UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

UNCTAD

MARKET ACCESS, TRADE AND SUSTAINABLE DEVELOPMENT:

THE LABOUR MARKET CHANNEL

DEVELOPING COUNTRIES IN INTERNATIONAL TRADE STUDIES

UNITED NATIONS

UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

UNCTAD

MARKET ACCESS, TRADE AND SUSTAINABLE DEVELOPMENT: THE LABOUR MARKET CHANNEL

DEVELOPING COUNTRIES IN INTERNATIONAL TRADE STUDIES

UNITED NATIONS
New York and Geneva, 2018

United Nations publication issued by the United Nations Conference on Trade and Development.

UNCTAD/DITC/TAB/2017/7

ACKNOWLEDGEMENTS

This publication is a product of the Trade Analysis Branch, Division on International Trade in Goods and Services, and Commodities (DITC), United Nations Conference on Trade and Development (UNCTAD). Marco Fugazza and Julia Seiermann were responsible for writing all the chapters under the general supervision of Bonapas Onguglo, Chief of the Trade Analysis Branch. The authors benefited from inputs from Emmanuel Milet for the practical section on Peru and from Céline Carrère for the practical section on UEMOA countries. Useful suggestions were received from TAB colleagues during the preparatory stage of the publication. Alessandro Nicita, Denise Penello, Meysut Saygili, Maria Sokolova and Graham Mott provided insightful comments on the final draft.

The authors also thank Stéphane Bothua for designing the layout and carrying out desktop publishing, Magali Studer for designing the cover, Fabienne Mourlon and Jenifer Tacardon for providing overall logistical and administrative support.

CONTENTS

FIGURES

TABLES

BOXES

IN BRIEF

Trade can play an important role in achieving progress towards the SDGs. This report contributes to the enhanced understanding of the interrelated nature of the sustainable development goals and provides guidance for trade-policy makers who would like to harness trade as a means of the implementation of the SDGs, focusing on the employment channel. Based on most recent advances in the trade and employment literature and on ongoing analytical work by the UNCTAD secretariat, this study aims at developing a general framework policy makers can use to design a SDG-sensible trade policy. Two practical cases study illustrate the implementation of this framework.

EXECUTIVE SUMMARY

The 2030 Agenda for Sustainable Development recognizes that "international trade is an engine for inclusive growth and poverty reduction, and contributes to the promotion of sustainable development".[1] At the macroeconomic level, trade serves as a source of finance for both the public and the private sector. At the microeconomic level, it affects people's opportunities for consumption and production. This study focuses on how trade affects sustainable development through production, and in particular, the labour channel.

The particular importance of the labour channel is twofold. First, (decent) work is an SDG target itself (8.5), and gainful employment helps individuals achieve other SDGs for themselves and other members of their household. Second, while trade has helped improving the standards of living of millions of people, the employment implications of international trade are not always positive, and can be very disruptive. Trade shocks may have long lasting effects due to the reallocation across sectors of productive resources and the fact that their respective markets do not function perfectly. Imperfections in the labour market are pervasive in most countries. Imperfections are usually reflected in high unemployment rates and high shares of informal employment. Therefore, the implications of trade policies on employment are of particular importance for welfare. Policy-makers who want to harness trade to achieve progress towards the SDGs need to be well aware of the consequences the liberalization of different sectors would have on employment in their country. It might be the case that even if a trade strategy aims at promoting sectors that are relatively more competitive on international markets, overall employment effects can be negative if the latter sectors are also characterized by relatively stronger imperfections on their respective labour markets.

This report provides guidance to trade-policy makers aiming to design employment-centered trade policies. The first chapter is a brief introduction to the issue at stake and underlines its relevance to the current debate about the role of international trade in facilitating the achievement of the SDGs. The second chapter of this report reviews the existing theoretical and empirical literature on the relationship between trade and labour market outcomes. Informality, which is an important feature of the labour market in most developing countries, and its role in framing the latter relationship are discussed in detail. The third chapter of the report presents a diagnostic tool constructed based on insights from the previous chapter, providing detailed information on data requirements and methodology. The diagnostic tool is designed to be used as a first step in assessing the potential employment implications of trade policy. It uses data to build evidence that provides qualitative guidance. It is complementary to simulation tools that estimate numerical outcomes under possible policy reform scenarios but rely on simplifying assumptions. Compared to existing tools and frameworks, its main advantages are:

- Use of an unsophisticated and technically parsimonious methodology.
- Possibility of adaptation to limited data availability.
- Accounting for labour market frictions, which can hamper the reallocation of workers after a trade shock.
- Accounting for informal employment, a common and important phenomenon, especially in developing countries.
- Accounting for intersections between trade, employment and other SDGs (through focusing on female employment, youth employment or creating jobs for the poor).

Two practical case studies illustrate how the framework can be applied and adapted to different policy contexts.

[1] 2030 Agenda for Sustainable Development, paragraph 68.

INTRODUCTION

In the context of the post-2015 development agenda, international trade is often seen as an "enabler" for achieving a broad range of development goals through promoting inclusive and sustainable economic growth. It has been regularly reiterated that "when properly harnessed, the opportunities brought by international trade can be a powerful force for creating jobs, enabling efficient use of resources, providing incentives to entrepreneurs and ultimately improving standards of living in all countries".[2] The 2030 Agenda for Sustainable Development recognizes that "international trade is an engine for inclusive growth and poverty reduction, and contributes to the promotion of sustainable development".[3]

Targets 17.10, 17.11 and 17.12 directly concern trade-related outcomes: a universal, rules-based, open, non-discriminatory and equitable multilateral trading system, an increase in the exports of developing countries, and duty-free, quota-free market access for all least developed countries (LDCs). The potential contribution of trade extends to almost all other goals and targets as well. As pointed out by UNCTAD (2016), trade as a means of implementation can, at the macroeconomic level, serve as a source of finance for both the public and the private sector. At the microeconomic level, it affects people's opportunities for consumption and production through its effect on the prices of goods and services in different countries. While all of these channels are relevant, this study focuses on how trade affects sustainable development through production, and in particular, the labour channel.

The labour channel is of particular importance for two main reasons: First, the 2030 Agenda commits to building "people-centered economies". The employment implications of international trade are those that have the most immediate, and potentially disruptive, effects on individuals' lives. On the consumption side, trade generally enables people to purchase a more desirable basket of goods and services. This benefit is relatively modest for each person, and relatively equally distributed across the population. People resemble each other more in what they consume than in what they produce - a farmer and a doctor both consume agricultural products and health services, even if they only produce one of them. Therefore, the impact of trade on what different individuals and families can consume is relatively similar, but its impact on what they can produce can be very different. On the production side, trade also has modest price effects on the wages of some individuals. However, for other individuals, trade can imply finding a job or losing one. (Decent) work is an SDG target itself (8.5), but also an important "ingredient" for individuals to achieve other SDGs for themselves and their family. Creating jobs and improving wages and working conditions for disadvantaged members of the population is crucial to reduce both gender and income inequality and to eradicate extreme poverty.

Second, trade liberalization by itself does not automatically create decent jobs, and not necessarily jobs for those who need them the most. Losing their

[2] UNCTAD Secretariat note to the TDB, Trade Commission, sixth session, TD/B/C.I/33.

[3] 2030 Agenda for Sustainable Development, paragraph 68.

job can be devastating for individuals and their families. Finding a new job in an industry that has benefited from trade liberalization is not always possible and may take a long time. Therefore, the implications of trade policies on employment are of particular importance for welfare. Policy-makers who want to harness trade to achieve progress towards the SDGs thus need to be well aware of the consequences the liberalization of different sectors would have on employment in their country.

Mapping out interlinkages between trade policy and sustainable development still represents a considerable challenge both from a theoretical and practical point of view. It is even more challenging to ensure that trade policy outcomes positively influence sustainable development. As Paul Krugman recently declared "We (the economic profession) have made mistakes, we underestimated the amount of pain being caused, but it doesn't mean we should be turning our backs on the global economy now".[4] Such under-estimation may be explained by the omission of a crucial element in assessing the impact of trade reforms, namely unemployment. Indeed, until fairly recently, most economists would agree with the younger Paul Krugman that "it should be possible to emphasize to students that the level of employment is a macroeconomic issue... with microeconomic policies like tariffs having little net effect".[5] It is no coincidence then that most international economics textbooks have no chapter on the impact of trade on unemployment. This is unfortunate as the economic situation and relative social status of most individuals are largely determined by their labour market experiences—that is, by their wages, their employers, and their intermittent spells of unemployment or under-employment.

The approach adopted in this report puts the labour market at the core of the analysis. Recent theoretical work at the crossroads between international trade and labour economics sheds light on the conditions for an economy to benefit from a trade reform, and allows deriving clear implications for policy making. This report builds on this literature to design a practical framework that can serve as a basis for trade policy making.

Trade and employment: An analytical framework

Generally speaking, a trade policy reform induces changes in relative prices of goods and services that in turn drive the reallocation of factors of production across sectors. In the framework above, the overall impact of a trade policy reform is the result of the combination of two sectoral patterns: comparative advantage and the labour market functioning. A positive price shock to sectors characterized by both stronger comparative advantage and more efficient labour markets should lead to both higher overall employment and higher export performance. However, a positive price shock to sectors characterized by stronger comparative advantage but less efficient labour markets could lead to higher export performance but also to lower employment. In other words, while concentrating on comparative advantage patterns to identify best policy options is crucial in terms of export performance prospects it might not be the best policy strategy in terms of overall employment.

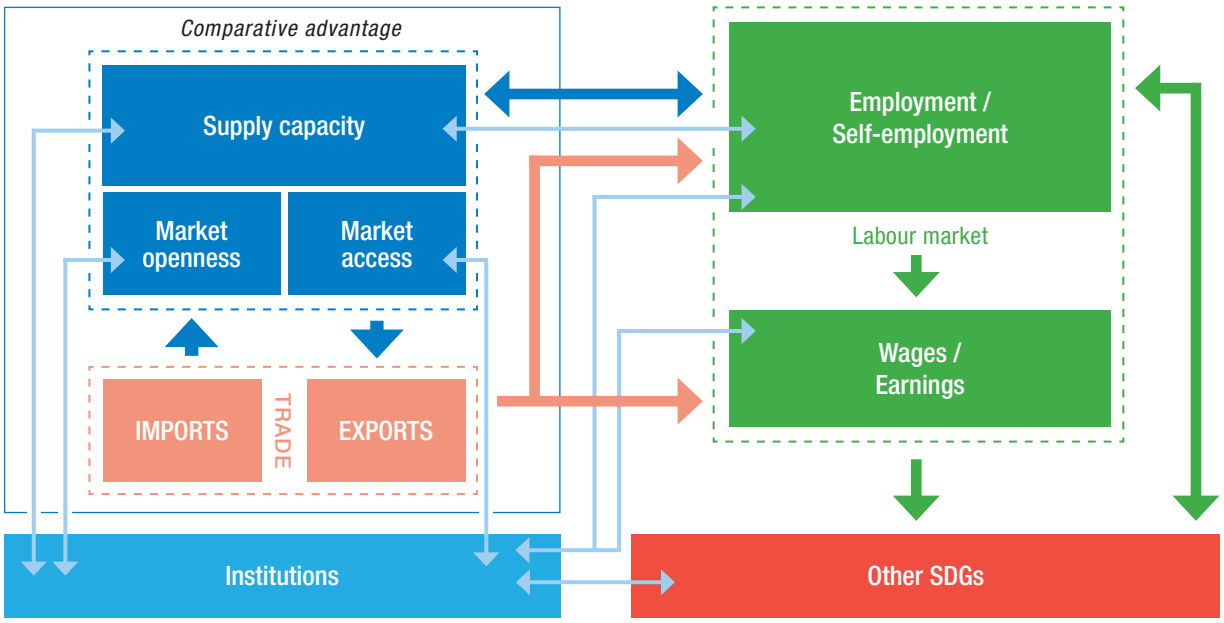
Furthermore, the labour market is not a perfect market, and adjustment mechanisms do not always generate full employment even in the long run. Search frictions characterize the functioning of the labour market. Higher frictions and subsequent lower matching efficiency necessarily result in higher equilibrium unemployment rates. There is clear evidence that these features are sector specific. Another element that impinges on the functioning of the labour market at the sectoral level is the incidence of informal employment. While the very existence of unemployment may be questioned in countries with limited welfare state instruments, informality is a prominent feature and deserves some specific attention. Indeed, informality could involve or concern a majority of the labour force in many developing countries and in particular in LDCs. Informality is usually associated with self-employment in the services sector or with employment in informal firms active in various goods sectors. However, there is evidence that informality is also present in formal production through the hiring of idle workers contributing to the production of goods and services sold on formal markets. Informal employment in both informal and formal firms is likely to reflect higher frictions in the labour market.

Figure 1.1 represents the overall analytical framework this report will refer to and illustrates its main arguments. Although it only features those economic and institutional components necessary to qualify the first order effects of trade on SDGs, economic linkages reported in the figure make up an already relatively complex representation of core mechanisms. The latter are discussed in Box 1.1.

[4] Allocution at the 2017 WTO public forum.

[5] Quote taken from Krugman (1993).

Figure 1.1 Trade and the SDGs: a basic analytical framework



Source: Authors' own elaboration.

Box 1.1 Trade, Labour market outcomes and SDGs

Figure 1.1 represents the overall analytical framework this study relies upon to identify the possible relationships between trade flows, labour market outcomes and other SDGs. The study focuses on first order effects of trade reforms on labour market outcomes and in particular employment in its various forms.The study argues that labour market outcomes directly affecting SGD 8 targets further represent the main production-side link to other SGDs such as poverty and inequality.

The analytical framework depicts three major interrelated economic blocks: the labour market block, the trade block and the supply/productive capacity block. The labour market and its functioning are reflected in both employment and wage outcomes. The trade block consists of both export and import flows. Supply capacity defines the structural production pattern and composition of the economy which is, however, intimately related to the external sector through access conditions to both domestic and international markets. The three blocks relate to the economy's institutional environment in a reversible and possibly multimodal way. The production-side link to SDGs other than those directly reflected by one of the three blocks goes through the labour market.[6] Once again labour market outcomes are crucial in defining welfare conditions of individuals and households.

Comparative advantage encompasses both trade and supply capacity. Primary factors determining structural comparative advantage (e.g. factors of production and natural resources endowments, labour force skills composition or technological advancement) frame the production pattern of an economy. Comparative advantage may be driven by structural components such as the endowment in arable land but also by more flexible factors likely to evolve across time such as technology or physical capital. Moreover, supply capacity and market access conditions on international markets determine the intensity of exports and their product composition (both goods and services could be included). However, supply capacity can also be affected by imports whether they are of final or of intermediate goods. Import penetration depends not only on comparative advantage and participation in global supply chains but also and obviously on the degree of openness of domestic markets. Trade reform by affecting relative prices is associated with a shock to supply capacity. Comparative advantage is also intimately linked to the labour market. Any shock to the former will impact directly the latter and vice versa, with unavoidable consequences for wages.

Each sub component in this framework may relate to any other inducing non-trivial relationships and calling for non-reductive analysis and reasoning. This complexity further points to the need to also consider linkages over some time horizon. For instance,

[6] There is also a consumption-side link between trade and the SDGs. Trade policies affect the prices of goods and can, for example, affect SDGs 2 (Zero Hunger) and 3 (Good Health and Well-Being) through effects on the prices of food and medicine. The consumption-side link is, however, not addressed in detail in this report.

institutions are so crucial in framing the relationships between and influencing the functioning of the various economic blocks represented here. The overall institutional framework affects the design of labour market institutions or the fiscal system.

Trade and the SDGs: From analysis to practice

As mentioned above, the main objective of this report is to develop an analytical tool in relation with the framework represented in Figure 1.1. Policy makers can use it to identify possible areas of attrition between trade policy and labour market outcomes within the determination of their SDG-oriented development strategy. The objective of this analytical tool is not to simulate the exact size of the impact of a specific trade reform but rather to provide qualitative insights with a focus on labour market outcomes. While labour market outcomes can also be obtained in simulation tools such as general or applied equilibrium models, those models do not encompass important features such as informality and rely on ad-hoc representation of unemployment. In sum, the analytical tool presented in this report should be considered as a complement to a more comprehensive simulation exercise. Its main advantages are the following: (1) it relies on a simple methodology, (2) it is adaptable to situations where data availability is limited, (3) it allows to account for labour market characteristics usually missing in existing simulation approaches and tools, such as labour market frictions, informality, and (4), it allows to focus on the employment of particular groups of the population (e.g. women, youth, or the poor) and thus to address intersections between trade, employment, and other SDGs.

Structure of the report

The rest of this report is divided into two major chapters. The next chapter (chapter 2) reviews the theoretical and empirical literature looking at the linkages between trade liberalization and the labour market. First, it discusses the links between trade policy reform and resource allocation based on insights from trade theory. Second, it addresses the functioning of labour markets, with a particular focus on developing economies and the different types of informality that can be encountered. Third, it presents the literature on the possible effects of a trade reform on labour markets, and fourth the costs induced by imperfect and non-instantaneous reallocation of resources across sectors during a trade liberalization event. Finally, the chapter presents and briefly discusses the set of trade related instruments policy makers have at their hands in the context of a policy reform. Here, the focus is on the different impact various trade related instruments may have on different sectors or on different firms within sectors. A discussion on how different decisional institutional contexts namely multilateral, regional, bilateral and unilateral matter in the decisional process matter closes this first part.

The last chapter (chapter 3) summarizes the core recommendations that can be drawn from the literature and, based on these, constructs a diagnostic tool that provides guidance to policy makers aiming to design employment sensible trade policies. It explains the various implementing steps in detail, with a clear reference to the methodology to be followed and the data needed to complete each step. Finally, the report presents two practical cases study offering an application of this framework. The first case study is a country specific application, using data from Peru. The country has been selection due to data availability, which allows to illustrate the computation of several detailed indicators that can be used in the analysis. While this first case study does not assess any specific trade policy reform, the second application focuses more explicitly on this aspect. Based on a study by Carrère (2018), it reviews the experience of regional integration amongst a set of West African countries through the lens of labour market outcomes. The second application is based on a less comprehensive set of data and offers a more macroeconomic assessment of the relationship between trade and labour markets outcome. Nevertheless, it provides informative insights related to the labour markets patterns of regional integration versus those of a more extensive trade-driven integration strategy. While chapter 3 builds on the insights from chapter 2, the two chapters can be read independently from one another.

HOW DOES TRADE (POLICY) AFFECT LABOUR MARKETS? A LITERATURE REVIEW

That trade reforms reallocate productive resources across sectors is a well-established theoretical result and empirical fact. However, what we may have missed is the extent to which the sharp growth in global trade has also produced sharper-than-expected income redistribution effects and transitional costs. Most economists shared the view of Krugman (1993) that microeconomic policies like tariffs have little net effect on macroeconomic issues such as the level of employment. However, the existence of labour market frictions able to generate equilibrium unemployment has now become a recognized theoretical feature supported by robust empirical evidence. In the context of a developing economy, labour market frictions can also lead to a large share of workers involved in informal employment and self-employment. Hence, in the presence of frictions on the labour market, any policy reform implying some reallocation of resources may affect equilibrium unemployment, the incidence of informal employment and participation in the self-employment sector. It may thus be the case that an intensification of international trade would lead to a worsening of general labour conditions. In addition to losses in terms of relative earnings as predicted by standard trade models losses in terms of employment status could also be observed in the event of some trade policy reform (or some trade shock).

The rest of the chapter is organized as follows. We first discuss the links between trade policy reform and resources allocation based on insights from trade theory. We then look at the functioning of the labour market in a developing economy with a clear reference to the different types of informality that can be encountered. The third section is dedicated to the possible effects of a trade reform on labour markets. The fourth section discusses the costs induced by imperfect and non-instantaneous reallocation of resources across sectors during a trade liberalization event. The last section reviews trade costs and its components with a focus on policy related ones.

