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European Commission

Trade and decent work: Handbook of assessment methodologies

Trade and decent work: Handbook of assessment methodologies

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Research Department / ILO Geneva

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Foreword

International trade plays a major role in the world economy, accounting for roughly 60 per cent of the total global gross domestic product. In addition to its contribution to economic growth, there is also a consensus that international trade has had a net positive effect on employment worldwide – also on the participation of women in the labour market. The 2030 Agenda for Sustainable Development acknowledges these beneficial effects of trade, which is one of the areas mentioned explicitly under Sustainable Development Goal 17 (on global partnerships and cooperation). The 2030 Agenda also recognizes how important trade is in enabling the achievement of other Sustainable Development Goals, such as Goal 1, which is about eradicating poverty, and Goal 8, which calls for the promotion of economic growth and decent work. Nevertheless, despite the positive outcomes observed at the aggregate level, trade has differential effects on firms and workers, creating both winners and losers within and between industries and sectors. It is therefore essential to undertake further efforts to make trade more inclusive.

There is a robust body of literature dealing with trade and labour issues, but the focus is generally on employment and wages. Far less research has been conducted on the relationship between trade and other aspects of decent work. The project "Trade, enterprises and labour markets: Diagnostic and firm-level assessment" (ASSESS for short), jointly funded by the European Commission and the ILO, is intended to address this gap. It seeks to pave the way for a more comprehensive analysis of the effects of trade on employment by critically assessing the existing methodological approaches and proposing a broad set of labour market indicators, based on the ILO's Decent Work Agenda, that can be used for such analysis. The project's main outputs are two publications: a Handbook (the present publication) and a Guide, which deal, respectively, with those methodologies and indicators. The Handbook traces the evolution of international trade theory and of the empirical methodologies used to study the effects of trade on employment, focusing on the assumptions underlying these methodologies, and examining their strengths and weaknesses. The Handbook's companion publication, Trade and Decent Work: Indicator Guide (2021), offers a toolkit of indicators covering substantive elements of decent work. A number of country studies – covering Malawi, Mexico and Viet Nam – are also currently being undertaken to provide a practical illustration of how the methodologies and indicators presented in these two publications can be used. By treating decent work as a central objective of trade impact assessment, these publications follow a human-centred approach that prioritizes people's needs and rights, as advocated by the ILO Centenary Declaration for the Future of Work.

The Handbook has been prepared by Marva Corley-Coulibaly, Sajid Ghani, Ira Postolachi and Pelin Sekerler Richiardi from the Globalization, Competitiveness and Labour Standards Unit in the ILO Research Department. It draws heavily on two background papers written by Benjamín Alemán-Castilla (2020) and Monica Hernandez (2020) as part of an ILO consultancy assignment. Souleima El Achkar Hilal, an ILO external consultant, provided initial inputs and structural suggestions for parts of the Handbook. The drafting was coordinated by Pelin Sekerler Richiardi under the supervision of Marva Corley-Coulibaly, and with support and guidance from Richard Samans, Director of the ILO Research Department.

The analysis is based on both desk and field research, and it was enriched by discussions with ILO constituents at two separate events. The first was an academic and tripartite seminar held in Mexico City in February 2020 that brought together officials from Mexico's Secretariat of Labour and Social Security and the Secretariat of Economic Affairs; representatives of the Mexican states and of workers' and employers' organizations, the National Institute of Statistics and Geography, the United Nations Economic Commission for Latin America and the Caribbean, and the

Delegation of the European Union to Mexico; and civil society representatives. Without the active involvement of the ILO Country Office for Mexico and Cuba, the organization of the seminar would not have been possible. Special thanks in that respect are due to Gerardina González Marroquín (former Director), Helmut Schwarzer (former Senior Specialist for Social Protection and Economic Development), and the administrative and technical staff of the ILO Country Office for Mexico and Cuba for their assistance with, and engagement in, the various seminar and consultation meetings.

The second event, a virtual peer review workshop, was organized jointly by the ILO Office for the European Union and the Benelux countries and by the European Commission in October 2020. The workshop brought together officials from the European Commission, representatives of workers' and employers' organizations, and officials from international trade organizations. In particular, valuable comments were provided by Jeronim Capaldo, Economic Affairs Officer, Division on Globalization and Development Strategies, United Nations Conference on Trade and Development; Nyasha Muchichwa, Economist and Researcher, Labour and Economic Development Research Institute of Zimbabwe; and Farooq Ahmed, Secretary-General, Bangladesh Employers Federation. We should like to thank our colleagues Lieve Verboven, Director of the ILO Office for the European Union and the Benelux countries, and Audrey Le Guével (from the same ILO Office) for their engagement in the project as a whole, and their support for and involvement in the workshop.

We are grateful to Lluís Prats, Head of the International Issues Unit within the European Commission's Directorate-General for Employment, Social Affairs and Inclusion, and Rudi Delarue and Ana Vukosavljević, both former officials at that Unit, for their support and participation in various events. Ruth Seitz and Alberto Funes-Betancor, both currently serving in the Directorate-General for Employment, Social Affairs and Inclusion, also provided valuable guidance and assistance in the final stages of the project.

The Handbook has benefited from comments and suggestions made by the members of the ILO Research Review Group who attended an advisory meeting on 2 December 2020, namely Professors Jennifer Bair, Iain Begg, Haroon Bhorat, Jayati Ghosh, Kamala Sankaran, Lord Robert Skidelsky and Bart van Ark. The team also appreciates the support and comments received from our ILO colleagues in the Bureau for Workers' Activities and the Bureau for Employers' Activities, and from the following colleagues in other areas of the Organization: Claire Harasty, Special Adviser to the Deputy Director-General for Policy on Economic and Social Issues; Elizabeth Echeverría Manrique; Christoph Ernst; David Kucera; Bashar Marafie; Bolormaa Tumurchudur-Klok; and Christian Viegelahn.

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Table of Contents

Foreword iii

Executive summary viii

Abbreviations xi

Introduction 1

1. Trade theory: From classical to new-new trade theory 3

1.1. Absolute and comparative advantage *(country level)* 4

1.2. Factor endowments *(country and sectoral level)* 5

1.3. Economies of scale and industry agglomeration *(country and sectoral level)* 7

1.4. Firm heterogeneity *(firm level)* 7

1.5. Worker heterogeneity *(firm and worker level)* 8

1.6. Labour market frictions *(firm and worker level)* 9

2. Empirical methodologies: From aggregate to distributional effects 7

2.1. Macro and meso approaches: Country and sectoral levels 16

2.1.1. General equilibrium approach 16

2.1.2. Partial equilibrium approach 22

2.1.3. Input–output approach, social accounting matrices and multiplier analysis 25

2.2. *Micro approaches: Econometrics at the firm and worker level* 27

2.2.1. Structural approach 28

2.2.2. Quasi-experimental approach 29

2.2.3. Randomized control trials 30

2.3. *Supplementing quantitative with qualitative methods* 34

2.3.1. Qualitative case studies 34

2.3.2. Mixed-methods approaches 36

▶ **3. Empirical applications using linked employer–employee data sets** 37

3.1. *An overview of LEEDs* 38

3.2. *Using LEEDs to study the labour market impact of trade: Three studies based on different approaches* 41

3.2.1. Structural approach: Studying the impact of trade on informality in Brazil 42

3.2.2. Quasi-experimental approach: Studying the impact of trade on wages in Mexico 44

3.2.3. Quasi-experimental approach: Studying the impact of trade on matching between workers and firms in France 45

▶ **4. Concluding remarks and considerations** 47

▶ **References** 50

▶ **Appendix I: Theoretical frameworks for analysing the effects of trade on labour market outcomes** 60

▶ **Appendix II: Decent work and trade in enterprise surveys** 63

▶ **Appendix III: Examples of empirical studies on trade and labour market outcomes** 72

List of figures

Figure 1. Evolution of the main theoretical frameworks for analysing the effects of trade on labour market outcomes 10

List of tables

Table 1. Overview of methodological approaches for assessing the labour market impacts of trade 14

Table 2. Assessments of the impact of trade policy on labour markets at the macro level performed by national and international institutions using computable general equilibrium models 17

Table 3. Selected Labour Market Indicators BWS, WBES and SMESV 66

List of boxes

Box 1. Trade and technology: An intersectional approach 6

Box 2. Overview of key aspects of macro (country) and meso (sectoral) approaches 12

Box 3. Overview of key aspects of micro (firm and worker) approaches 13

Box 4. The Global Trade Analysis Project (GTAP) model 19

Box 5. Software for Market Analysis and Restrictions on Trade (SMART) 23

Box 6. Relevant data sources for partial equilibrium models: The World Integrated Trade Solution (WITS) database 24

Box 7. Data for national and regional input–output tables 26

Box 8. Firm- and worker-level data sources 32

▶ Executive summary

The 2030 Agenda for Sustainable Development recognizes the role of international trade as an engine for inclusive economic growth and poverty reduction as pursued under Sustainable Development Goal 1. It also recognizes how important trade is in enabling the achievement of other Sustainable Development Goals, such as Goal 8, which calls for the promotion of decent work and economic growth. Indeed, international trade accounts for roughly 60 per cent of the total global gross domestic product,[1] and there is a consensus that it has had a net positive effect on employment worldwide – also in terms of increasing the participation of women in the labour market (ILO 2016) and contributing to poverty reduction (World Bank Group and WTO 2018; 2015). Nevertheless, despite these positive outcomes at the aggregate level, it is clear that more needs to be done to make trade more inclusive. Trade has differential effects on firms and workers when these are considered at a disaggregated level within countries and even within specific industries.

There is a robust body of literature on trade and labour markets that focuses on employment and wage effects. The ILO in particular has been active in this area, producing a number of studies on the effects of trade liberalization on employment, including its effects on skills and inequality (ILO and WTO 2017), informality (Bacchetta, Ernst and Bustamante 2009), gender equality (Jansen, Peters and Salazar-Xirinachs, 2011) and sectoral dimensions (Cheong, Jansen and Peters 2013). As well as the number of jobs created by trade, the quality of those jobs is important, which includes rights at work and working conditions. However, far less research has been undertaken on such aspects of the relationship between trade and the labour market, owing to fragmentation in the data and limitations in the methodologies used.

This Handbook – along with its companion publication, Trade and Decent Work: Indicator Guide (2021), which provides a toolkit of decent work indicators linked to trade – is intended to address the aforementioned research gap. By placing decent work at the centre of trade impact assessment, the Handbook follows a human-centred approach that prioritizes people's needs and rights.[2]

This Handbook presents and critically evaluates the methodologies used to assess the impact of trade on various areas of decent work. To that end, it traces the evolution of theories and methodological approaches ranging from the macro (country), through the meso (industry/sector), to the micro (firm and worker) level. The Handbook examines the strengths and weaknesses of these approaches, taking into consideration their underlying assumptions, data requirements and the scope that they provide for analysing broader labour market outcomes, including those that can be measured using decent work indicators. Particular attention is paid to micro approaches, since analysis at that level, especially using linked employer–employee data sets, allows one to understand better the distributional effects of trade. Such data sets make it possible to take into account not only firm and worker characteristics but also their interactions, potentially leading to more realistic conclusions.

The Handbook has been designed to help with the selection of methodological approaches for assessing the effects of trade on broader labour market outcomes. It is suitable for both researchers and a wider audience interested in learning more about these techniques. Policymaking is often informed by the results obtained from models, some of which, however, are based on rigid and unrealistic assumptions. An improved understanding

1 World Bank's World Development Indicators, available at https://data.worldbank.org/indicator/NE.TRD.GNFS.ZS

2 The ILO Centenary Declaration for the Future of Work, adopted by the International Labour Conference at its 108th Session in June 2019, calls upon the ILO to further develop its "human-centred approach to the future of work, which puts workers' rights and the needs, aspirations and rights of all people at the heart of economic, social and environmental policies".

of the various methodologies, and of the complementarities between them, could therefore lead to the development of more effective models.

The main conclusion of the Handbook is that, despite their weaknesses, many methodologies for assessing the impact of trade on the labour market are indeed complementary: using any one of them alone would give an incomplete picture. Macro, meso and micro approaches are increasingly being used in combination, the findings obtained using one approach feeding into those obtained using another, which makes for a more comprehensive analysis. The development of "mixed-methods" approaches has, moreover, made it possible to consider a greater number of aspects related to working conditions, which is essential when using decent work indicators to study the effects of trade.

The evolution of trade theory and associated methodologies has been driven by empirical observations …

The literature on international trade has evolved considerably since early classical trade models that were based on the concepts of absolute and comparative advantage. These initial frameworks were useful for conceptualizing trade but relied on an extensive set of assumptions that were incompatible with empirical observations. The emergence of neoclassical theories introduced other mechanisms, such as "factor endowments", to explain the gains deriving from trade liberalization. These new theoretical frameworks allowed for interactions between different factors of production, such as land and capital, and made it possible to study their effects on labour.

While the analysis of trade in classical and neoclassical theories was performed mainly at the country level, "new trade theory", emerging in the mid-1980s with Paul R. Krugman's work, disaggregated the effects of trade at the industry level. New trade theory also incorporated some key features of the market and of production and consumption, such as monopolistic competition or consumers' love of variety. Consequently, it was more successful in accounting for empirical observations and made it possible to analyse changing patterns of production, such as agglomeration in cities, network effects and increasing trade in intermediate goods. In parallel with these theoretical advances, empirical methodologies at the macro and meso levels were also developed. Computable general equilibrium models, partial equilibrium models and input–output multiplier analysis have been increasingly used to conduct ex ante and ex post assessments of the impact of trade policy on labour markets.

That being said, the above-mentioned methodologies have tended to focus on the structure of employment and wages, which means that there are certain limitations if they are used to study other aspects of the labour market. Some of them are, moreover, still highly dependent on assumptions that may not be realistic (such as full employment or perfect competition) and on parameters that are difficult to estimate (such as elasticities of substitution between goods and factors). Certain methodological approaches also require large and expensive data sets.

… and data availability leading to a stronger emphasis on individual firms and workers

As more data disaggregated at the firm level became available, persistent differences between trading and non-trading firms within the same industry were observed, leading to the emergence of "new-new trade theory" (NNTT). Initially put forward by Marc Melitz, the NNTT model is based on the premise that trade liberalization has uneven effects across firms: only the most productive enter the export market, while less productive firms are forced to exit. Models incorporating differences between workers – mainly in terms of their sex, level of skills, experience

and commitment – were also developed. Additionally, abandoning the full-employment assumption makes it possible to take into account labour market frictions, which in practice hamper workers' attempts to switch between jobs across industries or regions. These theoretical developments mean that the NNTT model can now be used to evaluate the impact of trade policy on broader labour market outcomes, such as structural unemployment and informality.

More sophisticated modelling and the increasing availability of disaggregated data have paved the way for the development of empirical methodologies that take firm and worker heterogeneity into account. Mostly using econometric techniques (based on structural or quasi-experimental designs), these micro-level approaches have improved the understanding of the distributional effects of trade.

The introduction of linked employer–employee data sets (LEED) has been a very important development in that respect. By combining information from both sides of the labour market, LEEDs allow analysts to determine the extent to which changes observed in outcomes are related to the characteristics of firms, workers or their interactions. Such an analysis is particularly relevant from the point of view of policy design, since relying solely on firm or worker level data could lead to false conclusions. Thanks to the greater availability of data at the firm and worker levels, and also to government efforts to link administrative data sources, LEEDs are becoming more widespread. However, there are still some drawbacks when using LEEDs, which have mainly to do with confidentiality concerns and technical difficulties in matching the data.

From quantitative to qualitative research methods

Qualitative research methods can facilitate an in-depth understanding of the processes being studied, in particular of the underlying drivers and motivations. Such methods involve gathering large amounts of detailed information from a usually small number of participants, focusing on specific groups of firms, workers or situations. It is possible to combine quantitative and qualitative approaches in what are referred to as "mixed" research methods. For example, an analyst looking at a specific region or country could use a quantitative tool supplemented by a case study based on the results of in-depth interviews with key participants in order to get a more complete picture of the labour market impact of a change in trade policy. However, the use of such mixed approaches requires substantial skills, time and financial resources.

Further research using decent work indicators is needed

Despite the theoretical and methodological advances that have been made, the amount of research on the implications of trade for decent work is still limited. Further empirical analysis at the sectoral and firm level is necessary. It is intended that the methodologies outlined in this Handbook be used in conjunction with the decent work indicators presented in the companion Guide to stimulate research in this area. A number of forthcoming studies on Mexico, Viet Nam and Malawi by the ILO will present the results of hands-on application of these methodologies with a view to informing policymakers about the specific effects of trade on the labour market. Comprehensive analysis of these effects can support the design of policies that are effective in the context of specific countries and regions.

In this regard, the Handbook is meant to support the mandate contained in the ILO Declaration on Social Justice for a Fair Globalization (2008), which assigns a distinct role to the ILO in terms of examining the effects of trade policy on employment. The Handbook also ties in with the ILO Centenary Declaration for the Future of Work (2019), since it seeks to help Member States to design and implement "trade, industrial and sectoral policies that promote decent work, and enhance productivity".

Abbreviations

BWS	International Labour Organization and International Finance Corporation's Better Work Surveys
CETA	Comprehensive Economic and Trade Agreement (between the EU and Canada)
CES	constant elasticity of substitution
CGE	computable general equilibrium
DADS	Déclaration annuelle des données sociales (Annual Declaration of Social Data) [France]
EU	European Union
FDI	foreign direct investment
GDP	gross domestic product
GE	general equilibrium
GPM	Global Policy Model (of the United Nations)
GTAP	Global Trade Analysis Project
IAB	Institut für Arbeitsmarkt- und Berufsforschung (Institute for Employment Research) [Germany]
IBGE	Instituto Brasileiro de Geografia e Estatistica (Brazilian Institute of Geography and Statistics)
ICIO	Inter-Country Input–Output Database (of the OECD)
I–O	input–output
IMSS	Instituto Mexicano del Seguro Social (Mexican Institute for Social Security)
INEGI	Instituto Nacional de Estadística, Geografía e Informática (National Institute of Statistics, Geography and Informatics) [Mexico]
IPEA	Instituto de Pesquisa Econômica Aplicada (Institute for Applied Economic Research) [Brazil]
LEED	linked employer–employee data set
MNC	multinational corporation
MNE	multinational enterprise
NAFTA	North American Free Trade Agreement

NBER	National Bureau of Economic Research [United States of America]
NNTT	new-new trade theory
OECD	Organisation for Economic Co-operation and Development
PE	partial equilibrium
PME	Pesquisa Mensal de Emprego (Monthly Employment Survey) (Brazil)
RAIS	Relação Anual de Informações Sociais (Annual Social Information Report) [Brazil]
RCT	randomized control trial
SAM	social accounting matrix
SMART	Software for Market Analysis and Restrictions on Trade
SMEs	small and medium-sized enterprises
SMESV	Small and Medium Enterprise Survey in Viet Nam
UNCTAD	United Nations Conference on Trade and Development
UNECE	United Nations Economic Commission for Europe
USITC	United States International Trade Commission
WBES	World Bank Enterprise Surveys
WIOD	World Input–Output Database
WITS	World Integrated Trade Solution
WTO	World Trade Organization

Introduction

The link between trade and labour markets has been a key concern for the ILO since its foundation in 1919 and is part of the Organization's founding principles. Over the past decades, this link has become even more prominent, with the ILO Declaration on Social Justice for a Fair Globalization (2008) assigning a distinct role to the ILO in examining the effects of trade policy on employment. The ILO Centenary Declaration for the Future of Work, adopted at the 108th Session of the International Labour Conference in June 2019, reaffirmed this mandate by calling upon Member States, with the support of the ILO, to put in place "trade, industrial and sectoral policies that promote decent work, and enhance productivity".

There is a substantial body of literature on trade and labour markets that concentrates on employment and wage effects. The ILO itself has been active in this area, producing a number of studies on the effects of trade liberalization on employment, including its effects on skills and inequality (ILO and WTO 2017), informality (Bacchetta, Ernst and Bustamante 2009), gender equality (Jansen, Peters and Salazar-Xirinachs, 2011) and sectoral dimensions (Cheong, Jansen and Peters, 2013). As well as the number of jobs created by trade, the quality of those jobs is important, which includes rights at work and working conditions. However, far less research has been undertaken on such aspects of the trade and labour market relationship, owing to fragmentation in the data and limitations in the methodologies used. This neglect partly reflects the methodologies themselves, which may not be suitable for such assessments, but it also has to do with the set of labour market indicators that are commonly (and readily) available to analysts.

The present Handbook seeks to address the above-mentioned research gap by adopting a human-centred approach to trade. Placing decent work at the centre of trade impact assessment, it reviews various methodologies and considers a wide range of labour market indicators, based on the ILO's Decent Work Agenda.

Examination of the different methodologies used reveals that the economic literature focusing on trade and labour linkages has evolved considerably over the past few decades. Theory has moved away from oversimplified country-level frameworks based on unrealistic assumptions to more complex but representative sector-, firm- and worker-level models. These micro-level frameworks are better suited to explain the actual patterns of trade and its implications for decent work, since they take into account previously neglected features of the product and labour markets, such as firm heterogeneity, worker heterogeneity and labour market frictions. Additionally, the developments in the theory have coincided with the growing availability of higher-quality longitudinal and cross-sectional data sets from many places around the world, along with an increase in computational capabilities and the enhancement of econometric tools. There has been an upsurge in empirical studies providing valuable evidence of the effects of trade on various labour market outcomes, including informality and gender inequality. Some of these effects had previously been ignored in the literature, yet they are important for the design of policies aimed at strengthening the decent work outcomes of trade.

