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Globalisation and Labour Markets: Literature Review and Synthesis

By D. Greenaway and D. Nelson

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Abstract

The literature on the labour market effects of globalisation is voluminous. This paper reviews many of the major contributions to that literature and sets them in the broader context. The papers reviewed are drawn from six branches of the literature relating to: the Stolper-Samuelson Theorem; Trade and Wages; Labour Market Microstructure and Adjustment; Trade and Employment; Migration and Labour Market Adjustment; FDI and Labour Markets. In addition to reviewing the literature, the paper also sets out an agenda for future research.

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Non-Technical Summary

Globalization is very much on the minds of public figures and the public at large throughout most of the world. While it not clear exactly what this means, it is clear that it refers to a process of growing interdependencies between economies and that international trade, international migration, and foreign direct investment are key drivers of the process. Although most trade economists are in no doubt that increased openness results in welfare enhancement in the long run, public perceptions are not so unequivocal - as events at Seattle and other venues have recently demonstrated. Public concerns regarding the impact of globalization relate to a range of issues, including alleged links to environmental degradation and poverty. Another concern is the notion that somehow globalization has contributed to a deterioration in labour market outcomes (declining wages, increased unemployment risk and so on) for the less skilled.

The deterioration of relative returns to labour market participation on the part of unskilled workers in the 1980s is accepted as fact by virtually all serious analysts of labour markets (Davis, 1992; Levy and Murnane, 1992). What is controversial is the relationship between this and any (or all) of the elements comprising globalization. Evaluating the widely divergent claims made in the literature on globalization and labour markets requires both systematic empirical work and a clear (and appropriate) theoretical framework within which to evaluate the empirical work. The literature is enormous, as the bibliography at the end of this paper demonstrates. The paper itself is actually the Introduction and Overview to a two-volume collection of over 40 of the most important papers in the literature, entitled Globalization and Labour Markets and published by Edward Elgar in 2001 (ISBN 1 84064 132 0).

In selecting the papers for these volumes, we identified a mix of both theory and empirical papers which have either played a particularly important role in the development of research on some aspects of the globalization-labour markets relationship or are particularly good illustrations of one or other aspects of the relationship. The papers are organised around six themes: Stolper-Samuelson Theorem; Trade and Wages; Labour Market Microstructure and Adjustment; Trade and Employment; Migration and Labour Market Adjustment; FDI and Labour Markets.

In this paper we review the literature overall, embedding those papers reprinted in the two Volumes in the broader context. We also evaluate the emerging agenda and areas for future research.

Something called globalisation is very much on the minds of public figures and the public at large throughout most of the world. While it not clear exactly what this means, it is clear that it refers to a process of growing interdependencies between economics and that international trade, international migration, and foreign direct investment are key drivers of the process. Although most trade economists are in no doubt that increased openness results in welfare enhancement in the long run, public perceptions are not so unequivocal - as events at Seattle and other venues have recently demonstrated. Public concerns regarding the impact of globalisation relate to a range of issues, including alleged links to environmental degradation and poverty. Another concern, which is the subject of these two volumes is the notion that somehow globalisation has contributed to a deterioration in labour market outcomes (declining wages, increased unemployment risk, etc.).[1]

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[1]The obvious fourth component in any definition of "globalisation" is international financial capital flows. However, the analytical and empirical frameworks commonly used in the analysis of international finance are quite different from those used to analyze the flows considered in this volume, and possess considerably less clear links to labour markets. As a result we abstract from financial flows in this volume.

[2]In addition, while the great majority of empirical research on these questions has focused on U.S. data, we have also sought, where possible, to include studies with a non-U.S. focus. We should also note that all of the empirical papers examine OECD countries. At this point in time, primarily as a result of data limitations, there are very few studies of developing countries.

The papers included in these two volumes are organised around a number of themes. We begin with a group of papers on general equilibrium theory, as setting the context against which much subsequent work is completed. We then have groups of papers on 'Trade and Wages', 'Labour Market Microstructure and Adjustment', and empirical research on 'Trade and Employment'. The focus then moves on to 'Migration and Labour Market Adjustment' and concludes with 'Foreign Direct Investment and Labour Markets'. In this introductory chapter we review briefly each of the papers included, but also endeavour to place it in the broader context.

I. Volume 1, Part I: General Equilibrium Theory as Intuitive, Open Economy Macroeconomic Theory

In selecting a theoretical framework for interpreting and evaluating empirical research on the link between globalisation and labour markets, we begin from the proposition that this relationship is essentially macroeconomic. That is, while there is evidence of considerable variability across, and within, sectors, the general fact of deteriorating labour market conditions for unskilled workers is a broad macroeconomic property of all OECD economies in the 1980s. Thus our primary theoretical framework must be pitched at a level that focuses on broad macroeconomic relationships.[3] In addition, the framework must be sufficiently rich to permit the explicit analysis globalisation and income distribution. The most widely used framework of this sort is the neoclassical general equilibrium model. A neoclassical economy is a triple $\varepsilon = \square \boldsymbol{Z},\boldsymbol{F},\boldsymbol{R} \square$, where $\boldsymbol{Z}$ is a vector of productive factors, $\boldsymbol{F}$ is a vector of technologies that take productive factors into final goods, and $\boldsymbol{R}$ is a vector of household preferences over final goods. Under quite general conditions on technologies and tastes, it can be shown that there exists at least one set of non-negative commodity and factor prices, and an allocation of commodities to households, with zero excess demand in all factor and commodity markets, such that the allocations to households maximise their utilities and outputs from firms are consistent with profit maximisation (Arrow and Hahn, 1971). We are interested in considerably more than existence.

To study the links between changes in international trade or factor flows, we require a model with sufficient restrictions that it yields clear comparative static predictions. Most of the

[3]Of course, cross-country and cross-sectoral differences are important facts as well, and will generally require theoretical frameworks with more structure to treat them seriously. We turn to such structures in Section III: Labour Market Microstructure and Adjustment.

theoretical papers reproduced here pursued the strategy of applying the minimal model sufficient to encompass the phenomenon being studied. This will generally involve 2 final goods (so that there can be exports and imports of distinct commodities) and 2 factors of production (so that there can be straightforward effects on the functional distribution of income). Chapter 1 in Volume 1 reproduces the single most important paper in the literature on globalisation and labour markets: Wolfgang Stolper and Paul Samuelson's "Protection and Real Wages".[4] Although published in 1941, this paper still repays careful study. Not only does the paper contain an exemplary exposition of the core result (the Stolper-Samuelson theorem), but the motivation in terms of both economic issues and careful attention to previous research make it an excellent example of scholarly craftsmanship.[5]

The next paper, Ronald Jones', "The Structure of Simple General Equilibrium Models", provides what is still the canonical version of 2-factor □ 2-good general equilibrium model. Using simple duality theory, Jones puts the basic general equilibrium model through its paces: presenting the main comparative statics for the small, open economy (i.e. an economy facing fixed commodity prices); introducing demand; dynamics; and the analysis of technological change. This last is particularly important, given the emergence of technological change as the alternative explanation of choice to globalisation for many students of the current labour market. Not only is Jones presentation of the main results standard, but his notation has become so standard that one is tempted to make this paper a prerequisite to the reading of any other papers in this volume.

Given the centrality of this result, it will be useful to be very clear about the content of the Stolper-Samuelson theorem. In what Deardorff (1994) calls the fundamental version, the theorem states:[6]

Theorem (Stolper-Samuelson, fundamental): In a two-factor □ two-good, Heckscher-

[4]Because the papers are collected in two volumes, with chapters in each numbered from 1, we will refer to chapters by volume (I or II) and chapter number (1 to n), as above.

[5]A testament to the continuing influence of the Stolper-Samuelson theorem, Deardorff and Stern (1994) collects many of the key theoretical papers generalizing the theorem from 5 decades (the 1940s - 1980s). As an added bonus, this volume contains reflections on the status and role of the Stolper-Samuelson theorem by many of the major developers of modern trade theory.

[6]Deardorff's paper, which is the introduction to the Deardorff and Stern volume mentioned in the previous footnote gives an admirably clear review of the various versions in which the Stolper-Samuelson theorem has appeared.

Ohlin-Samuelson (HOS) model, an increase in the relative price of a good increases the real wage of the factor used intensively in producing that good, and lowers the real wage of the other factor.

This is essentially the version present in Jones (Chapter I.2). Stolper and Samuelson present this specifically in terms of the effect of a shift from autarky to free trade on the part of a small, HOS economy. Thus, the original version is:

> *Theorem* (Stolper-Samuelson, original): International trade necessarily lowers the real wage of the scarce factor expressed in terms of any good.

Where the fundamental version identifies a link between domestic commodity prices and domestic factor prices, the original version requires the construction of a link between world prices, domestic prices, and endowments as well. In an HOS world this link is unproblematic, and identified by the Heckscher-Ohlin theorem. It is now well known that a variety of empirically plausible phenomena can interfere with the Heckscher-Ohlin theorem, and thus with the link from trade to factor-prices via factor scarcity.[7] The absence of evidence for this part of the link will prove to be an essential element in the case against trade as a culprit in the deterioration of labour market returns to unskilled workers.