1. TRADE POLICY REFORM AND RESOURCES ALLOCATION

This section briefly describes and discusses possible major income redistributive channels at stake in the event of a trade shock through the lens of various trade models. The very origin of the policy shock is not extensively discussed and the focus is on the reallocation of factors of productions and consequent redistributive forces at work. However, we assume that trade liberalization corresponds to a policy reform that makes relative prices of tradable-goods move towards neutrality. In this context as discussed in Harrison and Hanson (1999) trade liberalization will affect not only the allocation of resources across sectors (e.g. capital, labour (skilled, unskilled)) but also relative factors' earnings (e.g. capital, labour (skilled, unskilled)) and tax revenues. As a consequence trade liberalization is

expected to impact inequality in earnings and poverty, employment rates and the sectoral composition of production (and exports).

Classic Trade Theory: Full employment hypothesis

Standard explanations of how trade affects income distribution have been originally retrieved from two competing theories of trade. Both models make the hypothesis of full employment. In the traditional two-factor two-good Heckscher–Ohlin model, the impact of trade on income distribution is summarized by the Stolper–Samuelson Theorem. Stolper and Samuelson (1941) within an augmented Heckscher-Ohlin framework argued that freer trade is likely to create winners and losers, although the overall economic gains are larger than the losses. This argument draws on a crucial theorem they established linking goods prices to factor prices. This theorem simply states that when countries trade, if the price of a good were to increase, then the (real) price of the factor of production used intensively in the production of that good will also increase, while the (real) price of the other factor should decline. The Heckscher–Ohlin model assumes that workers move freely from one sector to another one. This may be realistic in the long run, but not in the short run. In contrast, the traditional Ricardo–Viner model provides a framework to assess the effects of mobility frictions but always preserving full-employment. The model predicts that free trade benefits the factor specific to the export sector, harms the factor specific to the import sector, and has an ambiguous impact on the welfare of the mobile factor. In this model, workers in import-competing sectors may lose from trade liberalization because they are unable to move easily to the expanding export sector (i.e. they are sector-specific factors). Although both models are intuitive and tractable they do not appear to be fully reliable when confronted with the data. They are unable to replicate several important facts of today's international trade flows.

- First, wage inequalities have increased in both rich and poor countries, at least during the 1980s and 1990s.
- Second, the price of skill-intensive goods has not increased as they should have in the Heckscher–Ohlin's framework.
- Third, most of international trade flows occur between countries with similar factor endowment.
- Fourth, a significant share of trade is not in final products, but in intermediate goods, i.e. in parts and components.

Empirical and theoretical research has therefore moved into several directions in order to incorporate important features of most recent international trade flows.

Box 2.1 Comparative advantage in a nutshell

While the two classical trade theories differ in what they view as its source, they agree on the importance of comparative advantage for determining the patterns of international trade. In the Ricardo model, comparative advantage is driven by technology, while in the Heckscher-Ohlin model, it is driven by factor endowments. However, both assert that the existence of different comparative advantage patterns enables countries that open up to trade to specialize in what they are relatively good at producing. They export (import) the goods for the production of which they incur lower (higher) opportunity costs, which leads to gains from trade, i.e. an increase in overall welfare in all trading countries. The theory of comparative advantage has been confirmed by Bernhofen and Brown (2004) studying historic price and import data of Japan, which was practically autarkic for two centuries before being forced to suddenly open up to free trade in the 1859s.

Trade in tasks and offshoring

These include trade in tasks and offshoring. Grossman and Rossi-Hansberg (2008) propose a complementary model of trade in tasks and offshoring.[7] The model builds on the previous work by Feenstra and Hanson (1996), with two countries (North and South), and a continuum of task that need to be performed in order to produce a final good. The benefits from offshoring stem from the lower production cost in the other country. Firms in the North incur two costs when offshoring: a trade cost because the intermediate input has to be shipped back, and a coordination (or supervision) cost which is increasing in the complexity of a task, so that more complex tasks are more costly to offshore. As in Feenstra and Hanson (1996), complex tasks require relatively more skilled labour than simple tasks. A fall in the offshoring cost (trade cost and/or coordination cost)

[7] As defined by Grossman and Rossi-Hansberg (2008), trade in tasks goes beyond the increase in trade in services following new outsourcing strategies due to the international fragmentation of production. Their basic idea is that instead of trade being an exchange of goods exculsively, it "increasingly involves bits of value being added in many different locations". Trade in tasks is therefore a theory of offshoring – the consequence of the separation of tasks in time and space.

of simple tasks affects unskilled workers in several ways.

- First, there is a **productivity effect**. Because the cost of performing simple tasks, which are performed by unskilled workers, has fallen due to offshoring, the demand for unskilled workers increases and this pushes up their wage. The reduction in the cost of offshoring acts just like an improvement in the productivity of unskilled workers.
- The second effect is called the **terms-of-trade effect**. It comes from the fact that offshoring can affect the price of the good that is being produced in a way that is going to hurt the unskilled workers. A fall in the cost of offshoring is typically going to reduce the price of the unskilled-intensive good, thereby reducing the wage of unskilled workers.
- Finally, by offshoring simple tasks, the demand for unskilled workers declines in the North, which puts a downward pressure on their wage; this is the **supply effect**. Skilled workers in the North unambiguously benefit from offshoring through the terms-of-trade effect, and potentially through the supply effect too.

What Grossman and Rossi-Hansberg highlight with their model is that **the effect of offshoring on unskilled workers is ambiguous**. The three effects determine together how the wage of unskilled workers is affected by offshoring. Unskilled workers can see their wage increase if the productivity effect dominates the other two effects; they can see no change if the three effects perfectly cancel each other out; or they can experience a decline in their wages if the terms-of-trade and supply effect more than offset the positive gain from the productivity effect. Which effect dominates is therefore an empirical question. This class of model improved substantially on the H-O framework. They feature trade in intermediate goods, and can predict that wage inequalities increase in both the North and the South.

Firm-level heterogeneity

Previous models completely abstract from any issue of heterogeneity whether at the firm level of at the consumer level which is in complete contradiction with what observed in reality. The acknowledgement that firm and/or consumer heterogeneity matters in understanding trade patterns has brought to the need to develop new frameworks for the analysis of the causes and consequences of international trade, with firm-level or consumer-level heterogeneity at the core of the analysis. The focus however has been essentially on firms' heterogeneity. The reason may be related to the fact that heterogeneity in itself is more easily interpretable and more easily quantifiable when considering firms rather than individuals. Looking at the production side first, including heterogeneity implies dropping the assumption of the representative firm. In this context **firm heterogeneity becomes a new source of trade with gains from trade arising from higher average productivity** as first shown in Melitz (2003). Importantly, this approach, the so-called "new-new" trade theory, challenges the prediction that winning or losing from trade reforms depends on individuals' sector of activity in the short-run and on their factor endowment in the long run. Rather, it predicts that high-productivity firms will expand and low-productivity firms will shrink or disappear. Within his framework, firms face a sunk cost of entry into the market; after paying this cost they draw their productivity level from an exogenous distribution and they will export, produce for the domestic market or exit the market according to whether their productivity is higher than the productivity threshold, which is endogenously determined.

The productivity increase determining the gains from trade will be due to two main effects:

- A **productivity effect**: exporting increases expected profits and therefore the threshold for survival, thus only the most productive firms survive and average productivity increases.
- A **reallocation effect**: exporting allows the most productive firms to expand and the least productive ones to contract.

Moreover, **individuals working in more productive firms gain and those working in less productive firms lose either temporarily or permanently** (Bernard et al., 2007). Several papers show that whenever a country opens up to trade **skilled workers are paid higher wages in all countries** (Yeaple, 2005; Sampson, 2014; Helpman et al., 2010; Antràs et al., 2006).

Consumer-level heterogeneity

Recognizing heterogeneity amongst consumers and introducing consumer-specific price effects introduces an additional channel that can potentially disrupt results from standard models. Nigai (2016) builds a general equilibrium model in which consumers differ not only in terms of their labour endowment (capital, ability or skills), but also in terms of their likelihood to consumer necessity versus luxury goods. His

estimates demonstrate that the simplifying assumption of representative, i.e. homogeneous, consumers leads to a bias in the size, but not the direction, of the impact of trade cost reductions on both the rich and the poor.

Dropping the full-employment hypothesis

In all theoretical models reviewed so far, full employment, or at least no permanent unemployment, prevails. Davidson, Martin and Matusz (1999) were the first to show that introducing equilibrium unemployment invalidates some, but not all, results from trade models that assume full employment.

Carrère, Grujovic and Robert-Nicoud (2015) show that **opening up to trade can lead to a reduction in unemployment under certain conditions**.

- First, if trade openness leads to a **more efficient allocation of factors of production**, it can create jobs and raise wages (in the presence of labour market frictions).
- Second, if **labour market frictions** vary across sectors, which is usually the case as discussed in Carrère et al. (2016), unemployment decreases (increases) if trade openness directs workers towards sectors with low (high) frictions.

The authors also emphasize that a trade reform can increase (or decrease) income and unemployment at the same time, which has important implications for inequality. For example, if both income and unemployment increase, some workers lose their jobs while others enjoy an increase in wages.

This class of models points to the fact that **trade can have redistributive effects** which are unrelated to worker heterogeneity.[8] The nature and amplitude of these effects relate to the **functioning of the labour market**. Even if all workers are identical and employable in any sector indistinctly, trade reform can have a different impact on the level of unemployment and wages in different sectors.

A more precise understanding of how labour markets operate is at the core of a better understanding of the consequences of a trade reform in terms of both employment status and earnings. The next section steps away from the trade perspective to briefly discuss the functioning of labour markets before considering the two issues jointly in section 3.

[8] In the standard Hecksher-Ohlin international trade framework reviewed previously income redistribution usually occurs either across different inputs owners (i.e physical capital versus labour) or across workers with different skills (i.e skiled versus unskilled).

2. THE LABOUR MARKET

Although the standard supply and demand model remains useful, alternative approaches are needed to account for other important labour market features. One is **unemployment** which is best treated by labour market models based on imperfect matching between firms and workers. Other crucial features are **self-employment** and **informality**, which can closely relate to each other, especially in developing countries.

2.1 From full employment to search frictions

The standard labour market model: full employment

In most analytical frameworks labour markets are assumed to operate as any other market with demand, supply and forces driving their pairing up. If a labour relationship is established, firms pay wages to workers in exchange for some supply of labour.

On the labour **demand side** driving forces reflect the willingness of firms (the buyers) to create jobs. It reflects customers' demand for the firm's product (i.e. how much the firm can sell), but also the most efficient combination of different production factors (such as labour and physical capital). In a perfectly competitive environment, firms are price takers and pay a wage equal to the marginal product of labour. Put otherwise, they hire more workers as long as the revenue from the output produced by these workers is higher than the market wage they pay them.

On the **supply side**, driving forces reflect the willingness of workers (the sellers) to accept jobs at certain wages. In the standard approach, this is modeled as the worker's tradeoff between consumption and leisure. Given the market rate, workers chose how many hours to work in order to reach their preferred available balance between the goods they can buy and the free time they can enjoy. Changes in wages affect this balance, and their effect typically differs between low and high-income earners. At low incomes, people may be willing to work more if wages rise, but at high levels, people who are already able to consume many goods may prefer reducing their working hours instead.

There are different types and skills level of labour and a distinct labour market exists for every type and skill level. The equilibrium wage rate is the rate that equates demand and supply in a particular market, and it changes with underlying conditions of demand or supply. Demand for labour is, for example, affected

Box 2.2 The unemployment rate: definition and estimation

The unemployment rate as reported in Table A can be defined as a measure of the underutilization of the labour supply. It is thus seen as an indicator of the efficiency and effectiveness of an economy to absorb its labour force and of the performance of the labour market. The unemployment rate is given by the ratio between the number of unemployed persons and the total number of persons in the labour force expressed in percentage points. The labour force corresponds to the sum of both the number of persons employed and the number of persons unemployed. From a statistical point of view, the ILO defines the unemployed as including "all persons of working age who were: a) without work during the reference period, i.e. were not in paid employment or self-employment; b) currently available for work, i.e. were available for paid employment or self-employment during the reference period; and c) seeking work, i.e. had taken specific steps in a specified recent period to seek paid employment or self-employment. Future starters, that is, persons who did not look for work but have a future labour market stake (made arrangements for a future job start) are also counted as unemployed, as well as participants in skills training or retraining schemes within employment promotion programmes" (ILO, 2018).

Unemployment was included as one of the indicators proposed to measure progress towards the achievement of the Sustainable Development Goals (SDG), under Goal 8.

Table A Unemployment rate (selected years)

	2000	2005	2010	2016
Central Europe and the Baltics	12.4	12.0	9.9	6.7
East Asia & Pacific	4.6	4.7	4.4	4.3
Europe & Central Asia	9.6	8.7	9.1	8.2
Middle East & North Africa	12.7	11.9	10.5	11.1
Sub-Saharan Africa	8.4	8.0	7.8	7.4
Latin America & Caribbean	10.9	9.2	7.7	8.1
Low income	5.3	5.6	5.6	5.6
Lower middle income	5.7	6.2	5.3	5.0
Middle income	6.4	6.2	5.6	5.6
Upper middle income	7.0	6.1	5.9	6.2
High income	6.5	6.7	8.3	6.3
OECD members	6.3	6.6	8.3	6.3
Euro area	9.5	9.0	10.1	10.0
European Union	9.3	8.9	9.6	8.6
Arab World	13.0	11.9	10.0	11.3
Least developed countries: UN classification	5.1	5.6	5.5	5.5
Heavily indebted poor countries (HIPC)	6.7	6.6	6.3	6.2

Source: ILOSTAT.

by changes in the productivity of labour, the price of the product dues to changes in non-labour input prices, or the demand for the product due to changes in consumers' preferences. Labour supply can also vary due to various elements, such as the legal length of the working week, participation rates, demographic factors such as migration or the age structure of the population, or modifications of the required qualifications and skills to accomplish a given production task.

"Twisted" Standard Models: Accounting for unemployment

Under perfectly competitive market assumption the meeting of supply and demand is quasi instantaneous as wages, the price of labour, are assumed to adjust so that possible changes in demand and supply conditions are fully accounted for and maintain the labour market in an equilibrium characterized by full employment. This adjustment process appears somewhat unrealistic as it does not reflect the experience of several firms forced to shut down their activity and workers who have to spend a shorter or longer period in unemployment. As shown in table A of Box 2.2 unemployment is a reality shared more or less intensively by all countries in the world.

A way to bypass or attenuate some of the baseline assumptions has been to include ad-hoc mechanisms or institutions able to produce market imperfections that lead to an excess labour supply, i.e. unemployment. Examples include public regulations (minimum wages, unemployment benefits) and non-competitive behaviour of firms (e.g., monopolies) or workers (unions). Such models can generate unemployment while maintaining the assumption of homogeneous labour.

The ***efficiency-wage model*** is one of the most popular models based on this approach. Its basic idea is that offering higher wages will allow firms to achieve higher productivity of workers (by discouraging shirking or attracting better applicants). However, if all firms offer higher wages than the market wage, labour supply exceeds demand and there is unemployment. ***Contract models*** assume firms may not be allowed to lower wages and therefore need to lay off workers to adapt to weaker demand, which causes unemployment. ***Insider-outsider models*** assume that those who are already working have a higher bargaining power than those who are not, which can keep wages above the market rate and thus cause unemployment.

Search Frictions and the Level of Unemployment

Another approach that departs from the perfectly competitive market paradigm emphasizes the role played by the process governing the matching between firms and workers in determining unemployment. A graphical representation is given in Figure 2.1. Unemployment described by the search theories is an equilibrium phenomenon and can exist even if there are as many vacant jobs as unemployed workers. It results from the fact that searching for a job/an employee takes time, which is more realistic than the assumption of a centralized labour market where labour is traded at a market rate. The searching time can be affected by several features such as institutions of skills. For instance the degree of centralization in wage bargaining may affect the length of negotiation and thus the stringency of search frictions. Some jobs may require specific skills which are not easily available in the pool of workers in search mode.

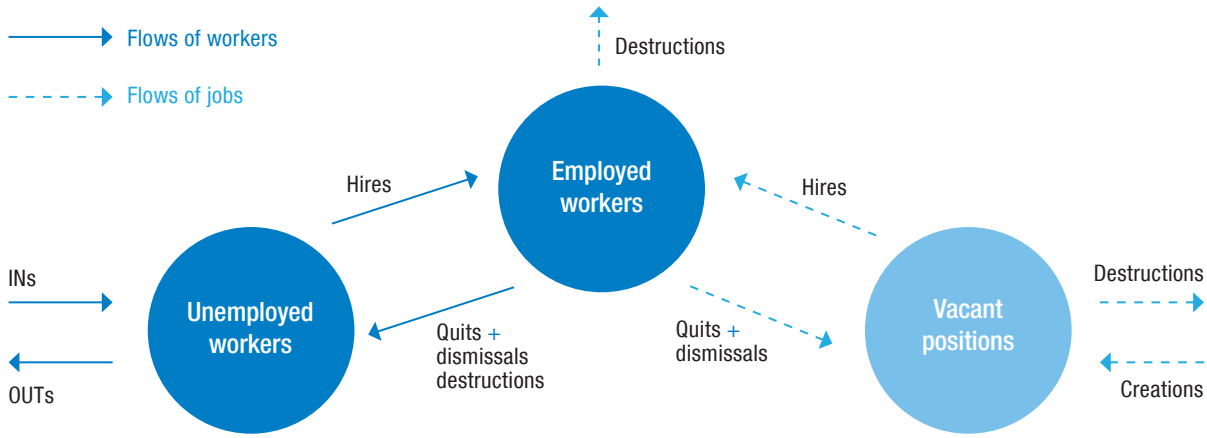
These frictions cause some equilibrium unemployment in the economy implying that the balance between supply and demand is not a necessary condition any more to be at equilibrium. The steady-state/equilibrium unemployment is reached when the flow into unemployment flow corresponds to the flow out of unemployment.[9] The steady-state/equilibrium unemployment rate is thus given by the job destruction rate divided by the job destruction rate plus the rate at which workers leave unemployment (which is different from the job creation rate).

While the supply-and-demand approach remains useful for some applications, alternatives are more appropriate to study questions such as the length of unemployment, the co-existence of vacant jobs and unemployed workers or the observation of different wages for similar jobs.

Forces driving the match between firms and workers are crucial in defining the speed of adjustment on the labour market in the event of a shock affecting either supply or demand conditions or both simultaneously. **Stronger frictions are associated with longer spells of unemployment for any displaced worker and eventually higher overall unemployment rates**. Frictions may vary across sectors and industries as labour market institutions and possibly regulations

[9] Unemployment-vacancy combinations that are consistent with flow into unemployment being equal with flow out of unemployment draw a downward sloping locus (in the Unemployment-Vacancy space) referred to as the Beveridge Curve, or the U-V curve. Shifts of this relationship can reflect structural changes in the labour market.

Figure 2.1 Flows in a Search Model



Source: Authors' *own elaboration*.

can also be sector or industry specific. Indeed, there are numerous institutional (or not fully competitive) forces acting on the labour market such as labour unions, wage mandates, product and labour market regulations, taxes and subsidies, and social norms and structures, all of which can differ between sectors or industries. Any sector/industry specific shock will result in changes in unemployment at the sector/industry level. The new sectoral composition and distribution of workers is likely to affect the aggregate level of unemployment. The sign and size of the changes will depend on the sign and size of the shock and on how easy it is for workers to change sector or industry on top of facing sector/ industry specific search frictions. If, for instance, a sector is heavily hit by a negative price shock and the skills needed in that sector are not easily transferable to other sectors, structural impediments to inter-sectoral mobility add to generic search frictions. In this case, the period of adjustment is likely to increase and a larger share of the labour force may remain unemployed. The very existence of unemployment thus lowers possible gains from trade reform, a point that is analyzed in detail in the next section.

