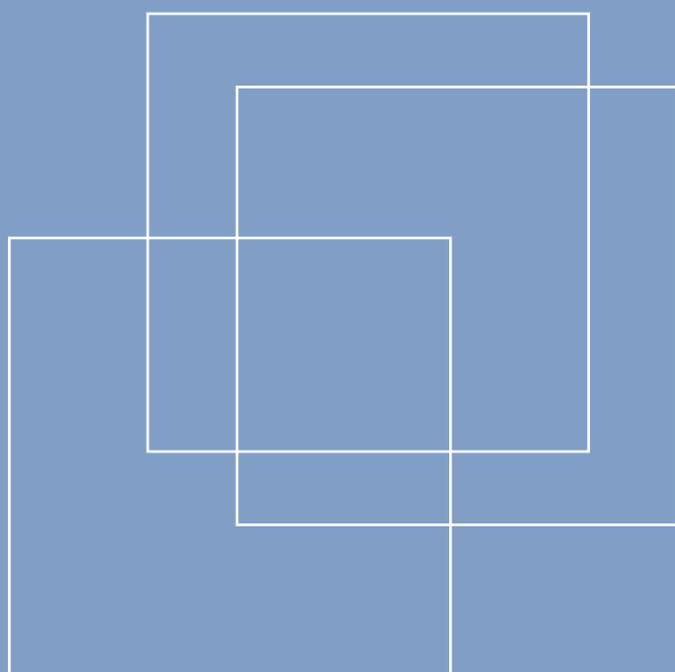




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Structure Matters:
Sectoral drivers of growth and the labour
productivity-employment relationship

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Abstract

The paper uses accounting methods to decompose aggregate labour productivity and employment growth into their sectoral components as well as into within-sector and employment reallocation effects for a sample of 81 developed and developing countries using data going back to the mid-1980s. Key findings are that aggregate labour productivity growth in Asia as a whole is driven by as much services as by industry, in spite of strong differences between countries (e.g., with industry dominant in China and services dominant in India) and that within-sector effects on aggregate labour productivity growth are more important than employment reallocation effects, a pattern that holds for all regions. At the aggregate level, the paper identifies a stronger positive relationship between output and employment growth in developed than developing countries, a stronger negative relationship between labour productivity and employment growth in developing than developed countries, and that “jobless growth” is more of a problem for developing countries in Asia than the more slowly-growing countries of Latin America-Caribbean.

Keywords: economic development, economic growth, employment, Kaldor, productivity decomposition

JEL classification: E24; O14; O4

1 Introduction

It is possible for a country to experience bursts of growth through a number of means, but sustainable economic growth requires structural transformation. This is the central tenet of the structuralist development perspective (e.g., Ocampo, Rada and Taylor, 2009). A key characteristic of structural transformation is the changing sectoral composition of output and employment, with particular attention traditionally given to manufacturing as a leading sector in driving economic growth.

The role of manufacturing in economic development was the subject of an online debate between Ha-Joon Chang and Jagdish Bhagwati hosted in 2011 by *The Economist*, with Chang arguing in favor of and Bhagwati against the motion that “an economy cannot succeed without a big manufacturing base” (*The Economist*, 2011). After two rounds of debate, readers were invited to side with either Chang’s or Bhagwati’s views. Two contrasting developments, *The Economist* argued, gave the debate special resonance. First was the post-2008 global crisis, during which some countries more dependent on financial services fared poorly – e.g., the U.K. and the U.S. – while others more dependent on manufacturing did better – e.g., Germany and China. Second, and of longer precedence, was the so-called “emergence” of India, for which such advanced services as information technology (IT) and business processing outsourcing (BPO) played highly visible roles.

Indeed, much of the debate circled around the interpretation of India’s development path and its relevance for other developing countries, in particular whether and how services can provide an alternative to manufacturing as a driver of economic development. For both Chang and Bhagwati, a key reference in this regard was Kaldor, whose seminal works on economic growth were published in the 1960s (Kaldor, 1966, 1967, 1968). In this sense, the debate turned on the relevance of Kaldor’s theories, particularly what have come to be known as “Kaldor’s growth laws,” for developing countries today. These growth laws state, in short, that more rapid expansion of manufacturing relative to the economy as a whole results in more rapid GDP growth as well as more rapid productivity growth within manufacturing and also agriculture. Kaldor also argued for the importance of returns to scale at the macro level that were not measurable at the level of individual firms or sectors – that is, positive externalities or spillovers (Kaldor’s application of Young’s work on increasing returns (Young, 1928. Cf. Thirwall, 1983, p. 349)).

At least historically, labour has tended to shift from agriculture to manufacturing in the process of economic development, that is, from a low average productivity to a high average productivity sector. Such structural transformation creates a positive effect on aggregate productivity. This is an example of a *reallocation effect*, defined as the change in aggregate productivity resulting from shifts in the composition of employment or output among sectors with different levels of productivity. This is distinct from the *within-sector effect*, defined as the change in aggregate productivity resulting from the sum of changes in productivity within sectors (more detailed definitions of these effects as well as the interaction between the two are provided in section 3).

For Kaldor, reallocation effects were less important than the within-sector effects *induced* by such reallocations. Within manufacturing, productivity growth is argued to result from the sector’s particular amenability to increasing returns to both static and dynamic economies of scale, the latter characterized by learning-by-doing (Kaldor’s application of Verdoorn’s Law (Verdoorn, 1949)). Within agriculture, productivity growth is argued to result in part from the reduction of surplus labour in the form of “disguised unemployment” (Kaldor, 1968, p. 386). This passive form of productivity growth in

agriculture is complemented by an active form which Kaldor argues “is mainly dependent on the progress of land-saving, as distinct from labor-saving innovations,” and that he describes as follows: “These land-saving innovations include not only technical discoveries but the social framework of agriculture, the whole network of institutions which determine land tenure, and the progress of education in rural areas” (1967, p. 56).

Summarizing these dynamics and the relative importance of reallocation versus within-sector effects, Kaldor writes:

It is my contention that it is the rate at which this transfer [of labour from low to high productivity sectors] takes place which determines the growth rate of productivity of the economy as a whole. The mechanism by which this happens is only to a minor extent dependent on the *absolute* differences in the levels of output per head between the labour-absorbing sectors and the surplus-labour sectors [that is, employment reallocation effects]. The major part of the mechanism consists of the fact that the *growth* of productivity is accelerated as a result of the transfer at both ends – both at the gaining-end and the losing-end; in the first, because of increasing returns, productivity in industry will increase faster, the faster output expands; in the second because when the surplus-sectors lose labour, the productivity of the remainder of the working population is bound to rise (Kaldor, 1968, p. 386).

Of the service sector, Kaldor had a dualistic view, characterized by what can be called traditional and advanced services. Traditional services – urban informal employment in effect – were a source of surplus labour expected like agriculture to contract in the process of economic development. But advanced services were a complement to manufacturing and were expected to grow. In Kaldor’s words:

In the field of services however (unlike in agriculture) there are two contrary processes at work: on the one hand, industrialization absorbs labour from services on a large scale; on the other hand, the growth of industry itself gives rise to the growth of services of various kinds which are both complementary and ancillary to industrial activities (by “ancillary” I mean that the demand for these services, e.g. transport, distribution, accountancy, banking services, etc. *are derived from, but cannot generate, industrial activities*). As a result, the total employment in services tends to rise during the process of industrialization... (Kaldor, 1968, p. 387, with emphasis added).

We know now that traditional services often expand alongside industrialization – witness the vast literature on urban informal employment – but that is another story.¹ More to the point are the contrasting views on the relationship between services and manufacturing in the process of development, which variously see services (in particular advanced services) as:

- i. A potential *substitute* for manufacturing, enabling countries to leapfrog from agriculture to services and pass over manufacturing to a large extent.
- ii. A *lagging complement* to manufacturing, expanding alongside manufacturing because services are, as Kaldor puts it, “derived from... industrial activities.”
- iii. A *leading complement* to manufacturing, expanding alongside manufacturing because, in contrast to Kaldor, services *can* generate industrial as well as other activities. In this view, services can be a leading sector though a strong manufacturing base remains essential.

Exemplary of the first view are Bhagwati and as well as Ghani and Kharas (2011). India’s experience shows, Ghani and Kharas argue that services can provide an alternative to manufacturing as a leading sector in driving economic growth, for services have become increasingly tradeable and share with manufacturing the potential for increasing returns to scale. They write, “The globalization of services

¹ Though informal employment is of fundamental importance as a defining characteristic of labour markets in developing countries, we regard it as beyond the scope of our already wide-ranging paper.

provides alternative opportunities for developing countries to find niches, beyond manufacturing, where they can specialize, scale up and achieve explosive growth, just like the industrializers” (ibid., p. 4). This export-oriented path is sustainable, they argue, because the potential global market for services is vast and largely untapped (cf. NASSCOM-McKinsey, 2005).

Representing the view that services are a lagging complement to manufacturing are Kaldor and Chang, with Chang writing that “[M]ost of the more dynamic elements of the service sector are dependent on the manufacturing sector” (*The Economist*, 2011).

The third view shares with the first that services can be a leading sector, but emphasizes domestic inter-industry linkages, spillover effects, and the importance of the co-evolution of services and manufacturing and indeed agriculture for sustainable growth. Exponents of this view are Joshi (2004) and Dasgupta and Singh (2005, 2006).² Summarizing this view with respect to India, Dasgupta and Singh write:

In the case of IT, in particular, it seems that the services are leading to the expansion of manufacturing, rather than the other way round. A policy implication of this evolution is that India should take advantage of its strength in IT and use it extensively in all areas of the economy in order to upgrade manufacturing and agriculture as well as services (Dasgupta and Singh, 2005, p. 1055).

While Dasgupta and Singh remark that trade in services has improved India’s balance of payments, they also caution that the importance of manufacturing “can hardly be exaggerated in view of the high income-elasticity of demand for manufactures at India’s level of per capita income” (ibid., p. 1055). More than that, they argue that the potential for positive spillovers from services is even greater than from manufacturing, so that it is strategic for India to leverage this potential for the benefit of both its manufacturing and agricultural sectors.

For what it is worth, online voters decided the debate between Chang and Bhagwati in favor of the former. Yet the view that services can be a leading complement to manufacturing suggests that there is something of value in what both economists have to say.

This paper empirically addresses three main issues. First is the issue of “jobless growth,” or more precisely the relationships among labour productivity and employment growth as well as the growth of the working age population and labour force. Second is the relative importance of different sectors in contributing to aggregate labour productivity growth and thus their role in structural transformation. Third is the relative importance of within-sector versus employment reallocation effects in contributing to aggregate labour productivity growth. For all three issues, we provide evidence on variation across countries and regions and over time, going back to the mid-1980s. Within the developing world, we highlight a number of differences between Asia and Latin America and the Caribbean (LAC). The paper also provides a survey of the most closely-related empirical studies and closes with a discussion of some policy implications of our findings.

Key findings are that there is a stronger positive relationship between output and employment growth in developed than developing countries, a stronger negative relationship between labour productivity and employment growth in developing than developed countries, and that “jobless growth” is more of a problem for developing countries in Asia than the more slowly-growing countries of LAC; that aggregate labour productivity growth in Asia as a whole is driven by as much services as by industry, in spite of

² Cf. Mattoo (2009) for related views.

strong differences between countries (e.g., with industry dominant in China and services dominant in India); and – consistent with Kaldor – that within-sector effects on aggregate labour productivity growth are more important than employment reallocation effects, a pattern that holds for all regions. This latter finding is generally consistent with the related literature, with McMillan and Rodrik (2011) the notable exception.

2 Literature review

Several prior studies decompose labour productivity growth to address a similar set of questions, notably Pieper (2000), Ocampo, Rada and Taylor (2009), Timmer and de Vries (2009) and McMillan and Rodrik (2011). These studies differ in method, as described below, and in this regard we closely follow Pieper and Ocampo, Rada and Taylor. These studies also differ regarding years, countries and sectoral breakdowns evaluated as well as how value-added is denominated (whether in constant national currencies, constant U.S. dollars, or PPP U.S. dollars), and these particulars as well as those of our own study are summarized in Table 1.

Pieper (2000) evaluates 30 developing countries over two periods, 1975 to 1984 and 1985 to 1993, based on four sectoral breakdowns: agriculture, industry (mining, manufacturing and construction), industry services (public utilities, transport, storage and communication, and finance, insurance, real estate and business services), and other services. Pieper provides evidence that industry contributed most to aggregate labour productivity growth in both periods, followed by other services. The contribution of these two sectors was stable between the two periods, but there was a big shift away from agriculture and toward industry services, illustrating the increased importance of the latter in contributing to aggregate labour productivity growth. Looking at individual countries, Pieper observes that the more rapidly growing countries in Asia had large and often increasing contributions of industry to aggregate labour productivity growth, whereas many countries in Latin America and Sub-Saharan Africa had low or declining contributions of industry.

In her analysis of employment, the author finds that countries with positive contributions of industry to aggregate employment growth tended to experience favorable aggregate employment growth, and vice versa for countries with negative contributions of industry. The contribution of industry to employment increased between the two periods in most countries in Asia, with India and Singapore notable exceptions (though the contribution of industry to employment remained positive in both periods). Pieper also finds that most countries in Asia (but not Latin America or Sub-Saharan Africa) were able to combine labour productivity increases with employment increases, for both industry and the economy as a whole, indicating that there is no necessary trade-off between the two.³

³ Pieper notes, however, that there was a correlation coefficient between labour productivity growth and employment growth of -0.47, significant at the 5% level, for the 1985-1993 period. The author does not report the correlation coefficient for the 1975-1984 period, but notes that it was not statistically significant (*ibid.*, p. 73).

Table 1: Specifications of studies in literature review

	Pieper (2000)	Ocampo, Rada & Taylor (2009)	McMillan & Rodrik (2011)	Timmer & de Vries (2009)	Kucera & Roncolato
Years	1975-1984, 1985-1993	1990-2004	1990-2005	1950-2005	1984-1998, 1999-2008
No. of countries	30	57	38	19	81
Regions and No. of countries within	9 South & East Asia 2 Turkey & Middle East 11 LAC 8 SSA	8 Semi-industrialized 6 Central & Eastern Europe 2 Former USSR 4 Tigers 1 China 4 South Asia 4 Southeast Asia 3 Small Andean 5 CA & Caribbean 10 MENA 4 Representative Africa* 6 Other Africa**	9 High income 10 Asian 9 LAC 1 Middle East 9 Africa	9 LA 9 Developing Asia 1 Japan	25 Developed 18 Central & Southeast Europe, CIS 14 Developing Asia 19 LAC 3 MENA 2 SSA
Sectors	1) Agriculture 2) Industry 3) Industry services 4) Other services	1) Agriculture 2) Industry 3) Services	1) Agriculture, hunting, forestry, fishing 2) Mining, quarrying 3) Manufacturing 4) Utilities 5) Construction 6) Wholesale & retail trade, restaurants, hotels 7) Transport, storage, communication 8) Finance, insurance, real estate, business services 9) Other services	1) Agriculture 2) Manufacturing 3) Other industries 4) Market services 5) Non-market services	1) Agriculture, hunting, forestry, fishing 2) Mining, utilities 3) Manufacturing 4) Construction 5) Wholesale & retail trade, restaurants, hotels 6) Transport, storage, communication 7) Other services
Data	Output: <i>U.N. National Accounts</i> , in constant national currency; Employment: <i>ILO</i>	Output: <i>World Bank WDI</i> , in constant US dollars; Employment: <i>ILO GET</i> database	Output: <i>GGDC</i> and national sources, in PPP dollars; Employment: <i>GGDC</i> and national sources	Output: <i>GGDC</i> in constant national currency; Employment: <i>GGDC</i>	Output: <i>U.N. National Accounts</i> and <i>GGDC</i> , in constant national currency; Employment: <i>ILO Laborstat</i> and <i>GGDC</i>

Notes: * includes Ghana, Kenya, Uganda, and Tanzania;

** includes Cameroon, Ethiopia, Ivory Coast, Mozambique, Nigeria and Zimbabwe.

Pieper elaborates on this last point by classifying countries as “low-road” versus “high-road,” depending on whether their patterns of development were “economically sustainable” and “socially sustainable” – defined as three per cent or greater average annual labour productivity and employment growth, respectively – with “low-road” countries being below and “high-road” countries being above both thresholds. For the 1985 to 1993 period, there were only four “high-road” countries and all were in Asia: Indonesia, Malaysia, South Korea and Thailand. All four had large contributions of industry to aggregate labour productivity growth in both periods, consistent with industry being a leading sector for development. India and Singapore were noted above as having smaller contributions of industry to aggregate employment growth in the 1985 to 1993 than the 1975 to 1984 period, and were also the two Asian countries classified as “economically sustainable” but not “socially sustainable” in more recent period, again suggesting the importance of industry.