In thinking about generalisations from the 2 □ 2 world to the empirically more plausible world of many goods and factors, it is useful to consider four essential elements of the fundamental theorem: friends and enemies; magnification; partition; and globality. For the general case, suppose that there are m factors of production (individual factors indexed by $i \in I$) and n produced goods (individual goods indexed by $j \in J$). The basic notion of *friends and enemies* is that, for every factor, there is at least one good (a *friend*) such that an increase in the price of that good results in an increase in the return to i, and there is at least one good (an *enemy*) such that an increase in the price of that good results in a decrease in the return to i. This is what Ethier (1982) refers to as the directional part of the theorem. We have already seen that this is the case in the HOS world, but the strongest directional generalisations in the $m \neq n$ case take

[7] Metzler (1949) develops a large country analysis in which terms-of-trade effects can interfere with the original Stolper-Samuelson logic, while Bhagwati (1959) presents a systematic analysis of sources of slippage between HOS axioms and empirically plausible properties of the world generating the data. Both papers can be found in Deardorff and Stern.

the form of correlations between vectors of commodity price changes and factor price changes.[8] This, however, does not provide much analytical leverage since, from an economic point of view, what we really want to know is what happens to the real incomes of factors. Thus, the second essential fact of the original and fundamental versions of the Stolper-Samuelson theorem is that the factor-price changes are real changes, what Jones referred to as *magnification*.[9] In the important paper by Jones and Scheinkman, reproduced here as Chapter I.3, the authors identify a good and a factor as "natural friends" if the pair are not only friends, but that magnification applies, similarly for "natural enemies".[10] In the general $m \neq n$ case, Jones and Scheinkman show that natural friends/natural enemies relationships are not to be expected. However, if every factor is used in at least two sectors, and $m = n$, they do establish that every factor has at least one natural enemy, but they show that there need be no single natural friend.[11] The third aspect of the 2×2 Stolper-Samuelson theorem is that a change in relative commodity prices *partitions* factors into losers and winners. The existence of such a partition is the basis of Chipman's (1969) "strong" generalisation of the Stolper-Samuelson theorem. The failure of such generalisations under economically meaningful conditions on technology is what led to generalisations of the friends/enemies and correlation sort in the first place. The final aspect of the Stolper-Samuelson theorem is that the natural friendship/enemy relationships are *global*–that is, a good and a factor are linked as friends or as enemies over the entire parameter space, they never change affiliation. In the HOS world this is guaranteed by the economically intuitive assumption of no factor-intensity reversals. Unfortunately, the higher dimensional analogue (global univalence) has no such natural economic interpretation.

Chapter I.3, by Ronald Jones and José Scheinkman, provides a particularly clear analysis of one class of generalisation.[12] This paper is really two papers rolled into one: the first part of the

[8]Ethier (1982) presents one set of these generalizations. This class of result has interesting application to empirical work and is discussed in Chapter I.9, by Staiger and Deardorff.

[9]Stolper and Samuelson discuss this in terms of "the elimination of the index number problem".

[10]Jones and Scheinkman also develop a dual friends and enemies analysis of the Rybczynski relationship between endowments and outputs.

[11]That is, an increase in any, single commodity price must raise the return to some factor, but for any given factor there need not be any such commodity price. Furthermore, it is true that every commodity is a friend to at least one factor and an enemy to at least one factor. In a later paper, Jones (1985) shows that there must be some subset of goods such that a uniform increase in all of their prices will suffice to raise the real return to any factor.

[12]Ethier's (1984) survey is the essential reference for higher dimensional issues in general, but covers a much wider range of issues than those considered in this volume. Several other classic papers generalizing the Stolper-Samuelson theorem can be found in the Deardorff and Stern volume.

paper presents a rigorous, but intuitive, discussion of generalisations to many factors and goods; while the appendix gives an extremely clear technical presentation of the main comparative statics. For the purposes of this volume, the appendix is particularly important. As mentioned in the previous paragraph, the key expository tool developed in the generalisations of Jones and Scheinkman is their notion of "natural friends and enemies". In addition, the factor-price equalisation theorem appears as a comparative static relationship between endowment changes and factor-price changes. In this form, factor-price equalisation (a multi-country theorem) is naturally interpreted as what Leamer (1995) calls factor-price insensitivity, a single-country theorem with important application to the analysis of immigration, as we shall see below in our discussion of the papers in Volume 2, Part III.

To this point, the income distribution results, via the Stolper-Samuelson theorem, have all focused on the functional distribution of income. However, much of the policy and political economy discussion is more appropriately framed in terms of the household distribution of income. Most applications generate a very simple link between the functional and household distributions by assuming that each household owns only one type of factor, but in Chapter I.4, Lloyd and Schweinberger develop what they call the "imputed output approach" to develop a direct analysis of the link between trade and the household distribution of income.

Where the previous papers in this section develop the general structure of applied general equilibrium models and present various versions of the Stolper-Samuelson theorem, the last paper explicitly links this literature to one of the prime concerns of the next section–the relationship between trade and technology change in determining changes in relative factor returns. In "Trade, Technology, and Income Distribution", Ronald Jones presents a very clear, graphical analysis of a 2-factor □ *n*-good model under a variety of assumptions (including factor specificity and fragmentation of production).[13]

II. Volume 1, Part II: Trade and Wages

In the last decade or so there has been a massive boom in research on the link between trade and wages.[14] Most of this work falls relatively straightforwardly into one or another of four broad

[13]Other good papers using basic trade theory to help organize thinking about the link between trade and wages are Baldwin (1995), Deardorff and Hakura (1994), Findlay and Jones (2000), Haskel (2000), Jones (2000), and Neary (2000).

[14]In addition to work that is primarily concerned with trade and wages, there has been a sizable body of

categories: simple checks for consistency with theory; factor-content studies; mandated-wage regressions; and CGE studies. We have selected several examples of each.

Faced with the labour market experiences of the 1980s, and the suspicious coincidence of increased trade with developing countries and rapidly deteriorating current account in the early 1980s, a number of journalists and politicians began to suggest that there might be something more than simple coincidence. Early work by labour economists also seemed to suggest a potentially important role for trade in explaining the rising skill premium (e.g. Murphy and Welch, 1991). The first wave of response by trade economists was to check for basic consistency between standard trade theoretic reasoning and the available data.

Before considering two prominent examples of this sort of analysis, we note the extremely clever, early paper by Stephen Magee, "Three Simple Tests of the Stolper-Samuelson Theorem", Chapter I.6, in which the author uses the political behaviour of agents testifying before Congress on the Trade Reform Act of 1973. Assuming that agents will reveal their preferred policy in testimony, and that policy preference is determined by economic effect, Magee compares two alternatives: the HOS model, in which the economic effect of a liberalisation is to raise the return to the abundant factor (presumed to be capital); and a Cairnes-Haberler model in which capital and labour are specific to sectors. If the world is best characterised by the former, we should expect to see capital and labour lobbying against one another, but if the world is better characterised by the Cairnes-Haberler model, we expect to observe capital and labour lobbying together by sector. Magee's finding that the pattern of testimony is more accurately rationalised by the Cairnes-Haberler model is important for at least two reasons: first, since lobbying is costly, there is indirect evidence of real economic effects from changes in the trade regime; and second, the economy does not respond to a trade shock in Stolper-Samuelson fashion, at least over the time horizon relevant for political calculation. The first says that globalisation may well have real economic effects, the second that simple cross-section analysis may not reveal long-run tendencies toward Stolper-Samuelson outcomes.[15]

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work primarily concerned with explaining recent trends in relative wages in which trade, or some other aspect of globalisation, has figured more-or-less prominently as a candidate explanation. Not surprisingly, there have been a number of good surveys of this work. See, for example: Burtless (1995); Richardson (1995); Lawrence (1996); Belman and Lee (1996); Johnson and Stafford (1999); and Gaston and Nelson (2000).

[15]This second point follows from the now standard interpretation of the Cairnes-Haberler model as a short-run model.

Lawrence and Slaughter, (Chapter I.7), were among the first to respond to claims of a link between trade and the rapidly rising skill-premium from a trade theoretic perspective. The core of the paper is a pair of simple empirical exercises to check for consistency between the data and mechanisms generating Stolper-Samuelson outcomes. First they check for all industries adopting a more unskilled-intensive production technique; and second check for an increase in the relative price of skill-intensive products relative to unskilled-intensive products. At several levels of disaggregation, the authors find these tests are strongly inconsistent with the predictions of the Stolper-Samuelson theorem and, ultimately, argue that the observed patterns appear consistent with skill-biased technical change across sectors.[16] Lawrence (1996), in Chapter II.26, extends the discussion of relative prices to Germany and Japan, and responds to many of the early criticisms of Chapter I.7.

Bhagwati and Dehejia, (Chapter I.8), pursue a similar strategy. The authors first develop a critique of the HOS model as a framework for interpretation from first principles, then offer empirical evidence on relative trade prices complementary to that in Lawrence and Slaughter, and finally discuss some of the alternatives (even offering a globalisation link of their own via footloose production and outsourcing). Chapters I.7 and I.8 present analyses that lead to doubts about the validity of the trade theoretic account, rooted in the Stolper-Samuelson theorem, but, while suggestive, they remain preliminary.

Factor content analysis emerges more from the labour theorists traditional approach than from that of trade theory. In an effort to produce a straightforward estimating framework, labour economists often treat the market for labour (or some class of labour) in partial equilibrium. One convenient approach involves consideration of a downward sloping demand for labour and a vertical supply curve. In this context, the labour content of trade can be added to the domestic supply, thus shifting the supply curve and permitting the investigator to identify the effect of trade on the wage. The initial response by trade economists to this approach was overwhelmingly negative. After all, as explained in the papers in section I, in a competitive environment (at least of the HOS type), factor-prices can change only if commodity prices

[16]In the emphasis on skill-biased technical change, the authors echoed earlier work by Berman, Bound and Griliches (1994) and Krueger (1993). The role of skill-biased technical change continues to be a theme of research on contemporary wage inequality. For representative recent empirical work, see: Mishel and Bernstein (1998), Acemoglu (1999); and the papers in the symposium in the *Quarterly Journal of Economics* (1998, V.113-#4). Similar results with respect to the price relationship in the case of Europe can be found in Neven and

change (or if the country becomes specialised). An endowment change that does not effect commodity prices, cannot change factor prices. However, an interesting paper by Deardorff and Staiger, Chapter I.9, shows that, at least under some relatively restrictive assumptions on technology and taste, there is a well-posed comparative static relationship between factor-content of trade and factor returns, although it is not quite the comparative static considered in the labour literature. Specifically, Deardorff and Staiger show how to create autarky equivalent equilibria and compare the factor-returns in those equilibria. This permits what Krugman (2000), calls a "but for" comparative static: but for international trade, the factor-returns in autarky would have been ... . At this point, this justification for factor-content studies, while interesting, seems only distantly related to the empirical work and, in addition, appears to many to be quite fragile.[17] Nonetheless, factor-content studies continue to figure prominently in empirical research on the relationship between trade and wages[18]

One of the most prominent proponents of the method is Wood, whose 1994 book, *North-South Trade, Employment and Inequality: Changing Fortunes in a Skill-Driven World*, has been a primary stimulus to research and a lightning rod for criticism. This rich volume covers a wide variety of issues, but the core is a factor-content analysis adjusted for the presence of non-competing goods between northern and southern economies (also see Wood, 1991). The effect of such goods is to make the implicit import of labour even greater, resulting in some of the largest estimates of labour market impacts of trade in the literature. Wood's paper, "How Trade Hurt Unskilled Workers", Chapter I.10, provides a convenient summary of this work and responds to criticism (including discussions of the papers by Lawrence and Slaughter, and Sachs and Shatz, both in this volume).