Although unemployment and its variations are clearly important features to appreciate properly the impact of policy reform, **developing economies are often characterized by a relatively high incidence of informal labour and production**. It becomes crucial to account for such characteristic in order to fully cover the impact of nay trade policy reform. Looking at unemployment would not be sufficient as unemployment status may not be relevant for a majority of individuals in the labour force.

2.2 Informality

Informality, independently of the adopted definition and the estimation technique used to assess its size, either in labour force or production units, is a pervasive phenomenon in most countries.

Definition and statistics on the incidence of informality

As reported in Table 2.1 informality exists in both developed (top income quartile) and developing countries (lower income quartiles). The table also shows that figures are higher in lower quartiles implying that the incidence of informality relates to economic development. Indeed, in developing countries the informal economy comprises half to three-quarters of all non-agricultural employment. Informal employment should thus be accounted for when assessing the impact of trade policy reforms on labour market outcomes as discussed in the next section.

Several ways to define and measure the informal economy can be found in the literature, and these definitions vary greatly. Part of the reason for this varied approach to defining the informal sector is the nature of the informal sector itself. It continually evolves as various aspects of the formal or official economy change, for example, as taxes or punitive sanctions from tax authorities change, or even when general moral attitudes change. Despite a clear difficulty in

Table 2.1 Size of the Informal Economy by Alternative Measures - Percent except where stated otherwise

		MEASURES OF INFORMALITY						
Income Quartile	GDP/ Population ($US)	% GDP Informal (World Economic Forum)	% Tax Evasion (Enterprise survey)	% Self-Employ-ment	% Self-Employment non-agriculture	% GDP Informal (electricity consumption)	% GDP Informal (multiple indicators)	Registered firms / population (000s)
Bottom	429	35.4	29	46.4	57.3	38.9	42.3	3.2
Second	1,362	33.7	23.3	35.7	37.1	42.7	39.8	8.2
Third	4,002	27.6	19.7	23.1	24.6	31.3	34.1	28.7
Top	20,348	17.3	8.2	13.3	12.5	17.6	18.3	41.8
Sample mean	10,015	27.6	22.5	26.5	30.8	29	34.5	24.7
Difference 1st vs 4th quartile	-19,919a	-18.1a	-20.8a	-33.1a	-44.8a	-21.4a	-23.9a	38.7a
Observations	185	125	95	133	96	57	145	83

Source: La Porta and Schleifer (2014).
Note: a significant at the 1% level, b significant at the 5% level, and c significant at the 10% level.

Table 2.2 Taxonomy of Informal Economic Activities

	Monetary transactions		Non-Monetary transactions	
Illegal activities	Trade in stolen goods; drug dealing and manufacturing; prostitution; gambling; smuggling and fraud		Barter: drugs, stolen goods, smuggling, etc; production or growing of drugs for own use; theft for own use	
	Tax evasion	**Tax avoidance**	**Tax evasion**	**Tax avoidance**
Legal activities	Unreported income from self-employment; wages, salaries and assets from unreported work related to legal services and goods	Employee discounts; fringe benefits	Barter of legal services and goods	All do-it-yourself work and neighbor work

Source: Mirus and Smith (1997), Schneider and Enste (2000) and Peters (2017).

precisely defining the informal economy, Schneider and Enste (2000) state that a consensus definition of the legal and illegal shadow economy would include all economic activity that would generally be taxable if it were reported to the tax authorities as reported in Table 2.2. In other words, the informal economy, also called unofficial or shadow economy, constitutes activity that is not reported to the state statistical office as defined in Johnson, Kaufmann, and Shleifer (1997). This definition is in line with other definitions of the informal economy relating it to market-based production of goods and services, whether legal or illegal that is not reflected in the official GDP estimates.

From the ILO statistical point of view (see Box 2.3), the core identifying element is the employment relationship which reflects the employer's protection. In this approach, **informal employment corresponds to employment in the informal sector as well as informal employment in the formal sector**. Employment in the informal sector includes the self-employed (employers, own account workers, family helpers), wage employees of unregistered firms and employers in micro-enterprises (in general with less than five workers). Informal employment in the formal sector corresponds to those wage employees of registered firms and paid domestic workers without social protection.[10]

The issue of informal production and employment however is not only about adopting a proper definition of the phenomenon but also about understanding the scope and consequences of its very existence. This becomes desirable and even necessary when relating trade and its effects not only to employment, that is SDG 8, but also to other SDGs.

[10] This definition is the one we have adopted in our practical exercise presented in section 4.

Different views of informality in the literature

The debate over the role of the informal sector goes back almost half a century. A prominent stream of the literature has intellectual roots perhaps best distilled in Harris and Todaro's (1970) vision of markets segmented by wage setting in the formal sector that leaves the traditional sector rationed out of modern salaried employment. Informality then corresponds to the disadvantaged segment of a dualistic labour market segmented by legislated or union-induced rigidities and high labour costs in the protected or "formal sector". In this context being employed in the informal sector is the consequence of a lack of any better alternative in the formal sector. Workers have no other choice but to stay informal and their status is often associated with poor employment conditions and with increasing poverty. A large informal sector is a sign of inefficiencies in labour market allocation and a need for reforms. The downward rigidity of wages in the formal sector can be understood in the context of dynamic interactions between the formal and informal sector: in a downturn, the informal sector absorbs displaced formal workers and relative wages in the informal sector fall. During recoveries, they contract, as more workers are able to move back to the formal sector. This perspective draws a somewhat neutral picture on the two sectors and does not claim that the informal sector harms the formal sector, markets, products and customers are likely to be different. Informal firms are not a threat to formal ones. On the contrary, sub-contracting to unregistered productive units can be used by large formal firms to reduce costs and gain flexibility. According to an alternative view of the informal sector, the so-called "parasite" view this type of complementarity is precluded. Actually, informal firms act as unfair competitors to formal ones.

Box 2.3 ILO definition of informality

Statistics on informality presented in ILOSTAT are based on the following ILO supported concepts and definitions:

Workers in the informal economy *comprise all workers of the informal sector and informal workers outside the informal sector.*

Employment in the informal sector *comprises all persons who, during a given reference period, were employed in at least one informal sector enterprise, irrespective of their status in employment and whether it was their main or a secondary job. An informal sector enterprise satisfies the following criteria:*

- *It is an unincorporated enterprise, which means that:*
  - *It is not constituted as a legal entity separate from its owners, and*
  - *It is owned and controlled by one or more members of one or more households, and*
  - *It is not a quasi-corporation (it does not have a complete set of accounts, including balance sheets).*
- *It is a market enterprise: this means that it sells at least some of the goods or services it produces. It therefore excludes households employing paid domestic workers.*
- *And at least one of the following criteria:*
  - *The number of persons engaged / employees / employees employed on a continuous basis, is below a threshold determined by the country*
  - *The enterprise is not registered*
  - *The employees of the enterprise are not registered.*

Informal employment outside of the informal sector *comprises persons who in their main or secondary jobs were:*

- *Own-account workers engaged in the production of goods exclusively for own final use by their household (e.g. subsistence farming).*
- *Contributing family workers, irrespective of whether they work in formal or informal sector enterprises.*
- *Employees holding informal jobs, whether employed by formal sector enterprises, informal sector enterprises, or as paid domestic workers by households. Employees are considered to have informal jobs if their employment relationship is, in law or in practice, not subject to national labour legislation, income taxation, social protection or entitlement to certain employment benefits (paid annual or sick leave, etc.).*

A more detailed description and discussion can be found at http://www.ilo.org/ilostat-files/Documents/description_IFL_EN.pdf.

The parasite and the dual economy views differ in their statements regarding the actual benefits and harms of the informal sector. In the parasite view formal and informal firms compete on the same goods and services markets. By avoiding taxes and bureaucratic procedures, informal firms can produce at lower costs and therefore are able to set lower prices. As a consequence informal firms are likely to erode formal firms' market shares. The parasite view further states that due to their illegality informal firms need to stay small in order to not raise suspicions and therefore lack the advantage of using an efficient scale to produce. According to Farrell (2004), the advantage of not paying taxes and avoiding regulation outweighs the loss due to inefficiency. This is to say that according to the parasite view becoming informal is mostly voluntary, which is not the case in the dualistic view as mentioned above. **In both the dual economy view and the parasite view informality is associated with a non-optimal situation and its removal could bring benefits to the economy as a whole**. However, dating at least from Hart's (1973) work in Africa, a parallel stream has stressed the sector's dynamism and the likely voluntary nature of much of the entry into informal self-employment. The lack of protection is seen as "one dimension of an unregulated but dynamic sector of small scale entrepreneurs, most of whom enter the sector voluntarily, and who choose and are able to remain largely outside the regulatory structures" (Guasch, 1999). Labour markets may therefore be broadly integrated (not segmented) and the existence of unprotected labour is not in itself evidence of segmentation. This view of a more integrated labour market with workers deciding to become informal on a voluntary basis is extensively discussed and illustrated in Perry et al. (2007). The decision of becoming informal is taken not only because of monetary advantages but also because of non-pecuniary motivations. This includes for example more flexibility for mothers and women who coordinate

work and home at the same time, more autonomy, or the opportunity to "learn by doing" for workers that lack some special skills, meaning that they can start working and learn on the spot.

A more extreme expression of this view has been put forward by De Soto (1989) based on observations and findings related to the Latin American and in particular the Peruvian experience. Unofficial firms are depicted as fundamentally similar to official firms, but are kept down by policy. Unofficial firms should share the same basic characteristics as official firms -for example the quality of the entrepreneur- regardless of their regulatory status. De Soto's findings reveal that "unofficial firms are actually or potentially extremely productive, and are held back by government taxes and regulations, as well as by lack of secure property rights and of access to finance". It is also stated that the status of an unofficial firm is reversible. If the government lowers barriers to formalization informal firms may be willing to declare their activity in order to gain access to the official capital market had it to be through micro finance. These actions may lead to substantially higher potential in terms of economic growth. De Soto's view is often referred to as the romantic view of informality.

Evidence on types of informality

Existing statistical and empirical evidence suggests that no view systematically prevails over any other. The relative incidence of the different forms of informality varies across countries, sectors and time and across any combination of these dimensions. Various characteristics more or less relevant to the academic and institutional views of informal activity and employment seem to coexist.[11]

On the firm side, using data from three different sets of surveys from the World Bank, Shleifer and La Porta (2008, 2014) identify a non-negligible **productivity gap between informal and (especially large) formal firms**. Informal firms are small (on average less than four employees) and not perceived as competitive threat by formal firms. They have limited access to finance, and perceive this to be a serious obstacle to doing business, while formal firms are more concern about taxation. Poor infrastructures and disrupted electricity supply are another major concern to informal firms but also to small official enterprises. Another important finding is that **there is no evidence that informal firms ever become formal** (or vice versa). Finally, **only 0.1 percent of informal firms export**. Shleifer and La Porta (2008, 2014) also present stylized facts about entrepreneurs' and employees' characteristics. Formal entrepreneurs are on average better educated than their informal peers. However, and perhaps surprisingly, **no difference in the human capital of employees** can be identified. Following up on the worker/employee side, various studies (e.g. ILO-WTO (2009), OECD (2009)) show that informal workers are highly vulnerable to idiosyncratic and aggregate shocks due to a lack of protection and absence of benefits. **The share of informal workers is strongly correlated with poverty rates (SDG 1)** and decreases with GDP per capita. Moreover, women, migrants and other vulnerable workers often rely on lower quality informal sector employment because they face barriers to the formal labour market.

Informality and unemployment

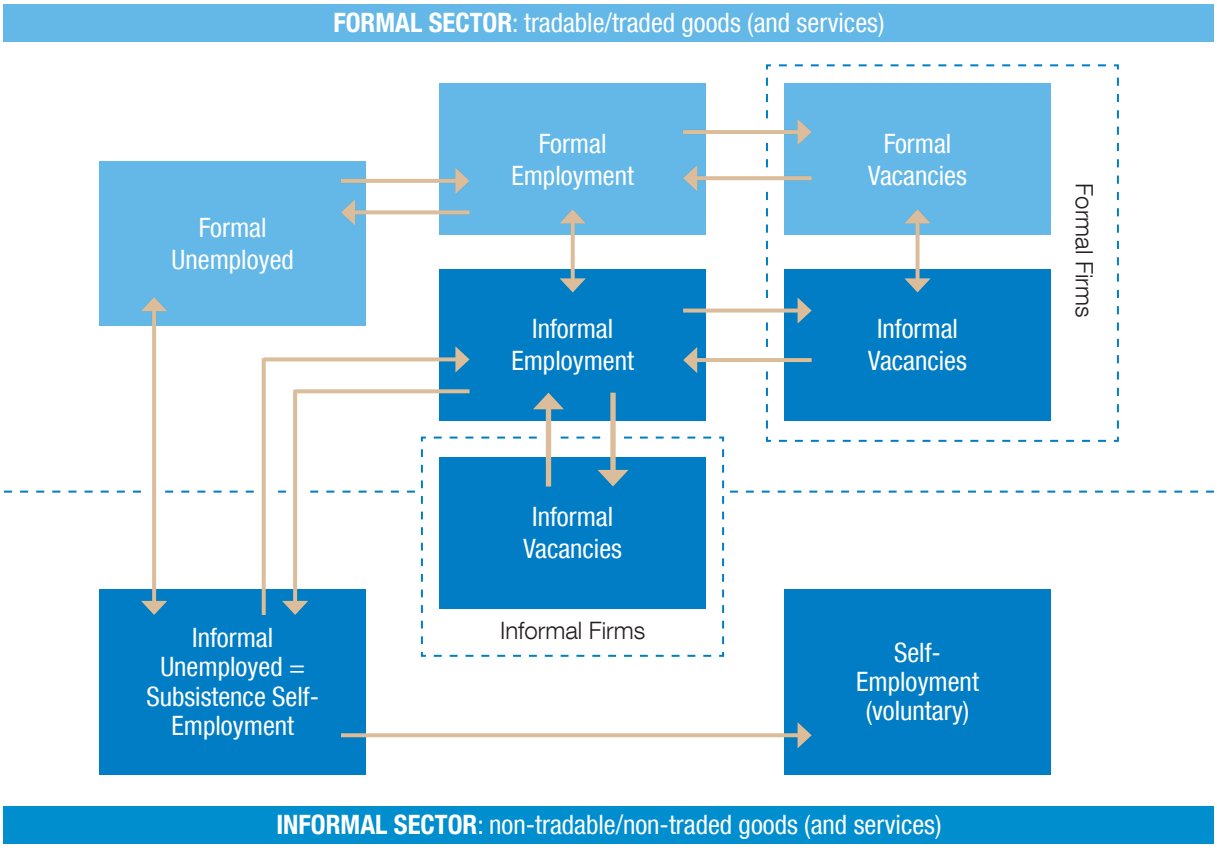
The approach to informality adopted hereafter is represented in Figure 2.2 and is based on several inclusive assumptions all retrieved from existing empirical evidence as just discussed. The analytical framework eventually encompasses features pertaining to each of the three main views of informality discussed previously. The scope is to account for the largest set of empirically observed stylized facts relating to informal employment and production. We had to leave certain considerations, such as workers skills for instance, to further development in order to keep the framework as simple as possible without altering however major analytical insights.

One core feature of the framework is that different forms of informality can co-exist. Informal workers can be either self-employed or employed without any official contractual arrangement by either formal or informal firms. The latter distinction is not necessarily crucial from a conceptual point of view although practically it may imply different working conditions.

Another core feature is the existence of frictions in the matching process between firms and workers. Vacant posts cannot be filled instantaneously with searching unemployed workers. Matching frictions characterize both formal and informal job markets. We also allow for some form of segmentation in the labour market. We consider that informal workers cannot easily search for formal jobs (e.g. it may require the acquisition of some skills or education). We also consider that informal jobs in either formal or informal entities cannot be easily formalized (e.g. there might be some credit rationing for informal firms and as a consequence makes formalization difficult).

[11] See for instance Maloney (2004) for a comprehensive discussion.

Figure 2.2 Informality and Unemployment in a nutshell



Source: Authors' own elaboration.

In sum workers are either formal or informal and changing status is not straightforward. If operating in the formal sector, workers are either employed by a formal firm with a formal contract or unemployed. While unemployed they may receive some transfers form a state welfare program. If operating in the informal sector, workers can chose between employment and self-employment is they have the necessary entrepreneurial skills. As to employment, the choice is between an informal firm and an informal position within a formal firm. Both types of informal employment are characterized by the absence of a formal work contract. If unemployed, informal workers do not receive any unemployment benefits as they could not subscribe to any formal unemployment insurance scheme and have no choice but to undertake some subsistence activity (e.g. street vendors, shoe shiner).

A last important feature of the framework relates to the types of goods produced in each sector. Despite the possibility of using informal inputs into formal production goods and services produced in either sector are only bad substitutes. It is often the case that goods and to a large extent services from the formal sector are tradable either by nature or due to their quality while those produced by informal production units are either non-traded or non-tradable. In our simplified framework formal and informal firms produce similar tradable but not necessarily traded goods while voluntary and forced self-employed workers produce non-tradable goods or services.

This rather simplified framework will help us identify in the next section channels of transmission of trade shocks induced to an economy and its various sub-segments. An already important insight is the positive relationship that can be established between formal unemployment and informal employment. If a larger share of informal workers search for an informal job rather than starting an independent informal productive activity then formal employees can be threatened either directly if their employer increase its share of informal jobs or indirectly if informal firms operating on the market are able to intensify domestic competition.

In both cases, opening up a formal vacancy becomes relatively less profitable and this relative profitability loss has to be compensated by an increase in the arrival rate of formal workers. As a consequence the ratio of unemployed workers to vacancies must increase, which also implies an increase in the formal unemployment rate. In other words, relatively higher formal unemployment rates and relatively higher informal employment incidence are closely linked.[12]

3. TRADE AND LABOUR OUTCOMES

This section discusses several papers looking at the impact of a trade shock on unemployment and informality merging the two literatures reviewed above. The existing literature is divided into two separate strands, one focusing on unemployment and the other on informality. However, insights from the framework discussed in the previous section can be used to offer a unified assessment of trade impacts.

Trade and unemployment: theory

As discussed before, the literature on trade and unemployment has abandoned the assumption that workers displaced by trade reform are simply reallocated to new productive activities. However, **whether equilibrium unemployment rises or falls because of trade reform remains an open question**. Theory provides contradicting answers as discussed in Helpman, Itskhoki, Muendler and Redding (2013). In an early contribution, Brecher (1974) develops a model of a small open economy with a minimum wage to show that the impact of trade liberalization on welfare and unemployment depends on **relative factor endowments**: labour-abundant countries experience a fall in unemployment as they open up to trade, whereas capital-abundant countries see unemployment increase. Davis (1998), building on Brecher's setup and allowing for terms-of-trade effects in a world with two identical economies except for their labour market rigidities, shows that openness reduces welfare and increases unemployment in the economy with more **rigid labour markets**. Davidson, Martin and Matusz (1999) assume that **sectoral labour market frictions can be a source of comparative advantage** and differences across sectors eventually manifest themselves as Ricardian technology differences. In this framework, they show that the impact of trade liberalization on unemployment depends on relative capital-labour endowments across different countries as in Brecher (1974). More precisely, when a relatively capital-abundant large country begins to trade with a small, relatively labour-abundant country, unemployed workers in the large country unambiguously suffer welfare losses even if the small country has a less efficient labour market. Cuñat and Melitz (2012) also recognize that labour market frictions can play an important role in framing comparative advantage patterns. However, they highlight a different mechanism, exploring how differences in the **volatility of industries** (defined as the variance of firm-level shocks) affect the reallocation of workers across firms within an industry. Their findings suggests that firms in countries with greater labour market flexibility are better able to respond to firm-specific shocks by hiring and firing workers, which gives countries with more flexible labour market institutions a comparative advantage in more volatile industries. Nevertheless the relationship between unemployment and trade liberalization is not explicitly modeled. Helpman and Itskhoki (2010) build a Diamond-Mortensen-Pisarrides model of labour market frictions in an open economy and show that a country with relatively low frictions in the differentiated-good sector will be a net exporter of that good. Intuitively, lower frictions imply lower labour costs and therefore a comparative advantage in the differentiated sector. The impact of trade on unemployment is ambiguous, with unemployment raising or falling in both or one country being possible depending on the extent of labour frictions in the differentiated sector relative to the homogenous-good sector.

