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THE 1990s TRADE AND WAGES DEBATE IN RETROSPECT

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Abstract

This paper revisits the trade and wages debate of the 1990s in light of widespread concern that, contrary to the consensus from that debate, the costs of globalisation to less-skilled workers in developed countries have been an important cause of the recent rise of populism. The 1990s debate stimulated a new and now large field of economic research, but in hindsight it suffered from errors of omission on both sides, and from an academic perspective it ended prematurely. Even now, the available evidence does not permit any firm conclusion about the contribution of globalisation to the rise in inequality in developed countries over the past few decades. The economic consensus at the end of the debate also fostered unwarranted political complacency about the social costs of globalisation.

1. Introduction

In the 1990s, after an intense debate, the economics profession concluded that increasing trade with developing countries was not substantially harming less-skilled workers in developed countries. Twenty years later, however, it was widely asserted that the costs of globalisation to less-skilled workers were a key cause of Brexit, Trump and political extremism in continental Europe. Did the economics profession thus make a serious mistake?

This paper addresses that question. Section 2 identifies the issues that were debated in the 1990s, and by whom, and explains how and why the debate came to an end. Section 3 reviews the evidence on the contribution of trade and other aspects of globalisation to the deterioration of the economic situation of the less-skilled in developed countries. Section 4 then considers what could be seen in retrospect as errors by economists on both sides of the 1990s debate, and section 5 asks whether the conclusion of that debate misled policy-makers.

An enduring success of the 1990s debate was to stimulate a new field of economic research.[1] Partly because there was much more to learn, however, economists on both sides of the debate only incompletely understood the impact of globalisation, and from an academic perspective it ended prematurely. Even now, the available evidence does not permit any firm conclusion about the contribution of globalisation to the rise in various forms of inequality in developed countries over the past few decades. The professional consensus of the 1990s also contributed to complacency about the social costs of globalisation – whatever their true size may be – greater awareness of which might have reduced subsequent political problems.

The literature on trade and wages stimulated by the 1990s debate is now so huge as to preclude a proper review in this paper, which refers to it only selectively and through surveys. Research on developing countries, which is most of the best recent work, is entirely omitted because of the focus of the paper on developed countries, and work by its author is over-represented. The interpretation of the material is probably also biased by the author's involvement on one – the losing – side of the 1990s debate, despite his efforts to achieve an objective balance (with much help from the comments of friends and colleagues with widely varying perspectives).

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[1] The F16 trade and wages JEL classification was created during that debate, and as of September 2017 EconLit records about 1090 books (mostly edited volumes) and 2360 journal articles using it.

2. The 1990s trade and wages debate

Concern about the adverse effect on employment and wages in developed countries of imports of manufactures from developing countries had accompanied their growth since the 1970s, though it was consistently downplayed by economists (Wood, 1994, ch. 3). In the early 1990s, however, the profile of this issue was elevated in the US by the presidential candidacy of Ross Perot, who claimed that the North American Free Trade Agreement (NAFTA), then being negotiated, would destroy manufacturing employment. It was further elevated by the discovery that the relative wages of unskilled workers had fallen sharply in the 1980s, which a few labour economists suggested might be a result of trade and particularly of the US trade deficit (e.g. Murphy and Welch, 1991; Borjas et al, 1992).

Two other economists argued more specifically on the basis of Heckscher-Ohlin (HO) trade theory, with empirical evidence, that this shift in relative wages – observed also in other rich countries[2] – had been caused by reduction of barriers to developed-developing country (North-South) trade in manufactures. One was Leamer (1993), who reasoned on standard Heckscher-Ohlin-Samuelson (HOS) lines that the mechanism was a change in relative goods prices. The other was the present author (Wood, 1991, 1994), whose reasoning owed more to Ohlin than to Samuelson and focused more on quantities than on prices.[3]

Perot's claims were refuted by trade economists (Lawrence and Slaughter, 1993; Krugman and Lawrence, 1993), who also contested the arguments of Leamer and Wood. Labour economists, moreover, stressed the contribution of skill-biased technical progress (Katz and Murphy, 1992), and some attributed the reversal of the downward trend of the relative skilled wage to diffusion of computers (e.g. Krueger, 1993). The profession was alerted to what had become, unusually for this issue, a debate among economists by a Journal of Economic Perspectives symposium (Freeman, 1995; Richardson, 1995; Wood, 1995), which also flagged other early contributions (e.g. Sachs and Shatz, 1994; Feenstra and Hanson, 1995).

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[2] In Europe, with less wage flexibility, it emerged partly as higher unemployment (Wood, 1994: 247-55).

[3] I did not work out how to formalise the theory in my book until much later (Wood, 2012; Rotunno and Wood 2017). Pressure to do so at the time led me (in Wood 1995, 1997, 1998) to try to force what was in key respects a non-HOS model into a multi-cone HOS framework, which was only partially successful.

The symposium stimulated a flood of further economic analysis over the next few years: its initial phase is insightfully surveyed by Cline (1997, ch. 2), with later contributions covered in Wood (1998) and Feenstra and Hanson (2001).[4] Most of the work focused on cross-sectoral patterns of change in skill intensity, productivity and employment and their relationship with goods prices and measures of trade and technology. Research on trade and wages has continued ever since, but the debate was largely over by 2000, with the last non-specialist landmark being a 1998 symposium in the Economic Journal.

What ended the debate was the emergence of a consensus among most economists that trade with the South, though a more significant contributor than previously supposed, accounted for only a small part of the decline in demand for unskilled labour in the North, which was caused mainly by skill-biased technical change.[5] A few economists still argued that the distributional effects of globalisation (a new term, broader than 'trade') were much larger – including Rodrik (1997) and Wood (1998). But the spectrum of opinions had stabilised.

The consensus was not based in any straightforward way on empirical evidence. The data that would have been needed to disentangle conclusively the effects of globalisation and exogenous technical change simply did not exist, and all the statistical analysis of changes in wages and employment in the North, though interpreted by most economists as inconsistent with the trade explanation, could also be interpreted as consistent with it (Wood, 1998; Feenstra and Hanson, 2001). What mainly shaped the consensus were four doubts about the trade explanation (Cline, 1997; Krugman and Obstfeld, 2006: 66-68; Autor et al, 2016a: 206-8).

First, about the change in relative goods prices needed to support Leamer's HOS explanation of the relative wage change. It was argued that this explanation could not be correct because the prices of labour-intensive relative to skill-intensive goods had not fallen, or not by enough,

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[4] Four references in Wood (1998) are to chapters in a book by Francois et al which ultimately was not published.
[5] Though the lower limit of 'small' was close to zero, it is hard to quantify the upper limit, because numbers on the proportional contribution of trade varied not only among participants but also with how the proportion was defined and with the empirical assumptions made. For example, Cline (1997) estimated from the literature that trade contributed 'about 20% of the rising wage inequality in the 1980s' (p. 144). His own assessment for 1973-93 was 'about half of the observed net rise in the skilled/unskilled wage ratio', but only 'about one-tenth of the gross unequalising forces' after allowing for the offsetting influence of rising skill supply. Wood (1998) argued by contrast that the relevant proportion was the contribution of trade during 1980-96 to the acceleration of the technology-driven trend in the relative demand for skilled workers. Feenstra and Hanson's (1999) estimates of the contribution of outsourcing to the rise in the relative wage of nonproduction workers during 1979-90 varied between 10% and 25%, depending on how their variables were measured.

or at the wrong time (e.g. Slaughter, 1998). The available price data could be interpreted in different ways, but by the end of the debate the only prominent supporters of their consistency with the trade explanation were Feenstra and Hanson (1999), who focused on the relationship between domestic prices and import prices in a model that differed substantially from standard one-cone HOS (and still found the contribution of trade to be smaller than that of computers). Most labour economists, moreover, did not believe the HOS model or its implication that 'your wages are set in Beijing' (Freeman, 1995; Cline, 1997: 98-100).