Another early application of this method is Borjas, Freeman and Katz' (1992) study of the labour

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Wyplosz (1999), while Pryor (1999) provides additional checks on key relationships for the US case.

[17]See the recent symposium in the *Journal of International Economics*, comprising papers by Deardorff, Krugman, Leamer and Panagariya. Deardorff (2000) and Panagariya (2000) offer generalizations of the Deardorff-Staiger analysis (from Cobb-Douglas technology and tastes to CES technology and tastes). Interestingly, Deardorff appears to be cautiously supportive of the empirical application of the method, while Panagariya is more doubtful. Krugman (2000) and Leamer (2000) discuss the breadth of application of the method on theoretical grounds, with Krugman being quite supportive and Leamer quite critical. Baldwin (2000) and Kohler (2000) also provide useful discussions of these issues. The Krugman and Leamer papers also present quite useful discussions of trade and technology as sources of the increased skill premium observed in the 1980s.

[18]In addition to the papers reproduced here, prominent examples of the factor-content methodology can be found in: Murphy and Welch (1991); Katz and Murphy (1992); Bound and Johnson (1992); Johnson and Stafford (1993); Berman, Bound and Griliches (1994); and Berman, Bound, and Machin (1998).

market impacts of international trade and immigration, where the authors conclude that trade, but not immigration, affected the skill-premium when unskilled is defined as high school graduates, but both trade and immigration are significant when unskilled is defined as high school dropouts. The authors extend this and respond to criticism of the earlier paper, in "How Much Do Immigration and Trade Affect Labor Market Outcomes?", (Volume 2, Chapter II.15). The new analysis leads then to conclude that trade has a relatively small effect on the wage premium under either definition, while immigration has a sizable effect when unskilled is defined as high school dropouts, but small when defined as high school graduate.

Messerlin, in Volume 2, Chapter I.7, presents an analysis of the relationship between trade and wages based explicitly on Borjas, Freeman, and Katz' framework. As with BFK, Messerlin finds that trade has generated an increasing reduction in demand for (or increase in supply of) unskilled labour. Interestingly, however, this is a phenomenon of the 1990s in Messerlin's data. Also like BFK, the shares are small. Overall, Messerlin concludes that trends in relative wages are driven more by domestic factors than by trade.

Sachs and Shatz (1994) present one of the most detailed factor-content studies of trade, disaggregating by sector and trading partner, motivating the analysis explicitly in terms of the Deardorff-Staiger analysis, and responding directly to criticisms of the sort given in the Lawrence-Slaughter and Bhagwati-Dehejia papers. In that paper the authors conclude that trade had a statistically significant, but quantitatively fairly small effect on the skill premium. In a later paper, "International Trade and Wage Inequality in the U.S.: Some New Results", Chapter I.11, the authors return to these issues, with a particular emphasis on responding to critics (like Lawrence/Slaughter and Bhagwati/Dehejia). They conclude that trade, and globalisation more generally, may well have played a significant role in the rise of the skill premium.

It is our reading of this literature that, while the findings of factor-content studies may be suggestive, their foundations are sufficiently dubious that their ultimate effect on professional priors has been essentially zero. In this respect, the mandated wage methodology, because of its closer relationship to the underlying theory, has probably had a considerably larger impact. This approach builds on Jones', (Chapter I.2 and I.3), demonstration that the proportional change in a commodity price will be equal to a distributive share weighted average of proportional change in factor prices:

$$\hat{p}_j = \sum_{i \in I} \hat{w}_i \theta_{ij}$$

(1)

where hats denote proportional changes $\left(\hat{x} = \frac{x'' - x'}{x'} \right)$ and $\theta_{ij} = \frac{a_{ij} w_i}{p_j}$ (where a_{ij} is the input of factor *i* in one unit of commodity *j*). Baldwin and Hilton (1984) and Hilton (1984) developed related methods, based on Jones' decomposition, for determining production cost differences between countries. With the emergence of interest in changing returns to skilled and unskilled labour, Baldwin and Cain (2001) recognised that essentially the same approach could be applied to a single country over time. Specifically, a regression of changes in commodity prices on factor shares provides an estimate of the change in factor-price mandated by the price change (and the structure of the model). By identifying a theoretically well-grounded approach to studying the relationship between trade and labour markets, this extremely important paper created the foundation for high impact studies on trade and wages.[19],20 Finding only relatively small trade mandated effects on the skill premium, the authors consider a number of alternative causes via the use of a variety of control variables, ultimately concluding that, technological change appears a more likely cause of the rising skill premium than trade.

One criticism of Baldwin and Cain's analysis is the relatively informal way, by comparison to their treatment of trade, in which they examine the effect of technological change on the skill premium. Leamer's, "In Search of Stolper-Samuelson Effects on U.S. Wages", Chapter I.12, extends the Jones-Baldwin framework of equation (1) to incorporate technical change as:

$$\hat{p}_j = \sum_{i \in I} \hat{w}_i \theta_{ij} + \hat{TFP}_j \qquad \textbf{(2)}$$

where $\hat{TFP}_j$ is the change in total factor productivity. Leamer uses this both as a platform to discuss problems with this sort of analysis and as a framework of his own empirical work.

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19 In addition, the authors directly implement the Deardorff-Staiger factor-content methodology, concluding that this methodology implies that trade accounts for about 19% of the change in the skill premium from 1977-1987.

20 See Slaughter (2000) for a survey of empirical findings in this area. Papers not included here that implement the mandated wage methodology include: Courakis, Maskus and Webster (1997); Desjonqueres, Machin and Van Reenen (1999); Krueger (1997); Luecke (1999); and Schmitt and Mishel (1996).

Leamer has staked out a distinctive position that seeks to take the trade theoretic model seriously as a framework for estimation and interpretation, and this paper is an excellent presentation of both the framework and the results, all carried out in Leamer's lively style.[21]

An interesting complement to econometric analysis is computational analysis and, here, there are two distinct strategies: the first involves the use of simple (i.e. low dimensional) computational general equilibrium (CGE) models, under vaguely plausible (given the low dimensionality) parameter values, to generate "back of the envelope" estimates of relevant magnitudes; and the second involves the use of large-scale CGE models, developed for other purposes, to simulate the relationship between trade shocks and labour market outcomes.[22] Krugman, in Chapter I.13, presents an archetypal example of the first strategy. After arguing that world trade has grown dramatically, Krugman develops a simple, computational model of a 2 □ 2 OECD economy in an effort to determine plausible orders of magnitude for labour market effects. After choosing a set of basic parameters that characterise the macroeconomy (e.g. wage ratio, endowment shares, distributive shares in each industry, and expenditure shares), Krugman considers two sets of labour market clearing conditions: a European case with a fixed relative wage/skill premium (i.e. □ = w_S/w_U); and a US case with a variable relative wage. With the OECD economy large in the North-South market being modeled, growing trade affects the world price and, thus, the labour market. In the European case, however, relative wages, and thus relative prices, are institutionally fixed, so the economy adjusts on the employment/ output margin, with North-South trade accounting for a significant share of observed unemployment. In the US case full-employment is ensured by a flexible relative wage, the model implies that trade with NIEs (newly industrialised economies) on the order of magnitude observed in the OECD would have only a very small effect on relative commodity prices and, thus, on relative factor prices.

Where Krugman uses simple CGE models to examine the plausibility of certain claims with respect to the link between globalisation and labour market outcomes, Francois and Nelson, in

[21] As we shall see, Feenstra and Hanson, Chapter II.25, use the same framework to study the effect of outsourcing on relative wages.

[22] Not surprisingly, given increasing availability of CGE software and dramatic drops in cost and increases in speed of computers, there is a substantial body of CGE research on trade and labour markets. Further examples of simple models can be found in: Thompson (1997); Rowthorn, *et al.* (1997); Minford, *et al*. (1997); Falvey, *et al*. (1997); and Abrego and Whalley (2000 a&b). For large scale models, see: Burfisher, *et al*. (1994); Cline (1997, chapters 3 and 4); Tyers, *et al*. (1999); Reinert and Roland-Holst (1998); Smith (1998);

Chapter I.14, use an equally simple computational framework to evaluate the quantitative significance of alternative assumptions about the production structure of the economy. Specifically, the authors consider: a baseline HOS model (essentially identical to the US model in Krugman); a model with interindustry flows; a model with Armington-type product differentiation; and one with Ethier-type product differentiation. In both homogeneous goods cases, the standard Stolper-Samuelson relationship goes through; while in the heterogeneous goods cases both factors can gain in welfare terms.

An interesting example of the application of a large-scale CGE model is Tyers and Yang's in Chapter I.15. In a sophisticated analysis of a large-scale model (5 factors □ 37 sectors □ 6 regions), the authors consider the effects of trade and skill-biased technical change (i.e. skill upgrading) on returns to factors, finding that the latter was the predominant cause of the increased skill premium.

Overall, and as reflected in the papers collected here, results of empirical research to date can be reasonably characterised as concluding that trade has had a small effect on the skill premium, with the more significant cause being some form of technical change. However, it should be noted that if this conclusion constitutes an aggregate prior, it is one that is relatively weakly held. More recent research of the mandated wage regression sort seems to be turning up larger effects, a number of prominent researchers dissent strongly from this conclusion, and researchers on the whole seem reticent to make strong claims This is in contrast to research on immigration, where, as we shall see below, the level of agreement is much higher. One of the main concerns, especially by labour economists, relates to the assumption of perfectly competitive markets (especially labour markets) made throughout the research we have considered to this point. In the first section of Volume II, we collect several papers that attempt to incorporate simple, but plausible, labour market considerations in general equilibrium models.

