeking FDI.

These results suggest that the effects of offshoring and MNEs' activities are mostly concentrated on specific groups of workers, especially those with low skill levels. The overall labour market impact of these phenomena, however, is rather modest and surely not enough to justify policies that would prevent firms from internationalizing their activities. More effective interventions would instead mitigate the negative consequences for the affected workers and spread out more evenly the overall gains accruing to the country. In the short run, these policies may entail wage insurance and income support schemes directed to displaced workers; in the long run, they may entail retraining programmes that accelerate the transition of workers towards the industries and the jobs that are less exposed to offshoring and MNEs' activities (Kletzer and Litan, 2001; Brainard and Litan, 2004; Brainard *et al.*, 2005; OECD, 2005).

Despite its richness, the existing literature leaves open some promising avenues for future research. First, it seems necessary to improve our understanding of the magnitude of the job losses induced by offshoring. The existing literature has so far produced heterogeneous results, which probably reflect differences in labour market institutions across countries. Understanding what factors determine the strength of the offshoring effect is crucial for choosing the most effective intervention in each

country. Second, more research efforts should probably be devoted to the analysis of the short-run effects of offshoring on individual wages. Offshoring may force domestic employees to move from high- to low-wage industries after displacement, and thereby cause some wage losses along with the job loss. Moreover, workers may sometimes accept a lower wage, if this is enough to prevent their employers from offshoring the job. Wage support schemes require knowing what types of workers are more exposed to these losses, as well as the magnitude of the latter. Third, recent studies have suggested a new channel through which offshoring may raise the volatility of employment: the possibility for firms to suddenly and rapidly modify their offshoring decisions in response to changes in cost differentials across countries (Bergin *et al.*, 2007). This mechanism has largely remained unexplored, because the yearly frequency of the data does not allow accounting for these sudden variations in offshoring. Fourth, the studies on MNEs have only analysed the effects of wage changes in those countries where the MNEs have already set up some affiliates: this has been defined as the *intensive margin* effect of FDI (Becker and Muendler, 2006). However, employment at home may respond also at the *extensive margin*, i.e. when the MNEs set up new foreign plants in other countries in response to relative wage changes. This is especially crucial nowadays, given the increasing importance of outward FDI in countries like China, where Western MNEs were virtually absent until a decade ago.

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Notes

1. *Outsourcing* means licensing of activities to an unaffiliated supplier, which can be either domestic (domestic outsourcing) or foreign (international outsourcing).
2. Several theoretical models propose explanations for the choice between the two offshoring modes. See, among others, Antras (2003, 2005), Antras and Helpman (2004, 2008), Grossman and Helpman (2003, 2004, 2005) and Feenstra and Spencer (2005), as well as Helpman (2006) for a survey. Hanson *et al.* (2005) and Marin (2006) perform instead empirical tests of the main determinants of this choice.
3. The main motive behind both material and service offshoring is the exploitation of cross-country cost differentials due to differences in resource endowments. Other forces may also play a role, like improvements in communication and transportation technologies and in political and economic institutions in foreign countries (Spencer, 2005).
4. In recent years, developing countries have started affirming themselves as the origin of FDI (UNCTAD, 2006); in this paper, however, I will only concentrate on the foreign activities of MNEs based in developed countries. Most FDIs from these economies are horizontal, although existing estimates based on aggregate industry data may have understated the amount of vertical FDI (Alfaro and Charlton, 2007).
5. See Section 2.1.2 for a discussion of measurement issues.

