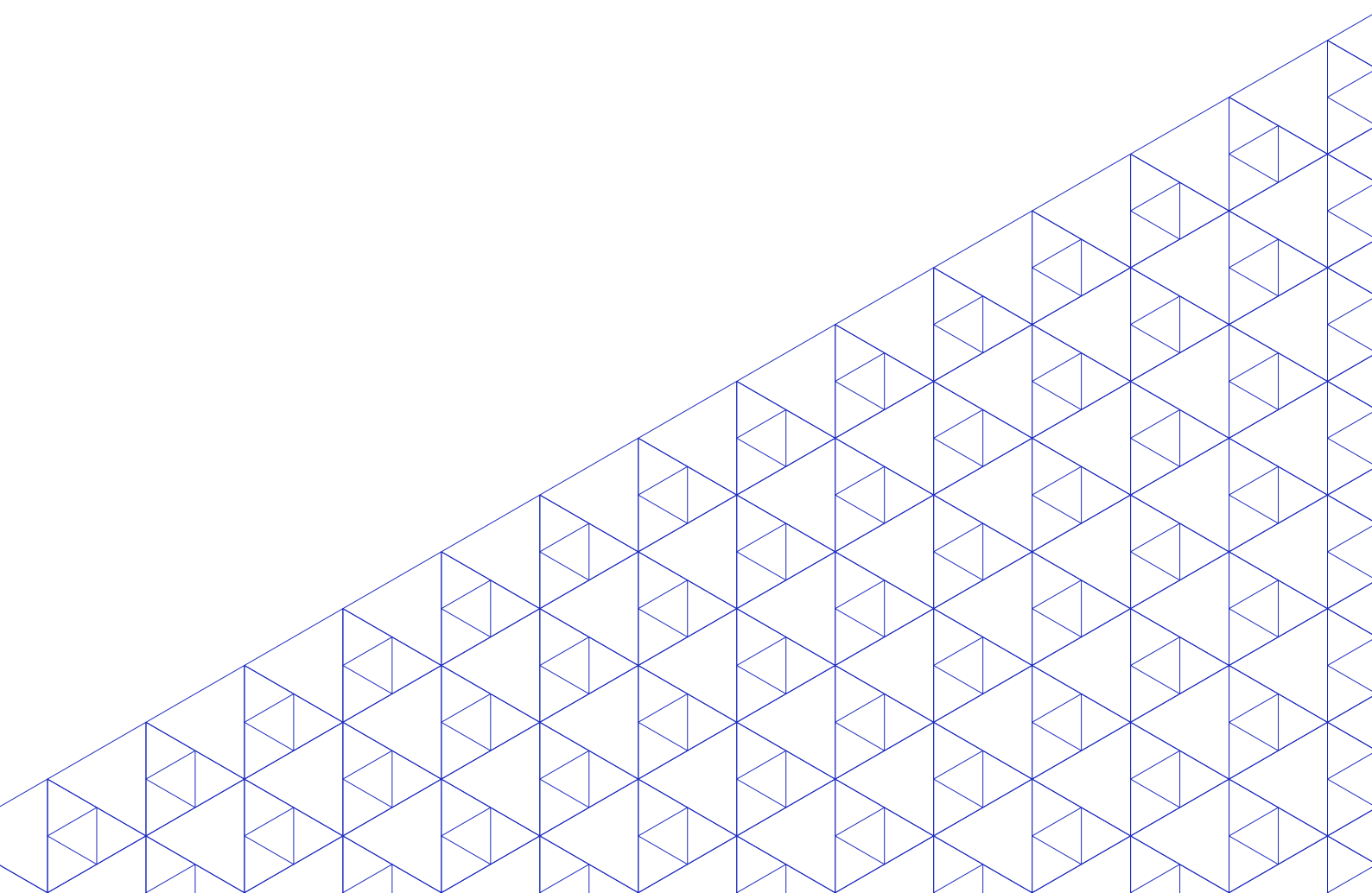




# ► The labour market impact of international trade: Methodological approaches for macro- and meso-level assessments

**Author** / Monica Hernandez





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## ▶ Abstract

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This working paper examines methodological approaches for the empirical assessment of the labour market impact of international trade at the macro and meso level. It considers the underlying assumptions, data requirements and the advantages and limitations associated with each of these approaches in order to evaluate their adequacy and to inform policymaking. A major takeaway of this review is that the approaches commonly used for such assessments tend to focus on quantitative changes in the level of employment and wages, while paying less attention to other aspects related to working conditions. This paper argues that a methodological approach based on mixed methods and drawing on a broader set of indicators can provide more comprehensive insights into the impact of international trade on labour markets.

## ▶ About the author

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## ▶ Table of contents

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Abstract	01
About the author	01
Acronyms	03
Introduction	04
<hr/>	
▶ 1 Partial equilibrium approach	06
Partial analysis for the study of the labour market impact of changes in trade policy	07
Strength and weaknesses	08
<hr/>	
▶ 2 General equilibrium approach	10
Using CGE models to study the indirect labour impact of trade	10
Strengths and weaknesses	15
<hr/>	
▶ 3 Input-output approach, social accounting matrices and multiplier analysis	17
Using multiplier analysis to study the labour impact of trade	18
Strengths and weaknesses	20
<hr/>	
▶ 4 Econometrics	21
Econometric studies of the labour market impact of trade	21
Strengths and weaknesses	24
<hr/>	
▶ 5 Counterfactual thought experiments, in-depth interviews and mixed methods	25
In-depth interviews	25
Case studies	26
Mixed-methods approach	27
Strengths and weaknesses	27
<hr/>	
▶ 6 Future avenues of research	29
<hr/>	
Conclusion	32
Appendix I	33
References	35
Acknowledgements	45

## ► Acronyms

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CETA	Comprehensive Economic and Trade Agreement (between the EU and Canada)
CGE	computable general equilibrium
CTE	counterfactual thought experiment
EU	European Union
GDP	gross domestic product
GE	general equilibrium
GPM	Global Policy Model (of the United Nations)
GTAP	Global Trade Analysis Project
ICIO	Inter-Country Input–Output Database (of the OECD)
I–O	input–output
NAFTA	North American Free Trade Agreement
NTM	non-tariff measure
OECD	Organisation for Economic Co-operation and Development
PE	partial equilibrium
SAM	social accounting matrix
SMART	Software for Market Analysis and Restrictions on Trade
UNCTAD	United Nations Conference on Trade and Development
USITC	United States International Trade Commission
WIOD	World Input–Output Database
WTO	World Trade Organization

## ► Introduction

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There is a general consensus that international trade has a considerable impact on labour markets. By driving structural change as well as productivity (McMillan, Rodrik and Verduzco-Gallo 2014; UNCTAD 2013a), international trade influences the level of employment, income and other labour market outcomes. Given that global supply chains<sup>1</sup> have been operating for several decades, it is not surprising that the effects of trade on labour markets have manifested themselves in countries of all income levels (Baldwin and Okubo 2019; Gereffi, Fernandez-Stark and Psilos 2011; Milberg 2004; UNCTAD 2013b). Excessive and increasing income inequality (ILO 2015a; ILO 2017a; ILO 2019a; UNCTAD 2019a) within a context of hyperglobalization (UNCTAD 2018) have also raised concerns over the effects of trade on working conditions.

It is important to determine whether the tools used for evaluating the labour market impact of international trade are the most adequate because such evaluations inform policy design. This working paper analyses methodological approaches for the empirical assessment of the labour market impact of international trade at the macro and meso level.<sup>2</sup> It considers the underlying assumptions, data requirements and the advantages and limitations associated with each approach. A major takeaway is that approaches commonly used for such assessment tend to focus on quantitative changes in the level of employment and wages, while paying less attention to qualitative changes related to working conditions.

Both partial equilibrium and general equilibrium models have been employed widely for assessing the labour impact of trade. While general equilibrium models allow one to look at the overall macroeconomic impact of trade policy changes,<sup>3</sup> partial equilibrium models focus on specific markets or sectors. When considering changes in trade policy, both types of model provide a framework that is suitable for assessing their impact on the level of wages and employment. They also allow differences in terms of workers' skill level and sex to be taken into account. However, the impact on other labour conditions is more difficult to capture under this framework.

Input-output multiplier analysis and econometric analysis are other common methods for assessing the labour impact of trade at the macro and meso level. Econometric analysis has been used to assess the impact of trade in relation to such issues as wage inequality and child labour. The input-output approach has been used to analyse the way in which the direct impact of trade on employment in one sector may spread to other sectors by considering the backward and forward linkages between sectors. Such an approach is particularly useful in the context of global supply chains (ILO, 2015a).

Despite the improvement and evolution of the available frameworks, there is still a need for a methodological approach that takes into account a broader set of questions and indicators. The inclusion of indicators such as type of contract, hours worked and trade union density, disaggregated by skill, age and sex, remains a priority, as does the use of approaches that make it possible to consider other aspects of the world of work.

In-depth interviews and mixed-methods approaches have also been used, albeit less frequently, to assess the labour impact of trade. Even though these approaches are context-specific and often require a substantial investment of time and financial resources, they are able to provide a detailed account of how labour impacts are experienced by workers (for example, how their working conditions are affected by changes in trade policy). Improving current methods is essential for future research and the adoption of appropriate policies.

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<sup>1</sup> Global supply chains refer to production and related processes that take place across several countries. As pointed out by Elms and Low (2013, xv), "The idiom might vary – referring to trade in value-added, production sharing, supply chains, outsourcing, offshoring, vertical integration, or fragmented production instead of GVCs [global value chains] – but the core notion of internationally joined-up production is the same."

<sup>2</sup> While the choice of methodology depends on the research question and the purpose of the study, rather than the other way round, it is worth noting that data availability and related constraints can affect this choice.

<sup>3</sup> Trade policy is understood as the regulations that govern exports and imports between countries. It includes both tariffs and non-tariff measures, such as quotas and sanitary and phytosanitary measures.

The paper starts by looking at the partial equilibrium approach (Chapter 1) and the general equilibrium approach (Chapter 2). Input-output multiplier analysis and econometric methods are covered in Chapters 3 and 4, respectively. The use of in-depth interviews and mixed-methods approaches is examined in Chapter 5. A brief discussion of future avenues of research is presented in Chapter 6, which is followed by the conclusion.

# ► 1 Partial equilibrium approach

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The most common methodological approaches for the assessment of the impact of trade policy changes are the partial and general equilibrium approaches –<sup>4</sup> specifically, computable partial and general equilibrium models (Cheong 2010a; François 2004; Plummer, Cheong and Hamanaka 2010). The underlying assumptions, data requirements, strengths and weaknesses of the two approaches are considered in this and the next chapter. As explained in more detail below, these approaches allow one to consider quantitative changes of labour market outcomes (such as changes in the level of employment).

The partial equilibrium (PE) approach provides a framework for analysing demand and supply in one market, region, sector, industry and so on, while taking other variables and interactions with other markets, sectors and so on to be constant (François and Reinert 1997). In the context of international trade, this approach is used to analyse the impact of policy changes in the market that is directly affected. It is important to note that this impact is reflected in changes in prices, trade flows,<sup>5</sup> tariff revenue and welfare (Van den Berg 2014; Krugman, Obstfeld and Melitz 2017; Plummer, Cheong and Hamanaka 2010).

The “partial” aspect of this approach implies that the analysis of the effects of trade policy refers only to a specific sector or market (such as the labour market), while the influence of the rest of the economy on that sector, along with non-economic aspects that may influence the sector, are held constant by omitting interactions with other markets.

By way of illustration we may consider a change in trade policy, such as reduction of a particular tariff.<sup>6</sup> When tariffs are implemented, the effect in theory is to increase the price of the imported good and to reduce welfare as a whole. If the tariff is reduced or eliminated, one would expect the opposite effect according to neoclassical economics: the price of the imported good is reduced while overall welfare increases (Elms and Low 2013; Krugman, Obstfeld and Melitz 2017). Hallren and Riker (2017a), give various examples of the use of a PE model to study the economic impacts of trade policy changes – in particular, reducing an ad valorem tariff and increasing an import quota. The authors also suggest ways in which the framework can be extended.<sup>7</sup>

Different PE models have been developed to assess empirically the impact of trade in the market of a specific good – for example, the Software for Market Analysis and Restrictions on Trade (SMART) model.<sup>8</sup> According to Gibson (2011), models like this show flexibility in considering the country- or sector-specific employment losses or gains associated with trade liberalization. The advantage of the SMART model is that, as with other PE models, it allows detailed analysis of the market of interest. The model estimates changes in trade flows (trade creation, trade diversion and price effects), tariff revenue effects and welfare effects. Welfare gains are the sum of additional consumer surplus and tariff revenue (government

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<sup>4</sup> Both approaches can be used for ex ante and ex post assessments of trade policies.