The second area of doubt stemmed from the smallness of the share of manufactured imports from the South in Northern GDP – only about 3% in 1995 – and was related more specifically to the factor content of trade calculations at the centre of the evidence in Wood (1994). The conceptual validity of such calculations was challenged (Leamer, 1996), though defended by Krugman (1995) and Deardorff (1997). The empirical assumptions of the calculations, which implied an impact of trade on labour demand in manufacturing ten times larger than earlier calculations, were questioned, too, and there was scepticism about the claim that adding service sectors and defensive innovation in response to low-cost imports would further quadruple the impact (Lawrence, 1996; Cline, 1997).[6] The results of Rowthorn and Ramaswamy (1998) also challenged the estimates in Wood (1994) of the size of the contribution of more trade with the South to deindustrialisation of employment in the North.

The third area of doubt arose from evidence that the skill intensity of employment was rising within sectors, which appeared to contradict the HO model, in which a trade-induced decline in the relative wage of unskilled workers should induce changes in production techniques that made more use of unskilled workers and less of skilled workers (Berman et al, 1994, 1998; Machin and van Reenen, 1998). The contradiction could be eased, however, by arguing that rising skill intensity reflected shifts within sectors towards more skill-intensive sub-sectors or firms (Bernard and Jensen, 1996), or, in the Feenstra and Hanson framework, increased use of labour-intensive imported intermediate inputs. That skill intensity was rising within non-traded sectors, too, showed that trade could not be the only force at work, but this was already agreed by all participants in the debate, who disagreed only over the size of its impact.

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[6] The reassessment of these calculations in the appendix of the present paper concludes that the scepticism with respect to services was well-founded, though in other respects the calculations still seem broadly accurate.

The fourth area of doubt concerned the effects of increased exposure to trade on relative wages in developing countries. In HO theory, rising wage inequality in the North should have been matched by falling wage inequality in the South. Wood (1994) documented that the relative wages of unskilled workers had indeed generally risen in the four East Asian tigers that had generated most of the South's manufactured exports. Later evidence, however, especially on Latin American countries, suggested that trade policy liberalisation had been accompanied by rising wage inequality (Robbins, 1996). This apparent contradiction of HO theory could be eased by arguing that in Latin America, unlike East Asia, unskilled labour was not abundant, relative to skill and land; or that manufacturing was intensive in unskilled but literate labour, for which the demand had risen relative to that for illiterate workers; or that the wage changes reflected labour market liberalisation (Wood, 1997). But doubts about the consistency with HO theory of outcomes in developing countries lingered (and were later reinforced – Goldberg and Pavcnik, 2007; Pavcnik, 2017; Silva and Messina, 2017).

3. Globalisation, Brexit and Trump: debate renewed

Now fast-forward twenty years from the economic consensus of the late 1990s. The UK has voted for Brexit, the US has elected President Trump, Marine LePen is runner-up for French President, and an extreme Right party has won 94 seats in the Bundestag. These outcomes are widely attributed, including by populist leaders and by some economists (e.g. Colantone and Stanig, 2017), to the harm that globalisation has inflicted on ordinary workers in the North, a claim that is strongly rejected by other economists. The debate has returned.

(a) Outcomes and causes

This paper does not seek to explain the victories of Brexit and Trump, which were propelled by curious political coalitions motivated by a mixture of economic and other discontents, about whose relative importance there is much disagreement. It is agreed, though, that most populist voters were relatively less educated (e.g. Becker et al, 2017), and that the economic position of less-educated people had deteriorated over the preceding few decades.

This deterioration emerges in several indicators. The rise in wage inequality between more- and less-educated workers and between white-collar and blue-collar workers that was the focus of the 1990s debate has endured, though it has not got any larger since about 2000 (Edwards

and Lawrence, 2013, fig. 9.2). There has been a dramatic rise in inequality between the mass of the population and the richest one percent (Atkinson and Piketty, 2010). Labour's share of GDP has fallen, so the average wage has grown slower than productivity (Autor et al, 2017; IMF, 2017). Employment in manufacturing, formerly a major provider of jobs requiring little education, has declined steeply (Edwards and Lawrence, 2013, figs. 3.1, 3.4), contributing to the polarisation of employment opportunities (Michaels et al, 2014). Casual contracts have replaced regular jobs (OECD, 2014, ch. 4). 'Deaths of despair' among the less well-educated have raised the mortality rate of middle-aged white Americans (Case and Deaton, 2015).

The causes of this deterioration are disputed. The political backlash against globalisation, and especially against the huge growth in trade with China, whose adverse side-effects have been reported in leading economic journals (Autor et al, 2013, 2016a; Acemoglu et al, 2016; Pierce and Schott, 2016), has prompted an unprecedented rise in official recognition of losers from trade and the need for policies to assist them, exemplified by a joint report of the International Monetary Fund, World Bank and World Trade Organisation (IMF-WB-WTO, 2016). But the official view, influenced by fear of protectionism, is that globalisation was a minor contributor to the problems of less-skilled workers, which were caused mainly by technical progress and rising productivity (e.g. OECD, 2017, ch. 3; WTO, 2017).

That the distributional impact of globalisation has been relatively minor remains the view also of many academic economists (e.g. Helpman, 2017). The correctness of this view, however, is hard to assess because of a shortage of evidence, especially on the aggregate effects of the various dimensions of globalisation on the several distributional indicators mentioned above. Empirical research on the North abated after 2000, since the main unsolved puzzle of the 1990s was about the South, though there is a rapidly growing number of studies of the impact of trade with China on the US and on European countries (recent literature is surveyed in Edwards and Lawrence, 2013; Autor et al, 2016a; OECD, 2017, ch. 3; and WTO 2017).

(b) Direct effects of North-South trade

As in the 1990s, the main focus of empirical research is on the direct effects of trade (imports and exports), and on how these compare with the effects of new technology. Most – though not all – studies find that both trade and technology have had some effect on wages or employment, but their results tend to be limited to the sign and size of coefficients relating particular channels

of impact to particular outcome variables, without trying to assess or compare the overall size of the impact of trade and technology (sometimes because such assessments are ruled out by their methodology – e.g. Pierce and Schott, 2016, n. 18).

The most widely cited challenge to the 'minor impact of trade' view is Acemoglu et al (2016: S174), which estimates that increased imports from China reduced manufacturing employment in the US between 1999 and 2011 by 1.4 million jobs, and employment in all sectors by 2.6 million jobs. This estimate (building on Autor et al, 2013) is based mainly on the correlation across localities between variation in employment changes and variation in exposure to imports from China as a result of initial differences in industry mix. An important practical corollary of this estimation method is that the impact of the imports has been concentrated in specific localities – and has also turned out to be persistent.

From a global perspective, estimates of one or two million jobs displaced by exports from the South still seem small, given the vastly greater number of workers producing these exports in the South. A broader approach to measuring the effects of North-South trade is factor content calculations of the sort in Wood (1994). The appendix to this paper updates these calculations, estimating the impact in 2011 on labour demand in the North (all OECD countries) of exports of manufactures and services from the South (all non-OECD countries).

The estimated direct and indirect Southern labour content of the South's non-primary exports to the North is 73 million workers, of whom 30 million are in manufacturing (about 20 million of them in China) and 19 million supply intermediate services to manufactured exports. Table 1 describes the estimated base case impact of these exports on labour demand in the North.

[Table 1 near here]

In manufacturing, imports from the South reduce demand for labour by 18 million jobs, which is only partly offset by the 6 million jobs generated by increased Northern exports to the South and thus lowers the overall number of jobs by 12 million (15% of manufacturing employment in 2011). In services, by contrast, Southern exports have little net effect on the overall demand for labour – the 8 million jobs generated by increased Northern exports almost match the 9 million displaced by imports. The net reduction of jobs in manufacturing and services together is only 2% of economy-wide employment.