6. The picture does not change if one uses a measure of vertical specialization as an alternative proxy: vertical specialization – defined as the share of export value accounted for by imported inputs (Hummels *et al.*, 2001) – has increased from 3.9% to 7.4% in the USA, from 14.3% to 19.1% in the UK, from 17.5% to 23.2% in Canada, from 14.0% to 18.7% in France and from 14.2% to 16.3% in Germany between 1970 and 1990 (Hummels *et al.*, 1998).
7. Greenaway and Nelson (2001) and Anderton *et al.* (2006) focus on globalization more in general.
8. Author's calculations based on the NBER Manufacturing Industry Productivity Database (Bartelsman and Gray, 1996) and the Annual Survey of Manufactures. The non-production/production workers classification represents a good proxy for the skilled/unskilled classification (Berman *et al.*, 1994).
9. In the second half of the 1990s, the employment ratio has started declining, while the wage ratio has kept on increasing. Feenstra (2007) argues that service offshoring may have contributed to this change; I will come back on the issue in Section 3.2.
10. The Stolper–Samuelson mechanism would predict that the skill intensity of production declines in every industry as relative skilled wage rises, because firms substitute skilled labour with less expensive unskilled labour. It should be noted that a different stream of studies, based on factor–content analysis, tends to attribute a somewhat larger role to international trade; also in this case, however, the effect of trade appears too limited compared with the observed outward shift in relative skilled labour demand (Sachs and Shatz, 1994; Wood, 1994, 1995).
11. A non-exhaustive list of theoretical models on offshoring and labour market includes Arndt (1997, 1999), Arndt and Kierzkowski (2001), Egger and Egger (2001), Kohler (2001, 2004), Egger and Falkinger (2003), Feenstra and Hanson (2003), Grossman and Rossi-Hansberg (2006), Baldwin and Robert-Nicoud (2007), Ekholm and Ulltveit-Moe (2007), Rodríguez-Clare (2007) and Egger and Kreickemeier (2008).
12. Feenstra and Hanson (1997) show that these effects may arise also in the foreign country, through a similar impact on the skill intensity of production.
13. Notice that equation (1) already imposes homogeneity and symmetry restrictions, as is standard in the translog case.
14. Alternatively, III_{it} can be normalized by industry output, value added or apparent consumption.
15. These findings are largely confirmed by Anderton *et al.* (2002b), Anderton and Oscarsson (2006) and Canals (2006).
16. This measure assumes that all imports are used as inputs by the industry. While this proxy is correlated with the ideal measure of offshoring in equation (3), the latter is better able to describe the international fragmentation of production, because the input–output matrices allow us to estimate the true fraction of imports used as intermediate inputs by the industry.
17. These results are confirmed by Hijzen (2007), who uses mandated-wage regressions, instead of wage-share regressions, to assess the effects of material offshoring. For a deep discussion of mandated-wage regressions, see Feenstra and Hanson (1999) and Slaughter (2000b).
18. Hansson defines skilled and unskilled workers according to the educational attainment of the employees: skilled workers are defined as those with post-secondary education, i.e. with more than 12 years of schooling.

19. Skilled workers are defined as those with tertiary education; unskilled workers are defined as those with either secondary or primary education. Results are robust to the use of the two definitions of unskilled labour.
20. The authors classify as skilled those workers whose job requires either high or special qualification; the remaining workers are classified as unskilled.
21. Other studies on Austria find similar results, despite the use of a different methodological approach based on mandated-wage regressions (Egger *et al.*, 2001).
22. Indeed, according to Lorentowicz *et al.* (2005) Austria's offshoring to countries like Germany and the USA involves skill-intensive activities, because Austria is relatively less endowed with skilled labour than such countries. As a consequence, the measure of overall offshoring used by Lorentowicz *et al.* (2005) is likely to be negatively correlated with relative skilled labour demand.
23. The white-/blue-collar classification is used to identify skilled and unskilled workers.
24. MNEs often carry out assembly activities in their foreign affiliates and then use these affiliates as a local presence to serve the local market or other neighbouring countries (export-platform FDI (Ekholm *et al.*, 2007)). In these cases, production transfer within MNEs does not give rise to trade in intermediates, but rather results in the expansion of foreign affiliates relative to the parent.
25. These are tasks that cannot be easily codified and translated into rules and instructions. The definition has first been used by Autor *et al.* (2003) and Spitz-Oener (2006).
26. Skilled workers are proxied by the white-collar workers.
27. See Berndt and Christensen (1974), Blackorby *et al.* (1977), Denny and Fuss (1977) and Koebel (2006).
28. $\varepsilon_{l,mos}$ has usually been defined as labour demand elasticity with respect to material offshoring. I will use this definition too, although it is slightly imprecise. In fact, $\varepsilon_{l,mos}$ represents only one component of such an elasticity, whose full expression is given by $\eta_{l,mos} = \varepsilon_{l,mos} + \xi_{C,mos}$, where $\xi_{C,mos}$ is the cost elasticity with respect to material offshoring. Since $\xi_{C,mos}$ is neutral across inputs, the only term capturing changes in factor intensity (and therefore changes in relative labour demand) is $\varepsilon_{l,mos}$. Therefore, $\varepsilon_{l,mos}$ can be used to measure the compositional effects of material offshoring, but should be interpreted as measuring such effects at *given costs*.
29. The authors classify as skilled the following occupations: managers and administrators and professional occupations. Semi-skilled include associate professional and technical occupations; clerical and secretarial occupations; craft and related occupations; personal and protective service occupations and sales occupations. Finally, the unskilled group consists of plant and machine occupations and other occupations.
30. Geishecker and Gorg (2005, 2008) and Munch and Skaksen (2005) find consistent results, using a wage equation approach on individual data for German and Danish workers over the 1990s.
31. A more elastic labour demand implies lower bargaining power for the employees and higher volatility of employment and wages.
32. Greenaway *et al.* (1999) and Bruno *et al.* (2004) test the effects of final trade (not offshoring) on labour demand elasticities in some OECD countries. They find no robust evidence in favour of the Rodrik hypothesis.
33. Senses uses instrumental variables to account for the endogeneity of wages in the first estimation stage. Her instruments are constructed using average non-manufacturing wages at the state, MSA and county level.

