



► **Trade and labour market outcomes**
Theory and evidence at the firm and
worker levels

Author / Benjamin Aleman-Castilla





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► Abstract

The literature on the impact of trade on labour market outcomes has experienced a remarkable evolution in recent decades. Theory has moved on from oversimplified to more comprehensive models that take into account previously disregarded characteristics of firms and of product and labour markets, such as firm heterogeneity and labour market frictions. Thanks mainly to the availability of higher-quality data, greater computational capacity and improved econometric techniques, an increasing number of empirical studies provide valuable feedback that can be used for the continuous enhancement of the underlying theory. This working paper surveys the literature on the impact of international trade on firms and workers, presenting the main theoretical and methodological frameworks, including the assumptions on which these are based and the results obtained. It also discusses briefly the challenges that need to be addressed in future research, such as the collection of more and even higher-quality data, and the development of new statistical indicators that better reflect the dimensions of decent work.

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► Acronyms

CEPII	Centre d'études prospectives et d'informations internationales (Centre for International Prospective Studies and Information) [France]
EEWT	employment in excessive working time
ENEU	Encuesta Nacional de Empleo Urbano (National Urban Employment Survey) [Mexico]
ENOE	Encuesta Nacional de Ocupación y Empleo (National Occupation and Employment Survey) [Mexico]
FDI	foreign direct investment
GDP	gross domestic product
H-O	Heckscher–Ohlin [theory/model]
IAB	Institut für Arbeitsmarkt- und Berufsforschung (Institute for Employment Research) [Germany]
IBGE	Instituto Brasileiro de Geografia e Estatística (Brazilian Institute of Geography and Statistics)
IMSS	Instituto Mexicano del Seguro Social (Mexican Institute for Social Security)
INEGI	Instituto Nacional de Estadística y Geografía (National Institute of Statistics and Geography) [Mexico]
LEED	linked employer–employee data set
MNC	multinational corporation
MNE	multinational enterprise
NAFTA	North American Free Trade Agreement
RAIS	Relação Anual de Informações Sociais (Annual Social Information Report) [Brazil]
RCT	randomized controlled trial
R&D	research and development
SUSENAS	Survey Sosial Ekonomi Nasional (National Socio-Economic Household Survey) [Indonesia]
TRAINS	Trade Analysis and Information System (of the UNCTAD)
UNECE	United Nations Economic Commission for Europe
UNCTAD	United Nations Conference on Trade and Development
WTO	World Trade Organization

► Introduction

Over the past 40 years, the economic literature dealing with the impact of trade on labour market outcomes has experienced a remarkable evolution. On the one hand, theory has moved away from over-simplified country-level frameworks based on unrealistic assumptions to more complex but realistic industry- and firm-level models that take into account previously omitted characteristics of firms and of product and labour markets (for example, firm and worker heterogeneity, search-and-matching frictions) and are therefore better suited to explaining the actual patterns of trade and its implications for the labour market. These new models also reflect the changes that have occurred in the composition of international trade, such as the increasing share of exchange taking place with or between non-rich countries as a consequence of international outsourcing and the offshoring of certain tasks within production processes (see figure 1 in the Annex).

On the other hand, thanks to the availability of larger and higher-quality longitudinal and cross-sectional databases in many places around the world, along with the greater computational capabilities and improved econometric tools developed in recent years, there has been a surge in empirical studies providing valuable findings on the effects of trade on various labour market indicators, some of which had previously been ignored by analysts (for example, informality, gender wage inequality and local labour market differentials), but which are important for the evaluation of trade policies in relation to decent work.

This working paper surveys the literature on the impact of international trade on enterprises and workers, presenting the main theoretical and methodological frameworks used, including their assumptions and predictions or results. It is intended to serve as a background paper for the project “Trade, enterprises and labour markets: Diagnostic and firm-level assessment”, which is being jointly conducted by the European Commission and the ILO. On the theoretical side, the paper briefly reviews the evolution of trade theory from the neoclassical concept of comparative advantage, which underlies the traditional Heckscher–Ohlin model and related theorems, to “new-new trade theory”, which has seen the development of models that incorporate such features as firm and worker heterogeneity in order to understand better the intra-industry and intra-firm consequences of trade. On the empirical side, the paper reviews the literature on the impact of trade on labour market outcomes, grouping the studies considered into two broad categories according to the research method used: the structural approach or the more frequent quasi-experimental approach.

The paper acknowledges both the progress achieved so far in assessing the impact of trade on employment and the challenges and limitations that need to be overcome in future studies. Of particular relevance in the latter regard are the collection and use of more and better-suited data, such as linked employer–employee data sets (LEEDs), and the development of new statistical indicators that better reflect the dimensions of decent work, as defined by the ILO. Accordingly, the paper presents the different types of LEED and the advantages and difficulties involved in using such data sets. It also considers how the analysis of labour market indicators could be extended to cover other dimensions of the Decent Work Agenda.

The text is structured as follows: Chapter 1 reviews the theoretical frameworks of trade and their implications for the labour market. Chapter 2 presents the main empirical approaches used to study the effects of trade on the labour market. Chapter 3 discusses briefly the theoretical and methodological advances in this field, notably the increasing relevance of LEEDs, along with the challenges and limitations that need to be taken into account. It also gives examples of new labour market indicators that are relevant to decent work. A final section provides some concluding remarks.

▶ 1 Theoretical trade frameworks and implications for the labour market

This chapter briefly reviews the main theoretical approaches in the international economics literature that have been used to assess the effects of trade policies on labour markets. Of particular interest are those frameworks where the analysis focuses on the firm and worker level, as recent empirical studies using highly disaggregated data and linked employer–employee data sets have found compelling evidence that firm and worker heterogeneity play a very important role in determining the effects of trade on firm productivity, trade engagement decisions, within-industry resource allocation and labour market outcomes such as wages, employment, skill and gender gaps, and informality.

The chapter is structured into five sections dealing with: (a) the neoclassical theory of comparative advantage, which explains the main characteristics of the traditional Heckscher–Ohlin framework and its implications for labour markets; (b) the Ricardo–Viner specific-factors model, which describes a framework commonly referred to as the short- or medium-run version of the Heckscher–Ohlin model, as it recognizes that factors of production cannot move immediately and freely between industries, regions or countries; (c) “new trade theory”, which takes into account various new features of product markets to explain the considerable levels of trade between countries with similar factor endowments and the influence of domestic markets on exporting decisions; (d) “new-new trade theory”, which builds on new trade theory’s eschewal of the neoclassical premise of homogeneous producers and emphasizes the role of firm-level differences in determining the impacts of trade within a particular industry, giving rise to a new family of models that take into account firm and worker heterogeneity, search-and-matching frictions and other characteristics of firms and of product and labour markets; and (e) the literature on global value chains, which combines the theories of international trade and organization of the firm to relax the neoclassical assumption that countries trade only final products, thereby providing new frameworks for the analysis of the effects of international outsourcing and offshoring on labour markets.

▶ Neoclassical theory of comparative advantage

Until the 1980s, the traditional explanations of international trade relied on the Heckscher–Ohlin framework (Ohlin 1933), which emphasizes the theory of comparative advantage first developed by Ricardo (1817) and Torrens (1815). The original version of the Heckscher–Ohlin (H–O) model is commonly referred to as the “2x2x2 model”, since it considers a world of two countries, two commodities and two homogeneous factors of production (such as labour and capital, or skilled and unskilled labour). The model assumes that both countries have identical production technologies, that there are constant returns to scale in the production of output, that there is perfect competition in all markets and that there is within-country mobility but between-country immobility of factors of production. It also rests on the premises that goods differ in terms of the factors of production required for their production, and that countries differ in their factor endowments.

The essence of the H–O theory may be summarized in four theorems: (a) the Heckscher–Ohlin theorem, which postulates that countries export goods whose production is intensive in the use of those countries’ abundant factors, and import goods whose production relies to a great extent on their scarce factors; (b) the factor-price equalization theorem, which postulates that trade tends to equalize the real prices of the factors of production between countries (and therefore regards trade as a substitute for international mobility of factors); (c) the Stolper–Samuelson theorem, which postulates that a rise in the relative price of a good generates an increase in the return to (or earnings of) the factor used most intensively in its production, and a fall in the return to the scarce factor; (d) and the Rybczynski theorem, which postulates that an increase in the endowment of one of the factors of production will increase the production of the good that uses that factor intensively and reduce the production of the other good.

The implication of the H–O model for the labour market is that international trade should increase labour demand in labour-abundant countries, and that real wages should tend to equalize between

trading partners. However, as pointed out by Michaels (2008), later studies have questioned its relevance (see, for instance, Krugman 1995; Berman, Bound and Machin 1998), since the H-O model does not explain properly the actual changes in global labour demand. Indeed, various studies (Feenstra and Hanson 1996; Acemoglu 2003; Kremer and Maskin, unpublished; Antràs, Garicano and Rossi-Hansberg 2006; Matsuyama 2007) have even suggested that trade openness could also increase the demand for skilled labour in countries that are abundant in unskilled labour.

► Ricardo–Viner specific-factors model

A variant of the Ricardian model, the specific-factors model was first discussed by the Canadian economist Jacob Viner (1892–1970) and later developed by Samuelson (1971) and Jones (1971). Unlike the neoclassical theory of comparative advantage, this model recognizes that in the short run, factors of production cannot move immediately and freely between industries, and that these differ in terms of the factors of production they require, so that a shift in the mix of goods produced by a country has a long-run effect on the relative demand for some factors of production. The combination of these two facts implies that even though international trade may be generally beneficial at the national level, it could have negative effects for some population groups or areas within a country.

Specifically, the Ricardo–Viner framework is based on an economy that produces two goods in two sectors, with three factors of production: typically labour, capital and land. Labour is a mobile factor that can be used in either sector, while land and capital are both immobile specific factors that can be used in the production of only one good and are not substitutable. When capital and land are held constant, labour exhibits diminishing returns. Markets are perfectly competitive, so that prices are treated as given and profit-maximizing employers demand labour up to the point where the value of the marginal product of labour in each sector equals the wage rate. In equilibrium, there is a unique wage rate in the economy, which is equal to the marginal product of labour in both sectors, and there is no unemployment. Additionally, the relative prices of the two goods produced equal the relative marginal products of labour between the two sectors.

In this model, a change in the relative prices of goods affects the distribution of income between the factors of production. The factor specific to the sector with a relative price increment is left better off, the factor specific to the sector with a relative price decrease is left worse off, and the welfare effect for the mobile factor (labour) is ambiguous. When international trade is considered, a country is assumed to face international relative prices that differ from the relative price of the closed economy,¹ and the model predicts that the country will export the good whose relative price increases and import the good whose relative price decreases. In terms of welfare, the general result is that trade benefits the factor specific to the export sector, harms the factor specific to the import sector and has ambiguous effects on labour. However, there are potential aggregate gains from trade as countries experience an expansion of consumption choices.

As noted by Krugman, Obstfeld and Melitz (2014), the prediction that trade damages the most immobile factors in import-competing industries applies not only to capital and land, but also to those in the labour force who cannot easily relocate to other sectors and therefore suffer unemployment spells. In this regard, empirical studies such as those by Topalova (2007; 2010) – who finds evidence of trade liberalization having the most pronounced impact among the geographically and sectorally least mobile population groups at the bottom of the income distribution in India – have prompted the development and use of specific-factors models of regional economies, such as Kovak (2013). Seeking to provide a theoretical foundation for measuring the effect of trade liberalization on local labour markets, these models use a weighted average of changes in trade policy, with weights based on the industrial distribution of labour in each region within the country of interest.

¹ This could be so because trading partners may have different technologies or factor endowments.

► **New trade theory: Economies of scale, product differentiation and imperfect competition**

Krugman (1979; 1980) argued that the neoclassical theory of comparative advantage was unable to provide a satisfactory explanation of the actual patterns of trade, such as the high level of exchange between economies with similar factor endowments (particularly the intra-industry trade in differentiated products between developed countries) and the role of large domestic markets in encouraging the concentration of production and exporting of goods with high transport costs (that is, the home-market effect). By incorporating economies of scale, product differentiation and imperfect competition, Krugman developed a new framework providing an alternative explanation to differences in technology or factor endowments in order to account for international specialization and trade.

In its more complete specification,² the model assumes a world of two countries with two industries that may differ in size, trade with each other and face positive transport costs of the “iceberg” type.³ In each of these countries, there is a large number of potential goods that can be produced, all of which are demanded by consumers with identical preferences. Labour is the only factor of production, and all goods are produced by firms with the same linear cost function. There is full employment, and homogeneous firms seek to maximize profits in an environment of monopolistic competition,⁴ with free entry and exit of firms. Under these assumptions, welfare gains from trade occur because the world produces and consumes a greater diversity of goods (each differentiated good is produced by only one firm in only one country, and all varieties are equally demanded by all consumers); wages are higher in the larger country; and each country specializes in the industry for which it has the largest home market, thereby realizing economies of scale and minimizing transport costs.

► **New-new trade theory: Dynamic industry models with heterogeneous firms**

As better and more disaggregated data became available, empirical studies began to find extensive evidence of differences in productivity between firms in the same industry, with more productive firms being more likely to engage in trade and benefiting the most from within-industry resource reallocations. These findings could not be explained by the then available theories because of their assumption of firm homogeneity. Consequently, Melitz (2003) – building on Hopenhayn's (1992) dynamic stochastic model of a competitive industry with a continuum of firms taking entry and exit decisions, and on Krugman's (1980) model of trade under monopolistic competition and increasing returns – developed a dynamic industry model with firm heterogeneity to study the intra-industry consequences of trade.

In this groundbreaking model, trade induces the more productive firms to export, some firms continue to serve only the domestic market, and the least productive firms are forced to exit the industry. Increasing the industry's exposure to trade gives rise to resource reallocations in favour of more productive firms, which in turn augments productivity and contributes to welfare gains. It also creates new opportunities to profit from foreign markets, inducing the entry of new firms to the industry. These two effects together increase the labour demand and the real wages in the industry. Melitz's pioneering work stresses the role of firm-level differences in determining the economic effects of globalization within an industry in a particular country. His model sparked a whole new trend in international trade theory, as subsequent studies expanded its applications by incorporating additional features of product or labour markets into the basic model, such as worker heterogeneity, frictions in the labour

² The model in Krugman (1979) was extended gradually. Krugman based his first model on a one-industry economy with no transport costs. He then introduced transport costs of the “iceberg” type before finally considering a two-industry economy with iceberg transport costs (the version referred to here).

³ The concept of iceberg costs means assuming that only a fraction of a good that is exported reaches its destination, the rest having “melted away” in transit.

⁴ In a monopolistically competitive market, a large number of producers offer differentiated goods that are not perfect substitutes; each firm takes other firms' prices as given and ignores any possible influence of its own pricing decisions on those of its competitors.

market, informality and international fragmentation of production (outsourcing and offshoring). Some of these novel contributions are described in the following subsections.

Worker heterogeneity

Yeaple (2005) presents a general equilibrium model with technology varieties and heterogeneous workers to explain why firms producing similar products are considerably different in size, productivity, wages paid to their employees and engagement in export activities. Firms are initially identical and are free to produce using different technologies and to hire workers with different skills in a perfectly competitive labour market. In contrast to Melitz (2003), firm heterogeneity does not arise from the random assignment of productivity levels, but rather because firms use different technologies, hire workers with different skills and face different trade costs. Yeaple's model considers two countries that consume and produce a homogeneous good (non-traded services) in a competitive sector and a composite differentiated good (manufacturing) in a monopolistically competitive sector, in both cases using only labour, which is provided by a continuum of workers with different skills. Firms are free to enter either sector, but to produce a variety of the differentiated good they must first pay a fixed cost, which depends on the technology employed. International trade is also costly, with fixed costs and variable iceberg transport costs. A single technology is used to produce the homogeneous good, while two alternative technologies are available to produce the composite differentiated good. Workers are paid a technology-specific efficiency wage, and firms minimize costs taking into account their technology and the wage distribution. Under this framework, the effect of trade on four decisions faced by firms is considered: entry into an industry, choice of technology, engagement in export activities, and selection of workers. It is then shown that the combination of trade costs, the characteristics of alternative technologies and the availability of skilled workers can explain why exporters are larger, adopt more advanced technology, pay higher wages and are more productive than non-exporters. In addition, lower transport costs lead to a reallocation of workers across technologies, and within and across industries. Specifically, a reduction in the shipping cost increases the labour force working with the advanced technology and the wages of the most highly skilled workers, while the wages of the less skilled are negatively affected.

Following a different approach, Davis and Harrigan (2011) introduce worker heterogeneity into the Melitz (2003) model by combining it with the Shapiro and Stiglitz (1984) model of efficiency wages at the firm level in order to account for the facts that most trade is intra-industry trade, that the greater part of adjustment to trade liberalization takes place within industries, and that the existence of worker rents could be a source of resistance to trade reforms for some workers. In this model, workers dislike effort and this tempts them to shirk, but they are held back by the risk of being caught and dismissed. Workers maximize their utility on the basis of the wage received and the effort exerted, the latter modelled as an iceberg cost affecting the perceived real wage. If workers are found shirking, they are dismissed and spend time in unemployment. Firms monitor workers' efforts imperfectly and they set a wage that is sufficiently high to induce employees to work. Wages differ across firms owing to differences in monitoring ability, and equilibrium wages decline with improvements in monitoring. The heterogeneity of firms arises from differences in their productivity levels and monitoring ability, both of which become known after they have decided whether or not to enter the industry. The resulting framework predicts that trade liberalization destroys jobs with high marginal costs, which in some cases are low-wage jobs with low productivity, and in others are high-wage jobs with a productivity that is not sufficiently high to secure the jobs. Within firms with the same productivity level, only the worst-paid jobs survive, and these even expand with trade openness. Finally, the average wage offered across all firms increases owing to the reallocation of output towards the largest ones, which translates into an increase in the unemployment rate.

Another example of a model that takes into account worker heterogeneity is provided by Ben Yahmed (2012), who proposes a framework based on statistical discrimination (Lazear and Rosen 1990), technology varieties and heterogeneous workers (Yeaple 2005), and monopolistic competition (Krugman 1980) with firm heterogeneity (Melitz 2003) to explain why trade affects the gender wage gap differently depending on the skill level of workers (Joekes 1995; Ozler 2000; Ederington, Minier and Troske 2009; Juhn, Ujhelyi and Villegas-Sanchez 2014). In this model there are two groups of workers, men and women, who differ in terms of skills and job commitment, the latter referring to an individual's availability and willingness to maintain a long and continuous working life. The skill distribution is common and perfectly observable, but commitment is unobservable by the employer, leading to statistical discrimination against women because, on average, they have a weaker attachment to the labour

market. Employers pay worker-specific wages, and women are hired at lower wages to compensate for lower commitment. Firms decide simultaneously on technology investment and hiring, calculating the expected productivity of workers on the basis of their skills and their expected degree of commitment. Highly skilled workers are more productive than low-skilled workers, particularly in high-technology firms. Likewise, committed workers are more productive, especially in high-technology firms. In a closed economy setting, this model predicts that skilled workers are employed in high-technology firms, where the rewards for their skills and expected commitment are higher. Women need to have an even higher skill level than men to compensate for what firms perceive to be their lower level of commitment. This leads to a wider gender wage gap in the upper end of the skill and wage distributions. When international trade is introduced, it takes place between two countries producing different varieties of a differentiated good, and trade costs induce the most productive high-technology firms to engage in exporting. In this setting, a reduction in trade costs prompts firms to adopt high technology and benefit from exporting, which increases the demand for skilled and committed workers. Thus, trade liberalization increases the gender wage gap in the upper tail of the wage distribution, but the effect on the mean wage gap is ambiguous.

Finally, Sampson (2014) incorporates labour assignment into a Melitz (2003) model to study the effects of trade on wage inequality when both worker and firm heterogeneity are taken into account. This model extends the labour assignment framework of Costinot and Vogel (2010) to describe matching between workers and large, monopolistically competitive firms. It considers an economy in which firms are heterogeneous in technology, workers are heterogeneous in skills, and the skill and technology distributions and the total numbers of workers and firms are endogenous. Human capital accumulation is determined by the returns to skill and the human capital investment costs, so that workers exit the labour force if wages fall below their outside option. From the firm's perspective, entry, exit and research and development (R&D) decisions depend on the fixed costs, the technologies available and the nature of the markets. Labour is the only factor of production, and each worker's productivity depends on the technology used by the employer and his or her skills. Along with the assumption that firms select their employees so as to maximize profits in a perfectly competitive labour market, these conditions imply that firms with better technologies offer higher wages to highly skilled workers, leading to positive assortative matching between these two groups. The resulting model is used to analyse how trade integration influences the matching of workers to firms and wage inequality. As in Melitz (2003), trade is a costly opportunity for firms to enter new foreign markets and exports are subject to variable iceberg trade costs. The positive assortative matching between skills and technology previously described gives rise to firm-size wage premiums and exporter wage premiums. Owing to the fixed costs of exporting, only the technologically advanced, high-skill firms export, shifting the firm technology distribution upwards. Under these conditions, wage inequality is typically higher in the presence of trade than in autarky. Trade increases wage inequality among highly skilled workers in exporting firms, but has an ambiguous effect on inequality among workers at the bottom of the wage distribution.

Labour market frictions

To account for the fact that workers who lose their jobs as a result of trade liberalization have to go through a period of active searching to find new employment opportunities, thereby increasing the rate of unemployment in the short run, Felbermayr, Prat and Schmerer (2011) develop a model that integrates the Melitz (2003) model with the Pissarides (2000) model of equilibrium unemployment. In this framework, the world is made up of symmetric countries interacting in product markets. There is a single final output good, manufactured under perfect competition from domestically produced or imported intermediate inputs that are supplied by monopolistically competitive firms. Labour is the sole factor of production and it is inelastically supplied by the household. There are fixed market access costs for input producers wishing to enter any of the symmetric export markets, and international trade exhibits variable iceberg trade costs. Finally, the labour market is imperfectly competitive because of search-and-matching frictions, which lead to intra-firm bargaining. In addition to individual bargaining, collective bargaining is also analysed, that is, where management negotiates wages and employment with firm-level unions. The model predicts that reducing variable trade costs, or increasing the number of trading partners, has a positive effect on both wages and employment. That is, unemployment falls with trade liberalization and wages increase whenever aggregate productivity net of transport costs increases. The effect on employment is stronger in the case of individual wage bargaining than in the case of collective bargaining.