Ocampo, Rada and Taylor (2009) evaluate 12 country groups comprised of 57 developed and transition countries, based on three sectoral breakdowns: agriculture, industry (mining, manufacturing and construction) and services (including public utilities). Based on average annual GDP per capita growth rates from 1970 to 2006, the authors classify these groups as having experienced “stagnant,” “slow,” or “sustained” growth. The four groups that experienced sustained growth were all in Asia: the Tigers (Malaysia, Singapore, South Korea and Taiwan), China, Southeast Asia and South Asia. These four groups also experienced the largest declines in agricultural output shares and the largest increases in industrial output shares.

The authors decompose labour productivity growth for the 1990 to 2004 period, and address the relative importance of employment reallocation versus within-sector effects. The authors find that of the three sectors, industry contributed most to labour productivity growth for the Tigers, China and Southeast Asia – driven more by the within-sector effect for the Tigers and China and more by the reallocation effect for Southeast Asia.⁴ Consistent with Pieper’s results, this suggests the importance of industry as a leading sector. For South Asia, in contrast, services were the most important contributor to aggregate labour productivity growth – driven more by the within-sector effect, though the reallocation effect was also important. This reflects the importance of services in India in particular, by far the largest country in South Asia.

The two country groups represented Sub-Saharan Africa are classified as having experienced “stagnant” growth, and are notable for having low within-sector effects on labour productivity growth as well as negative reallocation effects for agriculture.

The larger countries of Latin America dominate the group of semi-industrialized countries, for which all three sectors contributed positively to labour productivity growth through the reallocation effect whereas the within-sector effect was positive for agriculture and negative for both industry and services.⁵ Indeed, the total reallocation effect was about one per cent compared to average annual aggregate labour productivity growth of only about 0.2 per cent. The total reallocation effect was also positive for the group of Central American and Caribbean countries.⁶ Comparing Asia and Latin America at large, the

⁴ This is based on a comparison of the author’s figures 3.4 and 3.5, the former showing overall productivity growth and within-sector effects (according to the note for figure 3.4) and the latter showing reallocation effects.

⁵ The countries in this group are Argentina, Brazil, Chile, Columbia, Mexico, Venezuela, Turkey and South Africa.

⁶ The countries in this group are Costa Rica, the Dominican Republic, El Salvador, Guatemala and Jamaica. For the group of small Andean countries, comprised of Bolivia, Ecuador and Peru, the total reallocation effect was negative but small, much smaller in absolute value than the positive effects for the groups of semi-industrialized and Central American and Caribbean countries.

authors find that total reallocation effects are positive for both regions but that total within-sector effects are much larger for Asia. In sum, the wide gap in aggregate labour productivity growth between the two regions is accounted for more by within-sector than reallocation effects. We emphasize these results because they are corroborated by Timmer and de Vries (2009) and our own analysis but are at odds with the conclusions of McMillan and Rodrik (2011).

The authors also evaluate sectoral contributions to employment growth and observe large shifts from agriculture to services. Indeed, the sectoral contribution of services to employment growth was consistently positive for all 12 country groups. For industry, the picture is mixed, with negative contributions for seven of 12 country groups. The contribution of industry to employment growth was effectively zero in China and South Asia and was strongly negative for the Tigers. Considering these findings, the authors write, “An old structuralist observation in development economics is that the industrial sector is the main motor for productivity increases but not for job creation” (ibid., p. 47).

McMillan and Rodrik (2011) evaluate 38 developed and developing countries from 1990 to 2005, based on nine sectoral breakdowns corresponding to the major divisions of ISIC Revision 2. Their method differs from the prior studies as well as our own in that it does not separate out from within-sector and reallocation effects the interaction of these two effects (defined in section 3) and also differs in other respects. These differences turn out to substantively affect results, as we will see in section 4.3.

The authors argue that the wide gaps in labour productivity growth between Asia on the one hand and Latin America and Africa on the other are accounted for more by “structural change” effects (their equivalent for employment reallocation effects) than within-sector effects. They write, “where Asia has outshone the other two regions is not so much in productivity growth within individual sectors, where performance has been broadly similar, but in ensuring that the broad pattern of structural change contributes to, rather than detracts from, overall economic growth” (ibid., p. 68). Based on unweighted regional averages, the structural change effect is positive for Asia and negative for Latin America and Africa and the within-sector effect is indeed broadly similar between the three regions, at 3.3, 2.2, and 2.1 per cent, respectively.

The authors also present these results using *weighted* regional averages, which are more directly comparable with Ocampo, Rada and Taylor’s results for country groups (2009). Based on weighted regional averages, the structural change effect remains negative in Africa, turns positive though effectively zero in Latin America and becomes more strongly positive in Asia. Together with the within-sector effects based on weighted regional averages, these results indicate that the wide gap in aggregate labour productivity growth between Asia and Latin America is accounted for more by the within-sector effect – with about a 3.7 percentage point difference between the regions – than the structural change effect – with about a 1.3 percentage point difference.⁷

Timmer and de Vries (2009) evaluate nine countries in Latin America and ten in Asia (including Japan) from 1950 to 2005, divided differently for each country into periods of moderate growth, growth accelerations and growth decelerations. Results are presented for five sectoral breakdowns: agriculture, manufacturing, other industries (mining, public utilities and construction), market services (wholesale and retail trade, transport, storage and communication, and finance, insurance, real estate and business

⁷ Note that the colors of the bar graphs indicating within versus structural change are reversed between the relevant figures 2.8 and 2.9 (McMillan and Rodrik, 2011, pp. 66, 69).

services), and non-market (other) services.⁸ As with McMillan and Rodrik, Timmer and de Vries' method does not separate out interaction effects.⁹

At the sectoral level, the authors find that manufacturing contributed most to aggregate labour productivity growth during periods of moderate growth but that market services contributed most during growth accelerations and decelerations. The role of services was also remarked by Pieper, regarding the increased contribution of industry services to aggregate labour productivity growth, as well as by Ocampo, Rada and Taylor, regarding services being the most important contributor to labour productivity growth in South Asia. Timmer and de Vries country-level results show that services was a particularly important contributor to aggregate labour productivity growth in Hong Kong (for market services), India (for market and non-market services), Singapore (for market services), and Taiwan (for market and non-market services), results that are broadly corroborated by our own analysis.

Based on averages (unweighted) for the 19 countries at the aggregate level, the authors find that within-sector effects were more important than employment reallocation effects in contributing to labour productivity growth whether during periods of moderate growth, growth accelerations or growth decelerations. In periods of moderate growth, for example, within-sector effects accounted for 75 per cent of aggregate labour productivity growth. Regarding growth accelerations, the authors write that these “are explained by productivity increases within sectors, not by reallocation of employment to more productive sectors” (ibid., p. 165). Based on results for individual countries, within-sector effects were more generally important than reallocation effects in both Asia and Latin America. This held for Argentina, Brazil, Chile, Columbia and Peru, for example, including in the more recent years evaluated by Ocampo, Rada and Taylor (2009) and McMillan and Rodrik (2011). For Mexico, while the reallocation effect accounted for all of aggregate labour productivity growth for the 1988 to 2005 period, the effect was positive. Indeed, for Brazil and Mexico, the two largest economies in the LAC region, the reallocation effect was positive for every sub-period between 1950 and 2005.

3 Method and data

In decomposing labour productivity growth, we follow Pieper (2000) and Ocampo, Rada and Taylor (2009). Aggregate labour productivity is defined as total valued added over total employment, or $q = X/L$, and sectoral labour productivity is correspondingly defined as $q_i = x_i/l_i$. Aggregate labour productivity can be expressed as:

$$q = X/L = \sum x_i / \sum l_i \quad (1)$$

⁸ Timmer and de Vries analysis was based on ten sectoral breakdowns, but results were aggregated up to these five sectors.

⁹ Timmer and de Vries make an adjustment to employment reallocation versus within-sector effects on the assumption that shifts of workers from agriculture to other sectors increases agricultural labour productivity, which attributes more of labour productivity growth to reallocation than within-sector effects. The authors make an additional adjustment to within-sector versus reallocation effects depending on whether sectors are above or below average labour productivity levels. Based on the example given by the authors of South Korea for 1963-2005 (a growth acceleration period), these adjustments have more of an effect on sectoral than total estimates. That is, without adjustments, the total within-sector effect is 3.6 per cent and the total reallocation effect is 0.8 per cent; with either the first adjustment or both the first and second adjustments, the respective figures are 3.4 and 1.0 per cent.

Taking first-order differences with respect to time ($t = 0$), labour productivity growth can be expressed as:

$$\xi = \sum[\theta_{i0}(g_i - n_i) + (\theta_{i0} - (q_1/q_0)\lambda_{i0})n_i] \quad (2)$$

where:

$$\begin{aligned} \xi &= (q_1 - q_0)/q_0 \\ n_i &= (l_{i1} - l_{i0})/l_{i0} \\ g_i &= (x_{i1} - x_{i0})/x_{i0} \\ \theta_{i0} &= x_{i0}/X_0 \\ \lambda_{i0} &= l_{i0}/L_0 \end{aligned}$$

Labour productivity growth can be decomposed into within-sector versus reallocation effects based on the reallocation of either employment or output. Our decomposition is based on the reallocation of employment, consistent with the literature surveyed above and our interest in the changing sectoral composition of employment.

The *within-sector effect* on labour productivity growth is represented by the left-hand bracketed term in Equation 2, that is:

$$\xi_w = \sum[\theta_{i0}(g_i - n_i)] \quad (3)$$

In other words, the within-sector effect is the difference between sectoral value-added growth and employment growth weighted by the output share of the sector, holding constant employment reallocation among sectors. In this sense, positive within-sector effects result when sectoral value-added grows faster than sectoral employment.

Leaving aside the term q_1/q_0 for the moment, the *reallocation effect* on labour productivity growth is represented by the right-hand bracketed term in Equation 2, that is:

$$\xi_r = \sum[(\theta_{i0} - \lambda_{i0})n_i] \quad (4)$$

The reallocation effect is the difference between sectoral output and employment shares multiplied by sectoral employment growth, holding constant labour productivity growth within sectors. Positive reallocation effects result when sectoral employment grows in sectors for which the difference between sectoral output and employment shares is positive, that is, in sectors with above average labour productivity.¹⁰ The greater the difference in labour productivity among sectors, the larger the potential increases in aggregate labour productivity through reallocation effects, providing employment shifts from less to more productive sectors.

The interaction term is represented by q_1/q_0 , the result of first-order differencing in discrete time steps, while the *interaction effect* is the difference between aggregate labour productivity growth and the sum of within-sector and reallocation effects.¹¹ This effect captures the interaction between within-sector and reallocation effects, such as the reallocation of labour to sectors with growing labour productivity.

¹⁰ In this sense, the method we use is not vulnerable to the concern raised by Timmer and de Vries that “In the traditional procedure, all expanding sectors contribute positively to productivity growth, even though they have below-average productivity levels” (Timmer and de Vries, 2009, p. 170).

¹¹ Note that in Ocampo, Rada and Taylor (2009), the interaction term takes the form of $(1 + n_i)^{-1}$ outside of the summation operator in Eq. 2, but that within-sector and reallocation effects are identical to Eqs. 3 and 4.

We also address sectoral contributions to aggregate employment growth, defined as each sector's employment growth weighted by its share of employment. Aggregate employment growth can be expressed correspondingly as:

$$\varphi = (L1-L0)/L0 = \sum n_i \lambda_i \dot{\lambda}_i \quad (5)$$

Note that we define labour productivity in terms of employment rather than more precisely in terms of working hours, as data for the latter are of limited availability. Nor do we address total factor productivity (TFP). Here too there are data constraints, particularly for developing countries, but more fundamental are concerns about whether TFP is a meaningful notion in this context.¹²

One important limitation of the analysis is that while it enables the comparison of the structural characteristics of faster and slower growing countries, it does not provide estimates of what growth would be nor of the sustainability of growth in the face of counterfactual structural characteristics. For example, though we typically find low contributions from agriculture to aggregate labour productivity, for poorer developing countries there are reasons to believe that growth would be higher and more sustainable if contributions from agriculture were higher (Timmer, 1988). As another example, it may be that manufacturing-led growth is more sustainable than services-led growth, but the analysis does not directly address such dynamics.

Timmer and de Vries (2009) further argue that the method embodied in the above equations is limited in that it assumes that shifts of workers among sectors do not affect the labour productivity of these sectors and, related, that it assumes constant returns to scale. We do not necessarily regard these as limitations, however, for these assumptions are consistent with the theory that motivates our analysis. In particular, Kaldor viewed reallocation effects resulting solely from productivity differences among sectors as worthy of consideration in their own right, if only to illustrate their lesser importance compared to the effects *induced* by reallocation. For Kaldor, these induced effects include static and dynamic economies of scale within sectors and macro economies of scale across sectors, as well as increased labour productivity in agriculture resulting from the reduction of surplus labour. These effects are difficult if not impossible to measure separately from within-sector effects *not* induced by reallocation. For both theoretical and practical reasons, then, we view the method as appropriate.

Timmer and de Vries also point out that the measurement of value-added in services is notoriously problematic and indeed was the subject of a conference and edited volume in the early-1990s (Griliches, 1992) as well as of more recent papers (e.g., Li and Prescott, 2009 and Foley, 2011). In short, value-added for many service activities (e.g., financial, business, education and government services) is not estimated directly but rather imputed either from an index of inputs or from income, creating systematic and potentially large measurement errors. To give a flavor of these problems and their implications for measuring productivity growth, Griliches writes that “a number of service industries series are deflated by makeshift deflators, and real output is assumed to grow proportionately to some measure of input and to lead to no observed productivity growth by definition” (ibid., p. 6-7). In this sense, service sector results need to be interpreted with special caution.

¹² Cf. Ocampo, Rada and Taylor (2009, p. 5) regarding data limitations and Lipsey and Carlaw (2000) regarding the meaning of TFP. In the conclusion of their critical survey of TFP, Lipsey and Carlaw write: “TFP is as much a measure of our ignorance as it is a measure of anything positive. It seems to us that, whatever TFP does measure – and there is cause for concern as to how to answer that question – it emphatically does not measure all of technological change. In the long term, we are interested in increases in output per unit of labour, resources and waiting (in the Austrian sense of the term)” (ibid., p. 43).

The ILO's LABORSTA database is the source of employment data and United Nations Statistics Division the source of value-added data for 75 of the 81 countries in our sample. Employment and value-added data for six additional countries (Argentina, Columbia, Peru, India, Singapore and Taiwan (China)) are from the Groningen Growth and Development Center (GGDC) (Timmer and de Vries, 2009). Value added is measured in national currencies at constant 1990 prices. Both the ILO's and GGDC's employment data include self-employment, but do not capture all of informal employment (ILO, 2011; Timmer and de Vries, 2009). One implication is that what appears in the data as a decline in employment may actually reflect a movement from formal to informal employment, with attendant implications for the measurement of labour productivity growth.

Employment and value-added data are matched at the most detailed level possible, resulting in the following seven-sector breakdown:

- i. Agriculture, hunting, forestry, fishing
- ii. Mining, utilities
- iii. Manufacturing
- iv. Construction
- v. Wholesale & retail trade, restaurants, hotels
- vi. Transport, storage, communication
- vii. Other services

Our sectoral breakdown is broadly similar to that of prior studies, facilitating comparison among them. To further facilitate comparison, we also present results for industry as a whole – the sum of sectors (ii) through (iv) – and for services as a whole – the sum of sectors (v) through (vii). It should be noted for all studies, though, that the measure of within-sector versus reallocation effects depends on the level of data aggregation. That is, what are identified as within-sector effects at higher levels of aggregation may be identified as reallocation effects at lower levels of aggregation.¹³

Our main reservation with our sectoral breakdown is the heterogeneity of “Other services”, which groups three broad types of service activities: (a) Finance, insurance, real estate and business services (FIRE); (b) Community, social and personal services; and (c) Activities not adequately defined, as per the United Nations Statistics Division data on value-added. That is, “Other services” combines some of the most advanced services, e.g., FIRE, with some of the least, e.g., domestic service. Leaving aside the measurement issues noted above, we would expect this sector's contribution to aggregate labour productivity growth to be driven mainly by FIRE on the assumption that these activities have greater dynamic potential, and we interpret these results accordingly. It is more difficult, however, to make an analogous assumption regarding this sector's contribution to aggregate employment growth, given the persisting importance of traditional services as a source of employment growth.