In both sectors, the net effect of the South's non-primary exports is to increase the demand for skilled (college-educated), relative to unskilled, labour. In manufacturing, higher demand for skilled workers as a result of more Northern exports is greatly outweighed by lower demand for unskilled workers as a result of more Northern imports. In services, the rise in demand for skilled labour is nearly as large as the fall in demand for unskilled labour. The combined effect on the economy-wide demand for skilled relative to unskilled labour is an increase of 9%, three-fifths of which is attributable to manufacturing.

Plausible alternatives (in appendix Table A.2) to the base case assumptions in most cases cause the reduction in manufacturing employment to vary by only a couple of million jobs around the base case estimate, and the rise in the relative demand for skilled labour to vary by a couple of percentage points. There is one smaller reduction in manufacturing employment (7 million, with Southern efficiency in labour-intensive production assumed to be 30% lower than in the North), and two higher estimates of the rise in relative demand. A lower dividing line between skilled and unskilled (completed secondary rather than college) adds 5 percentage points to the demand shift, mainly by greatly reducing the unskilled employment denominator.[7] Narrowing the definition of the North to OECD member countries as of 1990 adds 4 percentage points, mainly because both skilled and unskilled employment denominators become smaller.

It is of interest to compare these results with the Acemoglu et al (2016) estimate of 1.4 million manufacturing jobs displaced in the US by imports from China during 1991-2011 (which omits jobs created by exports and must thus must be compared with the 18 million jobs displaced by reduced import substitution in Table 1). For this purpose, the Acemoglu estimate needs to be scaled up in three ways: to allow for the fact that the US is only part of the North (its share of OECD manufacturing employment in 1985 and 2000 suggests a multiple of 5); to allow for the fact that China is only part of the South (the present estimate of China's share of non-OECD export-related manufacturing employment suggests a multiple of 1.5); and to allow for imports before 1991 (the volume data in table A.4 imply a multiple of 1.2). This rough scaling-up would

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[7] The absolute increase in demand for skilled labour is almost the same and the absolute reduction in demand for unskilled labour is slightly (1 million) larger, but total unskilled employment is only one-third as large. The larger skilled employment denominator conversely mutes the relative demand shift, but by much less, since the absolute rise in skilled demand is much smaller than the absolute fall in unskilled demand.

make the Acemoglu estimate 13 million, which is of the same magnitude as the base case in Table 1 (and identical to the lower-Southern-efficiency variant in Table A.2).

Another interesting comparison is of these factor content estimates for 2011 with the estimates for 1990 in Wood (1994). On a like-for-like basis (Tables A.3 and A.4), the absolute reduction of manufacturing employment in the North as a result of trade with the South is only twice as large in 2011 as in 1990, despite an eight-fold increase in South-to-North manufactured export volume over this period. Productivity growth explains part of the difference: output per worker doubled over this period, halving the effect on manufacturing employment of any change in output, whether caused by changes in trade or in domestic demand. The rest of the explanation is a reduced North-South gap in the employment content of exports, reflecting changes in the product mix of Southern manufactured exports, which became more capital and skill intensive, partly as a result of more sophisticated forms of outsourcing.

The estimated impact on the economy-wide relative demand for skilled labour in 2011 is four times greater than in 1990. About half of this increase, though, arises from the decline in the relative number of unskilled workers economy-wide, without which the impact is a doubling. This proportional increase in impact is much larger for services than for manufacturing, and much smaller than the proportional rise in the volume of manufactured imports from the South, for the reasons mentioned above. However, it is similar in size to the proportional rise in the current-price ratio of non-primary imports from the South to Northern GDP.

The most significant comparison is of the factor content estimates with actual outcomes. The base case reduction in manufacturing employment of about 12 million compares with the actual 1985-2014 fall in OECD countries of 18 million, of which 12 million occurred after 2000.[8] The concentration of the actual fall in the second half of the period, when China's exports boomed, is consistent with the impact of North-South trade. But the base case estimate of the impact of trade is only 2 of the 8 percentage points (or 9 points in the more narrowly defined North) by which manufacturing's share of total employment declined during 1985-2014.

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[8] Calculated from the data for Wood (2017). The absolute falls are similar in size, whether the OECD is defined in terms of its membership in 1990 or in 2014, though 50% larger for the narrower North relative to end-period manufacturing employment.

The estimated trade-induced increase of 12% in the relative demand for college graduates in the narrow North (appendix Table A.2, case 1) compares with the actual increase in the US of about 30% between 1984 and 2003 (Burstein et al, 2017b: 24). The actual rise was much larger than the estimated rise, and three-fifths of it occurred before 1993, which is inconsistent with the time path of North-South trade.[9] Wage inequality continued to rise after 2000, especially at the top (Edwards and Lawrence, 2013: 205), but education-related gains were restricted to those with doctorates and professional graduate degrees (Scheve and Slaughter, 2007).

(c) Other globalisation impact channels

The results discussed above show that increased trade with China and the rest of the South had substantial effects, but leave unexplained much of the deterioration in the economic situation of less-skilled workers in the North. One qualification to this conclusion is that education is far from a perfect measure of skill. Moreover, recent research (Helpman, 2017; Pavcnik, 2017) suggests that factor content calculations with industry-level data understate the extent to which increased trade has raised the relative wages of skilled workers, which involves also changes across firms within industries and within firms, though there are no estimates of the aggregate impact of such changes in the North. The same research also shows how trade can raise wage inequality within skill groups – across individual workers, firms, industries and places – which increases overall inequality (and may exacerbate feelings of inequity and injustice).

There are other channels, too, through which globalisation is likely to have contributed to the misfortunes of less-skilled workers, though their effects are even harder to quantify. One such channel is the effects of globalisation on productivity. Most of the economic literature (OECD, 2017, ch. 3; WTO, 2017) attributes the declines in manufacturing employment and demand for unskilled workers in the North mainly to labour-displacing improvements in technology. Such improvements, however, are stimulated by trade. That low-cost imports from the South induce defensive innovation (Wood, 1994; Acemoglu, 2003) is suggested by the empirical results of Bloom et al (2016) and Pierce and Schott (2016: 1634), though not by those of Autor et al (2016b). The recent emphasis on firm heterogeneity has also clarified how exposure to trade – North-North as well as North-South – can raise industry-level productivity by restructuring the

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[9] As shown in case 8 of Table A.2, the rising Southern trade surplus after 2000 probably lessened the rise in the relative demand for skilled labour (by reducing skill-intensive Northern exports), but only slightly.

efficiency mix of firms (Melitz and Redding, 2014; Ahn and Duval, 2017). Stronger economies of scale in more skill-intensive industries, too, could cause both North-South and North-North trade to raise the relative demand for skilled labour (Epifani and Gancia, 2008).

There is not enough evidence to gauge the overall impact of trade-induced productivity change. This channel is missed by Acemoglu et al (2016) and similar studies, which assume the same relationship between imports and employment in all industries and thus overlook heterogeneity in their potential for defensive innovation and restructuring (Wood, 1998: 1476-7). It is missed by factor content calculations, too. Wood (1994) argued that trade-induced productivity change had at least doubled the direct effects of North-South trade on manufacturing employment and the relative demand for skilled workers, but the true effect could be either smaller or larger – possibly much larger – than this guess.

A second channel relates to offshoring of Northern technology in manufacturing and services, which not only contributed greatly to growth of exports from the South to the North (Baldwin, 2016), but also enriched the Northern owners of the technology, both individuals and firms, and thus contributed to the rise in the share of the top one percent and the fall in the share of labour in the North. In addition, as mentioned above, more sophisticated offshoring extended the range of the South's non-primary exports to include items of greater skill intensity and thus also extended competition with Southern imports to more skilled workers in the North.