Despite this progress, there is still only a limited number of studies on the effects of trade on employment, going beyond employment levels and structure. Further research is necessary in order to understand properly how trade affects labour market outcomes. The companion to this Handbook, Trade and Decent Work: Indicator Guide, 2021, offers a toolkit of indicators that reflect substantive elements of decent work and that can be used in assessments of the impact of trade on employment. The Handbook

is meant to improve understanding of the various methodologies that are available for that purpose. It is expected that the Handbook will pave the way for future studies using complementary methodologies and support more comprehensive assessments of the effects of trade on the labour market. In this regard, a number of studies on Mexico, Viet Nam and Malawi that will provide hands-on applications of these methodologies are being conducted by the ILO and will be published in an edited volume (forthcoming). The findings of such studies will have important implications for policies aimed at addressing the heterogeneous effects of trade and at enabling a wider range of firms and workers to share in the benefits of international trade.

The Handbook aims to discuss key elements of the above-mentioned approaches in an accessible manner that is suitable for a wider audience. It is intended for government officials, workers' and employers' representatives, and civil society representatives seeking to gain a better understanding of such techniques and their implications for policy design and implementation. The Handbook is also suitable for students, technical experts and academics who wish to expand their knowledge of the linkages between trade and labour.

The structure of the Handbook is as follows. First of all, it must be pointed out that the text as a whole covers the main theoretical and empirical approaches used to assess the impact of international trade on labour markets, including the evolution of these approaches. On the theoretical front, Chapter 1 describes the evolution of trade theory from the classical theories based on the concepts of absolute and comparative advantage to neoclassical theories based on factor endowments, before turning to newer trade theories that take firm and worker heterogeneity into account. On the empirical front, Chapter 2 classifies the existing methodologies as macro (country), meso (sectoral) and micro (firm and worker) level in line with the Handbook's analytical framework. It should, however, be noted that these categories may well overlap: macro-level studies are increasingly based on micro-level theoretical foundations; macro level frameworks are adapted to a micro-level context; and micro-level data are often "added up" to give results at the meso or macro level. In addition to quantitative methodologies relying on large data sets, qualitative and "mixed" research methods are also discussed. Chapter 3 goes into further depth by presenting three different econometric approaches that deal with firm and worker heterogeneity. The focus in that chapter is on the use of linked employer–employee data sets, which are at the cutting edge of research into the effects of trade on the labour market. Chapter 4 concludes the Handbook by considering areas for future research based on the approaches presented in the earlier chapters.

1 Trade theory: From classical to new-new trade theory

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▶ Chapter 1. Trade theory: From classical to new-new trade theory

The origins of the theoretical literature on trade and labour can be traced to the economists Adam Smith (1723–90) and David Ricardo (1772–1823), both of whom adopted a macro (country)-level approach. This was above all due to the nature of trade in the eighteenth and nineteenth centuries, with trade being conducted mainly at the level of national polities, but also because of the comparative ease of modelling at the country level and the limited availability of data. However, with the evolution of trading paradigms and of the nature of production and consumption, along with the emergence of more sophisticated modelling techniques and increasing data availability, meso (sectoral)- and micro (firm and worker)-level approaches began to be used more frequently. At the same time, the unit of analysis shifted from the country to the sector level, and from the sector to the firm and worker levels.

Drawing on these various approaches, the theoretical literature has identified a range of channels that transmit the effects of trade down to a wider set of labour market outcomes. Such channels include goods prices, skill demand, and the task composition of occupations, the factor content of production (capital, labour and/or land), firm productivity and capital goods. This chapter reviews the evolution of trade theory from the classical models based on a single factor of production to more recent theories that take into account labour and product market idiosyncrasies. Figure 1 at the end of the chapter provides an illustration of this evolution of the main trade theoretical paradigms and their direct and indirect associations with other theories. See Appendix I for a more extensive review of the theoretical frameworks and Box 1 for a brief note on the intersectionality of trade and technology in trade theory and its implication for labour market. In the contemporaneous literature on the effects of trade on labour markets, the models discussed in the following sections often complement each other and are combined in order to inform a more holistic analysis of the effects of trade.

1.1. Absolute and comparative advantage (country level)

The early classical trade models were based on the principles of absolute and comparative advantage and regarded the cost of production (expressed in terms of labour effort) as the main reason why countries could mutually benefit from trade. Smith (1776) provided the initial theoretical basis for gains from trade using the concept of "absolute advantage", whereby countries stood to benefit from commerce if they specialized in goods that they could produce at a lower cost than other countries. They could then export their surplus production of such goods in order to import other goods and maximize their welfare.

Building on this notion, Ricardo (1817) developed the theory of "comparative advantage", whereby it was not the direct cost of production that mattered but, rather, the relative cost of production. Even without achieving the lowest absolute cost of production for a particular good, a country could still enhance its own welfare through trade as long as it could produce the good at a lower cost than its trading partner.

Both these theories operated at the national level and broadly predicted increased production due to specialization and the reduction of inter-State inequality as a result of the welfare gains from trade. The underlying general equilibrium framework of these theories allowed a rudimentary examination of the long-term effects of trade liberalization. However, while the two theories were instrumental in laying the foundations for future work in this field and are often cited in contemporary models, their applicability to the real world was limited owing to their restrictive and unrealistic assumptions, the high level of aggregation and the narrow

range of modelled variables.[3] For example, in Ricardo (1817) price adjustments of goods are supposed to lead to balanced trade. However, this does not take into consideration other adjustment mechanisms, such as interest rates, which can give rise to persistent trade imbalances (Milberg 2002; Kucera and Roncolato 2011).

1.2. Factor endowments (country and sectoral level)

The ideas of Smith and Ricardo were elaborated by later economic theorists, who considered additional factors of production alongside labour, such as land and capital. These additional factors helped to explain frequently observed phenomena in the world economy of the early twentieth century, such as partial specialization, diminishing returns and inter-country wage differentials. Moreover, the underlying rationale for trade was regarded as stemming from differences in the "endowment" of factors of production between countries, rather than from comparative cost advantages. Two of the most frequently cited models in this category are the "specific factors model"[4] and the Heckscher–Ohlin model.[5] Factor abundance and factor intensity determine the pattern of trade (and the ensuing gains or losses) for different products in these models.

The above two models also provided a better approximation of a world with multiple countries and multiple commodities being traded. The Heckscher–Ohlin model, for example, introduced the effects of mobility on the gains of a particular factor.[6] This model is particularly famous in the literature for its prediction that trade liberalization would lead to a rise in wages in developing countries and a rise in capital rents in advanced economies (also known as the Stolper–Samuelson theorem). It is one of the first models that was run using empirical data in order to test its predictions. Such testing yielded varying results – for example, one of the empirical tests (Leontief 1953) led to the conclusion referred to as the "Leontief paradox", whereby capital-abundant countries seemed to be exporting labour-intensive goods.[7] Although the configurations of both the specific factors model and the Heckscher–Ohlin model were innovative for their time, their inability to take into account the structural features of a market, such as monopolistic competition and increasing returns to scale, limited the generalizability of their results.

3 Ricardo assumed two countries producing two goods and using one factor of production (labour). His macro-level framework is based on a set of restrictive assumptions, including full employment, perfect competition, homogenous products, no trade barriers, no transport costs, perfect information, constant returns to scale and frictionless labour markets.

4 A variant of the Ricardian framework, this model was originally proposed by the Canadian economist Jacob Viner (1892–1970) and is therefore often called the Ricardo–Viner model. A detailed mathematical version of the model was presented by Jones (1971) and Mussa (1974).

5 The two models differ mainly in the mobility of factors of production between industries in each country. The specific factors model provides for one mobile factor and two industry-specific immobile factors, whereas the Heckscher–Ohlin model considers two factors of production that are perfectly mobile between two sectors. These different approaches provide a good conceptualization of, respectively, the short- and long-run aspects of industrial production decisions, with the former assuming certain fixed production factors and the latter assuming only variable factors.

6 For example, the switch from perfect factor mobility between sectors in the classical framework to variable factor mobility in the neoclassical framework implies that trade liberalization would lead to the wages of low skilled workers in a capital-intensive country (such as the United States) converging towards the wages of low skilled workers in a labour-intensive country (such as Mexico).

7 Leontief (1953) was one of the first to try to empirically test the predictions of the Heckscher–Ohlin model. He found that the United States, a capital-abundant country, was a net exporter of labour-intensive goods.

▶ Box 1. Trade and technology: An intersectional approach

Since Chapter 1 of the Handbook traces the theoretical evolution of trade models, it is important to note that technology, in its various definitions, is intricately linked to trade and labour. This often calls for an intersectional approach when considering trade and labour market outcomes. For example, the relative contribution of technological advances and trade liberalization to labour market changes is highly contested (WTO 2017). The similarities and differences between trade and technology are often glossed over and do not receive sufficient attention.

A study of the treatment of technology in trade theory must begin with Ricardo, who understood technology as an exogenous factor that determined the comparative advantage of countries. This meant that technology, in his framework, often influenced labour market outcomes, for example through labour productivity. However, treating technology as an exogenous factor prevented a more detailed examination of its relationship with both trade and labour. Subsequent theories, such as the neoclassical theory, the "new trade theory" and the "new-new trade theory", assumed that the technology used by both countries in a trading relationship was identical in order to be able to attribute cause-and-effect chains directly to trade. Although this assumption made it possible to distinguish between labour market outcomes due to trade and technology, it failed to consider the interactions between the two. Theoretical work suggests that trade and technology may not necessarily have the same magnitude or directness of effect (Autor, Dorn and Hanson 2015).

Theoretical approaches developed in the early twenty-first century stress the need to treat technology as a distinct phenomenon in trade theory. There are a range of models that attempt to turn technology into an endogenous factor by positing differences in firm-level production technologies, factor markets (for example, in terms of labour skill and productivity) and trade patterns (capital content of imports/exports). Eaton and Kortum (2002), for example, devised a probabilistic formulation of technological heterogeneity in order to explore how technology and geography determine trading patterns and specialization. Their findings have important implications for the distribution of the gains of trade and the role of trade in the diffusion of technology. Others, such as Yeaple (2005), Sampson (2014) and Bustos (2011), model technology as a choice made by firms.

The evolution of the treatment of technology in trade theory has been influenced by data showing the empirical effects of both trade and technology to be fairly distinct. These effects can be explained by reference to mechanisms such as the nature of technical change (skill-biased vs routine-biased) and the automation of industries (WTO 2017). The empirical evidence shows that there are important complementarities, and substitution, in the labour market effects of the interaction of trade and technology, since they can work through either similar or competing channels. For example, Autor, Dorn and Hanson (2015) juxtapose trade (using an import exposure measure) and technology (using a computerization measure) within a local labour market framework in order to disentangle the differential effects and underlying mechanisms of the two. They conclude that the effects of trade and technology differ not only in their magnitude but also in their direction of influence and in the sectoral focus. That study underlines the importance of an intersectional approach when trying to understand labour market outcomes such as skill polarization and rising income equality.

1.3. Economies of scale and industry agglomeration (country and sectoral level)

Later modifications of the traditional (neoclassical and classical) frameworks attempted to take further empirical regularities into account by modelling structural features such as increasing returns to scale, monopolistic competition, heterogeneous consumer preferences and heterogeneous production. One of the earliest of these more sophisticated frameworks was Krugman's "new trade theory", which used industry as the unit of analysis for a more realistic simulation of trade dynamics and empirical observations. Establishing "economic geography" as a sub-branch of international trade theory, Krugman's model successfully took into account changing patterns of production such as agglomeration in cities, network effects, increasing trade in intermediate goods and the spatial reorganization of production. Moreover, the model provided a theoretical basis for the "home market effect", explaining why countries with high demand for a particular product will tend to run a surplus in trade for that product, especially if there are increasing returns to scale. It similarly provided a theoretical underpinning for consumers' "love of variety", that is, for their preference for a range of varieties of a single product within a framework of monopolistic competition. The literature on geographical economics has paved the way for further development of micro-level methodologies, such as using the concept of "local labour markets" to analyse the highly localized effects of trade on labour market outcomes.[8]

New trade theory helped international trade theory to catch up with the far-reaching changes brought by globalization in the 1980s in terms of production, consumption and trade. The theory's focus on the industry level and the incorporation of structural features of the market enabled better-informed discussions on issues such as competition and industrial policy. However, new trade theory was unable to account for the empirical evidence emerging at the time which pointed to the importance of firms in international trade. This shortcoming was particularly obvious with regard to the disproportionate role played by multinational enterprises.

1.4. Firm heterogeneity (firm level)

In view of considerable and persistent differences in productivity between firms operating in the same industry, Melitz (2003) developed a "heterogeneous firms model" to analyse the intra-industry effects of trade. This model heralded the emergence of "new-new trade theory" (NNTT), first articulated by Melitz himself (2003) and subsequently developed by other trade economists (Bernard et al. 2003; Melitz and Ottaviano 2008), which regards the firm as central to an understanding of disaggregated trade effects (Cernat 2015).

The NNTT framework assumes that only the most productive firms are able to overcome the high fixed costs associated with exporting and survive the competitive pressures (Ciuriak et al. 2015). Trade liberalization, accordingly, leads to more productive firms entering the export market, while the less productive ones produce only for the domestic market or are forced to exit the market altogether. This also has the effect of resources being reallocated

8 The concept of local labour markets is based on the "commuting zones" methodology developed by Autor, Dorn and Hanson (2013), which treats such zones as sub-economies subject to differential trade shocks. The methodology has been used to capture the spill-over effects of offshoring (Artuc and McLaren 2015), sectoral and occupational reallocation, and changes in demand for skills (Autor, Dorn and Hanson 2016).

from low- to high-productivity firms (Ciuriak et al. 2015; Pavcnik 2002; Melitz and Redding 2014), as may be seen in the reallocation of employment from the least to the most competitive firms (ILO and WTO 2017). Firms thus become even more productive, larger and more competitive as they gain in exporting experience (Bernard et al. 2007).

The productivity and employment gains from trade are generated by both the expansion of existing trade flows and markets ("intensive margins") and the new trade flows to new destinations ("extensive margins") (Ciuriak et al. 2015).[9] This suggests that trade liberalization leads to more productive firms being able to export more of their products to foreign markets or to access new export markets and sell new products, thereby creating greater employment opportunities.

Melitz's basic model has been used with a vast range of modifications in order to take into account other features of the global economy that are routinely observed in practice. While it is the more productive firms that tend to enter the trade market, it has also been recognized that, in response to trade liberalization, firms improve their productivity through the adoption of technologies and innovation (Bustos 2011; Lileeva and Trefler 2010; Yeaple 2005), diversification of the products (Eckel et al. 2015; Flach and Irlacher 2018), and fragmentation of their production across global supply chains (Blanchard and Matschke 2015; Antràs and Yeaple 2014). For instance, Amiti and Davis (2012) provide a theoretical framework that takes into account the growing importance of trade in intermediate goods organized around global supply chains. The disintegration of production involves a division of tasks and variation in the composition of the workforce (reflected in worker heterogeneity in skills, productivity and wages). This has prompted researchers to look more closely at the decisions taken by firms with respect to workforce composition and the outsourcing of tasks.

1.5. Worker heterogeneity (firm and worker level)

Although trade liberalization has uneven effects across firms in the NNTT model, it is assumed that all workers are affected in the same way, or that any differential effects depend on the firm that they are employed in. However, workers have different characteristics in terms of, say, their sex, skills, experience and level of commitment, as a result of which they do not all benefit in the same way from trade. This has prompted the development of new theoretical frameworks that seek to disentangle worker heterogeneity from firm heterogeneity as presented in the Melitz (2003) model (Irarrazabal, Moxnes and Ulltveit-Moe 2013).

The new frameworks take into account the fact that wages may vary across different groups of workers within the same firm. As they become engaged in international trade, firms increase the wages of skilled and committed workers at the top of the wage distribution, while reducing the wages of less skilled workers at the bottom (Yeaple 2005). In terms of gender differentials, women are assumed to be hired at a lower wage than men with identical skills, since they are considered to be less committed to the labour market. In order to compensate for their purported lower level of job commitment, women need to have a higher skill level. This leads to greater gender gaps in the upper tail of the wage distribution and thereby to increases in inequality (Ben Yahmed 2012).

Differences in wages can even be observed among workers with similar characteristics, depending on the profitability and size of the firm employing them. The "fair wage" models of Egger and Kreickemeier (2009) and Amiti and Davis (2012) assume that more productive firms pay higher wages, as

9 However, the relative importance of these margins can depend on different factors. For instance, the model proposed by Chaney (2008) indicates that when the elasticity of substitution between goods (varieties) is high, the productivity of firms plays a crucial role, with new entrants being at a disadvantage (owing to lower trade barriers) and unable to capture large market shares. Trade openness in such cases affects intensive margins more than extensive margins. On the other hand, if the elasticity of substitution is low, firms are shielded from competition to some extent, and new entrants may include less productive firms that nevertheless manage to capture larger market shares. Under such conditions, extensive margins are more important.

they are able to use their increased profits to reward workers. The "efficiency wage" models assume that enhancing wages beyond market-clearing rates can lead to a more productive and committed workforce (Davis and Harrigan 2011). These models predict that with an increase in exporting activities, firms gain in productivity and revenue, which in turn rewards workers through an increase in wages that is proportional to their effort or commitment. Sampson (2014) argues, moreover, that high-technology firms in the exporting sector offer higher wages to high-skill workers, generating inequalities within this group across exporting firms.

1.6. Labour market frictions (firm and worker level)

The theories discussed in the preceding sections do not take into account dynamic adjustments that occur when workers change jobs in the same industry or switch to jobs in a different industry, and which may not be instantaneous. This consideration led to the full employment assumption being abandoned in order to simulate more accurately job search and job-matching realities observed in the empirical data of labour markets. This theoretical contribution also expanded the NNTT framework's applicability and meant that it could be used to evaluate the impact of trade policy on broader labour market outcomes such as structural unemployment and informality.

Labour market frictions may arise when workers switch industries, change occupations or relocate to other regions. These frictions entail considerable costs for both workers and firms (McLaren 2017). On the firms' side, such costs include searching and hiring costs (Davidson, Matusz and Shevchenko 2008) and retraining and collective bargaining costs (Felbermayr, Prat and Schmerer 2011). As far as the workers are concerned, job searching and matching generates unemployment (Helpman, Itskhoki and Redding 2010), informality (Dix-Carneiro et al. 2019) and job turnover (Coşar, Guner and Tybout 2016).

For instance, in a context of considerable labour market frictions (where, for example, displaced workers face very high adjustment costs or firms face more intensive competition), overall employment levels could decrease as a result of trade, with displaced workers becoming unemployed in the short and possibly also the long run; they may even drop out of the labour force altogether. On the other hand, in a context of low labour market frictions (that is, one where workers generally have transferable skills and there is free movement of labour), trade would result in employment growth, with an increase in labour demand and inter- and intra-sectoral labour mobility offsetting the number of displaced workers who become unemployed or drop out of the labour force.

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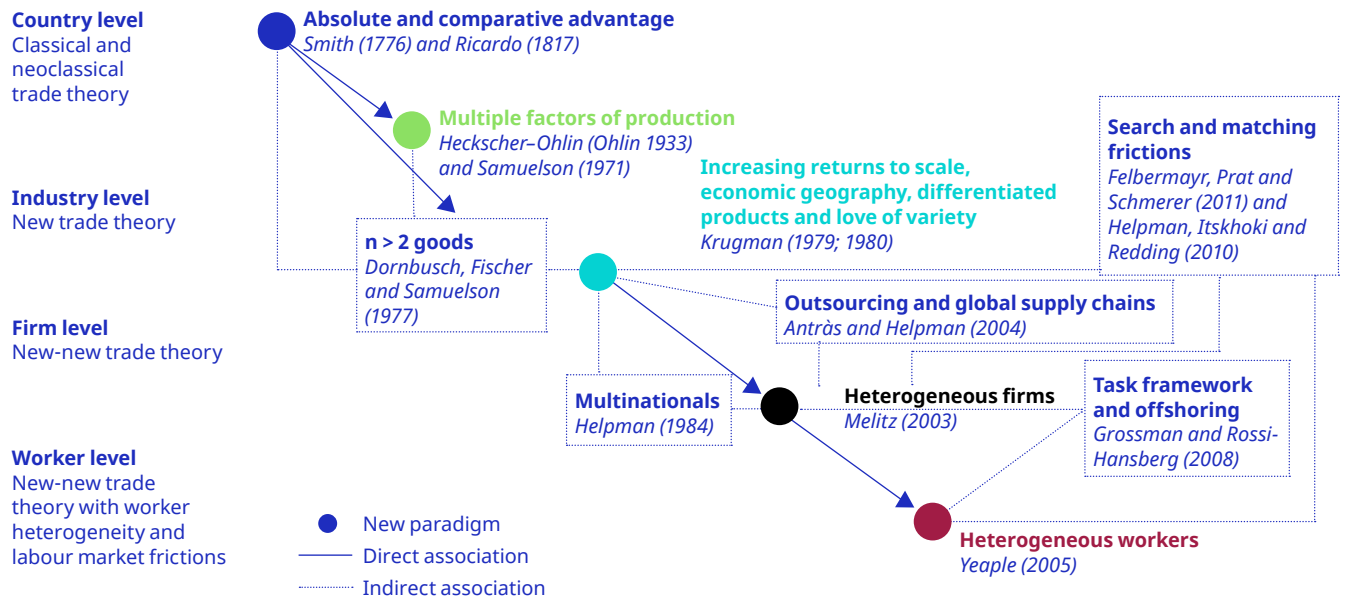
▶ Figure 1. Evolution of the main theoretical frameworks for analysing the effects of trade on labour market outcomes



2 Empirical methodologies: From aggregate to distributional effects

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▶ Chapter 2. Empirical methodologies: From aggregate to distributional effects

This chapter provides an overview of the methodological approaches used to empirically assess the labour market impacts of trade. It classifies them into macro (country), meso (sectoral) and micro (firm and worker) approaches, and discusses the main features of each approach. Although few approaches fall neatly into one of these three categories, the purpose of such a classification is to analyse the most widely used assessment methodologies at the three different levels of the economy. Based on trade theory, and its evolution, the distinction between macro, meso and micro approaches can help one to understand better how various aspects of the labour market can be considered in studies of the effects of trade. This classification is also useful for identifying complementarities between the approaches.