In order to get a sense of change over time, we follow Pieper (2000) in splitting the data into two periods, 1984 to 1998 and 1999 to 2008. We chose the breakpoint as it roughly divides the data into periods of slower global growth up to the Asian crisis and more rapid global growth up the post-2008 crisis, while allowing a fair number of observations for each period. It turns out that that our main results are quite similar for the two periods and so are not particularly sensitive to the breakpoint. The full range of years

¹³ For example, what are identified as within-sector effects for the manufacturing sector may result from the reallocation of employment from less to more productive manufacturing sub-sectors, say from apparel to machinery.

is not available for all countries, as detailed in the Appendix on Data Notes. Regional country groups follow the ILO's *Global Employment Trends* report, with the exception that our developed countries group is limited to the EU 15 and Malta rather than the EU at large (ILO, 2012). In our discussion of results for developing countries, we focus on Latin America-Caribbean (LAC) and Asia, as we have data for only three countries in the Middle East-North Africa (MENA) and only two in Sub-Saharan Africa (SSA).

4 Results

3.1 Jobless growth and the labour productivity-employment relationship

Results of our decomposition analysis are usefully viewed in the context of patterns of aggregate labour productivity, output, and employment growth. These are shown in Table 2, based on regional averages (unweighted) of growth rates for the 1984 to 1998 and 1999 to 2008 periods as well as differences between the two periods.¹⁴ Taking all countries together, growth rates were higher for each of the three measures in the more recent period. For developed countries, in contrast, labour productivity and output growth were lower in the more recent period – indeed well below the average for all countries – though employment growth was higher. Reflecting their vast restructuring, the countries of Central and Southeast Europe and the CIS had much higher rates of productivity and output growth in the more recent period, though employment growth remained well below the average for all countries. Between our two main developing regions, output growth was a good deal higher in Asia than in LAC but the difference in labour productivity growth was greater yet, resulting in lower employment growth in Asia than in LAC. These differences held for both periods, and also worth noting is the lower employment growth in the more recent period for both regions.¹⁵

Table 2: Aggregate productivity, output and employment growth by regional average (% unweighted)

	Productivity growth			Output growth			Employment growth		
	1984–1998	1999–2008	D	1984–1998	1999–2008	D	1984–1998	1999–2008	D
All countries	1.6	2.5	0.9	3.0	4.2	1.2	1.3	1.6	0.3
Developed countries	1.8	1.1	-0.7	2.9	2.7	-0.2	1.1	1.6	0.5
C & SE Europe, CIS	0.4	5.0	4.6	-0.3	5.8	6.1	-0.7	0.8	1.5
Developing countries	2.0	2.3	0.3	4.3	4.4	0.1	2.3	2.1	-0.2
Asia	3.4	3.8	0.5	5.5	5.7	0.2	2.1	1.8	-0.2
LAC	0.6	1.2	0.5	3.2	3.5	0.3	2.6	2.4	-0.3
MENA	NA	2.2	NA	NA	4.5	NA	NA	2.2	NA
SSA	NA	3.0	NA	NA	4.1	NA	NA	1.2	NA

Note: D refers to 'Difference' between the two periods.

¹⁴ Note that data are missing for some countries in either the 1984 to 1998 or 1999 to 2008 period (cf. Table 4), and these differences in country samples between periods can affect regional averages, as in Table 2, as well as correlation coefficients, as in Table 3. To address this potential problem, all relevant analyses were done for the full sample of countries as well as the restricted sample of countries with data for both periods, and in no case did this substantively affect results. Throughout the paper, therefore, only results with full samples of countries are shown. Results from restricted samples of countries are available from the authors on request.

¹⁵ Country-level results are available from the authors on request.

Table 3: Correlation coefficients (Pearson) between aggregate productivity, output and employment growth

Developed countries						
	1984-1998			1999-2008		
	Productivity	Output	Employment	Productivity	Output	Employment
Productivity	1.00	0.48	-0.12	1.00	0.60	-0.05
Output		1.00	0.81		1.00	0.77
Employment			1.00			1.00

Developing countries						
	1984-1998			1999-2008		
	Productivity	Output	Employment	Productivity	Output	Employment
Productivity	1.00	0.88	-0.36	1.00	0.88	-0.40
Output		1.00	0.12		1.00	0.08
Employment			1.00			1.00

These patterns suggest the possibility of trade-off between labour productivity and employment growth, and indeed this is confirmed by sizeable negative correlations between these measures for developing – but not developed – countries. This held for both periods, as shown in Table 3, which shows correlation coefficients (Pearson) among the three aggregate measures.¹⁶ Consistent with this, there were for both periods strong positive correlations between output and employment growth for developed countries and only weak correlations for developing countries, suggesting that jobless growth is more of a problem for developing than developed countries.

“Socially sustainable” employment growth is defined by Pieper as equal to or greater than three per cent, the estimated growth rate of the labour force in developing countries (2000, p. 90). We evaluate this by looking at the difference between a country’s employment growth with the growth of its working age (15 to 64) population and labour force. These differences are shown at the country level in Table 4, with negative values (marked in dark blue) indicating that employment growth was lower than working age population or labour force growth. In Pieper’s parlance, these negative gaps represent situations that are not “socially sustainable” (2000).

Worth noting is that even though developed countries grew more slowly in the more recent period, there were fewer negative gaps in this than the earlier period. Also striking is the comparison of Asia and LAC, with a higher share of negative gaps for the former than the latter. Looked at this way, the phenomenon of jobless growth was more a characteristic of dynamic Asia than LAC. As regards the gap with labour force growth, fast-growing India had the largest negative gaps in Asia, and we also see negative gaps of similar magnitude in Peru, Morocco, and South Africa.

¹⁶ We focus on samples of developed and developing countries rather than the sample of all countries, for the last includes the countries of Central and Southeast Europe and the CIS for which there are a number of extreme values.

Table 4a: Aggregate employment, working age population and labour force growth by country (%)

	Employment growth		Pop. growth, 15-64		Difference		Labour Force Growth		Difference	
	84-98	99-08	84-98	99-08	84-98	99-08	84-98	99-08	84-98	99-08
	Developed									
Australia	2.0	2.3	1.4	1.5	0.6	0.8	1.9	2.0	0.2	0.3
Austria	0.7	1.0	0.4	0.5	0.3	0.5	1.0	1.1	-0.3	-0.1
Belgium	0.7	1.3	0.1	0.5	0.6	0.8	0.5	1.2	0.2	0.1
Canada	1.4	2.0	1.1	1.2	0.3	0.8	1.3	1.7	0.0	0.3
Denmark	0.6	0.5	0.3	0.2	0.3	0.3	0.3	0.4	0.3	0.1
Finland	-0.6	1.3	0.3	0.3	-0.8	1.0	-0.1	0.7	-0.5	0.5
France	0.3	1.1	0.4	0.6	-0.1	0.4	0.4	1.0	-0.1	0.1
Germany	-0.7	0.8	0.3	-0.3	-1.0	1.1	0.8	0.5	-1.5	0.3
Greece	0.9	1.3	1.0	0.3	-0.1	1.0	1.3	0.8	-0.4	0.5
Iceland	1.1	2.0	1.1	1.9	0.0	0.1	1.3	1.9	-0.2	0.1
Ireland	2.2	3.5	1.1	2.1	1.1	1.4	1.5	3.2	0.8	0.3
Israel	3.3	2.6	3.0	2.1	0.3	0.5	3.5	3.0	-0.2	-0.4
Italy	0.3	1.3	0.1	0.2	0.1	1.1	0.1	0.9	0.2	0.4
Japan	0.9	-0.3	0.5	-0.4	0.4	0.2	1.0	-0.2	-0.1	-0.1
Luxembourg	3.1	3.7	0.8	1.5	2.3	2.2	1.0	2.2	2.1	1.5
Malta	NA	1.3	0.8	1.1	NA	0.2	1.0	1.7	NA	-0.4
Netherlands	2.6	1.2	0.6	0.4	2.0	0.9	1.5	1.4	1.1	-0.1
New Zealand	1.0	2.4	1.2	1.4	-0.2	1.0	1.1	2.0	-0.2	0.4
Norway	0.8	1.2	0.6	1.0	0.3	0.2	0.8	1.0	0.0	0.2
Portugal	1.4	0.7	0.5	0.4	0.9	0.3	0.7	1.0	0.8	-0.3
Spain	1.9	3.7	0.7	1.4	1.2	2.3	1.1	2.9	0.8	0.8
Sweden	-0.5	1.5	0.4	0.7	-0.8	0.8	0.0	1.1	-0.5	0.4
Switzerland	0.8	1.2	0.6	0.8	0.2	0.4	0.7	1.0	0.1	0.2
United Kingdom	0.7	0.8	0.2	0.7	0.5	0.1	0.5	0.9	0.2	-0.1
United States	1.6	1.0	1.0	1.2	0.6	-0.1	1.4	1.0	0.2	0.1
C & SE Europe , CIS										
Azerbaijan	0.1	1.0	1.3	1.9	-1.2	-0.9	1.2	2.1	-1.0	-1.1
Bulgaria	-2.8	0.8	-0.5	-0.5	-2.3	1.3	-1.5	0.0	-1.3	0.8
Croatia	NA	0.6	-0.3	-0.2	NA	0.8	-0.4	-0.1	NA	0.7
Cyprus	2.7	4.0	1.4	1.8	1.4	2.2	1.6	2.4	1.1	1.7
Czech Republic	0.0	0.3	0.5	0.4	-0.5	-0.1	0.4	0.2	-0.4	0.1
Estonia	-3.7	0.8	-0.7	-0.1	-3.1	0.9	-1.6	0.4	-2.1	0.4
Georgia	NA	-0.1	-0.6	-0.7	NA	0.6	-0.5	-0.7	NA	0.6
Hungary	-1.6	0.5	0.0	-0.1	-1.6	0.6	-1.2	0.5	-0.3	0.0
Kazakhstan	NA	2.3	0.0	1.1	NA	1.2	0.1	1.2	NA	1.1
Kyrgyzstan	-0.2	2.5	1.5	2.0	-1.8	0.5	1.6	2.3	-1.9	0.2
Latvia	NA	1.4	-0.6	-0.2	NA	1.6	-1.7	0.6	NA	0.8
Lithuania	NA	0.2	0.0	-0.1	NA	0.4	-0.5	-0.6	NA	0.8
Moldova	NA	-1.9	0.1	-0.6	NA	-1.3	-0.5	-2.7	NA	0.7
Poland	-1.0	0.0	0.6	0.4	-1.6	-0.5	-0.3	0.2	-0.6	-0.3
Romania	-0.4	-1.4	0.2	-0.2	-0.6	-1.2	0.3	-1.7	-0.7	0.3
Russia	-2.2	2.0	0.3	0.2	-2.5	1.8	-0.6	0.6	-1.6	1.3
Slovakia	NA	1.0	0.7	0.7	NA	0.4	0.0	0.7	NA	0.4
Turkey	1.3	0.1	2.6	1.9	-1.3	-1.8	2.1	1.0	-0.7	-0.9

Table 4b: Aggregate employment, working age population and labour force growth by country (%)

	Employment growth		Pop. growth, 15-64		Difference		Labour Force Growth		Difference	
	84-98	99-08	84-98	99-08	84-98	99-08	84-98	99-08	84-98	99-08
Asia										
China	1.0	1.2	1.7	1.3	-0.6	-0.2	1.7	0.9	-0.7	0.3
Hong Kong, China	1.6	1.2	1.7	1.1	-0.1	0.1	1.3	1.3	0.3	-0.1
India	2.5	0.7	2.3	2.1	0.2	-1.4	2.1	1.9	0.4	-1.2
Indonesia	2.0	1.6	2.4	1.7	-0.4	-0.2	2.9	2.3	-0.8	-0.8
Korea, Republic Of	2.4	1.7	1.7	0.6	0.7	1.1	2.4	1.1	0.0	0.6
Malaysia	3.6	2.4	3.2	2.6	0.3	-0.2	3.5	2.7	0.0	-0.3
Mongolia	1.1	2.8	2.3	2.8	-1.2	0.0	2.4	2.7	-1.3	0.1
Myanmar	1.5	NA	2.5	1.5	-0.9	NA	2.4	0.9	-0.9	NA
Pakistan	2.3	3.1	2.8	3.2	-0.5	-0.1	2.7	3.8	-0.4	-0.7
Philippines	2.4	2.0	2.8	2.5	-0.4	-0.6	3.0	2.2	-0.6	-0.2
Singapore	3.1	2.3	2.7	2.5	0.4	-0.2	3.0	2.8	0.1	-0.5
Taiwan, China	1.7	1.0	1.0	0.5	0.7	0.5	NA	NA	NA	NA
Thailand	1.6	1.6	2.1	1.3	-0.5	0.3	1.6	1.3	0.0	0.3
Vietnam	NA	2.3	2.7	2.4	NA	-0.2	2.5	2.1	NA	0.2
LAC										
Argentina	0.9	1.8	1.5	1.3	-0.6	0.4	1.7	2.1	-0.8	-0.3
Bahamas	3.5	1.7	2.5	1.7	1.0	0.0	2.8	2.1	0.7	-0.3
Barbados	1.1	1.8	0.7	0.7	0.4	1.2	1.1	0.7	0.0	1.1
Bolivia	1.5	2.7	2.4	2.5	-1.0	0.2	2.7	2.7	-1.2	0.0
Brazil	NA	2.8	2.4	1.7	NA	1.1	3.0	2.3	NA	0.5
Chile	3.6	2.2	1.8	1.7	1.7	0.5	2.7	2.5	0.9	-0.3
Colombia	2.7	3.1	2.5	2.1	0.2	1.0	3.2	2.7	-0.5	0.4
Costa Rica	3.2	4.3	2.9	2.8	0.3	1.6	4.0	3.1	-0.8	1.2
Cuba	NA	1.4	1.1	0.4	NA	1.1	1.4	0.7	NA	0.7
Dominican Republic	NA	2.3	2.4	2.0	NA	0.3	2.7	2.2	NA	0.1
El Salvador	NA	1.3	1.9	1.0	NA	0.3	2.1	1.0	NA	0.3
Jamaica	1.0	2.1	1.3	1.0	-0.3	1.1	0.8	0.5	0.2	1.6
Mexico	NA	1.7	2.8	1.7	NA	0.0	3.4	2.0	NA	-0.3
Nicaragua	4.3	4.5	2.8	2.4	1.4	2.1	3.1	2.9	1.2	1.6
Panama	3.5	3.6	2.7	2.1	0.8	1.5	3.6	2.7	-0.1	0.9
Peru	2.0	1.1	2.6	1.9	-0.6	-0.8	3.0	2.3	-1.0	-1.2
Puerto Rico	2.8	0.6	1.3	0.6	1.6	0.0	2.4	0.6	0.5	0.0
Trinidad and Tobago	2.6	2.2	1.3	1.4	1.3	0.9	1.5	1.9	1.1	0.3
Venezuela	4.3	3.2	2.8	2.4	1.5	0.8	3.7	3.0	0.6	0.2
MENA										
Egypt	0.9	3.3	2.7	2.8	-1.7	0.5	2.5	2.5	-1.6	0.8
Morocco	NA	1.1	2.6	2.1	NA	-1.0	2.8	1.9	NA	-0.7
Saudi Arabia	NA	2.3	3.9	3.4	NA	-1.1	4.3	1.4	NA	0.9
SSA										
Mauritius	NA	0.8	1.5	1.2	NA	-0.4	1.9	1.1	NA	-0.3
South Africa	NA	1.6	3.0	2.0	NA	-0.4	3.7	2.8	NA	-1.2

3.2 Sectoral drivers of aggregate labour productivity and employment growth

Based on our decomposition analysis, we turn to the question of which sectors have driven aggregate labour productivity and employment growth and how this differed among regions and over time. We first address this by looking at the covariance (expressed in percentages) between sectoral contributions to aggregate labour productivity growth – based on the sectoral components of Equation 2 combining within-sector, reallocation and interaction effects – and aggregate labour productivity growth itself. These are shown in Table 5 for the 1984 to 1998 and 1999 to 2008 periods for the samples of developed and developing countries. Below results for the seven sectors are results for industry as a whole – summing results from mining, utilities, manufacturing and construction – and services as a whole – summing results from the three service sectors. The rows for industry and services are shaded, as are the rows for agriculture, hunting, forestry, and fishing, and together the three shaded rows represent the aggregate economy.