Trade and unemployment: empirical evidence

When theory provides contradicting answers, the natural next step is to look for patterns in the data. However, the rapidly growing empirical literature has not found an unambiguous unemployment response to trade liberalization either. Several important papers suggest that trade liberalization or import growth have led to an increase in unemployment. Revenga (1994) provides evidence in this direction for Mexico's manufacturing, Harrison and Revenga (1998) for the Czech Republic, Poland, Romania and Slovakia, Pessoa (2016), Menezes-Filho and Muendler (2011) and Mesquita and Najberg (2000) for Brazil, Levinsohn (1999) and Edwards and Edwards

[12] From a practical point of view we will use in Chapter 3 both the unemployment rate and the share of workers employed informally as indicators of frictions/efficiency prevailing in any sectoral labour market.

(1996) for Chile, and Rama (1994) for Uruguay. There are also several important papers suggesting that trade has no impact on unemployment. Trefler (2004) provides such evidence for Canada for his long-run estimates. Bentivogli and Pagano (1999) show that trade has little or no impact in France, Germany, Italy and the United Kingdom of Great Britain and Northern Ireland. Goldberg and Pavnick (2005) findings suggest that there is no impact of trade on unemployment in Colombia. Hasan et al (2012) obtain similar results for India. Finally, there is also evidence suggesting that trade opening has led to reductions in unemployment. Kee and Hoon (2005) and Nathanson (2011) show that this is the case in Singapore and Israel, respectively. Milner and Wright (1998) found that openness reduce unemployment in Mauritius. Lee (2005) shows that trade growth reduced unemployment in China, India and Malaysia. Felbermayr, Prat and Schmerer (2011) show that in the long-run, higher trade openness is associated with a lower structural rate of unemployment. The fact is established using both a panel data from 20 OECD countries, and using cross-sectional data on a larger set of countries. Their benchmark specification suggests that "a 10 percentage point increase in total trade openness reduces aggregate unemployment by about three quarters of one percentage point". Heid and Larch (2016) evaluate the effects of regional trade agreements (RTAs) for sample of 28 OECD countries. Employment effects are positive in most cases. Moreover they find that introducing RTAs as observed in 2006 leads to greater welfare increases when accounting for aggregate employment effects. Dutt, Mitra and Ranjan (2009) provide evidence that more open economies have lower unemployment rates on average for a large sample of developing and developed countries. In an earlier study, Currie and Harrison (1997) assess the impact of trade reform on employment in manufacturing firms in Morocco in the 1980s. This paper does not investigate the direct impact of trade reform on unemployment but offers insights on the role of trade protection on labour market composition. Their results suggest that employment in the average firm has been unaffected by the reduction of tariffs and the elimination of quotas. However, exporting firms and industries most affected by the reforms (textiles, beverages and apparel) experienced a significant decline in employment. Currie and Harrison (1997)'s results further indicate that government-controlled firms behaved quite differently from privately-own firms. Government-controlled firms actually increased employment in response to tariff reductions, mostly by hiring low-paid temporary workers.

Reconciling theory and empirics

Recent contributions by Carrère et al. (2014, 2016) and Carrère, Grujovic and Robert-Nicoud (2015) have highlighted adjustment mechanisms able to reconcile the a priori contrasting theoretical and empirical results discussed above. Reforms that increase aggregate demand lead to job creation, raising both incomes and wages and reducing unemployment. Aggregate unemployment, which is usually of interest to policy-makers, and real wages, which economists tend to focus on, are, in this view, two sides of the same coin. However, trade reforms also reallocate resources across sectors, and sectors have heterogeneous labour market frictions. If a trade reform reallocates labour to a sector with high frictions, unemployment increases, and vice versa. This mechanism illustrates why **real income and frictional unemployment effects of trade liberalization can be imperfectly correlated**.

In the context of a trade reform Carrère et al. (2014, 2016) theoretical predictions indicate that **trade openness has an ambiguous effect on unemployment.** The sign of this effect **depends on the correlation between sector level labour market frictions and revealed comparative advantage**. More precisely, if positively correlated, then opening up to trade is expected to increase unemployment. If negatively correlated, then opening up to trade is expected to reduce unemployment. Hence, aggregate unemployment would fall only if a trade reform leads to the reallocation of labour towards sectors with relatively low labour market frictions assuming that the overall expansion effect is positive. In other words, reallocation effects may dampen real income effects on unemployment and possibly welfare. Empirical results obtained in Carrère et al. (2016) confirm these theoretical predictions. Some discussion is provided in Box 2.4. Moreover, predictions based on their estimated correlation coefficients are in line with evidence based on single country case studies discussed previously.

One strong message that can be retrieved from these findings is that even if a country is able to increase its trade following its comparative advantage pattern the associated employment and earnings effects may not be optimal from a social point of view. This has clear implications for policy makers and trade practitioners.

Box 2.4 Sectoral unemployment and Revealed Comparative Advantage

Bringing Carrère et al. (2016) theoretical predictions to the data requires both a measure of comparative advantage and a measure of sectoral labour market efficiency which. They measure the former using Costinot, Donaldson and Komunjer (2012) fixed effect gravity approach as well as Hanson, Lind, and Muendler's (2015) correction of this measure. The construction of a series of sectoral unemployment rates represents a major challenge and no comprehensive related dataset exists. To cope with this challenge they use the fact that observed country-level unemployment rates are a weighted-sum of sector-level unemployment rates, where weights are given by labour force shares in each sector. Using data on aggregate unemployment and employment by sector, which both exist on an extensive basis (e.g. as reported in the ILOSTAT database), they are then able to estimate econometrically sector level unemployment rates. Owing to the lack of time coverage in the sector level employment data that is available, they further assume that these sector level unemployment rates are common across countries. Although this is a rather strong assumption considering the sample of heterogeneous countries their computations are based upon they show that their measure of sector-specific labour market frictions is positively correlated with existing proxies of labour market frictions such as labour union coverage.

Table B provides the estimated unemployment rates and their bootstrapped standard errors for 21 manufacturing sectors, and two broad agriculture and services sectors. These values can be interpreted as sector level unemployment rates (in %) due to labour market frictions. The mean and a median of this distribution are around 15 percent with a standard deviation of 5, a maximum of 25 and a minimum of 6 percent.

Table B Estimated unemployment rates and standard errors

	Unemployment rate (%)	Standard Errors
Medical, precision and optical instruments	6.34	0.032
Radio, television and communication equipment	8.73	0.029
Machinery and equipment n.e.c.	11.8	0.03
Textiles	11.88	0.032
Rubber and plastics products	12.15	0.04
Non-metallic mineral products	12.56	0.038
Printing and publishing	12.86	0.036
Furniture; manufacturing n.e.c.	13.64	0.042
Services	14.96	0.045
Agriculture	15.07	0.045
Food, beverages and Tobacco	15.19	0.047
Fabricated metal products	15.41	0.047
Wearing apparel, fur	16.05	0.05
Other transport equipment	16.1	0.052
Chemicals and chemical products	16.83	0.052
Wood products (excl. furniture)	16.97	0.056
Office, accounting and computing machinery	17.19	0.06
Coke, refined petroleum products, nuclear fuel	17.42	0.07
Motor vehicles, trailers, semi-trailers	17.6	0.061
Paper and paper products	18.79	0.064
Basic metals	20.31	0.069
Leather, leather products and footwear	21.7	0.078
Electrical machinery and apparatus	25.31	0.082

Source: Carrère et al. (2016).

Note: Note that unemployment rates are obtained using a nonlinear combination of parameter estimates. Thus, calculations of the associated standard errors are based on the delta method, which is a good approximation appropriate in large samples. Sector's shares correspond to averages over 95 countries and 1995-2009.

They compute the correlation between their measures of comparative advantage and sector level labour market frictions. Estimates show that the country with the highest correlation is the Russian Federation, suggesting that trade liberalization following the Russian Federation's revealed comparative advantage would be associated with an increase in unemployment. At the other end of the spectrum, the country with the lowest correlation is Israel, which makes it the country where trade liberalization following revealed comparative advantage is the most likely to result in a fall in unemployment. Note that Brazil, Chile, the Czech Republic, Poland, Romania, Slovakia, and Uruguay, which are countries for which existing studies suggest that trade liberalization contributed to increases in unemployment, are among the countries with the highest correlation coefficients. Similarly, Singapore and Israel, which are countries for which existing studies suggest that trade liberalization contributed to a decline in unemployment, are among the countries with the lowest correlation coefficients. This evidence is at first sight in line with the theoretical predictions of the model.

First of all, even if policy makers are able to negotiate a trade agreement that fully accounts for and "promotes" the comparative advantage pattern of their economy, they may generate more unemployment. Second, it is crucial to consider the labour market and comparative advantage pattern simultaneously to get an idea of the primary employment effects of trade reform. In developing countries the incidence and role of informality should also be accounted for.

Trade and informality

The relationship between trade liberalization and informality has received little attention, whether from a theoretical or empirical point of view. However, informal employment and self-employment are crucial in assessing the impact of any policy reform leading to productive resources reallocation in a developing economy. According to a consensual but not necessarily formal argument trade liberalization is expected to increase competition for domestic producers. In an effort to lower production costs and somewhat consistent with both the dualistic and parasite views of informality, domestic producers will either seek informally-produced inputs (in the extreme all inputs would be produced informally) or increase their own share of undeclared production and employment. Greater demand for informally produced inputs and greater share of undeclared activity within formal production units are therefore expected to drive the extension of informality following trade liberalization.

Goldberg and Pavcnik (2003) adopt a model that unambiguously generates such a positive relationship. It is based on a dynamic efficiency wage model with three essential assumptions.

- First, the representative firm faces demand uncertainty.
- Second, the representative firm can hire workers either from a pool of formal or informal workers.
- Third, formal employment is subject to labour market legislation and formal workers receive benefits and severance pay on dismissal.

Trade liberalization is modelled as a change in the probability function that governs price shocks. Goldberg and Pacvnic (2003)'s model suggests that the impact of trade liberalization on informality depends on the degree of labour market liberalization: the less flexible labour markets, the greater the reallocation from the formal to the informal sector.

However, not all theoretical models provide such clear-cut predictions on the relationship between trade liberalization and informality. For instance, in the heterogeneous firm model of Aleman-Castilla (2006), trade liberalization (i.e. lower trade costs) implies that some firms will find it more profitable to enter the formal sector and still produce for the domestic market exclusively instead of remaining informal. The least productive informal firms will be forced to exit the industry and only the most productive (formal) firms will export to international markets. Here, trade liberalization reduces the incidence of informality. Moreover, both, the exit of the least productive firms and the rise in output of the most productive (formal) firms lead to an aggregate increase in productivity. Paz (2014) also puts firm heterogeneity at the core its theoretical framework used to uncover the effects of changes in import tariffs—domestic and those of the country's trading partners—on the equilibrium levels of the industry-level share of informal employment, the average formal wage, and the average informal wage. His theoretical predictions show that "a decrease in domestic import tariffs lowers the average formal wage but has an ambiguous effect on the employment share of informal workers". The predicted sign of the relation between domestic tariffs and informal employment depend on labour market conditions before the reform. For instance, for a given payroll tax and degree of enforcement (i.e. probability of being detected by fiscal authorities if evading), a decrease in import tariffs will reduce informality if it's initially high, but increase it if it's initially low. A reduction in the country's trading partner's import tariffs on the other hand decreases the informality share, increases the average formal wage but has an ambiguous effect on the average informal wage.

The above models assume that all goods can, in principle, be traded. Non-tradability is endogenously determined and depends only on firms' characteristics, not goods' characteristics. If some goods are non-tradable, the impact of trade liberalization on informality will additionally depend on the reaction of the real exchange rate and/or relative sector productivities. To illustrate, if the informal sector produces the non-tradable goods sector, and, if non-tradable goods are only for consumption, then the relationship between trade openness and informality could become negative. In this context, trade liberalization would lower the relative price of the non-tradable good in terms of the tradable good (i.e. a real depreciation) and this would decrease the size of the informal sector. Fiess, Fugazza and Maloney (2010) explore the patterns of co-movement between relative sector sizes, relative earnings and the real exchange

rate for Argentina, Mexico, Brazil and Colombia. Their results support the above conjecture. Their results also suggest that an expansion of the informal sector may be the consequence of a positive shock to some non-tradable sector such as construction. The origin of such shock could be the positive overall impact of a trade liberalization episode as observed for Colombia over the 1990s. In other words, trade liberalization through general equilibrium effects may lead to a real appreciation and hence eventually increase the size of the informal sector.

In a situation where formal firms use non-tradable (informal) goods as inputs, additional arbitrage conditions enter the relationship of trade liberalization and informality. Trade liberalization (a fall in trade costs) exposes uncompetitive firms to greater import competition. For these firms the use of cheaper, informally produced inputs may present a survival strategy. However, as formal wages may well rise with greater labour demand from exporting (old and new) firms, informal wages may also increase to eliminate any arbitrage in workers' occupational choice. The sign of the relationship between trade liberalization and informality will therefore depend on which force dominates. Furthermore, if pre-reform formal wages are determined by labour regulation (e.g. a binding minimum nominal wage), upward pressures on formal wages post reform might be slightly undermined; this would increase the chance to observe more informality as a consequence of trade liberalization.

In a framework similar to that represented in the above Figure 2.1, Fugazza and Milet (2017) find that if trade liberalization implies an increase in the relative price of tradables then voluntary self-employment would certainly fall but non-voluntary self-employment is likely to increase. The impact on formal unemployment would depend on both the original incidence of informal employment in formal firms and the composition effect put forward in Carrère et al. (2016).

The fiscal environment can also influence the relationship between trade liberalization and informality. Existing models generally assume that public expenditures fully adapt to fiscal revenues without specifying how fiscal adjustment is actually achieved. Fiscal consolidation may require higher taxes or new fiscal instruments and both are likely to affect firms' incentives to extend informal inputs and workers' choices to become informal.

Theoretical predictions of how trade liberalization impacts informality are ambiguous at best; the overall size of the informal sector could rise or fall with trade liberalization. Once again, we would have to rely on **empirical evidence** in order to discriminate amongst alternative theoretical frameworks. This evidence however remains limited and is generally **country specific**. Most of the papers mentioned above do have an empirical counterpart that usually validates theoretical predictions. Pavcnik and Goldberg (2003) use household survey data for Brazil and Colombia collected over the 1980s and the 1990s. They find no evidence of any significant relationship between trade liberalization and informality in Brazil, whether positive of negative. For Colombia, they present evidence that informality has increased after trade liberalization. However, this finding appears to be **directly related to the degree of labour market flexibility**. Pavcnik and Goldberg (2003) report that prior to labour market reform, when costs of firing formal workers were high, an industry-specific tariff reduction has been associated with a greater likelihood of becoming informal. After labour market reform, however, industry-specific tariff reductions have been associated with smaller increases in the probability of becoming informal. Aleman-Castilla (2006) uses the NAFTA experience to assess the impact of trade liberalization on informality in Mexico. Using Mexican and United States import tariff data and the Mexican National Survey of Urban Labour, Aleman-Castilla's (2006) findings suggest that lower import tariffs are related to lower informality in tradable industries. Results also suggest that informality decreases less in industries where import penetration is high and more in industries with greater export orientation.[13] At the example of Brazil, Paz (2014) results provide evidenceshows that the effects of that a reduction in import tariffs by its main Brazil's principal tradinge partners are to raise the Brazilian industry-level average formal wages and decreases the share of informal employment. Alternatively, a reduction in Brazilian import tariffs has precisely the opposite effect. The policy relevance of the first This former result lies in is potentially of considerable policy importance because it suggestings that

[13] Pavcnik and Goldberg (2003) and Aleman-Castilla (2006) use a similar two-step estimation approach. In a first step, a linear probability model of informal employment is estimated. Explanatory variables include worker characteristics and industry dummies capturing workers' industry affiliation. Coefficients of the latter are defined as industry-informality differentials. These differentials are then used as the dependent variable in the second-step estimations. They are regressed against import tariffs across years and resulting coefficients are taken as measures of the impact of trade liberalization on informality.

increased access to large markets, such as the United States, can improve labour conditions in developing countries. Results for the average informal wage, the empirical results are neither consistent nor often not statistically significant and coefficients switch signs depending on which identification strategy is used. The authors conclude that, "although multilateral trade liberalization may reduce informality and increase the average formal wage, the empirical results suggest that the benefits arising from trade liberalization differ according to the workers' propensity to be employed in a formal job". Menezes-Filho and Muendler (2011), who also usinge Brazilian data, find that that tariffs have no effect on the probability of a worker to examine the effect of import tariffs on the likelihood a worker will switch from formal manufacturing employment to informal work. Their principal finding, however, is that tariffs have no effect on this transition probability. Boni et al. (2007) also look at the Brazilian experience. They study gross worker flows to explain the rising informality in Brazil's metropolitan labour markets from 1983 to 2002. This period covers two economic cycles, several macro-economic stabilization plans, a far-reaching trade liberalization, and changes in labour legislation through the Constitutional reform of 1988. Secular movements in the levels and the volatility of gross flows suggest that the rise in informality during that period was largely caused by a reduction in job finding rates in the formal sector. Part of the remainder is linked to the constitutional reform which contributed to rising labour costs and reduced labour market flexibility; only a small fraction of the observed rise in informality is explained by trade liberalization. Using Argentinian data of manufacturing industries, Acosta and Montes-Rojas (2010) conduct an empirical investigation using Argentinean data, and find that the reduction of a decrease in domestic tariffs leads to an substantially increase in the s the industry-level share of informality share in manufacturing. McCaig and Pavcnik (2014) using Vietnamese households data show that reductions in trade barriers to exporting lead to a reallocation of workers from the informal to the formal sector. The estimated magnitudes imply that expanded export opportunities increased employment in the enterprise sector in manufacturing by 15% during the period of the study. About half of the decline in the aggregate share of workers in household businesses is attributed to the reallocation of labour from household businesses to employers in the enterprise sector within industries. To the extent that ifsecondary distortions (e.g. red tape costs in formal firms' registration, hard capital rationing) generate drive a wedge between in the marginal productivity of informal and formal sector workers between the informal and formal sector, the reallocation of workers from household businesses to firms in the enterprise sector could be associated with improved aggregate labour productivity. McCaig and Pavcnik (2014) estimates imply a 0.1 to 5.5 percent annual increase in aggregate manufacturing labour productivity (as measured by revenue per worker) due to the reallocation of workers from household businesses to firms in the enterprise sector as a result of reductions in export tariffs.