[Figure 1 near here]

The resulting predicted trajectory of relative wages in the North is shown in Figure 1 (Wood, 2002: 73), which corresponds approximately with reality. The relative wage, w_K, of workers with high-level know-how (acquired only partly through education) rises steadily as a result of increasing rents from offshoring, made possible by falling costs of cooperating with Southern workers (called 'coordination costs' by Baldwin and Robert-Nicoud, 2014). Falling transport and other trade costs, by increasing the specialisation of the North in education-intensive items, initially raise the wage of more-educated, relative to less-educated, workers (w_E/w_U). This trend is eroded and eventually reversed, however, by falling cooperation costs, which increase the share of skilled workers in the labour that is displaced from the tradable to the non-tradable sector (where this relative wage is determined).

The model behind Figure 1 is supported by evidence (Anderson et al, 2006), but not enough of it to quantify the contribution of the forces involved to outcomes in the North. The rise of the top one percent, moreover, must be explained by more than North-South interaction. Because the markets of the South have until recently been relatively small, the North-North dimension of globalisation has offered greater scope for superstar individuals and firms to amplify their rents by operating worldwide (Haskel et al, 2012; Autor et al, 2017).[10] In addition, forces other than globalisation surely caused part of both the rise of the top one percent and the related fall of the labour share (Kaplan and Rauh, 2013; Alvaredo et al, 2013).

Increased immigration is popularly seen as another major channel through which globalisation harmed less-skilled workers in the North. The impact of migration on Northern labour markets is deeply disputed among economists, but even their upper-end estimates suggest that popular views of its size are exaggerated (Dustmann et al, 2016; Burstein et al, 2017a). Immigration probably made a relatively small contribution to the overall impact of globalisation, above all because restrictions on the international movement of people remained far tighter than on the movement of goods, services, capital and technology.

In summary, and although there were certainly other causes of the long deterioration in the economic circumstances of ordinary people in the North, it is hard to be confident about the official position, and the belief of many economists, that the contribution of globalisation was minor. A more tenable position, given the state of the evidence, is that we don't know. In that light, the following two sections examine the correctness of the analysis and conclusions of the earlier debate.

4. Who got what wrong in the 1990s debate?

The broadest question about the 1990s debate, concerning the real-world consequences of the consensus that emerged from it, is postponed to the final section. The present section focuses instead on the specifics of the debate, and in particular on what seem in retrospect to have been substantial errors, mainly of omission, by protagonists on both sides.

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[10] That the top one percent gained most in English-speaking countries (Alvaredo et al, 2013, fig. 2) suggests the influence of globalisation, since English is the dominant international language.

One such error was that people's visions of reality were blinkered by HO theory, and especially by the HOS model. Leamer (1993) and Wood (1991, 1994) used HO theory as the basis for their arguments that increased trade with the South had caused the fall in unskilled wages, while Lawrence and Slaughter (1993) used the HOS model as the basis of their argument that Perot was wrong about the effects of NAFTA. More importantly, as explained in section 2, the consensus at the end of the debate that trade was a relatively minor cause of the misfortunes of unskilled workers emerged largely because too many features of the evidence seemed to most economists to be inconsistent with HOS. Insufficient attention was paid to other, non-HO, mechanisms by which trade might be affecting wages.

The insights of HO theory are vital to understanding how the world has evolved over the past few decades. As shown in Wood (2017), changes in the structure of trade, production and employment during this period of globalisation have varied among regions and countries in ways that correspond with the comparative advantages predicted by their factor endowments. Among other changes, the skill-abundant North has become more specialised in skill-intensive manufacturing, with corresponding specialisation in labour-intensive manufacturing in land-scarce and skill-scarce Southern countries with good infrastructure and political stability.

Standard HO theory, however, is only part of the explanation. As also shown in Wood (2017), relationships between endowments and comparative advantage shifted during this period in ways that suggest amplification by transfer of technology from the North of the comparative advantage in labour-intensive manufacturing of Southern countries with suitable endowments. This transfer reflects the offshoring of tasks modelled, for example, by Grossman and Rossi-Hansberg (2008) and Baldwin and Robert-Nicoud (2014). Its direction appears to have been influenced by factor endowments, but it adds (and acts differently) to the standard HO driver of change, which is reduction of cost barriers to trade in goods and services (though reductions of this sort were also important).

That other mechanisms were at work was recognised early by Feenstra and Hanson (1995), whose model of trade in intermediate inputs fitted better than HOS with several features of the evidence, including rising wage inequality in the South, though it was driven by capital flows rather than by technology transfer. Sachs and Shatz (1996) developed a specific-factors model driven by transfers of capital. In the model of Minford et al (1997), the driver was technology transfer, which Tang and Wood (1998) modelled as reduction of cooperation costs enabling

Northern workers with high-level know-how to work profitably with Southern workers. The Tang and Wood, Feenstra and Hanson, and HO mechanisms were synthesised in Wood (2002). This broadening analysis of causation contributed to the change of terminology from 'trade' to 'globalisation', but had no impact on the outcome of the debate.

The blinkering of vision by HO theory, with its assumption of costless factor mobility within countries, also had the unfortunate effect of causing economists to forget that the social costs of expansion of trade tend to be concentrated on narrowly defined industries, occupations and – with strong persistence – localities (Autor et al, 2016a; Dix-Carneiro and Kovak, 2017). This concentration of effects and associated adjustment costs, long recognised in specific-factors theory and in the political economy of trade policy, was for example discussed in less than 500 words of the 500-page Wood (1994), being sidelined by the simpler – though also important – view of skilled workers as a class gaining at the expense of unskilled workers.

Another shortcoming in retrospect on both sides of the debate was that too much effort was devoted to explaining the past and too little to analysing what might happen over the decades ahead, especially given the later emergence of China as a massive exporter of labour-intensive items to the North. To the extent that the future impact of China (and India) was discussed at all, predictions of its size were uncorrelated with beliefs about the size of the impact of North-South trade to date. Some who believed that the effect of trade on wages had been tiny argued that it might be much larger in the future (Slaughter, 1994; Sachs and Shatz, 1994). Conversely, some who believed that the past effect had been more substantial thought it would not become much larger in the future, including Cline (1997) and the present author.

As explained in the preface to Wood (1994), working on a World Bank report that anticipated China's growth and advised it to expand manufactured exports was what motivated my book on trade and wages, which includes a chapter on the future. That chapter, however, argued that the North was already almost completely specialised in skill-intensive manufacturing, so that an increased global supply of labour-intensive manufactures would improve the North's terms of trade without much reduction of its demand for unskilled labour. Less-skilled workers had more to fear from increased tradability of services and from increased competition with middle-income countries, including the transition countries of Eastern Europe.

That prediction was right about the North's terms of trade and increased tradability of services, but it was seriously wrong about the degree to which the North was already specialised in skill-intensive manufacturing. What it failed to recognise was how much scope still remained for splitting up manufacturing processes and offshoring their labour-intensive elements (a process whose scale and significance was emphasised by Feenstra, 1998). As a result, and despite my original motivation, even at the end of the debate I did not anticipate the subsequent massive expansion of China's manufactured exports to the North (Wood, 1998: 1479).

A third error of omission on both sides in the 1990s debate was to neglect the difference within the 'skilled' category between the mass of college-graduate and white-collar workers and a small group at the top whose earnings had been pulling away since the early 1980s. Though attention had been drawn to superstars by Rosen (1981) and Frank and Cook (1995), and though Bernstein and Mishel (1997) flagged the gains at the top, this aspect of wage inequality did not fit the two-factor HO model that dominated the debate. Leamer (1995) extended HO to include variation in talent, while Tang and Wood (1998) added a specific-factors component in which falling cooperation costs enriched the semi-mobile Northern workers who transferred know-how to the South, but these extensions, too, had no impact on the debate.

A fourth error on both sides of the 1990s debate was to focus almost entirely on relative wages, neglecting real wages and the wage share of GDP, despite US evidence that growth of average wages was lagging growth of labour productivity and that the real wages of narrowly defined skill groups were decreasing (Cline, 1997, table 1.2). Exceptions were Johnson and Stafford (1993) and Minford et al (1997), who emphasised the implications of Southern technological catch-up for Northern real wages.