<sup>5</sup> Trade flows refer to exports and imports of goods and services.

<sup>6</sup> A tariff is a tax on imports or exports. Tariffs can be ad valorem or specific. It is also possible to analyse non-tariff measures using a PE approach. Commonly, non-tariff measures are defined as policy measures “that can potentially have an economic effect on international trade in goods, changing quantities traded, or prices or both” (UNCTAD 2010a, xvi). Examples are technical barriers to trade, sanitary and phytosanitary measures, and government procurement restrictions.

<sup>7</sup> Hallren and Riker (2017a) explain how the PE approach may be extended to take into account vertically integrated production, trade in intermediate products, subnational regions, different modes of international supply of services and so on. The authors point out that, since there is more than one way to extend the basic PE model, it is important to find an extension that does justice to the complexities of the economy or sector being analysed.

<sup>8</sup> In the SMART model (see Cheong 2010a; Plummer, Cheong and Hamanaka 2010), the quantities traded are determined by demand and the prices do not change in response to policy changes such as tariff reductions. (The model also accommodates a finite version in which changes in demand have price effects.) In addition, import demand elasticity is the same for each national variety of the imported commodity; export supply elasticity is the same for all foreign exporters of the commodity; and substitution elasticity is also the same for any pair of varieties of the commodity.



rents) because of the increase in imports.<sup>9</sup> Similar models are the Global Simulation Analysis of Industry-Level Trade Policy (GSIM), the Tariff Reform Impact Simulation Tool (TRIST) and the Agricultural Trade Policy Simulation Model (see also Cheong 2010a and WTO 2012).

## ► Partial analysis for the study of the labour market impact of changes in trade policy

It is possible to make the labour market the focus of attention when assessing the impact of changes in trade policy (for example, the effect on labour when imports and exports change as a result of a new trade policy, see table 1<sup>10</sup>). In this case, when the PE approach is applied, the interactions of the labour market with other markets are disregarded. This means that the approach is simple to apply, but the lack of interaction with other markets is one of its main limitations (see section 1.2). Still, the PE approach has proven useful for the meso-level evaluation of job losses and displacement due to import penetration. Barbe and Riker (2017), for instance, have used it to simulate potential changes in foreign trade and domestic employment – in an industry with firm heterogeneity and global supply chains – that may result from an increase in the price of imports due to tariffs and similar measures.<sup>11</sup>

► **Table 1. Partial equilibrium models: Research questions, typical assumptions and data requirements**

Types of question answered	<ul style="list-style-type: none"> <li>– 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?</li> <li>– Answered by computing the factor content, or the amount of labour, of displaced domestic production</li> </ul>
Assumptions and other considerations	<ul style="list-style-type: none"> <li>– Armington assumption (the imported and the local good are imperfect substitutes for each other); implication: consumers do not always purchase the cheapest (normally imported) product</li> <li>– Economic interactions with other markets are excluded from the analysis</li> <li>– The PE approach can also be used to assess the employment effects of export increases</li> <li>– The PE approach can be used when input-output data or social accounting matrices are not available for one of the subjects of the analysis</li> </ul>
Data requirements	Trade flows (exports and imports of goods and services), trade policy (tariffs and NTMs) and elasticities (e.g. price elasticities). A relevant data source is the World Integrated Trade Solution (WITS) database.

**Source:** Based on Van den Berg (2014), Cheong (2010a), Gandolfo (1998), Gibson (2011), Krugman, Obstfeld and Melitz (2017), and Plummer, Cheong and Hamanaka (2010).

An example in the context of multinational firms is the study by Riker (2018), who develops an industry-specific model of international trade in order to examine the quantitative changes in firm-level cross-border employment in such firms when there is an increase in costs (for example, at one of their production locations). The international sourcing patterns of the firms operating in a given industry and the overlap of the markets in which they compete determine the effect on employment in each country.

Riker (2018) uses different PE models based on specific assumptions regarding technology, preferences and labour demand, among others, and offers two suggestions for extending the modelling framework: namely, to endogenize the costs of production or to consider other forms of imperfect competition. It is important to note that even with these extensions of the PE model, the focus of interest remains on changes in the level of employment.

<sup>9</sup> The main data requirements are the tariffs applied by the importing country and the trade flows. Relevant parameters are the export and import elasticity and the substitution (Armington) elasticity. Rather than forecasting, the simulation involves a counterfactual scenario (that is, exploring what would have been different in the absence of the change in policy) and considers only long-term effects.

<sup>10</sup> Table 1 gives examples of the types of question that can be answered using a PE model, together with the main underlying assumptions and the data requirements when considering specifically the labour market impact of trade.

<sup>11</sup> See Hinojosa Ojeda et al. (2000) for an example of the use of PE models in an ex post assessment of the employment impact of the North American Free Trade Agreement (NAFTA) in the United States of America. See also Buch and Schlotter (2013) for another example of the use of the PE approach for ex post analysis of the labour market impact of trade.

Another similar example is provided by Hallren and Riker (2017b), who develop an industry-specific PE model to study the link between changes in trade policy and changes in the level of employment in the United States of America. They also look at regional changes, that is, at how the same change in trade policy may have very different effects on employment in different regions of the country. It turns out that those differences depend on disparities in import penetration in each region. This approach allows one in general to estimate the employment-displacing effect of imports or the number of jobs “saved” (Gibson 2011) by protection tariffs and non-tariff measures (NTMs) (Cheong 2010a; Plummer, Cheong and Hamanaka 2010).

A central premise of PE analysis is the Armington assumption (see table 1), which emphasizes product heterogeneity by positing that the imported and the local good, albeit similar, are imperfect substitutes for each other.<sup>12</sup> Under this assumption (which gives countries a degree of market power), even if one of the goods is cheaper, consumers will not necessarily purchase it, at least not always.<sup>13</sup> Consequently, the labour market impact of changes in trade policy (such as a tariff reduction) depends primarily on the level of the elasticity of substitution between the imported and the local good (the Armington elasticity).<sup>14</sup>

When countries open to trade, they are opening to foreign competition. Imports may be “competitive” (those with the potential to replace local production) or “non-competitive” (those for which there is no substitute in the local economy). While the increase of competitive imports may reduce local production (which can displace or reduce labour, particularly in labour-intensive sectors),<sup>15</sup> the opposite effect can take place when non-competitive imports increase, since local production may be stimulated by the increase of certain imported inputs, leading also to a rise in employment (Dietzenbacher and Lahr 2004; Gandolfo 1994; Gibson 2011).

That is the reason why imperfect substitution of imported and local goods is a key assumption in the PE approach. A high elasticity of substitution indicates that consumers are less attached to local production, so that large job losses may occur once the country opens to trade (or once trade is liberalized). This is important because the whole assessment of the labour market impact of trade hinges on the quality of the estimation of the elasticity of substitution, which is not always easy to achieve (Gibson 2011).

## ► Strength and weaknesses

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One of the main advantages of the PE approach is that it is relatively easy to apply, compared with the general equilibrium approach.<sup>16</sup> This is reflected, in particular, in its low requirements in terms of data (trade flows, tariffs or other policy subject to change, and values of elasticities) and processing. In fact, the PE approach can also be used when one of the parties included in the analysis (say, one country) does not have input–output data or social accounting matrices, which are indispensable for computable general equilibrium models.

As pointed out by de Vet et al. (2010), the fact that PE models can focus on the labour market means that they are able to provide detailed results on employment levels, labour force by group, and wages.

<sup>12</sup> According to Gibson (2011), the first generation of PE models relied on the opposite assumption regarding consumption, namely, that local and imported goods were perfect substitutes for each other. This meant that the early models could be used only to consider negative impacts or worst-case scenarios, where imports always compete with local goods and displace local production if cheaper. By allowing for degrees of imperfect substitution one can avoid such extreme scenarios.

<sup>13</sup> The Armington assumption also implies that countries do not completely switch from importing to exporting a good or vice versa even when price changes take place (Tokarick 2005).

<sup>14</sup> Even though less common, the PE approach can also be used to assess the employment effects of export increases. As with imports, the elasticity of substitution plays a major part in determining those effects.

<sup>15</sup> Paradoxically, neoclassical economic theory considers that while imports may lead to job losses, prices are likely to decrease for consumers, which puts them in a better position than when international trade was absent or when trade had not yet been liberalized.

<sup>16</sup> However, the PE model can be extended to more complex versions that consider more than one market, which entails greater data requirements. Analysing more than one market should not be confused, though, with a general equilibrium analysis, where all markets in the economy are considered simultaneously. In addition, the use of a PE approach does not preclude an analysis that takes into account global supply chains (as in de Soyres et al. 2018; Jones, Demirkaya and Bethmann 2019; Barbe and Riker 2017).

Moreover, they can be used to identify relatively easily the individuals who are likely to lose their job when a country opens to trade and starts deregulating imports (WTO 2017). This can help to provide guidance on the trade adjustment assistance measures that might need to be introduced, and also on job training and other forms of transfer from the public sector (Gibson 2011).

The PE approach also has some drawbacks. In particular, it tends to lead to biased estimates. Since it does not consider the whole economy, the use of such an approach may overestimate the negative impact of a policy change on employment. In addition, there are problems associated with the dependence of the analysis on Armington elasticities. The use of different elasticity values in studies may lead to different conclusions.<sup>17</sup>

The PE approach has also been criticized because many of the models used are static, and adjustment processes, therefore, tend to be omitted in the analysis. For example, such models are unable to predict the speed of adjustment for those who lose their job after a change in trade policy.

Additionally, it is not possible to take into account other relevant inter-industry interactions and the net impact on labour because feedback effects among markets are omitted. In a real economy, job losses can have an impact on demand, while lower import prices may benefit producers in other markets, which are then able to employ more workers (Cheong 2010a; Plummer, Cheong and Hamanaka 2010). As will be seen in Chapter 2, the general equilibrium framework can take these aspects into account. Accordingly, it is widely acknowledged that partial and general equilibrium approaches are complementary and not necessarily substitutes for each other (Gibson 2011).

Another problem with the PE approach is that it may overestimate the impact of trade, leading to an anti-trade bias or vice versa. This confirms the preferability of using economy-wide rather than PE approaches when assessing the employment effects of trade (Gibson 2011). Finally, the examples mentioned above indicate that the focus of the PE approach is on the impact of trade on job losses or gains and on wage changes. Other aspects of the labour market are more challenging to capture with this framework. That being said, those aspects cannot be analysed anyway without available and compatible data.<sup>18</sup>

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<sup>17</sup> Chapter 2 discusses other limitations related to the Armington assumption in the context of the general equilibrium approach.

<sup>18</sup> For instance, data on formal and informal employment are not always available. In addition, while data on other aspects, such as age or region of employment, may be easier to obtain, those data may not always be compatible with the framework used. PE models and the computable general equilibrium models presented in Chapter 2 can be implemented in combination with an accounting framework (such as input–output tables or social accounting matrices), where data that are compatible with the framework can be included. For an example of a study that considers the impact of key public policies on quantitative and qualitative aspects of the labour market, see Alarcón and Ernst (2017).

## ► 2 General equilibrium approach

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Broadly speaking, general equilibrium (GE) refers to the simultaneous equality of supply and demand in all the markets that make up the economy or region under study. A GE approach can be used to analyse the macroeconomic implications of changes in trade policy.

A widely used tool, based on the GE framework, for the ex ante or ex post analysis of the economic impact of changes in trade policy is computable general equilibrium (CGE) models, which can be defined as computer-based simulations that are able to run counterfactual scenarios.<sup>19</sup> Unlike their PE counterparts, GE models consider how policy changes affect not only the market in which the policy shock takes place directly, but also the effects in interrelated markets (such as markets of substitutes and complementary goods, and also input markets).