III. Volume 1, Part III: Labour-Market Microstructure and Adjustment

An immediate concern with the HOS structure, and its generalisations considered to this point, is that some factors of production may experience substantial costs in adjusting to trade or technology shocks. We have already noted that Magee's "Three Simple Tests..." suggested factor-specificity, while Grossman and Levinsohn's (1989) capital market event study provides

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Cortes and Jean (1998); and Jean and Bontout (1999).

evidence that markets respond to a variety of shocks as if capital were specific. An obvious first approach to such considerations is to treat some factors as specific to the industry in which they are located, with some other factors fully mobile.[23] Mussa's important paper, on factor specificity (Chapter III.16), presents a clear and careful analysis of the income distribution effects of changes in the trade regime. This paper not only shows how easily income distribution effects are derived from the specific-factors model and the link between the short-run (when some factors are specific) and the long-run (when all factors are mobile), but also how easily the model is extended to multiple sectors. The explicit focus on trade policy makes the link from theoretical work to the results of empirical work on trade and wages quite straightforward.

The analysis of technological change in the specific-factors model is developed in Jones' in Chapter III.17, building directly on the framework in his "Structure of Simple General Equilibrium Models" (Chapter I.2). By comparison to the HOS model, factor-bias can play a major role in affecting the relative factor-returns. Specifically, if we suppose that labour is intersectorally mobile, while capital is sector-specific, labour-saving technical progress will tend to reduce the real return to labour. However, as the full analysis suggests, this is far from necessary.

While the introduction of intersectoral immobility adds an important dimension to the previous analysis, the specific-factors model, like the HOS model and its generalisations, is characterised by full-employment. Since most empirical research on the political economy of trade policy suggests that unemployment is causally related to trade policy outcomes, a fully satisfactory analysis of the link between trade and labour markets should be able to evaluate arguments relating not only to wages, but also to unemployment. Unfortunately, the theoretical foundations of unemployment analysis are considerably more controversial than those related to wage determination and income distribution. Nonetheless, labour economists have developed a range of institutionally rich, empirically plausible, candidate models for the analysis of unemployment, and these have begun to see application in open economy, general equilibrium analyses.[24] While this work has not reached consensus on canonical forms of any of these models, we present a

[23]The classic statements of the specific factor model are: Jones (1971); Samuelson (1971); Mayer (1974) and Neary (1978).

[24]See Layard, Nickell, and Jackman (1991) for a useful discussion of the entire range of theoretical, empirical, and policy issues raised by unemployment. Davidson (1990) is a clear and concise treatment of the major theoretical models.

leading example of search, efficiency wage, and union bargaining models. Each of these offers a specific microeconomic mechanism that generates unemployment in equilibrium.

Before considering these, we should note that considerable trade theoretic research effort, especially in the 1960s and 1970s, was spent analysing parametric (as opposed to endogenous) factor-market distortions.[25] One of the easiest ways to generate unemployment in a simple general equilibrium model is to introduce a minimum wage (either nominal or a fixed relative wage) above the market-clearing level.[26] In a pair of exceptionally clever papers, Davis has considered a two-country world in which one country (the "US") has a labour market characterised by a flexible wage, while the other ("Europe") is characterised by an economywide fixed relative wage. Davis shows that the effects of trade (Davis, 1998a) and technology change (Davis, 1998b) have asymmetric effects on these two economies precisely because they are linked in a common world economy. Davis' work alerts us to the importance of interdependence (what he calls a "global approach") in evaluating the consequences of shocks to national economies when those economies have asymmetric labour market institutions. Since both efficiency wage and union bargaining models yield economywide wage-premia, as well as unemployment, this message should be recalled in thinking about the labour-market microstructure literature and its application to the analysis of concrete situations.[27]

The notion that it is not so much labour markets, but an active process of search, that brings together firms and workers, at least for certain types of jobs, seems so plausible that search models have become a major framework for analysing a large number of macroeconomic issues.[28] Davidson, Martin, and Matusz, in Chapter III 19, construct a two-sector model along

[25]Bhagwati, Panagariya, and Srinivasan (1998, chapters 24-27) is a clear and up-to-date textbook treatment of these issues. For a more detailed survey of these models, as of the mid-1970s, see Magee (1973, 1976).

[26]In addition to the important series of papers by Brecher (1974 a&b, 1980, 1993), see Schweinberger (1978) and Neary (1985) for generalizations. Similarly, by introducing a sector-specific wage for the mobile factor in a specific-factors model and solving for an equilibrium in the expected factor-return, one generates unemployment a la Harris and Todaro (1970), also see Corden and Findlay (1975), Khan (1980), and Fields and Grinols (1991).

[27]An earlier paper by Melvin (1988), with two small regions facing a common world price, but with labour market heterogeneity, is another contribution showing the importance not only of different structures, but linkages between markets with different structures. For a recent analysis of the integrated equilibrium with a wage floor see Oslington (2000).

[28]For overviews of search theoretical applications to general macroeconomics and to labour markets, see Diamond (1984), Mortensen (1986), and Pissarides (2000).

the lines of Jones (Chapter III.17), but in which one of the sectors is a search sector.[29] That is, for each of the two types of factor, one sector generates jobs with certainty at a certain wage, while in the other each type of worker must find a worker of the other type, and form a match, to begin production. As a result of labour market frictions, such a match may not be made. Additionally, existing matches may end due to the death of one or the other factor, and newly born factors enter the labour market. Thus, there are always unemployed factors in equilibrium. The key result in this paper is that the Stolper-Samuelson relationship between commodity and factor prices (for employed factors) is fundamentally changed, creating the possibility of a downward-sloping relative supply curve. In their important later paper (Davidson, Martin, and Matusz, 1999), the authors demonstrate that opening trade between a large capital abundant country and a small labour-abundant country raises aggregate unemployment and is unambiguously welfare-worsening for unemployed workers in the large country.

Efficiency wage models offer an alternative microfoundation for unemployment.[30] All of these models share the property that, at least in some sector, firm costs are reduced if the firm pays a wage above the market-clearing wage. While this label applies to a broad class of models, the most widely applied group in this class derive more-or-less directly from an important paper by Shapiro and Stiglitz (1984) in which unemployment emerges as part of a scheme to induce worker performance. Specifically, as a result of less than perfect monitoring, effort-averse workers may choose to shirk. If there is no penalty for such shirking, all workers will shirk. Thus, to induce effort, firms pay above market-clearing wages so that the threat of termination (and entry into the unemployed or low wage pool) induces effort. Following work by Bulow and Summers (1986), 2 □ 2 versions of this model have been applied in a number of trade contexts.[31] Matusz', "International Trade Policy in a Model of Unemployment and Wage Differentials", Chapter III.20, provides a very interesting extension of the Stolper-Samuelson sort of logic in which trade liberalisation in the low-wage sector costs jobs (alternatively, protection actually

[29]Davidson, Martin, and Matusz (1987, 1989, 1991) have pursued this model in some detail. A complementary analyses can be found in Hosios (1990).

[30]General overviews of efficiency wage models can be found in: Stiglitz (1982, 1987); Katz (1986); and Weiss (1991). Many key papers in the development of this class of model, and a very useful introduction, are collected in Akerloff and Yellen (1986).

[31]Among others, see: Salehi-Esfahani (1988); Copeland (1989); Wilson (1990); Hoon (1991); Brecher (1992); and Brecher and Choudhri (1994).

protects jobs).[32]

A third obvious source of distortion, relative to the perfectly competitive norm, is the existence of unions with the power to secure above market-clearing wages for their members. It is probably not surprising, given the prominence of unions in most advanced industrial economies (especially in northern Europe), that there is are extensive theoretical and empirical literatures on the labour market effects of unions.[33] The analysis of union effects is complicated by the number of relevant dimensions that must be modeled: contents and form of the union objective function (e.g. wages, employment, seniority); scope of union representation (economywide v. sectoral); strategic environment (e.g. monopoly union, efficient bargain, Nash equilibrium); open versus closed economy; and a variety of institutional details. The most basic approach takes an agnostic approach with respect to most of these issues and simply assumes that the consequence of unionisation is to raise the equilibrium wage. A number of early general equilibrium analyses take this approach, treat unions as parametrically raising the wage in the unionised sector, and evaluate the impact on the economy relative to the situation without a union.[34] The union premium has been endogenised, in general equilibrium, under a variety of assumptions.[35]

Gaston and Trefler's paper, "Union Wage Sensitivity to Trade and Protection: Theory and Evidence", Chapter III.21, provides an excellent bridge between this section and the next. The authors develop a partial equilibrium model of union-firm bargaining in the context of oligopolistic competition between the home firm and foreign competitor, with endogenous protection.[36] This is interesting in itself, suggesting the sort of institutional richness that is common in work by labour and industrial organisation economists, but the authors then develop

[32]In other work, Matusz (1996, 1998) studies an economy with an efficiency wage on the labour market side and monopolistic competition in product markets.

[33]Useful surveys of these large literatures can be found in: Freeman and Medoff (1984); Hirsch and Addison (1986); and Lewis (1986). A survey of the basic theoretical models can be found in Oswald (1985).

[34]Leading examples of this sort of analysis are: Johnson and Mieszkowski (1970); Jones (1971b); Magee (1971); Bhagwati and Srinivasan (1971); Pearce (1971); Diewert (1974 a & b); Ballentine and Thirsk (1977); Schweinberger (1979); Parai (1985); Hayashibara and Jones (1989); and Fields (1997).

[35]For example, Carruth and Oswald (1981), Grossman (1983, 1984) and Brecher and Long (1989) study a monopoly union; efficient bargains are studied by McDonald and Solow (1985), Chaudhuri (1982), Hill (1984), Yip (1988), and Geide-Stevenson (2000); the monopoly and efficient bargain models are compared in Strand (1982, 1989); and Nash bargaining is considered in Calvo (1978) and Quibria (1988) in the context of a Harris-Todaro model.

[36]Gaston and Trefler's work builds on earlier work by Lawrence and Lawrence (1985), Brander and Spencer (1988), and Mezetti and Dinopoulos (1991). Recent analyses with a similar structure are Santoni (1996), Fung and Huizinga (1999) and Fisher and Wright (1999).

a unique data set that combines detailed data on trade, protection, and labour market outcomes to evaluate the predictions of the model. This permits the authors to study the role of trade and trade policy in union wage determination. Previous work had found a negative relationship between protection and wage (Fung and Huizinga, 1997; Gaston and Trefler, 1993, 1994a), but this paper demonstrates that this negative relationship is related to the presence of a union. That is, union sectors with lower tariffs are characterised by higher wages. The authors then account for this fact using their model.