Wood (1994) used both theory and evidence to argue that the basis of North-South trade in manufactures was differences in endowments of skill rather than of capital, and that the initial impact of this trade had been to reduce the profitability of Northern manufacturing. Persistently low interest rates also make it hard to believe that the falling wage share reflects rising returns to capital narrowly defined. Though there are other possible explanations (Autor et al, 2017; IMF, 2017), what seem most likely to have risen – and to have been amplified by globalisation – are economic rents of various kinds.

The preceding catalogue of errors and omissions on both sides suggests that from an academic perspective the trade and wages debate of the 1990s ended prematurely, without absorption of the new theories and evidence that emerged during it. For most economists, the main issue for further research was non-HO explanations of the effect of trade on wages in the South, a line of enquiry that has yielded excellent outputs (surveyed by Harrison et al, 2011; Helpman, 2017; Pavcnik, 2017; Silva and Messina, 2017). The effect of globalisation on wages in the North, by contrast, was seen as largely a closed book, although Feenstra and Hanson's (1995) insight provided the basis for further illuminating research on task trade and value chains.

5. Did economists in the 1990s mislead policy-makers?

What matters most about the 1990s trade and wages debate is not who was right or wrong academically, but whether the outcome of the debate was helpful or harmful at a practical level. Arguably, and for two different reasons, the truth is 'neither' – that the outcome of the debate was irrelevant – but there are also reasons for believing that it was on balance harmful.

One possible reason for irrelevance is that the protagonists on either side of the debate largely agreed about appropriate policy responses. Virtually no academic participants believed that protectionism would be an appropriate response. The present author, for example, wrote his book as a development economist to warn of a protectionist backlash that would be damaging to both North and South unless other steps were taken to tackle the adverse distributional effects in the North of the otherwise mutually beneficial expansion of trade with the South.[11]

Most participants believed that that the nature of the problem was a fall in the relative demand for less-skilled workers and agreed that the correct policy response, whether the fall was caused by trade or technology, was some mixture of measures to increase the relative supply of skilled workers, stimulate the relative demand for unskilled workers, and redistribute income from the skilled to the unskilled (Wood, 1994, ch. 10). The agreed diagnosis of the causes of the problem was incomplete, as explained above, but similar measures would be needed to redress the rise of the top 1% and the fall of the wage share of GDP.[12]

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[11] See for example the summary of the argument of the book in the first paragraph of Wood (1994).

[12] The agreed diagnosis also failed to recognise the preference of unskilled workers for manufacturing jobs (the fall in which was categorised by Wood, 1994, as merely a 'sectoral side-effect'). No imaginable policies could restore previous levels of employment in this sector.

The other possible reason for irrelevance is that all these measures would have required higher taxes on the gainers – to assist the losers – for which there was insufficient political support. On both sides of the Atlantic, ideology had shifted away from government intervention, taxes had been made less progressive, the political influence of the rich had risen, and most gainers did not feel any moral obligation to the losers. Even if political support had existed, moreover, globalisation had made it technically harder to tax the rich (Rodrik, 1997).

Some steps in the right direction were taken, notably the Earned Income Tax Credit in the US and similar changes to the taxation of low earners in the UK. Trade Adjustment Assistance in the US continued on a modest scale, the EU established the European Globalisation Adjustment Fund, and in European countries the framework of welfare states remained intact, providing a more comprehensive safety net for the unskilled than in the US. But as the political events of 2016-17 confirm, not nearly enough was done to address the well-founded concerns of many ordinary people that they were being left behind economically and socially.

Would a different outcome to the 1990s debate have caused better policies to be implemented to address these concerns? The answer is probably 'yes', because the actual outcome fostered unwarranted complacency about the social costs of globalisation. This answer does not depend on believing that globalisation was the main cause of the problems of the less-skilled, either in the 1990s or subsequently – an issue on which the most tenable position was argued above to be agnosticism. It depends only on believing that globalisation had significant adverse social effects, which is now almost universally acknowledged, as in IMF-WB-WTO (2016).

The unwarranted complacency was partly among economists. As explained in section 4, the debate ended prematurely, without resolution of some already recognised errors of omission on both sides. The consensus that globalisation was not the main cause of increasing inequality in the North deterred further research on the subject and dulled the alertness of most economists to signs of danger in the following two decades – including the impact of rising imports from China on local labour markets in the US emphasised by Autor et al (2016a).

The complacency was also political. The economic consensus encouraged policy-makers to tune out and undermined a crucial political lever for action, namely fear of protectionism. What might have attracted the attention of policy-makers and the self-interested support of gainers

(as it did in 2016-17) was a political backlash against globalisation. It was comforting to believe that the problems of the unskilled were caused by new technology, because there was so little risk of Luddite smashing of computers. Protectionism, by contrast, was a credible threat, and by making it seem less threatening at the time, the economic consensus of the 1990s stored up greater trouble down the road (and is unlikely to have reduced the actual risk of protectionism, because the consensus was not known to, or believed by, most ordinary people).

Though better policies would probably have resulted from a different outcome to the debate, it is hard to assess their likely extent and effectiveness. Efforts to mitigate the adverse effects of trade on particular groups of workers and particular places have had limited success, especially where local governments must rely on local revenue (Pavcnik, 2017: 33-6; WTO, 2017, section E). Targeting assistance on workers directly affected by trade is inherently difficult (Falvey et al, 2010) and neglects the pervasive indirect effects on other workers (Acemoglu et al, 2016). Broader policies to reduce inequality are more promising, but again subject to practical limits (Atkinson, 2015), as well as to political resistance from the better-off sections of society.

So although a different outcome to the debate would probably have reduced subsequent social and political problems in developed countries, there is no way of knowing by how much. Going forward, moreover, the policy challenge in these countries remains basically the same as in the 1990s: finding ways of spreading the gains from aggregate economic progress – whatever its causes – that will work, both economically and politically.

Appendix: The factor content of North-South trade revisited

The present author's main statistical contribution to the 1990s debate was non-standard factor content calculations of the impact of North-South trade on labour demand in the North and the South (Wood, 1994, ch. 4). They suggested an impact on the North that was much larger than the results not only of standard factor content calculations but also of most other methods of estimation (Cline, 1997: 139-46). This appendix updates those earlier calculations, partly as a contribution to the ongoing debate, partly to gauge how the estimated impact has changed over

time, and partly to reassess the accuracy of the earlier calculations in response to the empirical criticisms that were made of them (the theoretical criticisms having largely been resolved).[13]

The basic assumption of the calculations is that the effects of globalisation can be measured by comparing reality with a counterfactual in which the North imports no manufactures or services from the South (and exports correspondingly less to the South). The impact on labour demand in the North is thus the counterfactual labour content of its non-primary imports from the South, minus the labour content of an equal value of exports from the North (allowing for associated differences in trade in intermediate inputs).

The method also allows for part or all of the North's non-primary imports from the South to be non-competing (items or tasks that are not now profitable to produce or undertake in the North, but would be at different prices). Imports are non-competing for a mixture of two theoretical reasons. Some are items of such low skill intensity that, as in a pure HO model, they lie outside the North's skill-intensive cone of diversification. Others are tasks in which, as in a Ricardian model, the South has a comparative advantage through offshoring by being able to combine Northern technology with wages that are lower than in the North because of inferior technology in the rest of the Southern economy (Baldwin and Robert-Nicoud, 2014).

Empirical evidence suggests that most of the North's manufactured imports from the South are non-competing (Edwards and Lawrence, 2013, ch. 4), as probably are quite a lot of its services imports, too. Unlike competing imports, whose counterfactual labour content can be estimated from data on the production of similar goods in the importing country, the counterfactual labour content of non-competing imports has to be estimated from data on production in the trading partner, with adjustments for differences between the countries in factor prices and efficiency (explained below, with further details in Wood, 1994, ch. 4).[14] This more complicated method is in principle valid also for competing imports (a point not recognised in Wood, 1994), so the present calculations cover both sorts of imports, whereas the standard method would understate

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[13] The theoretical basis for factor content calculations is explained by Deardorff (1997), and extended to include imperfect competition and heterogeneous firms by Burstein and Vogel (2011). The empirical usefulness of such calculations, however, continues to be strongly contested by Leamer (1996).