### ► Using CGE models to study the indirect labour impact of trade

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Computable general equilibrium models can be used to estimate the macroeconomic impact of changes in trade policy on the economy and the indirect effects on a market (such as the labour market) while considering interactions with other markets. In terms of macroeconomic impact, such models are used to estimate the effects on gross domestic product (GDP), aggregate employment and welfare. A common example is the use of CGE models for the evaluation of the potential<sup>20</sup> economic effect of deregulation brought by regional trade agreements. CGE models develop counterfactual scenarios in which changes, normally reductions of tariffs and NTMs,<sup>21</sup> take place.

Some examples of the use of CGE models for ex ante impact assessments are: Civic Consulting and Ifo Institute (2018), where the model is used to assess the economic impact of the free trade agreement between the European Union (EU) and the Republic of Korea (see also LSE Enterprise 2017; European Commission 2017; ECORYS and CASE 2017); OECD (2018), which examines how market integration contributes to growth and employment; and Kitwivattanachai, Nelson and Reed (2010), who employ an extension of a basic CGE model to compare, under different scenarios, the economic effects of an East Asian free trade area while considering the effects on unemployment and real wages.

A CGE model is used by Raihan and Cheong (2013) to study the impact of trade on employment in the information technology sector in Bangladesh; by Carneiro and Arbache (2003) to study the impact of trade on the Brazilian labour market; and by Fontana (2004) to investigate the effects of trade on women. Moreover, UNCTAD (2017) has designed a Trade and Gender Toolbox for assessing the impact of trade from a gender perspective<sup>22</sup> (for further examples of CGE analysis, see Raihan 2013; Australia 2010; United Kingdom 2018; and USITC 2019).

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<sup>19</sup> A counterfactual scenario refers to a hypothetical situation in which changes in policy have not occurred, and which can therefore be compared with a situation in which the changes have already taken effect.

<sup>20</sup> This methodology has been used for the ex post assessment of regional trade agreements too (ECORYS 2017; Jean, Mulder and Ramos 2014).

<sup>21</sup> Both tariffs and NTMs are important when considering the overall impact of trade. In CGE models, NTMs are not represented by a specific number (a percentage of price or amount per unit), but they are treated in a similar way to tariff measures (for example, ad valorem equivalents of NTMs are incorporated into the simulations). However, a major shortcoming of this procedure is that it considers NTMs only as costs and does not take into account the loss of welfare that occurs when NTMs that are socially justified (for example, standards related to health and the environment) are eliminated as part of the simulation (Hayashi 2000).

<sup>22</sup> The core of the methodology is a CGE model, which draws on the Global Trade Analysis Project (GTAP) model (UNCTAD 2019b). The advantages and limitations associated with the GTAP model also apply in this case. Potential extensions of the Toolbox have also been identified (see UNCTAD 2019b).

It is worth bearing in mind that trade and economic models in general (and the results obtained by using them) depend on economic theories, and in that sense they cannot be said to be ideologically neutral. CGE models, for instance, are grounded in neoclassical economic theories, as may be seen from their underlying assumptions. Table 2 below lists the assumptions in a typical CGE model. In the most basic standard setting, when the overall economic impacts (on GDP and welfare) are considered, the labour market is represented in a way that treats labour supply as fixed, while a uniform and flexible wage allows labour supply and demand to reach equilibrium. Neoclassical CGE models, which assume full employment, postulate that wages can fall infinitely until everyone who wants to work is employed. This assumption has been criticized severely for its lack of realism (see section 2.2 below).

In the traditional standard model,<sup>23</sup> labour is a homogeneous factor of production that is used as an input to a production function – for example, a production function with constant elasticity of substitution.<sup>24</sup> In static models, the supply of labour is taken as a given parameter, while in dynamic models the supply of labour can be made endogenous.<sup>25</sup> CGE models in general make use of the Armington assumption of imperfect substitution between imported and local products, which is also used in the PE approach, as explained in Chapter 1.

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<sup>23</sup> For details of the different structures, equations and other features of the model, see Burfisher (2016). See also Gibson and Van Seventer (2000) and Taylor (1990) for a discussion of the differences between neoclassical and structural CGE models mentioned further on in the text.

<sup>24</sup> Other types of production function may also be used, such as fixed-coefficients and Cobb–Douglas production functions.

<sup>25</sup> By combining assumptions regarding the labour force participation rate with population forecasts (see Gibson 2011).

► **Table 2. Computable general equilibrium models: Research questions, typical assumptions and data requirements**

Types of question answered (overall economic impact)	What are the potential effects of changes in trade policy (e.g. reductions in tariffs and NTMs) on real GDP, trade flows and welfare? How will real GDP and the balance of trade change in a country that joins a regional trade agreement?
Typical assumptions <sup>a</sup> in neo-classical CGE model (see also table A in Appendix I for an example)	<ul style="list-style-type: none"> <li>– Perfect competition</li> <li>– Factor prices (e.g. wages) equal marginal productivity</li> <li>– Full employment</li> <li>– Constant elasticity of substitution (factors can be substituted for each other at a constant rate)</li> <li>– Armington assumption (the imported good and the local good are imperfect substitutes for each other); the implication is that consumers do not always purchase the cheapest (normally imported) product</li> </ul>
Typical assumptions <sup>a</sup> in structuralist CGE model	<ul style="list-style-type: none"> <li>– Imperfect competition (firms have some price-setting power)</li> <li>– Output, income and employment are driven by demand</li> <li>– Fixed real wages; excess supplies of labour<sup>b</sup></li> <li>– Involuntary unemployment (due to lack of employment opportunities)</li> <li>– Production technology features fixed proportions with underutilized resources</li> <li>– Installed capital equipment features excess capacities</li> <li>– Intersectoral reallocation effects exist</li> <li>– Wages are the result of collective bargaining and class conflict</li> </ul>
Data requirements	<p>Policy changes (e.g. percentage of tariff or NTM reduction); elasticities (behavioural parameters, which may be adopted from previous studies, such as goods substitution elasticities, factor substitution elasticities and consumer demand elasticities); national input–output tables organized into a social accounting matrix<sup>c</sup></p> <p>The Global Trade Analysis Project (GTAP) database is a common source of data when using a CGE model.<sup>d</sup></p>
<b>Labour market modelling in a CGE framework<sup>e</sup></b>	
Changes affect <b>labour supply</b> directly (labour supply receives direct initial shock)	<p>Focus: the labour market (for the analysis of changes regarding labour market institutions: minimum wages, unemployment benefits or trade unions)</p> <p>Sample question: How will in-work benefits increase the labour supply of low-skilled workers?</p> <p>There are two ways of proceeding with the analysis:<sup>f</sup></p> <ul style="list-style-type: none"> <li>– Representative household</li> <li>– Microsimulation approaches</li> </ul>
Changes affect <b>labour demand</b> indirectly (initial shock is received in a different sector and then impacts on labour demand)	<p>Focus: the labour market (for the analysis of policy changes in a sector other than the labour market that affects the labour market indirectly). For example, the impact of changes in trade policy on labour.</p> <p>Sample question: What are the potential effects of changes in trade policy (e.g. trade deregulation) on labour market outcomes (such as wages and employment)? Will real wages and employment be affected when tariffs and NTMs fall?</p> <p>Way to proceed with the analysis:</p> <ul style="list-style-type: none"> <li>– Substitutability and complementarity of different types of labour<sup>g</sup></li> </ul>

**Notes:** <sup>a</sup> The table lists some of the most common assumptions used in CGE models. However, since assumptions are model-specific, alternatives to the ones presented here are possible. The results of assessments of the economic and labour impact of trade critically depend on these assumptions.

<sup>b</sup> Excess supplies of labour generate higher employment multipliers than in standard CGE models (see Gibson 2011).

<sup>c</sup> In addition to input–output data, social accounting matrices include industry–institution and inter–institutional financial flows.

<sup>d</sup> The GTAP offers a database in which the reference years, regions, sectors and other information are regularly updated. However, the appropriateness of the data for each study should not be taken for granted, since potential good-quality data could be available from other sources for the specific economy being studied. Similarly, as pointed out by Cheong (2010a), when using a database, it is important to check that the data coverage and the time periods for which relevant parameters were calculated are pertinent to the countries and goods included in the simulation. This is of critical importance given that the results of the model also depend on the values of these parameters.

<sup>e</sup> The following section of the table is based on Boeters and Savard (2013). In addition to labour supply and demand, the authors of that study also consider issues related to labour market coordination (scope of the market, involuntary unemployment, wage-forming mechanisms and others).

<sup>f</sup> See Agénor, et al. (2007) for an example.

<sup>g</sup> For example, the estimation of labour demand for a specific set of labour types (estimation of labour demand elasticities or substitution elasticities). See Boeters and Savard (2013) for details.

**Source:** Based on Raza et al. (2016), Gibson (2011), de Vet et al. (2010), Boeters and Savard (2013) and Cheong (2010a).

Structuralist CGE models are a different type of CGE model. Even though they share some of the underlying assumptions of neoclassical CGE models, they differ in critical aspects. In contrast to neoclassical models, structuralist ones assume imperfect competition and incorporate country-specific “rigidities”. In addition, they tend to be highly “linearized”, with labour demand functions that are based on fixed labour coefficients – that is, they do not depend on the real wage (Gibson 2011).

In addition, while neoclassical CGE models assume that GDP, income and employment are determined by aggregate supply, structuralist models assume that they are determined by aggregate demand.<sup>26</sup> If an economy is demand-driven, an increase in exports, independently of a rise in imports, will increase employment. As indicated in table 2, the production technology in structuralist models features underutilized resources, while installed capital equipment features excess capacities. This means that, if aggregate demand increases, there will be an increase in the use of capital, which implies an increase in labour demand too.<sup>27</sup>

Structuralist CGE models do not overcome all the limitations of their neoclassical counterparts. They also omit potential positive effects from regulations, such as NTMs. They are based on the view that regulations in general impose only costs, and that reducing regulations is essential to bring about economic benefits (Raza et al. 2016).

CGE models generally rely on social accounting matrices, which represent the economy at a specific point in time and include data on consumption, investment, government spending, exports and imports. Such matrices are used to calibrate the models, defining both the structural parameters and the baseline values of most of the endogenous variables.<sup>28</sup> Once this step and a replication check<sup>29</sup> have been concluded, a simulation of the overall economic impact of changes in trade policy can be conducted. A change of policy will lead to a new equilibrium. If tariffs are already low, a further reduction may result in only small changes in employment, and vice versa.

A specific CGE model used widely to analyse the economic impact of changes in trade policy is the one developed under the Global Trade Analysis Project (GTAP).<sup>30</sup> The GTAP model in its standard version is described as multiregional (a region represents one country or a group of countries) and multisectoral – that is, the model considers the market for inputs, final goods, factors of production and so on (see Cheong, Jansen and Peters 2013 for examples). It incorporates a global banking sector that connects global savings and consumption, and also takes into account international trade and transport margins. The GTAP includes a database on bilateral trade, production and consumption of final and intermediate goods and services (see table A in Appendix I for further details of the model).

It is important to emphasize that when assessing the overall economic impact of changes in trade policy, CGE models consider only a basic version of the labour market. According to Boeters and Savard (2013), there are two main motivations for going beyond a typical simple labour market setting when using CGE models (see table 2 above).<sup>31</sup> The first is when there is a policy change that is directly related to the labour market (for example, a policy that affects wages, in-work benefits or collective bargaining), while the second such motivation is when the policy shock does not originate in the labour

<sup>26</sup> In contrast to neoclassical models, structuralist ones assume that investment is the independent variable that drives savings (it generates the savings necessary to finance itself). In this context, investment is a function of capacity utilization, the profit rate or the interest rate. Labour productivity also increases with demand, which takes place through different channels (see Raza et al. 2016).

<sup>27</sup> Aggregate labour demand is determined by the interplay between aggregate demand and aggregate productivity growth.

<sup>28</sup> Values for parameters may be adopted from the literature or they may be calibrated (see Cheong 2010a). It is worth noting that a wide variety of models can be calibrated using the same social accounting matrix.

<sup>29</sup> A replication to verify that the equilibrium solution reproduces the matrix data for the baseline year.

<sup>30</sup> The latest version of the GTAP model is version 7, which separates activities (sectors) and commodities (goods and services), thereby allowing for multi-product sectors and also different sectors producing the same type of good. Other changes introduced in the latest version have to do with sets, parameters and variables (see Corong et al. 2017).