Table 5: Covariance coefficients between sectoral contributions to aggregate labour productivity growth and aggregate labour productivity growth (%)

	Developed		Developing	
	1984-1998	1999-2008	1984-1998	1999-2008
Agriculture, hunting, forestry, fishing (ISIC A-B)	-1.7	6.2	10.7	10.0
Mining, utilities (ISIC C,E)	5.1	5.5	0.0	6.3
Manufacturing (ISIC D)	46.3	44.2	37.4	28.1
Construction (ISIC F)	0.7	1.4	5.8	3.2
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	8.0	27.8	11.6	14.5
Transport, storage, communication (ISIC I)	9.7	21.6	4.0	11.6
Other services (ISIC J-P)	31.8	-6.6	32.1	27.4
Industry (ISIC C-F)	52.2	51.0	43.2	37.7
Services (ISIC G-P)	49.5	42.8	47.7	53.5

Note: Totals for developing countries do not sum exactly to 100 because data on mining and utilities is missing for China.

For developed countries at the seven-sector level, manufacturing accounts for more of the variance in aggregate labour productivity growth than any other sector (around 45 per cent for both periods). For developing countries, manufacturing also accounts for more than any other sector, but other services accounts for nearly as much, especially in the more recent period. Agriculture accounts for about 10 per cent of the variance in aggregate labour productivity in both periods, more than either mining and utilities or construction. For developed countries at the three-sector level, industry accounts for somewhat more of the variance in aggregate labour productivity growth than services, especially in the more recent period (51 compared to 43 per cent). For developing countries, in contrast, services accounts for somewhat more of the variance in aggregate labour productivity growth in the earlier period (48 compared to 43 per cent for industry) and a good deal more in the more recent period (54 compared to 38 per cent for industry). Looked at this way, in sum, we see that services are as just as important as industry in accounting for aggregate labour productivity growth in developing countries.

Another way of addressing these issues is by comparing regional averages (unweighted) for the 1984 to 1998 and 1999 to 2008 periods of each sector's contribution to aggregate labour productivity growth –

as in Table 5 based on the sectoral components of Equation 2 – as well as each sector’s contribution to aggregate employment growth – based on the sectoral components of Equation 5.¹⁷ Following Pieper (2000), sectoral values from these equations are expressed as percentages by dividing by the absolute value of total labour productivity or employment growth and multiplying by 100, based on period averages. In some cases, period averages for total labour productivity and especially employment growth are nearly zero, resulting in problematically high sectoral values. To dampen the effects of such outliers while maintaining country samples and information on variation among sectors, we capped each sector’s maximum contribution to total labour productivity or employment growth at 200 per cent, and adjusted other sectors’ per cent contributions accordingly to maintain proportionality among sectors. We chose the threshold of 200 as there are a good number of sectoral values above 100 but quite few above 200.

Regional-level results are shown in Table 6. Below results for the seven sectors are results for industry as a whole and services as a whole, and together with agriculture, hunting, forestry, and fishing the three shaded rows represent the aggregate economy, as in Table 5. At the seven-sector level, manufacturing contributed more to aggregate labour productivity growth than any other sector, for all regions in both periods. At the three-sector level, however, results are more nuanced, particularly regarding the comparison of industry and services. For developed countries in both periods, the contribution of industry to was not much greater than that of services (36 compared to 26 per cent in the more recent period). For developing countries in both periods, the contribution of industry was much higher than for services (55 compared to 14 per cent in the more recent period). This pattern held even more strongly for LAC (56 compared to *minus* 9 per cent in the more recent period), but industry and services contributed more or less equally to labour productivity growth in Asia (46 compared to 48 per cent in the more recent period).

That is, for the most dynamic region in the world we find evidence that services and industry played equally important roles in contributing to aggregate labour productivity growth. Note that results in Table 6 suggest a weaker contribution of services to aggregate labour productivity growth for developing countries and particularly for LAC than results in Table 5. This arises because of the large negative *percentage* values for services for a number of LAC countries, resulting from nearly zero total labour productivity growth in these countries, even though these percentages were capped at 200 in the construction of Table 6, as noted above. It is on these grounds that we regard results in Table 5 as more definitive.

¹⁷ Results on each sector’s contribution to output growth are available from authors on request.

Table 6a: Industry-level contributions to labour productivity and employment growth by regional average (% , unweighted) 1984-1998

	All countries	Developed countries	C & SE Europe, CIS	Developing countries	Asia	LAC	MENA	SSA
Average contribution to labour productivity growth								
Agriculture, hunting, forestry, fishing (ISIC A-B)	6.0	14.5	-2.7	2.2	-9.8	9.6	NA	NA
Mining, utilities (ISIC C,E)	13.9	8.7	-8.1	26.6	15.2	38.4	NA	NA
Manufacturing (ISIC D)	35.8	32.5	27.2	41.9	37.4	46.6	NA	NA
Construction (ISIC F)	-1.5	2.6	6.8	-8.2	-5.5	-11.1	NA	NA
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	3.5	6.5	0.2	2.2	10.6	-6.1	NA	NA
Transport, storage, communication (ISIC I)	15.6	17.9	3.8	18.2	8.8	27.7	NA	NA
Other services (ISIC J-P)	-2.3	17.3	-1.9	-19.3	29.9	-66.2	NA	NA
Industry (ISIC C-F)	48.2	43.8	26.0	60.4	47.1	73.9	NA	NA
Services (ISIC G-P)	16.7	41.7	2.0	1.1	49.4	-44.6	NA	NA
Average contribution to employment growth								
Agriculture, hunting, forestry, fishing (ISIC A-B)	-8.2	-24.3	-10.3	6.5	22.4	0.5	NA	NA
Mining, utilities (ISIC C,E)	-2.1	-3.0	-6.9	0.4	1.3	-1.0	NA	NA
Manufacturing (ISIC D)	-18.4	-19.4	-70.1	2.9	4.2	1.3	NA	NA
Construction (ISIC F)	4.4	3.2	-11.8	11.7	10.3	12.3	NA	NA
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	31.5	23.3	58.3	28.1	27.8	25.4	NA	NA
Transport, storage, communication (ISIC I)	4.0	2.8	-8.8	10.0	8.8	11.0	NA	NA
Other services (ISIC J-P)	54.5	89.9	13.1	40.4	25.3	50.5	NA	NA
Industry (ISIC C-F)	-16.1	-19.2	-88.8	15.0	15.7	12.6	NA	NA
Services (ISIC G-P)	90.0	116.0	62.6	78.5	62.0	86.9	NA	NA

Table 6b: Industry-level contributions to labour productivity and employment growth by regional average (% , unweighted) 1999-2008

	All countries	Developed countries	C & SE Europe, CIS	Developing countries	Asia	LAC	MENA	SSA
Average contribution to labour productivity growth								
Agriculture, hunting, forestry, fishing (ISIC A-B)	9.7	12.1	22.0	2.1	6.6	-4.6	5.5	30.0
Mining, utilities (ISIC C,E)	8.9	1.5	5.5	15.6	6.8	21.1	20.5	8.9
Manufacturing (ISIC D)	42.6	46.4	29.8	46.3	40.9	49.9	62.8	21.8
Construction (ISIC F)	-7.8	-12.2	-3.9	-6.8	-1.3	-14.8	17.0	-2.2
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	-1.4	-12.4	8.3	1.4	14.7	-9.5	12.0	2.7
Transport, storage, communication (ISIC I)	22.7	29.4	21.9	18.5	14.4	20.0	23.2	24.1
Other services (ISIC J-P)	1.2	9.1	5.3	-6.1	18.4	-19.6	-41.1	14.9
Industry (ISIC C-F)	43.7	35.7	31.4	55.1	46.4	56.3	100.3	28.4
Services (ISIC G-P)	22.5	26.1	35.5	13.8	47.5	-9.2	-5.8	41.6
Average contribution to employment growth								
Agriculture, hunting, forestry, fishing (ISIC A-B)	-15.4	-7.9	-60.3	1.5	2.8	3.8	19.5	-56.6
Mining, utilities (ISIC C,E)	-1.5	0.3	-9.3	0.6	2.0	1.0	-0.6	-8.9
Manufacturing (ISIC D)	-7.6	-21.0	-2.0	-1.2	5.1	-1.0	0.6	-47.5
Construction (ISIC F)	15.1	8.7	31.2	11.7	7.1	12.0	14.9	35.1
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	29.8	22.1	42.5	28.8	30.7	26.9	12.8	57.7
Transport, storage, communication (ISIC I)	5.6	3.8	2.5	8.2	7.1	7.5	12.1	16.7
Other services (ISIC J-P)	61.5	86.1	50.2	50.4	45.4	49.8	40.7	103.6
Industry (ISIC C-F)	6.0	-12.0	19.9	11.1	14.1	12.0	14.9	-21.3
Services (ISIC G-P)	96.9	111.9	95.3	87.4	83.3	84.2	65.6	178.0

In the majority of LAC countries, industry contributed positively to labour productivity growth in both periods, though no clear pattern emerges for agriculture and services. Focusing more narrowly on what Ocampo, Rada and Taylor categorize as the semi-industrialised LAC countries of Argentina, Brazil, Chile, Colombia, Mexico and Venezuela, some commonalities do emerge for the 1999 to 2008 period. Services made either a small or negative contribution to labour productivity growth in these countries, with Mexico the exception. We also find that agriculture in this more recent period contributed positively to labour productivity growth in these countries, with Colombia the exception. These findings for semi-industrialised LAC countries are broadly consistent those of Ocampo, Rada and Taylor (2009) and Timmer and de Vries (2009).

Regarding sectoral contributions to employment growth at the regional level, the picture is clear if unsurprising: the contribution of services was far more important than that of industry or agriculture for all regions in both periods (Table 6). Within services, the contribution of transport, storage and communication to employment growth was generally much less important than that of the other two service sectors, that is, wholesale and retail trade, restaurants, hotels; and other services. For developed countries, the contribution of agriculture and industry to employment was negative for both periods. Within industry, this was driven by negative contributions from manufacturing in both periods. For developing countries, the contributions of agriculture and industry – though much smaller than that of services – was positive for both periods. Within industry, this positive contribution was driven more by construction than by manufacturing or mining and utilities, and these patterns held for the Asia and LAC regions as well.

At the country level for Asia and LAC, we find that for the vast majority of countries, the contribution of services was more important than that of industry or agriculture (Tables 7 and 8). One notable exception is India, where the contribution of agriculture to employment growth exceeded services in both periods. The contribution of industry to employment growth, though much smaller than that of services, was positive in most Asian and LAC countries in both the 1984 to 1998 and 1999 to 2008 periods. However, there were marked differences in whether manufacturing or construction drove this result. During the more recent period in China, for example, the positive contribution of industry to employment growth was driven by construction, offsetting a negative contribution by manufacturing. Conversely in Singapore and Taiwan (China), the positive contribution of industry was driven by manufacturing. Among LAC countries in the more recent period, construction contributed more to employment growth than manufacturing in the majority of countries, while the reverse held for Bolivia, Brazil and Colombia.

Table 7a: Industry-level contributions to labour productivity and employment growth for Asian countries (%) 1984-1998

	China	Hong Kong, China	India	Indonesia	Korea, Rep. of	Malaysia	Mongolia	Myanmar	Pakistan	Philippines	Singapore	Taiwan, China	Thailand	Vietnam
Asia & Pacific														
Average contribution to labour productivity growth														
Agriculture, hunting, forestry, fishing (ISIC A-B)	7.4	1.2	-3.7	24.2	17.8	8.3	-42.7	-226.5	16.4	23.2	0.5	8.3	11.9	NA
Mining, utilities (ISIC C,E)	NA	4.4	10.3	12.7	4.7	18.2	48.9	16.1	17.7	36.5	3.3	3.6	7.3	NA
Manufacturing (ISIC D)	55.6	28.4	21.4	45.9	41.0	42.2	12.8	-2.1	32.0	107.4	36.2	28.5	36.7	NA
Construction (ISIC F)	7.0	-1.0	3.7	3.4	8.2	-11.0	1.2	22.3	-5.7	-95.6	-2.2	-0.8	1.8	NA
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	3.9	6.2	19.3	4.5	-0.8	-7.6	20.4	18.3	15.1	14.6	13.9	17.0	15.6	NA
Transport, storage, communication (ISIC I)	5.2	3.3	11.5	1.4	7.6	14.0	18.8	35.2	10.6	-19.2	12.1	5.9	12.5	NA
Other services (ISIC J-P)	20.9	57.6	37.4	7.8	21.4	35.9	40.7	36.7	13.8	33.0	36.2	37.5	14.1	NA
Industry (ISIC C-F)	62.6	31.8	35.4	62.0	53.9	49.4	62.9	36.3	44.0	48.3	37.3	31.3	45.8	NA
Services (ISIC G-P)	30.0	67.1	68.2	13.7	28.2	42.3	79.9	90.2	39.5	28.4	62.2	60.4	42.2	NA
Average contribution to employment growth														
Agriculture, hunting, forestry, fishing (ISIC A-B)	28.8	-3.1	44.3	-13.4	-24.7	6.9	166.1	84.0	30.7	12.0	-1.3	-22.6	-16.3	NA
Mining, utilities (ISIC C,E)	NA	1.0	1.5	1.9	-1.5	0.7	12.5	-0.2	-0.1	0.5	-0.7	-1.4	0.9	NA
Manufacturing (ISIC D)	1.3	-86.8	18.1	19.1	15.4	29.8	-18.3	6.8	0.7	11.4	13.4	6.7	36.8	NA
Construction (ISIC F)	15.3	18.2	6.8	12.2	12.1	5.5	0.7	3.5	11.0	9.7	9.0	17.5	12.3	NA
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	33.5	65.2	12.6	40.8	40.7	21.6	15.3	3.9	19.2	22.5	18.7	38.1	29.8	NA
Transport, storage, communication (ISIC I)	8.9	24.7	4.7	13.6	8.6	5.6	5.8	-1.7	8.1	11.9	13.7	5.5	5.4	NA
Other services (ISIC J-P)	12.2	80.8	12.0	25.9	49.5	29.8	-82.1	3.7	30.5	32.1	47.1	56.2	31.0	NA
Industry (ISIC C-F)	16.6	-67.6	26.4	33.2	26.0	36.0	-5.1	10.1	11.6	21.6	21.7	22.8	50.0	NA
Services (ISIC G-P)	54.6	170.7	29.3	80.3	98.8	57.0	-61.0	5.9	57.8	66.5	79.5	99.8	66.2	NA

Table 7b: Industry-level contributions to labour productivity and employment growth for Asian countries (%) 1999-2008