IV. Volume 2, Part I: Empirical Research on Trade and Employment[37]

We have already noted that there is widespread concern about the relationship between trade and employment and several contributions in the previous section demonstrate that such a relationship is at least theoretically plausible. Section IV collects a number of contributions that seek to identify the empirical extent of such a relationship. As with the literature on trade and wages, there are, broadly speaking, three main empirical approaches: input-output based methodologies; regression-based methods; and CGE based methods.[38]

The input-output based studies adopt essentially the same methodology as that used in the factor-content studies, but focus directly on excess demand for labour rather than attempting to determine wage effects.[39] Schumacher's paper, "North-South Trade and Shifts in Employment", Chapter I.1, provides an excellent example of early work of this sort.[40] The author examines the aggregate and sectoral employment effects of trade with developing countries for six European

[37]Useful overviews of research on the empirical link between international trade and employment can be found in: Martin (1979); Tyson and Zysman (1988); Dickens (1988); and Baldwin (1995).

[38]We will not discuss the CGE models with unemployment here, but leading examples of this small literature are: Staiger, Deardorff, and Stern (1987) and Lee and Roland-Holst (1994, 1995). Overviews papers on the treatment of labour market institutions in CGE models can be found in Thierfelder and Shiells (1997) and Maechler and Roland Holst (1997).

[39]An even earlier literature used input-output methods to study the question of whether the structure of protection favored labour. The classic references are to Vaccara (1960) and Salant and Vaccara (1961). Baldwin (1976) and Baldwin and Lewis (1978) present a substantial extension of this method. A related literature developed concerning the appropriate measure of protection (i.e. nominal v. effective rate): Basevi (1966), Ball (1967), Travis (1968), and Balassa *et al*. (1970). Cheh (1976) considered nontariff barriers. Zandano (1969) and Constantopoulos (1974) considered European countries. While results varied, overall there seems to be some evidence of a tendency to protect labour.

[40]Other early examples include Mitchell (1975), de Grauwe, *et al*. (1979), and Sapir and Schumacher (1985). Recent applications are Sakurai (1995), Courakis, *et al.* (1997), and Gregory and Greenhalgh (1997).

A closely related literature applied an accounting decomposition to derive estimates of the employment effects of trade. Leading examples of this approach include: Cable (1977); Frank with Levinson (1977); Krueger (1979); Wolter (1979); and Lawrence (1983, 1984 chapters 3 and 4). Recent applications are contained in Eichengreen (1988), Su and Chentrens (1988), Borkakoti (1997) and Hine and Wright (1997). For critical

countries (Federal Republic of Germany, France, Italy, UK, Netherlands, and Belgium), by calculating the jobs "created" and "lost" through exports and imports. Given the small shares of LDC trade in these economies, it is not surprising that, in all cases, the net employment effects are found to be small, and positive (i.e. more jobs are created by trade with developing countries than are lost). However, across a range of labour intensive consumer goods, all six countries experience net job loss. That is, trade with developing countries does induce structural change and, at least short-run, job displacement.

Driver, Kilpatrick, and Naisbitt, in, Chapter I.3, apply a similar methodology to the UK, but develop a number of extensions.[41] First, the authors consider the effect of balanced increases in trade (i.e. a 10% increase across the board in all imports and exports) with important subsets of trading partners–NICs and the EEC–on employment and value-added. As with Schumacher's work in, the aggregate effects are small, with some more sizable distributional effects. In this case, however, the aggregate effects of increased trade on employment are in all cases negative, though the effects on value-added are positive for trade with both definitions of NICs, but negative for trade with the EEC.

A final example of a factor-content study is given in the context of a broader study of the relationship between various aspects of globalisation and labour markets in the French case by Messerlin, in Chapter I.7. Focusing on the period from 1977-1992, he first documents the close relationship between exports and GDP growth, and the sizable increase in that relationship in the latter half of the period. Exports also seem to have driven a shift out of agriculture and energy, into manufacturing and, especially, services. The net effects, as in the other studies, were generally small and slightly negative (especially in the 1987-1992 period).

One of the fundamental criticisms of the factor-content approach, that we have already seen in our discussion of the trade-wages relationship, has to do with its weak theoretical foundations. For studying the trade-employment relationship, Grossman (1986, 1987) proposed an alternative framework, based on the estimation of reduced form wage and employment regressions. Specifically, he models a representative competitive sector producing final output according to a Cobb-Douglas function of capital, labour, and energy, which permits Hicks-neutral technical

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perspectives see Martin and Evans (1981) and Grossman (1982).

[41] Also see Driver, Kilpatrick, and Naisbitt (1985, 1988).

progress. This sector is taken to be embedded in a 3-factor □ many-good economy in which energy is globally traded at a fixed price, capital and labour are internationally immobile and intersectorally imperfectly mobile, and the sector being studied competes with imports which are imperfect substitutes. Within this framework, Grossman derives reduced form wage and labour employment relations which he estimates using quarterly data for nine unskilled labour intensive manufacturing sectors (Grossman, 1987) and for the steel industry (Grossman, 1986). Using the parameter values derived in this fashion, and treating the relative price of the imperfectly substitutable import relative to that of the domestically produced good as a measure of import competition, the author is then able to carry out counterfactual simulations that provide estimates of the effects of trade on employment and wages.[42] With the exception of the radio/TV sector (which is estimated to have 71% lower employment as a result of trade), the effects on both employment and wages were generally small, and sometimes even positive.[43]

Revenga's paper, "Exporting Jobs: The Impact of Import Competition on Employment and Wages in U.S. Manufacturing", Chapter I.2, applies a similar methodology to Grossman, but finds that for a panel of 38 manufacturing industries (quarterly for the years 1977-1987) import prices have a sizable, and statistically significant, effect on employment and a smaller, but still significant, effect on wages. Kletzer, in Chapter I.6, applies a similar methodology to 24 sectors over her sample period, finding a strong relationship between trade and job displacement in sectors identified as import sensitive, but finding little support in other sectors or in cross-section. Greenaway, Hine and Wright, in Chapter I.4, also apply a similar methodology to a panel of 167 industries, finding that trade reduces the derived demand for labour.[44] Interestingly, when the authors disaggregate by origin, they find that imports from the EU and the US have a

[42]In the steel case, Grossman (1986) considers a number of alternative sources of sectoral job loss, including structural shift toward high-technology products, sluggish real income growth, and steelworker union success in raising wages above market clearing, concluding that import competition was significant, but considerably less significant than structural shift. Furthermore, by far the most significant component of import competition was caused by exchange rate appreciation. For other work on the relationship between exchange rate overvaluation and employment, see: Branson and Love (1987), Dornbusch and Frankel (1987), Eichengreen (1988), and Goldberg and Tracy (2000).

[43]This framework was extended and applied by Mann (1988) and Freeman and Katz (1991). Mann's primary extension relates to the terms of product market competition, which Freeman and Katz are interested in the role of unions. Like Grossman, Mann finds little evidence of labour market impact from trade, while Freeman and Katz, like Gaston and Trefler, in Chapter II.5, find that unionized sectors show evidence of strong wage response to import competition. However, as with Grossman's analysis of the steel industry, both Mann and Freeman and Katz conclude that domestic factors are the most significant explanation of sectoral job loss.

[44]Other studies that have examined the trade-employment relationship for the UK include Konings and Vandenbussche (1995), Borkakoti (1997), and Hine and Wright (1997), all of whom find evidence of a negative

stronger effect on employment than do imports from East Asia.[45] Noel Gaston, in "The Impact of International Trade and Protection on Australian Manufacturing Employment", Chapter I.8, also estimates a reduced form system, focusing on the role of trade policy variables as well as trade variables, finding that employment changes are positively related to exports and negatively related to imports, as in other studies considered here.[46]

A related issue of considerable importance is the short- and long-term consequence of job displacement. For example, an essential part of the trade adjustment assistance program, that itself plays an important role in providing political support for trade liberalisation in the United States, is an ongoing attempt to identify sectors and workers that are affected by trade.[47] Of particular interest is the attempt to link the concern with trade-sensitivity to the large body of research by labour economists on the economic costs of job displacement.[48] Hungerford, (Chapter I.5), develops a switching regression model to analyse the relationship between trade shocks and layoffs, finding essentially no relationship between trade shocks and short-run layoff behaviour of firms in import competing industries, and only small effects in exporting industries. Hungerford also provides evidence that import competing firms make short-run work force adjustments through layoffs more than do exporting firms, and that unskilled and female workers face greater layoff risk because they tend to work in import competing industries. In addition to the sectoral results mentioned above, Kletzer, in "Trade and Job Displacement in U.S. Manufacturing, 1979-1991", Chapter I.6, like Hungerford, analyses data at the level of individual workers. She also finds a strong negative relationship between layoff in an import competing sector and likelihood of reemployment, but also finds this to be closely related to worker

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relationship between trade and employment.

[45]Freeman and Revenga (1999) report a similar result for Europe, while Dewatripont, *et al*., (1999) report essentially no effect of LDC trade on European labour markets. By contrast, Cortes, *et al*., (1999) report a significant negative impact on French employment from trade with NICs, while Aiginger, *et al*. (1996) report moderately negative results for certain labour groups (e.g. blue collar workers and the elderly) as a result of opening of trade with Eastern Europe. There is a related body of work that examines deindustrialization using a similar empirical framework: e.g.: Dollar and Wolf (1993, chapter 2); Lawrence (1983, 1987); Rowthorn and Wells (1987); Rowthorn and Ramaswamy (1999); and Saeger (1997).

[46]Analyses for Australia (Karunaratne, 1999), Canada (Gaston and Trefler, 1997; Beaulieu, 2000) and New Zealand (Lang, 1998) produce broadly similar results.

[47]A useful, recent, analysis of assistance under the trade agreements program can be found in Jacobson (1998), while Kapstein (1998) provides an interesting discussion of the political relationship between this program and the trade agreements program. For examples of work by the Bureau of Labor Statistics to identify sectors and workers affected by trade, see: Aho and Orr (1981), Schoepfle (1982), Bednarzik (1993), and Shelburne and Bednarzik (1993).