An alternative way of taking labour market frictions into account is provided by Davidson, Matusz and Shevchenko (2008), who propose a model based on unemployment generated by search and matching and on heterogeneity among both firms and workers to explain the facts that exporting firms are larger and pay higher wages (Bernard and Jensen 1999), that a firm's decision on whether to export is not strictly persistent over time (Roberts and Tybout 1997; Bernard and Jensen 1999), and that trade liberalization widens the skill wage gap (Hanson and Harrison 1999). In their model, the product market is perfectly competitive, but there are frictions in the labour market, as it takes time for unemployed workers and firms with vacancies to find one another. Low- and high-skilled workers search for a job, while firms decide on entering the industry and choose between a basic and an advanced technology (Albrecht and Vroman 2002). Both capital and labour are used in the production of a homogeneous good in a perfectly competitive market, and each firm requires a single manager to coordinate production. In these circumstances, some firms choose the basic technology, hire unskilled workers and pay low wages, while others opt for the advanced technology and hire highly skilled workers at high wages. Underemployment is likely to be present if the revenues generated by the two different groups of firms are similar, which occurs when highly skilled workers are matched with low-tech firms. As expected, larger and more productive firms pay higher wages and engage in exporting, but their decision to export is imperfectly persistent, as they will do so only as long as they are matched with highly skilled workers.

Egger and Kreickemeier (2009) also address the effect of trade liberalization on wage inequality, but between workers of the same skill group. They embed a model with labour market imperfections and fair wages (Akerlof and Yellen 1990) into a framework with monopolistic competition between heterogeneous firms (Melitz 2003). Their model assumes that fair wages depend on the productivity and economic success of firms. The authors consider an economy in which labour is the only factor of production and is used to produce differentiated intermediate goods and a homogeneous final output. The producers of the final goods seek to maximize profits in a competitive market, while the producers of the intermediate goods are monopolistic competitors, each one producing a single variety with a production function that depends on the firm's productivity level, a common fixed cost and labour, which is measured in efficiency units and depends on the number of workers and their effort level. Workers prefer fairness and choose their effort level depending on the wage they are paid relative to the fair wage, which is assumed to be a weighted average of the firm's economic success (the "market potential") and the average wage income per worker. The market entry and exit patterns of the producers of intermediate goods are modelled as in Melitz (2003), where firms have to pay a fixed sunk cost, establish their productivity level and decide whether or not to produce. Exporting implies an additional fixed cost and transport costs of the iceberg type. Under this set of assumptions, more productive firms pay higher wages, demand lower prices and are more profitable than less productive firms. Additionally, the more concerned workers are about fair wages, the larger is the wage differential between more and less productive firms. International trade increases the available varieties of intermediate goods, boosting market competition and reducing demand at the firm level, which translates into higher average profits (due to cheaper intermediates), greater welfare (due to more varieties), higher unemployment (due to a lower firm-level demand) and a larger wage differential between firms with different productivity levels.

Lastly, Helpman, Itskhoki and Redding (2010a) build on their earlier study (2010b) and on Helpman and Itskhoki (2010) in order to understand better how a country's labour market frictions affects its trading partners in a framework that incorporates firm and worker heterogeneity and search-and-matching frictions modelled as in the standard Diamond–Mortensen–Pissarides approach. Their model considers a world of two countries, each with one sector that manufactures a homogenous good and another sector that produces varieties of a differentiated product. Firms choose to enter the latter sector by paying a sunk cost; they then observe their productivity and decide accordingly whether to exit the industry, produce solely for the domestic market, or produce for both the domestic and export markets. Production involves a fixed cost, and exporting requires firms to pay an additional fixed cost and an iceberg variable trade cost. Regarding the labour market, workers are assumed to be identical and they may choose whether or not to search for employment. Workers attain a match-specific ability, and firms hire them only if their ability lies above a screening threshold. Firms and their workers bargain over the division of surplus from production, output is produced and markets clear. In equilibrium, larger and more productive firms export and pay higher wages, implying that international trade

increases wage inequality and unemployment. Finally, if search-and-matching frictions are reduced, welfare increases in the home country and decreases in its trading partners.⁵

Informality

In the Transition from the Informal to the Formal Economy Recommendation, 2015 (No. 204), the ILO defines the “informal economy” as all those economic activities performed by workers and economic units that are not covered or not properly covered by formal arrangements. Jobs are considered informal if the employment relationship is not subject to national labour legislation, income taxation, social protection or entitlement to employment benefits. The ILO clarifies that informality does not cover illicit activities, such as the provision of forbidden services or goods (notably drugs); and that informal work can be found across all sectors of the economy, in both the public and private spheres. It is estimated that more than 60 per cent of the world’s employed population and 56 per cent of workers in the Group of 20 (G20) economies are in informal employment (ILO 2018).

In this respect, the first attempt to use a dynamic industry model with firm heterogeneity to describe how trade liberalization may affect informality can be found in Aleman-Castilla (2006). Following Roberts (1989), the informal sector is defined as the set of economic activities carried out in small firms or by the self-employed, eluding government requirements such as registration, taxes and social security. This framework adds to the Melitz (2003) model the decision by firms whether to become formal or informal. Formality is assumed to lead to higher labour costs, but it also gives firms the opportunity to achieve higher productivity and access foreign markets. Informality, in contrast, exposes firms to the risk of being caught by the government and of having to pay part of their profits as a fine. In this set-up, a reduction in import and export tariffs induces the least productive informal firms to exit the industry and increases the market share and profits of formal firms that are already exporting, thereby contributing to an increase in aggregate productivity. The greater exposure to trade opens up new profit opportunities and prompts the entry of new firms, which increases labour demand and pushes real wages up. This in turn increases the costs of formality, forcing the firms at the margin to become informal. Along with the exit of the least productive informal firms, this leads to an ambiguous effect on the informality rate.

Paz (2014) also examines the impacts of trade liberalization on informality. He focuses on a small open economy in which changes in trade policy affect a firm’s decision to offer formal or informal jobs, the latter defined as an employment relationship in which the employer does not comply with payroll tax regulations. The formality decision is embedded in the Davis and Harrigan (2011) model of trade with firm heterogeneity (Krugman 1980; Melitz 2003) and efficiency wages (Shapiro and Stiglitz 1984), allowing for worker heterogeneity through different levels of effort, so that among firms with the same level of employment, some hire formal workers and others hire informal workers. The model predicts that a reduction in import tariffs decreases the average formal wage and the share of informal workers. Likewise, a reduction in export tariffs increases the average formal wage and the share of informal employment.

Becker (2018) investigates the link between informality and the effect of trade liberalization on welfare, employment and wage inequality. Informality is defined here as firm-level non-compliance with registration requirements (de Soto 1989). Heterogenous firms decide whether to be formal or not on the basis of profitability, and there are frictions in the labour markets due to workers’ preference for a fair wage. The informality decision is embedded in the model of Egger and Kreickemeier (2009). The resulting framework indicates that more productive firms are more likely to be formal and larger, to pay high wages and engage in trade, while less productive firms have a higher probability of being informal and smaller and of paying lower wages. It also suggests that trade liberalization has an ambiguous effect on formal employment and reduces informality, through a mechanism similar to that presented in Aleman-Castilla (2006). Openness to trade also has an ambiguous effect on aggregate output and welfare, as the increased aggregate output resulting from the shift of resources towards

⁵ Carrère, Grujovic and Robert-Nicoud (2020) present a multi-sector and multi-country model with risk-averse workers, sector-specific labour market frictions, unemployment benefits and equilibrium unemployment that, among other features, makes it possible to study the effects of discriminatory trade liberalization. This model predicts that trade liberalization reduces unemployment if it raises wages and reallocates labour towards those sectors with lower labour market frictions. The model is calibrated using country-level data and then used to estimate possible unemployment and wage effects of repealing the North American Free Trade Agreement (NAFTA) and raising tariffs between Mexico and the United States of America.

the most productive exporting firms may not necessarily compensate for the loss associated with the exit of the least productive informal firms. Trade liberalization also increases the wage differential between the formal and the informal sector, which increases aggregate wage inequality.

Lastly, Dix-Carneiro et al. (unpublished) build on Coşar, Guner and Tybout (2016) to develop a model of trade with search-and-matching frictions and collective bargaining in the labour market, in which heterogeneous firms decide whether to operate formally or informally. Formal firms comply with minimum-wage regulations, are subject to dismissal costs, and pay taxes. There is imperfect enforcement by the government, which gives rise to informality. The presence of labour market frictions and hiring costs imply that there is unemployment in equilibrium. In the product market, there is a tradable and a non-tradable sector, each one producing differentiated goods in a monopolistic competition environment with formal and informal firms. At the beginning of each period, incumbent firms establish a new productivity level and decide whether to exit the industry, adjust their labour force and become formal.⁶ This regular adjustment of the labour force implies posting vacancies or dismissing workers. Hiring costs are assumed to increase with the firm's employment growth rate, while dismissal costs are only paid by formal firms and they are equal in both sectors. Entry of new firms also occurs every period. Potential entrants observe an ex ante productivity signal and decide whether to enter or not, as a formal or an informal firm. If they do decide to enter, they observe their actual productivity. The authors allow for the fact that there may be an overlap of productivity of entrants in both the formal and informal sectors (Meghir, Narita and Robin 2015). Finally, firms in the tradable sector are able to export, facing fixed costs, ad valorem tariffs and iceberg trade costs. This model predicts that reducing trade costs would give rise to a reallocation of workers towards larger and more productive firms, which are more stable and have lower worker turnover. At the same time, exporters become more sensitive to idiosyncratic shocks, which increases worker turnover. Additionally, trade liberalization would affect the productivity, size, formalization, exit and exporting thresholds of firms.

► Global value chains: International outsourcing and offshoring

According to Inomata (2017), the literature on global value chains represents a “third wave of reconstructing classical [trade] theory”.⁷ Thanks to the remarkable advances in transport and information and communication technologies, production can now be divided into several sequential tasks, each of which can be geographically reallocated to maximize efficiency. Thus, a new area of interest for contemporary research has to do with the international transfer of tasks. A significant body of literature has already emerged on trade and the international organization of firms, as can be seen from the surveys in Spencer (2005), Helpman (2006), Antràs and Rossi-Hansberg (2009) and Shingal (2015). Theoretical frameworks dealing with global value chains and their implications for labour markets appeared as early as the 1990s. Relevant examples are the studies by Feenstra and Hanson (1996), who build an H-O-type model of foreign direct investment and outsourcing to study the rising relative wages for skilled workers in both the United States of America and Mexico, as a result of the entry into force of the North American Free Trade Agreement (NAFTA) in 1994; and by Grossman and Maggi (2000), who develop a model of trade between countries with similar factor endowments but different talent distributions to explain patterns of specialization and trade. Kremer and Maskin (unpublished) also propose a model of international co-production by workers with different skills to explain the small scale of trade between countries with different factor endowments and the role of globalization in increasing inequality. In a closely related paper, Antràs, Garicano and Rossi-Hansberg (2006) propose a theory of the assignment of heterogeneous agents to hierarchical teams – with the less skilled specializing in production and the more skilled in problem-solving – and use it in a two-country (North and South) model to study how globalization leads to international teams, in which northern managers supervise southern workers (offshoring), affecting wages, occupational choices and the distribution of

⁶ Formal firms are not allowed to become informal.

⁷ The first wave was new trade theory, which shook the premises of perfect competition and constant returns to scale. The second wave was new-new trade theory, which reconsidered the assumption of homogeneous producers. The above-mentioned third wave challenges the neoclassical premise that countries trade only final products and that each product is made using domestic factors of production.

firm sizes in both countries. Finally, to analyse the impact of falling offshoring costs on income in the source country, Grossman and Rossi-Hansberg (2008) develop a theory of global production, whereby tradable tasks have heterogeneous offshoring costs, and the prospects for offshoring depend on coordination improvements between a firm's headquarters and its foreign suppliers. In this model, a decrease in the cost of offshoring low-skill tasks induces a productivity effect (from the savings obtained when prospects for offshoring improve), which benefits low-skilled workers; a relative-price effect, as a fall in offshoring costs alters a country's terms of trade, with the usual implications for wages; and a labour-supply effect, stemming from the reabsorption of displaced workers who used to perform the tasks now carried out abroad.

Without wishing to devalue the above-mentioned studies, we may describe Antràs and Helpman (2004) as a key contribution to the literature on global value chains in that it integrates the concepts of increasing returns to scale and firm heterogeneity into a model based on contract theory. To explore issues arising from the choice between outsourcing and vertical integration and between domestic and foreign production, the authors propose a North-and-South framework that considers the effect of within-sectoral heterogeneity on firms' decision to export (Melitz 2003; Helpman, Melitz and Yeaple 2004) and on their choice between outsourcing and integration (Grossman and Helpman 2002). Labour is the only factor of production, wages in the North are higher than in the South, and all consumers have identical preferences. The production of differentiated final goods requires headquarter services (provided by the North) and manufactured intermediates (produced in both the North and South). Final-good producers supply headquarter services, and operators of manufacturing plants supply intermediate inputs. International fragmentation of production is allowed, so that a final-good producer may choose between manufacturing partners in the North or in the South. Coordination with a foreign manufacturer is more costly than with a national one, and relationship-specific investments are governed by imperfect contracts. Firms choose between vertical integration and the outsourcing of intermediate inputs, and in either case they also decide from which country to source those inputs. The authors show that in equilibrium highly productive firms acquire inputs in the South, while low-productivity firms acquire them in the North. Among the firms that do not outsource abroad, the more productive ones tend to vertically integrate. Additionally, in sectors with a low need for headquarter services there is no vertical integration, less productive firms outsource domestically and more productive ones outsource abroad. Finally, the model also predicts that widening the wage gap between the North and the South, or reducing the trading costs of intermediate inputs, increases, in each country, the proportion of firms importing intermediate inputs and the proportion of firms that outsource.

Table 1 in the Annex outlines the main features of the models discussed so far. Their main predictions about the effects of trade and globalization on labour markets may be summarized as follows:

- Exporting firms are larger, technologically superior, more productive, and they pay better wages.
- Demand for skilled and committed workers increases with trade openness, as do their wages (the wage gap between skilled and unskilled workers is widened).
- Demand for female workers also increases with trade openness, but the effect on the gender pay gap is ambiguous.
- Social welfare rises with trade, as do unemployment, labour turnover and wage inequality.
- The positive effect of international trade on employment and wages is greater when they are negotiated individually, than through trade unions.
- Trade liberalization reduces informality in exporting sectors, but it has an ambiguous effect on this labour market outcome for the whole economy.
- Reducing offshoring costs for basic activities increases productivity and benefits the most skilled workers.
- Trade liberalization and the widening of the wage gap between developed and developing countries lead to increased outsourcing.
- The reduction of tariffs on final products reduces wages in domestic-oriented firms and raises wages in exporting firms. The reduction of tariffs on intermediate products increases wages in input-importing firms and lowers wages in firms that do not import inputs.

► 2 Empirical studies of trade and implications for the labour market

As pointed out by Goldberg and Pavcnik (2016), empirical studies have used a variety of research methods to evaluate the effects of trade on outcomes such as those concerning labour markets. Those methods should be regarded as complementary, with the specific choice depending on the research question and the characteristics of the data used. The various strategies can be grouped into three broad categories: the structural approach; the randomized controlled trial (RCT) approach; and the quasi-experimental approach.

The second of these categories relies on experiments designed to measure the effect of a treatment, such as a new policy intervention. Randomized controlled trials are the “gold standard” in other areas of knowledge, such as medicine and psychology, and they have been progressively adopted by economists, particularly in the field of development economics. Angrist and Pischke (2010) argue that the advantages of good research designs become most easily apparent when randomized assignment is used, but they also recognize that conducting experiments can be time-consuming, expensive and impractical. Moreover, regarding the feasibility of conducting RCTs in the context of trade policies at a national level, Goldberg and Pavcnik (2016) point out that even though this method could in principle be used, carrying out trials in such cases is virtually impossible. That is why to date there is no empirical research on trade and labour market outcomes using the RCT approach.

This chapter provides a brief description of the structural and quasi-experimental approaches, reviewing some examples of their use in the analysis of the effects of trade on labour market outcomes.

► Structural approach

The structural approach involves evaluating the effects of policies through the estimation of key parameters or reduced-form equations⁸ derived from an underlying theoretical framework. Keane and Wolpin (1997) describe it as a method that uses economic theory to guide empirical work, and they classify the related studies into two groups: those that seek to recover primitive parameters, and those that estimate decision rules derived from models. The structural approach is useful in conducting ex ante evaluations and in estimating the general effects of policies. Blundell (2017) explains that structural models are useful for identifying what he calls structural “deep” parameters (such as wage elasticities), the underlying mechanisms of observed economic behaviour (such as models of partial insurance) and policy counterfactuals (for instance, in ex ante evaluations of trade policies). Their effectiveness nonetheless depends heavily on the consistency of the estimators and on the assumptions about preferences and constraints made in the underlying theory, which need to be tested and relaxed if possible.

According to Nevo and Whinston (2010), structural modelling allows one to extrapolate past observations in order to predict responses to hypothetical future changes, when sources of credible inference of exogenous variation are available. On the downside, structural modelling has two important limitations. First, the empirical strategies for recovering key parameters rely very often on questionable instrumental variables; and secondly, the theoretical models used to predict how policy changes affect the behaviour of economic agents are frequently non-transparent, complicated, based on strong simplifying assumptions and ignorant of long-term effects. Nevertheless, the growing availability of better and larger data sets, more powerful computers, and improved modelling and econometric methods that allow more robust inference have enabled researchers to achieve significant improvements.

⁸ A reduced-form equation, or system of equations, refers to the expression(s) obtained from solving the equilibrium or first-order conditions in a model for all its endogenous variables, where these are expressed as functions of the existing exogenous variables.

Structural methods of estimation have been used to evaluate the effects of trade on labour market outcomes, including employment, wages, welfare and informality. Some examples are given below.

Employment and wages

Coşar, Guner and Tybout (2016) use a structural estimation procedure to explore the combined effects of reductions in trade frictions, tariffs and dismissal costs on firm dynamics, job turnover and wages in Colombia, a country that conducted a significant liberalization of trade during the late 1980s and early 1990s, and which also adopted important reforms in 1991 to reduce dismissal costs. Their study seeks to identify the mechanisms through which globalization increased wage inequality, unemployment and job instability, and to determine how trade and labour market reforms shaped the impact of global integration on labour market outcomes. The authors develop a general equilibrium model linking globalization and labour regulations to wages, job flows and unemployment, in a set-up that extends previous models of dynamic matching (Bertola and Caballero 1994; Bertola and Garibaldi 2001) and search frictions with heterogeneous multiple-worker firms (Koeniger and Prat 2007) to include fully articulated product markets, international trade (Melitz 2003), serially correlated productivity shocks, intermediates and endogenous entry and exit of firms. The model is fitted by estimating 16 of its parameters⁹ through the method of simulated moments (Gouriéroux and Monfort 1996), using establishment-level data for Colombia, which consist of annual observations on all manufacturing plants with at least ten workers. Assuming that Colombia was in a steady state prior to the reforms, the authors fit the model to annual data from 1981 to 1990 and then use it to simulate the effects of the reforms and reductions in trade barriers on labour market outcomes. The study indicates that reductions in import tariffs and labour market reforms can explain a significant part of the increase in inequality experienced over the following decade, but that they are unlikely to be the reason for the increased job turnover and unemployment observed. Additionally, reductions in trade frictions intensified the effects of the labour reforms and serve partly to explain the increase in unemployment. The authors conclude that if the trade reforms had not been accompanied by labour reforms, their negative effects would have been greater and job turnover would also have increased.

Another example is Helpman, Itskhoki, Muendler and Redding (2017), who study the effects of trade on wage inequality in Brazil. They develop an extension of the Helpman, Itskhoki and Redding (2010b) heterogeneous-firm model of trade and inequality. The authors consider an economy of many sectors and a large number of monopolistically competitive firms using a production technology that features complementarity between firm productivity and worker ability (Rosen 1982). Workers choose a sector in which to search for employment and are heterogeneous in their ability. Sectors exhibit search-and-matching frictions. Firms do not observe workers' ability, but they can invest in screening. Firms are heterogeneous in export-market entry costs and screening efficiency. The model features a "selection effect", whereby highly productive firms hire more workers, are more likely to export and pay higher wages; and a "market access" effect, whereby serving foreign markets requires production on a larger scale, which is complementary with greater selectivity in the labour market. Hence, exporters have more skilled workers and pay higher wages. This framework is used to derive a reduced-form model for employment, wages and export status:

$$\begin{cases} h = \alpha_h + \mu_h \iota + u \\ w = \alpha_w + \mu_w \iota + \zeta u + v \\ \iota = I\{z \geq f\} \end{cases}$$

where $I\{\cdot\}$ denotes an indicator function; h and w are the natural logarithms of employment and wages, respectively; ι is the firm's export status; and (u, v, z) are linear transformations of the heterogeneous productivity, screening efficiency and fixed export cost shocks of the firm, which are jointly normally distributed with mean 0 and covariance matrix Σ . The coefficients and covariance matrix are

⁹ The parameters that are not identified by the model were taken from external sources. These include the real borrowing rate, the average share of services in gross domestic product (GDP), dismissal costs, and the tariff equivalent of iceberg costs prior to the reforms.

functions of the parameters of the theoretical model and variables such as trade costs and relative market demand. In particular, μ_h and μ_w capture the “market access” effects of trade on employment

and wages, while the correlations in the covariance matrix capture the “selection effects” of larger firms into exporting. The econometric model is estimated using maximum likelihood, the generalized method of moments and a semi-parametric selection model following Powell (1994). The main data come from a linked employer–employee data set for the Brazilian manufacturing sector covering the years 1986–98, extracted from the Annual Social Information Report (RAIS), an administrative database of the Brazilian Ministry of Labour and Employment. This data set is combined with trade transactions data from the Secretariat of Foreign Trade within the Ministry of the Economy. The authors find considerable effects of trade on wage inequality, with the opening of a closed economy to trade raising the standard deviation of log worker wages by around 10 per cent. The model also suggests a non-monotonic relationship, where trade liberalization first raises and later reduces wage inequality.