	China	Hong Kong, China	India	Indonesia	Korea, Rep. of	Malaysia	Mongolia	Myanmar	Pakistan	Philippines	Singapore	Taiwan, China	Thailand	Vietnam
Asia & Pacific														
Average contribution to labour productivity growth														
Agriculture, hunting, forestry, fishing (ISIC A-B)	10.4	-0.1	0.6	8.4	12.9	1.9	4.2	NA	-10.4	14.7	-0.4	11.6	11.4	21.2
Mining, utilities (ISIC C,E)	NA	3.0	3.9	1.0	3.7	7.8	14.8	NA	3.4	7.1	2.7	1.7	12.3	20.6
Manufacturing (ISIC D)	58.9	14.4	22.1	38.2	71.6	58.4	15.1	NA	30.8	32.7	53.8	38.9	69.3	27.5
Construction (ISIC F)	3.3	-0.9	7.0	2.7	-1.6	-7.1	-6.1	NA	-2.2	4.6	-8.2	-0.2	-6.6	-1.6
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	7.3	43.6	19.7	14.2	13.0	5.6	17.6	NA	15.2	10.7	28.5	13.3	-15.6	17.7
Transport, storage, communication (ISIC I)	6.9	15.5	20.0	13.8	11.2	10.1	37.7	NA	9.3	9.5	15.8	16.7	18.4	2.5
Other services (ISIC J-P)	13.3	24.4	26.7	21.8	-10.9	23.3	16.7	NA	54.0	20.7	7.8	18.1	10.8	12.2
Industry (ISIC C-F)	62.2	16.5	33.0	41.9	73.7	59.1	23.8	NA	32.0	44.4	48.3	40.4	75.0	46.5
Services (ISIC G-P)	27.5	83.5	66.4	49.8	13.3	39.0	72.0	NA	78.5	40.9	52.1	48.1	13.6	32.4
Average contribution to employment growth														
Agriculture, hunting, forestry, fishing (ISIC A-B)	-29.3	-0.3	52.1	13.3	-22.1	8.5	-6.1	NA	35.2	16.8	0.5	-35.4	-8.9	11.8
Mining, utilities (ISIC C,E)	NA	-0.9	2.6	3.0	0.8	1.3	13.9	NA	0.6	1.0	-0.1	-0.9	-1.2	3.4
Manufacturing (ISIC D)	-6.6	-48.1	-10.0	18.4	3.1	0.3	-3.7	NA	23.3	1.6	19.1	17.4	19.5	31.5
Construction (ISIC F)	22.3	-9.8	6.8	13.0	6.4	10.7	14.7	NA	6.2	4.4	-5.7	-11.9	13.0	21.9
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	12.8	48.8	31.0	29.9	3.7	31.5	46.0	NA	17.1	33.4	24.5	47.8	63.8	9.2
Transport, storage, communication (ISIC I)	3.3	7.2	3.1	13.8	18.8	5.4	5.1	NA	5.6	11.6	11.0	0.4	3.0	4.6
Other services (ISIC J-P)	97.5	103.0	14.4	8.5	89.3	42.2	30.1	NA	12.0	31.2	50.7	82.6	10.8	17.7
Industry (ISIC C-F)	15.7	-58.8	-0.6	34.4	10.3	12.3	24.9	NA	30.1	7.0	13.3	4.6	31.3	56.8
Services (ISIC G-P)	113.6	159.0	48.5	52.2	111.8	79.1	81.2	NA	34.7	76.2	86.2	130.8	77.6	31.5

Table 8a: Industry-level contributions to labour productivity and employment growth for LAC countries (%) 1984-1998

Latin America & Caribbean	Argentina	Bahamas	Barbados	Bolivia	Brazil	Chile	Colombia	Costa Rica	Cuba	Dominican Republic	El Salvador	Jamaica	Mexico	Nicaragua	Panama	Peru	Puerto Rico	Trinidad and Tobago	Venezuela
Average contribution to total productivity growth																			
Agriculture, hunting, forestry, fishing (ISIC A-B)	12.9	113.5	15.6	-101.7	NA	-2.3	37.1	33.8	NA	NA	NA	1,284.9	NA	-235.3	17.2	-33.7	4.6	87.2	6.5
Mining, utilities (ISIC C,E)	10.5	221.7	20.5	253.7	NA	29.6	38.3	8.0	NA	NA	NA	215.5	NA	5.2	14.7	36.2	7.1	-1.3	188.7
Manufacturing (ISIC D)	39.0	40.0	17.9	253.7	NA	12.4	16.6	44.0	NA	NA	NA	70.0	NA	148.4	-18.1	51.7	73.5	152.9	30.7
Construction (ISIC F)	14.2	372.4	-46.8	-22.9	NA	3.5	-7.0	-3.6	NA	NA	NA	-710.6	NA	-40.2	-22.8	68.4	-4.6	-32.2	-28.6
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	12.3	300.0	147.5	133.5	NA	15.2	-44.4	6.3	NA	NA	NA	-469.3	NA	3.3	-50.9	-25.3	10.4	-25.2	-168.9
Transport, storage, communication (ISIC I)	14.1	247.3	30.2	25.6	NA	8.4	9.9	23.1	NA	NA	NA	311.1	NA	39.6	17.3	25.7	12.0	158.5	-14.0
Other services (ISIC J-P)	-3.1	-1,394.8	-85.0	-441.8	NA	33.1	49.4	-11.6	NA	NA	NA	-601.6	NA	-21.1	-57.4	-22.9	-3.1	-239.8	-114.4
Industry (ISIC C-F)	63.7	634.1	-8.4	484.5	NA	45.5	47.9	48.4	NA	NA	NA	-425.1	NA	113.4	-26.2	156.3	76.0	119.4	190.8
Services (ISIC G-P)	23.3	-847.5	92.7	-282.7	NA	56.7	14.9	17.8	NA	NA	NA	-759.8	NA	21.8	-91.0	-22.5	19.3	-106.5	-297.3
Average contribution to total employment growth																			
Agriculture, hunting, forestry, fishing (ISIC A-B)	-8.7	-2.7	-21.1	48.7	NA	15.6	2.0	0.1	NA	NA	NA	-86.6	NA	44.5	0.6	23.0	-2.9	-8.1	2.8
Mining, utilities (ISIC C,E)	1.1	-0.5	-1.1	-21.1	NA	1.5	2.8	0.3	NA	NA	NA	0.7	NA	1.8	0.5	-1.1	1.4	-0.2	0.0
Manufacturing (ISIC D)	-33.0	2.2	-10.9	-12.5	NA	17.8	11.9	12.7	NA	NA	NA	-30.2	NA	7.6	11.7	7.8	5.7	12.4	15.3
Construction (ISIC F)	-3.3	12.5	38.8	1.0	NA	15.6	7.2	7.5	NA	NA	NA	36.0	NA	8.1	9.0	0.9	9.6	16.6	12.8
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	33.7	9.4	-9.4	17.2	NA	17.2	36.3	28.5	NA	NA	NA	60.6	NA	17.5	34.0	36.4	21.9	20.7	32.2
Transport, storage, communication (ISIC I)	20.6	10.2	0.7	27.9	NA	10.2	7.3	9.1	NA	NA	NA	39.2	NA	1.6	5.5	7.2	3.9	5.6	4.7
Other services (ISIC J-P)	89.6	68.9	103.1	38.8	NA	22.2	32.5	41.9	NA	NA	NA	80.5	NA	18.9	38.7	25.8	60.3	53.0	32.3
Industry (ISIC C-F)	-35.2	14.2	26.8	-32.6	NA	34.9	21.9	20.5	NA	NA	NA	6.5	NA	17.5	21.2	7.6	16.7	28.8	28.1
Services (ISIC G-P)	143.9	88.5	94.4	83.9	NA	49.6	76.1	79.5	NA	NA	NA	180.3	NA	38.0	78.2	69.4	86.1	79.3	69.2

Table 8b: Industry-level contributions to labour productivity and employment growth for LAC countries (%) 1999-2008

Latin America & Caribbean	Argentina	Bahamas	Barbados	Bolivia	Brazil	Chile	Colombia	Costa Rica	Cuba	Dominican Republic	El Salvador	Jamaica	Mexico	Nicaragua	Panama	Peru	Puerto Rico	Trinidad and Tobago	Venezuela
Average contribution to total productivity growth																			
Agriculture, hunting, forestry, fishing (ISIC A-B)	33.2	15.5	10.3	-219.6	45.2	23.3	-32.5	39.2	3.3	10.1	58.9	-39.2	44.7	-1,726.9	12.0	0.6	10.2	5.1	13.8
Mining, utilities (ISIC C,E)	24.0	-0.7	8.1	145.4	21.0	32.2	16.3	4.8	2.8	1.3	0.8	9.4	16.9	-71.0	15.0	23.5	-12.2	36.0	77.5
Manufacturing (ISIC D)	27.5	74.4	55.4	81.6	24.5	30.8	27.0	93.5	5.5	39.7	45.8	5.0	27.0	2,508.9	-7.1	29.5	98.9	48.4	62.0
Construction (ISIC F)	-25.2	-41.0	44.4	13.0	8.4	-2.8	1.7	-16.1	5.3	-1.0	-6.0	-20.5	-26.9	-1,236.6	-14.7	-0.6	-5.3	-2.2	-79.7
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	-72.9	40.7	22.6	145.6	-47.5	2.6	-100.6	-65.0	1.7	4.5	-15.6	-49.9	3.3	-210.1	-11.0	17.3	11.2	2.9	-35.2
Transport, storage, communication (ISIC I)	14.9	13.2	27.7	27.5	4.2	18.7	-1.8	58.7	11.0	63.0	27.1	25.9	33.0	289.7	66.1	11.3	18.7	8.6	-62.0
Other services (ISIC J-P)	-101.6	-2.1	-268.6	-93.5	44.2	-4.8	-10.0	-15.1	70.3	-17.5	-11.0	-30.7	2.1	346.1	39.7	18.4	-21.6	1.1	-76.4
Industry (ISIC C-F)	26.3	32.7	107.9	240.0	53.9	60.2	45.0	82.2	13.6	40.0	40.6	-6.1	17.0	1,201.3	-6.8	52.4	81.4	82.2	59.8
Services (ISIC G-P)	-159.6	51.8	-218.3	79.6	0.9	16.5	-112.4	-21.4	83.0	50.0	0.5	-54.7	38.4	425.7	94.8	47.0	8.3	12.6	-173.6
Average contribution to total employment growth																			
Agriculture, hunting, forestry, fishing (ISIC A-B)	-6.2	-8.4	-8.0	61.9	3.7	0.5	18.4	-3.0	1.2	3.2	-41.2	9.9	-21.4	37.4	5.5	40.8	-13.2	-13.5	4.9
Mining, utilities (ISIC C,E)	-2.3	4.3	0.2	-5.1	1.5	1.2	0.6	2.3	-1.0	2.0	1.3	3.2	0.9	-0.6	0.1	3.7	2.6	3.3	0.3
Manufacturing (ISIC D)	-4.9	4.1	-25.9	7.5	20.4	3.3	8.5	6.2	-5.4	-6.2	-0.2	-8.0	7.3	9.0	5.3	-2.5	-46.2	3.5	5.6
Construction (ISIC F)	15.6	28.1	5.7	2.6	3.7	10.0	3.4	10.5	3.3	6.9	12.0	14.1	23.7	15.5	16.6	-0.8	3.8	41.1	11.6
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	29.3	31.4	10.3	-15.6	26.7	25.0	41.6	35.9	26.1	28.6	69.9	28.7	40.3	14.9	29.5	17.9	28.8	21.5	20.7
Transport, storage, communication (ISIC I)	15.5	3.8	-0.1	8.7	5.6	9.8	8.9	9.8	15.7	9.0	6.4	11.3	5.7	4.5	9.9	6.9	-9.4	5.2	15.4
Other services (ISIC J-P)	53.0	36.7	117.8	40.0	38.3	50.1	18.4	38.3	60.1	56.5	51.8	40.8	43.5	19.3	33.1	33.9	133.6	38.9	41.5
Industry (ISIC C-F)	8.4	36.5	-20.0	5.0	25.6	14.5	12.5	19.0	-3.1	2.7	13.1	9.3	31.9	23.9	22.0	0.4	-39.8	47.9	17.5
Services (ISIC G-P)	97.8	71.9	128.0	33.1	70.6	84.9	68.9	84.0	101.9	94.1	128.1	80.8	89.5	38.7	72.5	58.7	153.0	65.6	77.6

Note: For some countries, period averages for total labour productivity and employment growth are nearly zero, resulting in % greater than 100.

3.3 Within-sector versus reallocation effects and why it matters

Shown in Table 9 are regional averages of aggregate labour productivity growth for the 1984 to 1998 and 1999 to 2008 periods decomposed into within-sector and reallocation effects, based on Equations 3 and 4 (country-level results are provided in Appendix Table A.2). These are shown as both unweighted and weighted regional averages, with weights based on a country's GDP relative to average GDP for the full sample of countries (in constant USD, based on period annual averages).

Table 9: Within-sector versus reallocation effects on labour productivity growth by regional average (weighted and unweighted)

Unweighted	1984-1998			1999-2008		
	Productivity	Within	Reallocation	Productivity	Within	Reallocation
All countries	1.6	1.4	0.2	2.5	2.3	0.2
Developed countries	1.8	1.7	0.2	1.1	1.2	0.0
C & SE Europe, CIS	0.4	0.6	-0.2	5.0	4.8	0.1
Developing countries	2.0	1.5	0.5	2.3	1.9	0.4
Asia	3.4	2.7	0.7	3.8	2.9	1.0
LAC	0.6	0.5	0.1	1.2	1.1	0.0
MENA	NA	NA	NA	2.2	2.5	-0.2
SSA	NA	NA	NA	3.0	2.4	0.5
Weighted (relative to mean GDP in constant USD)	1984-1998			1999-2008		
	Productivity	Within	Reallocation	Productivity	Within	Reallocation
All countries	2.1	1.9	0.2	2.0	1.7	0.2
Developed countries	3.9	3.7	0.3	3.0	3.2	-0.1
C & SE Europe, CIS	-0.1	-0.2	0.1	1.0	1.0	0.1
Developing countries	1.2	1.0	0.2	1.7	1.1	0.6
Asia	1.3	1.0	0.4	4.0	2.5	1.5
LAC	0.1	0.1	0.0	0.2	0.2	0.0
MENA	NA	NA	NA	0.3	0.5	-0.2
SSA	NA	NA	NA	0.5	0.4	0.1

Except for one region, reallocation effects are small. For the 1999 to 2008 period, for example, they hover around zero for developed countries, the countries of Central and Southeast Europe and the CIS, and LAC. Asia is the exceptional region, having experienced sizeable positive reallocation effects. In both periods, reallocation effects account for roughly one-fourth of aggregate labour productivity growth based on unweighted averages and one-third based on weighted averages. At the same time, within-sector effects are more important than reallocation effects in accounting for the difference in aggregate labour productivity between Asia and other regions. Based on unweighted averages for the earlier period, for example, the differences between Asia and LAC are 2.2 percentage points for the within-sector effect and 0.6 percentage points for the reallocation effect; for the more recent period, the comparable figures are 1.8 and 1.0 percentage points.

The finding that within-sector effects are more important than reallocation effects in accounting for the wide gap in labour productivity growth between Asia and LAC is not anomalous. As our literature survey shows, this rather corroborates the findings of Ocampo, Rada and Taylor (2009) and Timmer and de Vries (2009). And though at odds with the conclusions of McMillan and Rodrik (2011), the authors' own results based on *weighted* regional averages show the considerably greater importance of within-sector than "structural change" effects in accounting for the difference between Asia and LAC and that the reallocation effect for LAC was not negative but zero.

These conflicting conclusions matter because they have policy implications. For McMillan and Rodrik, a fundamental problem for LAC is the mobility of workers toward higher productivity sectors. They write:

Our results show that since 1990 structural change has been growth reducing in both Africa and Latin America, with the most striking changes taking place in Latin America. The bulk of the difference between these countries' productivity performance and that of Asia is accounted for by differences in the pattern of structural change – with labor moving from low- to high-productivity sectors in Asia, but in the opposite direction in Latin America and sub-Saharan Africa (*ibid.*, p. 79).

This conclusion leads the authors to look to such factors as labour market rigidities to account for cross-country differences in "structural change," finding that "countries with more flexible labour markets experience greater growth-enhancing structural change" (*ibid.*, p. 51).¹⁸

One reason that McMillan and Rodrik find a sizeable negative structural change effect for LAC (at least based on unweighted regional averages) is that their method does not separate out interaction effects.¹⁹ We observe a large difference in results between methods when looking at the same nine LAC countries and same 1990 to 2006 period as McMillan and Rodrik, based on the data used in our analysis.²⁰ Using our method to derive the reallocation effect, the unweighted regional average for these nine LAC countries is -0.02; using McMillan and Rodrik's method, the figure is -0.45.

An additional consideration is that the reallocation (or "structural change") effect tells us how movements of workers among sectors affects labour productivity, which is determined in part by differences in labour productivity between expanding and contracting sectors, particularly between agriculture on the one hand and industry and services on the other. Shown in Table 10 for the 1984 to

¹⁸ Though the authors refer to their econometric analysis as a "first pass through the data" (p. 77), it is worth noting several concerns. First, the analysis is based on only 38 observations, and econometric results based on such small samples are prone to being driven by outliers. Second, country-level analyses of the impact of employment regulations on employment or unemployment can come to opposite conclusions depending on whether they are driven by variation across countries, as in McMillan and Rodrik's study, or by variation over time. More specifically, regressions driven by variation across countries can provide evidence of an adverse impact while those driven by variation over time can provide evidence of a beneficial impact, even though all other factors are equivalent (Cf. Heckman and Pagés (2000) and IMF (2003) for two examples of studies having such internally contradictory findings). Third, the authors use an employment rigidity index from the World Bank's Doing Business Indicators, which has been extensively critiqued (e.g., Berg and Cazes (2007) and Lee, McCann and Torm (2008)).