Few empirical studies offer **cross country analysis**. A major downside of such approaches is the difficulty to set up a robust identification strategy, as in most cases informality can only be proxied by some aggregate variable possibly merging several forms of informality into one category. The advantage of such studies is the possibility to extract general patterns which can complement information brought out through micro-level studies. In a cross-country study, ILO and WTO (2009) find some evidence that **trade intensity is associated with less informality in developing countries**. These results are consistent with the Vietnamese case study as presented previously in the case of a positive response of exports to improved market access conditions. They are also consistent with various adjustment mechanisms if considered as reflecting long term effects. For instance they could be associated with a situation where formal labour markets struggle to adjust to trade reforms in the short run, but improved market access conditions and eventually economic growth possibly driven by trade reforms affect positively formal markets in the medium-long run. Other studies obtain a **more nuanced relationship** between trade and informality. For instance, Temkin and Veizaga (2010) find that the impact of globalization that includes some indicator of openness to trade on informality depends on a country's level of economic development. In particular, **globalisation results in higher informality in developing countries but lower informality in developed countries**. This is likely to be due to the differences in the forms of informality between developed and developing countries. Fiess and Fugazza (2010, 2012) use three measures of informality and five measures of openness to trade and globalization to assess the sign of the relationship. As to informality, they first consider informal employment based on ILO estimates. They then consider two GDP related measures.

Their empirical results offer a mixed picture: While unconditional cross sectional correlations support the view that trade liberalization induces a reduction of informality, whether in terms of employment share or in terms of output share, static panel results do not. Dynamic panel estimation (system GMM) generates contrasting result across measures of informality. In particular, fewer trade restrictions are associated with more informal output but less informal employment. Co-integration analysis is also undertaken to investigate the relationship between two measures of informality (the ILO measure of employment and their estimates of informal GDO) and trade liberalization from a time series perspective that is, from a country specific perspective. They find strong evidence of cointegration between both measures of informality and two trade liberalization indicators, the trade over GDP ratio and the trade restrictions sub-component of the KOF index. There appears to be a fair degree of heterogeneity with respect to the sign of the empirical relationship between trade liberalization and informality. In 70 percent of cases, lower restrictions on trade have led to an increase of informal output according. For informal employment the split remains around 50:50. Where country information is available from both informality data sets, results are coherent in almost 2/3 of observable cases. These time series results by country seem to corroborate evidence from cases studies in the literature. We support Pavcnik and Goldberg (2003) findings of a more positive link between trade liberalization and informality in Colombia (deeper trade liberalization increases informality). We also support Currie and Harrison (1998) finding of an adverse impact of trade liberalization on informality in Morocco. The two measures of openness to trade affecting significantly any measure of informality generate contradicting evidence on the relationship between trade openness and informality for Brazil and Mexico, and this may explain why Pavcnik and Goldberg (2003) and Aleman-Castilla (2006) fail to identify a clear relationship in these two countries.

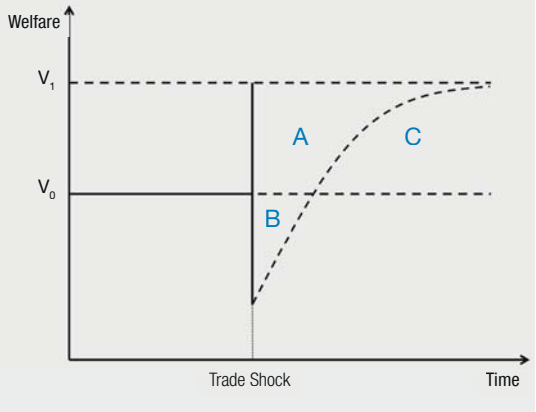
Fiess and Fugazza's (2010, 2012) analysis makes a clear distinction between output and employment effects. Their results suggest that **informal employment is likely to decrease with deeper trade liberalization while informal output is likely to increase with deeper trade liberalization**. This result may be seen as puzzling as to date no theoretical framework is able to replicate these empirical findings. Indeed, the sign of the relationship is the same for any dimension of informality in all models. Both informal output and employment either increase or decrease with trade liberalization. These empirical results suggest that productivity in the informal sector could increase due to trade liberalization. Such an outcome would be obtained in a framework where trade liberalization induces some pro-competitive effect in the informal sector and the output of informal firms staying active expands at a pace that more than compensates the output losses due to the drop out of the least productive informal firms. This is not an implausible scenario if part of the informal production is made of low quality tradable goods. In that context, goods of low quality produced in the informal sector would be replaced by imported varieties if cheaper or of better quality because of trade liberalization. More efficient informal firms remain competitive with respect to newly imported goods and are thus able to increase their domestic production. Their empirical findings would also be consistent with the case where the least productive individuals move to the formal sector, assuming that skills are easily transferable from one sector to the other, where new and comparatively better employment opportunities may have arisen because of trade liberalization. Improved formal employment opportunities after trade liberalization could be obtained in models with heterogeneity in formal firms' productivity. In this type of models, the least productive firms are forced to stop production but any associated loss in production and employment would be more than compensated by the expansion of exporting firms that enjoy lower trade costs (and/or cheaper inputs). Overall, formal employment and output would rise. Informal employment measured by self-employment would fall. As a consequence, informal output would rise only if remaining informal self-employed increase their production. This could the case only if some economies of scale exist in the informal sector and/or if some positive general equilibrium generates more demand for informal goods and services. In this situation the informal share in GDP may also rise.

The authors also consider the existence of some informality in the formal sector. This reflects the possibility that part of the production or labour is undeclared. Production or worked hours are either under-declared (e.g. part time for full time effective work, tax evasion) or completely kept out of-the-books (e.g. employees who are de facto informal workers). Informal production in the formal sector should be captured by macro estimates of informal production. However, informal employment in the

Box 2.5 Trade liberalization and adjustment

A trade reform implies a reallocation of productive resources that translate into higher welfare in the long run. In order to illustrate this argument we graphically represented a hypothetical scenario in Figure A. The pre-reform welfare annual value is represented by V_0 and the post-reform value by V_1. The scenario features a **transition path** that shows an **initial decline in welfare and a later recovery**. The potential gains (PG) from trade are thus represented by the area equal to A + C which is equal to the difference between the discounted welfare value estimated for an annual welfare equal to V_1 and the corresponding measure annual welfare equal to V_0. The actual gains are G = C-B and the trade adjustment costs (TAC) are equal to the area represented by A + B. A and B can also be thought as missed welfare improvement and direct welfare deterioration due to the fact that resources do not reallocate instantaneously.

Figure A Trade Adjustment Costs



Source: Artuç, Lederman and Porto (2015).

formal sector is not covered by the ILO measure and unlikely to be captured in any statistical figure. In that context, productivity in the informal sector does not have to increase necessarily. If higher wages are offered to informal workers in the formal sector, the latter may move to that sector even if their work is kept underground. Individuals with low entrepreneurial skills are likely to be attracted by salaried work, whether it is declared or not. If informal production and employment exists in the formal sector, the empirical findings can be reproduced. The fall in the size of the informal labour force has two potential causes which are similar to those in the previous set up: higher competition from foreign goods and better wage opportunities in the formal sector. As to the rise in informal production, it does not have to be necessarily a by-product of improvements in productivity of informal entities but could simply the expression of an increase in informal production and employment amongst formal firms. This may be motivated by tighter competition from foreign goods or by relatively lower costs to hire informal workers. The latter phenomenon could arise because of fiercer productive conditions in the informal sector due to foreign competition.

4. TRADE, ADJUSTMENT AND THE LABOUR MARKETS

Models reviewed previously do not consider **adjustment-related** costs per se as they look at the long run situation after all adjustments have taken place. The impact of policy shocks is analyzed through comparative statics that exclude adjustment related features and components. Higher resulting unemployment or subsistence informal activities may be associated with more painful adjustment but this is not explicitly accounted for. The adjustment process can cause additional costs that may undermine long term gains or amplify losses. Independently of its long-run repercussions in terms of unemployment or lower tier employment, labour adjustments are usually costly, due to moving costs, costs or hiring and firing workers, and costs for acquiring sector-specific skills. In this setting, wages and employment respond only gradually to trade shocks - a pattern which has important welfare implications. A graphical representation of a hypothetical scenario is presented and discussed in Box 2.5.

A quantitative assessment of these labour market responses would require estimates of the costs of labour mobility. This is not a straightforward exercise and different levels of precision can be reached.

Artuç, Lederman and Porto (2015) set up a dynamic model of sectoral employment choices in which workers can move across sectors (e.g., in response to wage differences) at a cost. There is no unemployment in the long run. They estimate this model for 22 developed countries and 25 developing countries and find that the average utility cost of changing sector of activity corresponds to 3.75 times the average annual wage in the economy. For developing countries, this labour mobility cost coefficient is 4.93, more twice as much as for developed countries (2.41).

Figure 3 illustrates the country level results: mobility costs are highest in Singapore, the United States, and Japan and lowest in Bangladesh, Ethiopia, Turkey, Azerbaijan, and Peru. Labour mobility costs are higher in countries with lower GDP per capita, higher poverty, and lower educational quality and attainment. They tend to occur in tandem with other frictions, distortions and constraints.

Dix-Carneiro (2014) estimates mobility costs at the individual level using administrative data from Brazil, which allowed the author to follow millions of workers over 10 years. He finds that the **median direct mobility costs that workers face in switching sectors range from 1.4 to 2.7 times annual average wages** (Panel A of Table 2.3)[14], **depending on the sector** of entry as reported. In addition, experience accumulated in one sector is not perfectly transferable to another. For instance, **one year of experience accumulated in the construction sector is worth 2 to 4 times more in the construction sector than in the manufacturing**

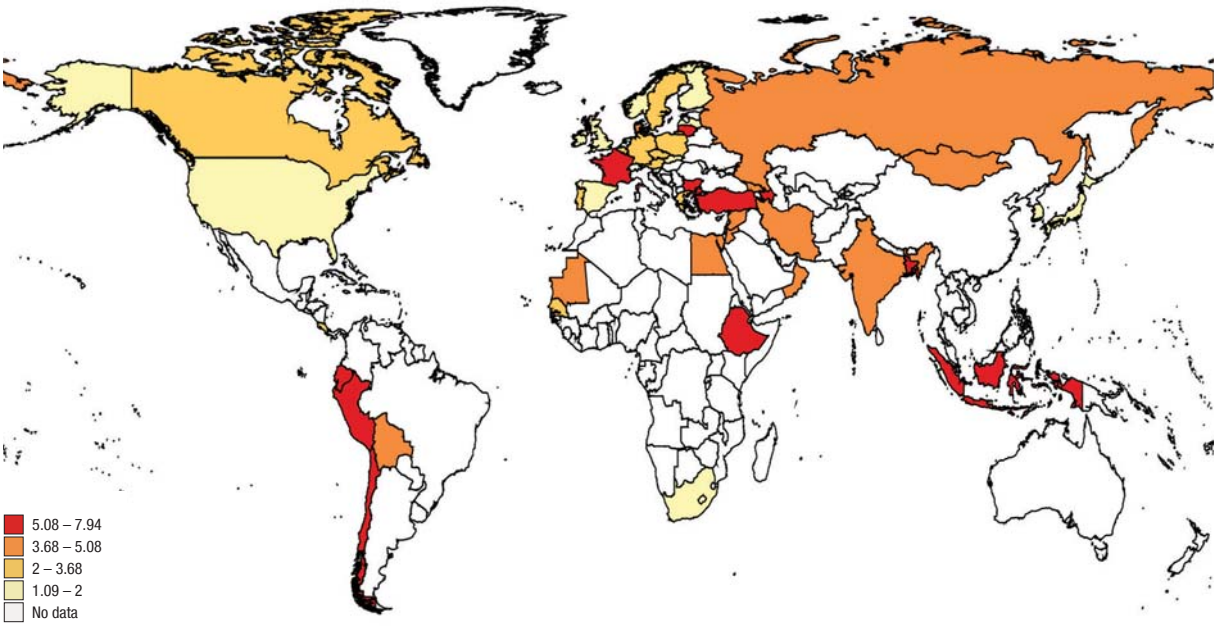
[14] The median costs shown in Panel A of Table 2.3 are those workers would incur had they changed sectors and net of preference shocks. These are not actually incurred costs of mobility; these are barriers that limit mobility, which can be incurred or not. Panel B of Table 2.3 reports median costs of mobility that switchers faced during the sample period.

Table 2.3 Costs (Median) of Mobility (ex-ante versus ex-post)

Sector	From a formal sector	From the residual sector
A. Costs in Terms of Wages		
Agriculture/Mining	1.43	8.93
Low-Tech Manufacturing	1.55	9.3
High-Tech Manufacturing	2.7	10.62
Construction	1.4	9.24
Trade	1.38	8.96
Trans/Util	1.9	9.96
Services	2.17	9.17
B. Costs in Terms of Wages, Conditional on Switching		
Agricultre/Mining	-0.66	-1.39
Low-Tech Manufacturing	-0.13	1.74
High-Tech Manufacturing	0.6	1.68
Construction	-044	-1.44
Trade	-015	-1.77
Transportation/Utilities/ Communication	023	1.35
Services	048	2.28

Source: Dix-Carneiro (2014).

Figure 2.3 A Mapping of Labour Mobility Costs



Source: Artuç, Lederman and Porto (2015).

sector. Importantly, direct inter-sectoral mobility costs are quite heterogeneous across the population, with **women, unskilled workers and older workers facing significantly higher costs**. These results have important consequences for the distributional consequences of trade liberalization: for example, if tariffs are reduced in manufacturing, workers initially employed in manufacturing lose relative to workers in other sectors, but older workers in manufacturing lose even more. Compared to a situation where reallocation occurs immediately, the present value of gains from trade is estimated to be 11 to 26 percent lower due to delays in the reallocation of workers across sectors.

Dix-Carneiro and Kovak (2017) are able to provide an even more comprehensive and detailed analysis on how labour markets in Brazil adjusted to trade by using administrative data covering the 1986-2010 period. They are able to account for informal employees in registered firms as well as self-employment. Their results suggest that over the medium run (1991-2000) non-employment and informal employment increased in locations harder hit by trade liberalization; that is, those locations characterized by a stronger presence of firms heavily exposed to import penetration. More precisely, they find that the proportion of informal employees increases, but the proportion of self-employed does not. In the long run (1991-2010), non-employment does not respond to local trade shocks, but informal activity strongly increases in regions affected by trade liberalization. More precisely, the proportion of informal employees does not appear to be affected, but the proportion of self-employed increases. Together with the individual worker results, it seems that **trade-displaced workers spend time unemployed or out of the labour force, but eventually find re-employment in the informal sector**. According to these results, the informal sector may have smoothed the labour market outcomes of trade displaced workers, at least partially. Hence, the authors conclude that without this fall-back sector, trade-displaced workers might have experienced even longer non-employment spells. Estimates at the individual level show that adjustment costs are very heterogeneous across the population. **Higher barriers of mobility across sectors are found for older, less educated and female workers**. Workers in import competing sectors show substantially larger losses following liberalization. Dix-Carneiro and Kovak (2017) set up also allows to test the standard prediction of regional convergence in the aftermath of a trade liberalization episode. A robust conclusion from the available literature is that trade's costs and benefits are unevenly distributed geographically, potentially leading to local economies lagging behind or surging ahead as a result of freer trade. Standard economic models predict, however, that these geographic differences will not persist for long as workers in relatively depressed areas are expected to move to places with more job opportunities. This adjustment process should help regional economies convergence, suggesting that trade's effects on regional labour markets will vanish over time. The prediction is tested in the context of Brazilian trade liberalization. Unexpectedly, rather than declining over time, **the regional effects of freer trade on the formal labour market grow for 20 years following the start of liberalization, with increasing gaps in wage and employment growth** between more positively and negatively affected local economies.

Studies on different countries provide related evidence on spatial frictions in labour reallocation after a trade shock. Topalova (2010) shows that poverty reduction and consumption growth were lower in rural districts most exposed to the 1991 Indian trade liberalization in terms of production sectors, and that the impact was highest for poor people, who were less geographically mobile. Autor, Dorn and Hanson (2013) find that, in the United States, unemployment rose and labour force participation and wages declined in commuting zones with manufacturing industries competing with Chinese imports. While the previous literature uses the existence of spatial frictions as an identification strategy and document differences in outcomes between regions, Zi (2016) leverages the Chinese household registration system (hukou) to explicitly demonstrate that important geographic labour reallocation has followed input trade liberalization in China. She estimates that the gains from tariff reductions would have been higher, and their negative distributional consequences lower in the absence of these administrative barriers to spatial mobility.

Assessing precisely the cost related to adjustment in the labour market is an important contribution towards a better understanding of the effects of trade liberalization not only at the country regional sectoral but also individual level. The identification of winners and losers become more accurate. As mentioned by Dix-Carneiro and Kovak (2017) an additional step would be to account for other factors of production

complementary to labour and whose degree of mobility would become crucial in defining that of workers across sectors and regions. Data allowing such assessment however have not been collected or put together yet.

5. TRADE POLICY INSTRUMENTS

This chapter briefly discusses the set of trade related instruments policy makers can use in the context of trade policy reform. As the practical application of this guide focuses on identifying sector-level employment potential, the focus of the chapter is on the different impact trade policy instruments may have within sectors on different firms.

We also briefly discuss how different decisional institutional contexts namely multilateral, regional, bilateral and unilateral matter in the decisional process. Indeed, this dimension is crucial in assessing the impact of any envisaged policy reform in terms of resource reallocation and eventually employment as discussed in the previous chapter.

5.1 Trade costs components

Trade related instruments are policy instruments that affect trade costs that is, the costs of exporting and importing goods. Trade costs are crucial in defining market access conditions imposed domestically and faced internationally. They include all factors that drive a wedge between the producer price in an exporting country and the consumer price in an importing country. As mentioned previously, any policy reform aiming at either liberalizing or facilitating trade is expected to reduce this wedge.

Trade costs are an important determinant of national trade performance and the competitiveness of enterprises. This includes not only export values but also participation in international production networks and diversification into new products and new markets. Most trade cost components have fallen for all groups of countries over the last decade but more slowly in low-income countries. Trade costs remain higher for countries with lower levels of per capita income. As a consequence, it is more difficult for these countries to take up crucial trade, production and development opportunities.

Trade (transaction) costs consist of two broad categories. The first encompasses essentially costs dependent on exogenous factors such as physical geographic distance. The second category includes possibly endogenous trade costs that are a direct consequence of policy choices. Estimations in Arvis et al. (2015) based on a newly compiled dataset on trade costs[15] yield a series of robust empirical results. Physical distance has a major trade reducing effect. Policies also have a significant influence on trade costs. Tariffs and non-tariff barriers remain substantial in developing countries and play a significant role in shaping trade cost patterns. However, maritime-transport connectivity and logistics performance are also found to be important and even predominant determinants of bilateral trade costs. Their combined effect can be comparable to that of geographical distance.

We consider four broad categories of trade-related policy instruments: tariffs, non-tariff measures, trade facilitation, and trade infrastructure-related measures.

The general tendency is to estimate or at least try to estimate some proportional or ad valorem price effect for each type of instrument so that the comparison with tariffs becomes immediate and the impact assessment straightforward. However, this approach could be extremely mistaken as the respective impact of the different types of trade-related policy instruments does not necessarily take the form of a proportional price effect. Indeed, shipping a good from one location to another can involve two broad types of costs, namely variable costs and fixed costs. These costs are not necessarily related to transportation per se but rather to the act of trading.

Variable costs can be defined as costs that apply to each unit of shipped goods. Moreover, variable costs could take either a multiplicative or an additive form. A multiplicative trade related costs translates into some ad valorem value. An additive trade related costs is expressed in per unit terms and does not have to depend upon the value of the good it applies to. In other words, its ad-valorem equivalent decreases with the value of that good. As an immediate consequence, the influence of this type of trade related cost can vary not only across sectors but also within sectors. Alchian and Allen (1964) argued that relative demand for the high quality good increases with additive trade costs ("shipping the good apples out"). A specific tariff has obviously an additive form. But many transport related costs also have an additive form more than a multiplicative one. Hummels and Skiba (2004) using data on freight costs obtained empirical estimates that strongly support

[15] The database is published by the World Bank at http://data.worldbank.org/data-catalog/trade-cost.

the Alchian-Allen hypothesis. Using micro estimates based on Norwegian firms' data Irarrazabal, Moxnes and Opromolla (2016) show that "an additive import tariff reduces welfare and trade by more than an equal-yield multiplicative tariff".