Workers’ welfare

Another interesting example of the use of structural modelling in evaluating the effects of trade policies on labour market outcomes can be found in Artuç, Chaudhuri and McLaren (2010), who propose a dynamic equilibrium model with costly inter-industry labour mobility in order to study the effects of international trade on workers’ welfare. The authors seek to identify the costs faced by workers in moving between sectors as a result of import competition; the time needed for the labour market to adjust; and the relative position and welfare of the displaced workers in the new steady state. Their methodology is based on the dynamic rational-expectations model with full employment presented in Cameron, Chaudhuri and McLaren (2007), which is a Ricardo–Viner trade model with workers who choose to move to a different industry in each period, but must pay a cost to do so that has a constant component and a time-varying idiosyncratic component. Assuming that the latter is independently and identically distributed under an extreme-value distribution with parameters (γ, ν) , they derive an Euler equation for the equilibrium condition that can be interpreted as a linear regression:

$$\left(\ln m_t^{ij} - \ln m_t^{ii}\right) = \frac{-(1-\beta)}{\nu} C^{ij} + \frac{\beta}{\nu} (w_{t+1}^j - w_{t+1}^i) + \beta (\ln m_{t+1}^{ij} - \ln m_{t+1}^{ii}) + \mu_{t+1}$$

where m_t^{ij} is the fraction of the labour force in industry i at time t that chooses to move to industry j ; β is the rate of time preference; C^{ij} is the common time-invariant component of moving costs; w_t^j is the wage that a worker in industry j receives at time t ; and μ_{t+1} is information revealed at time $t + 1$, so that $E_t(\mu_{t+1}) = 0$. The parameters C^{ij} , β and ν are estimated by regressing current inter-industry

labour flows on future flows and the future wage differential, using past values of the flows and wages as instrumental variables with the generalized method of moments (Hansen 1982). Gross inter-industry flow measures and average industry wages are constructed from individual-level data using the 1975–2000 US Census Bureau’s March Current Population Surveys, which provide information on the individual’s industry, occupation and employment status at the time of the interview and during the previous calendar year. The estimates of the parameters are then used to study the effect of a hypothetical trade shock in the manufacturing sector. The simulations predict a slow reallocation of workers,¹⁰ with wages in the sectors affected falling in the short and long run, but possibly higher welfare due to better outside options. Finally, as workers change sectors quite often, inter-industry wages do not equalize after trade liberalization.

Informality

Dix-Carneiro et al. (unpublished) estimate their structural equilibrium model with heterogeneous firms, formal and informal sectors, and labour market frictions – described in Chapter 1 – using several data sources from Brazil. They first fix some of the parameters by combining aggregate data, estimates from

¹⁰ In the simulated elimination of a 30 per cent tariff on manufacturing, 95 per cent of the reallocation is completed in eight years.

previous papers and the statutory value of institutional parameters (such as tax rates). The remaining parameters are then obtained using an indirect inference estimator with equilibrium constraints.¹¹ In this step, 35 parameters are estimated using 139 data moments and auxiliary parameters. The study uses seven data sets with information on formal and informal firms and their workers: the Annual Social Information Report (RAIS), the Annual Survey of Industry, the Annual Survey of Trade and the Annual Survey of Services, which collect detailed information on firms' inputs, output and revenues; customs data from the Secretariat of Foreign Trade; the Urban Informal Economy Survey, which is a linked employer–employee survey conducted by the Brazilian Institute of Geography and Statistics (IBGE) in 1997 and 2003; and the Monthly Employment Survey. The authors run counterfactual experiments to assess the effects of trade shocks on an economy with a large informal sector. Four main results are obtained: first, that changes in import tariffs do not affect welfare, unemployment and informality; secondly, that reductions in trade costs reduce informality and increase productivity in the tradable sector, but they also increase informality in the non-tradable sector, the net effect being small; thirdly, that the relative effects of trade liberalization on welfare and labour market outcomes are not very sensitive to the size of the informal sector; and finally, that eliminating informality has stronger effects on welfare than, say, an unrealistic reduction in iceberg trade costs by 50 per cent.

► The quasi-experimental approach

Like the structural approach, the quasi-experimental approach also uses economic theory to guide empirical work, but as described by Angrist and Krueger (1999), it seeks to identify the causal effects from specific events or situations. The randomized controlled trial is recognized as the ideal research design, and the quasi-experimental study is an attempt to approximate an experiment. Meyer (1995) explains that such studies compare the outcomes of treatment and control groups in which individuals are not randomly assigned, but which have been carefully and adequately selected. Good quasi-experimental studies use transparent exogenous sources of variation to determine the treatment assignment. Meyer stresses the importance of understanding how this variation is used to estimate the key parameters of interest. The combination of a clear source of variation and a particular econometric technique to exploit it constitutes the identification strategy. From the point of view of Angrist and Krueger (1999), the main difference between the structural and the quasi-experimental approach is that the former makes assumptions about exogenous variability and the latter makes theoretical assumptions. Quasi-experimental studies provide evidence about causal effects, controlling for observable differences between groups, comparing the same units of observation at different points in time to reduce biases from unobserved characteristics, or using instrumental variables as a source of external variation. According to Angrist and Pischke (2010), the econometric methods most widely used in quasi-experimental studies are precisely instrumental variables, regression discontinuity and differences-in-differences estimation.¹²

Goldberg and Pavcnik (2016) point out that even though the quasi-experimental research design is typically guided by theory, the identification of the causal effects of trade policy depends less on specific functional-form assumptions, which makes such studies unsuitable for evaluating welfare or general effects of policy changes. In addition, as noted by Meyer (1995), there are general problems, or “threats to validity”, that are common to all empirical studies and may undermine the value of causal interpretations. On the one hand, there are threats to internal validity, which refers to problems related to omitted variables, ignoring pre-existing trends in outcomes, model misspecification, mismeasurement of variables, endogeneity of policies, endogeneity of explanatory variables (simultaneity), selection (when there is correlation between assignment and outcomes in the absence of treatment), attrition (differential loss of respondents from treatment and control groups) and omitted interactions. On the other hand, there are threats to external validity or problems that cast doubts on whether the effects found in a study can be generalized to different situations. These problems include possible

¹¹ See, for example, Gouriéroux and Monfort (1996) and Smith (2008). Indirect inference is a simulation method used to estimate parameters of economic models, particularly when the likelihood function is analytically intractable or very difficult to evaluate.

¹² Other econometric methods commonly used in quasi-experimental designs include propensity score matching (in which a control group is artificially generated by matching each treated individual with a non-treated one of similar individual characteristics) and sample selection bias correction (such as the Heckman correction technique, which aims at eliminating biases in estimates deriving from non-random samples or truncated dependent variables).

interactions between the treatment and individual characteristics (the treatment group may not represent the population), location (the effect may differ across geographical or institutional settings) and history (the effect may change over time). Meyer (1995) points out that knowing the theory, institutions, data collection process and other relevant background information is key to assessing and controlling for these problems adequately. Quasi-experimental studies have provided a large amount of evidence on the effects of trade on a variety of outcomes – including firm-level productivity, institutional distortions and labour market indicators – which in turn has informed the development of new theoretical models. In particular, evidence of the effects of trade on firms and workers has given rise to models such as those discussed in Chapter 1. The following subsections review some of these empirical contributions.

Wages

Frías, Kaplan and Verhoogen (unpublished) investigate the relationship between exports and wage premiums, using linked employer–employee and plant-level data from Mexico. Wage premiums are defined as wages above what workers would receive elsewhere in the labour market. The study uses the devaluation of the Mexican peso in 1994 to estimate the effect of exogenous export incentives on the skill and wage premium components of plant-level average wages. Their estimation strategy has two parts. First, on the basis of Abowd, Kramarz and Margolis (1999) – a standard methodology for decomposing wages by observable characteristics, individual, and firm heterogeneity – the plant-level average wages are decomposed into skill and wage premiums:

$$w_{it} = \eta_t + \alpha_i \delta_t + X_{it} \gamma_t + D_{it} \psi_t + \sum_{m=1}^M \varphi_{mt} w_{it-m} + \varepsilon_{it}$$

where w_{it} is the log wage of individual i at time t ; η_t is a time effect; $\alpha_i \delta_t$ is a time-variant individual effect; X_{it} is a vector of observable characteristics; D_{it} is a vector of indicators for the presence of individual i in plant j at time t ; ψ_t are the time-variant coefficients on this vector of plant indicators; and $\sum_{m=1}^M \varphi_{mt} w_{it-m}$ is a set of M lags of the dependent variable, which are included to capture the slow adjustment of wages to individual productivity shocks and absorb some of the serial correlation within individuals. In the second part of the estimation, changes in the key outcome variables (that is, plant-level export share, average wages and the estimated skill and wage premium components) are related to variation of the effective inducement to export:

$$\Delta y_j = \mu + \hat{\lambda}_{0t} \beta + D_j \pi + u_j$$

where j indexes plants; $\hat{\lambda}_{0t}$ is a Melitz-type firm productivity term in an initial year, proxied by log domestic sales;¹³ and D_j is a set of industry and state dummies. The parameter of interest is β , which captures a differential change in the outcome variables by the initial value of the productivity proxy. It is estimated for the Mexican peso crisis period of 1993–97 and compared with analogous estimates for the later period of 1997–2001, during which there was no devaluation of the peso. The employer–employee data come from 1985–2005 administrative records of the Mexican Institute for Social Security (IMSS) and contain individual information on age, sex, daily wage, state of residence, year of first registration with IMSS and establishment information on industry and location. This data set is then linked to plant-level data from the 1993–2003 Annual Industrial Survey conducted by the National Institute of Statistics and Geography (INEGI), which contains information on employment, total wage bill, investment, capital stock, domestic and export sales, among other variables. The study shows that approximately two thirds of within-industry wage differences is due to wage premiums, and the rest to workforce composition. It also suggests that the exogenous trade shock induced by the 1994

¹³ To check for robustness, the authors use four additional proxies: log employment, sales per worker, total factor productivity and an index of export propensity.

devaluation of the peso generated a differential increase in within-industry wage premiums, explaining essentially all of the differential changes in plant-level wages.

Amiti and Davis (2012) also analyse the relationship between wages and international trade, looking at how the effect on wages of tariff reductions for final products and inputs varies with the firm's level of trade involvement. Using a general equilibrium model with firm heterogeneity, trade in inputs and final products, and firm-specific wages, they predict firstly that reducing output tariffs lowers wages at import-competing firms but raises them at exporting firms; and secondly, that reducing input tariffs increases wages at importing firms. To test these predictions, they estimate a firm-level equation of wages (defined as the total wage bill divided by the number of workers) on industry-level output tariffs; firm-level weighted average input tariffs; exporter/importer indicators; firm-fixed effects and location-year effects; and a vector of firm characteristics. In order to control for possible endogeneity of the trade reform pattern,¹⁴ initial industry-level characteristics are used as instruments in a differenced version of the equation (Trefler, 2004). The authors use 1991–2000 Indonesian firm-level data from the annual survey of large and medium-sized manufacturing firms, which are classified into 290 five-digit categories on the basis of the International Standard Industrial Classification of All Economic Activities (ISIC). To determine the market orientation of the firms, they use firm-level information from the census on importers and exporters, which reports the value of exports, imported inputs and domestically purchased inputs for each plant in a given year. To disentangle the effects on wages from input and output tariffs, they use a list of all intermediate inputs and the amount spent on them for each firm in the 1998 manufacturing survey, provided by Statistics Indonesia. The results from the empirical study support the predictions of the proposed theoretical model.

In general, the effect of trade on wages has been extensively studied. The papers by Krishna, Poole and Senses (2011; 2012; 2014) are other recent examples. They use linked employer–employee data from Brazil to examine the impact of the 1990s trade reform on the wages of workers employed at heterogeneous firms, allowing for the non-random assignment of workers to firms.¹⁵ They confirm a differential and positive effect of trade liberalization on wages at exporting firms. However, after controlling for worker and firm characteristics, and using firm–worker match specific effects to account for the endogenous mobility of workers, they find that this effect is insignificant and that the workforce composition improves systematically in exporting firms in terms of skills and the quality of matches (Krishna, Poole and Senses 2011; 2014). The authors also find differential effects of trade reform on wage inequality between worker groups, with more educated workers experiencing greater increases in wage dispersion, and university-educated workers at exporting firms experiencing wage increases relative to their counterparts at non-exporting firms (Krishna, Poole and Senses 2012).

A further relevant study is that by Baumgarten (2013), who uses linked employer–employee data from the German manufacturing sector to analyse the role of exporting establishments in the rise of wage inequality between 1996 and 2007. He shows that the increase in the exporter wage gap contributed to the growth in wage inequality, and that the rise of employment in exporting firms lowered wage dispersion. Other empirical studies on trade and wages are Hanson and Harrison (1999) and Feliciano (2001) on Mexico; Attanasio, Goldberg and Pavcnik (2004) on Colombia; Pavcnik et al. (2004) on Brazil; Scott (2005) on Jamaica; Dutta (2007) on India; Said (2012) on Egypt; Lee and Lee (2015) for the impact of offshoring on the wages of temporary workers in the Republic of Korea; Meschi, Taymaz and Vivarelli (2016) on Turkey; Matthee, Rankin and Bezuidenhout (2017) on South Africa, using linked employer–employee administrative data collected by the South African Revenue Service; and Schank, Schnabel and Wagner (2007), Schröder (unpublished) and Winkler (unpublished) on Germany, all using linked employer–employee data.

Local labour market outcomes

Since the late 2000s, many studies have documented the differential effects of trade policies on local or regional labour markets that differ in their industry mix. A recent example is the paper by Dix-Carneiro

¹⁴ For example, it could be argued that firms in industries with slow wage growth lobby for protection, which would lead to reverse causality and a negative bias on the output tariff coefficient.

¹⁵ In order to allow for the fact that a worker's assignment to a firm may not be independent of the time-invariant match-specific productivity, worker–firm match fixed effects (or job-spell fixed effects) are included in the wage equations that are fitted on sector-level trade protection variables, worker and firm characteristics, and region-year and sector-year dummies.

and Kovak (2017), who study the evolution of the effects of trade liberalization on Brazilian local labour markets. The authors point out that regions facing larger tariff cuts experienced more prolonged declines in formal employment and wages, with increasing effects over time. They draw on 25 years of administrative data to study the ways in which local labour markets adjusted to the 1990s trade liberalization. In particular, they use variation in tariff reductions across industries and variation in the industry mix of employment at the regional level to measure changes in local labour demand induced by liberalization, applying the following specification estimated separately for each year between 1992 and 2010:

$$y_{rt} - y_{r,1991} = \theta_t RTR_r + \alpha_{st} + \gamma_t (y_{r,1990} - y_{r,1986}) + \epsilon_{rt}$$

where y_{rt} is the value of a regional outcome of interest (earnings or employment); θ_t is the cumulative effect of liberalization by year t ; α_{st} are state fixed effects, allowed to differ across years; $(y_{r,1990} - y_{r,1986})$ is a pre-liberalization trend in the regional outcome variable; and RTR_r is a time-invariant liberalization shock (regional tariff reduction) constructed using an adapted version of the specific-factors model of regional economies in Kovak (2013):

$$RTR_r = - \sum_i \beta_{ri} d \ln(1 + \tau_i), \quad \text{with} \quad \beta_{ri} = \frac{\lambda_{ri} \frac{1}{\varphi_i}}{\sum_j \lambda_{rj} \frac{1}{\varphi_j}}$$

where φ_i is the cost share of non-labour factors in industry i ; λ_{ri} is the share of regional labour initially allocated to tradable industry i ; τ_i is the tariff rate; and d is the long difference from 1990–95, the period of Brazilian liberalization. The regional labour market data come mainly from the RAIS database for the years 1986–2010. Given that this source does not contain data on informal workers, it is supplemented with the Brazilian demographic censuses from 1970–2010 where necessary. Local labour markets are defined using the “microregion” definition of Brazil’s national statistical office (IBGE), which groups together economically integrated contiguous municipalities with similar geographical and productive characteristics. Finally, tariff data are taken from Kume, Piani and de Souza (2003). The study finds large and increasing effects of trade liberalization on regional wages and formal employment. Regions facing larger tariff declines have worse outcomes compared to other regions, with these effects growing steadily until the late 2000s.¹⁶ Using the census data on informal workers, it is also found that regions with larger tariff cuts have higher levels of informal employment. After considering a variety of alternatives, the authors find strong evidence for imperfect interregional labour mobility acting as an adjustment mechanism that can account for these results.

Another relevant study in this area is that by Topalova (2010), who measures the impact on poverty of the trade liberalization that was initiated in India in 1991. Using the variation in sectoral composition across districts and liberalization intensity across production sectors to conduct a difference-in-differences estimation strategy, she finds that rural districts – in which production sectors more exposed to liberalization were concentrated – experienced a slower decline in poverty and lower consumption growth; and that the impact of liberalization was stronger for the least geographically mobile people at the bottom of the income distribution in Indian states with rigid labour laws. Other examples are Kovak (2013), who investigates the effect of the 1990s Brazilian trade liberalization on wages; Autor, Dorn and Hanson (2013), who analyse the effect of the rising Chinese import competition between 1990 and 2007 on US local labour markets; and Kim and Vogel (unpublished), who focus on the analysis of non-wage margins of adjustment (namely, hours worked per employee, unemployment and labour force participation) to trade shocks at the local labour market level in the United States. As noted by Dix-Carneiro and Kovak (2019) – who look at how Brazilian workers and regional labour markets adjusted to changes in labour demand induced by the 1990s trade liberalization episode – a consistent finding of such studies is that the costs and benefits of trade are unevenly distributed geographically, not just across industries or skills.

¹⁶ The effect on regional wages 20 years after trade liberalization is three times larger than the effect after 10 years.

Informality

Goldberg and Pavcnik (2003) examine the effect of trade liberalization on the informal sector, which is defined as the sector that does not comply with labour market legislation and does not provide workers with benefits. Using Brazilian and Colombian data from the 1980s and the 1990s, they look at whether, as a result of exposing formal firms to increased foreign competition, trade reforms force them to reduce labour costs by cutting employee benefits, hiring temporary workers or subcontracting work to informal firms. In this study, trade liberalization is measured through changes in import tariffs, which were different across sectors. The authors use this variation to identify the effects on informality by relating it to changes in the likelihood of informal employment in each sector. Methodologically, trade is related to the probability of working in the informal sector through a two-step estimation approach. In the first stage, a linear probability model is used to regress the indicator Y_{ijt} (which indicates whether

a worker i in industry j at time t works in the informal sector) on a vector of worker characteristics, H_{ijt} , and a set of industry affiliation indicators, I_{ijt} :

$$Y_{ijt} = H_{ijt}\beta_H + I_{ijt} * ip_{jt} + \varepsilon_{ijt}$$

where the coefficients ip_j capture the variation in informality due to industry affiliation. This equation

is estimated separately for each year in the sample. In the second stage, the “industry informality differentials” ip_j are pooled over time and regressed on trade-related industry characteristics:

$$ip_{jt} = T_{jt}\beta_T + D_{jt}\beta_D + u_{jt}$$

where T_{jt} is a vector of trade measures such as tariffs, imports and exports; and D_{jt} is a vector of in-

dustry and time indicators. This equation is estimated using weighted least squares. For Colombia, tariff data come from the National Planning Department, and labour force data from the National Household Survey, conducted twice a year between 1986 and 1998. For Brazil, the source of trade data is Muendler (2004), and the labour force data, covering the period 1987–98, come from the Monthly Employment Survey. The study finds no significant evidence that trade reforms contributed to an increase in informal employment in either country. For Brazil, no relationship was found between tariff reductions and informality, while for Colombia tariff elimination was found to increase informal employment in the most liberalized industries, albeit only until the adoption of some important labour market reforms.

Similar methodological strategies have been used in other studies, with mixed results for different developing countries. One example is the study by Aleman-Castilla (2006), who looked at the impact of NAFTA on informality in Mexico and found that reductions in Mexican import tariffs were associated with reductions in the likelihood of informality in the tradable industries, with this effect being stronger in industries that were relatively more export-oriented. Another example is Paz (2014), who assesses the effects of the Brazilian trade liberalization episode from 1989 to 2001, finding that a reduction in import tariffs slightly increases informality and the average informal wage, and reduces the average formal wage, while cutting foreign tariffs has the opposite effect. Other related studies are Bosch, Goñi-Pacchioni and Maloney (2012) and Ulyssea and Ponczek (2018) on Brazil; Selwaness and Zaki (2013) and Ben Salem and Zaki (2019) on Egypt; Cruces, Porto and Viollaz (2018) on Argentina; and Ben Yahmed and Bombarda (2020) on Mexico.

Gender wage gap

Ben Yahmed (2017) investigates the effect of international trade on gender wage differences, using a model in which trade patterns and the gender wage gap are both internally determined. The economy is characterized by an international Cournot oligopoly, where two countries produce and trade a homogeneous good. Following Becker (1957), firms are assumed to care about the gender composition of their workforce. Prejudiced employers offer men a wage premium, and the degree of prejudice against women generates firm heterogeneity in labour costs. International trade impacts on discrimination through a pro-competitive effect, with discriminatory firms assumed to be less productive because discrimination is costly. Import penetration forces discriminatory firms to reduce the demand for costlier

male labour, thus reducing the gender wage gap. Moreover, a market-size effect arises from the new opportunities abroad and the selection of firms into exporting, as only the most competitive export and the gender wage gap consequently narrows. These theoretical predictions are tested for the liberalization episode that took place in Uruguay after the creation of MERCOSUR in 1991, using the market access potential as defined in new economic geography models (Fujita, Krugman and Venables 1999):

$$\widehat{WG}_{jt} = \beta_0 + \beta_1 \ln \widehat{MA}_{j,t-1} + \beta_2 \ln C_{j0} \ln \widehat{MA}_{j,t-1} + \beta_3 \ln \widehat{CA}_{j,t-1} + \beta_4 \ln C_{j0} \ln \widehat{CA}_{j,t-1} + \theta_t + \mu_j + \epsilon_{jt}$$

where \widehat{WG}_{jt} is the estimated gender wage gap (Oaxaca 1973; Blinder 1973) in sector j at time t ; \widehat{MA} and \widehat{CA} are the market access measures – estimated through the computation of gravity equations

for each sector and year in the sample (Fally, Paillacar and Terra, 2010; Hering and Poncet 2010) – which capture the profit opportunities abroad and the competitive pressure of imports, respectively; C_{j0} is

the level of sectoral concentration in the first period;¹⁷ θ_t is a vector of year effects; and μ_j is a vector

of industry effects. The data used are taken mainly from the Uruguayan longitudinal household survey over the period 1983–2003, which covers all urban areas in the country and is restricted to employees in manufacturing. This source is complemented with data from the Annual Survey of Industry for 1988–96, the 1997 Economic Census, and the Survey of Economic Activity for 1998–2003. Trade data come from the CEPII TradeProd database (Mayer, Paillacar and Zignago 2008). The analysis finds that foreign competition reduces the gender wage gap, and that profit opportunities from exports widen it when domestic concentration is high.