<sup>31</sup> According to Boeters and Savard (2013), the labour market, more than any other element in a CGE model, lacks a consensus or majority set-up. The modelling strategy ultimately depends on the policy shock to be analysed and on the variables of interest. The authors also point out that, compared with other aspects related to the modelling of labour markets in CGE models such as labour supply and market coordination, labour demand offers the least conceptual choices.



market, but triggers consequences that have a direct bearing on that market (for example, the labour impact of a trade policy).<sup>32</sup>

In the second case, it is possible to use CGE models to look at the effects of, say, trade deregulation on wages and employment. The impact of the change in trade policy on labour market outcomes is indirect; it is transmitted via other elements of the model. The policy change first affects export and import markets and subsequently the labour market.<sup>33</sup> CGE models are also useful for studying the impact of changes in trade policy on the informal sector. Such models have been used to address informality in markets for goods and factors of production. Sinha (2011), for example, employs a CGE model that considers both the impact of trade on the informal economy and the impact of the informal sector on trade (see also Bautista, Lofgren and Thomas 1998).

According to Boeters and Savard (2013), modelling multiple dimensions of labour demand heterogeneity<sup>34</sup> is particularly challenging. These dimensions include skill level (the most prominent – see, for example, Hertel 1997); occupation, which is also regarded as a substitute for skill level (Carneiro and Arbache 2003); formal and informal work; rural and urban areas (Hendy and Zaki 2013); gender (Fontana 2004); and ethnicity (Flaig et al. 2011). Different models may include more than one of these dimensions of labour heterogeneity. In such cases, the structure of the production function has to be designed accordingly,<sup>35</sup> which is another challenge in using these models (see Boeters and Savard (2013) for details and more examples).

The final results concerning the labour impact of changes in trade policy will depend on the models' assumptions and their structure. If they are not representative of reality and the lack of realism is not sufficiently justified, the conclusions obtained cannot properly inform policymaking.

An alternative to CGE models is available for assessing the labour impact of trade, namely the United Nations Global Policy Model (GPM),<sup>36</sup> which is a dynamic macroeconomic model that has been used to analyse the impact of policies at a global level while considering global and regional interactions. Even though the GPM is not a trade model as such, it allows one to consider global international trade and its links with growth and income distribution (UNCTAD 2018). This model can be used to analyse historical developments, and it has also been used to simulate potential future impacts of policy changes (Cripps and Izurieta 2014; Michell 2016). Notably, and in contrast to other models with a global perspective, the GPM is distinguished by the fact that it allows for the possibility of persistent involuntary unemployment and for changes in income distribution.<sup>37</sup>

A recent example of the use of the GPM is provided by Kohler and Storm (2016), who apply the model to study the macroeconomic impact of the Comprehensive Economic and Trade Agreement (CETA) between Canada and the EU, allowing for changes in employment and income distribution. They found that CETA is expected to lead to intra-EU trade diversion, unemployment, inequality and overall welfare losses. Another example is the study by Capaldo (2015), who uses the GPM to assess the impact of the Transatlantic Trade and Investment Partnership on the economy as a whole, including employment. Among other things, the author predicts a contraction of GDP, employment and personal income and

<sup>32</sup> Boeters and Savard (2013) have developed a classification of typical CGE models with a labour market focus. They identify strands in the development of labour market modelling (for example, more complex mechanisms and more detailed disaggregation) and the importance of their interaction. The authors also provide a comprehensive overview of modelling options, but acknowledge that they do not take into account dynamic models with forward-looking agents or business cycle issues (such as the role of “sticky wages”) or problems related to factor mobility that arise in regional modelling.

<sup>33</sup> The key element here is whether the real wage is assumed to follow the movement of the marginal product of labour one-to-one (the case of perfect competition) or whether there are wage rigidities (imperfect competition). See Boeters and Savard (2013) for more details.

<sup>34</sup> These dimensions of heterogeneity may give rise to a problem of “nesting hierarchy”, that is, where it is not clear which types of labour should be grouped into a nest at a higher level, and which at a lower level (Boeters and Savard 2013).

<sup>35</sup> However, many studies include elasticities of substitution that have been developed informally or even just guessed (Boeters and Savard 2013).

<sup>36</sup> 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.

<sup>37</sup> In this sense, the GPM may be said to be demand-driven. Financial aspects and the flow of funds play a major part in the model and influence other macroeconomic variables. The GPM considers technological change endogenously, modelling it as a function of demand and export diversification (Onaran 2016).



also a continuing downward trend in the labour share of GDP. Analysis based on the GPM is also used for the *Trade and Development Reports* (see, for example, UNCTAD 2014; 2018; 2019c).<sup>38</sup>

## ► Strengths and weaknesses

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The most obvious advantage of CGE models is that they can be used to study the macroeconomic impact of changes in trade policy, which, as seen in Chapter 1, is not possible with the PE approach. CGE models take into account prices, competition and interactions between sectors after policy changes have taken place. For instance, after a tariff reduction, the local production of a specific good may decrease owing to foreign competition, which will reduce the demand for related local inputs from other sectors and consequently also affect labour demand.<sup>39</sup> As well as interactions, CGE models take feedback effects into account. An increase in imports may negatively affect local production, reducing the demand for domestic inputs and driving down their prices. The reduction of prices, however, can also prompt local producers to increase the production of a particular good, which may in turn trigger an increase in the demand for inputs and labour.

CGE models can be adjusted to consider a more complex labour market structure. However, the need for large and expensive data sets (see de Vet et al. 2010) imposes certain constraints on their use.<sup>40</sup> Additionally, because their focus is on overall impacts, these models are unable to provide detailed information on the specific markets that make up an economy – for example, on where and when job losses are expected to occur following a fall in labour demand.

The assumptions of full employment and perfect competition are a further limitation of CGE models and indicative of their lack of correspondence to the real world (Ackerman and Gallagher 2008; Ackerman and Nadal 2004). Perfect competition is an “idealistic”, unattainable assumption of how an economy should be: it suggests that agents possess perfect information in a static model or perfect foresight in a dynamic one.<sup>41</sup> Similarly, Hendy and Zaki (2013), Ackerman and Gallagher (2008) and other studies have pointed out that one major problem with CGE models is their dependence on the assumption that only free markets can lead to general equilibrium, which is the optimal state. With such an unrealistic target, regulation – including trade regulation – can never be welfare-improving.

In fact, CGE models see all forms of trade regulation as costs (Hernandez 2019; Raza et al. 2016). When using ad valorem equivalents of NTMs, they treat all such measures uniformly, overlooking their differences and the fact that some of them have been introduced in response to social and environmental concerns (see UNCTAD and World Bank 2018; Cadot, Munadi and Ing 2017). CGE models cannot account for the positive aspects of NTMs, thereby leading to the wrong conclusion that the elimination of such measures must always be welfare-improving. Something similar is observed with CGE models that have been used to study the potential effects of a minimum wage. For instance, Storm and Isaacs (2016) show how, by construction, the use of a neoclassical CGE model leads to the conclusion that higher wages can only result in job losses and economic deterioration. Caution should therefore be exercised when considering what drives the usually positive economic impact of trade deregulation predicted by these models (see Hernandez 2019; Raza et al. 2016).

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<sup>38</sup> The GPM's features and assumptions have been examined by Lavoie (2016), who also compares the GPM with other models, including structuralist CGE models. Regarding the dynamics of employment and income distribution in the GPM, Onaran (2016) points out that the model includes behavioural equations for labour force participation, wages and unemployment. Unemployment is modelled via an identity that reflects the difference between labour force participation and the unemployed population, while labour supply is modelled via labour force participation for men and women. Technical documents on the GPM may be found at: <https://www.un.org/development/desa/dpad/publication/united-nations-global-policy-model/>.

<sup>39</sup> Changes in the prices of inputs will depend on how important those inputs are for the local industry. When the local industry is a major employer, workers will face major reductions in their wages while employment decreases. Moreover, workers will reduce their consumption of the local good.

<sup>40</sup> As pointed out by de Vet et al. (2010), differences in the functioning of national and regional economies, labour markets and institutional contexts make it particularly difficult to use such models for studies at the regional level.

<sup>41</sup> Even though it is not representative of any real economy, this assumption is used in standard PE and CGE models. Otherwise it would not be possible for equilibrium to be reached.

The CGE models' reliance on the Armington assumption has also been criticized, since it understates the possibility of trade diversion. Complete substitution of local production with imports is not possible if one assumes imperfect substitutability, which may lead to a bias towards particular trade policies, such as the adoption of free trade agreements (Cheong 2010a). In other words, under the Armington assumption, not implementing a particular trade policy (a regional trade agreement, for example) can only lead to a reduction in welfare. Studies by Taylor and von Arnim (2006) and Hammouda and Osakwe (2008) have identified the vulnerabilities associated with the Armington function and its estimated elasticities. As already mentioned, critical policy recommendations depend on parameters that cannot be estimated with great accuracy (in Gibson, 2011). According to the same source, critics have, moreover, pointed out how CGE models neglect features central to development (such as credit markets, uncertainty over property ownership and rights, asymmetric information, coordination issues and adjustment costs), along with power relations and strategic considerations.

Even though fully fledged dynamic CGE models do exist,<sup>42</sup> some of the models used to evaluate the economic impact of changes in trade policy rely on a comparatively static framework that omits information on adjustment processes. Such information could be relevant for those negatively affected and is particularly important when assessing labour market outcomes. The CGE approach has, accordingly, been criticized for not taking into account the long-term implications of changes in trade policy and for not anticipating the potential need for workers to change jobs after a trade shock has taken place (see Ackerman and Nadal 2004).

An interesting observation by Gibson (2011) is that CGE models have an attribute that is both a strength and a weakness at the same time. On the one hand, they can help to quantify the welfare cost of those excluded from particular measures (such as fair-trade measures, improvements at factories and decent work initiatives). On the other hand, the models' results may be interpreted as if the costs of implementation of those measures were actually higher for society than if they were not implemented.

Finally, it should be stressed that just as with the PE approach, the focus of the GE approach is on the quantitative impact of trade on the level of wages and employment. Even though disaggregation by skill level and sex may be incorporated into the analysis, other worker characteristics are more difficult to represent using a supply and demand framework. Moreover, the availability of data plays a vital role in such analysis.

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<sup>42</sup> See, for example, Gibson and Van Seventer (2000).

# ► 3 Input–output approach, social accounting matrices and multiplier analysis

Input-output (I-O) tables and social accounting matrices (SAMs) provide a simple but rich overview of the economic structure of a country. A basic I-O table shows the inter-industry transactions between all sectors in the economy. A SAM extends the I-O framework by also recording the non-market monetary transfers between sectors and institutions (household, companies and government), thereby factoring in distributional aspects (Ernst and Peters 2012).

I-O analysis is an approach commonly used for the ex post<sup>43</sup> assessment of the economic and labour impact of changes in trade policy. A basic I-O model considers the interrelations between the sectors in an economic system and draws on the information provided in national accounts. As can be seen in table 3 below, regional models also link regional data. Leontief (2008) provides an explanation of the basic structure and ideas behind I-O analysis (see also Miller and Blair 2009).

In I-O analysis, factors of production such as labour and capital are represented by fixed coefficients under the assumption that their prices do not change. Table 3 lists this and other underlying assumptions, together with examples of questions that can be answered using this approach, a representation of the basic equation of I-O analysis, and a summary of the data requirements.

► **Table 3. Input–output approach: Research questions, typical assumptions and data requirements**

Types of question answered with I-O analysis	<p>What are the sectoral employment effects of trade policy changes? What is the effect of changes in net exports on sectoral output?</p> <p>How many jobs were created and how many destroyed as a consequence of the implementation of a new trade policy? And how many in each country?</p> <p>(This approach can be used in the context of global supply chains too. See table 4 further down.)</p>
Assumptions	<ul style="list-style-type: none"> <li>– Fixed-coefficients or linear production technology<sup>a</sup></li> <li>– Factor prices remain unchanged (e.g. fixed wages)</li> <li>– Level of productivity is exogenously given (not determined within the I-O framework)</li> </ul>
Basic equation of I-O analysis	<p><math>X = AX + F</math></p> <p>where <math>X</math> is a column vector of gross output, <math>A</math> is the coefficient matrix and <math>F</math> is a column vector representing final demand.</p>
Data requirements	<ul style="list-style-type: none"> <li>– Economy-wide models require aggregate data from national accounts or more disaggregated I-O tables (detailed information on industry interactions, with one another and the rest of the economy)</li> <li>– Regional models link regional I-O matrices</li> <li>– Sources of global I-O tables are the Inter-Country Input-Output Database (ICIO) developed by the OECD, the World Input-Output Database (WIOD) and the Eora multi-region I-O tables<sup>b</sup></li> </ul>

**Notes:** <sup>a</sup> In general, production functions reflect the maximum level of output that can be achieved with a given amount of inputs. Fixed or linear production functions combine inputs in a fixed proportion. This type of production function is also known as a fixed-proportions, or Leontief, production function.