The analysis presented in this chapter is based on careful examination of the following aspects of each approach: (a) main assumptions, particularly regarding the labour market; (b) data requirements; and (c) the strengths and weaknesses of the approach.

Table 1 below provides a summary of the results of this analysis and gives examples of the research questions that can be explored using each approach.

Macro and meso approaches (section 2.1), such as those used in country or sectoral level assessments of trade impacts, rely mainly on partial and general equilibrium analysis and on input–output multiplier analysis. Input–output tables and social accounting matrices are crucial for these types of analysis. The macro and meso approaches discussed in this Handbook generally focus on employment (with some differentiation by such characteristics of workers as skill level and sex) and wages, and are less concerned with other dimensions of decent work Box 2 provides an overview of the key aspects of macro and meso approaches.

▶ Box 2. Overview of key aspects of macro (country) and meso (sectoral) approaches

The most widely used approaches are computable general equilibrium models, partial equilibrium models and input–output multiplier analysis:

- **Use:** These approaches are widely used by national and international organizations to conduct ex ante and ex post labour market assessments of trade.
- **Labour market indicators:** When considering the labour market, most assessments based on these approaches focus on employment levels and structure (with some differentiation by skill level and sex) and on wages.
- **Assumptions:** These approaches are often based on full employment, frictionless labour markets and perfect competition.
- **Benefits:** These macro approaches are regarded as complementary. Partial equilibrium models can be used to predict job displacement resulting from trade policy. Computable general equilibrium models are useful for analysing the overall impact of trade on welfare and interactions between markets. Input–output multiplier analysis is useful for analysing labour market outcomes in global supply chains.
- **Challenges:** The assumptions regarding the labour market are highly unrealistic; different parameters in the models may be difficult to estimate. The approaches require large and expensive data sets, such as input–output tables.

Econometrics is the most widely used approach at the micro level (section 2.2). Although it is also widely used at the macro level, the availability of disaggregated data and the feasibility of matching databases makes it particularly suitable for analysing disaggregated effects of trade at the micro level. Econometrics has the advantage of accommodating a wider set of assumptions and it allows one to analyse a broader range of labour market outcomes, including not only informality and gender gaps but also the elimination of child labour and collective bargaining. Box 3 provides an overview of the key aspects of micro approaches.

The methodologies outlined above are often used in complementary ways to assess different aspects of the labour market. Additionally, supplementary approaches – qualitative techniques and mixed-methods approaches (section 2.3) – are used to achieve a more comprehensive understanding of the labour market.

▶ Box 3. Overview of key aspects of micro (firm and worker) approaches

The econometric approaches that are used at the micro level can be classified under the structural approach, the quasi experimental approach and randomized control trials:

- **Use:** These approaches are less institutionalized and more widely used by researchers.
- **Labour market indicators:** A broader range of labour market outcomes – including not only informality and gender gaps but also workers' rights, skills and the elimination of child labour – can be analysed.
- **Assumptions:** These approaches can accommodate a wide set of assumptions (such as firm heterogeneity) and can be performed using both micro-level (worker, firm or matched) data and sectoral or macro-level data (industry regressions or cross-country studies).
- **Benefits:** The greater availability of disaggregated data and the possibility of matching databases mean that these approaches can be used more widely. They have yielded important insights into the effects of trade on heterogeneous firms and workers (within sectors).
- **Challenges:** The findings obtained using these approaches cannot always be generalized to different groups of individuals, contexts or outcomes.

▶ Table 1. Overview of methodological approaches for assessing the labour market impacts of trade

	Scope	Examples of research questions	Main labour market assumptions*	Data requirements	Strengths and weaknesses
CGE models (neoclassical)	These models can be used to estimate the effects of trade policy changes on the whole economy and the indirect effects on a specific market (e.g. the labour market) while considering interactions with other markets.	What are the potential effects of trade policy change (e.g. tariffs and NTMs reductions) on real GDP, trade flows, and welfare? How will real GDP and trade balance change in a country that joins a regional trade agreement?	Perfect competition; full employment; wage flexibility; frictionless labour market; Armington assumption.	Trade flows; tariffs; elasticities; I–Os (SAMs) (for example, as provided by the GTAP database).	**Strengths** – These models take into account the impact of trade on the overall economy and linkages between industries and between markets. – They can take into account feedback effects and adjustment processes. **Weaknesses** – No in-depth analysis of the labour market at the sectoral level. – Extensive data requirements. – Highly dependent on rigid assumptions (such as full employment and balanced trade) and parameters (which may be difficult to estimate). – Emphasis on employment and wages, rarely other labour market indicators. – They do not take into account the potential benefits of regulation (only costs).
PE models	These models can be used to estimate the direct effects of trade policy changes on one market (e.g. the labour market), region, sector or industry.	What would foreign competition do to employment? How do tariffs protect jobs in a given sector? How much employment may be lost in an industry as import prices fall?	Static model; frictionless labour market; Armington assumption.	Trade flows; tariffs; elasticities (for example, as provided by the WITS database).	**Strengths** – In-depth analysis of a specific market for policy guidance. – Limited data requirements in the basic version of such models. **Weaknesses** – These models do not take into account interactive markets and feedback effects. – They may underestimate or overestimate impacts. – Emphasis is on employment and wages; they rarely include other labour market indicators.
I–O tables, SAMs, multiplier analysis	These approaches can be used to estimate the direct and indirect impact of trade policy changes on the whole economy or on a specific sector or market.	What are the sectoral employment effects of trade policy changes? What is the effect of changes in net exports on sectoral output? How many jobs were created and how many destroyed as a consequence of the implementation of a new trade policy? How many per country? How many sectoral jobs are created per country as a result of changes in foreign final demand (e.g. in the context of global value chains), and how are skilled and unskilled workers affected?	Factors of production, such as labour and capital, are fixed coefficients and factor payments (e.g. wages) do not change.	National I–O tables and SAMs (as provided by the WIOD and ICIO or similar databases for regional studies.	**Strengths** – These approaches take into account intersectoral linkages and supply chain dynamics. – They take into account the direct, indirect and induced effects of a policy change or trade shock. **Weaknesses** – Data may not be readily available, and, if available, may be outdated.

▶ Table 1. Overview of methodological approaches for assessing the labour market impacts of trade (suite)

	Scope	Examples of research questions	Main labour market assumptions*	Data requirements	Strengths and weaknesses
Structural approach	This approach can be used to evaluate the welfare implications or overall effects of actual or counterfactual trade policies.	Through what mechanisms and to what extent may trade liberalization have affected a range of labour market indicators such as wage inequality, unemployment rates and job insecurity? What are the labour market adjustment costs faced by both firms and workers, and how long will the adjustment take?	The assumptions will depend on the underlying theoretical framework.	Data can be obtained from various macro- and micro-level sources. The use of linked employer–employee data would be ideal for this approach. Large datasets are required.	**Strengths** – This approach allows for interdependencies between labour market outcomes. – It gives a good fit for evaluating welfare implications and the overall effects of trade policies. – It can accommodate a wide set of assumptions. **Weaknesses** – It does not support exogeneity assumptions and instruments very well. – The theoretical assumptions may be overly simplistic or restrictive.
Quasi-experimental approaches	These approaches focus on identifying the causal effects with respect to a specific outcome of interest.	How does the impact of tariff cuts on workers' wages vary with the global engagement of their firm? What is the impact of trade liberalization on workers' individual employment trajectories?	Rather than on specific theoretical assumptions, these approaches rely more on statistical assumptions related to the econometric methods used.	Data can be obtained from various sources such as population censuses, household or establishment surveys, and administrative records. Much less onerous data requirements than other approaches; considerable flexibility.	**Strengths** – These approaches make it possible to control for endogeneity, selection bias and unobserved, confounding factors. – They are able to assess the impact of trade on various aspects of decent work. **Weaknesses** – Threat of external validity: it is difficult to generalize the findings to different groups of individuals, contexts or outcomes. – Detached from theory: the theory helps only to understand the findings, not to shed light on the way in which the findings are obtained.
RCTs	These approaches rely on experiments designed to measure the effect of a trade policy intervention.	How does exporting vs non-exporting affect a firm's profits and productivity? How effective are export promotion programmes and "aid for trade" schemes?	Randomized assumption.	Data collected through an RCT experiment, combined with survey data.	**Strengths** – Good research design controls for selection bias by incorporating randomized assignment. – Useful for impact evaluation of trade interventions, particularly when assessing the effects on SMEs and global value chains. **Weaknesses** – Conducting experiments is time-consuming, expensive and not always practical or ethical. – Evaluating nationwide trade policy effects is not feasible.
Qualitative research methods	These include in-depth interviews and case studies, and are used to provide a detailed analysis of the impact of trade on specific communities or persons.	– How does the EU's trade policy impact on labour standards? – How does trade impact on working conditions in specific industries or SMEs in the context of global supply chains?	Assumptions depend on the specific methodological tool used.	Data sources and collection methods can include observation, unstructured interviews, official or private documents (questionnaires and reports).	**Strengths** – Such approaches provide more in-depth information, and make it possible to cover more aspects of decent work than other methods. **Weaknesses** – Bias introduced by the group effect and the interviewer effect. – Can be costly in terms of financial and human resources. – It is difficult to generalize the results from such studies.

CGE = computable general equilibrium; EU = European Union; GDP = gross domestic product; GTAP = Global Trade Analysis Project; ICIO = Inter-Country Input–Output Database; I–O = input–output; NTM = non-tariff measure; PE = partial equilibrium; RCT = randomized controlled trial; SAM = social accounting matrix; SMEs = small and medium-sized enterprises; WIOD = World Input–Output Database; WITS = World Integrated Trade Solution.

Note: (*) These are some of the most common assumptions used. However, since assumptions are model-specific, alternatives to the ones presented here are possible. The results of modelling the economic and labour impact of trade critically depend on the assumptions used.

2.1. Macro and meso approaches: Country and sectoral levels

At the macro and meso level, empirical assessments of the impact of trade on labour markets rely mainly on general and partial equilibrium models. Many prominent national and international organizations use such models to estimate the potential impacts of regional trade agreements, including sectoral shifts of employment between partner countries.

2.1.1. General equilibrium approach

General equilibrium (GE) models are often used for ex ante assessments of the potential impact of a change in trade policy before that change is implemented. Although not as frequently, GE models may also be used for ex post assessments, that is, to consider the impact of the change in policy after its implementation (see, for example, Ojeda et al. 2010; Buch and Schlotter 2013).

In general, the most widely utilized GE models are consistent with the assumptions of neoclassical trade theory (such as full employment). With respect to the labour market, they are therefore used mainly to analyse the potential impact of trade on employment levels and wages. However, structuralist GE models have been extended to incorporate assumptions from new trade theory and new-new trade theory, such as trade in intermediates and firm heterogeneity. The newer models can also provide disaggregation by sex and skill level (differential impacts). Although they have sometimes been extended to cover some aspects of decent work (such as informality), in practice these models have rarely been used to assess the dimensions going beyond employment and wage levels.

The GE approach provides a framework for analysing simultaneous changes in the various markets comprised in an economy or region that occur after a shock (for example, a change in trade policy). Specifically, when a shock takes place, prices (for example, wages) and quantities (for example, labour demand) adjust such that a new equilibrium is reached in the various markets.

2.1.1.1. Computable general equilibrium models

Description

A widely used set of models under the GE approach is that of computable general equilibrium (CGE) models, which can be defined as computer-based simulations that are able to develop counterfactual scenarios.[10] CGE models allow one to examine the impact of a change in trade policy on the market directly affected, but also the impact on related markets (either complementary or substitutes) and on the economy as a whole in terms of trade flows, gross domestic product (GDP), aggregate employment and welfare. CGE models can be grouped into two broad categories: neoclassical and structuralist, as described below.

CGE models have often been used to evaluate, at the national and regional level, the impacts of trade liberalization associated with regional trade agreements (see table 2). They have also been used to assess the impact of trade on a specific sector (for example, the information technology sector in Bangladesh studied in Raihan and Cheong 2013) or on a particular demographic group (for example, women, as studied by Fontana 2004). A widely used CGE model developed specifically for the analysis of trade policy is the Global Trade Analysis Project (GTAP) model, which is a multiregional and multisectoral neoclassical model (see box 4). The United Nations Global Policy Model (see section 2.1.1.2) is another dynamic macroeconomic model. It is not a trade model as such but a global model used to analyse policy impacts (including trade policy) worldwide.[11]

10 The "counterfactual" refers to a hypothetical situation in which the change in policy has not taken place, and which can be compared with a situation in which the change has already occurred.

11 For further details of the Global Policy Model, see Onaran (2016), Lavoie (2016) and Michell (2016). Technical information can be found at: https://www.un.org/development/desa/dpad/publication/united-nations-global-policy-model/.

▶ Table 2. Assessments of the impact of trade policy on labour markets at the macro level performed by national and international institutions using computable general equilibrium models

Institution(s) and study (or studies)	Purpose	Methodology	Examples of agreements evaluated
European Commission (ECORYS and CASE 2017; Civic Consulting and ifo Institute 2018; LSE Enterprise 2017)	Ex ante/ex post assessment	CGE GTAP	FTA negotiations with Australia and New Zealand; modernization of EU–Chile FTA; EU–Republic of Korea FTA
United States International Trade Commission (De La Cruz and Riker 2014; USITC 2019)	Ex ante/ex post assessment	CGE GTAP	NAFTA; USMCA
EU and ILO (Raihan 2013)	Ex ante impact assessment of hypothetical trade agreements	WITS/SMART PE model and CGE model	Bangladesh–India FTA; Bangladesh–Malaysia FTA; BIMSTEC
UK Department for International Trade (United Kingdom 2018)	Ex ante impact assessment	CGE model	Comprehensive Economic and Trade Agreement (CETA) between the EU and Canada
Government of Australia Productivity Commission (Australia 2010)	Ex ante impact assessment of hypothetical trade agreements	CGE GTAP	Hypothetical trade liberalization scenarios
Asian Development Bank (Cheong 2013)	Ex ante impact assessment	CGE GTAP	Trans-Pacific Strategic Economic Partnership Agreement

BIMSTEC = Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation; CGE = computable general equilibrium; EU = European Union; FTA = free trade agreement; GTAP = Global Trade Analysis Project; NAFTA = North American Free Trade Agreement; PE = partial equilibrium; SMART = Software for Market Analysis and Restrictions on Trade; USMCA = United States–Mexico–Canada Agreement; WITS = World Integrated Trade Solution

Main assumptions

Standard (neoclassical) CGE models rely on assumptions that are consistent with neoclassical trade theory: full employment and perfect competition. These models assume that there is a uniform and flexible wage, which in the long run ensures full employment. Wages fall until equilibrium between demand and supply is reached – that is, until everyone who wants to work is employed. The assumption of perfect competition implies that there are no information asymmetries: workers have perfect information in a static model, and perfect foresight in a dynamic one. Workers are also considered homogeneous factors of production,[12] with factor prices (in this case, wages) equal to their marginal products. Additionally, the labour supply is fixed in static CGE models, although it can be made endogenous in dynamic models.[13] CGE models also generally make use of the "Armington assumption" of imperfect substitution between imported and locally produced goods, which implies that consumers will not purchase the cheapest (normally imported) product. It also means that multiple varieties of the same product will be produced and traded between the countries that are engaged in their production, and that consumers can choose between these varieties.

12 A constant-elasticity-of-substitution (CES) production function is normally used at the sectoral level (sometimes specific cases such as the Cobb–Douglas and fixed-coefficients functions). A CES function implies that factors can be substituted for one another at a constant rate.

13 For example, Kitwiwattanachai, Nelson and Reed (2010) employ an extension of a basic CGE model to compare the economic effects of an East Asian free trade area while considering the unemployment and real wage effects for different scenarios.

In comparison to neoclassical CGE models, structuralist CGE models (such as that presented in Raza et al. 2016) approximate better some of the assumptions of new trade theory by allowing for, say, trade in intermediates, impact on intermediate goods markets and imperfect competition. Structuralist CGE models are demand-driven in the sense that income and employment are determined by aggregate demand. This means that an increase in exports, regardless of any change in imports, would result in employment growth. In structuralist models, labour market rigidities and wage determination are based not just on supply–demand interactions but also on collective bargaining, for example. Such additional elements imply that real wages can be fixed, enabling excess labour supply (involuntary unemployment due to lack of opportunities).[14] These models also take intersectoral reallocation into account and can, therefore, provide insights into sectoral impacts. Technological change is usually exogenous in CGE models.

Labour demand in CGE models is, in general, derived from sectoral production functions. In order to reflect labour demand heterogeneity, it is necessary to design the production functions accordingly – not always a straightforward task. Nevertheless, a number of CGE models have disaggregated labour demand by skill level (for example, the Global Trade Analysis Project model discussed in box 4); by occupation, which is generally equivalent to level of education (Carneiro and Arbache 2003); region (rural or urban) (Zaki 2016); sex (Fontana 2004); and ethnicity (Flaig et al. 2011).

Data requirements

The main data requirements for CGE models are measures of changes in trade policy, values of key parameters and national input–output data. The data on trade policies include, for example, the percentage reductions in tariffs and non-tariff measures. Key parameters include elasticities of goods substitution, factor substitution and consumer demand, the values of which may be adopted from previous studies or estimated econometrically. National input–output tables are organized into social accounting matrices (see section 2.1.3), which serve "to calibrate models, defining both structural parameters and the baseline values of most endogenous variables" (Hernandez 2020).

A widely used source of data for CGE models is the Global Trade Analysis Project (GTAP) database, which covers 141 regions and 65 sectors. It contains data on bilateral trade in, and production and consumption of, final and intermediate goods and services for four reference years. The reference years can be regarded as constituting a time series of "snapshots" of the global economy (Aguiar et al. 2019).[15] Despite the widespread use of this database, the appropriateness of the data for modelling should not be taken for granted. Potentially better quality data for the specific economy being studied could be available from other sources. As pointed out by Cheong (2010), it is important to check whether the data coverage and the time periods for which key parameters were calculated are relevant to the countries and goods included in the simulation.[16] The results obtained from the model will ultimately also depend on the values of these key parameters.

14 The production technology features fixed proportions, with resource underutilization (excess capacities).

15 The latest release of the database is GTAP version 10 (2019), which covers the reference years 2004, 2007, 2011 and 2014. AggGTAP and RunGTAP are two programs developed specifically to be used in conjunction with the GTAP database to analyse policy changes related to international trade (Cheong 2010). Further changes and improvements with respect to earlier versions are outlined on the project website: https://www.gtap.agecon.purdue.edu.improvements with respect to earlier versions are outlined on the project website: https://www.gtap.agecon.purdue.edu.

16 Documentation on the GTAP's main database and various associated databases is available from the project website.

▶ Box 4. The Global Trade Analysis Project (GTAP) model

A computable general equilibrium model that is widely used for analysing the effects of trade policy is the one developed by the Global Trade Analysis Project (GTAP), which is coordinated by the Center for Global Trade Analysis at Purdue University. The basic GTAP model is a comparative-static applied general equilibrium model of the world economy. It is multiregional (a region represents one country or a group of countries) and multi-sectoral (for example, it considers the market for inputs, final goods and factors of production for sectors). The model assumes perfect competition and constant returns to scale. Household preferences are represented by a non-homothetic[a] constant-difference-of-elasticity[b] function. The model incorporates a global banking sector that connects global savings and consumption, and it also takes into account international trade and transport margins. Armington elasticities influence international trade in the model. Significantly, the quantity of endowments is fixed exogenously (including skilled and unskilled labour, land and capital). Since labour supply is fixed, rather than mobile, equilibrium implies full employment.

The GTAP model relies on the idea of an equilibrium position of the economy and a return to such a "natural" equilibrium over a period of time. The model is well known for its versatility: a wide range of variant models using its basic specifications have been developed to study particular issues. For example, in the GMig 2 variant, the GTAP model was adapted for the study of international labour mobility (Walmsley, Winters and Ahmed 2007), while the GTAP-SC variant was developed for the study of supply chains (Walmsley, Hertel and Hummels 2014).

a. This means that consumers do not increase their purchases of goods proportionately as their incomes rise. This assumption is crucial to the investigation of income inequality effects within a model.

b. Modelling household preferences on the basis of constant difference of elasticity (CDE) is less demanding than using flexible functions. It also allows one to calibrate income elasticities and own-price elasticities independently. Because a CDE function is non homothetic, it is possible to obtain a more accurate representation of income effects on the demand system. For more details, see Corong et al. (2017); Hertel (1997).

Strengths and weaknesses

CGE models take into account the impact of a change in trade policy on the overall economy: linkages or interactions between markets and feedback effects. These are reflected in changes in prices, trade flows, tariff revenue and welfare (Van den Berg 2016; Krugman, Obstfeld and Melitz 2014). GCE models are particularly suitable for studying the long term effects and economy-wide linkages of a particular trade policy. They are able to incorporate a wider range of channels into their mechanisms of adjustment than other models (such as partial equilibrium models – see section 2.1.2), including income effects, substitutability and complementarity of goods, and shifting factors of production.

Although CGE models can be used to study a more complex economy, they do have some limitations. For example, there is less scope for in-depth analysis of specific markets than with other techniques. Moreover, the structural framework requires large and expensive data sets, which may not always be available.

A major weakness of neoclassical CGE models, in particular, are the restrictive assumptions, which may be inconsistent with economic realities. The assumptions of full employment and perfect competition, along with the use of CES production functions, all of which underlie CGE models, have been heavily criticized in the literature (Ackerman and Gallagher 2008; Ackerman and Nadal 2004).[17]

17 The perfect competition assumption is considered an "idealistic", unattainable assumption of how an economy should be. It implies that agents possess perfect information in a static model or perfect foresight in a dynamic one. Even though not representative of any real economy, this assumption is used in standard CGE

Although many of these assumptions are relaxed in structuralist models, other assumptions (such as the Armington assumption) are retained and the associated parameters (for example, elasticities), on which the results depend, are difficult to estimate accurately (Gibson 2011).