The number of studies on trade and the gender wage gap has increased significantly in recent years. Juhn, Ujhelyi and Villegas-Sanchez (2013) use firm-level data from the Mexican National Survey of Employment, Wages, Technology and Training for 1992 and 2001 to look at the effect of NAFTA, finding that reductions in tariffs benefited female workers. Hakobyan and McLaren (2017) explore the impact of NAFTA in the United States, using an empirical approach based on local labour markets (Hakobyan and McLaren 2016) and data from the United States Censuses of 1990 and 2000. They find a negative effect on wage growth for blue-collar married women. Bøler, Javorcik and Ulltveit-Moe (2015) investigate the difference in the gender wage gap between Norwegian exporting and non-exporting manufacturing firms, using linked employer–employee data from different sources collected by Statistics Norway between 1996 and 2010. By controlling for unobservable worker and firm heterogeneity, they find that exporting firms exhibit a larger gender wage gap than non-exporting firms. Aguayo-Tellez (2012) and Papyrakis, Covarrubias and Verschoor (2012) provide comprehensive literature reviews on this topic.

Child labour

Kis-Katos and Sparrow (2011) examine the effects of trade liberalization on child work in Indonesia, a country that went through a major trade opening process between 1993 and 2002 in connection with its accession to the World Trade Organization (WTO) in 1995. During that same period, the workforce participation of children aged between 10 and 15 years more than halved. Owing to Indonesia's size and geographical variation, districts were affected differently by trade liberalization. Following an approach based on local labour markets, the authors exploit geographical variation in average exposure to trade liberalization over time. Their main specification for a static analysis using a pooled district panel is given by the following equation:

$$Pr(y_{ikt} = 1) = Pr(\alpha + \beta T_{kt} + \sum_{e} s_{ekt} \gamma_e + \lambda_{rt} + \delta_k + \epsilon_{ikt} > 0)$$

where y_{ikt} reflects work activities for child i in district k at time t ; T_{kt} is the average tariff in district k at time t , weighted by the sector shares of active labour force; λ_{rt} are time-region fixed effects that

¹⁷ Industry concentration is proxied using the Herfindahl index $C_{jt} = \sum_e s_{ejt}^2$, where s_{ejt} is firm e 's share of production in industry j at time t . The index values range from 1 (monopoly) to $1/N$, where N firms have equal market shares.

control for aggregate time trends; δ_k are district fixed effects; and \mathbb{X}'_{ikt} is a set of time-variant household and individual characteristics. This model is fitted using data from the Indonesian National Socio-Economic Survey (SUSENAS) and tariff lines from the Trade Analysis and Information System (TRAINS) of the United Nations Conference on Trade and Development (UNCTAD). An alternative specification for a dynamic analysis aggregates the data at the district level and includes a lagged dependent variable and a lagged tariff measure. This study suggests that trade liberalization contributed to a strong decline in child labour, particularly among older children and among children from low-skill backgrounds and in rural areas.

The above study is one of the few studies on the effects of trade on child labour that are based on micro-level data. Edmonds and Pavcnik (2005) offer a similar study that relates child labour to regional and intertemporal variation in the price of rice in Viet Nam. Using data from the 1992–93 and 1997–98 Vietnam Living Standards Surveys, they find that higher rice prices are associated with a reduction in child labour, particularly in households that are large net producers of rice. These results suggest that market integration is associated with less child labour. Edmonds, Pavcnik and Topalova (2010) examine the influence of trade policy on schooling and child labour in the context of India's 1991 tariff reforms. Using primarily the rural samples in the National Sample Surveys of 1987–88 and 1999–2000, together with the district-specific industry employment weighted average for 1991 of nominal, national, industry ad valorem tariffs, they find that while schooling increased and child labour decreased, these effects were weaker in districts with employment concentrated in more liberalized industries, as tariff elimination in those industries caused a relative rise in poverty that prompted families to reduce their children's school attendance – something that disproportionately affects girls.

Table 2 in the Annex presents the main features of some of the most relevant empirical studies that were mentioned in this chapter but not discussed in depth. The main findings on the effects of trade on labour market outcomes may be summarized as follows:

- Even if only to a certain degree, trade liberalization and globalization have contributed to an increase in wage inequality in several countries.
- Within a country, trade liberalization affects regions, sectors and labour markets in a differentiated way, and the type of liberalization reform (leading either to greater competition from imports or greater opportunities for exports, or both) is important.
- Trade liberalization leads to a slow relocation of displaced workers and lower wages in the sectors most affected, but also to a potential increase in welfare thanks to improved external options.
- Trade liberalization reduces informality in the tradable sectors (particularly in exporting firms) and increases it in non-tradable sectors, which translates into an ambiguous aggregate effect for the economy.
- Trade liberalization reduces the gender wage gap.
- Trade liberalization has contributed to a sharp reduction in child labour, particularly for older children from an underprivileged background in rural areas.
- Globalized companies, particularly exporting and multinational enterprises, employ more workers, pay better wages and improve the options available in the labour market.

▶ 3 Notable achievements and challenges

▶ Evolution of the theoretical frameworks

The field of international economics, in particular the strand focusing on the impact of trade on labour markets, has experienced a remarkable evolution over the past 40 years. On the theoretical side, analysts have moved away from a useful but simplistic framework based on unrealistic or outdated assumptions – such as all markets being perfectly competitive, or factors of production being fully mobile within countries – to a new family of industry-level models that incorporate more realistic assumptions and are better suited to explain the actual patterns of trade and its effects. This change began in the early 1980s with Krugman’s work taking into account economies of scale, product varieties and monopolistic competition. International economic theory was now able to explain that trade generates welfare gains because it leads to a greater diversity of goods worldwide; that wages tend to be higher in larger countries; and that, as a result of transport costs and economies of scale, countries specialize in the industry for which they have a larger domestic market.

As more and better data from many places around the world became available, the effects of trade at the industry level became more relevant for researchers. Empirical studies found evidence of different levels of productivity for firms in the same industry, with productivity being positively correlated with export orientation, and also evidence of a significant reallocation of resources favouring more productive exporters. In the light of these findings, Melitz (2003) developed his famous dynamic industry model, stressing the importance of firm heterogeneity when assessing the impact of trade in a given industry. The Melitz model prompted a new line of theoretical research devoted to features of the product and labour markets that had previously been neglected, but which proved to be empirically relevant. Among these additional features were worker heterogeneity, gender discrimination, labour market frictions, international outsourcing and offshoring, and informality.

The appearance of studies that seek to reconcile firm heterogeneity and imperfect competition with the neoclassical theory of comparative advantage (Bernard, Redding and Schott 2007), or that highlight the importance of local labour market rigidities, indicates that the above-mentioned surge in the development of new and extended theoretical frameworks is by no means over yet. Moreover, it is worth bearing in mind the slow but persistent trend towards deglobalization – reflected in the declining or stagnating share of global GDP attributable to global exports and imports of goods and services (see figure 2 in the Annex) – that began with the global financial crisis of 2008–09. This trend – which has recently been accelerated by the “trade war” between China and the United States and is expected to intensify because of the negative impact of the COVID-19 crisis on global value chains – may yet induce a new and profound shift in the way international trade is modelled and studied.

Furthermore, most of the conceptual dimensions of decent work still need to be incorporated into a formal theoretical approach. The ILO, in particular, has declared the promotion of “opportunities for women and men to obtain decent and productive work in conditions of freedom, equity, security and human dignity” to be its primary goal, emphasizing that “decent work is the converging focus of all its four strategic objectives: the promotion of rights at work; employment; social protection; and social dialogue” (ILO 1999, 3). The ILO’s decent work indicators (ILO 2013), particularly those that are relevant for trade policy analysis (ILO, forthcoming), are a useful set of alternative labour market measures that should be considered for future research.¹⁸ After convening an international Tripartite Meeting of

¹⁸ The *Handbook on Measuring Quality of Employment: A Statistical Framework* (UNECE 2015), prepared by the Expert Group on Measuring Quality of Employment (in whose work the ILO participated), also provides a coherent framework for measuring quality of employment as a multidimensional concept. The Handbook identifies 7 dimensions and 12 sub-dimensions of quality of employment, and proposes corresponding statistical indicators.

Experts on the Measurement of Decent Work in September 2008, the ILO adopted the Framework on the Measurement of Decent Work, which covers ten substantive elements: employment opportunities; adequate earnings and productive work; decent working time; combining work, family and personal life; work that should be abolished; stability and security of work; equal opportunity and treatment in employment; safe work environment; social security; and social dialogue, employers' and workers' representation. These elements represent the structural dimensions of the decent work measurement framework under which both statistical and legal framework indicators on decent work are organized and classified.

As could be seen from the discussion in Chapter 1, the theoretical frameworks available to date have focused mainly on the effects of trade on wages, employment, skill bias, informality and gender discrimination. There is clearly still room for developing new frameworks that can be used to measure the impact of international trade and globalization on other substantive elements of decent and productive work.¹⁹

► Empirical studies and the use of linked employer–employee data

As mentioned above, the appearance of larger and more reliable longitudinal and cross-sectional data sets in many countries prompted a significant number of quasi-experimental studies on the impact of trade on labour market outcomes. These studies have in turn provided valuable feedback for the continuous improvement of theoretical frameworks, leading to a revival of interest in the structural approach in econometrics. In this regard, the increasing availability and use of linked employer–employee data sets (LEEDs) have played a particularly important role. On the one hand, data sets of this kind allow a deeper and simultaneous analysis of the effects of trade on worker and firm outcomes. On the other hand, as pointed out by Abowd, Kramarz and Woodcock (2008) and Abowd, Kramarz and Margolis (1999), LEEDs allow one to identify separately the effects attributable to firms and workers.

By combining data from both sides of the labour market, it is possible to conduct equilibrium analyses of labour market outcomes while taking into account both worker and firm heterogeneity. Hamermesh (1999) argued that the relevance of LEEDs is evident because there is already a large amount of firm-level data that can be linked to household surveys, and labour market outcomes are determined by both sides of the labour market. LEED-based studies can help in validating household-based research, and many research questions in the labour economics field can only be answered properly by using such data sets.

Types of LEED and the advantages of using linked employer–employee data

Bryson, Forth and Barber (2006) distinguish between two types of LEED: longitudinal, which are usually based on administrative data; and cross-sectional, which are based on surveys of workplaces and their employees. Longitudinal LEEDs follow workers and firms over time, are suitable for linking the firm's outcomes (such as productivity) to workers' trajectories (such as tenure and wages), and they allow one to identify the impact of firm-level practices and policies. Cross-sectional LEEDs are usually collected through dedicated surveys that provide detailed information on employers, employees and the attitudes of the latter to the firm for which they work. Combining surveys with administrative data further enhances the analysis of long-term effects of practices and policies.

¹⁹ Understanding the implications of trade for decent work becomes even more relevant in view of the growing evidence of the positive effect that better working conditions have on firms' performance. For example, Brown, Dehejia and Robertson (2018) assess the impact of the Better Work Programme (a joint programme of the ILO and the International Finance Corporation) on firms in Indonesia, Jordan and Viet Nam. The authors find that participation in the programme had led to an increase in productivity, wages and profits. Similarly, in a case study covering over 10,000 employees in 14 organizations in the UK National Health Service, Robinson, Perryman and Hayday (2004) argue that engaged employees ("engagement" defined as a positive attitude towards the firm or organization and its values) perform better, and that this positive attitude is driven by such factors as involvement in decision-making, career development opportunities and the extent to which employers care about workers' health and well-being.

Abowd and Kramarz (1999) consider the sample design as an important second dimension in characterizing LEEDs. They identify six types, depending on the method used to construct them: (a) representative cross-sections of firms and workers, in which both firms and workers are cross-sectionally representative of the population; (b) cross-sections representative of firms but not of workers, with non-dynamic representativeness of firms in a given year and with some workers; (c) representative cross-sections of workers with longitudinal data on firms, where the sources of data for workers and firms are not previously coordinated, but rather linked by researchers; (d) representative worker–firm administrative-data panels, which are based on governmental administrative files; (e) representative worker–firm panels from statistical surveys, which are typically household surveys that include employer identifiers (examples include the French Labour Force Survey and the US National Longitudinal Survey of Youth); and (f) non-representative cross-sections and panels of workers and firms, which are not designed by statistical agencies and are not meant to be representative (for instance, salary surveys by employers).

Analysis based on LEEDs becomes very powerful when the employer–employee matching process is relevant to understanding the functioning of labour markets, which is often the case when heterogeneity is present in the population groups being analysed and when the underlying theoretical framework allows for some complementarity between firms and workers (Mittag 2019). According to Bryson, Forth and Barber (2006), using data from both sides of the labour market allows one to control for characteristics that are specific to the employment relationship. The disentanglement of within-firm and between-firm dispersion of certain outcomes of interest is made possible by observing workers' trajectories with multiple employers. As Woodcock (2015) shows, in addition to worker and firm effects, LEEDs allow one to take into account match-specific effects the omission of which would result in biased estimates. Additionally, LEEDs are useful for understanding why seemingly productive or beneficial practices are not adopted by all firms, and for identifying heterogeneous effects when such practices are indeed widely adopted. They are also helpful in understanding how the workforce composition and internal changes affect firms.

As Abowd, Kramarz and Woodcock (2008) point out, there are several areas of application for LEEDs in labour economics research, including the study of the wage structure of firms; employment mobility; the relationship between within-firm seniority and productivity, or between profits and within-firm job creation and destruction; technological upgrading and wages; training and general versus specific knowledge with between-firm movements of workers; wage determination in unionized firms; and race and gender discrimination. Other linked data sets similar to LEEDs²⁰ have been used to analyse the positive selection and sorting effects for highly skilled international migrants (Grogger and Hanson 2011); the impact of the match between teachers and schools for pupils' achievement (Jackson 2013); and the relationship between competition in the healthcare market and intensity of antibiotic use (Bennett, Hung and Lauderdale 2015). Goetz, Hyatt, McEntarfer and Sandusky (2017) discuss the potential of LEED-type data for use in research on entrepreneurship.

In addition – as already discussed in relation to new-new trade theory – LEEDs are proving to be an ideal source of data for analysing and understanding the implications of policies and events, such as trade reforms or exogenous economic shocks, on firm- and industry-level wage distributions (Frías, Kaplan and Verhoogen, unpublished; Helpman et al. 2017); informality (Dix-Carneiro et al., unpublished); labour reallocation (Menezes-Filho and Muendler 2011); wage premiums at exporting firms and multinational enterprises (Schank, Schnabel and Wagner 2007; Matthee, Rankin and Bezuidenhout 2017; Schröder, unpublished); and wages and employment at multinational corporations (Alfaro-Ureña, Manelici and Vasquez, unpublished). Finally, as pointed out by Jensen (2010), governments can benefit from the construction of LEEDs, as such data sets allow researchers to obtain more and better evidence that can inform the design and improvement of public policies.

Difficulties and challenges in using linked employer–employee data

The principal difficulty in using LEEDs is that the data need to be collected, which in most cases is expensive and requires different government agencies or institutions to collaborate and invest in this task.²¹ Bryson, Forth and Barber (2006) point out that while building a longitudinal data set implies

²⁰ These are data sets that focus on matches other than those between employers and employees.

²¹ For Hamermesh (1999), the reluctance of different government agencies to cooperate with one another is one of the main reasons why there are not more LEEDs.

following individuals or establishments over time and minimizing attrition, the collection of cross-sectional data is expensive and changes in rules or regulations may be necessary before existing data sets can be linked. Another challenge has to do with making the LEEDs available to researchers, which can be very difficult when the data were originally collected as part of statutory obligations (for example, tax returns or social security statements). In some cases, it may even be necessary for the research to be conducted by public servants and/or on governmental premises, and confidentiality issues may arise even with anonymized data.²² A third challenge is that the format of the data must be such as to allow manipulation and analysis, which can be a problem if the data were not originally collected for research purposes. Moreover, it is hard to ensure the comparability of results and studies over time when different data handling procedures are used. Finally, as pointed out by Mittag (2019), specifying and estimating models using LEEDs can be considerably difficult, as such models require the inclusion of not only a large number of fixed effects (namely, individual, firm and match-specific effects), but also some additional covariates that if omitted would lead to biased estimations (see, for example, Lechner and Wunsch 2013).

Independently of the outcome of interest and the type of data used, empirical studies on trade face some recurrent issues that should always be borne in mind. Goldberg and Pavcnik (2016) identify important challenges regarding: (a) measurement, specifically the possibility of an event not being the result of a real policy but of a deficient quantification of trade-related variables;²³ (b) aggregation and heterogeneity, which arise because it is often necessary to summarize the original trade information in order to link it with the available data on the outcomes of interest at a suitable level of analysis, and the theoretical framework behind the chosen aggregation method may impose the assumption of homogeneous or heterogeneous effects with which the study should be consistent; (c) endogeneity, meaning that it is possible for trade policies to be moulded by the interests of certain groups and industries, or by the prevailing economic conditions at the time of implementation; there may also be econometric endogeneity as a result of the omission of relevant variables, conjunctural macroeconomic events or pre-existing trends; (d) anticipation, which refers to when economic agents adjust their behaviour from the moment that a trade reform is announced and in anticipation of its actual implementation, leading to the misestimation of real effects; and (e) uncertainty, a problem that arises when the implemented trade policies strengthen the confidence and consumption decisions of economic agents, leading to an increase in trade flows and to other outcomes that cannot be easily explained by either the modified terms of trade or the higher level of certainty in the economy.

Additionally, Sidebottom (2017) identifies conceptual problems that arise when assessing the impact of multinational enterprises on employment and livelihoods, and which are also relevant in the broader context of international trade and labour market outcomes, particularly for studies that rely on firm-level data. These problems include disagreement on how to define the unit of analysis, which could be resolved through a better understanding of the internal structure of firms; lack of clarity about the type of globalization that is subject to analysis (for example, international fragmentation of production versus international outsourcing; or trade in intermediate inputs versus trade in final goods); and the importance of identifying the degree of international outsourcing within globalized firms, which implies that data sources should ideally also collect information on the firms' production networks (that is, on external suppliers). In sum, the challenges surrounding the assessment of the impact of globalized enterprises on labour market outcomes call for broader and more detailed data on the nature and internal organization of firms.

²² Jensen (2010) gives a number of examples illustrating how various countries, such as the United States and Norway, have overcome privacy concerns relating to the use of LEEDs. The solutions found include the use of a multiplicative noise distortion factor that alters sums, counts and ratios while retaining analytical validity; and non-disclosure agreements signed by each researcher who uses the data.

²³ Measurement problems are particularly important when non-tariff barriers are the main policy instrument.

► Future considerations: Extending the analysis of labour market indicators

In both the theoretical and the empirical literature, there is still a need to look beyond traditional metrics and devise new statistical indicators that better reflect the qualitative dimensions of decent work.²⁴ In this respect, we may consider, for example, the element of decent working time, for which the ILO's measurement framework includes five statistical indicators – employment in excessive working time (EEWT), defined as the percentage of the employed population²⁵ who worked more than 48 hours per week during a reference period; employment by weekly hours worked; average annual working time per employed person; the time-related underemployment rate; and paid annual leave – and two legal framework indicators: maximum hours of work and paid annual leave.²⁶ The first statistical indicator, EEWT, is identified by the ILO as the main measure for decent working time. Significantly, it is included by Galhardi (2018) as a relevant statistical indicator for the evaluation of decent work in the context of international trade, particularly in settings involving multinational enterprises. EEWT is a measure of exposure to overwork, that is, of people working longer hours than the threshold beyond which negative effects become visible. Among other negative consequences, a high EEWT value alters the work-life balance, increases the risks of injury, may be indicative of unjust payment and can also reduce productivity. The EEWT indicator can normally be constructed from labour force surveys in countries that meet the ILO standards; such surveys generally allow analysis of the data at different disaggregation levels. However, even though some studies have analysed the change in hours worked as one of the possible margins of adjustment of the labour market to trade liberalization or globalization (for example, Feliciano, 2001; Author et al., 2013; Kim and Vogel, unpublished), there seem to be no studies as yet that focus on the impact of these processes in terms of excessive working time. Such studies could be relevant not only for the evaluation of decent work outcomes, but also for gauging the possible effects on firms' performance (Brown, Dehejia and Robertson 2018).

As pointed out by Galhardi (2018), Mexico could be a good candidate country for studying the effect of trade on decent working time and other decent work elements, notably by virtue of the availability of data and the openness of its economy. Figures 3 to 6 in the Annex offer a glimpse of this potential by presenting the EEWT indicator for Mexico, using first-quarter data from the National Occupation and Employment Survey (Encuesta Nacional de Ocupación y Empleo; ENOE) for 2005–20.²⁷ The EEWT indicator can be easily disaggregated by different criteria such as sex (figure 3), employment status (figure 4), economic sector (figure 5) or geographical region (figure 6). It may readily be seen from these graphs that, on average, 28 per cent of the employed population in Mexico work more than 48 hours in a typical week; that EEWT is typically higher for men than for women; that even though EEWT has decreased steadily in recent years, excessive working time is more common among the self-employed and in the trade sector; and that, until 2019, EEWT consistently decreased in the states of Jalisco and Nuevo León (which are highly exposed to globalization), in contrast to Mexico City and the rest of the country.