¹⁹ An additional difference is evident when comparing our within-sector calculation to McMillan and Rodrik's. While algebraic manipulation shows a similar central term of sectoral output growth minus sectoral employment growth, McMillan and Rodrik use the ratio of sectoral output (at $t = 0$) to sectoral employment (at $t = 1$) multiplied by the sectoral employment share (at $t = 0$) as a weight in calculating the within-sector effect, whereas we use the sectoral output share (at $t = 0$) as shown in Eq. 3. Further details are available from the authors on request.

²⁰ Note that we use the same employment data as McMillan and Rodrik for Argentina, Columbia and Peru.

1998 and 1999 to 2008 periods are regional averages (unweighted) of labor intensity by industry (the employment-output ratio in each industry divided by employment-output ratio for the economy as a whole, with figures of greater than one thus indicating greater than average labour intensity). The gaps between agriculture and other sectors are consistently wider for Asia than for LAC, particularly for the more recent period. This means that the movement of a comparable number of workers from agriculture to other sectors has a larger positive reallocation effect in Asia than LAC.

4 Summing up and some policy considerations

Rapid labour productivity growth is generally associated with rapid output growth. This is best exemplified by the late-developing countries of Asia, yet employment growth in a number of these countries has been outpaced by the growth of the labour force and working age population. In this sense Asia has more of a problem with jobless growth than the less dynamic LAC region. More widely, while strong output growth translates into strong employment growth in developed countries, this does not hold in our sample of developing countries. That is, there is a stronger positive relationship between employment and output growth in developed than developing countries coupled with a stronger negative relationship between employment and labour productivity growth in developing than developed countries.

Jobless growth presents a fundamental developmental challenge, but what are its policy implications? With some important exceptions, noted below, policies to increase the employment-intensity of growth are at odds with sustainable economic development. For employment intensity is the direct inverse of labour productivity, as generally measured using annual data on output and employment (e.g., Kapsos, 2005; ILO, 2009). In the language of labour productivity growth decomposition, increasing the employment-intensity of growth means lowering labour productivity growth whether through employment reallocation to more labour-intensive sectors or the use of more labour-intensive production within sectors. This has negative implications for per capita incomes, for as Ocampo, Rada and Taylor write, “Historically, labor productivity increases have been the major contributing factor to growth in real GDP per capita” (2009, p. 42). In other words, labour productivity increases – that is, employment intensity declines – make possible rising living standards alongside less work and more leisure, provided that productivity gains are equitably distributed to workers through higher earnings and reduced working time over the course of lifecycles. In this sense, the jobless growth challenge is bound up with the distribution of productivity gains, which is of particular concern in light of the growing earnings inequality and declining wage shares observed in many countries in recent years (ILO, 2010).²¹

Resolving the challenge of jobless growth is well beyond the scope of this paper, but it seems worth exploring a two-pronged strategy comprised of a balanced expansion of structural transformation sectors characterized by economies of scale and the creation of positive spillovers alongside labour-intensive sectors that also create positive spillovers. More precisely, the latter involves the use of labour-intensive methods in such largely non-tradeable sectors as infrastructure, construction (e.g., of schools and health facilities) and climate change adaptation and mitigation measures. Such use of labour-

²¹ Examples of beneficial declines in employment intensity include less child labour, more years of schooling, retirement, and – arguably – declines in women’s labour force participation in earlier stages of economic development (Goldin, 1994). Among labour force participants, labour productivity increases make possible fewer annual working hours through shorter workweeks and more vacation time.

intensive methods is perhaps best exemplified by the work of the ILO's Employment Intensive Investment Programme (EIIP), which has long experience in combining job creation with other important development objectives in a cost-effective manner.²² What determines a viable balance between these two prongs would depend on evolving country-specific considerations that differ widely between developed and developing countries, but for a start requires addressing the rate of output and labour productivity growth, the distribution of labour productivity gains through earnings and working time, and the extent of under- and unemployment and informal and formal employment.

The paper decomposes aggregate labour productivity growth into its sectoral components to identify which sectors contributed most. Consistent with the debates on the role of manufacturing versus services in economic development, we find that labour productivity growth in China is largely driven by manufacturing and in India largely by services. In spite of the problems of measuring value-added in services, these differences are sufficiently corroborated by other evidence that we view them as broadly capturing real differences between the two economies. Evidence for services as a leading sector is found not just for India. For Asia as whole, in fact, labour productivity growth is driven as much by services as by industry. This is a noteworthy finding in its own right, given that Asia is the world's most dynamic region.

Services may be regarded as a leading sector in that it contributed strongly labour productivity growth in a compositional sense, but can it be a leading sector in the sense of spearheading the process of structural transformation and economic development? That is, can services be a *leading complement* to manufacturing or indeed even a *substitute* for manufacturing, or is it rather a *lagging complement*, as in Kaldor's view? The answer depends on the extent to which labour productivity growth in services is dependent on the dynamics of other sectors, manufacturing in particular. Our analysis cannot provide a definitive answer to this question, and more in-depth approaches are required to deepen the understanding of the potential for positive spillovers from services and the causal linkages among sectors (e.g., the approach taken by Dasgupta and Singh (2005, 2006) for the IT sector in India). Yet our results and our reading of the literature suggest the plausibility of the view that advanced services and IT in particular can be a *leading complement* to manufacturing and to other sectors in the process of economic development. The shift from the traditional structuralist emphasis on manufacturing is reflected in a 2009 paper by Taylor, in which he writes:

[A]s opposed to what was usually accepted in the past, sectors other than manufacturing also offer opportunities for innovation. They include modern services, but also primary production, both in niche high value-added products (e.g., fresh fruits and vegetables) and also the technological upgrading of other natural resource-intensive activities (Taylor, 2009, p. 13).

Yet considerations in addition to productivity growth come into play in assessing manufacturing-led versus services-led development paths, such as whether one path might be more effective in creating decent jobs and reducing poverty and gender inequality, and here the evidence is mixed (e.g., Loayza and Raddatz, 2010; Ghani and Kharas, 2010; Tejani and Milberg, 2010).

Much of this paper has focused on manufacturing and services, but – as the above quote from Taylor suggests – agriculture too offers prospects for upgrading and diversification. This is supported by Hidalgo's study of several countries in Sub-Saharan Africa, based on the analysis of how pairs of 5,000

²² For further information, see: <<http://www.ilo.org/emppolicy/units/employment-intensive-investment-unit-empinvest/lang--en/index.htm>>

products are co-exported by countries around the world (Hidalgo, 2011). By addressing products at such a fine level of detail, Hidalgo is able to identify untapped opportunities for these predominantly rural economies within agriculture itself, based on diversifying into agricultural products for which these countries could export but do not. No less important is evidence on the benefits of agricultural development for poverty reduction (Majid, 2004; Loayza and Raddatz, 2010).

An important strand of development economics emphasizes the role of technology-driven productivity increases in agriculture and the importance of agricultural modernization more generally. Kaldor argued, for example, that the “general cause which is common to most countries” that failed to industrialize is the “backwardness and stagnation of agriculture” (1967, p. 55). Timmer and Akkus are worth quoting at length in this regard, for they provide a vivid sense of the importance of agriculture in the process of structural transformation:

No country has been able to sustain a rapid transition out of poverty without raising productivity in its agricultural sector (if it had one to start – Singapore and Hong Kong are exceptions). The process involves *a successful structural transformation* where agriculture, through higher productivity, provides food, labor, and even savings to the process of urbanization and industrialization. A dynamic agriculture raises labor productivity in the rural economy, pulls up wages, and gradually eliminates the worst dimensions of absolute poverty. Somewhat paradoxically, the process also leads to a decline in the relative importance of agriculture to the overall economy, as the industrial and service sectors grow even more rapidly, partly through stimulus from a modernizing agriculture and migration of rural workers to urban jobs (Timmer and Akkus, 2008, pp. 3–4).

Our analysis indicates that agriculture contributed much less to aggregate labour productivity growth than industry or services. Yet as we have noted, one of the limitations of such analyses is that they do not provide a sense of what would have happened in the face of counterfactual structural characteristics. It may well be that poorer developing countries would have grown faster and more sustainably if they had been more successful in modernizing agriculture.

In addition to decomposing aggregate labour productivity growth into sectoral contributions, we decompose into within-sector and employment reallocation effects. For all regions of the world, these results support Kaldor’s view of the greater importance of within-sector than reallocation effects in driving aggregate labour productivity growth. Yet the exceptionally strong positive reallocation effects in Asia do require additional explanation. How were a number of Asian countries able to so successfully expand production in higher productivity sectors, resulting in greater demand for workers from lower productivity sectors? How were they able to so successfully upgrade their technologies and capabilities and produce for world markets at world prices? These are defining questions in development economics and the subjects of vast and contentious literatures, for example, regarding the role of governments and trade and industrial policies and whether the development path taken by Asian late-developers remains open in light of what Nolan refers to as the “challenge of the global business revolution” (2003). For the purposes of this paper, perhaps it suffices to say that if other developing regions had been as successful as Asia in these respects, positive reallocation effects would likely have followed in due course.

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Appendix 1: Employment data

For 75 of 81 countries: ILO, LABORSTA, <<http://laborsta.ilo.org>> (Downloaded 22 June 2010).

For Argentina, Colombia, Peru, India, Singapore, Taiwan (China): Timmer and de Vries, 2009, Groningen Growth and Development Center (GGDC) 10-Sector Database, <<http://www.rug.nl/feb/Onderzoek/Onderzoekscentra/GGDC/data/10sector>> (Downloaded 27 July 2011).

Note that we use the total employment data from LABORSTA because it includes self-employment, whereas the paid employment data does not. The GGDC employment data also includes self-employment (Timmer and de Vries, 2009).

Appendix Table A.1a: Industry-level contributions to labour productivity and employment growth for countries not in Asia or LAC (%)

Developed countries, 1984-1998	Australia	Austria	Belgium	Canada	Denmark	Finland	France	Germany	Greece	Iceland	Ireland	Israel
Average contribution to total productivity growth												
Agriculture, hunting, forestry, fishing (ISIC A-B)	3.6	10.3	5.4	6.7	22.4	13.5	16.2	9.9	53.7	12.0	8.3	2.3
Mining, utilities (ISIC C,E)	29.0	5.9	7.6	13.0	14.6	3.9	2.5	6.2	8.6	6.7	7.4	-4.9
Manufacturing (ISIC D)	17.8	39.7	36.9	30.7	5.0	45.2	38.3	44.0	4.7	13.9	51.3	-0.7
Construction (ISIC F)	1.5	7.3	4.7	-0.5	-1.0	4.2	8.1	-6.0	7.0	11.8	-1.7	7.7
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	-12.8	16.4	-0.3	9.4	11.6	6.8	8.3	2.7	1.8	31.7	-0.5	-21.5
Transport, storage, communication (ISIC I)	26.0	13.3	10.5	17.4	16.7	15.9	12.3	13.5	19.3	16.5	10.1	16.2
Other services (ISIC J-P)	34.8	7.3	35.2	23.2	30.7	10.5	14.2	29.7	4.9	7.5	25.0	100.8
Industry (ISIC C-F)	48.3	52.9	49.2	43.2	18.6	53.3	48.9	44.2	20.3	32.4	57.0	2.1
Services (ISIC G-P)	48.0	37.0	45.4	50.0	59.0	33.2	34.8	45.9	26.0	55.7	34.6	95.5
Average contribution to total employment growth												
Agriculture, hunting, forestry, fishing (ISIC A-B)	1.0	-26.6	-7.1	-2.3	-30.9	-81.2	-88.0	-33.6	-71.9	-11.1	-12.4	-2.2
Mining, utilities (ISIC C,E)	-4.6	-2.4	-8.2	-0.2	1.5	-5.3	-10.1	-19.2	-0.7	-1.0	-2.1	1.5
Manufacturing (ISIC D)	-1.8	-22.8	-29.8	6.9	16.8	-57.0	-143.8	-158.9	6.2	10.1	19.4	16.2
Construction (ISIC F)	9.7	6.0	11.4	3.6	10.1	-23.0	-24.6	17.2	5.0	6.2	12.3	7.4
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	33.1	35.2	13.6	24.8	32.5	-0.8	40.4	11.2	64.8	-2.4	29.4	22.0
Transport, storage, communication (ISIC I)	2.5	7.7	1.9	3.5	2.0	-5.3	3.9	-16.1	-4.0	19.3	2.1	3.8
Other services (ISIC J-P)	60.3	102.9	118.3	63.7	68.0	72.6	322.1	99.5	100.5	78.8	51.2	51.3
Industry (ISIC C-F)	3.3	-19.2	-26.6	10.3	28.4	-85.3	-178.5	-160.9	10.5	15.3	29.6	25.1
Services (ISIC G-P)	95.9	145.8	133.8	92.0	102.5	66.5	366.4	94.6	161.3	95.7	82.7	77.1

Note: For some countries, period averages for total labour productivity and employment growth are nearly zero, resulting in % greater than 100.

Appendix Table A.1b: Industry-level contributions to labour productivity and employment growth for countries not in Asia or LAC (%)

Developed countries, 1999-2008	Australia	Austria	Belgium	Canada	Denmark	Finland	France	Germany	Greece	Iceland	Ireland	Israel
Average contribution to total productivity growth												
Agriculture, hunting, forestry, fishing (ISIC A-B)	14.8	3.0	-10.4	10.8	-25.3	10.2	37.1	6.3	11.0	13.6	2.0	10.4
Mining, utilities (ISIC C,E)	13.9	12.9	-0.7	1.1	-80.7	4.6	4.3	4.7	2.4	5.6	7.9	6.6
Manufacturing (ISIC D)	11.7	65.1	44.5	28.2	-98.7	89.1	31.2	67.5	20.2	31.1	115.2	20.8
Construction (ISIC F)	-1.5	1.9	-6.7	-2.8	9.4	-6.6	-10.9	9.4	1.2	1.2	-21.2	-11.1
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	6.1	-1.3	23.1	23.3	-37.1	8.5	3.2	5.8	17.2	23.4	-12.2	-10.4
Transport, storage, communication (ISIC I)	38.0	8.5	15.1	18.0	98.8	18.8	34.6	15.4	55.3	22.0	0.6	20.3
Other services (ISIC J-P)	17.0	9.9	35.0	21.4	33.5	-24.5	0.6	-9.1	-7.5	3.1	7.7	63.3
Industry (ISIC C-F)	24.1	79.9	37.1	26.5	-170.0	87.1	24.6	81.6	23.8	37.9	101.9	16.3
Services (ISIC G-P)	61.1	17.1	73.2	62.7	95.2	2.8	38.4	12.1	65.0	48.5	-3.9	73.2
Average contribution to total employment growth												
Agriculture, hunting, forestry, fishing (ISIC A-B)	-3.1	-3.9	3.4	-4.4	-15.4	-9.8	-18.0	-5.3	-36.2	-12.3	-2.8	-0.9
Mining, utilities (ISIC C,E)	3.9	-3.1	1.8	3.6	3.8	-2.0	-2.7	-1.1	4.7	0.9	1.1	-0.1
Manufacturing (ISIC D)	0.0	-16.6	-8.3	-3.2	-81.0	-2.6	-18.0	1.5	-8.3	-14.6	-3.0	12.1
Construction (ISIC F)	16.7	3.8	15.4	15.6	8.7	14.8	17.3	-23.2	18.9	20.1	20.0	4.4
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	16.9	32.0	6.6	23.3	66.4	21.5	14.8	16.5	40.0	15.4	22.7	20.3
Transport, storage, communication (ISIC I)	6.9	0.9	2.5	6.0	-16.3	1.7	5.4	7.9	-4.3	2.4	7.0	6.0
Other services (ISIC J-P)	58.7	86.8	78.7	59.2	133.7	76.5	101.2	103.8	85.1	88.2	55.1	58.1
Industry (ISIC C-F)	20.6	-15.9	8.9	16.0	-68.5	10.2	-3.4	-22.8	15.3	6.4	18.1	16.4
Services (ISIC G-P)	82.5	119.7	87.8	88.5	183.8	99.7	121.4	128.2	120.8	106.0	84.8	84.4

Note: For some countries, period averages for total labour productivity and employment growth are nearly zero, resulting in % greater than 100.