<sup>b</sup> An example of the use of the Eora I-O tables in the context of global supply chains is the UNCTAD–Eora Global Value Chain database. See Casella et al. (2019).

**Source:** Gibson (2011); Leontief (2008); OECD; WIOD and Eora databases.

The I-O approach can be used to estimate the impact of changes in final demand (private and public consumption, investment, net exports) on levels of production. It is also useful for the examination of

<sup>43</sup> For an overview of approaches that can be used in the ex post economic assessment of free trade agreements, see Cheong (2010b).

the effects of policy changes (for example, changes in trade policy) in a specific sector such as the labour market. Lurweg, Oelgemöller and Westermeier (2010), for example, used I–O analysis to examine the link between trade and job creation/destruction in the manufacturing sector in Germany for the year 2005. The authors concluded that, despite the gains in employment associated with international trade, the country's dependence on mainly two sectors placed it in a vulnerable position because of business fluctuations.<sup>44</sup>

## ► Using multiplier analysis to study the labour impact of trade

One of the main characteristics, and also advantages, of I–O analysis is that it allows a multi-market approach so that interactions between sectors can be taken into consideration (see the toolkit developed by the ILO (2019b)).<sup>45</sup> Multiplier analysis is useful for evaluating whether employment changes in one sector after a shock are offset by employment changes in other sectors.<sup>46</sup> I–O models can also take into account the informal sector by treating it as operating alongside the formal sector and trading with it (Gibson 2011). The analysis of such intersectoral effects is possible because I–O models are based on backward and forward associations, or linkages, between each sector and the rest of the economy. In other words, they are suitable for examining the direct and indirect<sup>47</sup> employment effects of changes in trade policy.

Indirect effects can be the result of either consumption linkages or production linkages. Consumption linkages are present if, as a result of the exogenous shock, changes in production affect factor income, which translates into changes in household revenue that trigger other changes in private consumption. These linkages are determined by the distribution of income and by household consumption patterns. Production linkages can be divided into backward and forward linkages. The former arise from the use that the shock-receiving sector makes of the inputs produced in other sectors. Backward linkages capture the effect of the shock on the final demand in the affected sector. Forward linkages, on the other hand, originate in the distribution of the output generated by the shock-receiving sector to other sectors, which use it as an input in their own production processes.<sup>48</sup>

In order to use multiplier analysis to quantify the number of jobs created or destroyed in an economy after receiving a shock in demand, it is necessary to construct a matrix of employment multipliers, which is the result of employment–output ratios multiplied by their corresponding output multipliers.<sup>49</sup> These output changes are then transformed into employment effects when the multiplication of both matrices (employment–output ratios and output multipliers) takes place.

The employment effect of a particular shock to final demand is, then, the result of the multiplication of the matrix of employment multipliers with a vector representing the shock to final demand in the sectors that make up the economy.

<sup>44</sup> Lurweg, Oelgemöller and Westermeier (2010) specify the number of German jobs embodied in net exports as being equal to  $LC * (I - A)^{-1} * TM$ , where  $LC$  is a diagonal matrix having the labour coefficients as diagonal entries,  $(I - A)^{-1}$  is the inverse Leontief matrix and  $TM$  is the trade matrix. This study also includes an overview of the literature on the sectoral job effects of trade.

<sup>45</sup> The toolkit explains how to perform multiplier analysis using SAMs. The SAM multipliers are computed using the standard Leontief inverse formula (ILO 2019b, 19–28).

<sup>46</sup> Examples of pioneer studies advocating the use of I–O analysis to examine the employment effects of trade are Sachs et al. (1994) and Wood (1991).

<sup>47</sup> The impact of an exogenous demand shock (for example, on export demand) can be direct (when it affects the sector where the shock takes place) or indirect (the effect on sectors other than the one where the shock takes place). The sum of both types of impact defines the total multiplier effect, which refers to the extent to which the direct effect is amplified by the endogenous interlinkages between sectors.

<sup>48</sup> Backward linkages for a specific sector correspond to the column sum of the Leontief inverse matrix. Forward linkages for a particular sector correspond to the row sum for that sector in the Ghosh inverse matrix. See ILO (2019b) for details and examples of how to perform these calculations.

<sup>49</sup> Output multipliers represent the total change in the output value of a sector (ILO 2019b, 26).

Table 4 below shows, among other things, the data requirements for multiplier analysis. SAMs and employment data in “satellite accounts”<sup>50</sup> are required to compute the employment–output ratios (number of workers per unit of output for a specific year) for each sector.

► **Table 4. Application of multiplier analysis to the study of the labour market impact of trade**

Types of question answered with multiplier analysis	What is the employment impact of an indirect change in final demand? How many jobs are created or destroyed after a shock in net exports?  What is the number of sectoral jobs created per country as a result of changes in foreign final demand (for example, in the context of global supply chains), and how are skilled and unskilled workers affected?
Data requirements	Data from SAMs and satellite accounts; employment–output ratios
Employment effect (job creation and destruction)	$Employment\ effect = EmpM * X$  <i>EmpM</i> : matrix of employment multipliers <i>X</i> : shock vector affecting final demand

**Source:** Based on ILO (2019b).

An example of the use of an I–O approach is the study by Kucera, Roncolato and von Uexkull (2010), who carry out an ex post<sup>51</sup> evaluation of the labour and distributive impact of trade contraction in India and South Africa during 2008–09. The authors use data from SAMs in an I–O model to look at aggregate and industry-level employment while also taking into account differences between workers (for example, in terms of sex and skill level). The authors consider two types of multiplier: Type I multipliers addressing the direct effects of trade contraction on incomes and employment and the indirect effects stemming from forward and backward production (I–O) linkages; and Type II multipliers, which, in addition to these direct and indirect effects, include the income-induced effects resulting from changes in household expenditures.<sup>52</sup> In this way, the authors show how a shock taking place in one sector can have significant effects (such as employment changes) in other sectors.<sup>53</sup>

By using global I–O tables, it is possible to estimate the number of sectoral jobs created in different countries as a result of changes in foreign final demand. This application of the I–O approach is very important, given that internationally linked-up production through global supply chains has been taking place for more than four decades now (Amador and Cabral 2016; Gereffi, Fernandez-Stark and Psilos 2011; Milberg and Winkler 2013; UNCTAD 2013b).

Significantly, the use of global I–O tables also allows one to take into account the type of employment (skilled or unskilled) used in the production process. A relevant example is the study by Timmer et al. (2014), who used the 2013 version of the World Input–Output Database (WIOD),<sup>54</sup> covering the 27 EU countries at the time and 13 other “major” countries for the period 1995–2011, in order to track the flow of products across industries and countries and, thereby, measure the value added in global supply chains. An earlier study by the same group of authors, Timmer et al. (2013), looked at the changes in the number and skill level of jobs and the distributional effects arising from the internationalization of production.<sup>55</sup>

<sup>50</sup> These are matrices containing data on employment (for example, the number of workers per sector).

<sup>51</sup> It is worth noting that this methodology can also be used for ex ante analysis (Wixted, Yamano and Webb 2006).

<sup>52</sup> The study by Kucera, Roncolato and von Uexkull (2010) uses only exports in constructing the demand vector, while other studies have used net exports (exports minus imports) relative to domestic production for a more precise analysis of the effects of a changing structure of trade (see, for example, Kucera and Milberg 2003).

<sup>53</sup> See also Ernst and Peters (2012) for a study of the employment impact on Indonesia of the free trade agreement between the Association of Southeast Asian Nations (ASEAN) and China, which combines the SMART model introduced in Chapter 1 with SAMs.

<sup>54</sup> The most recent release of the database is the 2016 version, which covers the then 28 EU countries and 15 other countries during the period 2000–14. See [www.wiod.org](http://www.wiod.org). Another example of a global I–O database is the Inter-Country Input–Output Database (ICIO) developed by the Organisation for Economic Co-operation and Development (OECD). See [www.oecd.org/sti/ind/inter-country-input-output-tables.htm](http://www.oecd.org/sti/ind/inter-country-input-output-tables.htm). See also Koopman et al. (2010).

<sup>55</sup> An aspect worth considering in this type of analysis is the actual extent of “global” chains and its implications for the labour market. Some researchers have looked at whether global supply chains are truly global or whether they are in fact regional (Johnson and Noguera 2012; Los, Timmer and de Vries 2015).

## ► Strengths and weaknesses

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The I–O approach and multiplier analysis have the advantage of being a multi-sector framework, which enables a more comprehensive analysis of the labour market impact of trade than when only one sector is considered in isolation. This is a major strength of I–O analysis, since interactions at the local and international level, especially as part of global supply chains, are a distinguishing feature of real economies. Another advantage has to do with the databases used. Global I–O databases make it possible to separate imported intermediate and final goods in bilateral trade flows (Koopman et al. 2010). In addition, given the assumption of a linear production function, the general I–O model is considered relatively easy to use, since the processing requirements are less demanding than those of models with more complex specifications.

The weaknesses associated with the I–O approach and multiplier analysis have mainly to do with the framework's simplifying assumptions. The assumption that factor content remains fixed over a long period of time, for example, limits the realism of the framework, since it makes factors almost immune to changes in policy (Gibson 2011). Similarly, since productivity is considered to be exogenously determined, it is treated as if it were not affected by changes in international trade. In a real economy, however, changes in foreign policy can influence the organization of production and productivity. In addition, as pointed out by Gretton (2013), multiplier analysis does not consider other types of interaction that are relevant in a real economy. For example, competition for factors of production is generally omitted in the analysis – something that has to do with the price of factors being assumed to be constant (for example, fixed wages) and with factors being assumed to be infinitely available.

Just as with PE and CGE models, I–O models have been applied in a way that takes into account workers' characteristics, such as their skill level, when considering the labour market impact of trade. Nevertheless, they are not commonly used to study the impact on working conditions, even though the I–O framework accommodates various extensions of the basic model (see Miller and Blair 2009) and allows one to consider the informal sector.

# ► 4 Econometrics

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Econometric analysis can be used for the ex post assessment of the impact of international trade on labour market outcomes. This approach has been applied in analysing the impact of trade on such areas as informality, wages, child labour and forced labour.<sup>56</sup>

Econometric techniques such as difference-in-differences, instrumental variables and regression discontinuity are commonly used in quasi-experimental studies. In contrast to methods based on a general equilibrium framework, quasi-experimental studies focus on specific parameters that allow one to evaluate the causal effect of international trade on labour.

## ► Econometric studies of the labour market impact of trade

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Basic regressions and more complex econometric methods, such as those mentioned in the introductory paragraph, have been used to tackle various research questions concerning the labour impact of trade.

For instance, the question of how economic and social upgrading or downgrading are affected by international trade has been considered by Flanagan (2006). Applying an instrumental variables estimation<sup>57</sup> using cross-country and panel data that include a range of variables – number of working hours, job safety, child labour, forced labour – the study finds that openness to trade has a positive direct impact on income per capita and, thereby, also a positive indirect impact on working conditions.

A study by Milberg and Winkler (2011) considers a similar question, but reaches a different conclusion and proposes different policy recommendations. The authors focus on global production networks.<sup>58</sup> In addition to economic upgrading – understood as industrial upgrading in the sense of the ability to produce more efficiently – they consider social upgrading as the “gains in living standards and conditions of employment over time”, of which the most basic expressions are employment and pay.<sup>59</sup> Applying cross-sectional analysis,<sup>60</sup> the authors find that while the link between economic upgrading and improved export performance is relatively strong, the link between economic and social upgrading tends to be weak. Economic upgrading is relevant, but it is not the only way to achieve social upgrading.<sup>61</sup>

Another question that has been the subject of numerous econometric studies over the past decades concerns the impact of trade on the wages of skilled and unskilled workers (Borjas et al. 1997; Burstein and Vogel 2017; Cravino and Sotelo 2019; Fan 2019; Goldberg and Pavcnik 2007; Krugman 1995, 2000, 2008; Lee and Yi 2018; WTO and ILO 2007; Bacchetta and Jansen 2011). Different econometric methods have been used for the empirical study of this relationship.