In principle – and as long as adjustments are made for changes in the questionnaires and geographical coverage – the period of analysis could be extended back to 1987 using data from ENOE's predecessor, the National Urban Employment Survey (Encuesta Nacional de Empleo Urbano; ENEU).²⁸ Taking older data into account may be relevant, as the most intensive trade liberalization episode for the Mexican economy took place between 1985 and 1994, when the country joined the General Agreement on Tariffs and Trade and NAFTA. In addition, thanks to its scope (five tables for collecting data on housing, socio-demographic characteristics, occupation and employment), geographical representativeness and

²⁴ Anker et al. (2002) is one of the earliest papers to discuss and propose viable statistical indicators for measuring the dimensions of decent work. Burchell et al. (2014) review the development of concepts related to the European Union's quality of employment measures and the ILO's Decent Work Agenda in the academic literature.

²⁵ The employed population is defined by the ILO as the working-age persons who were in paid employment or in self-employment during the reference period.

²⁶ See ILO (2013, 91–105) for a full description of the indicators and of the concepts and definitions used (such as employment, work and working time), and the preferred data sources for measuring decent working time.

²⁷ ENOE is a quarterly rotating-panel labour force survey administered by the National Institute of Statistics and Geography (INEGI). The databases and related documentation can be downloaded from the following web page: <https://www.inegi.org.mx/programas/enoe/15ymas/>.

²⁸ The ENEU databases and related documentation are also publicly available on INEGI's website: <https://www.inegi.org.mx/programas/eneu/2004/>.

the rotating-panel structure, the ENOE data set could be used in a variety of econometric studies based on different research designs and identification strategies. For example, table 3 in the Annex presents the ordinary least squares estimates of the following equation, which relates the EEWT indicator with other covariates from ENOE:

$$EEWT_{ijkt} = \alpha + \mathbb{X}_{ijkt} \beta_{\mathbb{X}t} + \mathbb{I}_{ijt} * ip_{jt} + \mathbb{C}_{ikt} * cp_{kt} + \varepsilon_{ijkt}$$

where $EEWT_{ijkt}$ is an indicator that takes the value of 1 if worker i in industry j in city k at time t is employed in excessive working time, and is equal to 0 otherwise; \mathbb{X}_{ijkt} is a vector of worker characteristics such as the natural logarithm of hourly wages, age, years of education, sex, marital status, an indicator of informality,²⁹ a set of indicators of employment status (namely, paid employment, employer or self-employment), a set of indicators of the type of economic unit (namely, a business in the private sector, an institution, the household sector and a special or unspecified situation); \mathbb{I}_{ijt} is a set of dummy variables for worker i 's industry affiliation;³⁰ \mathbb{C}_{ikt} is a set of dummy variables for worker i 's city of residence; and ε_{ijkt} is the error term. This equation is estimated separately using data from the first quarter of each year between 2005 and 2020. The results indicate that EEWT increases with hourly earnings and decreases with age and years of schooling. Excessive working time is less common among women than men, and is more frequent among married people. EEWT is higher for employers and the self-employed than for paid employees; and it is also higher for those working in businesses than for those working in institutions or in the household sector. Even though significant for some of the years in the sample, the relationship between EEWT and informality is not consistent over time. Although not reported, both the industry and the city dummies were individually significant in most of the cases.

At a proper level of aggregation, the ENOE and ENEU labour force data could be linked to data from other sources, such as the trade databases from UNCTAD-TRAINS and the WTO,³¹ or the Annual Survey of Manufacturing Industry for the years 2009–17 and its predecessor the Annual Survey of Industry for the years 1994–2009,³² two surveys for the manufacturing sector conducted by INEGI to collect plant-level data on employment, wages, working hours, revenues, costs, inventories and capital. Other useful Mexican plant-level surveys are the Annual Trade Survey for the years 2010–19; the National Survey on Productivity and Competitiveness of Micro, Small and Medium-Sized Enterprises, conducted in 2015 and 2018; the National Survey of Employment, Wages, Technology and Training, directed at workers in the manufacturing sector and available for selected years between 1992 and 2005; and the Survey on Information and Communication Technologies for 2009 and 2013. Likewise, there are other household-level surveys that could provide relevant complementary data, such as the National Survey of Household Income and Expenditure, conducted twice a year during 1984–2018; the National Household Survey for the years 2014–17; and the National Survey on the Availability and Use of Information Technologies in Households for the years 2015–18.³³

The administrative records of Mexico's Tax Administration Service combined with those of the Mexican Institute for Social Security (IMSS) are a promising alternative data source for studying the effects of trade policies on decent work elements that are currently not covered by establishment or household surveys to a sufficient degree. The great potential of these administrative records derives from the fact that the issuance of electronic invoices for all payroll payments in Mexico became mandatory as of 2017. Every time an employer pays their workers, the Tax Administration Service automatically collects information on the employer; the worker; the employer–employee relationship; type of contract; nature of the payments (for example, wages, pensions or benefits for temporary incapacity due

²⁹ As defined and pre-codified by INEGI.

³⁰ Based on the two-digit level of the North American Industry Classification System.

³¹ Available at <https://trains.unctad.org/> and <https://data.wto.org/>, respectively.

³² The documentation for the two surveys is publicly available at <https://www.inegi.org.mx/programas/eaim/2008/> and <https://www.inegi.org.mx/programas/eia/2009/>, respectively. For confidentiality reasons, however, the data have to be processed by INEGI upon request by researchers.

³³ Details of all the surveys conducted by INEGI can be found at: <https://www.inegi.org.mx/datos/?ps=Programas>.

to occupational injury); deductions; and hours paid. Given that the information on the employer and the worker includes their Federal Taxpayer Number and the worker's Social Security Number, the payroll-related electronic invoice data can be linked to the IMSS records.

In the context of the recent signing of the United States–Mexico–Canada Agreement and its entry into force on 1 July 2020, the linked data from the Tax Administration Service and the IMSS could be very useful for studying the Agreement's implications for certain decent work elements, such as “safe work environment”, for which the ILO's measurement framework has four statistical indicators – frequency rate of fatal occupational injuries; frequency rate of non-fatal occupational injuries; time lost due to occupational injuries; and labour inspection coverage – and two legal framework indicators: employment injury benefits and occupational safety and health labour inspection.³⁴ The data needed to calculate the values of these indicators are not normally collected by household and establishment surveys, but they are now captured to some extent via the Tax Administration Service records, which could be complemented with IMSS records on labour inspections, insurance and compensation payments. Two important challenges must nevertheless be taken into account. First, making the data from the Tax Administration Service and the IMSS available for analysis might be difficult, as these data are collected as part of statutory obligations and the authorities are obliged to safeguard their confidentiality. To access the data, it may be necessary for researchers to sign non-disclosure agreements with both agencies, whereby they agree to anonymize the information, work in collaboration with teams of public officials, and conduct all their analysis on governmental premises. Secondly, the original format of the raw data would very likely need to be modified – especially the Tax Administration Service data, which are collected in XML format – so that these data can be linked with complementary data sources and to facilitate data handling and analysis, which tend to be difficult and time-consuming.

³⁴ See ILO (2013, 154–168) for a full description of the indicators and of the concepts and definitions used, and the preferred data sources for measuring safe work environment.

► Concluding remarks

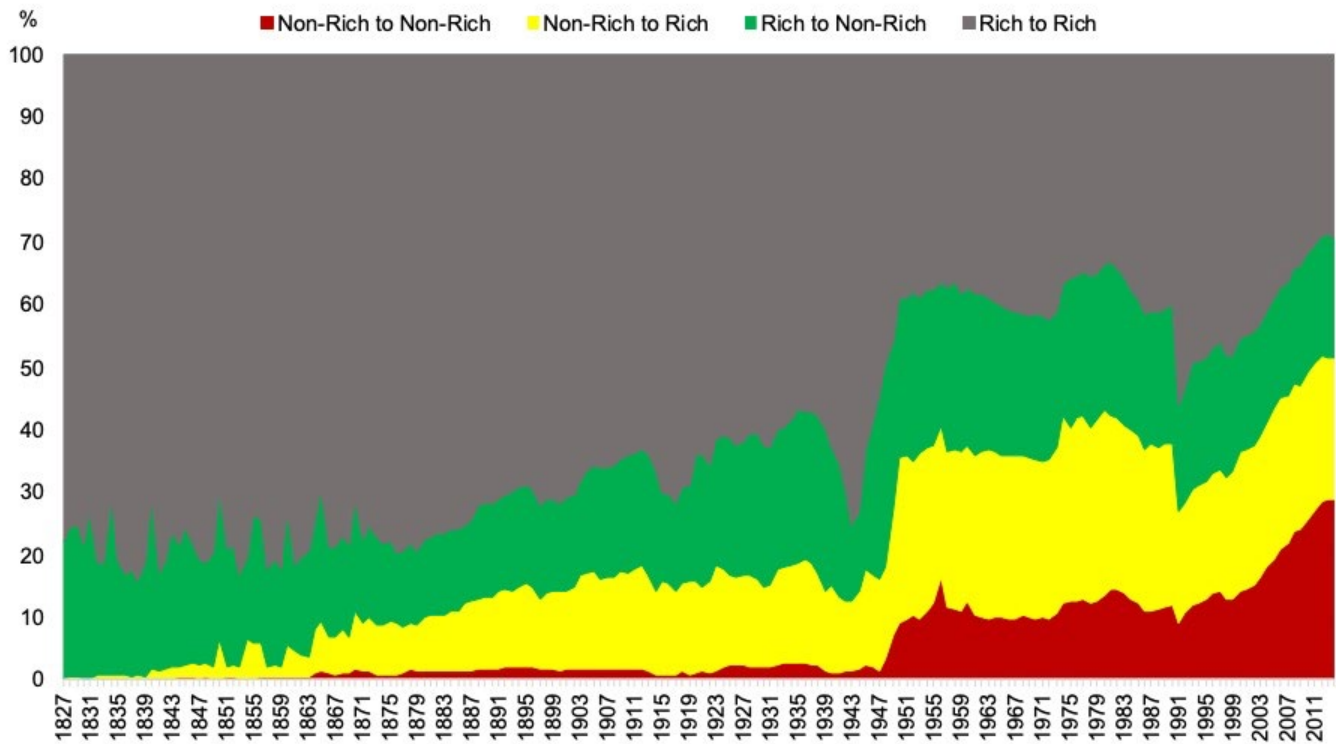
The theoretical literature on trade has evolved significantly over the past four decades. Analysts have moved away from the neoclassical model based on the concept of comparative advantage (involving two countries using technologies characterized by constant returns to scale to produce commodities with homogeneous factors of production under perfect competition) to the new-new trade theory and a related family of dynamic industry models that take into account heterogeneous firms and workers, labour market frictions, international outsourcing or offshoring, and other more realistic and modern features of the product and labour markets. However, even though novel theoretical frameworks have been developed to assess the impact of trade on various labour market outcomes (such as wages, employment, informality and skill and gender wage gaps), most of the structural dimensions of decent work, as defined by the ILO, have not yet been taken into consideration. These dimensions encompass ten substantive elements: employment opportunities; adequate earnings and productive work; decent working time; combining work, family and personal life; work that should be abolished; stability and security of work; equal opportunity and treatment in employment; safe work environment; social security; and social dialogue, employers' and workers' representation (ILO 2013).

The growing availability of more comprehensive and higher-quality data in many countries, along with enhanced computational and econometric tools, has led to a significant amount of research on the effects of trade on labour market outcomes, providing valuable feedback for the continuous improvement of the underlying theoretical frameworks. In this respect, linked employer–employee data sets (LEEDs) have become particularly relevant, as they permit researchers to disentangle the effects of firm-level decisions from worker-level decisions, conduct equilibrium analyses of labour market outcomes, and investigate the combined effects of worker and firm heterogeneity. There are nevertheless some important challenges that researchers need to be mindful of.

First, allowance has to be made for certain recurring methodological issues, including measurement and aggregation problems, heterogeneity, endogeneity of policies, anticipation and uncertainty. Secondly, despite the progress achieved so far, there is still room for improvement in the coverage and quality of the data. It would be very useful to have a greater number of LEEDs, particularly for developing countries, and, what is more, data sets containing more comprehensive information on the nature and characteristics of firms so as to attain a better understanding of their trade-related decisions (for example, on outsourcing and offshoring). A combination of administrative records, such as those held by tax authorities, with data from social security institutions constitutes a very promising source of worker- and firm-level data in that respect, making it possible to study the impact of trade policies on labour market outcomes that are not sufficiently covered by traditional establishment or household surveys. Thirdly, it is necessary to widen the scope of analyses of the effects of trade by using alternative statistical indicators that capture properly the dimensions of decent work. The ILO's decent work indicators (ILO, 2013) and the statistical framework in UNECE (2015) provide a very useful starting ground for such research.

▶ **Annex**

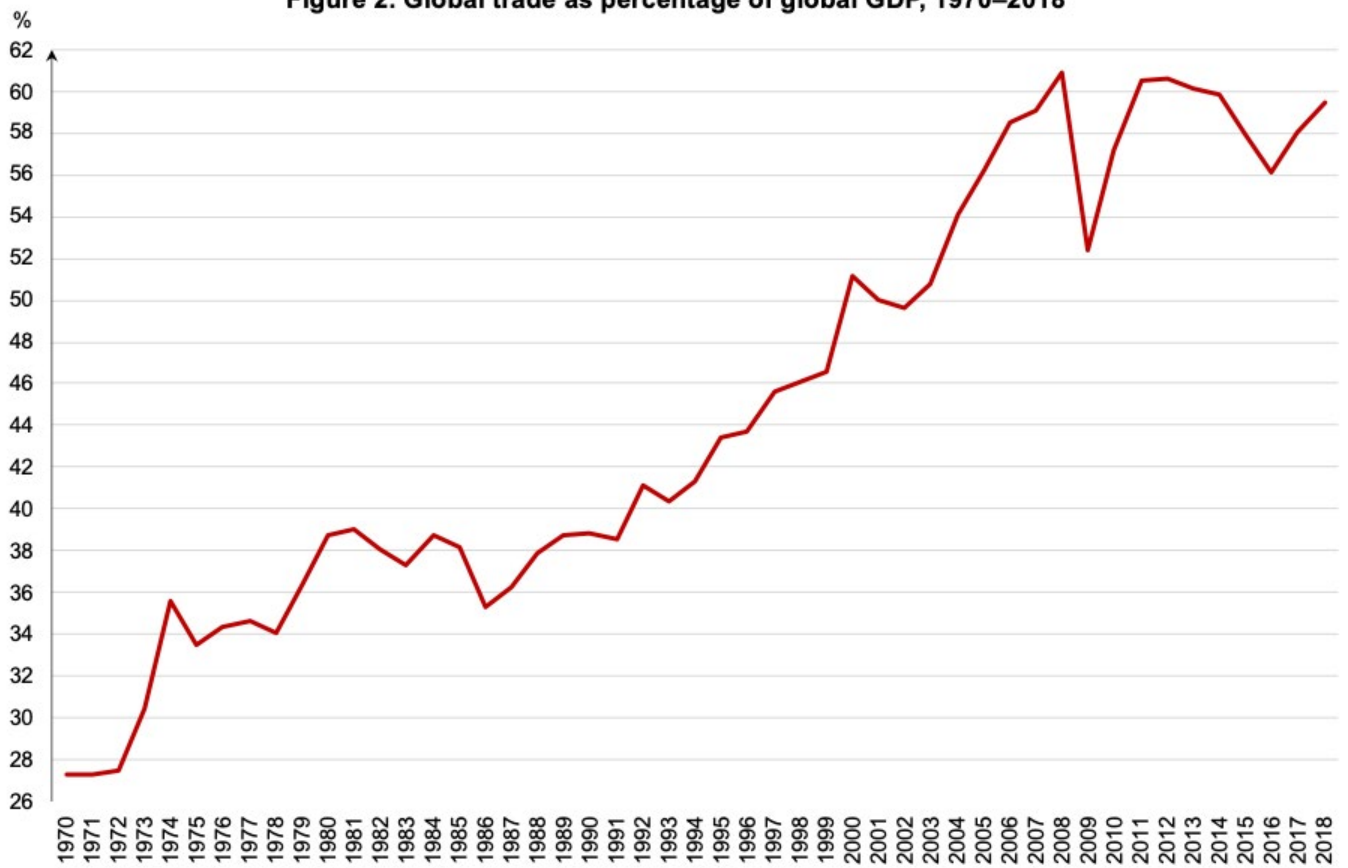
Figure 1. Value share of world merchandise exports, 1827–2013 (percentage)



Note: Non-rich countries are all countries in the world except for Australia, Austria, Belgium, Canada, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and US.

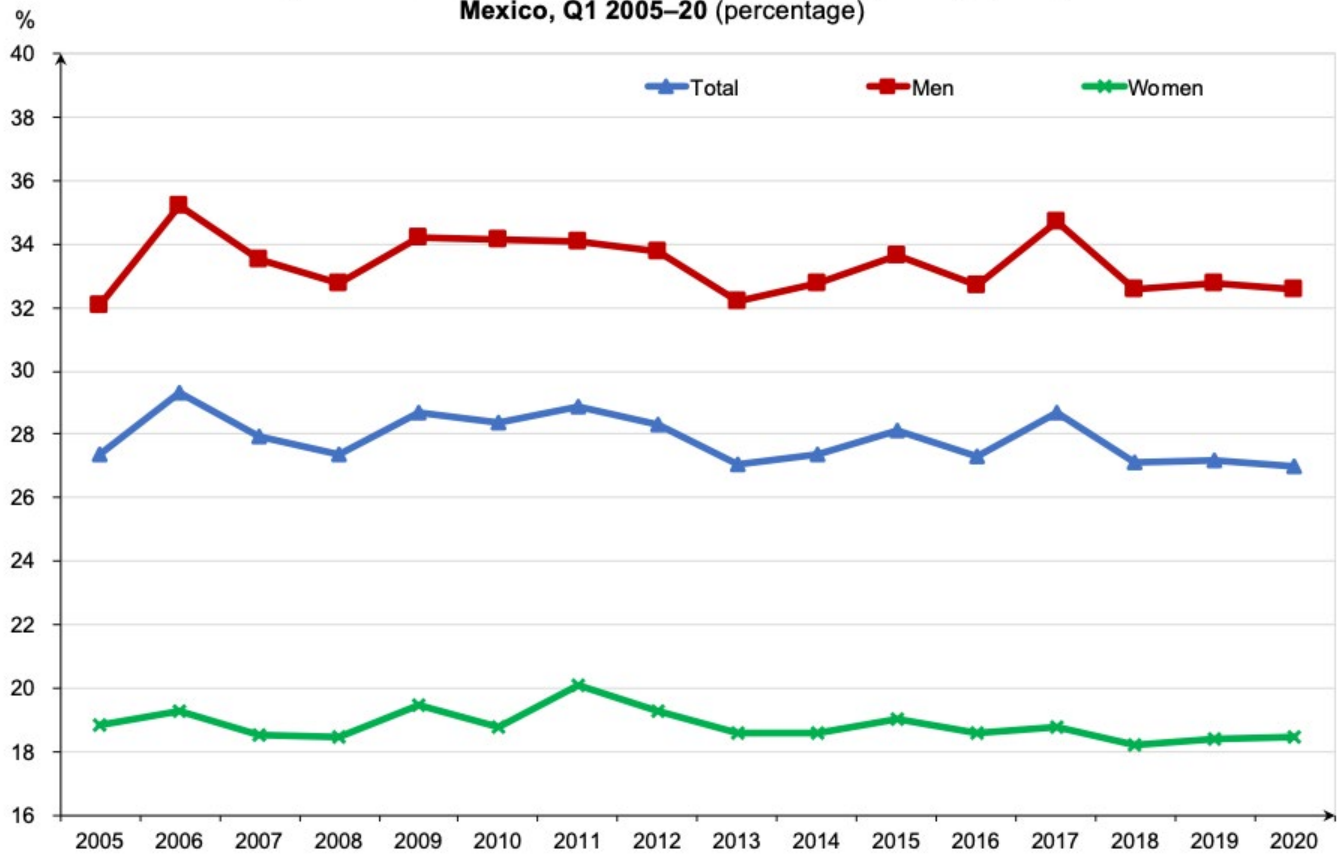
Source: Our World in Data, "Exports between Rich and Non-rich Countries," Oxford Martin School, University of Oxford (available at <https://ourworldindata.org/grapher/share-of-world-merchandise-trade-by-type-of-trade>), based on work by Fouquin and Hugot (2016).

Figure 2. Global trade as percentage of global GDP, 1970–2018



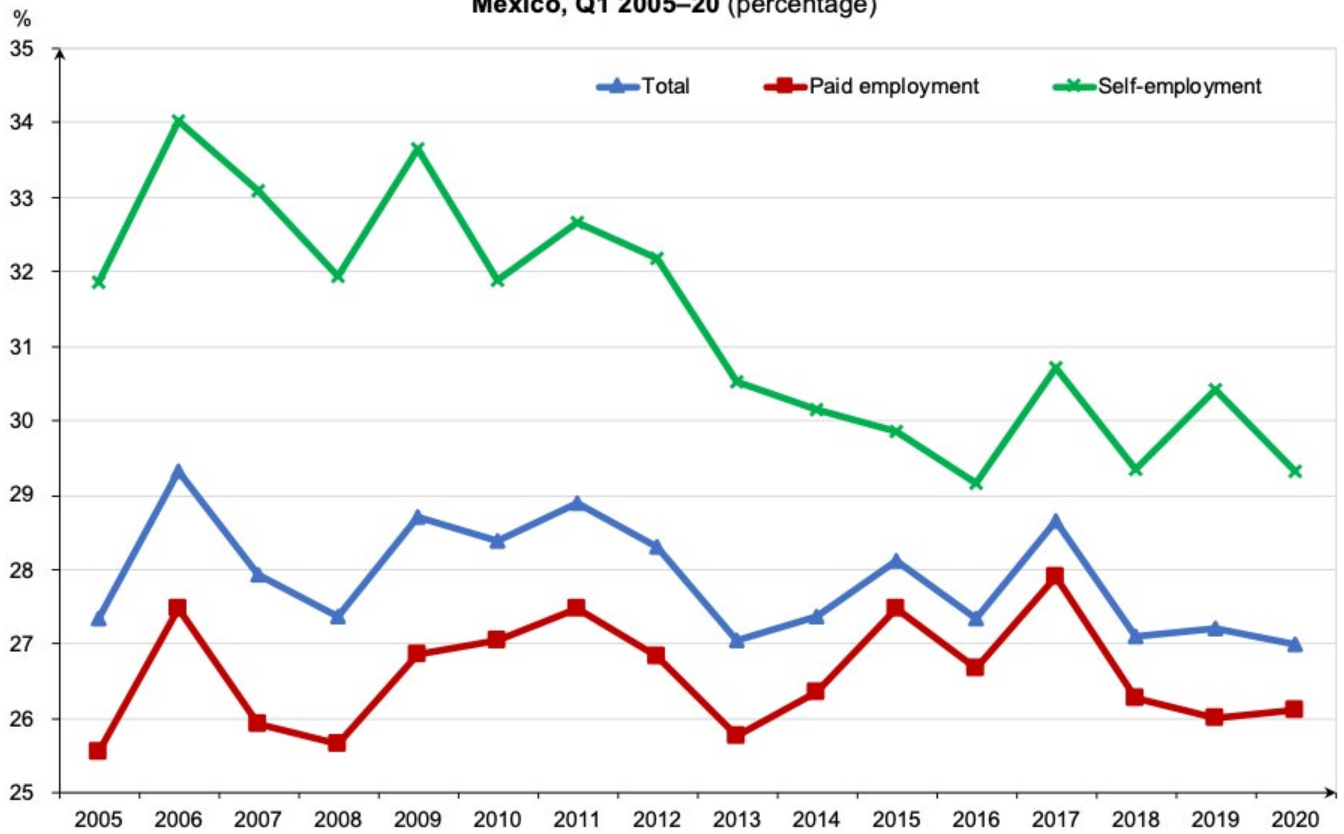
Note: Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.
 Source: World Bank national accounts data and OECD National Accounts Statistics data files.