[48]Useful surveys of this work can be found in Hamermesh (1989), Jacobson, LaLonde and Sullivan (1993), Fallick, (1996), and Kletzer (1998a).

attributes, with the most significant being gender. Thus untangling the relationship between trade-displacement and disadvantaged characteristics is difficult.[49] There does, however, appear to be considerable evidence that workers who must shift sectors to find employment experience significant losses, and the evidence reported in these papers suggests that trade displacement generates particularly strong pressure for sectoral relocation.

V. Volume 2, Part II: Migration and Labour Market Adjustment

This collection of papers reflects the current concern in academic research on globalisation and labour markets with international trade. It is the case, however, that the concern with immigration (and foreign direct investment) has older roots in the empirical literature. Since we are unable to reflect the full range of this literature in the space available for articles, we deviate from our practice to this point and start with a survey paper. The paper by Rachel Friedberg and Jennifer Hunt, "The Impact of Immigrants on Host Country Wages, Employment and Growth", Chapter II.17, does a fine, and fair, job of putting this literature in context.[50]

As with the case of the literature on unemployment, while there are substantial theoretical contributions studying the relationship between immigration and labour-market outcomes, we choose to focus on empirical contributions. On the one hand, like the theoretical literature on unemployment, there are no canonical references.[51] On the other hand, the one essential theoretical contribution is the factor-price insensitivity theorem, which is well-covered in Jones and Scheinkman, Volume 1, Chapter I.3. That result suggests that, if there are more traded final consumption goods than internationally immobile factors of production, increases in factor endowments that do not cause any commodities to become non-produced will have no effect on factor-returns. Since, as we shall see, empirical research on the relationship between immigration and labour markets has produced little systematic evidence of wage or employment effects, factor-price insensitivity would seem to be a useful base-line result. We can identify three broad methodologies for studying the empirical link between immigration and labour

[49]See Kruse (1988, 1991) on this issue. For other work on the relationship between trade and displacement in the U.S., in addition to other work by Kletzer (1998b, 2000), see: Addison,*et al*. (1995, 2000), Clark, *et al*. (1998), and Haveman (1998). For complementary analyses of the U.K., also using individual level data, see: Haynes, Upward, and Wright (1999, 2000) and Greenaway, Upward, and Wright (1999, 2000).

[50]Among the many other surveys of this literature, we note: Borjas (1999); DeFreitas (1998); Friedberg and Hunt (1999); Gaston and Nelson (2000b); Greenwood and McDowell (1986); LaLonde and Topel (1997); and Smith and Edmonston (1997).

[51]However, see Gaston and Nelson (2000b) for a discussion of these theoretical contributions.

markets: structural econometric analyses; reduced form regression analyses; and natural experiments.[52]

The most direct approach to the relationship between immigration and labour markets involves assuming that GNP is produced according to a production function with a specific functional form and using the restrictions implied by that form, along with those implied by competition and cost minimisation, to estimate a structural model.[53] For research on immigration, this approach was first adopted by Grossman, in "Illegal Immigrants and Domestic Employment", Chapter II.9, in which the author estimates a translog function of native labour, first generation immigrants, second generation immigrants, natives, and capital on individual-level data for 1970. The main findings were a complementary relationship between capital and all three labour groups, and a substitutive relationship between any pair of labour groups. The main finding is that, increases in immigration have an effect on other first-generation immigrants, but virtually no effect on natives. Borjas, Chapter II.10, used a Generalised Leontief production function and a more detailed breakdown of immigrant and native labour, with results that are qualitatively similar to those of Baldwin.[54] In what is surely the most sophisticated application of this methodology to date, Greenwood, Hunt, and Kohli, in "The Factor-market Consequences of Unskilled Immigration to the United States", Chapter II.16, marry human capital theory with the production theoretic approach by sorting immigrant and domestic labour into four skill categories and then estimating a symmetric normalised quadratic (semiflexible) functional form in those four labour factors and capital.[55] Variants of the production function methodology have been applied to a substantial number of datasets in the US and in a small number of other countries with a surprising consistency of result: immigration has no significant effect on natives,

[52]There is a substantial literature that applies CGE methods, but we do not pursue these here for the same reason that we do not attempt to cover the theoretical literature. Simple CGE studies that attempt to illustrate quantitative significance of theoretically established results include: Hamilton and Whalley (1984); Hill and Mendez (1984); Thompson and Clark (1990); and Rivera-Batiz (1986). Simple models applied to dynamic questions without closed-form solutions include Francois and Nelson (1999) and Heckman, *et al*. (1998). Large-scale CGE models of immigration include: Burfisher, *et al*. (1994); Faini, *et al*. (1999); Hinojosa-Ojeda, *et al*. (1998); Levy and van Wijnbergen (1994); and Weyerbrock (1995).

[53]For a particularly clear presentation of the general theory that underlies virtually all research by labour economists on the link between immigration and labour markets see Johnson (1998). Also useful are Borjas (1999b), Chiswick, *et al*. (1992), and Johnson (1980).

[54]In fact, Borjas applied this methodology to a number of datasets and breakdowns, see Borjas (1983, 1986 a & b).

[55]In Greenwood and Hunt (1995) the authors consider a number of variations on the ways immigration and domestic labour might be linked; in Greenwood, Hunt, and Kohli (1996) the authors illustrate problems with the applications of the structural methods by Grossman and Borjas, and in Davies, Greenwood, Hunt, Kohli, and

with the exception of the least skilled (high school dropouts), but does have a significant effect on other immigrants of the same origin and vintage.[56]

An alternative, more pragmatic, approach relies less on theory for strong identifying assumptions and works with regression of wages (or annual earnings, or unemployment) on a variety of variables known to have an effect on wages, and immigrant share, across regions. That is, they estimate a regression of the form:

$$w_{Nj} = \beta X_{Nj} + \gamma f_j + \varepsilon_{Nj} \qquad \textbf{(3)}$$

where w_{Nj} is the wage (or other labour market variable) for native group N in city j, X is a vector of control variables, and f is the fraction of immigrants in the region j population. Probably the most widely cited of these studies is Altonji and Card, "The Effects of Immigration on the Labor Market Outcomes of Less-Skilled Natives", Chapter II.12, which provides an admirably clear discussion of the theory and method, as well as results. This framework is then extended by Altonji and Card, as well as many others, to deal with a variety of econometric problems. Particularly prominent in application are estimation in differences and instrumental variables estimation to deal with problems of omitted variables, simultaneity, and sample selectivity.

LaLonde and Topel, in Chapter II.14, are particularly concerned to evaluate claims about deteriorating quality of immigrants, and the implication for labour market outcomes of natives.[57] This concern also motivates Borjas, Freeman and Katz, "How Much Do Immigration and Trade Affect Labor Market Outcomes?", Chapter II.15, who carry out regression analyses similar to those in the other papers. Once again, as with the production theoretic methods, most of these studies end up concluding that there is little evidence of sizable labour market effects. This conclusion emerges in a number of studies across different samples and countries, under a variety of related methodologies.[58]

Tienda (1998) the methodology is applied in detail to the case of NAFTA.

[56]Other applications to the US include: Bean, *et al*. (1988); King, *et al*. (1986); and Rivera-Batiz and Sechzer (1991). Akbari and DeVoretz (1992) and Roy (1987, 1997) study Canada; Bürgenmeier, *et al*. (1991) study Switzerland; Bauer (1997) studies Germany; and Gang and Rivera-Batiz (1994) study Europe as a whole;

[57]This paper summarizes work reported at greater length in LaLonde and Topel (1991, 1992). Immigrant quality has been a major theme of George Borjas' work (see Borjas, 1999).

[58]For the US case, see: Butcher (1998), Enchautegui (1997), Reimers (1998), and Schoeni (1997). Applications to Germany are Hatzius (1974), Pischke and Velling (1997), DeNew and Zimmerman (1994) and Zimmerman and DeNew (1994). Applications to Austria are Winkelmann (1996) and Winter-Ebmer and Zweimuller (1996). For an application to Italy see Gavosto *et al*. (1999). Broadly similar methods have also

One of the most interesting, and certainly one of the highest impact, papers in this literature is Card's (1990) study, "The Impact of the Mariel Boatlift on the Miami Labor Market", Chapter II.11. On 20 April 1980, 125,000 Cuban nationals exited Cuba for the U.S. through the port of Mariel. In less than 6 months, the Miami labour force grew by about 7%. Interestingly, Card finds no labour market effect of even such a large shock. This striking result was the stimulus to much of the research by labour economists in the following years.[59] Perhaps even more surprising, however, Friedberg (1996) examines what may be the largest proportional immigration shock in modern history–the emigration of 670,000 Russian jews to Israel (a staggering 11% of the population and 14% of the labour force from 1989 to 1996), once again with essentially no impact.[60]

In the face of generally small estimates of labour market effects, one group of labour economists has been concerned that internal migration patterns are affected to such an extent by immigration flows that they render cross-sectional analysis uninformative.[61] This argument is made strongly in Borjas, Freeman and Katz, Chapter II.15, as part of their effort to discredit earlier research claiming small effects and to support their preferred simulation methodology. The authors present a suggestive analysis of California's native flows which is consistent with their claim. Altonji and Card, Chapter II.12, also present evidence consistent with this claim and adopt an instrumental variable methodology to deal with the problem. Applying this method, Altonji and Card do produce some of the largest negative effects in this literature, but the implied elasticities are again tiny–implying that a 10% increase in the percentage of foreign born workers in a local labour market results in a .86% reduction in wages (Friedberg and Hunt, Chapter II.22). Butcher and Card, in "Immigration and Wages: Evidence from the 1980s", Chapter II.13, present a careful analysis of foreign and domestic immigration in 24 major U.S. cities, concluding that, that there is considerable variance in relative growth rates of high and low wage workers across

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been applied to the case of unemployment for the US (Espenshade and Muller, 1985; Manson, *et al*., 1985; Simon, *et al*., 1993; Dorantes and Huang, 1997), Germany (Winkelmann and Zimmermann, 1993; Mühleisen and Zimmermann, 1994), Austria (Winter-Ebmer and Zweimuller, 1994), and the EU (Gang and Rivera-Batiz, 1994b).

[59]Other papers seeking to exploit natural experiments are Hunt's (1992) study of Algerian repatriates to France, and Carrington and de Lima's (1996) study of repatriates from Angola and Mozambique to Portugal.

[60]Gandal, Hanson, and Slaughter (2000) take an empirical approach informed by general equilibrium trade theory and is an excellent complement to Friedberg's study.