[14] See also Deardorff (1997, section 4), who explains that estimating the effect on factor demand in the importing country of non-competing imports needs not only to calculate their factor content differently, but also to recognise that their existence is equivalent to a Hicks-neutral improvement in the technology of the sector concerned.

the effect of trade with the South on Northern labour demand to the extent that the imports are non-competing.[15]

An advantage of these factor content calculations, compared to a typical computable general equilibrium (CGE) model, is their coverage of all the causes of globalisation – changes in trade policies, improved transport and communications, and innovation in business organisation. A disadvantage is its inability to disentangle these causes and in particular to isolate the influence of policy choices. As with a CGE model, moreover, this method requires many assumptions, and its results should be regarded as, at best, approximate.

Data

The North is the OECD and the South is the rest of the world. The calculations refer to 2011, the latest year in the OECD-WTO TiVA database, from which can be extracted the domestic value added (DVA) and imported intermediate input content of the South's non-primary exports to the North, and vice versa, split between the primary, manufacturing and services sectors. From the WIOD database for 2009 can be estimated for both North and South in each sector the wage share of value added and its division between skilled (college-educated) and unskilled labour, the relative wage rates of skilled and unskilled workers, and the profit rate on capital. Wage rates in US dollars for 2011 are taken from the Conference Board's international comparative database. Employment is calculated by dividing wage bills by wage rates.

More specifically, the share of profits and the rate of profit on capital are export-DVA-weighted averages of the values for all manufacturing and for all services in the ten largest Northern countries (for the North) and all the available Southern countries for the South. Average yearly working hours (WIOD) and hourly wage rates in manufacturing (Conference Board) are also export-DVA-weighted averages (with the sample of Southern wage rates being extrapolated on the basis of per capita GDP to all the non-tiny non-OECD TiVA countries).

The WIOD data on skill shares refer to sectoral production for all destinations, not specifically to production for export. Skill shares (and relative wage rates) for the North are based on those

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[15] Factor content calculations using the simpler method consistently show only small effects on labour demand in the North, with the number of jobs displaced by the imports being, say, 20% greater than the number created by the exports (Wood, 1994, ch. 3, table 4.9; Edwards and Lawrence, 2013: 210).

in the US and for the South on those in China. In the base case, the skill shares for exports are assumed to be weighted averages of those for the broad sector concerned (manufacturing or services) and for the most (in the North) or least (in the South) skill-intensive sub-sector. The weight of the sub-sector is the share of direct domestic value added in the total value added of that sector's exports to the other region (indirect value added by intermediates involves sub-sectors of widely varying skill intensity). An exception is Southern exports of services, whose skill intensity is assumed simply to be equal to that of the entire service sector in China.

The estimated direct and indirect Southern labour content of the South's non-primary exports to the North is 73 million workers, of whom 30 million are in manufacturing (about 20 million of them in China) and 69 million are unskilled. Of the 43 million service sector jobs, about 19 million are in production of intermediate inputs to manufactured exports. These numbers are much smaller than the estimates from the most comprehensive alternative source, the OECD's trade in employment database, where the corresponding total for 2011 is 110 million workers, of whom 41 million are in manufacturing (24 million of them in China).[16] The difference is probably mainly because the OECD's labour input coefficients are inflated by the inclusion of small informal firms producing for the domestic market.[17]

Method

The first step in calculating the counterfactual labour content of the North's imports from the South is to estimate the parameters of the production functions for the domestic value-added content of the South's exports, separately for manufactures and for services, from the data on Southern inputs and assumptions about substitution elasticities. The form of the production functions is assumed to be two-level CES, in which an aggregate of skilled labour and capital is combined with unskilled labour. The elasticity of substitution between skill and capital is set

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[16] The OECD numbers quoted are the sums across all the non-OECD countries in the trade and employment database of 'domestic employment embodied in foreign final demand' in OECD partner countries for the source industries 'total manufactures' and (for services) 'total services including construction activities' plus 'electricity, gas and water supply'. The estimates are biased downward by the omission from the database of all but 14 non-OECD countries, though these include most of the largest ones.

[17] The present calculations estimate employment using wage rates relevant to the larger and more modern firms that produce most exports, while the OECD's estimates are based on total employment to output ratios in each sector and country. This explanation is consistent with the relatively small proportional difference between the present estimates and the OECD estimates for China, where the informal sector is small. The present and the OECD estimates for manufacturing in China are also consistent with Kiyota's (2014, Annex Table A9) WIOD-based estimate for 2008 of 34.7 million employed in manufacturing for export to all destinations, since almost 70% of China's manufactured exports in that year were to the OECD (implying employment of 24 million).

at 0.1, reflecting capital-skill complementarity, and between the capital-skill composite and unskilled labour at 0.5, which is consistent with casual observation that offshoring of labour-intensive production involves little change in either skill intensity or mechanisation, despite large differences in factor prices.[18]

The Southern CES production functions are then used, in conjunction with the data on Northern factor prices, to estimate how much skilled and unskilled labour would be used in the North to produce one unit of the sorts of items imported from the South. The level of efficiency is held constant, since most Southern non-primary exports to the North are produced in modern firms. However, higher wages in the North would cause more capital-and-skill-intensive techniques to be chosen and so less unskilled labour to be employed: in the base case, total labour content per unit of output is reduced by almost 40%.

The higher Northern wages (partly offset by the absence of international trade costs and tariffs) would also cause the counterfactual purchaser prices of non-competing items to be higher than the actual prices of the imports, and thus fewer of these items to have been bought and produced domestically, further shrinking the amount of unskilled labour displaced by the imports.[19] In the base case, the purchaser price increase is 50% for manufactures and 120% for services (whose labour content is larger).[20] The price elasticity of demand is set low, at 0.5, since many imports from the South are either intermediate inputs or basic consumer goods such as clothing (which are non-competing with Northern production and for which demand elasticities are low at industry level, though sometimes high at firm level for lack of product differentiation).

In the counterfactual calculations, the South's manufactured exports to the North are reduced to zero, and its services exports to the North by 80% (the other 20% being what it would have earned from shipping its primary exports). The corresponding reduction in the North's exports

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[18] Econometric estimates of capital-labour and skilled-unskilled substitution elasticities are higher, because they also pick up variation in product mix and so overestimate the elasticity relevant to the present calculation, which refers to the likely changes in factor input mix if specific goods or tasks were transferred between countries with different factor prices. The evidence cited in Wood (1994) to support the 0.5 elasticity is strengthened by recent work cited by Grossman et al (2017, n. 3), as well as by the increased importance of trade in tasks.

[19] The increase in the counterfactual price reflects the degree to which trade with the South benefits all factors in the North, including those whose wages are lowered by this trade, reflecting especially Deardorff's (1997) point that the existence of non-competing imports is equivalent to technical progress in the sector concerned.

[20] The rise in the purchaser price as a result of wages being higher in the North than in the South depends on the share of the price that is accounted for by wages. It is assumed that the cost of traded intermediate inputs would not alter (except for trade costs) and that there would be no change in the cost of domestically supplied service sector intermediate inputs to manufacturing or manufactured intermediate inputs to services.

assumes no change in the overall North-South trade balance, that the South's primary exports would have been increased by intermediate input demand from labour-intensive production in the North, that non-primary intermediate trade flows would have changed in proportion to the relevant gross exports, and that the manufactures/services ratio of the reduction in the South's non-primary imports from the North would have been the same as the actual ratio.