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<sup>56</sup> The literature on econometrics and its use for assessing the labour impact of trade is vast. This chapter does not attempt to present an exhaustive review.

<sup>57</sup> Instrumental variables estimation seeks to obtain a consistent estimation when endogeneity – that is, the correlation between explanatory variables and the error term – is present. Instrumental variables may be highly correlated with the original explanatory variables, but they are uncorrelated with the error term in the explanatory equation (Hayashi 2000).

<sup>58</sup> According to Coe, Dicken and Hess (2008), the analysis of global production networks aims to unveil the multi-actor characteristics of transnational production systems while considering notions of power, value and embeddedness. In neoclassical economics, the link between economic and social upgrading is via technology and its influence on wages, while in institutionalist economics the link is mediated by labour market institutions (minimum wages and trade union protections) and their influence on wages.

<sup>59</sup> The notion of decent work advanced by the ILO (2003) is one basis for operationalizing the concept of social upgrading (Milberg and Winkler 2011).

<sup>60</sup> The study considers the correlation between export growth and value added per worker and uses an “upgrading ratio” (ratio of the growth in value added per person engaged to the growth in exports) to indicate the strength of the upgrading.

<sup>61</sup> See Taglioni and Winkler (2016) for a study that considers economic and social upgrading in the context of global supply chains.



For instance, Li (2015) examines the effect of trade liberalization on the wages of skilled and unskilled workers in the United States during the period 1999–2008. Applying the difference-in-differences method<sup>62</sup> and fixed effects, the author seeks to identify the forces driving the increase of wage inequality across the 50 states comprising that country. (The first part of table 5 below lists some of the features of that study.) Among the variables considered, union density stands out for its negative, and significant effect on wage inequality, which suggests that, apart from trade liberalization, the decline in organized labour has played a critical role in increasing wage disparities between skilled and unskilled workers in the United States.

The difference-in-differences technique is a quasi-experimental approach that considers the differential effect of a specific treatment on two groups: a treatment group and a control group. In the case of Li (2015), the technique is used to compare the average change over time in wage inequality within the treatment group (the 50 US states, which engaged in free trade agreements during the period of analysis) and within the control group (territories, represented here by ten Canadian provinces, that did not engage in free trade agreements) before and after the trade liberalization shock.<sup>63</sup>

► **Table 5. Examples of econometric studies on the labour market impact of trade**

<b>Example of a study using the difference-in-differences technique:</b>	
Research questions	What is the impact of free trade agreements on wage inequality between skilled and unskilled workers? Is there a difference – in terms of the wage gap between skilled and unskilled workers – between territories that have engaged in free trade agreements and similar territories that have not engaged in them?
Main assumptions	Parallel trends assumption: provinces in Canada provide a good counterfactual in the example; <sup>a</sup> the composition of “individuals” in the two groups is assumed to remain unchanged over time
Model specification	Difference-in-differences model: $W_{ict}^S/W_{ict}^U = \beta_0 + \beta_1 US_{it} + \beta_2 FTA_{t+} + \beta_3 (FTA_{t+} * US)_{it} + \epsilon_{ict}$ Regression <sup>b</sup> : $W_{ict}^S/W_{ict}^U = \alpha + \beta (FTA * US)_{it} + \gamma X_{ict} + \eta_i + \eta_t + \epsilon_{ict}$ Coefficient of interaction term: $\beta$ (estimated change in wage inequality for the US states after the trade shock)
Data requirements	National statistics from different institutions for both countries; the data set contains panel or longitudinal data (time-series and cross-sectional data)
<b>Example of a study using instrumental variables:</b>	
Research question	What was the effect of rising Chinese import competition between 1990 and 2007 on US local labour markets?
Main assumptions	– Instrument relevance: the instrument $Z$ has a causal effect on the independent variable $X$ , since $Z$ is correlated with the endogenous regressor, $Cov(Z_i, X_i) \neq 0$ – Instrument exogeneity: the instrument is uncorrelated with the error term, $Cov(Z_i, u_i) = 0$ (that is, it satisfies the exclusion restriction), and has no direct effect on $Y$
Instrument for the measured import exposure variable ( $\Delta IPW_{uit}$ )	A non-US exposure variable $\Delta IPW_{oit}$ that is constructed using data on contemporaneous industry-level growth of Chinese exports to other eight high-income markets $\Delta IPW_{oit} = \sum L_{ijt-1} / L_{uit-1} - \Delta M_{oijt} / L_{it-1}$
Data requirements and sources	Trade flows from UN Comtrade Database; data on industry employment structured by commuting zones from County Business Patterns data; data on federal and state transfer payments to commuting zone residents from the Bureau of Economic Analysis and the Social Security Administration; census data used to create the variables that represent changes in commuting zones’ population, employment and wage structure

**Notes:** <sup>a</sup> The parallel trends assumption states that, in the absence of treatment, the average change in the response variable would have been the same for the treatment and the control groups.

<sup>b</sup>  $W_{ict}^S/W_{ict}^U$  represents the ratio of skilled to unskilled workers;  $FTA$  is a dummy variable (it equals 1 for observations after 2002, and 0 for all other years);  $US$  is another dummy variable (it equals 1 for the US states and 0 for the Canadian provinces);  $\eta_i$  denotes the state fixed effects (controls for time-invariant state and province characteristics);  $\eta_t$  denotes the year fixed effects (controls for secular shocks in each year);  $X_{ict}$  is a vector of observable characteristics for state or province including immigrants (e.g. population ratio, union density, physical capital–labour ratio, relative skilled to unskilled labour employment, and research and development intensity).

**Source:** The study using the difference-in-differences technique is Li (2015); the study using instrumental variables is Autor, Dorn and Hanson (2013).

<sup>62</sup> The difference-in-differences technique has been used for a relatively long time in economics. According to Lechner (2010), who provides a list of relevant studies (up to the early 2000s) it was used as early as 1915 to analyse the impact of introducing a minimum wage in one of the US states.

<sup>63</sup> For a study that uses the difference-in-differences technique to analyse offshoring, wages and employment, see Sethupathy (2013).



Other studies have drawn on regional data to analyse the impact of trade on local labour market outcomes. In particular, this approach has been used to examine the role of international trade in the recent decline in manufacturing employment in various high-income countries.

Autor, Dorn and Hanson (2013),<sup>64</sup> for example, analyse the impact of rising Chinese import competition on local labour markets in the United States. They relate changes in labour market outcomes (across local labour markets) to changes in the exposure to Chinese import competition during the period 1990–2007. As part of their methodological approach, the authors make use of “commuting zones”, which represent all the metropolitan and non-metropolitan areas in the United States, to define local labour markets (see also Acemoglu et al. 2016). These markets are treated as subeconomies subject to differential trade shocks.

The study considers the effects of the exposure to Chinese imports on an array of variables (including wages, employment levels, industry employment shares, unemployment and labour force participation rates, and the use of public benefits such as unemployment and disability benefits), disaggregating the impacts by age, sex and educational level. To identify the causal effect of rising Chinese import exposure on outcomes in US local labour markets, they employ an econometric strategy based on instrumental-variables that takes into account the potential endogeneity of US trade exposure (see table 5 above).

In general, the instrumental variables approach allows one to tackle endogeneity in econometric models.<sup>65</sup> Endogeneity, which occurs when an independent variable is correlated with the error term, leads to biased parameter estimates. This problem can arise because of omitted variables (key variables not included owing to the lack of data), measurement error (independent variables are measured erroneously) or simultaneity (one or more independent variables is jointly determined with the dependent variable). While a valid instrument<sup>66</sup> generates changes in the independent variable, it has no independent effect on the dependent one. This makes it possible to determine consistently the causal effect of the independent variable on the dependent variable.

In the above-mentioned study by Autor, Dorn and Hanson (2013), the instrumental variable used to address the potential endogeneity of US trade exposure is the change in the level of Chinese imports to eight other high-income countries. This is based on the assumption that within-industry changes in Chinese imports to the United States and other high-income countries are based on China’s increasing comparative advantage and low trade costs.

The same approach has been applied to other countries. For instance, Dauth, Findeisen and Suedekum (2014) use it to analyse the effect on German local labour markets of increasing trade between Germany, on the one hand, and China and Eastern Europe, on the other, during 1988–2008. The assumption in these studies that employment in less than exposed regions does not react at all to the import shock can be considered as one of the main limitations of the approach (see (WTO, 2017, p. 112). Without this assumption, however, it would not be possible to deduce national-level effects from regional-level effects (Muendler 2017).

A significant number of studies have also considered the linkages between trade liberalization and informality (Fugazza and Fiess 2010; Pham 2017; Salem and Zaki 2019; Selwaness and Zaki 2015). In general, the empirical evidence of the relationship between trade liberalization and informality, wage growth and other labour market outcomes is country-specific. Other studies have considered the relationship between trade and gender equality, measured in terms of labour force participation rates and the income of male and female workers (Fatima and Khan 2019; Hakobyan and McLaren 2017, 2018; Papyrakis, Covarrubias and Verschoor 2012; Sauré and Zoabi 2014), human rights and labour standards (Gamso 2019; Kim 2012; Lim, Mosley and Prakash 2015; Mosley and Uno 2007; Neumayer

<sup>64</sup> The authors explain that their local labour market approach builds on previous work by Borjas and Ramey (1995), Chiquiar (2008), Topalova (2010) and Kovak (2013). Autor, Dorn and Hanson (2016) also provide a detailed literature review in which they consider variations and extensions of their approach. See Hakobyan and McLaren (2016) for a study that considers local labour markets and industry effects.

<sup>65</sup> When there is a single endogenous independent variable and multiple potential instruments, two-stage least squares regression can be used to produce a single instrument for the instrumental variables estimation.

<sup>66</sup> The instrument should be correlated with the endogenous independent variable, but it cannot be correlated with the error term in the equation, since otherwise the estimation will be inconsistent. It is crucial to select instruments carefully because weak instruments can also increase the bias of the estimator.

and de Soysa 2007). Table B in Appendix I presents a sample of these studies, indicating the methods used in each case and their main results.

Other research questions that have been explored using econometric methods include: the wage costs arising from workers' movement between economic sectors after changes in trade policy (Artuç, Chaudhuri and McLaren 2010; Artuç and McLaren 2015); how job displacement as a result of changes in trade policy has induced the movement of workers, particularly low-skilled male workers, from legitimate to criminal employment (Dell, Feigenberg and Teshima 2019; Dix-Carneiro and Kovak 2017); and the effect of trade on workers' health, including mental health (Colantone, Crinò and Ogliari 2019; Crozet, Hering and Poncet 2018; Giuntella, Rieger and Rotunno 2020; Lang, McManus and Schaur 2019; Pierce and Schott 2020).<sup>67</sup>

## ► Strengths and weaknesses

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Econometrics offers a flexible framework for the evaluation of the impact of changes in trade policy on a range of labour market outcomes. This flexibility makes it possible to include aspects of the labour market that are omitted when using other approaches (such aspects as, for example, child labour and workers' health). Another advantage is that the data requirements of econometric approaches are generally not as onerous as those of other approaches, such as CGE models.

When using econometric methods, it is important to bear in mind the underlying assumptions and their implications. For instance, in the study by Li (2015) on wage inequality discussed in section 4.1, the successful implementation of the difference-in-differences technique depended on the parallel trends assumption (see table 5 above). If that assumption were violated, the technique would result in biased estimates of the causal effects. This highlights the importance of the choice of the control group when implementing this method.

Also relevant to the study by Li (2015) is the fact that when the difference-in-differences technique is applied to data that cover many pre-treatment periods but only one post-treatment period, it is normally the case that while the variable of interest varies at a group level, the outcome variables are serially correlated. This leads to underestimation of the standard deviation of the estimators (a downward biased estimation) – a problem that the author deals with by applying the standard bootstrapping method and the clustering of errors.

Similarly, the study by Autor, Dorn and Hanson (2013) acknowledges challenges to the validity of the instrumental variables approach. For instance, the authors note the potential correlation of product demand shocks across the eight high-income countries used for the instrument. They perform a robustness check by adopting a gravity-based strategy<sup>68</sup> that allows them to neutralize demand conditions in importing countries. The similarity between the estimates obtained using the gravity-based strategy and those obtained using the instrumental variables technique leads them to conclude that the above-mentioned correlation is not so important for the results.