CGE models have also been criticized for failing to take into account important elements such as the presence of asymmetric information, uncertainty, the role of credit markets, adjustment costs and processes, political economy factors and so on (Taylor and von Arnim 2006).

Another criticism of the CGE approach is that it tends to consider regulations as presenting costs without taking into account their potential benefits (for example, social and environmental benefits – see Cadot, Munadi and Ing 2017). In CGE models, reducing regulations is crucial if economic gains are to be achieved (Hernandez 2020). In other words, these models' results are biased as a result of the assumption that only free markets lead to an optimal general equilibrium and that trade regulation, including non-tariff measures, can therefore never enhance welfare.

CGE models are primarily used to assess labour market impacts in terms of employment levels, wages and their intersectoral reallocation. Other aspects of the labour market are generally not considered within these frameworks.

2.1.1.2. The United Nations Global Policy Model

Description

The United Nations Global Policy Model (GPM) is a dynamic macroeconomic model used to analyse the impact of policy at a global level while considering global and regional interactions. The GPM is not a trade model as such, but it can be used to consider international trade and its links with growth and income distribution (UNCTAD 2018). This model can be used for the analysis of historical developments, and it has also been used to simulate potential future impacts of policy changes (Cripps and Izurieta 2014; Michell 2016).[18]

In contrast to other models with a global scope, the GPM allows for the possibility of persistent involuntary unemployment and changes in income distribution. The model may also be said to be demand-driven.[19] Financial aspects and flow of funds are a major part of the model and influence other macroeconomic variables. The model considers technological change endogenously, treating it as a function of demand and export diversification (Onaran 2016).[20]

The GPM has been used to assess the economic and labour market impact of regional trade agreements. Kohler and Storm (2016), for example, use this model to consider the economic impact of the Comprehensive Economic and Trade Agreement (CETA) between the European Union (EU) and Canada, allowing for changes in employment and income distribution. They find that CETA is expected to lead to the diversion of intra-EU trade, unemployment, inequality and overall welfare losses. In another example, Capaldo

(and partial equilibrium) models, since otherwise equilibrium would not be achievable.

18 As explained by Michell (2016), the underlying principles of the GPM are derived from the Cambridge-Alphametrics Model (CAM), which was developed at the University of Cambridge and is considered to be the academic counterpart of the GPM. The GPM was developed by the United Nations Department of Economic and Social Affairs in 2007. Responsibility for its maintenance, update and further development was transferred to UNCTAD in 2013, with the ILO providing support.

19 Technical documents on the GPM can be found at: https://www.un.org/development/desa/dpad/publication/united-nations-global-policy-model/.

20 The GPM's features and underlying assumptions are discussed in more detail by Lavoie (2016), who also compares the GPM with other models, including the structuralist CGE strand.

(2015) uses the GPM to assess the impact of the Transatlantic Trade and Investment Partnership on the economy as a whole, including employment. Among other aspects, the study predicts a contraction of GDP, employment and personal income, along with a continuing downward trend in the labour share of GDP. Analysis based on the GPM is also used for the Trade and Development Reports prepared by the United Nations Conference on Trade and Development (UNCTAD) (see, for example, UNCTAD 2014, 2018, 2019).

Main assumptions

The GPM model maps the relationships between GDP, trade and balance of payments through expenditure and income flows, which are mediated by institutional financial policies. Labour market conditions, such as employment levels and technological change, endogenously affect those relationships, whereas global financial conditions play more of an exogenous role.

The model includes behavioural equations based to some extent on labour market indicators, such as labour force participation, wages, income distribution and unemployment.[21] It also takes into account trends such as urbanization, demographic change and migration. The aim is to explain the historical evolution of these trends as they shape population size and structure. Unemployment is assumed to be a function of mainly demand-side factors, while labour force participation is estimated econometrically as a function of GDP per capita, urbanization and demographics (Michell 2016). Furthermore, income distribution between labour and capital is assumed to be strongly path-dependent and affected by factors such as terms of trade and public policy.

Data requirements

The data for the GPM are contained in the model itself and include trade, macroeconomic aggregates, financial flows, and environmental and labour market indicators drawn from a variety of historical sources (Cripps and Izurieta 2014).[22] The data on population, unemployment and labour force participation are taken from ILO databases; they are disaggregated by age group and sex (Michell 2016; Onaran 2016).

Strengths and weaknesses

One of the main strengths of this model is that it uses an alternative configuration of many of the assumptions from the neoclassical CGE models while explicitly accounting for many of the modelled behavioural relationships through econometric estimations. The GPM provides a good approach to macroeconomic modelling without relying on neoclassical microeconomic assumptions, such as representative agents (consumers, workers and producers) maximizing utility or minimizing costs in line with rational expectations. It prioritizes aggregate demand and income multiplier effects while taking unemployment into account. Along with other factors, this allows the model to incorporate the idea of hysteresis, which suggests that demand shocks may lead to permanent alternatives in the long-term growth trajectory of a country. In this case, output and productivity are path-dependent on the interaction of economic policy variables, rather than on exogenous population or technological change.

The GPM can be criticized because of its over-reliance on multiplier effects on the demand side (for example, those affecting aggregate demand and income). The values of these multipliers differ significantly in the literature. Furthermore, the model's forecasting value for a range of research questions is affected by the high number of variables that are taken to be exogenous.

21 In contrast to many other CGE models, the behavioural equations are estimated using a fixed-effects panel instead of being calibrated.

22 The full list of variables for the GPM can be found in Cripps and Izurieta (2014).

2.1.2. Partial equilibrium approach

Description

In contrast to general equilibrium models, the partial equilibrium (PE) approach focuses on the policy impact in a market/region/sector without taking into account the interaction of, or impact on, other markets/regions/sectors that may also be affected. On the whole, PE models are therefore particularly suitable for looking at disaggregated effects of trade policies within a particular market. For example, PE models are often used to estimate the employment displacing effect of imports or the number of jobs "saved" (Gibson 2011) by tariffs and non-tariff measures (Cheong 2010; Plummer, Cheong and Hamanaka 2010), particularly in the short and medium run. While PE models have become more complex over the years and can now incorporate a wide range of channels and mechanisms, the basic model typically works by transmitting trade policy changes to the labour market through the prices of goods and services. These adjust to equilibrate sectoral labour demand and supply, with consequences for employment and wages. Thus, as in CGE models, the focus with respect to the labour market is primarily on changes in the level of wages and employment, with some differentiation by such worker characteristics as skill level and sex.

PE models that analyse the labour market generally compute the factor content of domestic production (namely, labour) that is affected by trade policy. Studies based on this approach include that by Barbe and Riker (2018), who develop a two-country model to simulate the impact of tariff changes on trade flows and on employment in an industry with firm heterogeneity, in the context of global supply chains. Other examples are the studies by Riker (2018), who uses an industry-specific model to assess changes in employment levels of multinational firms resulting from changes in costs (for example, in one of their locations of production); and by Hallren and Riker (2017), who develop an industry-specific model explaining regional changes in employment, taking into account import penetration in each region.

In addition to models developed to assess the impact of trade on a specific market (such as the labour market), the PE approach also includes models developed to analyse the impact of trade in the market of a specific good. One popular PE modelling tool for trade analysis is the Software for Market Analysis and Restrictions on Trade (SMART), which can be used to analyse the impact of tariff changes on economic and social outcomes in two countries (see box 5).[23] Other similar modelling tools include the Global Simulation Analysis of Industry-Level Trade Policy (GSIM), the Tariff Reform Impact Simulation Tool (TRIST) and the Agricultural Trade Policy Simulation Model (ATPSM) (see Cheong 2010; Peters and Vanzetti 2004).

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23 For more details on SMART, see Cheong (2010); Plummer, et al (2010).

▶ Box 5. Software for Market Analysis and Restrictions on Trade (SMART)

The Software for Market Analysis and Restrictions on Trade (SMART) is a partial equilibrium modelling tool developed by the World Trade Organization that can be used for market analysis in evaluating the effects of a change in a particular tariff on two economies (importing and exporting). The effects of the trade policy change are transmitted through price effects and are moderated by the demand and supply elasticities, such as export supply, import demand and substitution. The elasticities need to be calibrated by the researcher. These price effects, which can lead to changes in trade flows (for example, through trade diversion and creation effects), influence economic outcomes, such as government tariff revenues, consumer surplus and welfare. The model's flexibility means that it can also be used to consider country- or sector-specific employment losses, or gains, associated with the trade policy change (Gibson 2011).

While SMART lacks the ability of computable general equilibrium models to conduct detailed analysis of intersectoral dynamics, the software is particularly suitable for short-term analysis at the sectoral level of specific trade policy changes, such as the introduction of tariffs. The data required for the operation of SMART is self-contained but can also be accessed through the World Integrated Trade Solutions (WITS) database.

Main assumptions

Different PE models rely on different assumptions. However, the Armington assumption, which emphasizes product heterogeneity (that is, that imports are imperfect substitutes for domestic goods), underlies all such models. In this context, "competitive" imports are those with greater potential to replace or reduce local production and, hence, have an adverse impact on employment. "Non-competitive" imports, which have no equivalent in local markets can, however, stimulate local production through an increase in certain imported inputs, and lead to employment gains. Depending on the specific PE model used, there may also be other assumptions regarding technology, household preferences and labour market dynamics.

Data requirements

PE models mainly require data on trade policy measures (tariffs and non-tariff measures) and trade flows (exports and imports of goods and services) for the market being examined. Other data required include values of key parameters, such as export and import price elasticities and the substitution (Armington) elasticity. A relevant source of data for PE models is the World Integrated Trade Solutions (WITS) database, which combines data from UNCTAD, the Statistics Division of the United Nations Department of Economic and Social Affairs, the World Trade Organization (WTO) and the World Bank (see box 6).[24]

24 For more information on the WITS database, see: https://wits.worldbank.org/.

▶ Box 6. Relevant data sources for partial equilibrium models: The World Integrated Trade Solution (WITS) database

A widely used data source for partial equilibrium (PE) models, including the Software for Market Analysis and Restrictions on Trade (SMART), is the World Integrated Trade Solution (WITS) database, which is jointly maintained by the United Nations Conference on Trade and Development (UNCTAD), the United Nations Statistics Division,* the World Bank and the World Trade Organization (WTO). The WITS database combines a range of databases, including the UN Comtrade Database, the UNCTAD Trade Analysis and Information System (TRAINS), the WTO's Integrated Data Base and the World Bank's Global Preferential Trade Agreements Database.

WITS provides data on bilateral trade flows (imports and exports), tariffs, non-tariff measures and development indicators at the product, regional and country level for over 130 countries spanning at least 20 years. The database can be used to generate custom statistics and also to directly simulate the effects of changes in trade policy through the SMART tool.

However, it is worth noting that there are some persistent challenges in the collection and utilization of data, which have an impact on the results of PE models such as SMART. These include reporting errors in trade flows, difficulty in capturing informal flows, missing values and mismatching levels of aggregation (WTO 2017). For example, there are reporting errors in both exports and imports because of inaccuracies in the processing of the data by government and statistical agencies, leading to gaps in the data. In some cases, data are reported on the volume of a good instead of its value, which makes comparison and aggregation with the data on other goods challenging. Furthermore, varieties of a particular good are often lumped together and the price is represented as an average of many different versions of the good.

The data processing needs to be adjusted to meet the specific requirements of the research question. The above-mentioned limitations of the data must be taken into account by researchers when using any PE model.

* Formally the Statistics Division of the United Nations Department of Economic and Social Affairs.

Strengths and weaknesses

Owing to their focus on one market, PE models have much less onerous data requirements than their GE counterparts and can therefore be implemented more easily. For instance, such models can be used when the country does not have input–output tables or social accounting matrices, which are indispensable in CGE models. PE models also allow one to conduct in-depth analysis of labour market impacts in terms of employment and wages – for example, among distinct groups of workers and in specific industries or regions. In this respect, PE analysis is particularly useful for obtaining projections of job displacement, which can inform "the design of trade adjustment assistance, job retraining and other forms of transfer from the public sector" (Gibson 2011, 75).

However, because PE models focus on one market, rather than on the economy as a whole, and because they tend to be static, they do not take into account interaction and feedback effects, such as those between industries or markets. They also usually do not take into account adjustment processes, which is why they are particularly relevant for short- and medium-run analysis. Consequently, these models can underestimate or overestimate the impacts of trade policy changes. Nevertheless, some extensions of PE models have succeeded in reflecting more accurately the complexities of the economy or sector being analysed, including complexities related to global supply chains.[25]

25 For instance, Hallren and Riker (2017) demonstrate how the basic PE model may be extended to include vertically integrated production, trade in intermediate products, subnational regions and different modes of international supply of services.

PE models usually focus on the dimensions of employment and wages. They do not provide so many insights into other aspects of decent work, a weakness that they share with GE models. Another weakness of the PE approach, again shared with GE models, is the Armington assumption and the high dependence of results on the parameters and assumptions used. For example, using different values of elasticities can result in different conclusions on the same issue.

2.1.3. Input–output approach, social accounting matrices and multiplier analysis

Description

At the meso level, input–output (I–O) analysis and multiplier analysis are commonly used with either I–O tables or social accounting matrices (SAMs) to assess the actual (ex post) impact of changes in trade policy on the labour market.[26]

Both I–O tables and SAMs describe the structure of an economy. The former record the relationship between inputs and outputs in the production and consumption of goods and services by industry. The recent harmonization of a large number of national I–O tables has made it possible to construct regional I–O tables and global inter-country I–O tables (see, for example, Guilhoto et al. 2019; Timmer et al. 2015, 2016). SAMs, which can be seen as an extension of I–O tables, capture all transactions and transfers, showing the interrelationship between value added and final expenditures, social transfers, including linking final demand with the rest of the world (Hirway, Saluja and Yadav 2008). In this respect, a SAM reflects the full circular flow of income between enterprises, households, governments and the rest of the world (ILO 2019).

An I–O model represents the inter-industry relationships within an economy, drawing on the structure provided in the country's national accounts. Leontief (2008) provides an explanation of the basic structure and ideas behind I–O analysis (see also Miller and Blair 2009). I–O analysis is performed using the I–O model and involves examining changes across different economic sectors as a result of a change in final demand, including a change induced by a trade shock or a change in trade policy. Using backward and forward linkages between economic sectors, the analysis captures spill-over effects across industries resulting from an expansion or contraction (of output and employment) in one sector.[27] "Backward" linkages are those between an industry and its suppliers, while "forward" linkages are those between an industry and other industries that use its output as input for their own production processes. I–O analysis therefore allows one to capture both the direct and indirect effects of trade induced changes.

"Direct" effects refer to changes in the sector directly affected by the shock or policy, while "indirect" effects refer to changes in industries that either provide inputs to the directly affected industry or use that industry's output as inputs for their own production processes. Because intersectoral linkages can be examined at the national or regional level, this approach is particularly suitable for analysis of the impacts of trade transmitted along global or regional supply chains (see, for example, Los, Timmer and de Vries 2015).

Additionally, "induced" effects are those due to income and consumption linkages. For example, when the impact of a shock affects factor prices or payments, specifically wages, this can translate into household income changes. The change in household income can result in consumption changes, feeding back into final demand. I–O analysis also allows one to identify strategic or key sectors in an economy, usually considered as those with an above-average number of forward and backward linkages (see Miller and Blair 2009).

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26 It is worth noting that I–O and SAM models are used in combination with CGE or PE models, which extends the scope of labour market analysis. In an I–O or SAM model, it is possible to have a physical module on employment with details such as sex, age, skill level, formal/informal status and rural/urban location at the production level.

27 Backward linkages correspond to the column sum for that industry of the Leontief inverse multiplier matrix, derived from the I–O table. Forward linkages correspond to the row sum for that industry's Ghosh inverse multiplier matrix, also derived from the I–O table. As part of the process, both inverse matrices are normalized following Rasmussen (1956). For more information, see Miller and Blair (2009) and ILO (2019).

To quantify the number of jobs created or destroyed in an economy after a shock in demand, it is necessary to construct a matrix of employment multipliers. Employment multipliers are based on employment–output ratios derived from output multipliers at a point in time.[28] Some examples of studies using I–O analysis to examine the employment impacts of trade are Sachs et al. (1994), Wood (1991), Kucera, Roncolato and von Uexkull (2010), Feenstra and Sasahara (2018).

Main assumptions

The main assumption for I–O models is fixed coefficients or linear production technology (Leontief or fixed-proportions production function). This assumption means that inputs are combined on the basis of fixed proportions and fixed factor prices (such as wages). Moreover, labour productivity is assumed to be exogenously determined.

Data requirements

The data required include I–O tables, which provide "snapshots" of an economy at a given point in time, including relationships between industries, and between final demand and primary and intermediate inputs into the production processes. Economy-wide analysis requires aggregate data from national accounts or more disaggregated I–O tables providing detailed information on interactions between industries and between these and the rest of the economy.

Linked regional I–O tables are needed for regional models (see box 7). Global models use linked I–O tables for many countries. Sources of global I–O tables are the Inter-Country Input–Output (ICIO) database developed by the Organisation for Economic Co-operation and Development (OECD) (Guilhoto et al. 2019) and the World Input–Output Database (Timmer et al. 2015, 2016). Additionally, the ILO (2019) has developed a toolkit for the assessment of the impact of trade on employment, including multiplier analysis using SAMs.

▶Box 7. Data for national and regional input–output tables

Two widely used sources for input–output (I–O) tables are the World Input–Output Database (WIOD) and the Eora global supply chain database. WIOD contains I–O tables for 43 countries and 56 sectors over the period 2000–14, while Eora contains I–O data for 190 countries covering the period 1990–2015. Eora also includes data on the environment and data organized on a geospatial level. Some of the components used in order to construct I–O databases, such as national supply and use tables and national accounts tables, can also be accessed separately for analysis.

The choice between these data sets often depends on the geographical and thematic focus of the researcher's questions, and on assumptions about national supply and use tables.* However, as with the problems with the trade flow and trade policy data in partial equilibrium analysis, there are significant challenges in using I–O data sets, namely measurement errors, missing data and aggregation biases. For example, the trade data in supply and use tables often do not match the data in the national accounts or the data in the UN Comtrade Database. Product aggregation levels are often different across countries and it is hard to disentangle intermediate goods from final goods trade. Data are often missing on re-exports by countries. The harmonization of data across a wide range of countries in such databases is a constant challenge for researchers.

* Some databases are better suited to particular regions than others – for example, the database of the Institute of Developing Economies, Japan External Trade Organization (IDE-JETRO) covers Asia and the Pacific – or have wider coverage for developing economies (for example, Eora). If a researcher is interested in environmental data, then Eora would be a suitable database.

28 Output multipliers represent the total change in the output value of a sector. These output changes are transformed into employment effects when both matrices (employment–output ratios and output multipliers) are multiplied (ILO 2019).

Strengths and weaknesses

In contrast to the PE approach, I–O analysis is particularly useful for both sectoral analysis and inter-industry linkages. This is especially relevant in terms of identifying and examining both domestic and global supply chains (Koopman et al. 2010), which is a major strength of the I–O approach, since production and trade through global and regional supply chains are key components of modern economies.

The main weaknesses of the approach are related to its simplifying assumptions of fixed factors of production, fixed factor prices and infinitely available factors. Another assumption that has been challenged is that of exogenous productivity, as trade can be expected to have an impact on productivity (through the channels described in Chapter 1). As mentioned above, I–O tables are available in global databases and at the country level; however, the quality and availability of data are not the same across data sets because of the different countries covered by these. The construction of national I–O tables can often take several years, and because they represent a snapshot of an economy at a given point in time, inter-industry linkages obtained from these tables may not reflect the real situation at the time of analysis.

The I–O approach has been applied in ways that allow one to disaggregate the data by various worker characteristics, including sex, age group, skill level and region (rural or urban), depending on the availability of employment data. Theoretically, I–O analysis could be used to study other aspects of the labour market, such as the informal sector, which may operate alongside the formal economy and trade with it (Gibson 2011).

2.2. Micro approaches: Econometrics at the firm and worker level

Discussions on international trade have traditionally focused on aggregate concepts such as aggregate trade flows between countries or welfare at the national level. However, as Bernard, Moxnes and Ulltveit-Moe (2013) point out, "it is firms that trade, not countries". There are evidently considerable differences between firms – in terms of their size, productivity and workforce (for example, the skill level of workers). Over the past few decades, such differences have been taken into account in the literature thanks to more comprehensive theories (see Chapter 1) and empirical methodologies (this chapter). A greater number of studies have treated firms and workers as central to understanding the consequences of trade, owing in part to the increasing availability of disaggregated data at the firm and worker level, particularly of matched employer–employee databases. Developments in theory and empirical analysis have reinforced one another: empirical evidence has served as valuable feedback on new theories, which have, in turn, helped to improve empirical techniques. The ensuing wider use of econometrics at the micro level has made it possible to capture more accurately the distributional effects of trade on the labour market.

Description

Econometrics is the most commonly used tool for ex post assessment of the labour market impact of trade, as it can accommodate a wide set of assumptions and data disaggregation. Moreover, it has been increasingly used to assess the impact of trade on various aspects of employment, including not only wages or informality but also gender discrimination or the elimination of child labour (see Trade and Decent Work: Indicator Guide, 2021, for more details). Econometrics can be performed both at the macro or meso level (industry regressions or cross country

studies) and the micro level (worker, firm or joint worker–firm). An example of the use of econometrics at the macro level is the gravity model of trade, whereby trade between two countries increases with their economic size and decreases with the geographical distance separating them, by analogy with Newton's law of universal gravitation. Although the gravity model has been used in numerous studies covering most areas of international trade, it has rarely been used to capture the effects of trade on the labour market.[29]

Econometrics includes a vast range of methods that allow one to control for endogeneity and for unobserved, confounding factors. Goldberg and Pavcnik (2016) suggest that econometric methods can be grouped into three broad categories: (a) the structural approach, (b) the quasi-experimental approach and (c) randomized control trials. The greater availability of micro data both at the firm and the worker level, and of matched databases, has made it possible to use these techniques more widely. The specific method chosen depends ultimately on the research question and on data availability. Owing to the particularities of the various econometric techniques, this section first discusses each of the three main approaches individually before concluding with general reflections on their assumptions, data requirements, strengths and weaknesses.