In calculating the effects of these differences in trade flows on output (and labour demand), all of the North's manufactured imports from the South are assumed in the base case to be replaced (to the extent of demand at the higher prices) by Northern output based on the adjusted Southern production function. However, it is assumed that half of the North's services imports are items similar to the North's own exports, for example shipping and tourism, and are thus replaced by Northern output of the same skill and labour intensity as Northern exports, with no net effect on output or labour demand in the North. This last assumption is intended partly to allow for the likely understatement by the data for China of the skill intensity of Southern service exports, and partly to allow for uncertainty about the factor intensity and measurement of many of the South to North (and North to South) exports of services shown in Table A.1.

[Table 1 near here]

Results

The calculations are in an Excel workbook, available (and including the 1990 calculations) at [web reference]. The base case results are shown and discussed in Table 1 and the related text of the main paper. Table A.2 summarises the results of ten plausible variants on the base case, specified in its notes and discussed in the text of the main paper.

[Table A.2 near here]

Comparison with earlier estimates

The method of the factor content calculations described above is in most respects identical to that of Wood (1994, ch. 4). Greatly improved data, however, enable the present calculations to cover North-South trade in services, rather than the rough estimate in Wood (1994: 162-5) that their inclusion would double the effect of trade in manufactures. The comments of Cline (1997:

131-2) on that earlier estimate also shaped the assumptions of the present services calculation: only a fraction (rather than all) of the North's imports of services from the South are assumed to affect employment in the North, and domestically supplied intermediate inputs of services to labour-intensive manufacturing (and of manufactured intermediates to services) are assumed to be no more labour-intensive in the North than in the South.[21]

The definition of the North in the present calculations is broader than in Wood (1994) because the OECD now has more members, including Chile, Korea and Mexico, and so is the definition of the South, which now includes all non-OECD countries, including Russia. The definition of manufactures is unavoidably broadened to include processed primary products.

As in Wood (1994), the quality of skilled labour in the South is assumed to be half of that in the North, but the quality-adjusted skill premium in wages in the present calculations is only twice as large in the South as in the North, compared to three times in the earlier calculations. As in Wood (1994), rental rates on capital are similar in the North and South, with a higher profit rate in the South being offset by a lower price of capital goods.

[Table A.3 near here, in landscape orientation]

Table A.3 compares the results of the current calculations with those in Wood (1994). The first row shows the earlier estimates: a reduction in manufacturing employment of 9 million and a rise in the economy-wide relative demand for skilled workers of 11% (including the estimated doubling effect of services, but excluding the estimated doubling by defensive innovation). The second row adjusts the earlier estimates with different assumptions about services, as explained above, and the third row uses an export-weighted Southern manufacturing wage rate, as in the present calculations.[22] For the purpose of comparison, the fourth row further adjusts the earlier estimates by using the same assumptions as in the current base case (no change in the Southern trade balance and no lost Northern labour-intensive exports – see row 10 of Table A.2).

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[21] This change in the treatment of intermediates reduces the indirect labour content of counterfactual import-substituting production, but also lowers its counterfactual purchaser price.

[22] The justifications in Wood (1994: 398-402) for using a lower wage in the earlier calculations (generating a higher estimate of employment in Southern manufacturing) now seem less convincing.

The net effect of all these adjustments is to make the impact of trade on labour demand in the North considerably smaller than in row 1. The numbers in row 3 represent corrections of errors in Wood (1994): the reduction in manufacturing employment is only slightly smaller, because the corrections largely cancel out; but the rise in relative demand for skilled workers is 40% or 5 percentage points smaller, mainly because of the revised treatment of services. The numbers in row 4 are lower still, but this is for comparison with the 2011 base case, whose assumptions were simplified for purposes of exposition rather than because the 1990 assumptions now seem to have been incorrect (they are covered in the sensitivity analysis in Table A.2).

The current base case, in row 5, defines skilled labour as college graduates, more narrowly than in the earlier estimates, which at the sectoral level included professional, technical, managerial and skilled manual workers (Wood, 1994: 402-4) and at the economy-wide level included all workers with a complete secondary education or more. It is thus more accurate to compare the earlier estimates with the variant of the current base case (row 3 of Table A.2) in which skilled workers are defined as those with a complete secondary education or more, shown in row 6. Comparability also requires adjustment, shown in row 7, to match the country categories of the earlier estimates, in which the North was defined more narrowly and the former Soviet Union and Eastern Europe were omitted from both North and South, and further adjustment to use the narrower definition of manufactured exports (row 8).

Row 9 shows the differences between the comparably specified 1990 and 2011 estimates. The reduction of manufacturing employment in proportion to actual manufacturing employment is over twice as large in 2011 as in 1990, but only slightly larger in proportion to total employment (of which the share of manufacturing fell). However, the absolute reduction of manufacturing employment in the North is less than twice as large in 2011 as in 1990 (a difference of under 5 million jobs), despite a more than eight-fold increase in South-to-North manufactured export volume over this period.

[Table A.4 near here]

Table A.4 unpicks this surprising result. The estimated number of manufacturing workers in the North displaced by imports from the South increased by a slightly smaller proportion than the number of workers producing these goods in the South, whose productivity rose by about 5% per year. Employment in Northern manufacturing production of exports to the South rose

almost in proportion to the employment displaced by imports, with slower growth in export volume than in the South (mainly as a result of improved manufacturing terms of trade) being offset by slower growth of labour productivity (3.5% per year) than in the South.

Productivity growth is a key part of the explanation of the smallness of the employment impact of the large rise in manufactured imports from the South. Even at the slower rate in the North, output per worker doubled over this period, halving the effect on manufacturing employment of any change in output, whether caused by changes in trade or in domestic demand.

The rest of the explanation is the reduction over the period of the gap between the North and South in the employment content of exports, reflected in the South's higher rate of productivity growth and probably causally related to the North-South transfer of manufacturing technology through outsourcing and value chains. To the extent that this transfer just reduced inefficiency in Southern production of its initial set of export goods, the estimates for 1990 in Wood (1994) over-estimated labour displacement by imports in the North. The narrowed gap in employment content, however, also reflects changes in the product mix of Southern manufactured exports, which have become more capital and skill intensive, partly as a result of economic progress in Southern countries (recall, for example, that the South as defined in Table A.4 includes Korea in both years) and partly through more sophisticated forms of outsourcing.

Reverting to Table A.3, the impact on the economy-wide relative demand for skilled labour of 19% in 2011 is 14 percentage points (and four times) greater than in 1990. About half of this increase, though, arises from the decline in the relative number of unskilled workers economy-wide: replacing the 2011 unskilled share of 28% with the 1990 share of 50% cuts the difference in impact to little more than a doubling.[23] This proportional increase in impact is much larger for services than for manufacturing, and much smaller than the proportional rise in the volume of imports from the South, for reasons discussed above. However, it is only slightly smaller than the rise in the current-price ratio of non-primary imports from the South to Northern GDP, which was 2.7% in 1990 and 7.1% in 2000.

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[23] The correspondingly lower share of skilled workers pulls the other way, but with less effect on the outcome because in absolute terms the reduction in demand for unskilled workers in 2011 is over three times larger than the increase in demand for skilled workers.