[61]In addition to the papers discussed here, papers by Filer (1992), White and Imai (1994), Frey (1995, 1996), and Frey and Liaw (1998) provide evidence in favor of this claim.

cities, but that this variance is essentially unrelated to immigrant flows.[62]

Borjas, Freeman and Katz, Chapter II.15, ultimately conclude that the econometric approach based on cross-sectional analysis of cities is too fraught with problems to be a serious framework for analysing the effects of immigration and trade on labour markets. As a result, they turn to a simulation analysis based on a one final good □ 2 factor analysis of the national labour market, considering shocks to that market from both direct and indirect import of foreign labour.[63] Even in this framework, which is biased toward finding large results, the authors find that immigration of unskilled workers only has significant effects on the least skilled (i.e. high school dropouts) domestic workers. Given the small size of this population, this is a surprisingly weak result from a paper which is strongly critical of other work and self-consciously seeks to find large effects.

VI. Volume 2, Part III: FDI and Labour Markets[64]

Before considering more systematic theoretical and empirical research, it is useful to have some basic facts available to help evaluate claims being made about the relationship between FDI and labour market outcomes. Lawrence's paper, in Chapter III.21, provides a very useful discussion of the basic facts in the context of a general analysis of globalisation and the need, or lack thereof, of globally common labour standards. Consistent with his work on trade and labour markets, Lawrence ultimately concludes that the effects of both trade and FDI on labour markets are small relative to the effects of technological change.

Broadly speaking, research on foreign direct investment (FDI) is organised in terms of one of three theoretical frameworks: real capital arbitrage models; market power/industrial organisation models; and firm-theoretic models. While capital arbitrage models have long found general equilibrium representation, it is only recently that the other two approaches have been systematically analysed in such a framework.[65] At least since Hymer's (1960) dissertation it has been clear that the capital arbitrage model lacks something essential. Specifically, to the extent that doing business in another country entails a variety of costs not borne by local firms,

[62]More recent work reported in Card (2000) and Card and DiNardo (2000) provides further support for the claim that internal migratory response is neither of sufficient magnitude, nor of the right pattern, to offset international migration shocks to the U.S. market.

[63]The authors also incorporate capital at a later point in the paper.

[64]The best overall survey of the large literature on FDI is Caves (1996). Markusen (1995) provides a very useful survey of the modern theory.

[65]See Ruffin (1984) for a clear review of real factor arbitrage models of international factor mobility.

multinational firms must possess some form of competitive advantage to permit them to function in foreign markets.[66] Where early developments, including Hymer's own work, emphasised essentially monopolistic elements, current work has stressed oligopolistic and monopolistically competitive elements. Building on work in the Coase (1937)-Arrow (1964)-Williamson (1975) tradition, a number of international business researchers began to develop a model of the international firm built on internalisation considerations.[67]

All of this early work was based on partial equilibrium reasoning. After all, the central concern of this literature was to account for the existence of multinationals–an essentially partial equilibrium (i.e. firm-level) question. When it comes to linking FDI to broad labour market facts, like increasing skill premia, the partial equilibrium framework tends to be dominated by general equilibrium reasoning.[68] The earliest attempts to build general equilibrium models incorporating insights from the market structure and firm theoretic approaches motivate the use of a specific-factors model in terms of essentially unspecified firm-specific advantages. The basic structure involves two countries, each with a standard specific-factors model, in which one of the specific factors is internationally mobile (though still intersectorally immobile).[69] In essence, these are firm-specific capital arbitrage models, but they have the virtue of a simple structure, which is well-motivated by firm-theoretic concerns, and yield a variety of clear comparative statics depending on the exact structure of the model. In its most basic form, a small country, 3-factor □ 2-good model, with both final goods traded, labour intersectorally mobile and capital internationally mobile, an inflow of capital will raise the return to labour and lower the return to both capitals (the internationally mobile and the internationally immobile varieties). With one of the sectors non-traded, Burgess (1978) shows that such an inflow can

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[66]These themes received important early development by Kindleberger (1969, pp. 1-36) and Caves (1971).

[67]Rugman (1981), Hennart (1982), and Casson (1987) are good examples of the first generation of this literature. John Dunning's (1981) work has a strong element of this firm theoretic approach, but in his attempt to construct a broadly synthetic framework containing elements of all three approaches sketched here, is also somewhat outside all of them.

[68]The direct study of firm-union relations, of course, is a central issue that can be well-studied in partial equilibrium. For examples of partial equilibrium models of firm-union bargaining, like that in Gaston and Trefler (Chapter II.5), applied to the analysis of multinational firms, see Carmichael (1992) and Bughin and Vannini (1995). See Zhao (1998) for an analysis placing this sort of analysis in a general equilibrium setting.

[69]This is suggested in Caves (1971) and implemented in, among others, Amano (1977), Batra and Ramachandran (1980), Burgess (1978), Falvey (1979), and Jones, *et al*. (1983). Jones and Dei (1983) provide an exceptionally useful graphical framework.

reduce the real return to labour.

A more substantial step toward integrating Hymer's essential insight into a general equilibrium framework was taken in early work by Helpman (1984, 1985), Markusen (1984), and Ethier (1986). These papers defined an important agenda for theoretical research which is continuing to generate important results. Following a standard practice in this literature, it is useful to distinguish between horizontal and vertical multinational firms. The former produce the same product in many markets, whilst the letter engage in different activities in different markets. In either case, as with the earlier partial equilibrium literature, the first task is to explain the existence of a single firm with economic activity (of some kind) in more than one country rather than arms-length contracting between firms. That done, the general equilibrium framework can be applied to such macro questions as the global allocation of activity (e.g. production, FDI, trade), and the welfare and labour market consequences of such activity. The general equilibrium analysis of economies with vertical multinationals was pioneered by Helpman (1984), who considered firms with home office activities that could be separated from production. Given the structure of the model, the production facility will be located in only one location which, if separate from the home office, makes the firm a multinational.[70] This structure is then attached to a model of Chamberlinian monopolistic competition (Helpman, 1981). In Markusen (1984), the existence of a joint input, for which there is no arms length market, explains the existence of multinational production in a sector characterised by oligopolistic interaction in a number of national markets.[71] Where the models of both Helpman and Markusen focus on the choice between exporting and FDI as the mode of market service, Ethier (1986) develops a general equilibrium analysis of an economy in which firms must choose between FDI and licensing.

The great majority of this work is primarily concerned with characterising the patterns of trade and production that emerge in economies characterised by FDI. However, Markusen and Venables, in "The Role of Multinationals in the Wage-Gap Debate", Chapter II.22, directly address the concerns of this volume in such a model.[72] The underlying model is a substantial

[70]In another paper, Helpman (1985) develops a model with both horizontal and vertical activities in the same firm.

[71]See Markusen, *et al*. (1996) and Markusen (1997) for a model that nests models with vertical, horizontal and mixed firms. Brainard (1993) is another important theoretical paper.

[72]Also see Brecher and Choudhri (1996) for an explicit analysis of the income distribution effects of

extension of the approach in Markusen (1984).[73] Like HOS models, the Markusen-Venables (MV) model is a 2 factor □ 2 good □ 2 country model. One sector, *Y*, is characterised by competitive firms producing under constant returns to scale, while the other sector, *X*, produces homogeneous goods under a more complex production structure involving both firm-level and plant-level fixed costs. In this environment four types of firm can emerge, where "type" denotes headquarters location and number of plants. That is, a national firm produces entirely in a given country and serves foreign markets by exports, and a multinational firm produces in both countries. Since each type can be headquartered in the Home and Foreign countries, there are four types. The firms compete in Cournot (Nash in quantities) fashion. Thinking of the two factors as skilled and unskilled labour, and assuming that the input ratios of skilled to unskilled labour are such that:

[firm-level fixed costs] > [plant-level fixed costs] > [integrated *X* production]
> [branch-plant *X* production] > [*Y* production] > [multinational production]
> [national firms, at common output scale],

the authors show, among a variety of things: that investment liberalisation raises the real wage of skilled labour and the wage ratio in the skilled-labour abundant country; and falling trade costs tend to put downward pressure on the wage of skilled labour. Not surprisingly, given the complexity of the model, which must be solved computationally to get results, a variety of outcomes are possible under differing values of parameters, and the paper's discussion provides a useful guide to understanding what drives the results.

Where early literature on the income distribution effects of FDI took an aggregate approach, contemporary empirical research, like the theoretical research we have just discussed, has begun to incorporate firm-theoretic considerations in research design.[74] One straightforward approach

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FDI in a model of vertical FDI based on that in Helpman and Krugman (1985, chapter 12).

[73]For a detailed development of the theory underlying this paper, see Markusen and Venables (1998)

[74]Important early work on the U.S. taking a theoretically well-grounded approach includes Horst (1978) and Frank and Freeman (1978 a & b). Throughout the 1980s, as part of a general concern with globalisation and deindustrialization a number of high visibility studies analysed the linkage between foreign direct investment and labour market outcomes in industrial countries, see, for example, Fröbel, Heinrichs and Kreye (1980); Tolchin and Tolchin (1988); and Glickman and Woodward (1989).

Much of the early work on FDI and income distribution was concerned with developing countries, and the research was often framed in terms of dependency theory. Leading examples of this work include: Bornschier, *et al*. (1978), Bornschier and Balmer-Cao (1979), Evans and Timberlake (1980). Weede and Tiefenbach (1981) provide a critical reanalysis of the relevant data. Recent work on LDCs and middle income

to this question is to examine the simple relationship between employment in the parent and foreign production. This is precisely what Blomström, Fors and Lipsey do in, Chapter II.18.[75] The authors use firm-level data from U.S. and Swedish multinationals (in successive analyses), finding a negative relationship for U.S. multinationals in a number of specifications, where the relationship is consistently positive for Swedish firms. The authors conclude that, where US multinationals have outsourced a considerable amount of their labour-intensive manufacturing to developing countries, Swedish multinationals do most of their manufacturing in other industrial countries where increased production leads to increased blue collar employment in the national market.