2.2.1. Structural approach

The structural approach is useful for evaluating the welfare implications or overall effects of actual or counterfactual trade policies ("counterfactual" refers to what would have happened in the absence of trade policy change). The structural approach has a long tradition in economics: it has been used to study economy-wide (Ossa 2016) or industry-specific trade effects (Feenstra 1995). Thanks to developments in theoretical frameworks, the wider availability of disaggregated data and improved econometric techniques, recent studies have been able to capture labour market adjustments of firms and workers and thereby give a more complete welfare analysis.

The structural approach uses economic theory to guide empirical analysis (Angrist and Krueger 1999). First, a theoretical framework is used to postulate functional forms for agents[30] in the economy with corresponding assumptions regarding their behaviour, including their response to trade policy changes. Then, based on this underlying theory, the values of key economic parameters are estimated from a wide range of data sources. This makes it possible to obtain behavioural parameters from non-experimental data which could otherwise not be inferred statistically. The model can thus be applied to estimate the effects of a certain change through the use of counterfactual simulations.

This approach draws on a much more precise framework of causal relationships and mechanisms than a pure quasi-experimental approach because of the narrower specification of agents and their behaviour. However, its effectiveness depends on both the consistency of the estimated parameters and the assumptions of the theoretical framework. First, while the estimation procedure is assumed to yield credible parameters, in practice this depends on the statistical method used and the estimation often has to rely on weak

29 An exception is the study by Ernst, Ferrer and Zult (2005), which uses a gravity framework to evaluate the impact of trade on employment. Although some studies have incorporated micro assumptions into their theoretical frameworks (for example, Chaney 2008), it is difficult to conduct empirical analysis at a disaggregated level because of the substantial data requirements. See Head (2003) for an introduction to the gravity equation in economics, WTO and UNCTAD (2012) for the theoretical foundations of gravity models, and Ossa (2016) and Costinot and Rodríguez-Clare (2014) for the potential applications of such models.

30 The agents studied depend on the specification of the underlying theoretical model, but they usually include workers, firms, consumers, producers and government.

instrumental variables.[31] Secondly, in order to predict how a policy change will affect firm and worker behaviour, simplified assumptions or restrictive theoretical models, which tend to ignore long-run effects or heterogeneity, are often adopted. Finally, when estimating counterfactuals with a structural model, one must necessarily assume that a change in a particular parameter can be carried out while the underlying structural system remains unchanged.

An example of the application of this method is the study by Helpman et al. (2017), who use a structural approach to explore the effects of trade on wage inequality in Brazil. They first develop a heterogeneous-firm model of trade and inequality and derive a reduced-form econometric model for employment, wages and export status. They then use three econometric techniques to estimate the key parameters of their model, which, as the authors argue, fit well the observed distributions of wages and employment between firms and workers.[32] They find that trade openness at first increases and later decreases wage inequalities. This effect is mainly due to the inequalities between the firms within the sectors and occupations rather than between the sectors.

2.2.2. Quasi-experimental approach

The quasi-experimental approach aims to identify the causal effects of trade policy with respect to one specific labour market outcome by using an econometric method. While the selection of the econometric method is guided by theory, it relies less on theoretical assumptions than on statistical assumptions related to the econometric technique. The combination of a clear causal relationship and a particular econometric technique is the strategy used to identify causal effects. This provides considerable flexibility to explore broader labour market outcomes, such as the elimination of child labour (Kis-Katos and Sparrow 2011), informality (Dix-Carneiro and Kovak 2019) or the fragmentation of production across global supply chains (Bernard et al. 2012), which are harder to capture in structural studies. However, the quasi-experimental approach limits the focus of the study to one-way causality and its findings are not always generalizable to other contexts or groups of individuals. Moreover, it is not suitable for evaluating the overall effects of policy changes.

The econometric methods that feature most prominently in quasi-experimental studies for analysing impacts are regression discontinuity design, instrumental variables and the difference in-differences technique (Angrist and Pischke 2010). Regression discontinuity designs are used to account for observable differences between groups. They determine whether a programme or treatment is effective by assigning a cut-off or threshold before and after an intervention. This may imply either comparing a given intervention with a no-intervention condition or comparing two alternative interventions. Instrumental variables are introduced to address endogeneity, which occurs when there is correlation between explanatory variables and the error term. A good instrumental variable should be highly correlated with the original explanatory variable, but uncorrelated with the error term (see Hayashi 2000). Difference-in-differences is possibly the most widely used quasi-experimental method for impact assessment. The technique allows one to estimate the effects of a trade policy intervention across time and among different groups of individuals affected and not affected by the policy.[33]

31 An instrument is a variable that predicts exposure; it is correlated with the explanatory variable of interest but uncorrelated with the outcome. A ''natural experiment'' that generates random assignment is an example of what would be expected to be an "ideal instrument". However, in reality, it is very difficult to come up with strong instruments that are uncorrelated with the outcome term. Moreover, they are sensitive to assumptions about the functional form

32 The three different econometric methods are maximum likelihood estimation, the generalized method of moments and a semi-parametric selection model based on Powell (1994).

33 The difference-in-differences technique has been used for a relatively long time in economics. Lechner (2011) provides a list of studies that have used the technique, beginning with a study from as far back as 1915 that analyses the impact of introducing a minimum wage.

For instance, Dix-Carneiro and Kovak (2019) use a difference-in-differences framework to analyse the aftermath of the unilateral trade liberalization policy adopted by Brazil in the 1990s and the regional effects of trade on the dynamics between unemployment and informality. They construct what are referred to in the literature as "local labour markets", which are economically integrated regions with similar geographical and productive characteristics. Their approach builds on previous work by Topalova (2010), Autor, Dorn and Hanson (2013), Kovak (2013) and Hakobyan and McLaren (2016),[34] but goes further by exploring how the local labour market effects evolve over time, both for workers and for regional economies. By using this approach, Dix-Carneiro and Kovak were able to compare regions facing large tariff cuts (the treatment group) with those experiencing smaller tariff decreases (the control group). The authors found that, even though trade liberalization had a considerable effect on unemployment in the short run, unemployment effects vanished in the long run and informality increased. Additionally, they found that trade costs and benefits were unevenly distributed geographically, with regions facing larger tariff cuts experiencing prolonged periods of decline in formal sector employment and earnings relative to other regions.

2.2.3. Randomized control trials

The randomized control trial (RCT) approach involves experiments designed to measure the effect of a treatment, such as a policy intervention. This approach is the most robust method in determining the causal relationship between a policy change and labour market outcomes, since it controls for the self-selection bias by randomly allocating subjects to two groups: those affected by trade (the treated group) and those that are not (the non-treated group). The effectiveness of a trade policy is assessed by measuring and comparing the responses of the two groups. Angrist and Pischke (2010) argue that a major advantage of RCTs is the good research design incorporating randomized assignment, but they also recognize that conducting experiments is time-consuming, expensive and not always practical or ethical.

Even though RCTs could in principle be used to evaluate the effects of trade, conducting such trials in the context of trade policies is basically impossible (Goldberg and Pavcnik 2016). This is because in reality it is not feasible to randomly allocate individuals to treatment and control groups when new nationwide trade policies are introduced. For this reason, to date there is no research based on experimental data on the overall effects of trade liberalization on labour market outcomes.

Nonetheless, recent studies suggest that there could be scope for a more extensive application of the RCT approach to international trade. For instance, Atkin, Khandelwal and Osman (2017) conducted a randomized experiment on rug producers in Egypt to explore the mechanisms through which exporting affects the performance of firms. The experiment was carried out by randomly providing some non-exporting firms with the opportunity to access foreign markets (treatment group); the other firms did not receive such treatment (control group). This approach can also be applied to evaluate the effectiveness of policy initiatives, such as aid-for-trade schemes, in improving firm performance. Moreover, Cadot et al. (2011) suggest that RCTs could be considered as an additional tool for evaluating the impact of new trade interventions such as export promotion. As they allow more specific survey design, RCTs can furthermore be used to study the behaviour of small and medium-sized enterprises (SMEs), and to capture trade in intermediaries rather than trade in final products.

34 See Autor, Dorn and Hanson (2016) for a detailed literature review that considers variations and extensions of the local labour market approach, and also Artuc et al. (2019) for a review and revision of the methodology.

Main assumptions of econometric approaches

Econometric approaches can accommodate a wide set of assumptions that are determined by an underlying theory (for example, heterogeneous firms and imperfect competition). While the structural approach relies on explicit a priori theoretical assumptions, the quasi-experimental approach leaves the key assumptions implicit (Keane 2010) and focuses instead on statistical assumptions related to the econometric methods used (for example, the standard assumptions of ordinary least squares, fixed effects).

Data requirements

Econometric approaches have wide applicability and are able to capture trade effects ranging from the country level to local labour markets, and from the sectoral level to firm and worker levels. The data requirements depend on the approach used and the relationship studied. The structural approach requires substantial data on various agents and indicators, while RCTs require a collection of primary data combined with survey data. The quasi-experimental approach has far less onerous data requirements. Nevertheless, the availability of data is crucial in the quasi-experimental approach, as it is data-driven, with the data required depending on the econometric techniques used.

Typically, the data required by econometric approaches include labour market outcomes (for example, labour market indicators), trade variables (for example, change in the weighted average tariff rate) and control variables (for example, firm and worker characteristics). Country-level data can be obtained from both international and national sources, such as administrative data in the latter case. Industry-level data are usually available from national sources (for example, national accounts). Firm-level data can be obtained from establishment surveys. Worker-level data are collected using household surveys and labour force surveys or administrative data (social security records). (See box 8 below, on micro-level data sources). Additionally, I–O tables have been extended at the micro level to construct indicators related to trade that make it possible to capture more accurately the impact of trade on firms across global supply chains (Tang, Wang and Wang 2016).

In order to take into account both worker and firm heterogeneities, linked employer–employee data are the most relevant. On the one hand, this kind of data enables a deeper and simultaneous analysis of the effects of trade on worker and firm outcomes. On the other hand, such data allow researchers to disentangle the effects of firm-level decisions from those of choices made by workers. By bringing together information from both sides of the labour market, matched employer–employee data make it possible to perform equilibrium analyses of labour market outcomes and to investigate the joint role of worker and firm heterogeneity (see Chapter 3 for a comprehensive discussion of linked employer–employee data sets).

Although limited in number, some establishment surveys include extensive information on the labour market. In some cases, such information is obtained by interviewing simultaneously the workers and enterprises, which allows creating matched data at the designing stage. Appendix II provides more details on such data sets and makes suggestions for improvement in the methodological designs and implementation of future surveys.

▶ Box 8. Firm- and worker-level data sources

At the micro level, data can be obtained from various sources such as population censuses, household or establishment surveys, and administrative records. All data sources have advantages and weaknesses, and their use will depend on the unit of analysis, the timespan (cross-sectional vs longitudinal data) and the research question. The ultimate choice may be a combination of sources in order to provide a more comprehensive picture.

- Population censuses collect information on all households and individuals in a country. They have universal coverage and are highly representative. However, they collect only general information, if any, about many trade and labour variables without going into specific topics. As they cover the whole population, they are also very costly and are therefore conducted very infrequently (for example, the US population census is conducted every ten years).
- Household surveys can instead be used to collect information on a sample of the population. As they require less resources, they can be conducted more frequently, thereby enabling the analysis of short-term trends. They also allow one to obtain more comprehensive information, as more detailed questions about any specific topic can be integrated into the survey. For example, the Brazilian National Household Sample Survey, carried out annually until 2015 but monthly since then, covers over 200,000 households and asks questions relating to education, income, work and migration.[a] Among household surveys, labour force surveys focus specifically on labour-related matters and provide detailed statistics on wages, income, working hours, employment terms and conditions, and social security coverage.
- The conduct of such surveys is coordinated by the national statistical offices with the ILO, which compiles the labour force survey data from a wide range of its Member States.[b] Household surveys may have some deficiencies stemming from coverage issues (non-representativeness of small groups) and problems with the reliability of the responses (for example, over- or underestimating income, one person responding for all household members, non-responses to questions).
- The sampling unit of a census or survey can also be an establishment, that is, a single physical unit (a firm may comprise several establishments). Establishment surveys provide important information both on establishment characteristics and on the income and working time of employees, and they are easier to conduct than household surveys. For example, the Monthly Survey of Manufacturing Industry conducted by Mexico's National Institute of Statistics, Geography and Informatics reaches more than 11,000 establishments each month and covers such variables as their employees, production and sales revenue.[c] Furthermore, the World Bank provides enterprise survey data from around 144 countries in its Enterprise Surveys database, including data on variables relating to trade and employment.[d] However, establishment surveys usually contain information only on formal firms – that is, they exclude informal and small establishments. Moreover, they mostly cover employees and do not include other types of employment such as the self-employed. In contrast, household surveys allow one to take into account both informal workers and different statuses in employment.

▶ Box 8. Firm- and worker-level data sources (suite)

- Administrative data come from administrative records of specific agencies that create data on their members, such as social security institutions, tax authorities, customs authorities and labour inspection agencies. Since they are recorded by the agency itself, such data are not costly. However, their accuracy depends on how strict the rules on registration are. Also, as the data are not collected for statistical purposes, substantial processing and cleaning are required before the data can be used for analysis.

As may be seen from this brief description, all databases have their strengths and weaknesses. A combination of different data sources may help to offset some of the shortcomings. In this regard, linked employer–employee data sets (LEEDs), which combine information on both workers and firms from various data sources, are increasingly being used (see Chapter 3). Such databases are often created and maintained by government agencies –for example, in Brazil, the Relação Anual de Informações Sociais (Annual Social Information Report; RAIS) is maintained by the Ministry of Labour and Employment;[e] in Germany, the LEED of the Institute for Employment Research is maintained by the German Federal Employment Agency;[f] and in New Zealand, the national LEED is maintained by Statistics New Zealand[g] (see Jensen 2010 for other examples). However, in many cases, researchers themselves have to combine the databases from various sources. In all cases, data are made available under strict confidentiality conditions and accessing the data is a lengthy process. Discrepancies in the variables used in various data sets may also undermine the possibility of matching. It would be important to promote the use of standardized classifiers (for example, for worker occupations) so that new, more reliable LEEDs can be assembled.

Notes:

a Further details of this survey are available at: https://www.ibge.gov.br/en/statistics/social/population/20620-summary-of-indicators-pnad2.html?=&t=o-que-e.

b A list of labour force surveys available by country and region can be accessed at: https://www.ilo.org/dyn/lfsurvey/lfsurvey.list?p_lang=en.

c Further details of this survey are available at: http://en.www.inegi.org.mx/programas/emim/2007/.

d A complete list of countries and surveys available through the World Bank's Enterprise Survey database is available at: https://www.enterprisesurveys.org/en/data.

e Further details of this database are available at: https://www.psc.isr.umich.edu/dis/data/resource/detail/1731.

f Further details of this database are available at: https://fdz.iab.de/en/Integrated_Establishment_and_Individual_Data/LIAB.aspx.

g Further details of this database are available at: http://archive.stats.govt.nz/browse_for_stats/income-and-work/employment_and_unemployment/leed.aspx#gsc.tab=0.

Source: ILO (2017b) and authors.

Strengths and weaknesses

Econometric approaches have wide applicability, from macro-level and industry studies to micro-level analysis of firms and workers. They also allow one to assess the impact of trade on a broad range of labour market outcomes, including informality, gender discrimination and the elimination of child labour. This has become possible thanks to further advances in econometric techniques, the greater availability of disaggregated data and improvements to the underlying theoretical frameworks. Econometric approaches allow one to control for endogeneity (for example, through the use of instrumental variable-based techniques), selection bias (for example, through a two-step approach) and unobserved, confounding factors (for example, through fixed effects in panel regressions).

However, there are two equally important challenges with this type of approach: internal and external validity. Internal validity refers to how well a model is specified in order to obtain trustworthy and unbiased findings by controlling for omitted variables, selection bias and mismeasurements. External validity refers to the difficulty in generalizing the findings to different groups of individuals, contexts or outcomes. It is important to take both aspects into account in a study so as to assess the extent to which the findings are relevant and sound.

2.3. Supplementing quantitative with qualitative methods

The research methodologies discussed in the first two sections of this chapter can be classified as quantitative research methods, since they rely heavily on large data sets that are "considered representative of the population" (Queirós, Faria and Almeida 2017). In contrast, qualitative research methods allow one to gather a large amount of detailed information from a usually small number of participants. Qualitative methods are meant to facilitate a deep understanding of the processes being studied. It is possible to combine quantitative and qualitative research methods in what is referred to as a "mixed methods" approach. For example, quantitative analysis of the labour market impact of a change in trade policy in a specific region or country can be supplemented by a case study based on the results of in-depth interviews with key participants in order to support a more general interpretation. In this section, some of the qualitative and mixed approaches that have been used to study the labour market impact of trade are outlined.

2.3.1. Qualitative case studies

Description

In general, case studies refer to the in-depth examination of a single instance affected by a specific phenomenon – for example, a worker, firm or community likely to be affected by the implementation of an international trade policy. Different tools can be used for the conduct of a case study, including observation, in-depth interviews (Harrison et al. 2019), official documents (Oehri 2017) and "informal" documents such as diaries.

In-depth interviews can be categorized into unstructured one-on-one interviews and focus group interviews. Unstructured interviews consist of open questions, asked

in a conversational manner with no specific order (in contrast to traditional structured interviews, which use the same sequence of questions for different participants). Focus-group interviews involve interviewing a set of participants at the same time, in a group discussion format, where the interviewer's main role is to guide the conversation (that is, to prevent it from deviating from the topic) and facilitate interaction between the participants. In-depth interviews are flexible tools and allow one to capture detailed information on the unique experiences of participants (or groups of participants). For instance, in an assessment of the labour market impact of trade, producers of a specific good might be asked to discuss how they perceive the implementation of a free trade agreement may affect (or have affected) them in terms of their traditional economic roles.

Case studies and qualitative research techniques such as in-depth interviews have been used less frequently in the context of trade and labour markets, but there are some examples. Thus, Harrison et al. (2019) used in-depth interviews to examine the impact of the EU's trade policy on labour standards for three different cases. A number of case studies have looked at trade impacts on labour unions, transnational labour rights and working conditions (Alford, Kothari and Pottinger 2019; Smith et al. 2018; ILO 2017a; ILO 2016; Helfen and Fichter 2013; Cumbers, Nativel and Routledge 2008). In particular, some case studies have considered the impact of trade on working conditions in specific industries – for example, the garment industry in many countries (Brown, Dehejia and Robertson 2018; Brown et al. 2016) – or within global supply chains (Birner 2015), and the impact of trade on SMEs in the context of global supply chains (UNCTAD 2010).

Data requirements

Data sources and collection methods vary and may include observation, unstructured interviews, official or private documents (questionnaires and reports). These techniques usually allow one to capture a large amount of detailed information from a relatively small number of participants. Accordingly, the data obtained are often complex and highly specific to the context. This means that contextual factors, such as social norms or customs (for example, with regard to gender roles), need to be considered when interpreting the results. Statistical data are sometimes used as well in such studies, but they usually play a secondary role.

Strengths and weaknesses

Qualitative case studies can provide more in-depth information and cover more qualitative aspects than other methods. The research techniques implemented with them allow researchers to capture a great amount of detailed information (for example, on the way in which labour market impacts are experienced by workers), which is not possible to the same extent with other tools. In that respect, such methods can be used to study both objective and subjective (that is, perception-based) aspects of employment quality. [35]

Case studies make it possible to account for contextual factors to a greater extent than other methods, but the drawback is that the results are less generalizable. They may also require substantial resources, both in terms of time and funding. Even developing the skills required to implement the research techniques involved, such as interviews and focus groups, can be time-consuming and expensive, let alone completing the analysis of the results. A further drawback is possible bias introduced by the "group effect" (that is, when

35 The distinction between objective and subjective indicators has been made in the UNECE (2015) statistical framework for measuring the quality of employment. In this context, "objective" refers to the "actual conditions shaping the quality of employment" (for example, number of hours worked), while "subjective" refers to "how workers perceive certain aspects of quality of employment" (UNECE 2015, 19). This distinction has not been adopted in the present Handbook, but analysts may use it in the context of qualitative and mixed-methods approaches to derive valuable insights. However, when using perception-based data, analysts need to be mindful of the influence of cultural and institutional factors, which affect the cross country comparability of results.

participants in a focus group are influenced by the presence or answers of other participants) and the "interviewer effect" (that is, when the interviewer has unintended effects on the participants owing to characteristics such as their age or sex). Furthermore, these approaches are "liable to interference from the analysts' subjective beliefs because of the focus on descriptive data that need to be interpreted" (Hernandez 2020).

2.3.2. Mixed-methods approaches

Description

Mixed-methods research combines qualitative methods with quantitative methods to offer a more comprehensive understanding of the topic than can be achieved using only qualitative or quantitative approaches. Different tools can be used to generate data and to complete the analysis and interpretation of the information.[36] For instance, the impact of a tariff change on workers in an industry (specifically on, say, employment levels or wages) can be assessed through econometric analysis, and a focus group of workers can be interviewed to provide additional insights regarding impacts on their working conditions and labour rights. An example of a mixed-methods approach is the United States International Trade Commission's study of the impact of the North American Free Trade Agreement (NAFTA) on different economic aspects, including employment and skills requirements, using PE and CGE models along with interviews and qualitative analysis (USITC 1993). Other, more recent examples can be found in Civic Consulting and ifo Institute (2018), Shaffer (2018) and Gibson (2011).

Data requirements

In mixed-methods research, the data required depend on the specific combination of approaches used. Combined research techniques (e.g. an interview and a survey) are normally used to generate data.