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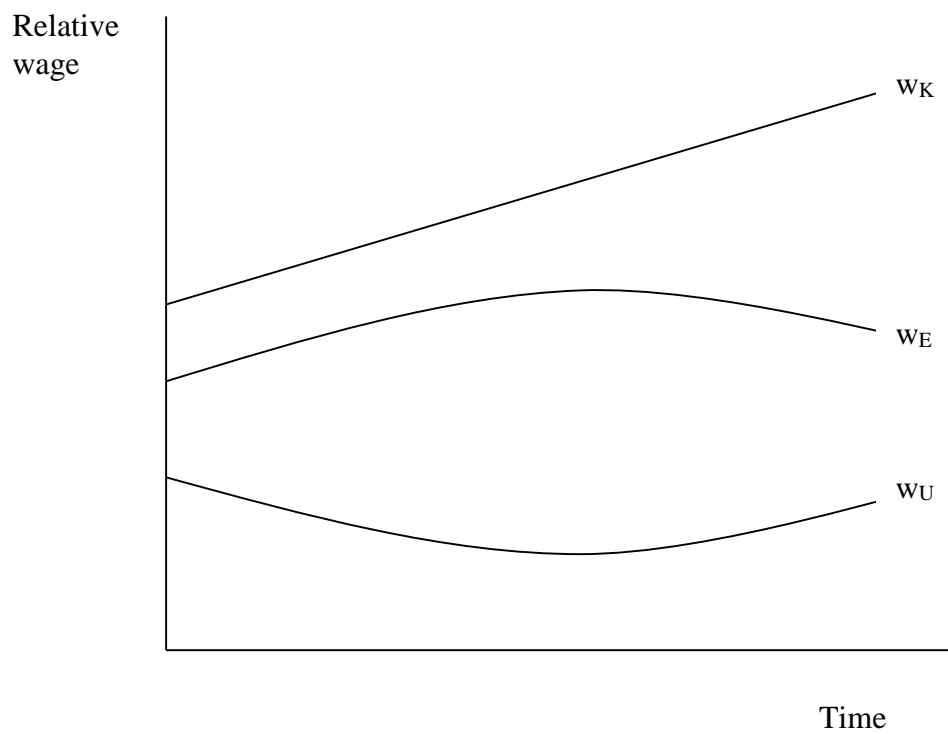Figure 1. Effects on relative wages of falling transport and co-operation costs

Relative
wage

w_K

w_E

w_U

Time

Table 1. Impact of North-South non-primary trade on demand for labour in North

| | Manufacturing | | | Services | | | Combined |
	More N exports	Less imp substit'n	Net effect	More N exports	Less imp substit'n	Net effect	Net effect
Absolute (million person-years)							
Skilled labour	2.5	-0.5	2.0	3.4	-0.7	2.7	4.8
Unskilled labour	3.9	-17.5	-13.6	4.5	-7.9	-3.4	-16.9
Total labour	6.4	-18.0	-11.5	7.9	-8.6	-0.6	-12.2
Proportionate (%)							
Total relative to actual employment			-15.1			-0.1	-2.1 *
Skilled relative to all skilled employment			2.0			2.6	4.6
Unskilled relative to all unskilled empt			-2.9			-0.7	-3.7
Skilled/unskilled economy-wide			5.1			3.4	8.6

Source: author's calculations, described in the appendix.

Notes: * = relative to employment in whole economy (including primary sector)

Table A.1 Composition of North-South service exports 2011 (%)

	From non-OECD to OECD	From OECD to non-OECD
Electricity, gas and water supply	0.5	0.4
Construction	1.8	1.7
Wholesale and retail trade; repairs	49.6	33.7
Hotels and restaurants	4.3	4.4
Transport and storage	17.0	29.4
Post and telecommunications	2.1	1.5
Financial intermediation	3.1	14.5
Real estate activities	1.0	0.8
Renting of machinery and equipment	1.6	1.3
Computer and related activities	3.4	1.9
R&D and other business activities	10.9	6.1
Public admin. and defence; compulsory soc. sec.	0.1	0.6
Education	0.1	0.9
Health and social work	0.2	0.3
Other community, social and personal services	4.3	2.7
Total services (including utilities and	100.0	100.0
Total (US $ billion)	967.5	1,110.2

Source: author's calculation from OECD-WTO TiVA database.
Note: numbers refer to domestic value added content of exports.

Table A.2. Sensitivity of estimated labour demand impact to plausible alternative assumptions

	Impact on manufacturing (million person-years)	Impact on economy-wide skilled/unskilled labour (%)
Base case, as in Table 1	-11.5	8.6
Alternative assumptions:		
1 Narrower country coverage of the North	-12.2	12.4
2 Broad sectoral manufacturing and services skill shares	-10.7	6.6
3 Skilled ≥ complete secondary (rather than college)	-12.0	13.7
4 Southern efficiency 70% of North (rather than equal)	-7.2	7.3
5 Subst. elasticity in prod'n = 0.25, in consumption = 0.75	-13.7	9.9
6 Subst. elasticity in prod'n = 0.75, in consumption = 0.25	-8.4	6.9
7 10% of manufactured imports similar to Northern exports	-9.6	8.4
8 Increase in Southern trade surplus of $250 billion	-12.2	8.1
9 Manufs 50% (vs 67%) of S's marginal imports from N	-12.9	8.8
10 Lost labour-intensive exports from North to South	-13.7	9.0

Source: author's calculations, described in text.

Notes: in row 1, the North is the OECD in 1990 minus Turkey, the South is the rest of the world, and 5% of manufactured imports from the South are assumed to be similar to Northern exports and thus replaced by output of the same factor intensity as Northern exports. Row 2 makes no adjustment for differences between the skill intensity of exports and that of all production in the sectors concerned. In row 4, total factor productivity in Southern export production is assumed to be 30% lower than for counterfactual production of the same items in the North. In rows 5 and 6, the alteration to the substitution elasticity in production is to that between capital-plus-skill and unskilled labour. In row 7, one-tenth of manufactured imports are replaced by output of the same factor intensity as Northern exports. In row 8, the South's imports from the North increase by less than its non-primary exports to the North. In row 9, a higher share of the South's earnings from its non-primary exports is spent on Northern services rather than on Northern manufactures. Row 10 assumes that the South would have spent half of its primary export earnings on labour-intensive imports from the North that technology transfer related to non-primary exporting has enabled it to produce domestically.

Table A.3. Comparison of 2011 estimates of impact on labour demand in North with 1990 estimates in Wood (1994)

	Impact on manufacturing			Impact on economy-wide skilled/unskilled labour (%)		
	million person-years	% of actual	% of all employment	Total impact	From manuf'g	From services
Wood (1994) estimates for 1990						
1. Base case in Table 4.9 plus doubling for services	-9.0	-12.1	-2.6	11.4	5.7	5.7
2. With revised assumptions about services	-11.0	-14.8	-3.1	7.9	6.6	1.3
3. Plus export-weighted wage in Southern manufacturing	-8.4	-11.4	-2.4	6.5	5.4	1.1
4. Plus other current base case assumptions	-5.9	-8.0	-1.7	4.8	4.0	0.8
Current estimates for 2011						
5. Current base case, as in Table 1	-11.5	-15.1	-2.0	8.6	5.1	3.4
6. Base case with skilled ≥ complete sec, as in Table 2	-12.0	-15.8	-2.1	13.7	8.7	4.4
7. Plus 1990 country coverage of North and South	-11.4	-21.7	-2.7	20.4	13.0	5.9
8. Plus narrow definition of manufactured exports	-10.6	-20.0	-2.5	19.2	11.9	5.9
Comparison of 1990 and 2011 estimates						
9. Row 8 (2011) minus row 4 (1990)	-4.6	-12.1	-0.8	14.4	7.9	5.1

Table A.4. Change between 1990 and 2011 in impact of trade on manufacturing employment

	1990	2011	Growth
South to North (narrow) manufactured exports			(% p.a.)
Value (current $ billion)	287	1,746	9.0
Volume (2000 $ billion)	264	1,498	8.6
Employment content in South (million jobs)	12.6	26.6	3.6
Employment displacement in North (million jobs)	-9.0	-16.5	2.9
Output (volume) per worker	21.0	56.2	4.8
Counterpart North to South manufactured exports			
Value (current $ billion)	269	1,423	8.3
Volume (2000 $ billion)	242	951	6.7
Employment content in North (million jobs)	3.1	5.9	3.1
Output (volume) per worker	78	161	3.5

Source: author's calculations, described in text.

Notes: all trade and employment data for 1990 on same basis as in line 4 of Table A.3, and for 2011 on same basis as in line 8 of Table A.3. Export volumes derived with unit value indices from UN Monthly Bulletin of Statistics. 'Counterpart' exports are the additional Northern exports of manufactures financed by the South's revenues from its exports of manufactures to the North.