Export related fixed costs are borne by the exporting entity independently of the total number of shipped units and the total value of the shipment. They act as an entrance fee to international markets and could be destination specific or not. Fixed costs play a crucial role in the presence of heterogeneous firms as they directly affect the number of exporting firms and provide some reasonable micro-foundations for zero trade whether we look at the aggregate or sectoral level. As already mentioned in chapter 2 in a standard heterogeneous firm model of trade with constant elasticity of substitution preferences à la Melitz (2003) or Chaney (2008), when the fixed costs of export decrease, less productive firms are able to enter the export market since the lower fixed costs of exporting will be covered by the revenue they generate.

As will be mentioned below, the implementation of some trade-related measures may also affect production costs variables and fixed on top of affecting trade costs. Hence, by focusing on some estimated trade related price effects would allow only a partial understanding of the channels of transmission and mechanisms driving the impact of changes in some trade related instrument.

From a practical point of view it is difficult to identify all possible channels of transmission of a trade related reform. It is important to keep in mind that the impact of a trade policy change is not uniform at the level of the change. For example, a regional trade agreement may include a provision that applies to all exports - but its effect may differ between sectors. Similarly, a non-tariff measure that applies to a particular product may affect different firms differently.

What emerges from the most recent literature, whether theoretical or empirical, is the crucial role played not only by cross-sector heterogeneity but also by within-sector heterogeneity between producers. Nevertheless the link between within sectoral heterogeneity and labour market outcomes is not unequivocal. Traditionally, employment in small firms has been considered to be more sensitive to output shocks than employment in large firms. Small firms are usually thought to find it more difficult to hoard labour during periods of weak product demand due to financial constraints (Sharpe, 1994). This argument implies that the sensitivity of both employment and earnings-per worker to output should decline with firm size. However, this traditional view has been challenged by Postel-Vinay and Moscarini (2011) who suggest that large firms may have weaker incentives to retain workers when facing a negative shock since they tend to be more productive and offer higher wages and, as a result, find it easier to hire new workers during a recovery. Gal et al. (2013) empirical assessment supports this argument using a comprehensive and comparable firm-level data for 20 OECD countries for the period 1993-2009. They estimate the responsiveness of employment and earnings per worker to output shocks across countries, industries and firm-size groups. They find that differences in the responsiveness of labour inputs to output shocks across size groups are less pronounced than those across industries, and that the responsiveness of both employment and earnings-per-worker to output shocks increases with firm size.

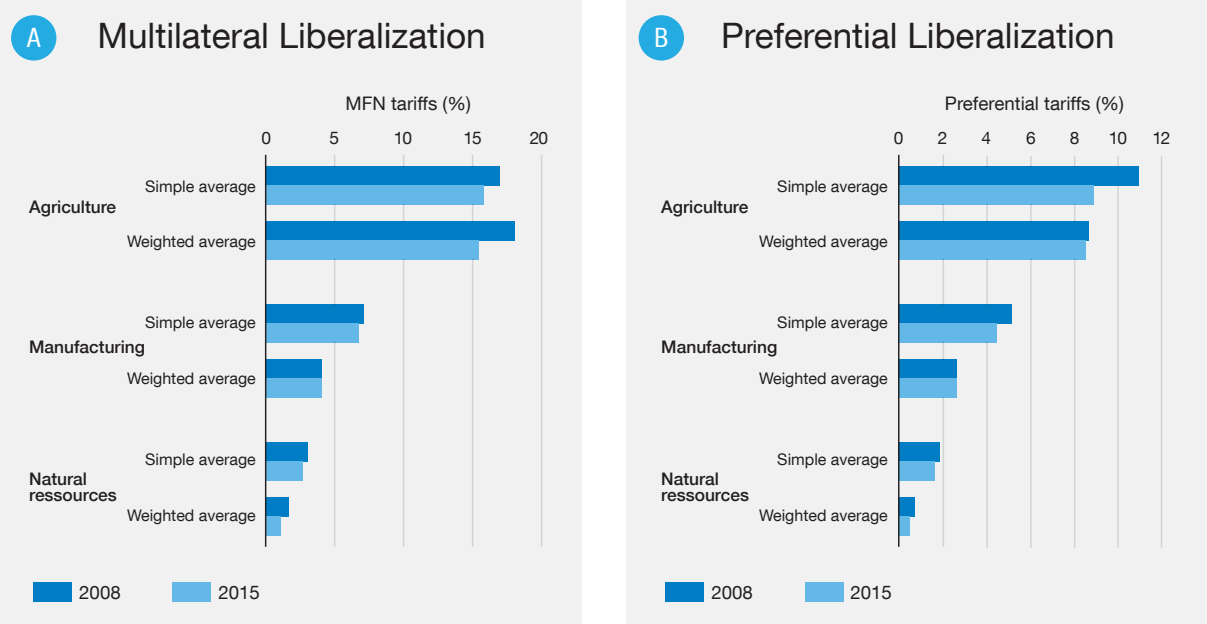
The next sections report results from existing work assessing the impact of the categories of trade related policy instruments considered here in the presence of heterogeneous firms.

5.2 Tariffs

Tariffs have been diminishing steadily since the completion of the WTO Uruguay round. The downward effect has been accelerated also because of the exponential growth of agreements promoting preferential trade since then. This is reflected in Figure 2.4A where simple and weighted averages of MFN and Preferential Tariffs are reported for three major sectors for the years 2008 and 2015.

The impact of tariffs on international trade has been studied extensively. Higher tariffs are associated with lower trade flows. In most frameworks, tariffs imposed on imports increase their landing price and tariffs faced by exports lower the price received by exporting firms. As established by Kahn (1956), increasing tariffs should not be motivated by positive trade effects expectations. Indeed, based on simple computation he showed that "if all countries become protectionist each will (except in very special cases) be worse off-each and will suffer the adverse effects on the distribution of resources and will experience no favourable effect on the terms of trade". Despite a clear distortionary impact on trade flows and no positive terms of trade effect, welfare assessment may advocate non-zero tariff levels in the presence of market distortions, as

Figure 2.4 Multilateral and Preferential Tariff Liberalization



Source: UNCTAD Key Statistics and Trends in Trade Policy 2016.

first discussed in Bhagwati (1971) based on insights from the second-best theory formalized by Lipsey and Lancaster (1956). In the presence of such secondary distortions, the effects of the removal of bilateral tariffs may go beyond the removal of primary price distortions and the subsequent reallocation of factors of production. The effects of a trade policy reform that operate through the secondary distortions might be as important as the primary effects.[16]

The impact of tariff shocks also varies across firms operating within the same sector. For instance, Spearot's (2013) theoretical analysis and empirical results suggest that the effect of tariff liberalization varies with import demand elasticities across product varieties. More precisely, the liberalization of a common tariff disproportionately increases imports of low revenue varieties. In some cases, this increase comes at the expense of high revenue varieties. In other words, countries are less responsive to trade shocks when their exporting firms are relatively large and they tend to export a larger share of relatively higher revenue varieties. A major implication of this result is that the liberalization of a common ad-valorem tariff needs not increase bilateral imports of all product varieties.

[16] See Goldberg and Pavcnik (2017) for a discussion and a concise review of the current literature.

5.3 Non-Tariff Measures

With steadily diminishing tariffs, the focus of trade policy makers and analysts has logically been turning towards Non-Tariff Measures (a succinct definition of NTMs is provided in Box 2.6). Indeed, NTMs and in particular technical measures have become a prominent feature in the regulation of international trade in goods. While technical regulations were imposed on almost 37 percent of tariff lines in 1999, the equivalent figure for 2015 is more than 60 percent (UNCTAD, 2016). Some studies argue that NTMs represent a major challenge to international trade regime reforms, as they can undermine the progress made so far in liberalizing trade (Evenett and Fritz, 2015; Jensen and Keyser, 2012). Others argue that the impact of NTMs on trade flows remains ambiguous depending on the magnitude of their cost raising effects (Chen and Mattoo, 2008; Maertens and Swinnen, 2009). Finally, if welfare considerations are taken into account, negative trade effects may be very well associated with positive welfare effects (Disdier and Marette, 2010).

What clearly emerges from the theoretical literature is the need to place the empirical analysis at the level of the firm. Responses of exporting firms to NTMs can be heterogeneous across various dimensions, making it at the same time important and challenging

Box 2.6 NTMs in a Nutshell

Broadly defined, NTMs include all trade-related policy costs incurred from production to final consumers, with the exclusion of tariffs. For practical purposes, NTMs are categorized depending on their scope and/or design and are broadly distinguished in **technical measures** (Sanitary and Phyto-Sanitary Standards, SPS; Technical Barriers to trade, TBT; and Pre-Shipment Inspection) and **non-technical measures**. These are further distinguished in hard measures (e.g. price and quantity control measures), threat measures (e.g. anti-dumping and safeguards), and other measures such as trade-related finance, anti-competitive and investment measures).

In practice, NTMs are measures that have the potential to distort international trade, whether they are aimed to be protectionist or not. For example, measures such as quality standards, although generally imposed without protectionist intent, may be of particular concern to poor countries whose producers are often ill-equipped to comply with them. On the other hand, quality standards might help in information exchange between buyers and sellers, signaling product quality, and thus can reduce transaction costs and facilitate trade. NTMs may affect welfare beyond trade, e.g. by protecting public health or the environment.

Non-technical measures vary considerably by intent and scope. However, their effect on trade is generally better understood and easier to quantify. The effects of price control measures are relatively simple to measure, especially anti-dumping and safeguards. Quantity control instruments have been extensively examined in the analysis of quotas, tariff rate quotas and their administration (see Boughner, de Gorter, and Sheldon, 2000). Para-tariff measures can be analyzed as conventional tax instruments and their incidence is straightforward to perceive. Finance, anti-competitive, and trade related investment measures have indirect effects on trade, and their actual impact is more difficult to assess (see de Melo and Shepherd (2018) and Fugazza (2015) for an extensive discussion).

to study all possible reactions and evaluate the net impact of policy change. Evidence at the firm level still remains scarce. Fontagné et al. (2015) consider the heterogeneous trade effects of restrictive Sanitary and Phyto-Sanitary (SPS) measures on exporters of different sizes, and the channels aggregate exports are affected. They matched a detailed panel of French firm exports to a recent database of SPS regulatory measures that have been raised as of concern in the dedicated committees of the WTO. SPS concerns discourage the presence of exporters in SPS-imposing foreign markets and negatively affect the intensive margins of trade. Importantly, the negative effects of SPS regulatory measures are attenuated in larger firms. Another important contribution is Fernandes et al. (2015). Compared to Fontagné et al. (2015), the set of regulatory measures considered is more specific but country coverage is significantly extended. The paper assesses the impact of pesticide standards on firms' exports using two novel datasets. Their results show that pesticide standards significantly affect foreign market access of affected products. Moreover, they find evidence of heterogeneous effects amongst exporters. Smaller exporting firms are more negatively affected in their market entry and exit decisions by the relative stringency of standards than larger ones. In a recent paper, Fugazza, Ugarte and Olarreaga (2016) present novel results based on a unique dataset merging information about the implementation of NTMs (both technical regulations and non-technical regulations) in LAIA countries and Peruvian firms' exports during the period from 2000 to 2014. Large firms are found to benefit from the implementation of NTMs and in particular of Technical Barriers to Trade and pre-shipment formalities at the expenses of smaller firms. Both exports value and the probability of exporting of the 25 percent largest firms increase. In addition, their probability to exit the export sector decreases. The reverse is true for smaller firms. All these empirical results point to the fact that NTMs and in particular technical regulations impose trade related costs that cannot be seen as multiplicative. Rather additive trade costs are easily interpretable in terms of NTMs. For instance any labeling requirement is likely to imply a cost which is unrelated to the price of the good to which the measure applies. Nevertheless, NTMs could also affect fixed cost components. For instance the respect of various quality requirements imposed by a TBT could act as a fixed component of trade costs.

5.4 Trade Facilitation measures

Generally speaking, trade facilitation refers to all the steps that can be taken to smooth and facilitate the flow of trade. Trade facilitation in its narrow definition refers to administrative procedures at the border only. In its broad definition, trade facilitation also includes behind the border measures such as domestic regulation or the quality of infrastructure. As to the quality of infrastructure a distinction should

be made between soft and hard infrastructure. Soft infrastructure refers to transparency, customs management and other intangible institutional aspects while hard infrastructure refers to physical transport and ICT infrastructure.

WTO members have adopted a somewhat restrictive but also more transparent definition of trade facilitation. The latter results in "the simplification and harmonisation of international trade procedures" covering the "activities, practices and formalities involved in collecting, presenting, communicating and processing data required for the movement of goods in international trade".[17]

Dennis and Shepherd (2011) estimate the impact of cost to export as measured the World Bank Doing Business database on the number of products exported to the European Union. Their estimates suggest that a 1% reduction in the costs to export increases the number of products (i.e corresponding to different lines at the 6-digit level of the Harmonized System classification of goods) exported to the European Union by 0.3%. Persson (2013) assesses the impact of time to export, also taken form the World Bank Doing Business database, on the number of products exported to the European Union, and finds that a 1% reduction in the time to export 1% increases the number of exported differentiated and homogenous products by 0.6% and 0.3%, respectively.

Beverelli, Neumueller and Teh (2015) assess the effect of the WTO Trade Facilitation Agreement on two extensive margins related to export diversification: the number of products by export destination, which varies between 43 for Sub-Saharan Africa and 501 for East Asia and Pacific and, the number of export destinations served by product, which varies between 1 for Sub-Saharan Africa and 16 for East Asia and Pacific. Their results suggest that the implementation of the WTO TFA could increase the number of products by export destination by 15.7% and the number of export destinations by product by 34.9% for SSA countries. For countries in Latin America and the Caribbean the corresponding figures are 12.2% and 21.7% respectively.

Hoekman and Shepherd (2013) assess the impact of trade facilitation, i.e. time to clear customs, on firm level exports and imports using data from World Bank Enterprise Surveys (2006-2011). Overall, despite some variation across sectors, their results suggest that both large and small firms benefit from trade facilitation. There is weak evidence that small firms in the garment sector may not experience substantial gains. The impact of trade facilitation on exports results to be stronger than the one on imports, a 10% reduction in time to export being associated with an 1.1% export gain. In a follow-up paper, Han and Piermartini (2016) consider a sample of both exporting and non-exporting firms and find that, in this set-up, small firms benefit more than large firms when time to export is reduced, an effect likely to be driven by the extensive margin.

Volpe Martincus et al. (2015) use Uruguayan customs transaction data to estimate the effect of customs-related delays on firms' exports. They find that a 10% increase in customs delays results in a 3.8% decline in exports. This effect operates through two channels: on the supply side, a reduction of foreign sales by exporters due to higher costs, and on the demand side, a reduction of exposure to exporters subject to such shocks by buyers. Effects are heterogeneous across several dimensions, appearing to be more important for newer buyers, time-sensitive products and countries that are difficult to reach or experience a banking crisis.

Fontagné et al. (2016) match a detailed panel of French firm exports to a new database of Trade Facilitation Indicators (TFIs) by the Organisation for Economic Cooperation and Development (OECD). They study the heterogeneous effects of different policies of the Trade Facilitation Agreement (TFA) on exporters, finding that they vary across firm size. Information Availability, Advance Rulings and Appeal Procedures appear to have a positive effect on the extensive and intensive margins of small and medium firms in particular. This corresponds to "the perception of such firms that lack of information is a major obstacle to trade, and the perception that the reforms mainly reduce fixed trade costs" (Fontagné et al.: 2016). On the other hand, the simplification of documents together with automation are more beneficial to large firms and have a negative impact on the intensive margin of small firms.

5.5 Transport connectivity

Transport connectivity is a prominent factor in determining trade costs. Arvis et al. (2015) empirical estimates suggest that a 10% improvement in the indicator they used for international transport

[17] A Trade Facilitation Agreement (TFA) was negotiated in 2013 at the Bali Ministerial Conference. It entered into force in February 2017.

connectivity[18] is associated with a 2.3% reduction in trade costs. This makes international transport connectivity a key determinant of trade flows. Both exports and imports are expected to react positively to improvement in transport connectivity. The latter also plays a central role in facilitating participation in international chains of production.

Transport connectivity is intimately related to the mode of transport to be taken into consideration. Physical goods can be transported via air, water or land. When considering international trade around 80 per cent of the volume of goods is transported via sea (UNCTAD, 2008). Air cargo accounts for less than 1% of world trade shipments by volume but makes up around 35% by value. Measuring transport connectivity is not trivial. Indicators of connectivity available for a comprehensive group of countries and years exist only for air and sea transport. Major ones are the World Bank Air Connectivity Index (ACI), the UNCTAD Liner Shipping Connectivity Index (LSCI) and its bilateral extension the Liner Shipping Bilateral Connectivity Index (LSBCI).

Arvis and Sheperd (2016) show that countries with a higher ACI score have stronger air connections to a wider range of destinations than countries with a lower ACI score. They also show that a higher ACI score is robustly associated with deeper integration into the world trading economy. A recent report commissioned by the International Air Transport Association (IATA)[19] further shows that a one percent increase in air cargo connectivity (measured by the ACI) is associated with a 6.3% increase in total exports and imports. Moreover, countries with better air cargo connectivity also engage in more trade in value terms. A one point increase in the ACI is associated with a 2.9 percentage point increase in GVC participation.

Results from the UNCTAD's secretariat recent empirical work suggest that liner shipping connectivity plays a crucial role in determining a country's trade performance (Fugazza and Hoffmann 2017, Fugazza 2015). Everything else remaining the same, an increase (decrease) by one unit of the LSBCI would translate into an increase (decrease) of the value of exports of containerizable goods by 3 percent.

UNCTAD's research further shows that lacking a direct maritime connection with a trade partner is associated with lower values of exports; any additional transshipment is associated with a 40 percent lower value of bilateral exports. An additional common direct destination is associated with about 5 percent higher value of bilateral exports. An increase by 1000 TEU (unit of reference of LSBCI fourth component) of the largest ship operating on any leg of a maritime route is associated with an increase in the value of bilateral exports of 1 percent.

The evidence reviewed here is based on aggregated data and very little can be inferred to appreciate even qualitatively the impact of connectivity at the firm level. Transport connectivity can be easily associated with standard trade costs representation in trade models that is behaving as a fee proportional to the unit value of the good shipped. In the presence of non-constant elasticities of substitution, theory predicts (Spearot (2013)) that a uniform reduction of bilateral trade costs, which is exactly what should be observed with an improvement of transport connectivity, would favor small firms over larger ones. Based on Peruvian exporting firms' data, Fugazza (2018) empirical findings are in contradiction with these theoretical predictions. The paper assesses the impact of the establishment of a new direct connection either via sea or via air on export margins. On one hand, the impact of a new direct air connection is positive only for very large firms and negative otherwise. On the other hand, the average impact of a new direct sea connection is positive but remains negative for smaller firms. Moreover, while the number of exporting firms increases with the opening of a direct sea connections it decreases in the case of new direct air connection. The interpretation of such results is not straightforward and relates to the type and value of goods shipped via either modes. Importantly, transport connectivity has a differentiated impact amongst exporting firms as a consequence of both their productivity(size) and the type of goods they sell.

5.6 Trade policy: the institutional context

Any trade reform leads to a change in relative prices and, as a consequence, affects the allocation of factors of production across sectors. The sectoral bias resulting from any reform is expected to vary with the scope and deepness of that reform. Both the scope and deepness of a trade reform are intimately related to the institutional framework within which the reform is implemented. Both trade flows, imports and exports, can be impacted or only one of the two.

[18] The indicator corresponds to a bilateral version of the UNCTAD Liner Shipping Connectivity Index (LSCI).

[19] See Sheperd, Shingal and Raj (2016).