Strengths and weaknesses

In addition to obtaining complementary and more comprehensive information, a key advantage of the mixed-methods approach is that using tools from one approach can help to mitigate weaknesses inherent in the other approach. Conclusions reached using a combination of methods may represent more solid evidence than those obtained with one method alone. In other words, validation of the findings takes place, at least to some extent, within the mixed-methods study itself. Similarly, this approach reduces the analyst's biases and makes the findings accessible and appealing to a wider audience. The main disadvantages of mixed-methods approaches have to do with resource requirements in terms of time, financial cost and skills. In particular, because different tools are involved, more than one researcher may be needed to complete the study.

36 Feedback between the two types of method is possible. For instance, data from unstructured interviews can be used at a later date to develop a survey questionnaire.

3 Empirical applications using linked employer–employee data sets

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▶ Chapter 3. Empirical applications using linked employer–employee data sets

The objective of this chapter is to improve understanding of the use of some of the micro-level methodologies presented in the previous chapter, specifically through a comparative review of three papers that may be regarded as representative examples of these methodologies. The chapter seeks to clarify issues that may arise with the implementation of some empirical techniques used to answer specific questions about trade and labour. The papers reviewed are Frías, Kaplan and Verhoogen (2009), Dix-Carneiro et al. (2019) and Bombardini, Orefice and Tito (2019). They have been selected because they employ different methodological approaches (structural and quasi-experimental) to the study of emerging and advanced economies while using the most detailed form of data available at present, namely linked employer–employee data sets (LEEDs).

The present chapter focuses on these micro approaches for a number of reasons. First, they are particularly suitable for examining broader aspects of decent work. The development of new econometric tools and the availability of more disaggregated data have made it possible to take into account the specificities of different agents (firms and workers) and frictions in the labour market (such as equilibrium unemployment). This has allowed not only a deeper analysis of the within-industry effects of trade (firm level), but also the consideration of a wider range of labour market outcomes, such as informality or gender gaps. Secondly, as micro approaches allow one to carry out ex post evaluations of trade policies (that is, after implementation), the results of such evaluations can provide valuable feedback both for the underlying theory and for macro and meso models (for example, when estimating or calibrating parameters). Micro approaches, therefore, have great potential for furthering analysis at all levels. Finally, there are a number of important publications that focus on assessing the labour market impacts of trade at the meso and macro levels – including ILO (2019), Cheong (2010), and Plummer, Cheong and Hamanaka (2010) – whereas micro techniques and methodologies have been neglected in the literature.

As for the emphasis on LEEDs, that is because such data allow one to disentangle not only the effects that are related specifically to firms and workers but also their interactions. This is particularly important for understanding the role played by firms and workers in changing labour market outcomes in the context of international trade. Relying only on firm-level or worker-level data can lead to biased estimates and, consequently, to false policy conclusions (Lechner and Wunsch 2013). Thanks to the greater availability of firm- and worker-level data and governments' efforts to link administrative data sources, LEEDs are becoming increasingly common. However, there are still considerable challenges in using them.

This chapter first highlights the opportunities afforded by the use of LEEDs in general and the problems that may arise (section 3.1). The three selected papers mentioned above are then discussed, specifically their empirical strategies, underlying theoretical framework and findings (section 3.2).

3.1. An overview of LEEDs

Labour market outcomes are determined by both sides of the labour market: firms and workers (Hamermesh 1999). Hence, it is essential to examine the characteristics of both firms and workers, and their interactions, in order to better understand the effects of trade on the labour market. LEEDs have proven to be ideal data sets for such analysis, as they combine information from different sources on both firms and workers (namely, establishment surveys, administrative data, customs data, labour force surveys and

household surveys). Researchers can use LEEDs to connect each person to the firm where they perform an activity and to observe worker mobility between firms. Over the past two decades, thanks to the increasing availability of disaggregated data, it has been possible to construct such data sets. In some cases, the data sets are matched by the users themselves (for example, researchers matching labour force survey data and establishment data), but government institutions are increasingly making linked administrative data sources publicly available, sometimes matching them directly with surveys (see Jensen 2010 for some examples).

A variety of LEED applications feature in the labour economics literature. The use of such data has enabled researchers to examine whether wage and employment differentials are attributable to firms or workers, taking into account differences between workers (in terms of such characteristics as sex, ethnicity and past experience) and between firms (such as whether they are exporting firms, or in terms of their unionization status or profit level), and also the interactions between these differences. In the context of trade – particularly with the emergence of new theories that incorporate firm and worker heterogeneity or labour market frictions (see Chapter 1) – an increasing number of studies have been examining the implications of policies and events such as trade reforms or currency devaluation on the labour market. Examples include studies on the effects on firm- and industry-level wage distributions (Frías, Kaplan and Verhoogen 2009; Helpman et al. 2017); informality (Dix Carneiro et al. 2019); labour reallocation (Menezes-Filho and Muendler 2011); wage premiums for exporter and multinational enterprises (Schank, Schnabel and Wagner 2007; Matthee, Rankin and Bezuidenhout 2017; Schröder, 2018); the influence of multinational enterprises on wages and employment (Alfaro-Ureña, Manelici and Vasquez 2019); and the dispersion of worker ability (Bombardini, Orefice and Tito 2019). See Appendix III for a more extensive list of such studies.

Three of these studies are examined in more detail in section 3.2. The present section gives an overview of the different types of LEED, highlighting the advantages of using such data sets and the difficulties involved.

Advantages of using linked employer–employee data

Since LEEDs provide data on both sides of the labour market, they allow a deeper and simultaneous analysis of the effects of trade on worker and firm outcomes. For example, many studies have found that exporting firms pay higher wages than firms that serve only the domestic market. However, in order to understand whether this is due to the characteristics of the firm (exporting, larger size) or of the worker (more skilled), or a combination of both, data from both sides are necessary.

Going beyond analysis of the separate contributions of firms and workers, researchers can use LEEDs to study the effect of characteristics specific to the matching of the two, that is, joint firm–worker characteristics. This is of interest "whenever the way in which agents are paired with each other matters", which is usually the case when analysing the interaction between heterogeneous groups (Mittag 2019, 1). LEEDs make it possible to take into account such match-specific effects, the omission of which would result in biased estimates (Woodcock 2015). For example, as Bryan (2006) notes, working hours are usually examined only from the workers' (supply) perspective. If workers were perfectly indifferent towards the firms they worked for, then there would be no reason to look into match-specific effects. However, if workers prefer a particular firm (for example, because it is conveniently located), there is something specific to their matching, and so it is necessary to obtain information from both sides.

Linked data sets can also shed light on the adoption of different policies and practices by firms (such as entry wages, exit/entry of workers) and relate these to firm performance (Bryson and Forth 2006). This can help one to understand, for instance, why not all firms adopt certain practices that seem to increase productivity, or why not all firms benefit in the same way when such practices are indeed adopted. It also helps in understanding how the workforce composition and internal changes affect firms.

Finally, governments can benefit from the creation of linked data sets, as they allow researchers to obtain more and better evidence that can feed into the design and improvement of public policies (Jensen 2010). Research relying on only one type of data can lead to the adoption of ineffective measures.

Difficulties in using linked employer–employee data

The greatest difficulty in using LEEDs is that the data need to be collected, which in most cases is expensive and requires various government agencies or institutions to collaborate and invest in this task (Alemán-Castilla 2020). Bryson and Forth (2006) point out that building a longitudinal administrative data set implies following individuals or establishments over time and minimizing attrition. Moreover, the collection of survey data is expensive and changes in rules or regulations may be necessary to link existing data sets.

Another challenge has to do with confidentiality. The linking of data makes it possible to identify individuals and businesses, which gives rise to concerns over privacy (Abowd, Schmutte and Vilhuber 2018). For example, the use of matching programmes by government agencies was prohibited in the United States of America in 1974 in order to protect privacy. While such legal restrictions are not in place in all countries, the linking of data can usually only be done under very strict conditions. Especially in the case of administrative data that were originally collected as part of statutory obligations (such as tax returns or social security statements), it may not even be possible to access the data. Alternatively, only public servants may be allowed to conduct research with such data, and they may have to do all their work on governmental premises. However, novel techniques are being developed to anonymize such data more effectively (Abowd, Schmutte and Vilhuber 2018), which could potentially mitigate concerns related to confidentiality.

A further challenge is that the format of the data must be such as to allow processing and analysis. This can be particularly difficult if the data were originally not collected for research purposes (Alemán-Castilla 2020). For example, when matching labour force survey data with administrative data, spelling errors in the names of firms as provided by the workers may lead to many observations being discarded (Samaniego de la Parra 2017). Moreover, the comparability of results across different studies and over time is limited if researchers follow different procedures when handling the raw data.

Finally, as pointed out by Mittag (2019), specifying and estimating models using linked employer–employee data can be considerably difficult, as it requires the inclusion not only of a large number of fixed effects (that is, individual, firm and match-specific effects), but also of some additional variables that if omitted would lead to biased estimations (see, for example, Lechner and Wunsch 2013).

Types of linked employer–employee data

LEEDs can be characterized according to several attributes, such as the source of the data, frequency of collection in time and the sample design. The source of the data may be administrative (for example, data from customs authorities or social security records) or the data may come from surveys conducted by national statistics offices or other public or private institutions (mainly research institutions). Administrative data are usually longitudinal, meaning that workers and firms are followed over time. Such data are suitable for linking a firm's outcomes (such as productivity) to workers' trajectories (such as tenure and wages) (Bryson and Forth 2006). Surveys may be longitudinal or cross-sectional, meaning that they collect data from workers and firms at a particular point in time. In general, surveys contain fewer observations but are richer in covariates providing detailed information on employers, employees and their attitudes towards the firm. Combining surveys with administrative data further enhances the analysis of long-term effects of practices and policies (Alemán-Castilla 2020).

Abowd and Kramarz (1999) consider the sample design to be an important feature of LEEDs, as some of these data sets "focus on the employee while others use the firm as the primary unit of analysis" (Abowd and

Kramarz 1999, 2632). The authors identify six types of LEED, depending on the method used to construct the data set: (a) representative cross-sections of firms and workers, in which both firms and workers are cross-sectionally representative of the population; (b) cross-sections representative of firms but not of workers, with non dynamic representativeness of firms in a given year and some information collected on workers; (c) representative cross-sections of workers with longitudinal data on firms, where the sources of data for workers and firms are not coordinated previously, but rather linked by researchers; (d) representative worker–firm administrative-data panels, which are based on governmental administrative files; (e) representative worker–firm panels from statistical surveys, which are typically household surveys that include employer identifiers (examples are the French labour force survey and the US National Longitudinal Survey of Youth); and (f) non-representative cross-sections and panels of workers and firms, which are not designed by statistical agencies and are not meant to be representative (for example, salary surveys by employers).

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3.2. Using LEEDs to study the labour market impact of trade: Three studies based on different approaches

Studies using LEEDs in the context of trade and labour usually examine the impact of trade on employment, particularly on wages – for example, such effects as wage inequalities and polarization. However, recent studies have begun exploring other aspects of employment, in particular informality (see Trade and Decent Work: Indicator Guide, 2021). In addition to a limited number of labour market outcomes, existing studies tend also to focus on a limited number of countries, mainly owing to data availability. Brazil is frequently studied in this context because of the availability of abundant matched employer–employee data and the intense period of trade liberalization that the country went through in the 1990s. In Europe, French, German and Swedish data have been used in many research papers (see Jensen 2010 for a list of countries where LEEDs are available). In terms of theoretical approaches, almost all studies take into account firm heterogeneity and different variations of labour market frictions. As for empirical methodologies, examples of the use of both structural and quasi-experimental approaches can be found, but the latter are more common. This is mainly because of the difficulties inherent in constructing theoretical structural models at the micro level. The studies frequently use a decomposition technique to disentangle different components of changes (firm and worker components). With regard to estimation techniques, difference-in-differences and instrumental variables are the ones used most frequently.

3.2.1. Structural approach: Studying the impact of trade on informality in Brazil

The study by Dix-Carneiro et al. (2019) is a good example of the structural approach (discussed in section 2.2.1), which first specifies a general

equilibrium theoretical model and then carries out empirical simulations based on the model. The aim of that paper is to analyse the impact of trade on informality, and the role played by informality in moderating the effects of trade on a broader range of labour market outcomes (wages, employment, income and welfare), in an emerging country, Brazil.

Theory

Dix-Carneiro et al. (2019) build a general equilibrium theoretical framework that draws on the literature on firm heterogeneity, search-and-matching frictions and collective bargaining in the labour market. The agents in their model are workers (as providers of labour and as consumers), firms (as both producers of goods and consumers of factors) and the government (as the collector of taxes and fines). There are two sectors in the economy: one producing tradable goods, and the other, non-tradable goods.

Consumers aim to maximize the utility they receive from goods by consuming a combination of goods from the two sectors. Workers bargain their wages collectively, with formal and informal workers differing in bargaining power. Firms aim to maximize their profits in both sectors and use labour as the only factor of production with constant returns to scale in a monopolistic competition environment. Firms in the tradable sector are able to export, facing fixed costs, ad valorem tariffs and iceberg trade costs.[37] They are subject to taxes, minimum wages and dismissal costs if they formalize. However, if they choose not to formalize, they risk being detected by the government and fined (the risk increasing with size). At the end of every period, firms reach a new productivity level and decide whether or not to exit the industry, become formal and adjust their labour force accordingly. This regular adjustment of the labour force implies posting vacancies or dismissing workers. Hiring costs are assumed to increase with the firm's employment growth rate, while dismissal costs are paid only by formal firms and they are equal across both sectors. The presence of labour market frictions and hiring costs imply that there is unemployment in equilibrium.

The government exists to collect any revenues and costs imposed on the firm by regulations (taxes, minimum wages and dismissal costs). The government pays unemployment benefits to those previously in formal jobs, and all surplus is rebated to consumers. There is imperfect enforcement of regulations by the government, which gives rise to informality. The model is brought into equilibrium when firms make all their decisions (on formalization, entry or exit, workforce changes), workers solve their bargaining problem, labour markets clear, the government budget reaches balance, product markets clear, and trade is balanced (imports are equal to exports).

Data, simulation and estimation

The study uses seven data sets with information on formal and informal firms and their workers: the Annual Social Information Report (Relação Anual de Informações Sociais; RAIS), which is a LEED assembled annually by the Brazilian Ministry of Labour and Employment since 1976; the Annual Survey of Industry, the Annual Survey of Trade and the Annual Survey of Services, which collect detailed information on firms' inputs, output and revenues; customs data from the Secretariat of Foreign Trade within the Ministry of the Economy; the Urban Informal Economy Survey (Economia Informal Urbana; ECINF), which is a linked employer–employee survey conducted by the Brazilian Institute of Geography and Statistics (IBGE) in 1997 and 2003; and the Monthly Employment Survey (Pesquisa Mensal de Emprego; PME).

In the first step of estimation, Dix-Carneiro et al. (2019) calibrate a set of parameters using data from previous papers and government sources. These parameters include trade costs, share of expenditure in the tradable

37 Ad valorem tariffs are tariffs which are based on a percentage of the value of a good. Iceberg trade costs are usually modelled as a fraction of the value of the good itself. They have been used in the estimation of trade costs since Samuelson (1954).

sector, interest rate, sales tax, payroll tax, import tariffs, dismissal costs, minimum wage and unemployment benefits.

In the second step, taking the above-mentioned parameters as given, they estimate the remaining parameters using an indirect inference estimator[38] with equilibrium constraints, which makes it possible to combine information from the various data sources. In this step, 35 parameters are estimated using 139 data moments and auxiliary parameters. These estimates are then compared with data from the data sets (PME, RAIS, ECINF, IBGE) in order to gauge the fitness of the model for a wide range of channels, mechanisms and impacts contained in the moments.

Once the model has been judged to be a good fit, the authors carry out counterfactual experiments by changing the parameters in the first stage to see the subsequent changes in the secondary stage. The main counterfactuals that they carry out consist of modifying import tariffs (to simulate gradual trade liberalization), iceberg trade costs (to simulate large-scale trade cost changes that can arise from globalization trends, such as technological progress), changes in labour market regulations (by doubling the minimum wage) and productivity shocks[39] in order to assess the subsequent impacts on informality and the transmission of those impacts through informality to a broader range of labour market outcomes for workers and firms (employment, wages, productivity and income).

Findings

Five main results concerning trade and informality are obtained from the exercises presented above. First, import tariff movements have negligible effects on informality and unemployment. Secondly, reductions in trade costs lead to a reduction in informality and an increase in productivity within the tradable sector, but they also lead to an increase in informality within the non-tradable sector, the net effect being small. Thirdly, the effects of trade liberalization on welfare and labour market outcomes are not very different in an economy with a large informal sector compared to an economy without an informal sector. However, informality acts as a buffer against negative shocks. Fourthly, eradicating informality has strong positive effects on welfare, much larger than, say, an unrealistic reduction in iceberg trade costs by 50 per cent. Finally, greater trade openness cannot reduce the misallocation of resources caused by informality.

Strengths and weaknesses

Dix-Carneiro et al. (2019) propose a rigorous and well-specified structural model that they then use to conduct an in-depth study of causal relationships based on quasi-experimental data on informality – traditionally an area that has been challenging to explore in such depth. As the model allows better identification of causality, this study can be said to have relatively high internal validity. However, its choice of econometric tools – for example, an indirect inference estimator instead of a method of simulated moments – could impair the internal validity of the results because of the less precise estimation of the model's underlying parameters.

Moreover, the study includes a particularly extensive set of assumptions in its theoretical model and estimates a large number of parameters in its calibration stage, which could undermine its external validity. The assumption that underlying parameters governing agent behaviour remain unchanged in the counterfactual tests even though the situations change (a policy taking place or not) could affect the

38 See, for example, Gouriéroux and Monfort (1996) and Smith (2008). Indirect inference is a simulation-based method for estimating or making inferences about the parameters of economic models, particularly when the likelihood function is analytically intractable or very difficult to evaluate.

39 A productivity shock can broadly be described as a decline in the productivity of firms across whole sectors due to exogenous reasons, and is modelled as a shift in the entire statistical distribution of productivity. Such productivity shocks may be caused by an earthquake or a pandemic, for example.

generalizability of the study's results. Other assumptions regarding agent behaviour (for example, homogenous infinitely-lived worker–consumers) are also not representative. Finally, the technically challenging nature of the modelling and simulations means that using such a methodology would be costly, time-consuming and difficult to apply to the study of the effects of changes in trade policy and regulations on the labour market.

3.2.2. Quasi-experimental approach: Studying the impact of trade on wages in Mexico

Frías, Kaplan and Verhoogen (2009)[40] follow an alternative approach, based on a purely econometric strategy and the use of quasi-experimental data, in order to study trade and labour market outcomes in another emerging economy, Mexico. The study investigates the extent to which changes in wages after the devaluation of the Mexican peso in 1994 were due to skills (worker component) and wage premiums (firm component). Wage premiums in this context refer to the additional earnings received by workers at a particular firm, compared with what they would receive elsewhere in the labour market.

Theory

Although the authors of this paper do not construct a specific theoretical model, they cite a range of theoretical studies on heterogeneous firms, technology choice, search and bargaining (Melitz 2003; Helpman, Itskhoki and Redding 2010; Yeaple 2005; Amiti and Davis 2012), which provide an underlying framework for their empirical investigation of within plant wage differences. Their categorization of firm productivity follows Melitz (2003).

Data and estimation

The employer–employee data are drawn from 1985–2005 administrative records of the Mexican Institute for Social Security (IMSS) and contain individual information on age, sex, daily wage, state of residence, year of first registration with IMSS, and establishment information on industry and location. This data set is then linked to plant-level data from the 1993–2003 Annual Industrial Survey conducted by the National Institute of Statistics, Geography and Informatics (INEGI), which contains information on employment, total wage bill, investment, capital stock, domestic and export sales, among other variables.

The estimation strategy consists of two parts. First, the employer–employee data are used to decompose plant-level average wages into skill and wage premium components, with a methodology that builds on that of Abowd, Kramarz and Margolis (1999). The latter essentially looks at the impact on wages of being in a particular production plant while having certain individual characteristics at a specific point of time. To the basic specification of the 1999 study, Frías, Kaplan and Verhoogen (2009) add the possibility of changes in a worker's return to ability over time, potential changes in a plant's wage policies and slow adjustment of wages to shocks.

In the second part, the authors estimate the changes in these individual and plant components following the export shock due to the devaluation of the Mexican peso. The devaluation is considered a trade export shock, since it provided incentives for more productive larger plants to start exporting. The differential change in the outcome variables is estimated for the peso crisis period, 1993–97, and compared with analogous estimates for the later period of 1997–2001, during which there was no devaluation. This approach may be likened to the difference in differences method, as it compares the changes in two different periods (treatment and control periods) between high- and low-productivity firms.

40 There are various versions of this paper focusing on the same research question with more or less similar approaches – for example, Frías, Kaplan and Verhoogen (2012).

Findings

The study shows that approximately two thirds of within-industry wage differences is due to wage premiums (firm component), with the rest being due to workforce composition (worker component). It also suggests that the 1994 devaluation generated a differential increase in within-industry wage premiums, explaining essentially all of the differential changes in plant-level wages. This highlights the crucial importance of labour market frictions in explaining the impact of trade liberalization on wages.

Strengths and weaknesses

As this paper is not based on a theoretical model, it avoids some of the shortcomings associated with the latter, such as relying on overly unrealistic assumptions. Moreover, the pairing of linked employer–employee data with econometric decomposition techniques provides a good basis for an initial investigation of wage and employment characteristics without the need for a laborious process of constructing a theoretical model and then carrying out counterfactuals.

However, in Frías, Kaplan and Verhoogen (2009), causal mechanisms cannot be explored in depth owing to the sparse nature of the theoretical specification. While the study is useful in identifying causal relationships, it does not shed much light on the channels determining those relationships. Furthermore, the study's purely econometric approach is relatively more susceptible to error and bias due to omitted variables, misspecifications in functional forms, measurement errors and sample selection, which means that its internal validity can be called into question.