These examples show how each econometric method has specific advantages and challenges. They also illustrate the importance of understanding how potential problems can be dealt with.

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<sup>67</sup> For a survey of the literature dealing with the impact of international trade on firms and workers, see Alemán-Castilla (2020).

<sup>68</sup> This strategy makes use of the gravity model of international trade, which is commonly used to estimate trade flows. The model considers that trade between two countries depends on their size (for example, in terms of GDP) and the distance between them. The gravity model has also been used, in combination with employment analysis, to study the employment impact of international trade. See Ernst, Hernández Ferrer and Zult (2005).

## ► 5 Counterfactual thought experiments, in-depth interviews and mixed methods

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This chapter looks at some of the most common, albeit underused (Gibson 2011; Shaffer 2018), approaches that have been used to analyse the labour impact of trade,<sup>69</sup> such as counterfactual thought experiments (as part of qualitative research) and mixed methods. In general, these approaches are well known for facilitating an in-depth understanding and interpretation of the underlying motivations behind the processes being studied. In contrast to the methods discussed in Chapters 1 to 4, these approaches entail a more intensive data collection process, which makes it possible to capture a large quantity of detailed information from a usually small number of participants.

The data can be gathered from different sources and in different ways:<sup>70</sup> for example, observation, unstructured interviews, analysis of public and private documents, and official questionnaires. Because of the complexity of the information thus obtained, it cannot be interpreted without reference to the context in which it originated. When it comes to the labour market impact of trade, it is important to consider the shared meaning of “work”, along with the social customs and gender roles in the specific context being analysed, in order to understand how the effects of a change in trade policy are perceived by those who experience the impact. Quantitative data and statistics may also be used for the analysis in such studies, but they tend to play a secondary role.

Shaffer (2018) has proposed the use of counterfactual thought experiments (CTEs) to improve the assessment of the impact of trade on employment. CTEs, as he explains, make use of subjunctive conditional (if/then) questions about a hypothesized link between trade and employment. It is possible to incorporate questions about potential changes of economic activity, for instance. In ex post assessments, the questions refer to what respondents would have done in the absence of the policy change. Questions can be posed to the participants while conducting household surveys, focus group discussions and semi-structured interviews.<sup>71</sup>

The use of CTEs in semi-structured interviews, focus group discussions and mixed-methods studies allows one to consider questions that go beyond the effect of a (potential) change in trade policy on the level of employment. As pointed out by Shaffer (2018), CTEs can give an indication of the magnitude of likely problems stemming from the failure to adjust to changes in trade policy, and they can also point to the reasons for such lack of adjustment. In this way, they can inform possible mitigation measures.

### ► In-depth interviews

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There are two types of in-depth interview: the one-to-one interview (also referred to as an unstructured interview) and the focus group discussion. In contrast to traditional structured interviews, in which the participants are all asked the same set of predetermined questions in the same order, an unstructured interview does not follow a specific order of questions. Rather, it is a conversational form of interview, in which open questions play an important role in helping to gather detailed information on the participants’ unique experiences (see, for example, ILO 2014). In this sense, unstructured interviews are

<sup>69</sup> As explained by Shaffer (2018), some of the studies in this area have focused specifically on analysing the impact of policy changes on poverty (see also Shaffer 2013; and Bourguignon and Pereira da Silva 2003), but, in principle, the same methodological approaches can be used to analyse the impact of policy changes that affect the labour market.

<sup>70</sup> Sampling is carried out in different ways too – examples are purposeful sampling, quota sampling and “snowball” sampling.

<sup>71</sup> An example of how the CTE methodology is applied is provided in the study by Shaffer (2008), where producers in Viet Nam were asked whether reductions in the price of their products, following that country’s accession to the World Trade Organization (WTO) in 2007, would make them or any members of their household change the way they earned income. Follow-up questions based on the producers’ potential responses were included in the survey.

a more flexible tool for capturing information. In the context of assessments of the labour market impact of trade, the participants of such interviews may talk in detail about how a change in policy (such as the importing of a specific input) has affected their working conditions in various dimensions.

Focus group discussions are on a specific matter affecting a set of participants, who are all interviewed at the same time. The main task of the interviewer is to ensure interaction among the participants and to guide the conversation so that these do not stray from the main topic. As with unstructured individual interviews, focus groups also allow one to capture detailed information and obtain a richer account of the situation and of the way in which the participants as a group have experienced it (ILO 2014; Krueger and Casey 2014). In assessments of the labour market impact of trade, producers of a specific good may, during a focus group discussion, talk about whether and how the introduction of a free trade agreement (with its concomitant deregulation and impact on prices) has displaced them from their traditional roles.

The study by Harrison et al. (2019) is an example of the use of in-depth interviews, specifically to examine the effects of EU trade policy on working conditions. The interviews focused on labour standards and the limits of the trade and sustainable development chapters included in the EU's free trade agreements. The authors conducted in-depth interviews with 121 key informants for free trade agreements signed with the Caribbean, the Republic of Korea and the Republic of Moldova. The key informants included "those involved in the negotiation and implementation of agreements in the case study countries as well as in the EU (such as civil servants, politicians and spokespeople of prominent interest groups); members of the institutional mechanisms set up through the agreements (the joint committees, expert panels and CSMs [civil society meetings]); and knowledgeable 'outsiders' from business, civil society and trade unions who ought to be affected by the respective provisions" (Harrison et al. 2019). Using this approach, the authors show how operational failings (such as shortcomings in the implementation of key provisions and the lack of legal and political prioritization of the trade and sustainable development chapters) can affect the way free trade agreements impact labour standards.

Other examples of the use of in-depth interviews in case studies that examine the relationship between trade and labour are Brown et al. 2016; Oehri (2017); Ruwanpura (2016); Tanwir and Sidebottom (2019); and UNCTAD (2010b).

## ► Case studies

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In this context, case studies refer to the in-depth examination of a single case or group of cases – for example, a person, the members of a family or a community – who are likely to be affected by the implementation of an international trade policy. A case study may be conducted using various tools, including observation, unstructured interviews (as in Harrison et al. 2019), official documents (see Oehri 2017) and "informal" documents such as diaries.

Smith et al. (2018) is a case study about labour standards and export production in the Moldovan clothing industry. The authors analyse the ways in which labour regimes are constituted and the limits of the labour provisions in EU trade policy, which have been designed to mitigate the negative effects of trade liberalization and economic integration on working conditions. They conclude that, although free trade agreements have provided EU lead firms with opportunities to contract with Moldovan-based suppliers, the mechanisms developed by the EU to regulate labour conditions are not sufficient to deal with the negative consequences for workers' rights and working conditions.

Relevant examples of case studies in this area may be found below:

- Alford, Kothari and Pottinger (2019), Cumbers, Nativel and Routledge (2008) and Helfen and Fichter (2013) – on trade unions, transnational labour rights and working conditions;
- Campling et al. (2016) – on labour provisions in free trade agreements;
- UNCTAD (2010b) – on the integration of small and medium enterprises into global supply chains;
- Brown et al. (2016) and Brown et al. (2018) – on the impact of the Better Work programme on working conditions in the garment industry in several countries;

- Riethof (2017) – for a comparative analysis of case studies on Brazilian trade union strategies in relation to free trade negotiations and their implications for labour standards;
- Van Roozendaal (2017) – on using trade agreements as a tool for improving working conditions;
- Oehri (2017) – on the relationship between free trade agreements and development institutions;
- ILO (2016a) and ILO (2017b) – on labour provisions in trade and investment arrangements;
- Birner (2015) – on working conditions in the context of e-commerce and global supply chains.

## ► Mixed-methods approach

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Mixed-methods research seeks to integrate in-depth interviews and similar qualitative tools with some of the approaches presented in Chapters 1 to 4 (such as CGE models) in order to offer a broader perspective of the topic being studied. Rather than relying on a single methodology, the point of such an approach is to draw on a wide array of available tools, where the results obtained with one tool are used to enrich those obtained with another. For example, an econometric study may be supplemented with interviews in which key stakeholders are asked for their views on the impact of a change in trade policy.

When evaluating the labour market impact of trade, quantitative data on the effect of a reduction in tariffs in a region in which producers are directly affected by the entry of new imports can be combined with qualitative information obtained from a focus group discussion with some of those producers. Carrying on with the same example, one could organize unstructured interviews to capture the individual experiences of those producers, which could then feed into the development of a detailed quantitative survey (see also Hulme 2007; Shaffer 2018; White 2009).

An interesting example along these lines is a study by the United States International Trade Commission (USITC) (1993), which combined PE and CGE models with interviews and qualitative analysis to examine the impact of the North American Free Trade Agreement (NAFTA) on employment and job skills requirements. As pointed out in the report, the qualitative analysis helped with the assessment of sectors for which models could not capture the implications of NAFTA. Interviews with experts and oral testimony were part of the qualitative tools used to capture relevant information for the assessment. (A more recent example of the use of a mixed-methods approach to evaluate a free trade agreement may be found in Civic Consulting and Ifo Institute 2018.) Shaffer (2018) and Gibson (2011) both provide several examples illustrating the use of mixed methods to study the relationship between trade and labour market outcomes.

## ► Strengths and weaknesses

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The flexibility afforded by in-depth interviews makes it possible to capture more details than is the case with traditional structured interviews. Their conversational nature facilitates understanding of the participants' perceptions regarding the impact of the policies being evaluated. Another advantage of in-depth interviews is that they offer a "second chance" to request clarification on the answers provided by the participants, which also ensures a certain degree of validation of the information. The disadvantages include the length of time it may take to complete the interview and to systematize and analyse the information collected. Developing the necessary skills for conducting such interviews can also be time-consuming and expensive.

Very similar advantages and disadvantages apply to focus group discussions too. However, confidentiality has been singled out as a potential specific problem with this technique, because the interviewer cannot guarantee that all the participants will respect the confidentiality of information disclosed during the discussion. If the interviewer, moreover, has not developed sufficient skills in guiding conversations, the discussion may well deviate from the topic of interest. It can be difficult to validate the information obtained from a focus group, since participants may be influenced in the answers they give by the presence and answers of other participants. A drawback common to both one-to-one interviews and focus group discussions is the possibility of "interviewer effects", that is, the influence which interviewers may inadvertently have on interviewees as a result of such factors as gender and age.

One major advantage of case studies is the large amount of detailed information they provide, which would be difficult to elicit from the participants in other circumstances. Moreover, case studies yield insights that can stimulate and inform future research. On the other hand, the conclusions obtained from case studies are not generalizable, which is one of the main weaknesses of that approach compared with other (especially quantitative) methods. They are also known to be time-consuming, difficult to replicate and liable to interference from the analysts' subjective beliefs (because of the focus on descriptive data that need to be interpreted).

Combining in-depth interviews with approaches that focus on quantitative changes in the level of employment or wages has both strengths and weaknesses. One of the main advantages of mixing tools based on different approaches is that the potential for complementarity helps to mitigate the weaknesses inherent in each method. In that sense, a mixed-methods approach allows one to collect more comprehensive information and to attain a broader perspective of the issue being analysed.

Additionally, since conclusions are based on results obtained using different types of methods, they may offer more solid evidence than is the case when only one type of method is used. For this reason, it is often argued that the conclusions from mixed-methods studies are to a certain degree validated internally as part of the analysis. Another advantage of combining methods is that it can help to reduce the analysts' biases while making it possible to produce reports that appeal to a wider audience.

The main disadvantage of a mixed-methods approach is that more time and financial resources need to be invested in order to collect the information. Additionally, a greater range of skills are required to work with tools based on different approaches, which may call for a larger number of researchers to be involved in a given study.



## ► 6 Future avenues of research

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The use of mixed methods continues to be a promising option for future research, as it can help to bring to light substantial and detailed information for robust analysis.<sup>72</sup> As pointed out in Chapter 5, in-depth interviews – either unstructured one-to-one interviews or focus group discussions – and case studies allow one to capture details that simply cannot be captured if only quantitative methods are used in the analysis.