Table 2.4 Trade liberalization Matrix

	Discriminatory	Non-Discriminatory
Non-Reciprocal	PTAs (Shallow versus Deep)	Unilateral (Shallow versus Deep)
Reciprocal	RTAs (Shallow versus Deep)	MFN

Source: Authors' own elaboration.

Table 2.4 shows a broad categorization of trade reforms. It applies to any country except for the lower right category, **most-favored nation** (MFN) treatment, which applies essentially to WTO members. This category is characterized by a non-discriminatory and reciprocal trade reform and corresponds to the implementation of a WTO agreement. At the other extreme (the upper left category) the trade reform corresponds to a **Preferential Trade Agreement** (PTAS) under the WTO definition. They are understood to mean non-reciprocal preferential schemes. The most well-known example remains the Generalized System of Preferences (GSP). Under GSP schemes of preference-giving countries, selected products originating in developing countries are granted reduced or zero tariff rates over the MFN rates. The least developed countries (LDCs) receive special and preferential treatment for a wider coverage of products and deeper tariff cuts. In other words, only exports in certain sectors of the receiving country are affected directly as well as imports in the same sectors in the preference-giving countries. PTAs are distinct from **regional trade agreements** (RTAs) which are both discriminatory and reciprocal. RTAs involve at least two members. There has been an exponential increase in the number of RTAs since the early 1990's.[20] Following the notification of the RTA between Mongolia and Japan in June 2016, all WTO members now have at least one RTA in force. All members receive some preferential treatment in some sectors in exchange for the concession of some preferential treatment in some sectors. Liberalized sectors do not have to coincide necessarily across RTAs members. A country's participation in RTAs is thus expected to affect directly both its imports and its exports. The last category reported in Table 2.4 refers to the most liberal type of trade reform, namely **unilateral trade liberalization**. Although it could apply to a limited number of sectors only, this type of reform does not discriminate against any country and does not involve any exchange of market-access concessions at least not explicitly. As put forward by Baldwin and Kawai (2013) the tariff-cutting was done unilaterally by the Association of Southeast Asian Nations (ASEAN) and the People's Republic of China. Unilateral trade liberalization was implemented mainly to attract Japanese businesses in search of lower cost manufacturing sites for labour-intensive stages of production. In Baldwin (2008) this tendency is referred to as the "hollowing out" of the Japanese economy and presented as the starting point of the so-called "Factory Asia" or the "Asian Manufacturing Matrix". In the context of unilateral trade liberalization imports in liberalized sectors of the reforming country are expected to be affected directly. The same is true for exports flowing from any country able to compete on the domestic markets of the opening country.

The sectoral bias or price effects could be in principle identified when considering the primary impact. If the primary effects are on intermediate goods (or services) then some additional analysis is likely to be required in order to properly identify the linkages with final goods (or services) sectors. However, trade reform may involve something more than a straightforward tariff cut applied to some sectors or equivalently the complete deregulation of some service sector.

Indeed, in principle each category of trade liberalization may include several elements on top of simple tariff cuts. In practice, deeper liberalization concerns mostly RTAs. Generally speaking agreements including essentially tariff cuts and elements from existing WTO agreements are referred to as **shallow agreements**. Agreements going beyond tariff schemes adjustments and covering deeper behind-the-border measures are called **deep agreements**. Box 2.7 discusses the special case of labour provisions included in trade agreements. Even without considering intra-European Union trade, about one third of world trade took place under deep trade agreements in 2015. Almost 10 per cent of world trade was covered by shallow RTAs, and about 7 per cent was under some PTA. In the context of a deep trade agreement primary effects are not easily assessable any more.

[20] As of July 2017, 279 RTAs involving at least one WTO member were in force. These correspond to 445 notifications from WTO members, counting goods, services and accessions separately.

Box 2.7 Labour provisions in international trade agreements

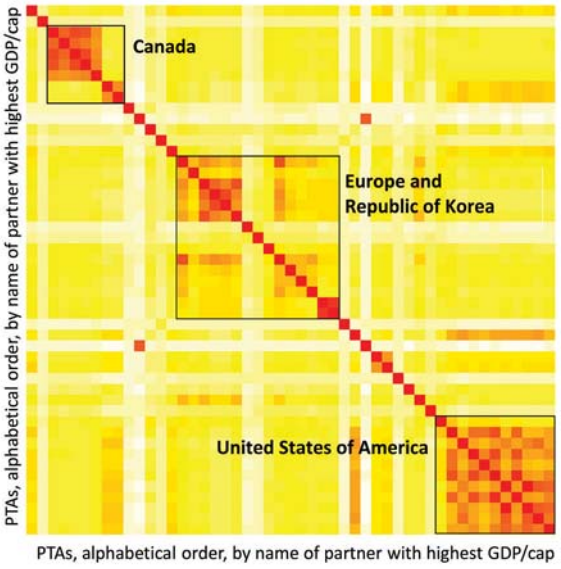
Including provisions on labour in trade agreements is another trade policy option to promote decent work through trade. The effect is not direct, through trade flows themselves, but indirect, through the conditions under which trade can occur. Hence, labour provisions are best seen as a complementary policy, similar to national labour legislation.

Including labour provisions in trade agreements has become increasingly common over the last decades: while in 1995, 34 per cent of newly concluded agreements contained labour provisions, the share has increased to 84 per cent in 2014 (Carrère, Olarreaga and Raess, 2017). However, provisions vary in terms of enforceability and aspirations. The heterogeneity of provisions across agreements is illustrated in figure B. It displays the textual similarity of labour provisions between different treaties. Each cell in the matrix represents one pair of treaties. It is colored red if they are very similar in terms of labour provisions and bright yellow if they are very dissimilar. Agreements of signatories with relatively high GDP (in 2015) are clustered together.

The figure shows that certain large countries have a relatively homogeneous treaty networks when it comes to labour provisions. Sometimes, similarities go beyond country models. For example, different European groupings (the European Free Trade Association and the European Union) and the Republic of Korea have concluded PTAs with similar labour provisions with different partners.

While textual convergence could help eventually multilateralizing labour commitments in line with SDG (QUOTE), another phenomenon is even more important: the broad willingness of countries at all development stages to address decent work in trade agreements. As stated by the ILO (2016), "regardless of the approach […], the objectives of countries are shared".

Figure B Provisions in RTAs



Source: Alschner, Seiermann and Skougarevskiy (2017).

CHAPTER 3

RECOMMENDATIONS FOR TRADE-POLICY MAKERS: A DIAGNOSTIC FRAMEWORK

Results discussed previously help defining a diagnostic framework that can be implemented practically in order to identify a set of best policy options. These options will of course have to be confronted with the overall objectives and constraints of each specific reform. In other words, the framework aims at supporting policy makers in identifying the most efficient policy options to achieve specific social and economic national objectives in the context of trade negotiations or unilateral policy reform.

The framework presented below is a diagnostic, not a simulation tool. It offers a first, essentially qualitative, appreciation of the expected effects of trade reform on labour market outcomes. The relevance and utility of such an exercise stays in the low degree of technicality and the relatively parsimonious set of data required to its implementation.

This diagnostic framework should be considered as a very first step of a more comprehensive assessment exercise involving more complex but also more demanding modeling approaches.[21]

The framework is based on modeling approaches of the ex-post analysis category (see box 3.1 below). It uses findings from existing ex post research to define a set of analytical rules that allow for the selection of relevant variables and of the interpretation of their inter-linkages. The assessment remains qualitative although it is based on precise metrics. The strength of such an assessment is twofold. It is highly flexible and adaptable to any contingency thanks to its parsimony. It does not rely on numerous modeling hypothesis and no arbitrary mechanisms needs to be imposed for mathematical reasons. In other words, the framework remains easily accessible and does not become a black-box for users.

1. INSIGHTS FROM THEORY AND EMPIRICAL EVIDENCE

Trade reforms influence relative prices, to which sector-level trade flows and production react according to the confrontation of price shock and comparative advantage patterns. Production adjustments induce changes in both wages and employment. An increase in production will lead to an increase in both of them. However, the magnitude of these relative changes is affected by the functioning of the labour market at the sectoral level.

Frictions or matching efficiencies are at the core of the functioning of the labour market. There is clear evidence, as discussed previously, that these features are sector specific. Higher frictions and subsequent lower matching efficiency result in higher unemployment rates. Beyond the employment-unemployment dichotomy, informality is another prominent feature of many labour markets. Informality

[21] We refer the reader to the UNCTAD-WTO practical guides for a comprehensive review of major existing assessment approaches and techniques.

Box 3.1 Major impact assessment methodologies

Deciding on a methodology for assessing trade policy is not necessarily straightforward. It involves choosing between descriptive statistics and modelling approaches, between econometric estimation and simulation, between ex ante and ex post approaches, between partial and general equilibrium.

Ex ante versus ex post approaches

Ex-ante simulation implies the projection of the effects of a policy change onto a set of economic variables of interest, while ex post approaches use historical data to conduct an analysis of the effects of past trade policy. The ex-ante approach is typically used to answer "what if" questions. As to ex-post approaches they could also answer "what if" questions through so-called counter-factual exercises or experiments, under the condition that past relations continue to be relevant. This condition is not necessarily verified but remains acceptable and plausible in many situations.

Partial versus general equilibrium analysis

Partial equilibrium analysis focuses on one or multiple specific markets or products, ignoring the link between factor incomes and expenditures, while general equilibrium explicitly accounts for all the links between sectors of an economy – households, firms, governments and the rest of the world.

Econometric versus simulation models

In econometric models, parameter values are estimated using statistical techniques and they come with confidence intervals. In simulation models such as Computable General Equilibrium (CGE) models, behavioural parameters are drawn from a variety of sources, while other parameters are chosen so that the model is able to reproduce exactly the data of a reference year, the so-called calibration exercise. Simulations using CGE models are often solicited for the assessment of the impact of trade reforms. These models provide a large set of numerical results covering a large set of economic aggregates that explain their intensive use. However, results are highly sensitive to the parameters and other components which are necessary to close the model, make it solvable and usable for simulations. Moreover, building a GE model for policy analysis is a time-consuming task. Opting for ready-to-use simulation packages is an attractive option but it implies that the control over any simulation exercise remains limited and that the interpretation of any result is subject to a black-box bias.

is usually associated with self-employment in the services sector. However, informal employment is also found in manufactures in both informal and formal firms. Previously reviewed analytical contributions show that higher informal employment is likely to reflect a labour market with higher frictions.

Insights from recent theoretical and empirical works suggest that the overall impact of a policy reform inducing changes in relative prices of goods and services is driven by the combination of two sectoral patterns: comparative advantage and labour markets functioning. A positive price shock to sectors characterized by both stronger comparative advantage and more efficient (with lower frictions) labour markets should lead to both higher export performance and higher overall employment (and possibly a lower incidence of informal employment). However, a positive price shock to sectors characterized by stronger comparative advantage but less efficient (with higher frictions) labour markets could lead to higher export performance accompanied by higher aggregate unemployment or a higher incidence of informality (depending on the productivity of informal hires relative to formal ones).

Several trade-related policy instruments have been reviewed, noting that they can have a differential effect on specific sectors (as opposed to the economy as a whole). For instance, it is obvious that tariff liberalization can be precisely targeted to specific sectors. But even seemingly economy-wide measures, such as the development of transport infrastructure, affect different sectors differently. Improving port infrastructure, for instance, is likely to facilitate the exchange of highly containerizable goods or that of raw materials. In addition to this potential sectoral bias, both theoretical and empirical assessments show that the impact of trade-related policy instruments is not homogenous across firms belonging to the same sector of activity and may, in turn, imply heterogeneous employment effects.

2. CORE RECOMMENDATIONS

Based on these insights, the following set of core recommendations will guide the construction of the diagnostic framework.

Recommendation 1: Within some policy reform scheme, trade and employment objectives should be jointly defined.

Trade should not be regarded as an objective in itself, but a means of improving people's lives. Globalization has generated waves of social discontent in different

countries, reminding policy makers to treat trade negotiations as part of a broader socio-economic framework. In particular, trade reform should not be implemented without a close look at its possible employment effects. Indeed, increasing trade does not systematically increase employment.

Recommendation 2: Trade policy reform can only reduce unemployment and informal employment if frictions in sectors receiving a positive shock are not too high.

The incidence of both unemployment and informal employment are (partially) caused by labour market frictions. Both unemployment and informal employment at the sector level are therefore a sign of labour market frictions in some particular sector. Employment gains of a trade reform are maximized if positive relative price effects affect primarily sectors characterized by relatively low labour market frictions and relatively high comparative advantage. Put otherwise, trade reforms that reallocate workers towards sectors that are already characterized by high unemployment and informal employment rates are expected to increase overall unemployment rates.

Recommendation 3: Trade policy reform should consider the job creation/destruction potential (size of the work force) of affected sectors as it may influence the length and depth of the adjustment process.

The existence of search frictions makes the transition across firms, whether they are in the same sector or not, non-instantaneous. Although what matters at equilibrium are relative values or rates, levels are likely to affect the length of the transition period, that is the length of adjustment. It is straightforward to foresee that relatively larger sectors if negatively affected by a trade reform will displace a relatively larger number of workers who may not be instantaneously re-employed in sectors not negatively affected by the same reform but originally of relatively smaller size. These sectors may be able to adjust their production capacity and their employment only gradually.

Recommendation 4: Trade policy design should pay attention to the composition of affected sectors in terms of firm size and market power.

Trade policy can affect different firms of the same sector differently. Whether the number of firms active in a sector is more or less important and whether the distribution of these firms in terms of their productivity is more or less disperse will influence their reaction in terms of production and employment in the event of a price shock. The amplitude of the production and employment response is expected to be the least disruptive in two situations: a single large firm or a limited number of similar non-atomistic (i.e. with market power) firms. In both cases the degree of heterogeneity is minimal and firms are likely to have some control over the price of their products. In this situation, part of the shock could be absorbed by the firm itself (imperfect pass-through/transfer). In other situations, there is more uncertainty as to the expected impact. As a rule of thumb more attention should be paid to sectors populated by more heterogeneous and more numerous firms.

Recommendation 5: Trade policy design should account for sector-specific impact of different measures.

Any trade policy reform can create sectoral bias. It is thus crucial not only to identify the affected sectors and but also the expected sign of the price shock related to the trade reform under consideration. As shown previously the sign of the price shock determines the sign of the prima facie labour demand shock at the sectoral level. A positive price effect due to improved market access conditions or in general lower trade costs can be associated with an increase in labour demand in the affected sector. A negative price effect due to either the intensification of competition from imports or higher trade costs in general can be associated with a decrease in labour demand in the affected sector.

Recommendation 6: Real income effects of a trade policy reform should be considered conjointly with its employment effects.

A guiding argument developed in previous sections is that employment effects appear to be crucial when assessing the social impact of a trade policy reform. We might be tempted to look at real income effects instead as in standard frameworks positive real income effects can only be associated with overall positive employment effects. In analytical frameworks allowing for sectoral characteristics to affect labour market outcomes this does not have to be the case any longer. Indeed, any trade reform could, at the same time, lead to both a higher level of average real wages and a higher unemployment rate. In other words, independently of the real income effects of the reform, there can be winners and losers in terms of employment.

3. A DIAGNOSTIC FRAMEWORK

Previous recommendations clearly indicate that the design of a trade policy reform that incorporates potential employment effects should rely on a sector-level mapping of:

- Comparative advantage
- Work force size
- Labour market frictions
- Sector composition (firm size and market power)
- Applicable trade policy instruments

3.1 Implementing steps

The diagnostic framework encompasses previous recommendations and consists of the seven following analytical steps:

Step 1:	Define the policy objective(s)
Step 2:	Assess the domestic economy comparative advantage pattern
Step 3:	Assess the functioning of the labour market in different sectors
Step 4:	Identify comparative advantage sectors with relatively low labour market frictions
Step 5:	Complement the analysis with estimates of sectoral employment shares
Step 6:	Complement the analysis with estimates of firm heterogeneity and concentration
Step 7:	Assess conditions of access to international markets
Step 8:	Jointly assess the outcomes of steps 2 to 7 and confront with the original policy objective(s) as set in step 1

Each step is presented separately below and contains a brief description of:

- the issue at stake and/or the objective(s) to be reached
- the methodological approach to complete the step.

STEP 1
Define the policy objective(s)

The policy objective is the natural starting point of any reform, and should be well-defined such that the appropriate analysis can be conducted to prepare fine-tuning implementation. Contexts in which a "trade for employment" analysis can be useful include, but are not limited to:

- trade negotiations or reform
- regional integration
- national SDG strategy
- strategic development or reinforcement of specific economic sectors.

Example 1: A developing country wants to use trade policy to increase employment. Formulated in terms of the SDGs, the government has the dual objective of:

- (1) increasing the country's exports by 10% (target 17.11: Significantly increase the exports of developing countries, in particular with a view to doubling the least developed countries' share of global exports by 2020).
- (2) creating as many formal-sector jobs as possible (target 8.5: By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value) while reducing the incidence of informality amongst formal firms.

Example 2: A small developing country starts negotiating a trade agreement with a larger trade partner. A major concern is the impact such agreement may have on its labour market. The main policy instruments to be included in the agreement are tariffs.

Methodology: There is no unique methodological approach to define policy objectives. These are the outcome of a - sometimes complex - political process. How the policy objective is decided depends on the specific context in each country, its economic and institutional entities, and its regulatory environment.

STEP 2
Assess the domestic economy comparative advantage pattern

This step aims at identifying sectors in which the domestic economy is likely to have a competitive advantage on international markets and there is scope to increase exports further. As discussed more in detail in Appendix A, relative competitiveness can be appreciated using, is comparative advantage as revealed by trade data, not necessarily its structural component. In addition, the evolution of RCA over time should be looked at carefully.

This framework uses two sets of measures of Revealed Comparative Advantage (RCA):

- The Balassa index of revealed comparative advantage and some augmented version of it.

- RCA measures based on empirical estimates from the gravity model.

These RCA measures represent a static approach to export performance and are recovered from existing trade flow data. They have been chosen due to their straightforward implementation and limited data requirements, which make them easily applicable for a wide range of countries.

Methodology:

- Computation of RCA measures based on export and import data as discussed in Appendix A and UNCTAD-WTO Practical Guide to Trade Policy Analysis (2012) Chapter I.22
- RCA measures based on gravity estimations following Costinot et al. (2012), Hanson et al. (2016) approaches and Leromain and Orefice (2013).
- Construction of a synthetic RCA indicator. As various RCA indicators are expressed in units that are not necessarily consistent with each other, we use rankings instead of absolute values. In order to obtain a single indicator the geometric mean of all retained RCA measures is computed.[23]

STEP 3

Assess the functioning of the labour market in different sectors

Labour markets and their response to trade shocks are crucial for linking trade to the SDGs. Recent contributions to the literature on trade and employment suggest that particular attention should be devoted to elements affecting both the intra- and inter-sectoral mobility of the labour force. We associate inter-sectoral and intra-sectoral mobility with market frictions as reflected by sectoral unemployment rates and the sectoral incidence of informality (the share of workers employed informally) within any specific sector.

Methodology: The estimation of both sectoral unemployment and sectoral informal employment requires the use of household surveys. Some, but not all, household surveys report the necessary information to generate such estimates. Most household surveys contain information about the employment status of individuals, the sector they are employed in, or the last sector they worked in if they are unemployed. This information allows estimating unemployment rates at the sectoral level. However, not all household surveys classify sectors using a standardized classification, which is required to match household data with trade data. If this type of data is not available for a country, alternative options, such as using alternative data sources or hand-coding a correspondence between the survey's *ad hoc* classification and trade classification need to be identified on a case-by-case basis. Additional information in household surveys indicates whether respondents were employed with or without a contract, which can be used to measure informality.[24] Once estimates of both unemployment and informal employment are obtained a simple synthetic measure of labour market frictions can be constructed. As in the case of RCA measures we opt for the geometric mean of rankings obtained for both measures in order to maintain coherence overall and allowing for further aggregation in the next three steps.