Brainard and Riker, in "Are U.S. Multinationals Exporting U.S. Jobs?", Chapter III.19, adopt a more structural approach by estimating a translog production function for multinational firms. The key finding is that, while there is evidence of substitution between labour at home and labour abroad, the substitution is far greater between affiliates in countries at similar levels of development.[76]

The final paper makes a strong link back to the literature on trade and labour markets. Feenstra and Hanson, in "The Impact of Outsourcing and High-Technology Capital on Wages: Estimates for the United States, 1979-1990", Chapter III.20, extend the mandated wage regression methodology to incorporate outsourcing. Drawing on their earlier theoretical work (Feenstra and Hanson, 1996a, 1998), characterising vertical relations involving outsourcing in a simple general equilibrium model, the authors first extend the mandated wage regression, in finite changes, to incorporate technical change (which they measure as computer use), and then treat trade as outsourcing. Within this framework, technical change explains about 35% of the change in the skill premium, while outsourcing explains another 15%.[77] Feenstra, Hanson and Swenson

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countries, applying models informed by more firm-theoretic considerations includes: Aitken, *et al*. (1997). Faini, *et al*. (1999), Feenstra and Hanson (1998); Figini and Görg (1999); and Santiago (1987).

[75]Similar work, focusing on U.S. multinationals can be found in Feliciano and Lipsey (1999); Kravis and Lipsey (1988), and Lipsey (1994, 1995, 1999).

[76]Braconier and Ekholm (1999) carry out a similar analysis for data on Swedish multinationals, but find a more complementary relationship between FDI and home employment. Driffield (1999) and Paul and Siegel (2000) study the effect of FDI on UK employment. Bruno and Falzoni (2000) extend the production function methodology to consider short-run fixed factors and, with respect to U.S. firms with affiliates in Canada and Latin America, finding that: in the short-run home and foreign employment are substitutes; but that, in the long-run, they are complements. The authors argue that their results support the existence of a vertical division of labour reflecting factor-endowment differences.

[77]Also see Feenstra and Hanson (1996b).

(2000), use production under the Offshore Assembly Provision of the U.S. tariff as a direct measure of outsourcing, finding that outsourced production is intensive in unskilled labour, relative to production in the U.S. Furthermore, they find that outsourcing responds positively to relative cost of production in the U.S. These results seem broadly consistent with the notion that outsourcing reduces relative demand for unskilled labour.[78]

VII. Areas for Future Research

As the collection of papers in these two Volumes demonstrate, globalisation and labour markets has been a fertile field for many years.

For those not immersed in this area, the results reviewed may seem a little surprising: there appears to be very little systematic evidence of large labour market impacts from globalisation. Whether we consider trade, multinationalisation, or immigration, the magnitude of the effects on wages and employment appear to be relatively modest. This contrasts sharply with 'public perceptions' of the impact of globalisation, as revealed in mass demonstrations surrounding WTO and World Bank/IMF meetings. So there may be good reasons to exercise caution in rushing to strong conclusions. We briefly consider six, and their implications for future work.

What is the Appropriate Economic Unit?

Econometric analysis requires making, essentially arbitrary, judgments about the geographic and economic units that have clear meaning in the theory. With respect to geographic aggregation, one of the main themes of much popular writing on globalisation has been the effect on the nation state. The importance of subnational regions has also been an important implication of recent research on economic geography. With respect to the link between globalisation and labour markets, this issue has been raised most explicitly in recent research on immigration, where high mobility between subnational units has been taken by some to account for low estimated labour market effects on local labour markets. Preliminary work on local spillovers from foreign direct investment also suggests the potential importance of local labour market

[78]Other research on the link between FDI, outsourcing, and wages includes: Anderton and Brenton (1999) for the UK; Hatzius (2000) and Slaughter (2000) for the US; Blomström and Kokko (2000) for Sweden; and Head and Ries (2000) for Japan. Another area of concern has been the effect of inward investment on relative wages. For work on this topic see: Blonigen and Slaughter (2000) for the US; and Conyon, *et al*. (1999), Girma, *et al*. (1999), and Taylor and Driffield (2000) for the UK.

effects (Girma and Wakelin, 2000). An interesting recent paper by Leamer (2000) has stressed the importance of local labour markets in thinking about the relationship between trade and wages. In all of these cases, the essential point for empirical evaluation of the link between globalisation and labour markets is that, if the primary locus of impact is a subnational unit, using national data can swamp the empirically estimated magnitude of effect. This is clearly an area with considerable room for more theoretical and empirical research.

Just as the geographic unit is theoretically uncontroversial, the meaning of "industry" is also clear in theory: an industry is made up of firms sharing the same technology of production. Especially when working within a general equilibrium framework, the move from a theoretical environment characterized by low dimensionality (of final goods and factors of production) to the empirical environment characterized by high dimensionality, aggregation problems of a fairly serious nature arise immediately – not unlike those which are endemic in the intra-industry trade literature. There are two issues here. The first relates to the fact that the categories used by the authorities that collect data do not have an obvious relationship to the economic concept of industry or factor of production implied by the theory. We cannot do much about this but the second problem is one which creates the basis for more systematic theoretical and empirical research: as more and more disaggregated data become available, we are led to think about the optimal level of aggregation of those data. However, there is little in the way of theoretical or empirical guidance on this question in the literature at this point. One exception is Chipman (1976, 1978), who attempts to econometrically evaluate the implied dimensionality of an underlying general equilibrium. Chipman has discussed the application of this methodology to both trade and wages (Chipman, 1994) and to capital mobility and wages (Chipman 1985). Another is the application of cluster analysis.

How Fast Does the H-O Clock Tick? (Slaughter 1998)

The second issue is closely related to the first, but moves from issues that are essentially atemporal into the time domain: optimal temporal aggregation and the intertemporal properties of labour market adjustment to globalisation shocks. Results like the Stolper-Samuelson and factor-price insensitivity theorems are comparative static results and they are silent on all aspects of adjustment. However, it is certainly the case that adjustment takes place in time, and we often talk about these results in terms of time. Nonetheless, the great majority of research on the link between globalisation and labour markets proceeds in an essentially atemporal cross-sectional

econometric environment. Part of the reason for this is simply data constraints: the appropriate data for estimating, say, the link between relative commodity-prices and relative factor-prices do not exist over sufficient time to permit compelling estimation of long-run relationships. The passage of time should help alleviate this problem, and permit us to increasingly exploit the recent advances in time series econometrics. Given advances in data collection and the development of panel data techniques, it seems possible to develop work that seeks to jointly study optimal aggregation along a number of dimensions.

What About Microfoundations?

The previous paragraph immediately suggests another important avenue for future research: the microfoundations of adjustment. Most of the theoretical work that provides the framework within which research on globalisation and labour markets is carried out is of a comparative static nature, but the data are generated by economies generally, to some degree or other, out of equilibrium. This has implications both for the interpretation of results and the construction of policy. There is considerable evidence that while we may not be dead in the long-run, we may be quite a bit older by the time the economy fully adjusts to shocks of any magnitude. This is the message, for example, of the now quite sizeable body of research on the adjustment of local labour markets to macroeconomic shocks (Pissarides and McMaster, 1990; Topel, 1994; Decressin and Fatas, 1995). On the other hand, there is also considerable evidence that citizens, and their political representatives, condition their behaviour on economic outcomes of a rather short-run nature. Thus, both for the purposes of achieving the maximum feasible welfare gain and the political sustainability, there are considerable gains to be had from developing greater theoretical and empirical knowledge of the short-run effects of globalisation shocks and the paths followed during adjustment. Specifically, we need considerably more research on the microfoundations of adjustment—both static and dynamic. Labour economists have developed a substantial body of research on which to build in this area. For overviews, see Hammermesh (1989) and Fallick (1996). Kletzer (2000) presents a recent discussion of the effect of trade on job displacement, while recent work by Haynes, Upward, and Wright (2000) and Brülhart, Murphy, and Strobl (2000) have pursued issues of inter- versus intra-sectoral adjustment in a context directly related to globalisation. Development economists have also developed a research agenda on the short run dynamics of adjustment. Admittedly, this is largely macro adjustment but some recent work has focused specifically on labour market dimensions. Matusz

and Tarr (2001) provide a survey.

Is Imperfect Competition Relevant?

A fourth set of issues revolves around the competitiveness of labour and product markets. Given the generally macroeconomic perspective of most trade-theoretic analysis, the central case considered is perfect competition in all markets. However, both from the perspective of adjustment and from comparative static analysis, it should be clear that imperfect markets can have a substantial effect on our conclusions. This is a difficult area for research because actually existing markets are imperfect in a bewildering variety of ways, many of which may have only very small implications for the link between globalisation and labour markets. Furthermore, the incorporation of these imperfections in highly aggregated models, while interesting as a check on conclusions drawn from such models are virtually always special cases with dubious empirical content. More research in this area would have to be a high priority, with a substantial weight on empirical work. Neary (2001) develops an elegant model of strategic interaction between firms which points to strong labour market effects from trade. Moreover, the predictions are consistent with recent empirical research which identifies observable disciplining effects from international competition, e.g. Oliviera-Martins (1994), Greenaway, Hine and Wright (1999).

Are Trade and Technology Alternatives?

Much of the theoretical, and even more the empirical literature, is framed in terms of trade versus technology – either trade with low wage economies or skill biased technical change are responsible for the shift in demand against unskilled labour in the OECD. This is surprising since the notion of defensive innovation, or trade-induced technical change, has long been recognised and indeed widely seen as the major shortcoming of the old 'accounting approach' to trade and employment change. Recent theoretical work on this issue, including Falvey and Reed (2000) and Neary (2001), is indicative of a growing interest. There is clearly an empirical agenda around modelling the interactions of trade and technical change.

Are Trade, Investment and Immigration Alternatives?

Finally, the broadest concern of all: most public discussion relates to something broad and poorly specified called "globalisation"; but most research deals with specific phenomena like trade, foreign direct investment, and immigration. Sceptics might reasonably wonder whether the

interaction of these more well-specified phenonmena, with each other as well as with other aspects of globalisation, can result in the sorts of negative effects feared by opponents of liberal international economic relations. There are good reasons why research has focussed on trade, foreign direct investment, and immigration as separate phenomena—our theoretical frameworks provide considerably more, and clearer, guidance for carrying out and interpreting research on the individual phenomena than on their interaction—but sceptics have a reasonable case on precisely these grounds. Leamer (2000), for example, sketches a very interesting analysis of the interaction between trade, immigration, and wages that suggests some very interesting directions for future research.

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