3.2.3. Quasi-experimental approach: Studying the impact of trade on matching between workers and firms in France

Bombardini, Orefice and Tito (2019) use quasi-experimental data to study the effects of trade in an advanced economy, France.[41] The paper explores whether the access of firms to the export market affects the matching of firms and workers, average wages and worker-type dispersion (which can be interpreted as variability of ability between workers). Going farther than Frías, Kaplan and Verhoogen 2009, the authors develop a theoretical framework to explain the forces behind their empirical results (Bombardini, Orefice and Tito 2019, 230). The conjectures that are tested are driven by this theoretical framework. However, the theoretical model itself is not used to estimate key primitive parameters or simulations as is done in the structural approach. Rather, insights from the model inform the econometric analysis.

Theory

This paper draws on the literature on heterogeneous workers and firms in a monopolistic competition environment, with a specific focus on search-and-matching frictions. The model used is based on the setting developed by Eeckhout and Kircher (2011) – a dynamic model with both heterogeneous firms and workers in which there are search frictions – but has been adapted to an open economy.

In this framework, production takes place only when firms and workers are matched: as long as there is no matching, there is no production. It is only after meeting that workers and firms are able to gauge each other's type and decide whether to produce. If the agents match, they share the surplus of the production. If not, they pay a fixed cost to be able to search in the following period. In the context of trade, the additional revenues that exporting can bring are fully achieved only when there is ideal matching between firms and workers. As

41 In a previous version of their paper – Bombardini, Orefice and Tito (2015) – the authors used a structural simulation approach.

a result, an exporting firm chooses a tighter matching set than a non-exporting firm. The two conjectures derived from this model are that: (a) the set of workers employed by an exporting firm is characterized by higher average ability; and (b) the set of workers employed by an exporting firm displays lower ability dispersion, normalized by the average worker ability in the firm (Bombardini, Orefice and Tito 2019).

Data and estimation

Three different micro-level data sets are used in this study. The first is the Annual Declaration of Social Data (Déclaration annuelle des données sociales; DADS), which is an administrative database of matched employer–employee information collected by the French National Institute of Statistics and Economic Studies. It contains information on individual workers' sex, year and place of birth, occupation, job spell, full- or part-time status, annualized real earnings, total number of hours worked, and the sector of the employing firm. The DADS data set is merged with data from the Annual Business Survey (Enquête annuelle d'entreprises), a firm-level survey containing information on sales (domestic and exports), total employment, value added, and the main sector of the firm. More information on exports at the firm–product destination level is obtained from French customs data. Finally, the UN Comtrade Database and WITS are used for data on aggregated trade flows and applied tariff levels, respectively.

The analysis consists of two steps. In the first step, based on Eeckhout and Kircher (2011), two proxies for worker type are constructed: the average wage of a worker over his or her job spells and a worker component extracted from a wage regression using fixed effects (as in the methodology of Abowd, Kramarz and Margolis (1999) mentioned in section 3.2.2 above). Worker type, therefore, refers to the level of innate ability of workers based either on their previous wages or on a construction drawing on estimated fixed effects. As for firm types, proxies such as value added per worker, total employment and share in the domestic market are used.

In the second step, two empirical specifications are elaborated to investigate the two conjectures mentioned above. A series of ordinary least squares regressions clustered at the firm level are run to estimate the impact of exports on average worker type and worker type dispersion. Although the export status of a firm is primarily used as a measure for exports, endogeneity issues mean that an instrumental variable, consisting of a measure of the tariffs faced by an individual firm, also needs to be used.

Findings

The analysis shows that measures of worker type (whether based on the average of previous wages or an estimation of worker fixed effects) are systematically different between exporters and non-exporters. The variability of worker ability (dispersion of worker types) is significantly lower in exporting firms, while the average ability of a worker (mean worker type) is higher.

Strengths and weaknesses

The study by Bombardini, Orefice and Tito (2019) occupies a middle ground between the methodological choices made by the previous two papers – Dix-Carneiro et al. (2019) and Frías, Kaplan and Verhoogen (2009) – in that it uses a theoretical model to inform its econometric specifications but does not carry out a structural simulation. This methodological middle ground allows an in-depth investigation of causal links and the channels driving them. Moreover, the relative ease of implementation also makes the methodology of Bombardini, Orefice and Tito (2019) attractive for a preliminary micro-level study of the effects of trade policy changes.

However, the internal validity of their econometric techniques is susceptible to the standard challenges, and the particular instrumentation strategy that they used could be criticized. Furthermore, the theoretical component of their model dealing with search-and-matching frictions rests on assumptions about the behaviour of firms and workers (such as assortative matching) that may not be representative of many labour markets.

4 Concluding remarks and considerations

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▶ Chapter 4. Concluding remarks and considerations

The objective of this Handbook is to contribute to a more realistic and comprehensive analysis of the labour market impacts of trade. To that end, it examines with a critical eye the main theoretical and empirical approaches used in the literature and their evolution, identifying their assumptions, strengths and weaknesses. At the theoretical level, the Handbook covers theories ranging from the classical frameworks of absolute and comparative advantages, through neoclassical theories of factor endowments, to newer theories that take into account firm and worker heterogeneity. At the empirical level, the Handbook classifies methodologies into macro, meso and micro approaches, while emphasizing that the boundaries of these categories are vague.

Macro and meso approaches have the advantage of providing information on aggregate impacts at the country and sectoral levels, and they are extremely useful for conducting ex ante and ex post evaluations of proposed trade policies (such as regional trade agreements). While such approaches increasingly take into consideration micro foundations, they are often of limited use in identifying the distributional effects of trade. Moreover, their applicability to analysis of the labour market is restricted because they generally rely on simplistic assumptions.

In contrast, micro-level analysis is able to take into account the characteristics of firms and workers, along with frictions in the labour market (such as search-and-matching frictions). Micro approaches are very useful for evaluating the differential effects of trade policies (ex post) on firms and workers. In recent decades – thanks to the development of more elaborate econometric tools and the increasing availability of disaggregated data, including linked employer–employee data sets (LEEDs) – there has been a surge in micro-level studies.

Such quantitative approaches can be combined with qualitative research methods to give an in-depth understanding of the effects of trade on particular groups at particular moments in time. Using a mixed-methods approach makes it possible to explore a broader range of labour market outcomes, and the findings obtained can serve as valuable feedback for policymakers.

However, despite the wide range of approaches and their evolution, there is still only a limited amount of research on various aspects of decent work. Most studies still focus on employment and wage effects of trade, while neglecting other crucial areas. Admittedly, a more comprehensive approach requires extensive resources in terms of time, cost and the skills of the researchers. A certain degree of compromise is therefore inevitable. The choice of methodologies and decent work indicators to be used in a study should ultimately be based on careful consideration of the following factors:

- Data and resource availability or constraints, which differ across countries and depend on their level of economic (and institutional) development – In this regard, it is important to promote increased data availability and harmonization. For example, it would be necessary to enrich input–output matrix data by increasing frequency and the level of disaggregation. With regard to LEEDs, collecting more data at the level of state but also non-state institutions, adopting standardized classifiers to improve matching, and facilitating researchers' access to data could help to increase the number and robustness of studies based on such data.
- Suitability of the assumptions underlying theoretical models and implementation methods – The strengths and weaknesses of the methods and their implications should be carefully analysed. The selection of the model or a combination of models should be carried out in accordance with the specific objective of the study, the research questions and the country context.

- Relevance of indicators for a specific country context – Some indicators might be more relevant in certain contexts than others. For example, in advanced economies, indicators relating to contractual arrangements, working hours and so on may be more relevant than informal employment or the incidence of child labour; the opposite may be true in some emerging and developing economies. When selecting indicators, one should therefore take into account the specificities of the countries being studied.

A robust analysis of the labour market impact of trade can help policymakers to develop a policy mix that is effective and context-specific, taking into account a country's level of economic and institutional development among other factors. It is intended that the methodologies presented in this Handbook be used in combination with decent work indicators to advance research in this area. Forthcoming ILO studies on Mexico, Viet Nam and Malawi will provide the results of hands-on application of these methodologies at the sectoral and firm level, the main objective being to inform policymakers about the effects of trade on specific labour market outcomes.

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Appendix I : Theoretical frameworks for analysing the effects of trade on labour market outcomes

Theoretical family	Framework	Main assumptions	Labour market predictions
Classical trade theory	Smith (1776)	Countries with different technologies of production; constant returns to scale; homogeneous single factor of production; perfect competition; full employment.	International trade increases production, decreases the prices of goods and increases aggregate welfare.
	Ricardo (1817)	Countries with different technologies of production; constant returns to scale; homogeneous single factor of production; perfect competition; full employment.	International trade increases production, decreases the prices of goods and increases aggregate welfare.
Neoclassical trade theory	Heckscher-Ohlin (Ohlin 1933)	Countries with identical technologies and possibly different factor endowments; constant returns to scale; homogeneous factors of production that move freely within a country; perfect competition; full employment.	International trade increases labour demand in labour-abundant countries, and real wages will tend to equalize between trading partners.
	Samuelson (1971) and Jones (1971)	Three factors of production (labour, capital and land); capital and land are industry-specific and cannot move within the country; perfectly competitive markets; no equilibrium unemployment.	International trade changes relative prices; countries export goods whose relative price increases; the factor specific to the export sector benefits; the factor specific to the import sector loses.
New trade theory	Krugman (1979; 1980)	Two-industry countries that differ in size and face transport costs; labour is the only factor of production; homogeneous firms in monopolistic competition; full employment.	International trade generates welfare gains through a greater diversity of goods; higher wages in the larger country; countries specialize in the industry with the largest home market.

Theoretical family	Framework	Main assumptions	Labour market predictions
New-new trade theory	Melitz (2003)	Countries differ in size, engagement in trade and the transport costs they face; firms produce different varieties of goods; labour is the only factor of production; firms differ in productivity; fixed costs of entry to industry and export sector; full employment.	International trade induces the most productive firms to export and the least productive firms to exit; resources are reallocated towards the more productive firms, generating a net productivity gain and an increase in workers' welfare.
	Antràs and Helpman (2004)	North–South model with firm heterogeneity; firms choose between outsourcing and integration; labour is the only factor of production; final-good producers supply headquarters services; manufacturing plant operators supply intermediate inputs.	Highly productive firms acquire inputs in the South; less productive firms obtain them in the North; among firms that do not outsource abroad, highly productive ones integrate into the production of intermediate inputs; widening the North–South wage gap or reducing trading costs increases outsourcing.
New-new trade theory and worker heterogeneity	Yeaple (2005)	A homogeneous competitive non-tradable sector and a monopolistically competitive tradable sector; labour is the only factor of production; firms adopt different technologies; trade is costly; workers with different skills receive technology-specific "efficiency wages".	Exporters are larger, adopt advanced technology, pay higher wages, and are more productive. A fall in trade costs reallocates workers towards firms with advanced technologies and increases the wages of the most skilled workers.
	Grossman and Rossi-Hansberg (2008)	Global production based on tradable tasks with heterogeneous offshoring costs; firms can produce two goods with constant returns to scale, and they can undertake tasks at home or abroad; labour is the only factor of production, and workers differ in their skills.	A decrease in the cost of offshoring low-skill tasks leads to a productivity effect that benefits low-skilled labour; a change in relative prices that affects wages in the traditional neoclassical way; and a labour-supply effect due to workers' displacement.
	Egger and Kreickemeier (2009)	Firm heterogeneity; labour market imperfections and workers with fair wage preferences; labour is the only factor of production.	More productive firms pay higher wages. Trade increases aggregate welfare (through more varieties), unemployment (lower firm-level demand), and wage inequality.
	Amiti and Davis (2012)	Firm heterogeneity; costly trade in intermediate goods; imperfect labour market with fair wage demands from workers; labour is the only factor of production.	Final-product tariff reductions lower wages at firms serving only the domestic market and increase wages at exporting firms; intermediate-product tariff reductions raise wages at input-importing firms and lower wages at non-importing firms.
	Davis and Harrigan (2011)	Firm and worker heterogeneity with efficiency wages; workers are fired if caught shirking and spend time in unemployment; wages vary across firms depending on their monitoring ability.	Trade liberalization destroys costly jobs; within firms with the same productivity, trade eliminates what workers perceive to be good jobs; industry-average wage increases due to reallocation towards larger firms; unemployment rises.

Theoretical family	Framework	Main assumptions	Labour market predictions
New-new trade theory and labour market frictions	Felbermayr, Prat and Schmerer (2011)	Firm heterogeneity; search-and-matching frictions and equilibrium unemployment; intra-firm individual and collective bargaining.	Reducing variable trade costs or increasing the number of trading partners raises wages and employment. These effects are larger when wages are bargained individually rather than collectively.
	Davidson, Matusz and Shevchenko (2008)	Firm and worker heterogeneity; search-and-matching generates unemployment; perfect competition in the product market; capital and labour are used in production; exporting is costly.	The largest and most productive firms pay the highest wages and have the strongest incentives to export. Trade liberalization increases the wage gap between high- and low-skilled workers.
	Helpman, Itskhoki and Redding (2010)	Firm heterogeneity; workers are heterogeneous in ability; search-and-matching frictions; a homogeneous-good sector and a differentiated-product sector; exporting is costly.	International trade may increase wage inequality, unemployment and welfare. Reductions in labour market frictions increase welfare, affect unemployment ambiguously, and always hurt the trading partner.

Source: Alemán-Castilla (2020) and authors.

Appendix II : Decent work and trade in enterprise surveys

This appendix reviews a subset of surveys at the establishment (or firm/plant/factory) level that explicitly integrate both trade and labour market indicators and thus, on their own, allow for an investigation of the effects of trade on labour markets. For this purpose, it presents three existing establishment-level surveys containing such data and discusses possible avenues for improvement in the methodological design and implementation of future surveys.

In order to allow for an exploration of the impact of trade on the labour market using enterprise surveys, it is desirable to have indicators related to both trade and labour within them. A list of decent work indicators suitable for evaluating the impact of trade on labour markets is provided in the *Trade and Decent Work: Indicator Guide* (ILO, 2021). In terms of trade, WTO and UNCTAD (2012) provides a convenient list of trade indicators with their conceptual and operationalized definitions.[42] These indicators relate to a broad range of dimensions of trade, such as openness and composition. A brief overview of selected enterprise-level surveys that contain indicators for both trade and labour is given below, followed by general observations and suggestions for future work.

1. Selected enterprise surveys with trade and labour data

Three surveys that include variables on both trade and labour and provide good illustrative examples of different ways to carry out an enterprise survey are presented below. The first two are multi-country surveys (WBES and BWS) which take different approaches to their identification of trade variables. The third survey (SMESV) focuses on a single country.

World Bank Enterprise Surveys (WBES): The WBES is the largest on-going enterprise survey of its kind with information on over 164,000 firms in 144 countries and data starting from 2002.[43] Panel data is available for 87 countries while the rest of the countries are covered by cross-sectional data with annual data collected every 3-4 years for a region. It monitors enterprises (both formal and informal in separate surveys) in the manufacturing and services sectors. The unit of analysis is an establishment, which is defined as a physical unit of production, business activity or service delivery. [44] A firm can be composed of multiple establishments. In terms of trade, the WBES collects information on direct and indirect exports, imported inputs, start date of exporting and customs clearance time among others. In terms of labour market outcomes, the survey collects information relating to employment, skills and working arrangements.

International Labour Organization and International Finance Corporation's Better Work Surveys (BWS): The ILO and IFC take a sector-specific approach with Better Work Surveys, and focus on workers and managers in factories in the garment industry between 2009 and 2015 (a trade-intensive industry measured by trade as a proportion of its output and its integration into Global Supply Chains). Panel data is available for multiple

42 The former relates to the understanding of a variable which can be utilized for mass communication whereas the latter is a concretized definition which is readily amenable to statistical application.

43 The surveys collect a broad range of information relating to the nature of the enterprise, infrastructure and services, sales and supplies, management practices, degree of competition, innovation, capacity, land and permits, crime, finance, business-government relations, labour, business environment and performance.

44 A detailed description of the World Bank's methodology is available here: https://www.enterprisesurveys.org/en/methodology

countries, and was collected at varying time intervals. The trade variables in these surveys are related to export sales and foreign ownership. The labour market variables are linked to employment, wages, training, productivity, education, working conditions, harassment, labour law compliance, health and safety services, social dialogue, collective bargaining and work stoppages.[45] Better Work Survey questionnaires and data are not publicly available but can be made available to researchers upon request.

United Nations University World Institute for Development Economics Research (UNU-WIDER)'s Small and Medium Enterprise Survey in Viet Nam (SMESV): The UNU-WIDER conducted a bespoke longitudinal enterprise survey in Viet Nam with panel data containing annual data tracking 2500 enterprises in 2011, 2013 and 2015.[46] In terms of trade, the survey collected information about, among other things, direct exports, imports and taxes on exports and imports. The labour market variables included in this survey are related to wages, working arrangements, skills, health and safety, social dialogue and collective bargaining.

2. General observations about enterprise-level surveys

A review of the academic literature on trade and labour markets leads one to a range of shortcomings of the present generation of surveys. These include the relative dearth of labour market indicators; gaps in the conceptual and operational definition of variables; lack of linked employer-employee data sets; the lack of data for low and middle-income countries, and for the agricultural sector. The surveys reviewed in the previous sub-section try to address some of these shortcomings.

Firstly, there has traditionally been a relative dearth of labour market indicators related to the Decent Work Agenda of the ILO in mainstream enterprise surveys. Many of them focus mostly on employment and wages and do not cover areas such as health and safety and social dialogue adequately. Simultaneously, when it comes to trade variables, they are often over-reliant on particular quantitative measures, such as exports and imports, rather than others, such as non-tariff barriers (NTBs), which are becoming more prominent in trade policies.[47] The WBES, SMESV and BWS try to expand the range of labour market variables that they incorporate and some of these selected variables, together with the questions that are used to collect information on them, are listed in Table 3.

Secondly, there is a significant gap in the conceptual and operational definition of variables relating to labour market indicators in historical mainstream surveys utilized for trade and labour studies. For instance, there is significant discordance between how informality is understood on a conceptual level (ILO, 2015) and how it is operationalized as a variable in many surveys. An example is the differential way that informality is operationalized in the WBES, SMESV and BWS.[48] The lack of harmonization of these conceptual and operational definitions also makes it difficult for researchers to combine these surveys with other data sources. Another issue that hinders the harmonization

45 In this section, only the questionnaires for the Viet Nam component of the Better Works surveys are discussed. Other country-level surveys, which are part of the programme might incorporate various other heterogenous components. The other countries included in the Better Work project are Bangladesh, Cambodia, Egypt, Ethiopia, Haiti, Indonesia, Jordan and Nicaragua.

46 A detailed description of the methodology of this survey is available at https://www.wider.unu.edu/database/viet-nam-sme-database.

47 Examples of non-tariff measures would be quotas, customs procedures, and provisions linked to health, labour and environmental standards.

48 In the WBES and SMESV, the formal registration of firms can be primarily used in order to ascertain a measure of informality on the firm level with no corresponding information on the worker level. In the BWS, the existence of work contracts can be used to ascertain a measure of informality on the firm level and no corresponding information on the firm-level. The ILO (2015) conceptual definition of informality includes both of these cases and just one or the other.

of survey data is the differential industry coding across regions or countries. [49]

Thirdly, traditionally, surveys have focused on either collecting firm-level data by interviewing managers/supervisors/owners about their firms/establishments or they have focused on collecting worker level data by interviewing workers. There is a distinct lack of linked employer-employee data sets (LEEDs), which collects data on both the firm and worker level. LEEDs allow for a more thorough and accurate investigation of causal mechanisms of the impact of trade on the labour market. They are discussed in detail in Chapter 4 of this handbook. While enterprise surveys are, by design, often restricted to enterprises as respondents, this does not always need to be the case. The SMESV provides an approach whereby workers are incorporated as participants within existing enterprise surveys. This could help create matched employer-employee datasets from the very beginning, at the designing step, instead of combining them at a later stage with the different issues that are associated with combining datasets (see Chapter 4). Furthermore, the surveys focusing on trade and labour often lack additivity. This means that they are not designed to be easily incorporated into other surveys which focus on different themes, such as technology or climate change but ask many of the same questions. Moreover, many such surveys are also not designed to be combined with administrative data sources and/or censuses. A modular design, for instance, as in the case of WBES, can greatly facilitate enhancing the future additivity of surveys.

Fourthly, there is a significant gap in the data available by the development level of economies. In particular, low-income and middle-income countries have far fewer surveys investigating trade and labour market indicators than high-income economies. The WBES and BWS provide good examples of multi-country surveys that focus predominantly on middle and low-income countries. An expansion of these surveys would allow researchers to conduct more extensive analysis on topics relevant in these countries, such as informal employment.

Finally, many of the surveys do not publicly share their data and therefore cannot be utilized by a broader set of researchers. This also has an impact on the perceived transparency of the work done on the labour market effects of trade. Furthermore, the lack of sharing of data often prevents the replicability or the validation of results arising from those surveys. The WBES and SMESV provide good examples of surveys whose data is publicly available. The BWS are available upon request to researchers.

49 A prominent example of differential industrial coding is between NAICS (North American Industrial Classification System) which is used mainly by North American economies and ISIC (International Standard Industrial Classification for All Economic Activities) which is used globally.