Appendix Table A.1c: Industry-level contributions to labour productivity and employment growth for countries not in Asia or LAC (%)

Developed countries (contd.), 1984-1998	Italy	Japan	Luxem- bourg	Malta	Nether- lands	New Zealand	Norway	Portugal	Spain	Sweden	Switzer- land	United Kingdom
Average contribution to total productivity growth												
Agriculture, hunting, forestry, fishing (ISIC A-B)	22.0	8.4	2.9	NA	25.1	29.0	10.0	3.4	65.9	6.6	3.6	2.2
Mining, utilities (ISIC C,E)	3.2	2.9	3.4	NA	6.2	10.6	39.0	8.3	9.8	1.9	5.9	10.6
Manufacturing (ISIC D)	35.3	36.7	40.7	NA	62.3	17.1	5.6	22.1	46.3	43.1	68.1	37.9
Construction (ISIC F)	4.0	-0.9	1.4	NA	3.0	-7.3	5.5	-1.8	-8.4	3.1	17.0	3.3
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	13.8	20.3	10.8	NA	-2.4	-24.0	13.8	2.7	-26.1	12.7	29.8	19.2
Transport, storage, communication (ISIC I)	12.8	7.9	21.7	NA	38.4	65.7	20.8	11.5	18.1	13.4	5.5	16.1
Other services (ISIC J-P)	8.8	24.6	19.1	NA	-32.6	8.8	5.3	53.8	-5.6	19.2	-29.9	10.7
Industry (ISIC C-F)	42.5	38.7	45.5	NA	71.5	20.4	50.1	28.6	47.7	48.1	91.0	51.8
Services (ISIC G-P)	35.4	52.8	51.6	NA	3.4	50.5	39.9	68.0	-13.6	45.3	5.4	46.0
Average contribution to total productivity growth												
Agriculture, hunting, forestry, fishing (ISIC A-B)	-138.5	-22.6	-3.0	NA	0.1	-9.1	-19.4	-5.1	-28.8	-42.5	-5.9	-7.0
Mining, utilities (ISIC C,E)	-1.3	-0.1	0.2	NA	0.0	-4.7	3.1	1.8	-0.6	-5.2	0.1	-17.7
Manufacturing (ISIC D)	-40.7	-6.3	-2.7	NA	6.3	-15.5	-12.6	24.4	6.2	-66.1	-29.1	-53.0
Construction (ISIC F)	-24.5	18.2	9.4	NA	3.1	3.9	-1.7	19.5	18.0	-15.3	-19.8	2.3
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	41.2	22.3	16.4	NA	25.1	50.2	21.8	27.1	37.5	10.4	-1.3	10.3
Transport, storage, communication (ISIC I)	6.4	8.6	8.8	NA	4.9	-4.0	0.0	2.4	6.8	-8.4	11.1	5.1
Other services (ISIC J-P)	257.5	79.8	70.8	NA	60.5	79.4	108.7	29.9	60.9	27.1	144.9	160.1
Industry (ISIC C-F)	-66.5	11.8	6.9	NA	9.4	-16.3	-11.2	45.7	23.6	-86.6	-48.8	-68.4
Services (ISIC G-P)	305.1	110.7	96.0	NA	90.5	125.6	130.5	59.4	105.2	29.1	154.7	175.5

Note: For some countries, period averages for total labour productivity and employment growth are nearly zero, resulting in % greater than 100.

Appendix Table A.1d: Industry-level contributions to labour productivity and employment growth for countries not in Asia or LAC (%)

Developed countries (contd.), 1999-2008	Italy	Japan	Luxem- bourg	Malta	Nether- lands	New Zealand	Norway	Portugal	Spain	Sweden	Switzer- land	United Kingdom
Average contribution to total productivity growth												
Agriculture, hunting, forestry, fishing (ISIC A-B)	177.3	7.4	-4.4	74.1	4.8	8.0	14.5	11.7	57.3	6.2	1.8	0.9
Mining, utilities (ISIC C,E)	80.1	4.5	6.5	-544.4	2.5	-0.6	5.2	9.5	21.9	-0.9	0.4	-3.6
Manufacturing (ISIC D)	119.0	49.9	36.1	1564.6	41.3	53.9	23.8	58.7	53.2	96.5	71.0	30.6
Construction (ISIC F)	-111.3	6.0	-10.2	-768.8	-0.8	-18.4	-12.2	-16.7	-80.9	-5.0	1.1	-4.7
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	-347.7	-3.4	-4.5	-2512.2	31.9	3.3	58.2	-15.5	-160.4	15.9	26.8	22.0
Transport, storage, communication (ISIC I)	210.8	7.2	72.7	-736.8	25.9	61.9	22.1	28.8	13.8	11.3	39.0	20.6
Other services (ISIC J-P)	-228.2	28.3	3.9	3023.4	-5.6	-8.1	-11.6	23.5	-4.9	-24.0	-40.1	34.1
Industry (ISIC C-F)	87.8	60.4	32.4	251.4	43.0	34.9	16.8	51.5	-5.8	90.6	72.5	22.3
Services (ISIC G-P)	-365.1	32.1	72.1	-225.6	52.2	57.1	68.7	36.8	-151.5	3.2	25.7	76.7
Average contribution to total productivity growth												
Agriculture, hunting, forestry, fishing (ISIC A-B)	-11.0	-45.2	0.5	3.9	-1.0	1.7	-12.4	-16.2	-3.8	-0.2	-2.3	-1.6
Mining, utilities (ISIC C,E)	-3.1	-4.8	0.1	0.5	-0.6	0.3	2.0	0.6	0.2	-1.3	0.0	1.9
Manufacturing (ISIC D)	-4.0	-125.0	0.2	-61.1	-11.1	-2.5	-13.3	-63.2	6.2	-17.5	0.1	-63.2
Construction (ISIC F)	15.4	-75.8	9.9	15.3	6.8	14.8	13.6	11.9	18.0	13.8	3.9	20.3
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	28.3	12.7	12.4	45.7	13.3	22.0	6.8	49.2	25.3	15.9	3.2	9.2
Transport, storage, communication (ISIC I)	7.1	-8.5	8.7	11.6	8.9	4.5	-5.1	11.4	5.9	0.8	5.0	8.5
Other services (ISIC J-P)	67.3	146.7	68.2	84.1	83.7	59.2	108.3	106.4	48.3	88.6	90.0	124.9
Industry (ISIC C-F)	8.3	-205.6	10.2	-45.3	-4.9	12.6	2.3	-50.7	24.4	-5.0	4.0	-41.0
Services (ISIC G-P)	102.7	150.9	89.3	141.4	105.9	85.7	110.0	167.0	79.5	105.3	98.2	142.6

Note: For some countries, period averages for total labour productivity and employment growth are nearly zero, resulting in % greater than 100.

Appendix Table A.1e: Industry-level contributions to labour productivity and employment growth

Central & South Eastern Europe & CIS, 1984-1998	Azerbaijan	Bulgaria	Croatia	Cyprus	Czech Republic	Estonia	Georgia	Hungary	Kazakhstan	Kyrgyzstan	Latvia
Average contribution to total productivity growth											
Agriculture, hunting, forestry, fishing (ISIC A-B)	-42.6	18.2	NA	12.1	-63.1	81.5	NA	16.8	NA	-28.5	NA
Mining, utilities (ISIC C,E)	-9.1	-2.6	NA	5.6	-36.2	NA	NA	3.9	NA	-12.1	NA
Manufacturing (ISIC D)	-20.8	-15.9	NA	10.1	230.0	27.9	NA	54.7	NA	-17.0	NA
Construction (ISIC F)	56.0	3.9	NA	-0.5	-10.9	32.6	NA	-0.2	NA	-4.5	NA
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	-30.3	8.6	NA	14.7	52.4	-23.8	NA	3.4	NA	-18.1	NA
Transport, storage, communication (ISIC I)	-14.3	21.9	NA	9.4	12.7	9.8	NA	8.2	NA	-8.7	NA
Other services (ISIC J-P)	-38.9	65.9	NA	48.6	-84.9	-28.0	NA	13.3	NA	-11.1	NA
Industry (ISIC C-F)	26.1	-14.6	NA	15.2	182.9	60.5	NA	58.4	NA	-33.6	NA
Services (ISIC G-P)	-83.5	96.4	NA	72.7	-19.8	-42.0	NA	24.9	NA	-37.9	NA
Average contribution to total employment growth											
Agriculture, hunting, forestry, fishing (ISIC A-B)	-189.8	-20.6	NA	-8.2	-1774.2	-55.4	NA	-48.6	NA	804.9	NA
Mining, utilities (ISIC C,E)	4.0	-1.4	NA	-0.4	-757.9	NA	NA	-10.6	NA	-28.7	NA
Manufacturing (ISIC D)	-747.0	-46.9	NA	1.0	-1669.7	-37.8	NA	-36.5	NA	-458.8	NA
Construction (ISIC F)	-329.2	-14.6	NA	6.2	790.0	-9.5	NA	4.1	NA	-300.7	NA
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	1327.0	-2.0	NA	42.9	2569.2	8.1	NA	-0.2	NA	243.6	NA
Transport, storage, communication (ISIC I)	-157.6	-4.7	NA	8.9	-167.0	-5.6	NA	-12.3	NA	-55.5	NA
Other services (ISIC J-P)	192.5	-9.8	NA	49.5	909.6	0.1	NA	4.2	NA	-304.7	NA
Industry (ISIC C-F)	-1072.2	-62.9	NA	6.8	-1637.6	-47.3	NA	-43.0	0.0	-788.2	NA
Services (ISIC G-P)	1361.9	-16.5	NA	101.3	3311.8	2.6	NA	-8.3	0.0	-116.6	NA

Note: For some countries, period averages for total labour productivity and employment growth are nearly zero, resulting in % greater than 100.

Appendix Table A.1f: Industry-level contributions to labour productivity and employment growth for countries not in Asia or LAC (%)

Central & South Eastern Europe & CIS, 1999-2008	Azerbaijan	Bulgaria	Croatia	Cyprus	Czech Republic	Estonia	Georgia	Hungary	Kazakhstan	Kyrgyzstan	Latvia
Average contribution to total productivity growth											
Agriculture, hunting, forestry, fishing (ISIC A-B)	8.4	-1.7	11.7	-94.1	10.5	6.1	-3.1	19.9	11.8	230.1	32.1
Mining, utilities (ISIC C,E)	3.5	-0.9	0.5	35.5	4.1	NA	3.1	1.5	14.4	-18.7	0.5
Manufacturing (ISIC D)	14.9	32.8	24.8	-2.1	49.4	58.4	19.0	52.1	8.3	-20.3	20.9
Construction (ISIC F)	63.3	0.9	-1.2	-112.3	-2.5	2.1	9.9	-0.1	12.6	-69.0	-8.2
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	1.3	4.6	30.6	45.5	25.5	8.5	21.7	1.5	10.9	-60.7	19.5
Transport, storage, communication (ISIC I)	5.3	27.1	9.5	204.7	6.9	8.3	13.7	9.2	11.1	28.5	14.4
Other services (ISIC J-P)	3.3	37.2	24.2	-177.3	6.2	16.7	35.8	15.8	30.9	10.0	20.8
Industry (ISIC C-F)	81.7	32.8	24.1	-78.9	51.0	60.5	32.0	53.5	35.3	-108.0	13.2
Services (ISIC G-P)	9.9	68.9	64.3	72.9	38.6	33.5	71.2	26.5	52.9	-22.2	54.7
Average contribution to total employment growth											
Agriculture, hunting, forestry, fishing (ISIC A-B)	-3.4	-13.4	-37.3	3.8	-74.1	-56.4	345.1	-54.9	-0.5	-15.9	-70.2
Mining, utilities (ISIC C,E)	3.4	-14.9	0.3	1.0	-33.2	NA	-28.7	-29.4	4.3	4.6	0.4
Manufacturing (ISIC D)	5.0	-26.1	-8.5	1.1	66.5	-5.7	-179.1	-20.8	5.0	6.5	-9.6
Construction (ISIC F)	20.5	26.0	48.4	15.5	-7.3	69.5	217.7	42.2	24.7	34.5	51.1
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	26.4	89.0	49.2	16.1	-3.4	36.0	52.6	79.0	16.4	39.5	38.9
Transport, storage, communication (ISIC I)	11.5	-10.1	-1.5	1.6	-2.5	1.1	-18.1	-7.3	6.9	11.7	19.7
Other services (ISIC J-P)	36.5	49.6	49.5	60.9	154.0	55.5	-489.7	91.1	43.2	19.1	69.8
Industry (ISIC C-F)	28.9	-15.0	40.2	17.6	26.0	63.8	9.9	-8.0	34.0	45.6	41.9
Services (ISIC G-P)	74.4	128.5	97.2	78.6	148.1	92.6	-455.2	162.8	66.5	70.3	128.4

Note: For some countries, period averages for total labour productivity and employment growth are nearly zero, resulting in % greater than 100.

Appendix Table A.1g: Industry-level contributions to labour productivity and employment growth

Central & South Eastern Europe & CIS (contd.), 1984-1998	Lithuania	Moldova	Poland	Romania	Russia	Slovakia	Turkey
Average contribution to total productivity growth							
Agriculture, hunting, forestry, fishing (ISIC A-B)	NA	NA	25.4	-44.8	-25.3	NA	12.7
Mining, utilities (ISIC C,E)	NA	NA	5.4	-23.7	-22.9	NA	6.2
Manufacturing (ISIC D)	NA	NA	52.4	-22.1	-13.1	NA	43.1
Construction (ISIC F)	NA	NA	9.6	-1.2	-11.0	NA	0.0
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	NA	NA	11.7	-19.3	-6.7	NA	15.9
Transport, storage, communication (ISIC I)	NA	NA	10.3	-9.2	-13.5	NA	17.2
Other services (ISIC J-P)	NA	NA	-14.9	20.3	-7.6	NA	4.9
Industry (ISIC C-F)	NA	NA	67.4	-47.0	-47.0	NA	49.3
Services (ISIC G-P)	NA	NA	7.1	-8.2	-27.8	NA	38.0
Average contribution to total employment growth							
Agriculture, hunting, forestry, fishing (ISIC A-B)	NA	NA	-95.8	127.4	-9.1	NA	-7.5
Mining, utilities (ISIC C,E)	NA	NA	-7.9	18.8	2.1	NA	0.2
Manufacturing (ISIC D)	NA	NA	-59.6	-258.9	-65.9	NA	30.8
Construction (ISIC F)	NA	NA	-1.7	-44.0	-28.0	NA	10.6
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	NA	NA	37.2	67.9	8.9	NA	33.1
Transport, storage, communication (ISIC I)	NA	NA	-8.3	-29.4	-7.5	NA	6.3
Other services (ISIC J-P)	NA	NA	36.1	18.2	-0.6	NA	26.6
Industry (ISIC C-F)	NA	NA	-69.2	-284.1	-91.8	NA	41.6
Services (ISIC G-P)	NA	NA	65.0	56.7	0.8	NA	66.0

Note: For some countries, period averages for total labour productivity and employment growth are nearly zero, resulting in % greater than 100.

Appendix Table A.1h: Industry-level contributions to labour productivity and employment growth for countries not in Asia or LAC (%)

Central & South Eastern Europe & CIS (contd.), 1999-2008	Lithuania	Moldova	Poland	Romania	Russia	Slovakia	Turkey
Average contribution to total productivity growth							
Agriculture, hunting, forestry, fishing (ISIC A-B)	15.4	59.1	13.2	32.4	18.8	16.0	36.6
Mining, utilities (ISIC C,E)	NA	1.2	-11.1	-0.6	47.8	0.6	4.2
Manufacturing (ISIC D)	40.1	24.2	77.8	38.5	17.6	59.3	18.5
Construction (ISIC F)	3.6	-0.8	2.6	5.8	4.8	-1.7	9.1
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	5.8	-7.0	10.2	3.1	0.4	23.1	-1.4
Transport, storage, communication (ISIC I)	10.9	8.3	8.8	5.4	6.0	-0.9	25.0
Other services (ISIC J-P)	24.2	15.1	-1.6	15.5	4.6	3.6	8.0
Industry (ISIC C-F)	43.7	24.6	69.3	43.7	70.2	58.2	31.8
Services (ISIC G-P)	40.9	16.4	17.4	24.0	11.0	25.8	31.6
Average contribution to total employment growth							
Agriculture, hunting, forestry, fishing (ISIC A-B)	-468.9	-143.2	-1176.0	-120.9	-2.7	-37.1	-897.0
Mining, utilities (ISIC C,E)	NA	0.8	-301.5	-12.2	6.3	-14.5	-10.1
Manufacturing (ISIC D)	-86.0	0.5	-31.0	-26.6	6.9	32.0	238.4
Construction (ISIC F)	194.9	17.0	-25.5	25.0	14.6	22.2	-47.4
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	222.7	24.9	375.3	22.1	34.3	35.8	363.9
Transport, storage, communication (ISIC I)	15.9	0.5	36.7	-0.8	9.5	2.6	-13.5
Other services (ISIC J-P)	221.5	-0.6	1022.0	13.4	31.0	58.9	465.7
Industry (ISIC C-F)	108.9	18.3	-358.0	-13.8	27.8	39.7	180.9
Services (ISIC G-P)	460.1	24.8	1434.0	34.7	74.8	97.3	816.1

Note: For some countries, period averages for total labour productivity and employment growth are nearly zero, resulting in % greater than 100.