Figure 3. Employment in excessive working time (EWT) by sex, Mexico, Q1 2005–20 (percentage)



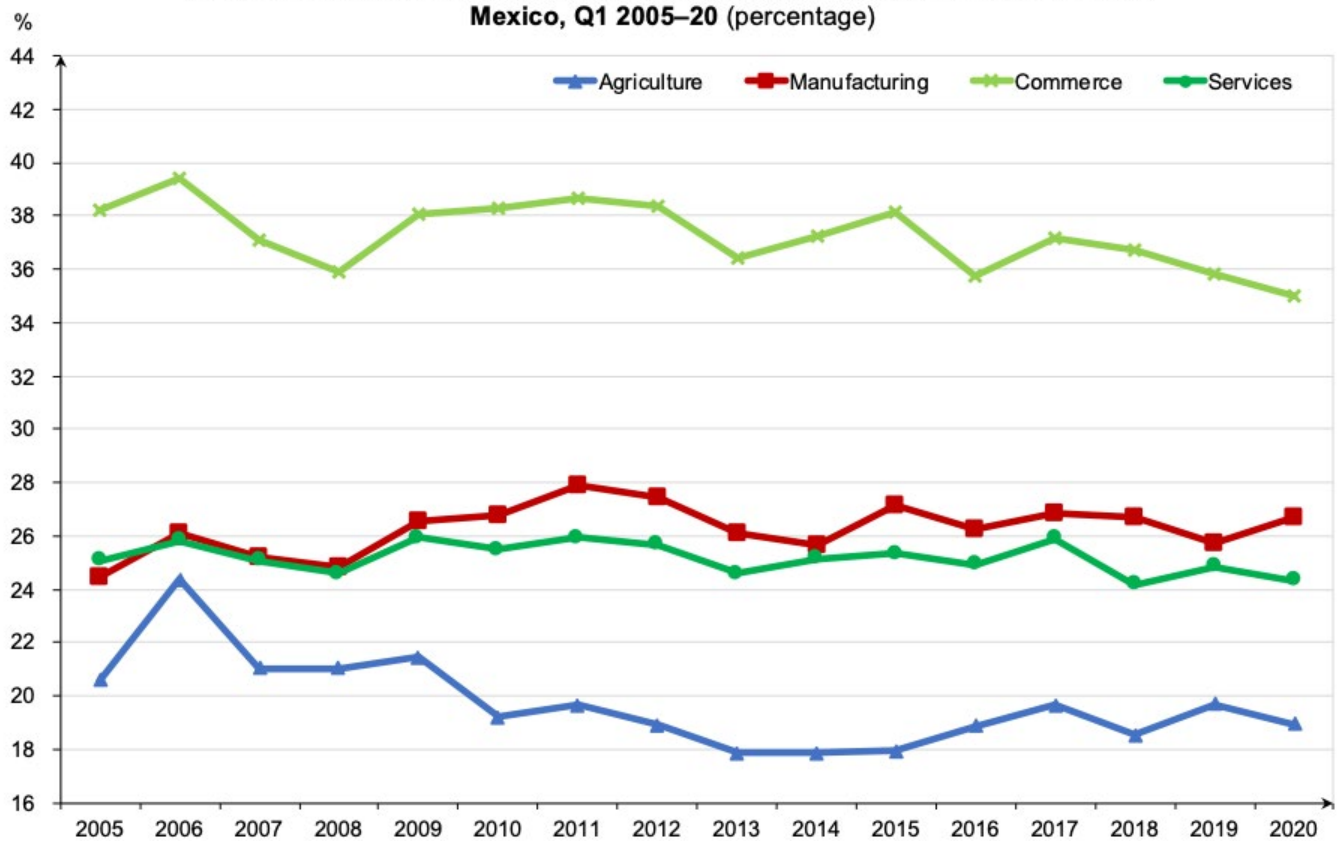
Source: Author's calculations based on the Mexican National Occupation and Employment Survey and the definition of the EWT indicator provided in ILO (2013).

Figure 4. Employment in excessive working time (EWT) by employment status, Mexico, Q1 2005–20 (percentage)



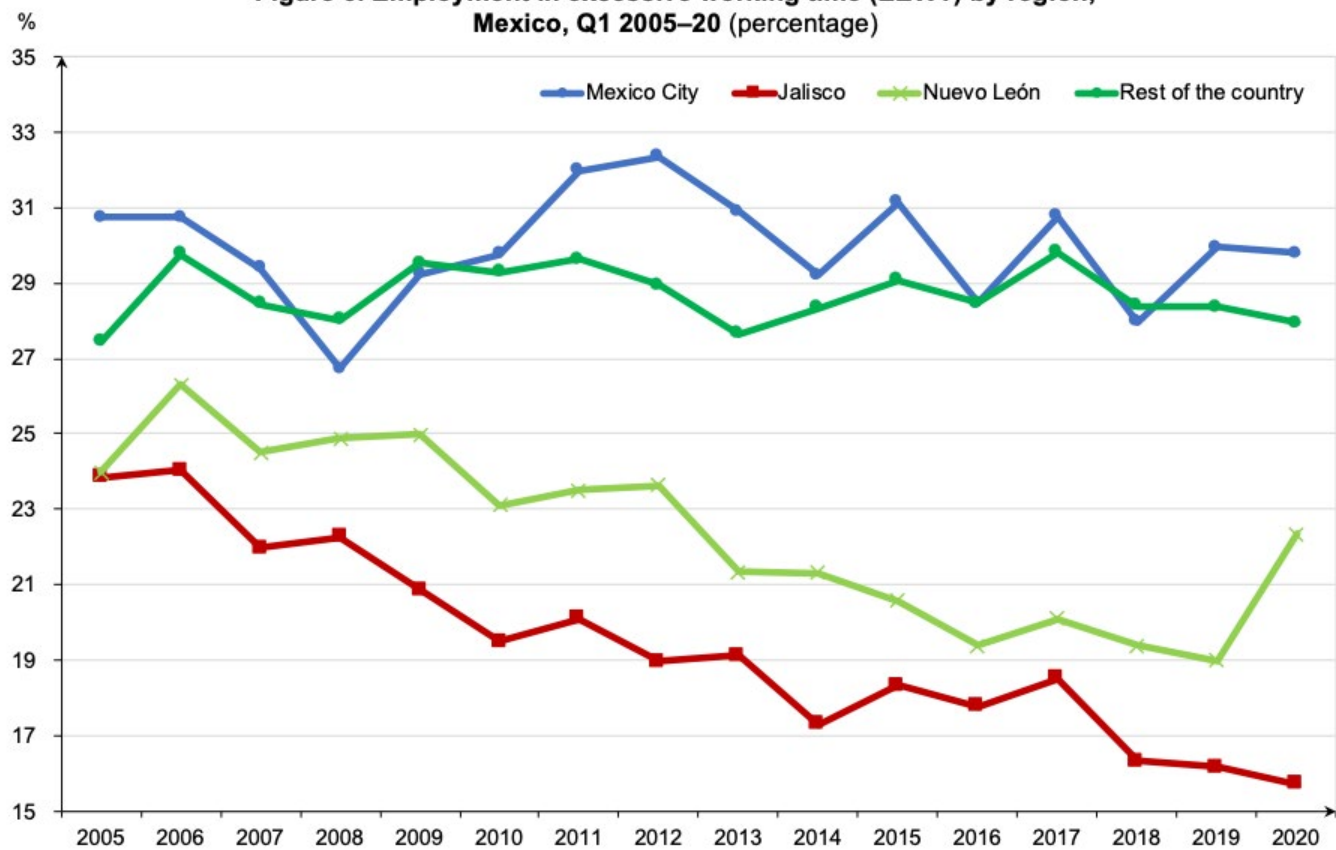
Source: Author's calculations based on the Mexican National Occupation and Employment Survey and the definition of the EWT indicator provided in ILO (2013).

Figure 5. Employment in excessive working time (EWT) by economic sector, Mexico, Q1 2005–20 (percentage)



Source: Author's calculations based on the Mexican National Occupation and Employment Survey and the definition of the EWT indicator provided in ILO (2013).

Figure 6. Employment in excessive working time (EWT) by region, Mexico, Q1 2005–20 (percentage)



Source: Author's calculations based on the Mexican National Occupation and Employment Survey and the definition of the EWT indicator provided in ILO (2013).

Table 1. Theoretical frameworks for analysing the effects of trade on labour market outcomes

Theoretical family	Framework	Main assumptions	Labour market predictions
Neoclassical trade theory	Ohlin (1933)	Countries with identical technologies and possibly different factor endowments; constant returns to scale; homogeneous factors of production that move freely within a country; perfect competition; full employment.	International trade should increase labour demand in labour-abundant countries, and real wages should tend to equalize between trading partners.
Specific factors model	Samuelson (1971) and Jones (1971)	Three factors of production (labour, capital and land); capital and land are industry-specific and cannot move within the country; perfectly competitive markets; no equilibrium unemployment.	International trade changes relative prices; countries export goods whose relative prices increase; the factor specific to the export sector benefits; the factor specific to the import sector loses.
New trade theory	Krugman (1979; 1980)	Two-industry countries that differ in size trade between them and face transport costs; labour is the only factor of production; homogeneous firms in monopolistic competition; full employment.	International trade generates welfare gains through a greater diversity of goods; higher wages in the larger country; countries specialize in the industry with the largest home market.
New-new trade theory	Melitz (2003)	Countries differ in size, trade between them and face transport costs; firms produce different varieties of goods; labour is the only factor of production; firms differ in productivity; fixed costs of entry to industry and export sector; full employment.	International trade induces the most productive firms to export and the least productive firms to exit; resources are reallocated towards the more productive firms, generating an aggregate productivity gain and an increase in workers' welfare.
New-new trade theory and worker heterogeneity	Yeaple (2005)	A homogeneous competitive non-tradable sector and a monopolistically competitive tradable sector; labour is the only factor of production; firms adopt different technologies; trade is costly; workers with different skills receive technology-specific "efficiency wages".	Exporters are larger, adopt advanced technology, pay higher wages, and are more productive. A fall in trade costs reallocates workers towards firms with advanced technologies and increases the wages of the most skilled workers.
	Davis and Harrigan (2011)	Firm and worker heterogeneity with efficiency wages; workers are fired if caught shirking and spend time in unemployment; wages vary across firms depending on their monitoring ability.	Trade liberalization destroys costly jobs; within firms with the same productivity, trade eliminates what workers perceive to be good jobs; industry-average wage increases due to reallocation towards larger firms; unemployment rises.
	Ben Yahmed (2012)	Firm heterogeneity; men and women differ in skills and job commitment; statistical discrimination against women; and technology varieties.	Reductions in trade costs induce firms to adopt advanced technology and export; demand for skilled and committed workers increases; the effect on the mean gender wage gap is ambiguous.
	Sampson (2014)	Firms are heterogeneous in technology and workers are heterogeneous in skills; perfectly competitive labour market; worker productivity depends on skills and technology.	Positive assortative matching between skills and technology generates employer size-wage premiums and exporter wage premiums. Fixed export costs cause the selection of advanced high-skill firms into exporting, increasing skill demand and wage inequality.
New-new trade theory and labour market frictions	Felbermayr, Prat and Schmerer (2011)	Firm heterogeneity; search-and-matching frictions and equilibrium unemployment; intra-firm individual and collective bargaining.	Reducing variable trade costs or increasing the number of trading partners rises wages and employment. These effects are larger when wages are bargained individually rather than collectively.
	Davidson, Matusz and Shevchenko (2008)	Firm and worker heterogeneity; search-and-matching generates unemployment; perfect competition in the product market; capital and labour are used in production; exporting is costly.	The largest and most productive firms pay the highest wages and have the strongest incentives to export. Trade liberalization increases the wage gap between high- and low-skilled workers.
	Egger and Kreckemeier (2009)	Firm heterogeneity; labour market imperfections and workers with fair wage preferences; labour is the only factor of production.	More productive firms pay higher wages. Trade increases aggregate welfare (through more varieties), unemployment (lower firm-level demand), and wage inequality.
	Helpman, Itskhoki and Redding (2010b)	Firm heterogeneity; workers are heterogeneous in ability; search-and-matching frictions; a homogeneous-good sector and a differentiated-product sector; exporting is costly.	International trade may increase wage inequality, unemployment and welfare. Reductions in labour market frictions increase welfare, affect unemployment ambiguously, and always hurt the trading partner.

Table 1. Theoretical frameworks for analysing the effects of trade on labour market outcomes

Theoretical family	Framework	Main assumptions	Labour market predictions
New-new trade theory and informality	Aleman-Castilla (2006)	Heterogeneous firms decide whether to become formal or informal; formality implies higher labour costs, higher productivity and access to foreign markets; informality implies the possibility of being caught and fined.	Trade liberalization may reduce informality by making it more profitable for some firms to become formal and by forcing the less productive informal firms to exit; reallocation towards most productive firms; wages rise owing to higher labour demand.
	Paz (2014)	Firm and worker heterogeneity with efficiency wages; firms decide whether to offer formal or informal jobs, the latter defined as employer's non-compliance with regulations on payroll taxes.	Reductions in import tariffs lead to a decrease in the average formal wage and in the informality rate. Reductions in export tariffs lead to an increase in the average formal wage and a decrease in informal employment.
	Becker (2018)	Firm heterogeneity and labour market frictions with fair wages; firms decide whether to become formal or informal, the latter defined as non-compliance with regulations on registration.	Trade liberalization ambiguously affects formal employment, output and welfare; informal sector employment decreases unambiguously; wage inequality between informal and formal workers rises.
	Dix-Carneiro et al. (unpublished)	Firm heterogeneity; monopolistically competitive firms decide whether to operate formally or informally; formal firms comply with regulations on minimum wages and dismissal costs; search-and-matching frictions and collective bargaining.	Reducing trade costs reallocates workers towards larger and more productive firms; worker turnover increases in exporting firms; ambiguous effects on the productivity and size thresholds for firms to export, operate formally and exit.
Global value chains	Grossman and Rossi-Hansberg (2008)	Global production based on tradable tasks with heterogeneous offshoring costs; firms can produce two goods with constant returns to scale, and they can undertake tasks at home or abroad; labour is the only factor of production, and workers differ in their skills.	A decrease in the cost of offshoring low-skill tasks induces a productivity effect that benefits low-skilled labour; a change in relative prices that affects wages in the traditional neo-classical way; and a labour-supply effect due to workers' displacement.
	Antràs and Helpman (2004)	North-South model with firm heterogeneity; firms choose between outsourcing and integration; labour is the only factor of production; final-good producers supply headquarters services; manufacturing plant operators supply intermediate inputs.	Highly productive firms acquire inputs in the South; less productive firms obtain them in the North; among firms that do not outsource abroad, highly productive ones integrate into the production of intermediate inputs; widening the North-South wage gap or reducing trading costs raises outsourcing.
	Amiti and Davis (2012)	Firm heterogeneity; costly trade in intermediate goods; imperfect labour market with fair wage demands from workers; labour is the only factor of production.	Reductions in tariffs on final products lower wages at firms serving only the domestic market and increase wages at exporting firms; reductions in tariffs on intermediate products raise wages at input-importing firms and lower wages at non-importing firms.

Table 2. Selected empirical studies on the effects of trade on labour market outcomes

Study	Labour market outcome(s)	Question	Main data sources	Findings
Aitken, Harrison and Lipsey (1996)	Wages	How does foreign direct investment (FDI) affect wages in the United States , Mexico and the Bolivarian Republic of Venezuela ?	Plant-level data for Mexico and the Bolivarian Republic of Venezuela; state- and industry-level data for the United States.	Higher levels of FDI are associated with higher wages. In Mexico and the Bolivarian Republic of Venezuela, this is true only of foreign-owned firms.
Said (2012)	Wages and job quality of the working poor	What is the impact of the 1998–2006 trade liberalization on wages and job quality in Egyptian manufacturing?	Labour Market Panel Survey; Household Income, Expenditure and Consumption Survey; WTO; World Bank.	Lower tariffs and increased export promotion have a positive effect on the income of the poor, at the expense of greater informalization and more low-quality jobs.
Kovak (2013)	Wages in local labour markets	What is the effect of the Brazilian trade liberalization of the 1990s on wages at the regional level?	Brazilian Institute for Applied Economic Research; demographic census.	Local labour markets with workers concentrated in more liberalized industries were affected more negatively.
Lee and Lee (2015)	Wages and workers' contract type	What is the effect of offshoring on wages in the Republic of Korea , taking into account contract types?	Korean Labour and Income Panel Study; World Input-Output Database (WIOD).	Workers under temporary contracts do not benefit from globalization, even after controlling for education, occupation and ability.
Bernard and Jensen (1999)	Employment, wages and workforce mix	Do good firms in the United States become exporters or does exporting improve performance?	Longitudinal Research Database of the US Census Bureau; Annual Survey of Manufacturers.	Good firms become exporters, but the benefits of exporting for firms are unclear. Employment growth and survival are both higher for exporters.
Autor, Dorn and Hanson (2013)	Employment and wages in local markets	What was the effect of the rising Chinese import competition in 1990–2007 in the United States ?	UN Comtrade Database; Tolbert and Sizer (1996); Census microdata samples; American Community Surveys.	Chinese imports raised unemployment, lowered labour force participation and reduced wages in local labour markets with import-competing industries.
Menezes-Filho and Muendler (2011)	Labour reallocation	What is the impact of trade liberalization on Brazilian workers' employment trajectories over time?	Employer–employee data from the Annual Social Information Report (RAIS).	Trade liberalization triggers worker displacements from more protected industries. No reabsorption of displaced workers for several years.
Pierce and Schott (2016)	Employment	Was the decline of manufacturing jobs in the United States in the 2000s due to the normalization of trade relations with China?	US Census Bureau's Longitudinal Business Database.	More exposed industries had greater employment loss. At the plant level, less labour-intensive production and exposure to the policy also played a role.
Berman, Bound and Griliches (1994)	Skill upgrading	What are the key drivers of the 1980s demand shift for skilled labour in the United States ?	Annual Survey of Manufactures; Census of Manufactures; trade data from the National Bureau of Economic Research.	The shift was due mostly to increased use of skilled workers within industries rather than to a reallocation of employment between industries.
Hanson and Harrison (1999)	Skill wage gap	Was the widening of the skill wage gap in Mexico in the 1980s linked to the country's trade reform?	Secretariat of Commerce and Industrial Development; Mexican industrial census.	Tariff reductions disproportionately affected low-skilled industries. The increase in the relative price of skill-intensive goods could explain the increase in wage inequality.
Feliciano (2001)	Employment and wage inequality	What was the impact of the 1980s trade reform on wages and employment in Mexico ?	National Survey of Urban Employment; Ten Kate (1992) data on trade.	Trade reform decreased the wages of workers in industries with reduced import licence coverage. It also increased wage dispersion and reduced the wages of less skilled workers.
Verhoogen (2008)	Within-industry wage inequality	Does trade affect wage inequality in Mexico through a quality upgrading mechanism?	Annual Industrial Survey; National Survey of Employment, Wages, Technology and Training.	Initially more productive plants increased their exports share, overall wages, relative wages of non-production employees, and ISO 9000 certification during the Mexican peso crisis.
Meschi, Taymaz and Vivarelli (2016)	Employment and wages of skilled and unskilled workers	How do globalization and technological upgrading affect employment and the wages of workers with different skills in Turkey ?	Firm-level database of all manufacturing firms, from the annual manufacturing industry statistics (Turkish Statistical Institute).	Technology and trade contribute to job creation. Skill-biased technological change, domestic R&D, imported technologies, exporting and FDI increase the demand for skilled labour.