▶ Table 3. Selected Labour Market Indicators BWS, WBES and SMESV

Survey	LMO	Variable	Question	Type of Respondent	Decent Work Theme
Better Works Surveys (BWS)*	Skills	Training Location	How are inexperienced workers trained in basic skills?	Manager	**Adequate Earnings and Productive Work**
		Initial Training Time for New Worker	How much time is spent on basic skills training for a typical new employee?	Manager	
		Initial Training Time for Worker with Job Experience	How is skills training provided to new employees with previous work experience in the apparel industry?	Manager	
		Training Time Required	How much time does such training require?	Manager	
		Availability of Training for New Employees	Did you receive any training the first month you worked in this factory?	Worker	
		Type of Training for All Employees	What types of training have you received in the past 6 months?	Worker	
	Safety at work	Labor Law Compliance	How do you think your firm's compliance record compares to that of its closest competitors?	Manager	**Safe Work Environment**
	Health and Safety	Incidence of Health Issues with Workers	Over the last 12 months, how many times have you or members of your family visited a health facility?	Worker	
		Rate of Sexual Harassment	Is sexual harassment or sexual touching a concern for workers in this factory?	Worker	
		Rate of Verbal Harassment	Is verbal abuse such as yelling or vulgar language a concern for workers in this factory?	Worker	
		Rate of Physical Harassment	Is physical abuse such as hitting or shoving a concern for workers in this factory?	Worker	
		Availability of Health Services in Workplace	What health services are available in the factory?	Manager	**Safe Work Environment/ Social Security**
		Availability of Income to Pay for Health Issues	Over the last 12 months, did your family have enough income to cover all of the health care fees?	Worker	
		Additional Sources of Income Utilized to Cover Health Expenses	What did your family do if you did not have enough income to cover health fees?	Worker	
		Availability of Health Services in Workplace	Does this factory have a health clinic?	Worker	
		Availability of Health Services in Workplace	What health services are available in the factory?	Worker	
		Quality of Health Services Available in Workplace	How would you rate the treatment you receive at the factory clinic?	Worker	

▶ Table 3. Selected Labour Market Indicators BWS, WBES and SMESV (suite)

Survey	LMO	Variable	Question	Type of Respondent	Decent Work Theme
Better Works Surveys (BWS)*	Social Dialogue and Collective Bargaining	Conflict Resolution Effectiveness	If this factory were having a conflict between managers and workers, how effective do you think the following mechanisms would be in helping resolve the conflict?	Manager	**Social Dialogue, Workers' and Employers' Representation**
		Perceived Relation of Workplace Abuse to Profit	What do you think the relationship is between verbal abuse (yelling or insulting workers) and factory profits?	Manager	
		Existence of Collective Bargaining Agreement	Does this establishment have a collective bargaining agreement?	Manager	
		Collective Bargaining Coverage	What issues are covered by the collective bargaining agreement?	Manager	
		Work Stoppage Rate	How many days of work were lost to strike activity in this factory over the past 12 months?	Manager	
		Work Stoppage Causes	What complaints have led to strikes in this factory?	Manager	
		Workplace Dialogue Resolution Mechanism Effectiveness	If this factory were having a conflict between managers and workers, how effective do you think the following mechanisms would be in helping resolve the conflict?	Manager	
		Collective Bargaining Coverage Rate	Are you represented by a collective bargaining agreement that you know of?	Worker	
		Availability of in-Factory Complaint Channels for Workers	If you were having a problem at work, how comfortable would you feel seeking help from your supervisor?	Worker	
		Availability of Trade Union Complaint Channels for Workers	If you were having a problem at work, how comfortable would you feel seeking help from the trade union representative?	Worker	
		Availability of in-Factory Complaint Channels for Workers	Do workers in this factory meet with managers to discuss concerns in the factory?	Worker	
		Availability of in-Factory Complaint Channels for Workers	I am comfortable raising concerns about poor quality and low productivity work by my direct colleague to my direct supervisor	Worker	
	Working Arrangement	Type of Contract	What type of work contract do you have?	Worker	**Stability and Security at Work**
		Length of Contract	How long have you had a training, probationary or temporary contract?	Worker	
	Skills	Type of Training for New Employees	What types of training did you receive when you first started working in this factory?	Worker	

▶ Table 3. Selected Labour Market Indicators BWS, WBES and SMESV (suite)

Survey	LMO	Variable	Question	Type of Respondent	Decent Work Theme
World Bank Enteprise Surveys (WBES)**	**Working Time**	Hours per week of operation	In fiscal year [Insert last complete fiscal year], how many hours per week did this establishment normally operate?	Establishment	**Decent working time**
	Skills		At the end of fiscal year [Insert last complete fiscal year], how many permanent, full-time production workers in this establishment were:	Establishment	
		Highly skilled production workers	In highly skilled Jobs	Establishment	
		Semi-skilled production workers	In semi-skilled jobs	Establishment	
		Unskilled production workers	In low-skilled jobs	Establishment	
		Percentage of full-time permanent workers who completed secondary school	What percentage or how many of the full-time permanent workers employed at the end of fiscal year [Insert last complete fiscal year] completed secondary school? Please provide the percentage or number, not both.	Establishment	
		Formal training	Over fiscal year [Insert last complete fiscal year], did this establishment have formal training programs for its permanent, full-time workers?	Establishment	
		In-house training	Referring to the training programs run over fiscal year [Insert last complete fiscal year], what percentage of permanent, full-time workers of the following categories received formal training? If easier please provide the total numbers (provide one or the other but not both).	Establishment	
		Percentage of production vs non-production workers trained		Establishment	
	Gender gap	Number of permanent, full-time workers that are female	At the end of fiscal year [Insert last complete fiscal year], in this establishment how many permanent, full-time workers in each of the following categories were female?	Establishment	
		Number of full-time temporary or seasonal workers that are female	How many full-time seasonal or temporary workers during fiscal year [Insert last complete fiscal year], were female?	Establishment	

▶ Table 3. Selected Labour Market Indicators BWS, WBES and SMESV (suite)

Survey	LMO	Variable	Question	Type of Respondent	Decent Work Theme
World Bank Entreprise Surveys (WBES)**	**Working Arrangement**	Number of full-time temporary or seasonal workers	How many full-time seasonal or temporary workers did this establishment have during [Insert last complete fiscal year]? Full-time, temporary workers are all short-term, that is for less than a year, workers with no guarantee of renewal of employment and work full-time	Establishment	**Stability and Security at Work**
UNU-WIDER Viet Nam Survey (SMESV)	**Working Arrangement**	Duration of employment	Are you a permanent full-time employee? (work at least 6 months per year)	Worker	
		Contract type	Do you have a formal (written down) labour contract?	Worker	
	Skills	Education	What is the highest level of education you have completed?	Worker	**Equal opportunity and Treatment in Employment**
		On the job training	How many times have you received on-the- job training at this enterprise?	Worker	
		Training duration	What was the training duration of the on-the-job training?	Worker	
		Informal training	How many times have you received informal training at this enterprise?	Worker	
		Off-the job training	How many times have you received off-the- job training at this enterprise?	Worker	
		Experience	How many years of wage-earning work experience did you have prior to joining this enterprise?	Worker	
		New worker training	How many new workers did the enterprise train in 2014?	Firm	
		Existing worker training	How many existing workers were trained within the different training categories?	Firm	
	Working Hours	Average weekly working hours; Average daily working hours	Since the beginning of 2013 to date, on average, how many days per week and how many hours per day do you work for this firm?	Worker	**Decent Working Time**
		Average number of days worked per month	What is the average number of days worked per month by a regular full-time employee at your firm?	Firm	
		Average number of hours worked per day	What is the average number of hours worked per day by a regular full-time employee at your firm?	Firm	

▶ Table 3. Selected Labour Market Indicators BWS, WBES and SMESV (suite)

Survey	LMO	Variable	Question	Type of Respondent	Decent Work Theme
World Bank Enteprise Surveys (WBES)**	**Social Security**	Provision of social security	Does your employer provide, either directly or through the Social Insurance Fund, any of the following benefits (according to regulations)?	Worker	**Social Security**
		Firm contribution to social security	Did you pay contribution to social insurance for your employees in 2014?	Firm	
		Hazardous working condition pay	Is there any difference in wages between employees who work in hazardous conditions and those who do not (i.e. a premium paid for working in hazardous conditions)?	Firm	
	OSH	Health and Safety Equipment	Does the enterprise provide you with the necessary health and safety equipment?	Worker	**Safe Work Environment**
	Social Dialogue and Collective Bargaining	Workplace dialogue	Informing employees/representative organizations of the labour force reduction in advance?	Firm	**Social Dialogue, Workers' and Employers' representation**
		Trade union representation	Does the enterprise have a local/ plant level trade union/employee representative organization?	Firm	

* The questionnaire for the Viet Nam component of the Better Works surveys was reviewed for this chapter. The questions and information collected in other Better Works Surveys may vary.

** The questionnaire of the manufacturing component of the WBES was utilized for this section.

3. How to go further?

To enhance analysis of trade and labour markets at the enterprise level, future surveys could benefit from explicitly incorporating a wider range of questions relating to decent work areas that are listed in the *Trade and Decent Work: Indicator Guide* (ILO, 2021). On that note, the SMESV and BWS, provide good examples for the type of questions that can be utilized in order to gather information on neglected areas of decent work such as safe work environment; social dialogue, workers' and employers' representation; and stability and security at work (see Annex 1). More specifically, on social dialogue, BWS contains questions on social dialogue institutions (trade unions and/or employers' associations) which are present in the enterprise, and the engagement of both workers and managers with these institutions.

Some labour market variables can be measured using multiple techniques. For instance, informality can be measured from the perspective of the registration of the firm and social security coverage of workers. Incorporating these multiple definitions and operationalization of variables allow for crucial statistical robustness checks for better results. A harmonization process that can allow for these differential definitions to be used together would expand the usage of the data. Furthermore, the proliferation of enterprise surveys on a range of different topics means that researchers often have to utilize information from a range of different data sources. Therefore, it is important that common harmonization standards are utilized in any survey designs in order to allow such complementarity. The collection of wider ranges of data in a single survey is often unfeasible and impractical due to resource considerations.

Existing enterprise surveys could benefit from incorporating multiple stakeholders as respondents from the design phase of the survey. For example, the SMESV, discussed above, explicitly administer the survey at both the firm level (represented by managers and/or supervisors) and worker level (represented by employees within those firms). This enhances the generalizability of the findings, allows for crucial robustness checks and more precise analysis of the causal links between trade and labour markets.

Surveys could opt for a modular approach in incorporating new sectors and/or themes into their existing methodological design. It is often not necessary to start from scratch with a new survey for trade and labour market outcome investigations. A surveyor can often add a module to an existing survey in order to collect the required information which can be complemented by the information already gathered by that particular survey.

Finally, organizations carrying out surveys should institute best practices that require the sharing of the raw data collected for the survey with adequate consideration of the anonymization of data.[50] This would enhance the replicability and hence the validity of the analysis that is carried out through those surveys. As such, it would allow for greater transparency in the work on trade's impact on labour markets. It would also avoid duplication and wastage of resources in future surveys.

50 This can often be achieved by anonymizing micro-identifiers for firms and workers and/or removing sections of the data with few observations.

Appendix III : Examples of empirical studies on trade and labour market outcomes

Study	Labour market outcome	Research question	Main data sources	Findings
Aitken, Harrison and Lipsey (1996)	Wages	How does foreign direct investment (FDI) affect wages in the **United States, Mexico** and the **Bolivarian Republic of Venezuela**?	Firm-level data for Mexico and the Bolivarian Republic of Venezuela; state- and industry-level data for the United States.	Higher levels of FDI are associated with higher wages. In Mexico and the Bolivarian Republic of Venezuela, this is true only of foreign-owned firms.
Said (2012)	Wages and job quality of the working poor	What was the impact of the 1998–2006 trade liberalization on wages and job quality in Egyptian manufacturing?	Labour Market Panel Survey; Household Income, Expenditure and Consumption Survey; WTO; World Bank.	Lower tariffs and increased export promotion have a positive effect on the income of the poor, at the expense of greater informalization and more low-quality jobs.
Kovak (2013)	Wages in local labour markets	What was the effect of the **Brazilian** trade liberalization of the 1990s on wages at the regional level?	Brazilian Institute for Applied Economic Research; demographic census.	Local labour markets with workers concentrated in more liberalized industries were affected more negatively.
Lee and Lee (2015)	Wages and worker's contract type	What is the effect of offshoring on wages in the **Republic of Korea**, taking into account contract types?	Korean Labour and Income Panel Study; World Input–Output Database (WIOD).	Workers under temporary contracts do not benefit from globalization, even after controlling for education, occupation and ability.
Bernard and Jensen (1999)	Employment, wages and workforce mix	Do good firms in the **United States** become exporters or does exporting improve performance?	Longitudinal Research Database of the US Census Bureau; Annual Survey of Manufacturers.	Good firms become exporters, but the benefits of exporting for firms are unclear. Employment growth and survival are both higher for exporters.
Autor, Dorn and Hanson (2013)	Employment and wages in local markets	What was the effect of the rising Chinese import competition in 1990–2007 in the **United States**?	UN Comtrade Database; Tolbert and Sizer (1996); Census microdata samples; American Community Surveys.	Chinese imports raised unemployment, lowered labour force participation and reduced wages in local labour markets with import-competing industries.
Menezes-Filho and Muendler (2011)	Labour reallocation	What was the impact of trade liberalization on **Brazilian** workers' employment trajectories over time?	Employer–employee data from the Annual Social Information Report (RAIS).	Trade liberalization triggers worker displacements from more protected industries. No reabsorption of displaced workers for several years.
Pierce and Schott (2016)	Employment	Was the decline of manufacturing jobs in the **United States** in the 2000s due to the normalization of trade relations with China?	US Census Bureau's Longitudinal Business Database.	More exposed industries had greater employment loss. At the plant level, less labour-intensive production and exposure to the policy also played a role.
Berman, Bound and Griliches. (1994)	Skill upgrading	What were the key drivers of the 1980s demand shift for skilled labour in the **United States**?	Annual Survey of Manufactures; Census of Manufactures; NBER trade data.	The shift was due mostly to increased use of skilled workers within industries rather than to a reallocation of employment between industries.

Study	Labour market outcome	Research question	Main data sources	Findings
Hanson and Harrison (1999)	Skill wage gap	Was the widening of the skill wage gap in **Mexico** in the 1980s linked to the country's trade reform?	Secretariat of Commerce and Industrial Development; Mexican industrial census.	Tariff reductions disproportionately affected low-skilled industries. The increase in the relative price of skill-intensive goods could explain the increase in wage inequality.
Feliciano (2001)	Employment and wage inequality	What was the impact of the 1980s trade reform on wages and employment in **Mexico**?	National Survey of Urban Employment; Ten Kate (1992) data on trade.	Trade reform decreased the wages of workers in industries with reduced import licence coverage. It also raised wage dispersion and reduced the wages of less skilled workers.
Verhoogen (2008)	Within-industry wage inequality	Does trade affect wage inequality in **Mexico** through a quality-upgrading mechanism?	Annual Industrial Survey; National Survey of Employment, Wages, Technology and Training.	Initially more productive plants increased their exports share, overall wages, relative wages of non-production employees and ISO 9000 certification during the Mexican peso crisis.
Meschi, Taymaz and Vivarelli (2016)	Employment and wages of skilled and unskilled workers	How do globalization and technological upgrading affect employment and the wages of workers with different skills in **Turkey**?	Firm-level database of all manufacturing firms from the annual manufacturing industry statistics (Turkish Statistical Institute).	Technology and trade contribute to job creation. Skill-biased technological change, domestic R&D, imported technologies, export, and FDI increase the demand for skilled labour.
Winkler (2019)	Workers' sorting and mobility patterns	How does **Germany**'s trade integration with China and Eastern Europe affect the sorting of high-wage workers and firms?	Integrated Employment Biographies and Establishment History Panel from the Institute for Employment Research (IAB); UN Comtrade Database; surveys by the Federal Institute for Vocational Education and Training and the Federal Institute for Occupational Safety and Health.	Import exposure increases sorting and wage inequality by pushing low-skilled workers out of high-wage manufacturing firms. Skilled workers also move to different sectors, but they manage to reallocate to high-wage firms.
Pavcnik et al. (2004)	Industry wage premiums and skill wage gap	How did the 1988–94 trade liberalization episode in **Brazil** affect the industry and skill wage premiums?	Labour data for Brazil's 6 largest metropolitan areas, 18 manufacturing and 2 mining sectors; Muendler (2004) data.	No association between changes in industry wage premia and changes in trade policy or between industry-specific skill premia and trade policy.
Scott (2005)	Industry wage premiums and skill wage gap	What were the effects of the 1990s trade liberalization reforms on the distribution of wages in **Jamaica**?	Jamaica Survey of Living Conditions; Statistical Institute of Jamaica.	Increased openness associated with higher wages and inequality in tradable sectors. Increased imports cause wages to fall, while exports to horizontal partners and niche markets raise wages.
Dutta (2007)	Industry wage premiums	What is the link between the 1990s trade and industrial reforms and industry wage premiums in **India**?	National Sample Survey Office; Indian Tariff Schedules; Central Statistics Office.	Workers in highly protected industries were better paid. Since these industries faced the largest tariff cuts and had more unskilled workers, trade increased wage inequality.

Study	Labour market outcome	Research question	Main data sources	Findings
Schank, Schnabel and Wagner (2007)	Exporter wage premiums	Is there an exporter wage premium in **Germany**, even after controlling for individual firm and worker characteristics?	Linked employer–employee data from the IAB.	Exporters pay higher wages. The wage differential becomes smaller when controlling for the observable and unobservable characteristics of the employees and firms.
Matthee, Rankin and Bezuidenhout (2017)	Exporter employment and wage premiums	What are the employment and wage differences between exporters and non-exporters in **South Africa**?	Tax data of companies and employees; customs data; South African Revenue Service.	Exporters employ more workers and pay higher wages. Among exporters, labour demand and wages are affected by destination served, number of products and number of destinations.
Schröder (2018)	Exporter and multinational enterprise (MNE) wage premiums	What is the wage premium of exporters and MNEs in **Germany**?	Linked employer–employee data from the IAB; administrative data from the German Federal Employment Agency.	Globalized firms pay higher wages, and MNEs pay the highest. Individual and match-specific effects indicate assortative matching on unobserved worker characteristics.
Alfaro-Ureña, Manelici and Vasquez (2019)	Wage effects from foreign multinational corporations (MNCs)	What are the effects of MNCs on the wages of workers in **Costa Rica**?	Linked employer–employee administrative data; Orbis; Compustat; National Household Income and Expenditure Survey.	There is a direct MNC wage premium, particularly for workers with a university education. MNCs improve the outside options of all workers by altering the level and composition of labour demand.
Attanasio, Goldberg and Pavcnik (2004)	Industry wage premiums and informality	How did the 1980–90s trade liberalization episode in **Colombia** affect wage distribution and informality?	National Household Survey; industry-level tariff changes and trade exposure.	Skill premiums not related to tariffs. Possible skill-biased technological change. Large tariff cuts linked to decrease in wage premiums. Trade reforms may have increased informality.
Bosch, Goñi Pacchioni and Maloney (2012)	Informality in metropolitan labour markets	What was the impact of **Brazil's** reforms on informality between 1986 and 2002?	Monthly Employment Survey; National Household Survey; Kume, Piani and de Souza (2003); Muendler (2004).	Trade liberalization had a small effect on informality. Constitutional reforms (dismissal costs, overtime, and union power) played a more important role. Both reduced hiring rates.
Selwaness and Zaki (2013)	Informality in manufacturing sector	What was the effect of **Egypt's** 1990s trade liberalization reforms on informality?	WTO World Tariff Profiles; Egyptian Labour Market Panel Surveys.	Trade reforms increased informality in 1998, while the inverse was found in 2006, with lower tariffs leading to lower likelihood of informality.
Cruces, Porto and Viollaz (2018)	Informality in manufacturing sector	How did **Argentina's** trade liberalization affect informality between 1980 and 2001?	Permanent Household Survey; import tariff data from Galiani and Porto (2010).	Trade liberalization raised informality at the industry level. Depending on the structure of sectoral protection, informality in the manufacturing sector decreased as the average tariff fell.

Study	Labour market outcome	Research question	Main data sources	Findings
Ulyssea and Ponczek (2018)	Informality in local labour markets	Did labour regulations shape the labour market effects of trade liberalization in **Brazil**?	Decennial population census; administrative data from the Ministry of Labour and Employment.	After trade opening, regions with weaker enforcement of labour regulations had almost no employment losses but experienced a substantial increase in informality.
Ben Yahmed and Bombarda (2020)	Gender differences in formal and informal employment	How did the **Mexican** trade liberalization of the 1990s affect formal employment among men and women?	National Urban Employment Survey; tariff data from Iacovone and Javorcik (2010).	Tariff cuts increase formality in manufacturing, particularly in large firms. Regional exposure to trade increases formality in manufacturing, especially for men. In the services, formality falls for low-skilled women.
Ben Salem and Zaki (2019)	Job quality (informal and irregular employment)	What is the effect of trade reforms on informal and irregular workers in **Egypt**?	Egyptian Labour Market Panel Surveys; tariff data from the WTO.	Positive relationship between tariffs and both informal and irregular employment, but the effect on irregular employment is less clear cut. Skilled formal work increases after openness.
Topalova (2010)	Poverty and income distribution in local labour markets	What were the regional impacts on poverty and income distribution of the 1991 trade liberalization episode in **India**?	National Sample Surveys; Census of India; tariff data from Indian Trade Classification (Harmonized System).	Rural districts experienced a slower decline in poverty and lower consumption growth. Stronger effect for the poorest and least geographically mobile, in states with inflexible labour laws.
Dix-Carneiro and Kovak (2019)	Wages, employment, interregional migration and informality	How did workers and regional labour markets adjust to changes induced by **Brazil's** trade liberalization episode in the 1990s?	Linked employer–employee administrative records from RAIS.	Workers in regions facing larger tariff declines spend less time in formality, are more likely to move to non-tradable sectors, and do not migrate to more favourable regions. In harder-hit areas, there is more informality.

Source: Alemán-Castilla (2020).

It is widely accepted that international trade has a positive net effect on both employment and income. However, as reflected in mounting public discontent, the benefits of trade are not evenly distributed. Some workers lose their jobs; some firms are forced to shut down, while others struggle to provide decent working conditions. Yet, many assessments of the impact of trade on the labour market do not fully take into account its distributional effects or the quality of the employment created.

The present Handbook seeks to fill that gap by critically examining the various methodologies used to analyse the effects of trade on employment. The use of a combination of techniques and specific indicators covering key aspects of decent work is proposed in order to pave the way to a more comprehensive and realistic assessment of the labour market effects of trade. This is crucial for the design of an effective and inclusive mix of trade and labour market policies.

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