Moreover, when in-depth interviews are combined with methodologies focusing on quantitative changes in the level of employment and wages, they can provide a better understanding of the implications for those directly affected by a policy shock. Some of the examples of studies using a mixed-methods approach cited in Chapter 5 highlight a further advantage of the approach, namely its ability to take into account a greater range of labour market outcomes. This is particularly important if one bears in mind that even the approaches with the most complex “structure” (such as CGE models) focus on changes in the level of employment while disregarding the quality of the jobs concerned.

As mentioned in the Introduction, the complex intertwining of international production and globalization in general have had an impact on labour market outcomes in countries of all income levels. Understanding how countries at different levels of development are affected is another reason why it is essential to extend the analysis so that it takes into account not only quantitative indicators but also qualitative ones. Conventional indicators of labour market outcomes based on employment and income become less informative if other labour conditions are not considered in the analysis.<sup>73</sup>

Table 6 below lists some indicators and aspects related to the qualitative dimension of the labour market that have been addressed in the past (in econometric studies, case studies and so on) and that could be used, either separately or in combination, in future studies. The table also includes the desired policy impact in the second column and cites previous studies and relevant data sources in the last column. This list is evidently not exhaustive. No study could possibly cover all the aspects mentioned here, nor could they all be used for *ex ante* or *ex post* evaluations. However, the purpose of the table is to provide analysts with a range of options that they can use to enrich their assessments.

When analysing the impact of a particular change in trade policy (for example, the signing of a new regional trade agreement), one can ask questions about working conditions and related aspects based on those listed in the first column of table 6. Thus, one could ask, for example, whether there will be (in an *ex ante* assessment) or whether there have been (in an *ex post* assessment) institutions established for the purpose of promoting labour rights through the specific trade agreement being studied.

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<sup>72</sup> For certain studies, depending on the research question and the main purpose, it is possible that using only one of the methodological approaches presented in this paper may be more appropriate. However, as an approach that facilitates the collection of more comprehensive information, the combination of different methods should generally be regarded as the superior option.

<sup>73</sup> An issue that should be kept in mind when considering established and potential new approaches is the difference between *ex ante* and *ex post* assessments. Independently of the approach used, *ex ante* assessments are well known for yielding more optimistic results concerning the labour market impact of changes in trade policy than *ex post* assessments. This can be observed in the evaluations of specific trade agreements (see, for example, Grumiller 2014 and O’Leary, Eberts and Pittelko 2012, both of which deal with NAFTA).

► **Table 6. Indicators for the analysis of the labour impact of trade**

Variable (indicator) or aspect related to working conditions	Desired policy impact	Previous studies/potential data sources
Number of institutions established to promote labour rights through trade agreements	Increase	Orbie and Van Roozendaal (2017)
Level of labour protection	Increase	Cingranelli–Richards Human Rights Database. See Kim (2012)
Respect for workers	Improvement	Cingranelli–Richards Human Rights Database. See Kim (2012)
Health and safety protection measures	Increase/improvement	Brown (2015)
Commitment to implement ratified international labour Conventions	Yes	Van Roozendaal (2017)
Enforcement of national labour law through trade agreements/number of commitments undertaken as part of trade agreements	Yes/increase	ILO (2015b; 2016b); this and similar indicators can be designed on the basis of an analysis of legal instruments, including free trade agreements
Possibility of/mechanisms for submitting complaints about labour rights violations (i.e. non-compliance with labour rights provisions in the labour chapters of trade agreements)	Yes/increase/ improvement	ILO (2015b; 2016b); Oehri (2017) Official documents on complaints can be a source of data
Links between preferential trading arrangements and compliance with labour standards	Yes	Orbie and Van Roozendaal (2017)
Social upgrading via decent work: employment to population ratio; labour share; formal employment; youth unemployment; gender equality in employment and wages; share of wage employment in non-agricultural employment; labour standards (dealing with freedom of association and collective bargaining, union density, type of contract, hours of work, job safety, elimination of child labour and forced labour, employment discrimination); regulation of monitoring; improved standards in plant monitoring; poverty; political rights; human development	Improvement	ILO (2003), Galhardi (2018) Used previously to consider social upgrading measures in different studies (see Milberg and Winkler 2011);  Potential data sources: ILO (2016b; 2019) Kucera and Sarna (2004) ILO statistics (e.g. Key Indicators of the Labour Market (KILM) database; ILOSTAT) Countries' official statistics  World Development Indicators Freedom House index Human Development Index (United Nations Development Programme)

**Note:** The second column indicates the desired/expected change in the labour market-related aspects referred to in the first column.

**Source:** Drawn up by the author on the basis of the sources listed in the table.

In general, it is important to undertake studies that include information on status of employment, trade union density, hours of work and other labour market outcomes disaggregated by sex, age and other characteristics. Data on some of these indicators are already available for many countries (see, for instance, ILO 2016b; ILOSTAT<sup>74</sup>). Such studies may be relatively easy to conduct where sufficient good-quality data for different years are also available. However, obtaining good-quality data is a challenge in itself. The inclusion of more indicators such as those presented in table 6 should be explored on a case-by-case basis.

Improving the methodological frameworks that are already available for analysis of the labour market impact of trade is also important. A relevant step in this regard would be the development of a time dimension in economic models. As noted in Chapter 2, models used for such analysis have been

<sup>74</sup> <https://ilostat.ilo.org/>



criticized for not specifying a time dimension of when adjustments in the labour market can take place after a trade shock.

Since trade policy is not neutral, it can result in gains for some sectors and for the workers tied to those sectors, while having the opposite effect in other sectors, where workers may face job losses or detrimental working conditions. The existing models used to assess the labour market impact of trade provide an estimate of employment gains and losses, but they do not indicate when those changes are likely to take place.

Consequently, the incorporation of a time dimension into economic models could help to identify the most appropriate moment for implementing response measures and also to clarify which sectors would benefit most from such measures. Governments would be enabled to improve their economic and social policy response, particularly for the sectors and workers most negatively affected by changes in trade policy.

## ► Conclusion

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The objective of this working paper was to review some of the most common methodological approaches used to assess the labour market impact of trade, particularly at the macro and meso level of analysis. The paper considered a range of approaches, some of which have been used in combination as well as separately for the same purpose.

Both partial and general equilibrium approaches have been extensively used for such assessments. In view of the two approaches' advantages and limitations – with PE methods focusing on only one sector and GE methods on the economy as a whole – it has been argued that combining both types of method can give the most satisfactory results. Some serious limitations of these methods are linked to their underlying assumptions, such as the Armington assumption and the full-employment assumption, particularly in the case of neoclassical CGE models. A further limitation, when it comes to analysis of the labour market impact of trade, is that their focus is on changes in the level of employment and wages; other labour market outcomes are more difficult to capture using a supply-and-demand framework.

Input-output multiplier analysis and econometric analysis are also widely used to assess the labour market impact of trade. The former method allows one to study both the direct effects of trade shocks on employment and the indirect effects because it takes into account the endogenous interlinkages between sectors. A significant number of studies based on econometric techniques have been devoted to the impact of trade on wage inequality; studies using such techniques have also dealt with other aspects of the labour market, including workers' health and informality.

In-depth interviews and mixed-methods approaches are particularly appropriate for considering various aspects related to working conditions in assessments of the labour market impact of trade.

All in all, the decision on which aspects are to be evaluated will ultimately depend on the purpose of the study and on the availability of data. The lack of good-quality data, in particular, may influence the selection of the methods used for the analysis.

One of the main criticisms of most of the methodological approaches examined in this paper is the lack of realism in some of their underlying assumptions. That is a further argument in favour of including aspects such as health and safety protection and labour rights (as listed in table 6 in Chapter 6). Moreover, the use of mixed-methods approaches is desirable because of their focus on context and the combination of qualitative and quantitative elements. In-depth interviews and similar tools allow one to capture details that can improve the quality of the data used.

That being said, the need for more time and financial resources to be invested can deter analysts from using mixed-methods approaches. Depending on the purpose of a study and the data constraints, it may not always be possible to use a combination of methods. In such cases, one of the main approaches presented in this paper could be used individually, but it is important to cover at least some of the aspects and indicators from table 6, especially if the study is concerned with the impact of trade policy in low- and middle-income countries.

Finally, improving economic models so that they are able to specify the timeframe between trade shocks and potential changes in the labour market is a key challenge that needs to be met. This would strengthen the necessary policy responses, especially those directed at the sectors and workers most negatively affected by changes in trade policy.

## ► Appendix I

► **Table A. Characteristics of the Global Trade Analysis Project (GTAP) model**

Standard model assumptions	<ul style="list-style-type: none"> <li>- Full employment<sup>a</sup></li> <li>- Perfect competition</li> <li>- Constant returns to scale</li> <li>- Imperfect substitution (Armington assumption)</li> <li>- No dynamic effects</li> <li>- Household preferences are represented by a non-homothetic constant difference of elasticities (CDE) function<sup>b</sup></li> </ul>
Closure <sup>c</sup>	<ul style="list-style-type: none"> <li>- Factor endowments (including skilled and unskilled labour, land and capital), technology, tax and subsidy rates are exogenous</li> </ul>
Data and parameters	<ul style="list-style-type: none"> <li>- Latest available GTAP database: version 10 (2019); reference years 2004, 2007, 2011 and 2014 (Aguiar et al. 2019); 141 regions and 65 sectors<sup>d</sup></li> <li>- Database relies on country-based input-output tables</li> <li>- 121 countries; 20 aggregate regions per year</li> <li>- Critical parameters: elasticities and investment parameters</li> <li>- The GTAP database contains the relevant data to be used with the GTAP model</li> </ul>
Output	<ul style="list-style-type: none"> <li>- Aggregate: real GDP; exports and imports; welfare</li> <li>- Sectoral: output; exports and imports; prices</li> </ul>

**Notes:** <sup>a</sup> CGE models that assume full employment consider that wages can fall infinitely until everyone who wants to work is employed.

<sup>b</sup> CDE is less demanding than flexible functional forms. It allows one to calibrate the model to income elasticities and own-price elasticities independently. Moreover, since the function is non-homothetic, it leads to an improved representation of income effects on the demand system. See Corong et al. (2017); Hertel (1997).

<sup>c</sup> Closure refers to decisions on which variables are exogenous in the model (the variables that are not determined within it).

<sup>d</sup> Changes and improvements made since earlier versions of the database are outlined at <https://www.gtap.agecon.purdue.edu>. 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. See Cheong (2010a).

**Source:** Cheong (2010a); GTAP Website; Aguiar et al. (2019).

► **Table B. Sample of econometric studies dealing with the impact of trade liberalization on various labour market outcomes**

Study	Focus of the impact assessment	Method	General conclusion
Fugazza and Fiess (2010)	Informality	Cross-sectional; time series and panel data regressions.  Three different data sets are used to assess the sign of the relationship between trade liberalization and informality.  Three different measures of the informal sector are considered, along with four different measures of trade liberalization.	No clear-cut conclusion: macro-founded data tend to support the conventional view that trade liberalization causes a rise in informality, while micro-founded data do not.
Selwaness and Zaki (2015)	Informality	Two-step analysis approach:  (a) A probit model for the probability of working in the informal sector;  (b) Industry coefficients, retrieved from the first-step regressions, are pooled over time and are then regressed on tariffs.  Combines a microeconomic data set with macroeconomic variables (tariffs).	Trade liberalization has reduced informal employment in Egypt
Hakobyan and McLaren (2016)	Workers' wage growth	Econometric regressions that allow characterization of the impact of NAFTA on workers' wages (by industry, educational level and geographical place)  US Census data for 1990–2000	Trade liberalization lowers wage growth for blue-collar workers in the most affected industries and localities (even for workers whose jobs do not compete with imports)
Hakobyan and McLaren (2018)	Wage growth for male and female workers	Econometric regressions that estimate the impact of trade liberalization on workers' wages with a focus on differences by sex	NAFTA tariff reductions are associated with substantially lower wage growth for married blue-collar women
Artuç, Chaudhuri, and McLaren (2010)	Workers' wages	Econometric estimation with a structural empirical model	Sharp movement of wages in response to liberalization;  liberalization lowers wages of import-competing workers in the short and long run but raises their option value
Dell, Feigenberg and Teshima (2019)	Movement of workers from legitimate to criminal employment, and increase in violence	Instrumental variables estimation to examine whether trade-induced changes in local labour markets (municipality-level) influence violence	Trade-induced job loss in Mexico leads to large increases in violence, particularly in municipalities where transnational criminal organizations are operating

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