Table 2. Selected empirical studies on the effects of trade on labour market outcomes

Study	Labour market outcome(s)	Question	Main data sources	Findings
Winkler (unpublished)	Workers' sorting and mobility patterns	How does Germany's trade integration with China and Eastern Europe affect the sorting of high-wage workers and firms?	Integrated Employment Biographies and Establishment History Panel from the Institute for Employment Research (IAB); UN Comtrade Database; surveys by the Federal Institute for Vocational Education and Training and the Federal Institute for Occupational Safety and Health.	Import exposure increases sorting and wage inequality by pushing low-skilled workers out of high-wage manufacturing firms. Skilled workers also move to different sectors, but they manage to reallocate to high-wage firms.
Pavcnik et al. (2004)	Industry wage premiums and skill wage gap	How did the 1988–94 trade liberalization episode in Brazil affect the industry and skill wage premiums?	Labour data for Brazil's 6 largest metropolitan areas, 18 manufacturing and 2 mining sectors; Muendler (2004) data.	No association between changes in industry wage premiums and changes in trade policy or between industry-specific skill premiums and trade policy.
Scott (2005)	Industry wage premiums and skill wage gap	What were the effects of the 1990s trade liberalization reforms on the distribution of wages in Jamaica ?	Jamaica Survey of Living Conditions; Statistical Institute of Jamaica.	Increased openness associated with higher wages and inequality in tradable sectors. Increased imports cause wages to fall, while exports to horizontal partners and niche markets raise wages.
Dutta (2007)	Industry wage premiums	What is the link between the 1990s trade and industrial reforms, and industry wage premiums in India ?	National Sample Survey Office; Indian Tariff Schedules; Central Statistics Office.	Workers in highly protected industries were better paid. Since these industries faced the largest tariff cuts and had more unskilled workers, trade increased wage inequality.
Schank, Schnabel and Wagner (2007)	Exporter wage premiums	Is there an exporter wage premium in Germany , even after controlling for firm and worker individual characteristics?	Linked employer–employee data from the IAB.	Exporters pay higher wages. The wage differential becomes smaller when controlling for the observable and unobservable characteristics of the employees and firms.
Matthee, Rankin and Bezuidenhout (2017)	Exporter employment and wage premiums	What are the employment and wage differences between exporters and non-exporters in South Africa ?	Tax data of companies and employees; customs data; South African Revenue Service.	Exporters employ more workers and pay higher wages. Among exporters, labour demand and wages are also affected by destination served, number of products and number of destinations.
Schröder (unpublished)	Exporter and multinational enterprise (MNE) wage premiums	What is the wage premium of exporters and MNEs in Germany ?	Linked employer–employee data from the IAB; administrative data from the German Federal Employment Agency.	Globalized firms pay higher wages, and MNEs pay the highest. Individual and match-specific effects indicate assortative matching on unobserved worker characteristics.
Alfaro-Ureña, Manelici and Vasquez. (unpublished)	Wage effects from foreign multinational corporations (MNCs)	What are the effects of MNCs on the wages of workers in Costa Rica ?	Linked employer–employee administrative data; Orbis; Compustat; National Household Income and Expenditure Survey.	There is a direct MNC wage premium, particularly for workers with a university education. MNCs improve the outside options of all workers by altering the level and composition of labour demand.
Attanasio, Goldberg and Pavcnik (2004)	Industry wage premiums and informality	How did the 1980–90s trade liberalization episode in Colombia affect wage distribution and informality?	National Household Survey; industry-level tariff changes and trade exposure.	Skill premiums not related to tariffs. Possible skill-biased technological change. Large tariff cuts linked to decrease in wage premiums. Trade reforms may have increased informality.
Bosch, Goñi-Pachioni and Maloney (2012)	Informality in metropolitan labour markets	What was the impact of Brazil's reforms on informality between 1986 and 2002?	Monthly Employment Survey; National Household Survey; Kume, Piani and de Souza (2003); Muendler (2004).	Trade liberalization had a small effect on informality. Constitutional reforms (dismissal costs, overtime and union power) played a more important role. Both reduced hiring rates.
Selwaness and Zaki (2013)	Informality in manufacturing sector	What was the effect of Egypt's 1990s trade liberalization reforms on informality?	WTO World Tariff Profiles; Egyptian Labour Market Panel Surveys.	Trade reforms increased informality in 1998, while the inverse was found in 2006, with lower tariffs leading to lower likelihood of informality.
Cruces, Porto and Violaz (2018)	Informality in manufacturing sector	How did Argentina's trade liberalization affect informality between 1980 and 2001?	Permanent Household Survey; import tariff data from Galiani and Porto (2010).	Trade liberalization raised informality at the industry level. Depending on the structure of sectoral protection, informality in the manufacturing sector decreased as the average tariff fell.

Table 2. Selected empirical studies on the effects of trade on labour market outcomes

Study	Labour market outcome(s)	Question	Main data sources	Findings
Ulyssea and Ponczek (2018)	Informality in local labour markets	Did labour regulations shape the labour market effects of trade liberalization in Brazil ?	Decennial population census; administrative data from the Ministry of Labour and Employment.	After trade opening, regions with weaker enforcement of labour regulations had almost no employment losses but experienced a substantial increase in informality.
Bøler, Javorcik and Ulltveit-Moe (2015)	Gender wage gap differences between exporters and non-exporters	Is the gender wage gap in Norwegian exporting manufacturing firms larger than in non-exporting ones?	Linked employer–employee data from the Norwegian manufacturing sector, using different data sources collected by Statistics Norway.	Exporters attract more educated and committed women, but exhibit a larger gender wage gap than non-exporters. The gap can be reduced through changes in social attitudes and measures such as increasing the length of parental leave available only to fathers.
Ben Yahmed and Bombarda (2020)	Gender differences in formal and informal employment	How did the Mexican trade liberalization of the 1990s affect formal employment among men and women?	National Urban Employment Survey; tariff data from Iacovone and Javorcik (2010).	Tariff cuts increase formality in manufacturing, particularly in large firms. Regional exposure to trade increases formality in manufacturing, especially for men. In the services, formality falls for low-skilled women.
Ben Salem and Zaki (2019)	Job quality (informal and irregular employment)	What is the effect of trade reforms on informal and irregular workers in Egypt ?	Egyptian Labour Market Panel Surveys; tariff data from the WTO.	Positive relationship between tariffs and both informal and irregular employment, but the effect on irregular employment is less clear-cut. Skilled formal work increases after openness.
Topalova (2010)	Poverty and income distribution in local labour markets	What were the regional impacts on poverty and income distribution of the 1991 trade liberalization episode in India ?	National Sample Surveys; Census of India; tariff data from Indian Trade Classification (Harmonized System).	Rural districts had a slower decline in poverty and lower consumption growth. Stronger effect for the poorest and least geographically mobile, in states with inflexible labour laws.
Kim and Vogel (unpublished)	Non-wage margins of adjustment at the local labour market level	How important are the non-wage margins of adjustment in the response of local labour markets to trade shocks in the United States ?	Integrated Public Use Micro Samples; 5% Census samples; American Community Surveys; UN Comtrade Database.	Decomposing the effect of trade shocks on income per capita shows that the effect across labour groups and different margins of adjustment (i.e. wages, hours worked per employee, unemployment and labour force participation) is heterogeneous.
Dix-Carneiro and Kovak (2019)	Wages, employment, interregional migration and informality	How do workers and regional labour markets adjust to changes induced by Brazil's trade liberalization episode in the 1990's?	Linked employer–employee administrative records from RAIS.	Workers in regions facing larger tariff reductions spend less time in formality, are more likely to move to non-tradable sectors, and do not migrate to more favourable regions. In harder-hit areas there is more informality.

Table 3. Linear probability model for employment in excessive working time (EEWI), Mexico, Q1 2005–20

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
log(hourly earnings)	0.073 *** [0.003]	0.057 *** [0.003]	0.049 *** [0.003]	0.049 *** [0.003]	0.036 *** [0.003]	0.036 *** [0.003]	0.029 *** [0.003]	0.029 *** [0.003]	0.028 *** [0.003]	0.033 *** [0.003]	0.028 *** [0.003]	0.033 *** [0.003]	0.026 *** [0.003]	0.024 *** [0.002]	0.029 *** [0.002]	0.029 *** [0.002]	
age	-0.001 *** [0.0001]	-0.0004 *** [0.0001]	-0.0005 *** [0.0001]	-0.0003 *** [0.0001]	-0.0004 *** [0.0001]	-0.0002 *** [0.0001]	-0.0003 *** [0.0001]	-0.0002 *** [0.0001]	-0.0004 *** [0.0001]	-0.0005 *** [0.0001]	-0.0005 *** [0.0001]	-0.001 *** [0.0001]	-0.001 *** [0.0001]	-0.0004 *** [0.0001]	-0.0004 *** [0.0001]	-0.0004 *** [0.0001]	
education	-0.002 *** [0.0003]	-0.002 *** [0.0003]	-0.002 *** [0.0003]	-0.002 *** [0.0003]	-0.002 *** [0.0003]	-0.002 *** [0.0003]	-0.003 *** [0.0003]	-0.003 *** [0.0003]	-0.003 *** [0.0003]	-0.003 *** [0.0003]	-0.003 *** [0.0003]	-0.004 *** [0.0003]	-0.005 *** [0.0003]	-0.004 *** [0.0003]	-0.004 *** [0.0003]	-0.004 *** [0.0003]	
woman	-0.126 *** [0.003]	-0.134 *** [0.002]	-0.134 *** [0.002]	-0.127 *** [0.002]	-0.131 *** [0.003]	-0.136 *** [0.003]	-0.130 *** [0.003]	-0.139 *** [0.002]	-0.128 *** [0.002]	-0.132 *** [0.002]	-0.132 *** [0.002]	-0.135 *** [0.002]	-0.129 *** [0.002]	-0.137 *** [0.002]	-0.125 *** [0.002]	-0.127 *** [0.002]	-0.124 *** [0.002]
married	0.033 *** [0.002]	0.032 *** [0.002]	0.035 *** [0.002]	0.030 *** [0.002]	0.033 *** [0.002]	0.026 *** [0.002]	0.030 *** [0.002]	0.026 *** [0.002]	0.033 *** [0.002]	0.030 *** [0.002]	0.029 *** [0.002]	0.028 *** [0.002]	0.031 *** [0.002]	0.029 *** [0.002]	0.030 *** [0.002]	0.030 *** [0.002]	0.027 *** [0.002]
informal	-0.015 *** [0.003]	0.001 [0.003]	0.004 [0.003]	0.007 ** [0.003]	0.003 [0.003]	-0.004 [0.003]	0.003 [0.003]	-0.003 [0.003]	0.006 * [0.003]	-0.004 [0.003]	-0.001 [0.003]	0.011 *** [0.003]	0.003 [0.003]	0.003 [0.003]	0.001 [0.003]	0.003 [0.003]	-0.002 [0.003]
employer (vs. paid employee)	0.143 *** [0.005]	0.162 *** [0.005]	0.158 *** [0.005]	0.146 *** [0.005]	0.168 *** [0.005]	0.137 *** [0.005]	0.165 *** [0.005]	0.139 *** [0.005]	0.140 *** [0.005]	0.138 *** [0.005]	0.135 *** [0.005]	0.126 *** [0.005]	0.136 *** [0.005]	0.129 *** [0.005]	0.129 *** [0.005]	0.129 *** [0.005]	0.135 *** [0.005]
self-employed (vs. paid employee)	0.038 *** [0.003]	0.036 *** [0.003]	0.050 *** [0.003]	0.037 *** [0.003]	0.035 *** [0.003]	0.020 *** [0.003]	0.036 *** [0.003]	0.019 *** [0.003]	0.020 *** [0.003]	0.018 *** [0.003]	0.012 *** [0.003]	0.017 *** [0.003]	0.012 *** [0.003]	0.018 *** [0.003]	0.027 *** [0.003]	0.027 *** [0.003]	0.013 *** [0.003]
works in an institution (vs. in a business)	-0.097 *** [0.007]	-0.098 *** [0.007]	-0.100 *** [0.007]	-0.089 *** [0.007]	-0.094 *** [0.007]	-0.106 *** [0.007]	-0.102 *** [0.007]	-0.117 *** [0.007]	-0.083 *** [0.007]	-0.090 *** [0.007]	-0.090 *** [0.007]	-0.092 *** [0.007]	-0.098 *** [0.008]	-0.077 *** [0.007]	-0.085 *** [0.007]	-0.085 *** [0.007]	-0.092 *** [0.007]
works in the household sector (vs. in a business)	-0.072 *** [0.004]	-0.091 *** [0.004]	-0.103 *** [0.004]	-0.095 *** [0.004]	-0.095 *** [0.004]	-0.091 *** [0.004]	-0.100 *** [0.004]	-0.095 *** [0.004]	-0.083 *** [0.004]	-0.087 *** [0.004]	-0.105 *** [0.004]	-0.109 *** [0.004]	-0.093 *** [0.004]	-0.092 *** [0.004]	-0.099 *** [0.004]	-0.099 *** [0.004]	-0.087 *** [0.004]
works in a special or unspecified situation (vs. in a business)	-0.059 [0.040]	0.130 * [0.068]	-0.085 [0.067]	-0.100 [0.066]	-0.013 [0.069]	-0.039 [0.074]	-0.014 [0.089]	-0.092 [0.074]	0.029 [0.069]	-0.215 *** [0.075]	0.090 [0.075]	0.016 [0.072]	0.119 [0.093]	-0.030 [0.093]	-0.070 [0.081]	-0.070 [0.081]	0.021 [0.057]
Constant	0.235 *** [0.009]	0.257 *** [0.009]	0.219 *** [0.009]	0.199 *** [0.009]	0.255 *** [0.009]	0.240 *** [0.009]	0.252 *** [0.009]	0.275 *** [0.009]	0.247 *** [0.009]	0.251 *** [0.009]	0.262 *** [0.009]	0.250 *** [0.009]	0.286 *** [0.009]	0.252 *** [0.009]	0.266 *** [0.009]	0.266 *** [0.009]	0.277 *** [0.009]
economic sector dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
city dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
No. Observations	151,416	158,673	159,784	159,439	153,797	154,010	152,411	155,746	152,787	157,213	159,406	159,499	158,192	159,690	167,833	174,912	
R-squared	0.103	0.108	0.108	0.098	0.107	0.110	0.111	0.114	0.108	0.108	0.114	0.108	0.114	0.108	0.104	0.103	
Adjusted R-squared	0.102	0.107	0.107	0.098	0.107	0.110	0.111	0.113	0.106	0.108	0.114	0.108	0.114	0.109	0.103	0.103	
F-Statistic	258.164 ***	285.256 ***	287.386 ***	258.792 ***	275.040 ***	283.996 ***	285.118 ***	296.532 ***	271.904 ***	283.689 ***	306.686 ***	286.283 ***	305.043 ***	285.999 ***	273.695 ***	272.251 ***	

Note: * p<0.1, ** p<0.05, *** p<0.01. Standard errors are shown in brackets.

▶ References

Abowd, John M., and Francis Kramarz. 1999. "The Analysis of Labor Markets Using Matched Employer–Employee Data." In *Handbook of Labor Economics*, edited by Orley C. Ashenfelter and David Card, vol.3, part B, 2629–2710. Amsterdam: Elsevier.

———, and David N. Margolis. 1999. "High Wage Workers and High Wage Firms." *Econometrica* 67 (2): 251–333.

Abowd, John M., Francis Kramarz, and Simon Woodcock. 2008. "Econometric Analyses of Linked Employer–Employee Data." In *The Econometrics of Panel Data: Fundamentals and Recent Developments in Theory and Practice*, 3rd ed., edited by László Mátyás and Patrick Sevestre, 729–762. Springer: Berlin.

Acemoglu, Daron. 2003. "Patterns of Skill Premia." *Review of Economic Studies* 70 (2): 199–230.

Aguayo-Tellez, Ernesto. 2012. "The Impact of Trade Liberalization Policies and FDI on Gender Inequalities: A Literature Review", background paper for the *World Development Report 2012*. World Bank.

Aitken, Brian, Ann Harrison, and Robert E. Lipsey. 1996. "Wages and Foreign Ownership: A Comparative Study of Mexico, Venezuela, and the United States." *Journal of International Economics* 40 (3–4): 345–371.

Akerlof, George A., and Janet L. Yellen. 1990. "The Fair Wage-Effort Hypothesis and Unemployment." *The Quarterly Journal of Economics* 105 (2): 255–283.

Albrecht, James, and Susan Vroman. 2002. "A Matching Model with Endogenous Skill Requirements." *International Economic Review* 43 (1): 283–305.

Aleman-Castilla, Benjamin. 2006. "The Effect of Trade Liberalization on Informality and Wages: Evidence from Mexico", CEP Discussion Paper No. 763. London School of Economics and Political Science, Centre for Economic Performance (CEP).

Alfaro-Ureña, Alonso, Isabela Manelici, and Jose P. Vasquez. Unpublished. "The Effects of Multinationals on Workers: Evidence from Costa Rica".

Amiti, Mary, and Donald R. Davis. 2012. "Trade, Firms, and Wages: Theory and Evidence." *The Review of Economic Studies* 79 (1): 1–36.

Angrist, Joshua D., and Alan B. Krueger. 1999. "Empirical Strategies in Labor Economics." In *Handbook of Labor Economics*, edited by Orley C. Ashenfelter and David Card, vol. 3, 1277–1366. Amsterdam: Elsevier.

Angrist, Joshua D., and Jörn Steffen Pischke. 2010. "The Credibility Revolution in Empirical Economics: How Better Research Design Is Taking the Con out of Econometrics." *Journal of Economic Perspectives* 24 (2): 3–30.

Anker, Richard, Igor Chernyshev, Philippe Egger, Farhad Mehran, and Joseph Ritter. 2002. "Measuring Decent Work with Statistical Indicators", ILO Policy Integration Department, Statistical Development and Analysis Group Working Paper No. 2.

Antràs, Pol, and Elhanan Helpman. 2004. "Global Sourcing." *Journal of Political Economy* 112 (3): 552–580.

Antràs, Pol, Luis Garicano, and Esteban Rossi-Hansberg. 2006. "Offshoring in a Knowledge Economy." *The Quarterly Journal of Economics* 121 (1): 31–77.

Antràs, Pol, and Esteban Rossi-Hansberg. 2009. "Organizations and Trade." *Annual Review of Economics* 1 (1): 43–64.

Artaç, Erhan, Shubham Chaudhuri, and John McLaren. 2010. "Trade Shocks and Labor Adjustment: A Structural Empirical Approach." *American Economic Review* 100 (3): 1008–1045.

Attanasio, Orazio, Pinelopi K. Goldberg, and Nina Pavcnik. 2004. "Trade Reforms and Wage Inequality in Colombia." *Journal of Development Economics* 74 (2): 331–366.

Autor, David H., David Dorn, and Gordon H. Hanson. 2013. "The China Syndrome: Local Labor Market Effects of Import Competition in the United States." *American Economic Review* 103 (6): 2121–2168.

Baumgarten, Daniel. 2013. "Exporters and the Rise in Wage Inequality: Evidence from German Linked Employer–Employee Data." *Journal of International Economics* 90 (1): 201–217.

Becker, Dennis. 2018. "Heterogeneous Firms and Informality: The Effects of Trade Liberalization on Labour Markets." *Oxford Economic Papers* 70 (1): 47–72.

Becker, Gary S. 1957. *The Economics of Discrimination*. Chicago: University of Chicago Press.

Ben Salem, Mélika, and Chahir Zaki. 2019. "Revisiting the Impact of Trade Openness on Informal and Irregular Employment in Egypt." *Journal of Economic Integration* 34 (3): 465–497.

Ben Yahmed, Sarra. 2012. "Gender Wage Gaps across Skills and Trade Openness", AMSE Working Paper No. 32. Aix-Marseille School of Economics.

———. 2017. "Gender Wage Discrimination and Trade Openness. Prejudiced Employers in an Open Industry", ZEW Discussion Paper No. 17-047. Leibnitz Centre for European Economic Research (ZEW).

———, and Pamela Bombarda. 2020. "Gender, Informal Employment and Trade Liberalization in Mexico." *The World Bank Economic Review* 34 (2): 259–283.

Bennett, Daniel, Che-Lun Hung, and Tsai-Ling Lauderdale. 2015. "Health Care Competition and Antibiotic Use in Taiwan." *The Journal of Industrial Economics* 63 (2): 371–393.

Berman, Eli, John Bound, and Zvi Griliches. 1994. "Changes in the Demand for Skilled Labor within U.S. Manufacturing: Evidence from the Annual Survey of Manufacturers." *The Quarterly Journal of Economics* 109 (2): 367–397.

Berman, Eli, John Bound, and Stephen Machin. 1998. "Implications of Skill-Biased Technological Change: International Evidence." *The Quarterly Journal of Economics* 113 (4): 1245–1279.

Bernard, Andrew B., and J. Bradford Jensen. 1999. "Exceptional Exporter Performance: Cause, Effect, or Both?" *Journal of International Economics* 47 (1): 1–25.

———, Stephen J. Redding, and Peter K. Schott. 2007. "Firms in International Trade." *Journal of Economic Perspectives* 21 (3): 105–130.

Bertola, Giuseppe, and Ricardo J. Caballero. 1994. "Cross-Sectional Efficiency and Labour Hoarding in a Matching Model of Unemployment." *The Review of Economic Studies* 61 (3): 435–456.

Bertola, Giuseppe, and Pietro Garibaldi. 2001. "Wages and the Size of Firms in Dynamic Matching Models." *Review of Economic Dynamics* 4 (2): 335–368.

Blinder, Alan S. 1973. "Wage Discrimination: Reduced Form and Structural Estimates." *The Journal of Human Resources* 8 (4): 436–455.

Blundell, Richard. 2017. "What Have We Learned from Structural Models?" *American Economic Review: Papers and Proceedings* 107 (5): 287–292.

Bosch, Mariano, Edwin Goñi-Pacchioni, and William Maloney. 2012. "Trade Liberalization, Labor Reforms and Formal–Informal Employment Dynamics." *Labour Economics* 19 (5): 653–667.

Bøler, Esther Ann, Beata Javorcik, and Karen Helene Ulltveit-Moe. 2015. "Globalization: A Woman's Best Friend? Exporters and the Gender Wage Gap", University of Oxford, Department of Economics Discussion Paper No. 743.

Brown, Drusilla, Rajeev Dehejia, and Raymond Robertson. 2018. "The Impact of Better Work: Firm Performance in Vietnam, Indonesia and Jordan", Better Work Discussion Paper No. 27. ILO and International Finance Corporation.

Bryson, Alex, John Forth, and Catherine Barber (eds). 2006. "Making Linked Employer–Employee Data Relevant to Policy", DTI Occasional Paper No. 4. UK Department of Trade and Industry.

Burchell, Brendan, Kirsten Sehnbruch, Agnieszka Piasna, and Nurjk Agloni. 2014. "The Quality of Employment and Decent Work: Definitions, Methodologies, and Ongoing Debates." *Cambridge Journal of Economics* 38 (2): 459–477.

Cameron, Stephen, Shubham Chaudhuri, and John McLaren. 2007. "Trade Shocks and Labor Adjustment: Theory", NBER Working Paper No. 13463. National Bureau of Economic Research.