34. High-offshoring sectors are apparel and textiles, leather, industrial machinery and equipment, electrical and optical equipment, transportation equipment, instruments and related products, miscellaneous manufacturing.
35. For each sector, Senses proxies the *threat* of offshoring with the share of imports from low-income countries in total import value and number of products; she also uses a measure of transportation costs to the same purpose.
36. For studies on trade and exchange rates, see Grossman (1987), Revenga (1992), Davis *et al.* (1996), Burgess and Knetter (1998), Goldberg *et al.* (1999), Kletzer (1998, 2001, 2002) and Klein *et al.* (2002, 2003a, b).
37. Author's calculations based on OECD (2007b, p. 93).
38. These are telecommunications, insurance, finance, business services, and computing and information services.
39. These are (1) telecommunications; (2) banking and finance, insurance and pension funds, auxiliary financial services; (3) renting of machinery; (4) computer services; (5) research and development; (6) legal activities, accounting services, market research, and management consultancy; (7) architectural activities and technical consultancy; (8) advertising; and (9) other business services.
40. Unlike the other studies, Gorg and Hanley evaluate the conditional labour demand elasticities with respect to service offshoring. Hence, their results may not take account of the employment responses triggered by the productivity effects.
41. Service offshoring includes imports of the following categories of private services: wholesale and retail trade, repairs, transportation, post and communication, finance, real estate, rental, computer, R&D and other business services. In a companion paper using the same sample, Hijzen and Swaim (2007) find that an overall measure of offshoring (material plus service) has typically no effects on labour demand.
42. Several studies have analysed the productivity effects of service offshoring (Gorg and Hanley, 2005a; Amiti and Wei, 2006b; Olsen, 2006; Gorg *et al.*, 2008). These studies complement a broad set of contributions on the productivity effects of domestic outsourcing. See, among others, Griliches and Siegel (1992) and Ten Raa and Wolff (2001), as well as Heshmati (2003) for a survey.
43. See Trefler (2005a, b) and Mankiw and Swagel (2006) for a summary of the debate.
44. In general, this first set of models attribute also some positive welfare effects to service offshoring; these are mainly due to the gains from specialization discussed before. Samuelson (2004) expresses a more cautious view, however, and draws attention to the possibility that service offshoring leads to welfare losses in the developed world.
45. Grossman and Rossi-Hansberg (2006) develop a model of offshoring which encompasses differences in tradable attributes across tasks. While the authors consider also the specific case of offshoring in high skill-intensive tasks, the validity of their model is more general and its applicability not limited just to service offshoring.
46. Real-world examples of tradable activities include call centre operations, bookkeeping, bill processing, cost estimation and many back office tasks. Overall, workers performing these activities account for roughly 25%–30% of total employment in the USA (Blinder, 2006) and for 19.2% in the EU-15 (Van Welsum and Vickery, 2005).
47. The categories of private services included in the analysis are (1) education; (2) insurance; (3) financial services; (4) telecommunications; (5) advertising; (6) computer and information services; (7) construction, architectural and engineering;

(8) industrial engineering; (9) legal services; (10) management, consulting and public relation services; (11) research, development and testing services; and (12) other business, professional and technical services.

48. High-skilled white-collar workers include management, business and financial occupations; professional and related occupations. Low-skilled white-collar workers include service occupations; sales and related occupations; office and administrative support occupations.
49. In the same study, Liu and Trefler also find that service offshoring does not raise the risk of unemployment for US white-collar workers. They do find, instead, that service *inshoring* from China and India generally reduces job insecurity and boosts earnings growth for US white-collar employees.
50. The categories of private services included in the proxy are (1) finance; (2) insurance; (3) computer and information services; (4) research, development and testing services; (5) business, professional and technical services; (6) advertising; (7) management, consulting and public relation services; (8) industrial engineering; (9) installation, maintenance and repair of equipment; (10) legal services; (11) operational leasing; (12) accounting, auditing and bookkeeping; (13) telecommunication; and (14) other business, professional and technical services.
51. These studies analyse the response of parent employment at given levels of activities performed by the MNE. A smaller set of contributions try instead to assess the effects of an expansion in the volume of foreign affiliate activities relative to the parent (Blomstrom *et al.*, 1997; Lipsey, 1997; Lipsey *et al.*, 2000; Desay *et al.*, 2005; Harrison *et al.*, 2007; Becker and Muendler, 2008). So far, results are inconclusive. Accurate surveys of this literature can be found in Blomstrom and Kokko (2000) and in Barba Navaretti and Venables (2004, chapter 9).
52. See Riker and Brainard (1997) for a study analysing exclusively the relationship between affiliate employment in different locations.
53. Due to the lack of affiliate-level wages for the two categories of workers, the authors proxy skilled wage with the average compensation in the following industries: chemicals, transportation equipment and scientific equipment. These are the most skill-intensive industries in the countries where US MNEs have affiliates. Similarly, unskilled wage is proxied by the average compensation in textile, footwear and apparel.
54. The latter result is inconsistent with Braconier and Ekholm (2000), who find no evidence of substitutability between parent employment and affiliate employment in low-income countries. The inconsistency probably depends on the use of different data and of different classifications of foreign affiliates by geographic region.

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