Appendix Table A.1i: Industry-level contributions to labour productivity and employment growth for countries not in Asia or LAC (%)

Middle East & North Africa and Sub-Saharan Africa, 1999-2008	Egypt	Morocco	Saudi Arabia	Mauritius	South Africa
Average contribution to total productivity growth					
Agriculture, hunting, forestry, fishing (ISIC A-B)	54.2	NA	NA	NA	NA
Mining, utilities (ISIC C,E)	0.5	NA	NA	NA	NA
Manufacturing (ISIC D)	35.0	NA	NA	NA	NA
Construction (ISIC F)	-2.7	NA	NA	NA	NA
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	9.4	NA	NA	NA	NA
Transport, storage, communication (ISIC I)	6.8	NA	NA	NA	NA
Other services (ISIC J-P)	-3.4	NA	NA	NA	NA
Industry (ISIC C-F)	32.8	NA	NA	NA	NA
Services (ISIC G-P)	12.8	NA	NA	NA	NA
Average contribution to total employment growth					
Agriculture, hunting, forestry, fishing (ISIC A-B)	-115.4	NA	NA	NA	NA
Mining, utilities (ISIC C,E)	10.2	NA	NA	NA	NA
Manufacturing (ISIC D)	7.2	NA	NA	NA	NA
Construction (ISIC F)	22.0	NA	NA	NA	NA
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	67.4	NA	NA	NA	NA
Transport, storage, communication (ISIC I)	12.2	NA	NA	NA	NA
Other services (ISIC J-P)	96.5	NA	NA	NA	NA
Industry (ISIC C-F)	39.4	NA	NA	NA	NA
Services (ISIC G-P)	176.1	NA	NA	NA	NA

Note: For some countries, period averages for total labour productivity and employment growth are nearly zero, resulting in % greater than 100.

Appendix Table A.1j: Industry-level contributions to labour productivity and employment growth for countries not in Asia or LAC (%)

Middle East & North Africa and Sub-Saharan Africa, 1999-2008	Egypt	Morocco	Saudi Arabia	Mauritius	South Africa
Average contribution to total productivity growth					
Agriculture, hunting, forestry, fishing (ISIC A-B)	-32.0	22.5	26.0	7.5	52.4
Mining, utilities (ISIC C,E)	22.1	9.0	30.4	4.3	13.4
Manufacturing (ISIC D)	62.3	11.1	115.1	33.1	10.4
Construction (ISIC F)	-22.0	-0.6	73.5	1.7	-6.1
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	34.6	9.5	-8.0	4.3	1.0
Transport, storage, communication (ISIC I)	12.9	20.2	36.6	27.3	20.8
Other services (ISIC J-P)	22.2	28.2	-173.6	21.7	8.1
Industry (ISIC C-F)	62.4	19.5	219.0	39.1	17.7
Services (ISIC G-P)	69.7	57.9	-145.0	53.3	29.9
Average contribution to total employment growth					
Agriculture, hunting, forestry, fishing (ISIC A-B)	37.0	23.2	-1.7	-41.7	-71.5
Mining, utilities (ISIC C,E)	0.7	-1.3	-1.2	-0.3	-17.5
Manufacturing (ISIC D)	6.6	-6.5	1.7	-118.6	23.6
Construction (ISIC F)	13.8	32.0	-1.1	40.5	29.7
Wholesale & retail trade, restaurants, hotels (ISIC G-H)	8.5	12.8	17.0	72.2	43.2
Transport, storage, communication (ISIC I)	9.2	14.3	12.7	22.1	11.2
Other services (ISIC J-P)	24.1	25.5	72.6	125.9	81.3
Industry (ISIC C-F)	21.1	24.2	-0.6	-78.4	35.8
Services (ISIC G-P)	41.8	52.6	102.3	220.2	135.7

Note: For some countries, period averages for total labour productivity and employment growth are nearly zero, resulting in % greater than 100.

Appendix 2: Value-added data

For 75 of 81 countries: United Nations Statistics Division,
<<http://unstats.un.org/unsd/snaama/selbasicFast.asp>> (Downloaded 24 June 2010).

Data are valued in national currency units at constant 1990 prices.

For Argentina, Colombia, Peru, India, Singapore, Taiwan (China): Timmer and de Vries, 2009,
Groningen Growth and Development Center (GGDC) 10-Sector Database,
<<http://www.rug.nl/feb/Onderzoek/Onderzoekscentra/GGDC/data/10sector>> (Downloaded 27 July 2011).

Data are valued in national currency units at constant prices in most recent base year available.

Appendix Table A.2a: Within-sector versus reallocation effects on labour productivity growth by country

	1984-1998			1999-2008		
	Productivity	Within	Reallocation	Productivity	Within	Reallocation
Developed						
Australia	1.7	2.0	-0.3	0.9	0.5	0.3
Austria	1.9	1.6	0.3	1.6	1.6	-0.1
Belgium	1.9	2.0	-0.1	0.7	0.7	0.0
Canada	1.1	1.2	0.0	0.9	0.9	0.0
Denmark	1.5	1.4	0.1	-0.3	-0.4	0.1
Finland	2.9	2.7	0.1	2.2	2.6	-0.4
France	1.7	1.4	0.3	0.8	0.8	-0.1
Germany	2.2	1.9	0.3	1.0	0.8	0.2
Greece	1.3	0.4	0.9	2.7	2.5	0.3
Iceland	1.5	1.4	0.1	2.6	2.7	-0.1
Ireland	3.3	3.3	0.1	1.9	2.8	-0.8
Israel	2.0	1.9	0.1	1.2	0.9	0.3
Italy	2.0	1.6	0.4	-0.1	-0.1	0.0
Japan	2.0	1.7	0.3	1.6	1.4	0.1
Luxembourg	3.0	2.7	0.4	1.3	1.4	-0.1
Malta	NA	NA	NA	0.0	-0.3	0.3
Netherlands	0.5	0.5	-0.1	1.2	1.4	-0.2
New Zealand	0.9	1.0	-0.1	0.8	0.9	-0.1
Norway	2.2	2.1	0.2	1.6	1.8	-0.2
Portugal	1.9	1.7	0.3	0.9	0.4	0.4
Spain	0.9	0.6	0.3	-0.3	-0.2	-0.1
Sweden	2.6	2.6	0.0	1.6	2.2	-0.6
Switzerland	0.9	0.7	0.2	0.8	0.7	0.1
United Kingdom	2.0	2.2	-0.1	1.6	1.7	-0.1
United States	1.5	1.6	0.0	1.6	1.9	-0.2
C & SE Europe, CIS						
Azerbaijan	-6.0	-3.9	-1.9	15.7	14.5	1.3
Bulgaria	3.8	3.6	0.1	3.5	3.6	-0.1
Croatia	NA	NA	NA	3.1	2.7	0.3
Cyprus	3.3	2.9	0.6	-0.3	-0.7	0.3
Czech Republic	0.7	1.1	-0.4	3.8	4.1	-0.2
Estonia	1.7	2.1	-0.4	5.0	5.4	-0.3
Georgia	NA	NA	NA	7.4	7.0	0.3
Hungary	4.4	4.2	0.1	3.3	3.6	-0.3
Kazakhstan	NA	NA	NA	6.0	5.7	0.4
Kyrgyzstan	-5.0	-4.4	-0.5	0.8	1.6	-0.8
Latvia	NA	NA	NA	4.6	5.1	-0.4
Lithuania	NA	NA	NA	4.7	5.0	-0.3
Moldova	NA	NA	NA	5.9	5.1	0.5
Poland	5.9	5.3	0.5	4.7	4.5	0.1
Romania	-1.2	-0.1	-1.1	6.9	5.9	0.7
Russia	-6.0	-6.2	0.3	6.4	6.6	-0.1
Slovakia	NA	NA	NA	4.5	4.4	0.2
Turkey	3.0	1.9	1.0	3.6	2.5	1.1

Appendix Table A.2b: Within-sector versus reallocation effects on labour productivity growth by country

	1984-1998			1999-2008		
	Productivity	Within	Reallocation	Productivity	Within	Reallocation
Asia						
China	8.5	7.9	0.6	7.3	3.3	4.1
Hong Kong	3.5	2.2	1.3	3.5	2.9	0.6
India	3.1	2.2	1.0	5.3	5.1	0.2
Indonesia	3.3	1.4	2.0	3.2	1.7	1.5
Korea, Republic Of	4.2	3.6	0.7	3.9	3.6	0.3
Malaysia	2.0	1.8	0.3	3.6	3.6	0.0
Mongolia	2.2	3.1	-0.9	4.6	2.8	1.9
Myanmar	-0.5	-0.5	0.0	NA	NA	NA
Pakistan	2.6	2.0	0.6	2.4	2.2	0.3
Philippines	0.3	-0.3	0.6	3.2	3.3	0.0
Singapore	4.1	3.9	0.3	2.6	2.3	0.3
Taiwan, China	5.3	4.8	0.6	3.0	2.5	0.5
Thailand	5.1	2.4	2.8	2.9	2.1	0.8
Vietnam	NA	NA	NA	4.2	1.7	2.6
LAC						
Argentina	1.9	1.8	0.0	-0.8	-0.5	-0.3
Bahamas	-0.1	-0.7	0.6	0.5	0.1	0.3
Barbados	0.7	0.4	0.3	-0.6	-0.5	-0.2
Bolivia	0.2	0.4	-0.4	0.5	0.5	-0.1
Brazil	NA	NA	NA	1.0	0.6	0.4
Chile	3.1	3.0	0.1	1.5	1.5	0.0
Colombia	1.2	0.4	0.6	-0.9	-0.8	-0.1
Costa Rica	1.6	1.1	0.6	1.3	0.8	0.3
Cuba	NA	NA	NA	4.9	4.0	0.9
Dominican Republic	NA	NA	NA	2.9	3.1	-0.2
El Salvador	NA	NA	NA	1.6	1.2	0.3
Jamaica	0.1	-1.0	1.0	-0.7	-1.4	0.5
Mexico	NA	NA	NA	1.2	0.8	0.3
Nicaragua	-0.5	-0.4	-0.2	0.0	0.0	0.0
Panama	-1.3	-1.8	0.5	2.0	2.0	0.0
Peru	0.5	0.2	0.1	2.5	2.4	0.0
Puerto Rico	2.0	2.5	-0.5	0.8	1.7	-0.9
Trinidad and Tobago	0.3	0.3	0.0	5.3	5.4	0.0
Venezuela	-0.7	0.0	-0.7	-0.5	0.3	-0.7
MENA						
Egypt	3.2	1.1	2.1	1.6	2.0	-0.4
Morocco	NA	NA	NA	4.7	4.0	0.7
Saudi Arabia	NA	NA	NA	0.4	1.3	-0.9
SSA						
Maritius	NA	NA	NA	3.4	3.0	0.4
South Africa	NA	NA	NA	2.5	1.9	0.6

Appendix 3: Cleaning and matching data

General guidelines:

1. Years for which employment data were reported in ISIC Rev. 1 were excluded because they could not be matched with value-added data without combining sectors.
2. When data was available in both ISIC Rev. 2 and ISIC Rev. 3, the latter were used because they more closely match value-added data broken down by ISIC Rev. 3.1.
3. When data from both labour force surveys and official estimate surveys were available, the former were used.
4. Employment data was examined for problematic changes, particularly when changes in method or industrial classifications were noted. Data for these transition years were deleted if we observed jumps that appeared to be due to these changes.

Further details on these and more idiosyncratic cleaning and matching issues are available on request.

Appendix 4: Years evaluated for each country

Countries were included in our sample only when it was possible to construct annual growth rates for at least 4 years (based on at least 5 years of data) within either or both the 1984 to 1998 and 1999 to 2008 periods. The actual annual *growth rate* years evaluated for each country are listed below, where “NA” indicates insufficient data.

Country	1984-1998	1999-2008
Argentina	1985-1998	1999-2005
Australia	1985-1998	1999-2008
Austria	1985-1993, 1995-1998	1999-2008
Azerbaijan	1991-1998	2000-2008
Bahamas	1992-1998	1999, 2002-2007
Barbados	1985-1998	1999-2004
Belgium	1985-1992, 1995-1998	1999, 2002-2008
Bolivia	1985-1990	2000-2002, 2005-2007
Brazil	NA	2003-2007
Bulgaria	1985-1991, 1997-1998	1999-2006
Canada	1985-1986, 1988-1990	1999-2008
Chile	1985-1998	1999-2008
China	1988-1998	1999-2002
Columbia	1985-1998	1999-2005
Costa Rica	1988-1998	1999-2008
Croatia	NA	1999-2008
Cuba	NA	1999-2008
Cyprus	1985-1995	2000-2008
Czech Republic	1994-1998	1999-2008
Denmark	1985-1998	2001-2008
Dominican Republic	NA	1999-2007
Egypt	1990-1998	1999-2007
El Salvador	NA	1999-2007
Estonia	1991-1998	1999-2008
Finland	1985-1998	1999-2008
France	1985-1994	2004-2008
Georgia	NA	1999-2007
Germany	1992-1994, 1996-1998	1999-2008
Greece	1985-1992, 1994-1998	1999-2008
Hong Kong	1985-1998	1999-2008
Hungary	1993-1998	1999-2008
Iceland	1992-1998	1999-2008
India	1985-1998	1999-2004
Indonesia	1990-1998	1999-2008
Ireland	1985-1998	1999-2008
Israel	1985-1994	2000-2008
Italy	1985-1992, 1994-1998	1999-2008

Jamaica	1993-1998	1999-2008
Japan	1985-1998	1999-2008
Kazakhstan	NA	2002-2008
Korea	1985-1998	1999-2008
Kyrgyzstan	1991-1998	1999-2008
Latvia	NA	1999-2008
Lithuania	NA	1999-2008
Luxembourg	1985-1990, 1996-1998	1999-2006
Malaysia	1985-1990, 1993, 1996-1998	1999-2000, 2002-2008
Malta	NA	2001-2008
Mauritius	NA	2001-2008
Mexico	NA	1999-2008
Moldova	NA	2000-2008
Mongolia	1995-1998	1999-2008
Morocco	NA	2003-2006
Myanmar	1985-1990, 1993-1994, 1998	NA
Netherlands	1985-1998	1999-2008
New Zealand	1987-1998	1999-2008
Nicaragua	1991, 1993-1998	1999-2001, 2004-2006
Norway	1985-1995, 1997-1998	1999-2008
Pakistan	1985-1998	1999-2008
Panama	1985-1989, 1992-1998	1999-2008
Peru	1985-1998	1999-2005
Philippines	1985-1998	1999-2000, 2001-2008
Poland	1985-1992, 1995-1998	1999-2007
Portugal	1985-1991, 1993-1998	1999-2008
Puerto Rico	1985-1993, 1995-1998	1999-2008
Romania	1985-1998	1999-2008
Russia	1991-1996, 1998	1999-2008
Saudi Arabia	NA	2000-2002, 2007-2008
Singapore	1985-1998	1999-2005
Slovakia	NA	1999-2008
South Africa	NA	2001-2008
Spain	1985-1998	1999-2004, 2006-2008
Sweden	1985-1998	1999-2008
Switzerland	1987-1990, 1992-1998	1999-2008
Taiwan (China)	1985-1998	1999-2005
Thailand	1987-1998	1999-2008
Trinidad and Tobago	1989-1998	1999-2008
Turkey	1989-1998	1999, 2001-2008
United Kingdom	1985-1987, 1989-1998	1999-2008
United States	1985-1998	1999-2002, 2004-2008
Venezuela	1985-1987, 1990-1998	1999-2008
Viet Nam	NA	1999-2004