Carrère, Céline, Anja Grujovic, and Frédéric Robert-Nicoud. 2020. "Trade and Frictional Unemployment in the Global Economy." *Journal of the European Economic Association*. 7 January.

Coşar, A. Kerem, Nezih Guner, and James Tybout. 2016. "Firm Dynamics, Job Turnover, and Wage Distributions in an Open Economy." *American Economic Review* 106 (3): 625–663.

Costinot, Arnaud, and Jonathan Vogel. 2010. "Matching and Inequality in the World Economy." *Journal of Political Economy* 118 (4): 747–786.

Cruces, Guillermo, Guido Porto, and Mariana Viollaz. 2018. "Trade Liberalization and Informality in Argentina: Exploring the Adjustment Mechanisms." *Latin American Economic Review* 27.

Davidson, Carl, Steven J. Matusz, and Andrei Schevchenko. 2008. "Globalization and Firm Level Adjustment with Imperfect Labor Markets." *Journal of International Economics* 75 (2): 295–309.

Davis, Donald R., and James Harrigan. 2011. "Good Jobs, Bad Jobs, and Trade Liberalization." *Journal of International Economics* 84 (1): 26–36.

De Soto, Hernando 1989. *The Other Path: The Invisible Revolution in the Third World*. New York: Harper and Row.

Dix-Carneiro, Rafael, Pinelopi Goldberg, Costas Meghir, and Gabriel Ulyssea. Unpublished. "Trade and Informality in the Presence of Labor Market Frictions and Regulations".

Dix-Carneiro, Rafael, and Brian K. Kovak. 2017. "Trade Liberalization and Regional Dynamics." *American Economic Review* 107 (10): 2908–2946.

———. 2019. "Margins of Labor Market Adjustment to Trade." *Journal of International Economics* 117: 125–142.

Dutta, Puja Vasudeva. 2007. "Trade Protection and Industry Wages in India." *Industrial and Labor Relations Review* 60 (2): 268–286.

Ederington, Josh, Jenny Minier, and Kenneth R. Troske. 2009. "Where the Girls Are: Trade and Labor Market Segregation in Colombia", IZA Discussion Paper No. 4131. Institute for the Study of Labor (IZA).

Edmonds, Eric V., and Nina Pavcnik. 2005. "The Effect of Trade Liberalization on Child Labor." *Journal of International Economics* 65 (2): 401–419.

———, and Petia Topalova. 2010. "Trade Adjustment and Human Capital Investments: Evidence from Indian Tariff Reform." *American Economic Journal: Applied Economics* 2 (4): 42–75.

Egger, Hartmut, and Udo Kreickemeier. 2009. "Firm Heterogeneity and the Labor Market Effects of Trade Liberalization." *International Economic Review* 50 (1): 187–216.

Fally, Thibault, Rodrigo Paillacar, and Cristina Terra. 2010. "Economic Geography and Wages in Brazil: Evidence from Micro-Data." *Journal of Development Economics* 91 (1): 155–168.

Feenstra, Robert C., and Gordon H. Hanson. 1996. "Foreign Investment, Outsourcing and Relative Wages." In *The Political Economy of Trade Policy: Papers in Honor of Jagdish Bhagwati*, edited by Robert C. Feenstra, Gene M. Grossman and Douglas A. Irwin, 89–127. Cambridge, MA: MIT Press.

Felbermayr, Gabriel, Julien Prat, and Hans-jörg Schmerer. 2011. "Globalization and Labor Market Outcomes: Wage Bargaining, Search Frictions, and Firm Heterogeneity." *Journal of Economic Theory* 146 (1): 39–73.

Feliciano, Zadia M. 2001. "Workers and Trade Liberalization: The Impact of Trade Reforms in Mexico on Wages and Employment." *Industrial and Labor Relations Review* 55 (1): 95–115.

Fouquin, Michel, and Jules Hugot. 2016. "Two Centuries of Bilateral Trade and Gravity Data: 1827–2014", CEPII Working Paper No. 2016-14.

Frías, Judith A., David S. Kaplan, and Eric A. Verhoogen. Unpublished. "Exports and Wage Premia: Evidence from Mexican Employer–Employee Data".

Fujita, Masahisa, Paul Krugman, and Anthony J. Venables. 1999. *The Spatial Economy: Cities, Regions, and International Trade*. Cambridge, MA: MIT Press.

Galhardi, Regina. 2018. "Measurement of the Employment and Labour-Related Impacts of MNEs: A Proposal for Action", ILO working paper.

Galiani, Sebastian, and Guido G. Porto. 2010. "Trends in Tariff Reforms and in the Structure of Wages." *The Review of Economics and Statistics* 92 (3): 482–494.

Goetz, Christopher, Henry Hyatt, Erika McEntarfer, and Kristin Sandusky. 2017. "The Promise and Potential of Linked Employer–Employee Data for Entrepreneurship Research." In *Measuring Entrepreneurial Businesses: Current Knowledge and Challenges*, edited by John Haltiwanger, Erik Hurst, Javier Miranda, and Antoinette Schoar, 433–462. National Bureau of Economic Research.

Goldberg, Pinelopi Koujianou, and Nina Pavcnik. 2003. "The Response of the Informal Sector to Trade Liberalization." *Journal of Development Economics* 72 (2): 463–496.

———. 2016. "The Effects of Trade Policy." In *Handbook of Commercial Policy*, edited by Kyle Bagwell and Robert W. Staiger, vol. 1, part A:161–206. Amsterdam: Elsevier.

Gouriéroux, Christian, and Alain Monfort. 1996. *Simulation-Based Econometric Methods*. Oxford: Oxford University Press.

Grogger, Jeffrey, and Gordon H. Hanson. 2011. "Income Maximization and the Selection and Sorting of International Migrants." *Journal of Development Economics* 95 (1): 42–57.

Grossman, Gene M., and Elhanan Helpman. 2002. "Integration versus Outsourcing in Industry Equilibrium." *The Quarterly Journal of Economics* 117 (1): 85–120.

Grossman, Gene M., and Giovanni Maggi. 2000. "Diversity and Trade." *American Economic Review* 90 (5): 1255–1275.

Grossman, Gene M., and Esteban Rossi-Hansberg. 2008. "Trading Tasks: A Simple Theory of Offshoring." *American Economic Review* 98 (5): 1978–1997.

Hakobyan, Shushanik, and John McLaren. 2016. "Looking for Local Labor Market Effects of NAFTA." *The Review of Economics and Statistics* 98 (4): 728–741.

- . 2017. "NAFTA and the Gender Wage Gap", Upjohn Institute Working Paper No. 17-270.
- Hamermesh, Daniel S. 1999. "LEEping into the Future of Labor Economics: The Research Potential of Linking Employer and Employee Data." *Labour Economics* 6 (1): 25–41.
- Hansen, Lars Peter. 1982. "Large Sample Properties of Generalized Method of Moments Estimators." *Econometrica* 50 (4): 1029–1054.
- Hanson, Gordon H., and Ann Harrison. 1999. "Trade Liberalization and Wage Inequality in Mexico." *Industrial and Labor Relations Review* 52 (2): 271–288.
- Helpman, Elhanan. 2006. "Trade, FDI, and the Organization of Firms." *Journal of Economic Literature* 44 (3): 589–630.
- , and Oleg Itskhoki. 2010. "Labor Market Rigidities, Trade and Unemployment." *The Review of Economic Studies* 77 (3): 1100–1137.
- Helpman, Elhanan, Oleg Itskhoki, Marc-Andreas Muendler, and Stephen J. Redding. 2017. "Trade and Inequality: From Theory to Estimation." *The Review of Economic Studies* 84: 357–405.
- Helpman, Elhanan, Oleg Itskhoki, and Stephen Redding. 2010a. "Trade and Labor Market Outcomes", CEP Discussion Paper No. 1028. London School of Economics and Political Science, Centre for Economic Performance (CEP).
- . 2010b. "Inequality and Unemployment in a Global Economy." *Econometrica* 78 (4): 1239–1283.
- Helpman, Elhanan, Marc J. Melitz, and Stephen R. Yeaple. 2004. "Exports versus FDI with Heterogeneous Firms." *American Economic Review* 94 (1): 300–316.
- Hering, Laura, and Sandra Poncet. 2010. "Market Access and Individual Wages: Evidence from China." *The Review of Economics and Statistics* 92 (1): 145–159.
- Hopenhayn, Hugo A. 1992. "Entry, Exit, and Firm Dynamics in Long Run Equilibrium." *Econometrica* 60 (5): 1127–1150.
- Iacovone, Leonardo, and Beata S. Javorcik. 2010. "Multi-Product Exporters: Product Churning, Uncertainty and Export Discoveries." *The Economic Journal* 120 (544): 481–499.
- ILO. 1999. *Decent Work*, Report of the Director-General, International Labour Conference, 87th Session. Geneva.
- . 2013. *Decent Work Indicators: Guidelines for Producers and Users of Statistical and Legal Framework Indicators – ILO Manual: Second Version*. Geneva.
- . 2018. "Informality and Non-Standard Forms of Employment", report prepared for the G20 Employment Working Group meeting in Buenos Aires, 20–22 February 2018.
- . Forthcoming. *Trade and Decent Work: Indicator Guide*.
- Inomata, Satoshi. 2017. "Analytical Frameworks for Global Value Chains: An Overview." In *Global Value Chain Development Report 2017: Measuring and Analyzing the Impact of GVCs on Economic Development*, 15–35. Washington, DC: World Bank Group.
- Jackson, C. Kirabo. 2013. "Match Quality, Worker Productivity, and Worker Mobility: Direct Evidence from Teachers." *The Review of Economics and Statistics* 95 (4): 1096–1116.
- Jensen, Paul H. 2010. "Exploring the Uses of Matched Employer–Employee Datasets." *The Australian Economic Review* 43 (2): 209–216.

Joeques, Susan. 1995. "Trade-Related Employment for Women in Industry and Services in Developing Countries", United Nations Research Institute for Social Development Occasional Paper No. 5.

Jones, Ronald W. 1971. "A Three-Factor Model in Theory, Trade, and History." In *Trade, Balance of Payments, and Growth: Papers in International Economics in Honor of Charles P. Kindleberger*, edited by Jagdish Bhagwati, Robert Jones, Robert Mundell and Jaroslav Vanek, 3–21. Amsterdam and London: Elsevier.

Juhn, Chinhui, Gergely Ujhelyi, and Carolina Villegas-Sanchez. 2013. "Trade Liberalization and Gender Inequality." *The American Economic Review* 103 (3): 269–273.

———. 2014. "Men, Women, and Machines: How Trade Impacts Gender Inequality." *Journal of Development Economics* 106: 179–193.

Keane, Michael P., and Kenneth I. Wolpin. 1997. "Introduction to the JBES Special Issue on Structural Estimation in Applied Microeconomics." *Journal of Business and Economic Statistics* 15 (2): 111–114.

Kim, Ryan, and Jonathan Vogel. Unpublished. "Trade and Inequality across Local Labor-Markets: The Margins of Adjustment".

Kis-Katos, Krisztina, and Robert Sparrow. 2011. "Child Labor and Trade Liberalization in Indonesia." *The Journal of Human Resources* 46 (4): 722–749.

Koeniger, Winfried, and Julien Prat. 2007. "Employment Protection, Product Market Regulation and Firm Selection." *The Economic Journal* 117 (521): F302–F332.

Kovak, Brian K. 2013. "Regional Effects of Trade Reform: What Is the Correct Measure of Liberalization?" *American Economic Review* 103 (5): 1960–1976.

Kremer, Michael, and Eric Maskin. Unpublished. "Globalization and Inequality".

Krishna, Pravin, Jennifer P. Poole, and Mine Zeynep Senses. 2011. "Trade Liberalization, Firm Heterogeneity, and Wages: New Evidence from Matched Employer–Employee Data", World Bank Policy Research Paper No. 5711.

———. 2012. "Trade, Labor Market Frictions, and Residual Wage Inequality across Worker Groups." *American Economic Review* 102 (3): 417–423.

———. 2014. "Wage Effects of Trade Reform with Endogenous Worker Mobility." *Journal of International Economics* 93 (2): 239–252.

Krugman, Paul R. 1979. "Increasing Returns, Monopolistic Competition, and International Trade." *Journal of International Economics* 9 (4): 469–479.

———. 1980. "Scale Economies, Product Differentiation, and the Pattern of Trade." *American Economic Review* 70 (5): 950–959.

———. 1995. "Growing World Trade: Causes and Consequences." *Brookings Papers on Economic Activity* 1: 327–362.

———, Maurice Obstfeld, and Marc Melitz. 2014. *International Economics: Theory and Policy*. 10th ed. New York: Pearson.

Kume, Honório, Guida Piani, and Carlos Frederico Bráz de Souza. 2003. "A política brasileira de importação no período 1987–1998: Descrição e avaliação." In *A abertura comercial brasileira nos anos 1990: Impactos sobre emprego e salário*, edited by Carlos Henrique Corseuil and Honório Kume, 1–37. Rio de Janeiro: MTE and IPEA.

Lazear, Edward P., and Sherwin Rosen. 1990. "Male–Female Wage Differentials in Job Ladders." *Journal of Labor Economics* 8 (1): S106–S123.

- Lechner, Michael, and Conny Wunsch. 2013. "Sensitivity of Matching-Based Program Evaluations to the Availability of Control Variables." *Labour Economics* 21: 111–121.
- Lee, Hongshik, and Joonhyung Lee. 2015. "The Impact of Offshoring on Temporary Workers: Evidence on Wages from South Korea." *Review of World Economics* 151 (3): 555–587.
- Matsuyama, Kiminori. 2007. "Beyond Icebergs: Towards A Theory of Biased Globalization." *The Review of Economic Studies* 74 (1): 237–253.
- Matthee, Marianne, Neil Rankin, and Carli Bezuidenhout. 2017. "Labour Demand and the Distribution of Wages in South African Manufacturing Exporters", WIDER Working Paper No. 2017/11. United Nations University World Institute for Development Economics Research.
- Mayer, Thierry, Rodrigo Paillacar, and Soledad Zignago. 2008. "TradeProd. The CEPII Trade, Production and Bilateral Protection Database: Explanatory Notes", MPRA Paper No. 26477. Munich Personal RePEc Archive (MPRA).
- Meghir, Costas, Renata Narita, and Jean-Marc Robin. 2015. "Wages and Informality in Developing Countries." *American Economic Review* 105 (4): 1509–1546.
- Melitz, Marc J. 2003. "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity." *Econometrica* 71 (6): 1695–1725.
- Menezes-Filho, Naércio Aquino, and Marc-Andreas Muendler. 2011. "Labor Reallocation in Response to Trade Reform", NBER Working Paper No. 17372. National Bureau of Economic Research.
- Meschi, Elena, Erol Taymaz, and Marco Vivarelli. 2016. "Globalization, Technological Change and Labor Demand: A Firm-Level Analysis for Turkey." *Review of World Economics* 152 (4): 655–680.
- Meyer, Bruce D. 1995. "Natural and Quasi-Experiments in Economics." *Journal of Business and Economic Statistics* 13 (2): 151–161.
- Michaels, Guy. 2008. "The Effect of Trade on the Demand for Skill: Evidence from the Interstate Highway System." *The Review of Economics and Statistics* 90 (4): 683–701.
- Mittag, Nikolas. 2019. "A Simple Method to Estimate Large Fixed Effects Models Applied to Wage Determinants." *Labour Economics* 61.
- Muendler, Marc-Andreas. 2004. "Trade, Technology, and Productivity: A Study of Brazilian Manufacturers, 1986–1998", CESifo Working Paper No. 1148. CESifo.
- Nevo, Aviv, and Michael D. Whinston. 2010. "Taking the Dogma out of Econometrics: Structural Modeling and Credible Inference." *Journal of Economic Perspectives* 24 (2): 69–81.
- Oaxaca, Ronald. 1973. "Male–Female Wage Differentials in Urban Labor Markets." *International Economic Review* 14 (3): 693–709.
- Ohlin, Bertil. 1933. *Interregional and International Trade*. Cambridge, MA: Harvard University Press.
- Ozler, Sule. 2000. "Export Orientation and Female Share of Employment: Evidence from Turkey." *World Development* 28 (7): 1239–1248.
- Papayrakis, Elissaios, Arlette Covarrubias, and Arjan Verschoor. 2012. "Gender and Trade Aspects of Labour Markets." *The Journal of Development Studies* 48 (1): 81–98.
- Pavcnik, Nina, Andreas Blom, Pinelopi Goldberg, and Norbert Schady. 2004. "Trade Liberalization and Industry Wage Structure: Evidence from Brazil." *The World Bank Economic Review* 18 (3): 319–344.

- Paz, Lourenço S. 2014. "The Impacts of Trade Liberalization on Informal Labor Markets: A Theoretical and Empirical Evaluation of the Brazilian Case." *Journal of International Economics* 92 (2): 330–348.
- Pierce, Justin R., and Peter K. Schott. 2016. "The Surprisingly Swift Decline of US Manufacturing Employment." *American Economic Review* 106 (7): 1632–1662.
- Pissarides, Christopher A. 2000. *Equilibrium Unemployment Theory*. 2nd ed. Cambridge, MA: MIT Press.
- Powell, James L. 1994. "Estimation of Semiparametric Models." In *Handbook of Econometrics*, vol. 4, edited by Robert F. Engle and Daniel L. McFadden, 2443–2521. Amsterdam: Elsevier.
- Ricardo, David. 1817. *On the Principles of Political Economy, and Taxation*. London: John Murray.
- Roberts, Bryan R. 1989. "Employment Structure, Life Cycle, and Life Chances: Formal and Informal Sectors in Guadalajara." In *The Informal Economy: Studies in Advanced and Less Developed Countries*, edited by Alejandro Portes, Manuel Castells and Lauren A. Benton, 49–51. Baltimore: Johns Hopkins University Press.
- Roberts, Mark J., and James R. Tybout. 1997. "The Decision to Export in Colombia: An Empirical Model of Entry with Sunk Costs." *American Economic Review* 87 (4): 545–564.
- Robinson, Dilys, Sarah Perryman, and Sue Hayday. 2004. "The Drivers of Employee Engagement", IES Report No. 408. Institute for Employment Studies.
- Rosen, Sherwin. 1982. "Authority, Control, and the Distribution of Earnings." *The Bell Journal of Economics* 13 (2): 311–323.
- Said, Mona. 2012. "Trade Reform, Job Quality and Wages of the Working Poor in Egypt: Evidence from Manufacturing Panel Data." *The Journal of Developing Areas* 46 (2): 159–183.
- Sampson, Thomas. 2014. "Selection into Trade and Wage Inequality." *American Economic Journal: Microeconomics* 6 (3): 157–202.
- Samuelson, Paul. 1971. "Ohlin Was Right." *The Swedish Journal of Economics* 73: 365–384.
- Schank, Thorsten, Claus Schnabel, and Joachim Wagner. 2007. "Do Exporters Really Pay Higher Wages? First Evidence from German Linked Employer–Employee Data." *Journal of International Economics* 72 (1): 52–74.
- Schröder, Sarah. Unpublished. "Wage Inequality and the Role of Multinational Firms: Evidence from German Linked Employer–Employee Data".
- Scott, Ewan B. 2005. "Trade and Wages in SIDS: The Jamaican Case." *Social and Economic Studies* 54 (4): 144–165.
- Selwaness, Irène, and Chahir Zaki. 2013. "Assessing the Impact of Trade Reforms on Informality in Egypt", Economic Research Forum Working Paper No. 759.
- Shapiro, Carl, and Joseph E. Stiglitz. 1984. "Equilibrium Unemployment as a Worker Discipline Device." *American Economic Review* 74 (3): 433–444.
- Shingal, Anirudh. 2015. "Labour Market Effects of Integration into GVCs: Review of Literature", Swiss Programme for Research on Global Issues for Development Working Paper No. 2015/10.
- Sidebottom, Richard. 2017. *Measurement of the Employment and Labour-Related Impacts of Multinational Enterprises (MNEs)*. Geneva: ILO.
- Smith, Anthony A. Jr. 2008. 'Indirect Inference'. In *The New Palgrave Dictionary of Economics*, 2nd ed., edited by Steven N. Durlauf and Lawrence E. Blume. London: Palgrave Macmillan.

- Spencer, Barbara J. 2005. "International Outsourcing and Incomplete Contracts." *Canadian Journal of Economics* 38 (4): 1107–1135.
- Ten Kate, Adriaan. 1992. "Trade Liberalization and Economic Stabilization in Mexico: Lessons of Experience." *World Development* 20 (5): 659–672.
- Tolbert, Charles M., and Molly Sizer. 1996. "U.S. Commuting Zones and Labor Market Areas: A 1990 Update", Economic Research Service Staff Paper No. 9614. US Department of Agriculture.
- Topalova, Petia. 2007. "Trade Liberalization, Poverty, and Inequality: Evidence from Indian Districts." In *Globalization and Poverty*, edited by Ann Harrison, 291–336. Chicago: University of Chicago Press.
- . 2010. "Factor Immobility and Regional Impacts of Trade Liberalization: Evidence on Poverty from India." *American Economic Journal: Applied Economics* 2 (4): 1–41.
- Torrens, Robert. 1815. *An Essay on the External Corn Trade*. London: J. Hatchard.
- Trefler, D. 2004. "The Long and Short of the Canada-U. S. Free Trade Agreement." *American Economic Review* 94 (4): 870–895.
- Ulyssea, Gabriel, and Vladimir Ponczek. 2018. "Enforcement of Labor Regulation and the Labor Market Effects of Trade: Evidence from Brazil", IZA Discussion Paper No. 11783. Institute of Labor Economics (IZA).
- UNECE (United Nations Economic Commission for Europe). 2015. *Handbook on Measuring Quality of Employment: A Statistical Framework*.
- Verhoogen, Eric A. 2008. "Trade, Quality Upgrading, and Wage Inequality in the Mexican Manufacturing Sector." *The Quarterly Journal of Economics* 123 (2): 489–530.
- Winkler, Erwin. Unpublished. "Trade, Firm Wage Premiums, and Wage Inequality: Worker-Level Evidence".
- Woodcock, Simon D. 2015. "Match Effects." *Research in Economics* 69 (1): 100–121.
- Yeaple, Stephen Ross. 2005. "A Simple Model of Firm Heterogeneity, International Trade, and Wages." *Journal of International Economics* 65 (1): 1–20.

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