STEP 4

Identify comparative advantage sectors with relatively low labour market frictions

Existing empirical results suggest that if labour market frictions as defined previously and comparative advantage in its revealed form are positively correlated then a reallocation of resources towards sectors with stronger comparative advantage from sectors with relatively weaker comparative advantage will generate higher unemployment. This means that if the policy objective is to both increase exports and employment it is important to set up a matrix linking frictions and comparative advantage in order to minimize the possible negative effects on employment of labour reallocation. A third dimension should be added to the matrix which is the incidence of informality. Moving resources towards sectors with a relatively high incidence of informality may generate more precarious employment and eventually contrast policy objectives. As established with recommendation 4 our analysis should also include some information about the relative importance of each sector in terms of employment size and potential.

Methodology: Results from step 2 and step 3 can be reported in a single matrix as Matrix I below. The identification of pro-(formal)employment sectors can

[22] https://www.wto.org/english/res_e/publications_e/wto_unctad12_e.pdf

[23] The Geometric mean is preferred to the arithmetic mean in order to minimize the influence of outlying figures.

[24] An alternative source of sectoral unemployment is Carrère et al. (2016). These data should only be used if no better estimates are available because sectoral unemployment figures are econometric estimates reflecting average labour market characteristics only. Moreover, these estimates do not explicitly account for the incidence of informal sectoral employment.

then be based on some overall ranking reflecting rankings over the two dimensions under consideration. This overall ranking is given by the geometric mean of the rankings obtained for each synthetic dimensional indicator. More precisely, the value given to the RCA synthetic indicator corresponds to the ranking across sectors of the latter. The same methodology is used to compute the labour market frictions synthetic indicator. As a final step, geometric averages are converted into rank values in order to allow for further aggregation in the next steps.

In the purely hypothetical case presented below, sector C appears to be the most pro-employment sector if it had to receive a positive trade shock. Its expansion should translate in relatively lower unemployment and informality.

Rankings Matrix I

Sector	RCA	Frictions	Overall_0	Overall_0 (ranking)
A	3	1	1.73	2
B	2	3	2.44	3
C	1	2	1.41	1

Note: Figures in columns 2 and 3 report rankings obtained for the synthetic indicator for each reported dimension. The column Overall_0 reports the geometric mean of the RCA and Frictions columns values. The last column translates average values into rank positions.

STEP 5

Complement the analysis with estimates of sectoral employment shares

The magnitude of employment effects could be critical in defining the length of adjustment to any price shock induced by some trade policy reform. For instance, shocking positively a relatively small sector may not be enough to absorb rapidly displaced workers from a relatively large sector hit negatively by the same reform. Taking explicitly into consideration the relative size of sectors possibly affected by a trade policy reform is necessary if part of the objectives is to create or at least preserve overall employment levels.

Methodology: Estimate sectoral employment shares based on the same household surveys used for the estimation of both sectoral frictions and sectoral informal employment. Absolute values are again converted into rank positions in order to be aggregate with results observed in step 4. The information about sectoral employment shares is added to complement Matrix II.

In our hypothetical case, sector C remains the most pro-employment sector if it had to receive a positive trade shock even after controlling sector employment shares. Similarly, the overall employment effect of a negative trade shock to sector A is likely to be limited and displaced workers could be expected to face shorter period of adjustment compare to a situation in which sector C would be negatively affected by a trade shock.

Rankings Matrix II

Sector	RCA	Frictions	Overall_0 (ranking)	Size	Overall	Overall_1 (ranking)
A	3	1	2	3	2.44	3
B	2	3	3	1	1.73	2
C	1	2	1	2	1.41	1

Note: Figures refer to rankings along the dimension reported in the respective column. The ranking of the size column is inverted meaning that rank 1 is attributed to the smallest sector in terms of employment. The column Overall_1 reports the geometric mean of the Overall_0 and Size columns values. The last column translates average values into rank positions.

STEP 6

Complement the analysis with estimates of firm heterogeneity and concentration

In addition to the economic dimensions discussed so far, insights from the literature suggest that supply-based features should also be incorporated when considering employment impact. More precisely, the degree of firms' heterogeneity and concentration within a given sector could influence the impact of a trade reform. The appreciation of their respective impact, however, is not necessarily straightforward. For instance, low heterogeneity amongst relatively large firms might be more favorable to high heterogeneity and high concentration in the presence of a negative price shock but not necessarily in the presence of a positive one. A size effect could also be at play with relatively smaller sectors being possibly more reactive to shocks either positive or negative that relatively larger ones.

Methodology: The objective is to complement Matrix II with additional information about firms' distribution within sectors. Results from the firms' side statistical analysis are kept separated and are used only to qualify sectoral considerations made along step 2 to step 5 because of possibly contradicting interpretations of firms' distribution properties and characteristics. Moreover, access to the full set of productive firms within an economy is likely to be restricted. It might be easier to get access to information on a sub-sample of firms such as the exporting ones. The rankings matrix below is based on such scenario.

In our hypothetical example sector C takes intermediate values in the number of exporting firms and variance of

Rankings Matrix III

Sector	Overall_0 (ranking)	Overall_1 (ranking)	Number of exporting firms	Variance of exporters size
A	2	3	3	1
B	3	2	1	3
C	1	1	2	2

Note: Figures refer to rankings along the dimension reported in the respective column.

exporting firm size. These results could suggest that in case of a positive or negative shock to that sector we should observe a relatively homogenous impact across exporting firms. However, a more specific analysis would be needed before reaching any definitive conclusion. Nevertheless, if we had to deal with any shock positive or negative sector C could be a good option in both cases at least from an employment point of view.

STEP 7
Assess conditions of access to international markets

Conditions of access to both international and domestic markets have three major components: international and domestic demand conditions; tariffs, non-tariff measures and procedural obstacles; and connectivity. These components are likely to be sector specific as discussed in the literature review.

Matching trade policy conditions with the sector-level characteristics obtained in steps 2 to 5 (6) allows to identify the best set of policy options at hand in terms of both exports and employment. In contexts such as the negotiation of a trade agreement, policy options are necessarily constrained by other parties' objectives. This may lead to a reconsideration of the objectives defined in step 1 and/or the available policy options identified in step 7. In other words, step 1 and step 7 may have to be treated simultaneously whenever policy options are decided in a framework involving partner countries.

Methodology:

Whenever relevant or feasible, indicators are generated at the sector level.

A. Demand conditions: Identify top importers

- Top-5 importers.
- All countries that, together, account for 80% of imports.
- Countries with highest growth in imports in these sectors.
- Imports of possible trade agreement partners.

B. Tariff and Non-Tariff conditions: Identify destinations with lowest obstacles to exports

- Tariffs: Display tariffs faced in main markets domestic and as defined in section A. Identify tariff peaks, tariff escalation schemes and/or other areas of negotiation if relevant.
- NTMs: Display NTMs faced in main markets domestic and as defined in section A (computation of various incidence indicators and use of country ITC firm level surveys if available).
- Procedural obstacles: Identify major procedural obstacles using ITC country data domestically and in major destinations as defined in Section A.
- RTAs: assess the prevalence of preferential trade.

C. Connectivity: Display connectivity with main markets.

- Maritime Connectivity indicators based on UNCTAD data.
- Air Connectivity indicators based on IATA-WB information if available.
- Land Connectivity indicators (intra and international) if available.
- Trade Costs Estimates from the WB-ESCAP database.

Note: relevant connectivity may vary by sector and by destination.

STEP 8
Jointly assess the outcomes of steps 2 to 6 and confront with the original policy objective(s)

This step aims at identifying those sectors towards which policy intervention should be prioritized. Step 1 has defined the policy objectives, steps 4, 5 (and 6 accessorily) have identified the priority sectors from a trade and employment perspective, and step 7 has outlined the set of available trade policy options. Conclusions form this step may very well lead to a re-consideration of original objectives or of the set of policy options originally contemplated.

Methodology: as mentioned in step 1 the definition of any policy reform is on most cases a political outcome guided by internal and external contingent elements and features. Nonetheless, the decisional process could be facilitated by the implementation of this framework as it could provide a relatively objective set of information able to support discussions about conceivable and acceptable policy options.

The approach adopted in this diagnostic framework is necessarily recursive as several dimensions have

to be examined contemporaneously. Flexibility in the underlying decisional process could be introduced if complementary measures (e.g. a reform of some labour market regulations) can be envisaged. This however goes beyond the scope of this exercise and we leave for further development.

3.2 Data constraints

In order to complete steps requiring computation or quantitative analysis, that is steps 2 to 6, two types of data are necessary, namely trade and employment/unemployment data.

As to trade data, they are easily accessible even at a disaggregated level through various extraction platforms[25] or processed datasets.[26] Step 6 is based on firm level information. This can be generated either through census data or customs data if only exporting firms are take into consideration. Access to census data is in most cases restricted. This is also the case for customs data but recent initiatives of international organizations such as the World Bank have led to the compilation and broad diffusion of relatively disaggregated statistics using this type of information.[27]

At to data regarding the labour market, it would be desirable to access household information as reported in households/labour force surveys. These are core reference sources in the computation of employment statistics as published for instance by the ILO.[28] However, although figures for employed workers are estimated at the sectoral level this is not the case for unemployment. This is explained to a large extent by the fact that the sectoral allocation of unemployed workers may not be straightforward. Should the sector the unemployed worker is allocated to be the one she or he used to work or the one she or he wishes to work in the future? The answer to that question is arguable but may eventually rely on the information accessible through the survey questionnaire. In most circumstances, unemployed workers are asked about the last sector they had a paid activity not about the sector in which they actively search for a job. Whenever missing, information about sectoral unemployment can be replaced by existing estimates as computed in Carrère et al. (2016).

These steps are reviewed in detail in next section using a specific case study based on Peruvian data. This choice was driven by the comprehensive information made publicly available by several Peruvian governmental institutions.

The framework could also be applied to country groups to assess for instance the relevance of regional rapprochement or integration. In this context data availability could become an issue. While trade data are usually easily accessible, employment ones may be more difficult to access. Household surveys may not be available or not consistently comparable across countries. Nonetheless, the framework is designed as much as possible to account for situations in which data availability is limited. As all the analytical steps are independent from each other in terms of methodology and, often, data sources, it is possible to leave our certain steps and use only the remaining available information. This allows producing relatively well informed recommendations in terms of conceivable policy options despite the lack of data. In order to illustrate the latter point, an example reporting the assessment of regional integration amongst several Western African countries is presented in the next session.[29]

3.3 Additional Steps

This diagnostic framework can be augmented to incorporate dimensions related to labour market outcomes which are of relevance to some SDGs. Labour force surveys contain information for different population categories such as gender and age. Instead of looking at employment as whole, the analysis could distinguish between female and male employment. Recent UNCTAD (2017) work has been dedicated to the construction of The Trade and Gender Toolbox which is the first attempt to provide a systematic framework to evaluate the impact of trade reforms on women and gender inequalities prior to implementation of those reforms. A major component of the approach is to recognize that women and men are not equally distributed across sectors. As a consequence if sectors where women are relatively more represented are negatively hit by a trade reform then we may expect a negative impact on overall gender inequalities in both earnings and employment terms. This approach is

[25] See for instance https://comtrade.un.org/data/ or https://wits.worldbank.org.

[26] See for instance the BACI-CEPII dataset.

[27] See the Exporter Dynamics Database consultable at https://data.worldbank.org/data-catalog/exporter-dynamics-database.

[28] A complete list of available although not necessarily downloadable surveys can be consulted at http://www.ilo.org/dyn/lfsurvey/lfsurvey.list?p_lang=en.

[29] This example draws on a recent applied work by Carrère (2018).

perfectly consistent with the reallocation component of a trade reform discussed and put forward so far. Moreover, a similar reasoning could apply to age groups. In other words, employment effects can be analyzed through the lens of different reference groups within the various sectors represented adding an additional SDG dimension to the political process driving the reform. This possibility is illustrated in the first application presented in the next section.

4. APPLICATIONS

This section presents two practical applications of the diagnostic framework presented in the previous section. By providing concrete examples, this report seeks to promote the idea that policy reform should be appreciated in the broadest context in order to assess its relevance from both a trade and an employment point of view.

The first application is a country specific exercise. The primary objective is not to simulate any officially planned policy reform but rather to illustrate the computation of the various indicators included in the framework. The country selected for the exercise is Peru. This choice is essentially motivated by the existence of comprehensive and relatively easily accessible data. In particular we have access to household survey data that contain information about workers' employment status and sector of occupation. It is also possible to identify undeclared workers in formal firms. Moreover, we have access to export firm level data that allows us to study firm heterogeneity and concentration at the export sector level. Sectors included in our application are based on the ISIC-revision 3.1 classification.[30] Estimates presented below are obtained at the Division level of the ISIC-revision 3.1 classification. At this level of disaggregation, there are 62 categories/industries. Amongst these industries, three refer to agricultural and fishing sectors, five to mining and quarrying, twenty three to manufacturing and the remaining thirty one to services and administration.

The second application involves several African countries in a context of intensifying regional integration. The application is drawn from Carrère (2018) who evaluates the relative effect of trade on the unemployment rate of the eight WAEMU countries over the period 2000-2015 and estimates the extent to which intra-WAEMU trade can have a different impact on this unemployment.

[30] See https://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=17&Lg=1 for a detailed description of the classification and its structure.

Both applications only consider trade in goods. Trade in services is not considered for methodological reasons. The diagnostic framework has been developed for trade in goods and would need to be adapted to account for the specificities of services trade, including differences in determinants and trade costs. Such a framework should be based on a clear distinction between the various modes of services trade and be flexible enough to encompass the set of policy reforms specific to each mode. As far as this exercise is concerned, we only refer to services in the labour market stylized facts section and leave the trade side for further investigation.

As explained in detail in the previous section, the implementation of our diagnostic framework is based on the following eight steps:

Step 1:	Define the policy objective(s)
Step 2:	Assess the domestic economy comparative advantage pattern
Step 3:	Assess the functioning of the labour market in different sectors
Step 4:	Identify comparative advantage sectors with relatively low labour market frictions
Step 5:	Complement the analysis with estimates of sectoral employment shares
Step 6:	Complement the analysis with estimates of firm heterogeneity and concentration
Step 7:	Assess conditions of access to international markets
Step 8:	Jointly assess the outcomes of steps 2 to 7 and confront with the original policy objective(s) as set in step 1

4.1 Application 1: Trade and export patterns in Peru

Peru's experience over the last two decades certainly represents an interesting and informative example of both regional integration and active promotion of preferential trade relationships. However, we leave these considerations for future work and do not discuss policy objectives (step 1) in this example. The focus hereafter is on steps 2 to 5 which constitute the core of the diagnostic tool. These 4 steps can be implemented independently of any other step as they offer a broad view of the trade and labour market nexus. We also discuss sector-level heterogeneity and concentration (step 6). Steps 1 and 7 are specific to

the policy objective a government may pursue either unilaterally or in the context of a bilateral or plurilateral negotiation. Step 7 is not considered here as we do not aim at simulating any specific trade policy shock.

As highlighted in the insights and recommendations, the analysis should be conducted at the sector level. Depending on the nomenclature adopted, "sector" may refer to different levels of aggregation. In this exercise, we use two distinct but associable product nomenclatures.

- The Harmonized System (HS)31, which is the reference classification for trade data and includes essentially tangible products or goods.
- The International Standard Industrial Classification of All Economic Activities (ISIC)32 covering most goods and services, which is often used to report domestic information on economic activities and outcomes such as employment status.

Trade observations originally downloaded following the HS classification are converted to ISIC3 rev.1 observations to match with employment sectoral information. Moreover, in order to keep results reporting as clear as possible we proceed to some sectors aggregation as presented in Appendix B.

4.1.1 Implementation of Step 2: Computation of RCA indicators

To start with several indicators of Revealed Comparative Advantage are computed and compared within (time perspective) and across sectors (cross sectional perspective). We first compute the standard Balassa index of RCA as discussed in detail in Appendix A. We also opted for a normalized version of the latter based on Proudman and Redding (2000) contribution. Their adaptation of Balassa's revealed comparative advantage index allows for its comparison across time and countries. The third type of RCA measure is export share simply as a level control measure. A sector may have a poor comparative advantage but could be crucial in terms of size. The last type of RCA measures corresponds to gravity based econometric estimates of sectoral productivity.

Before considering results of our RCA analysis, it is informative to look at basic facts about Peruvian exports. Table 3.1 shows the top ten industries in the last two years. Exports from these industries account for about 98 percent of total exports. Leading industries are mining and quarrying followed by electronics, and food and beverages. Together with agricultural products these industries make up about 85 percent of total exports.

Table 3.1 Top 10 industries (exports)

Industry Name	Share 2015	Share 2016
Mining & quarrying	35%	38%
Basic and fabricated metals, computer, electronic, electrical, optical, machinery	31%	30%
Food & beverages	11%	10%
Agriculture	10%	10%
Coke and refined petroleum products	3%	3%
Chemicals and chemical products	3%	2%
Textile	3%	2%
Rubber and plastic products	2%	1%
Wearing apparel	1%	1%
Other non-metallic mineral products	1%	1%

Source: Authors Calculations based on Peruvian customs data.

As to top destinations, Table 3.2 reveals that in the last 2 years the importance of China and of the United States has increased. The two markets absorb more than 40 percent of Peruvian firms' exports. Switzerland is the third largest destination market with a share of about 7 percent in 2016. Columns 3 and 6 of Table 3.2 indicate whether Peru has some sort of trade agreement with the destination countries. This is the case with all trade partners appearing in the table and making up about 90 percent of total Peruvian exports.

All RCA indicators presented in this section are computed using COMTRADE data either directly or as a support of some econometric estimation. We compute RCAs indicators at the Divisions level of the ISIC rev.3.1 classification as reported in Appendix B. Gravity based RCA measures are originally obtained at the 6-digit level of the HS classification. When then aggregate them up to the ISIC Divisions level using simple averages.

Table 3.3 reports coefficients of correlation between the various RCA measures mentioned above and computed on a yearly basis. All coefficients are positive

[31] See https://unstats.un.org/unsd/tradekb/Knowledgebase/50018/Harmonized-Commodity-Description-and-Coding-Systems-HS for a detailed description.

[32] See https://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=2&Lg=1 for a detailed description.

Table 3.2 Top destinations (90 percent of total exports)

	2015	Trade Agreement		2016	Trade Agreement
China	22.0%	BIL	China	23.4%	BIL
United States of America	14.9%	BIL	United States of America	17.3%	BIL
Switzerland	7.9%	EFTA	Switzerland	7.1%	EFTA
Canada	7.2%	BIL	Canada	4.6%	BIL
Japan	3.3%	BIL	Republic of Korea*	3.8%	BIL
Spain	3.2%	EU	Japan	3.5%	BIL
Republic of Korea*	3.2%	BIL	Spain	3.4%	EU
Chile*	3.2%	BIL, PA, LAIA	Brazil*	3.3%	LAIA
Brazil*	3.2%	LAIA	Chile*	2.8%	BIL, PA, LAIA
Germany	2.8%	EU	Netherlands	2.8%	EU
Colombia*	2.6%	LAIA, AND, PA	India*	2.6%	GSTP
Netherlands	2.6%	EU	Germany	2.5%	EU
Ecuador*	2.1%	LAIA, AND,EU	Colombia*	2.0%	LAIA, AND, PA
India*	2.0%	GSTP	United Kingdom	1.8%	EU
United Kingdom	1.8%	EU	Ecuador*	1.8%	LAIA, AND,EU
The Plurinational State of Bolivia*	1.8%	LAIA, AND	Belgium	1.7%	EU
Italy	1.7%	EU	The Plurinational State of Bolivia*	1.5%	LAIA, AND
Mexico*	1.6%	BIL, PA, LAIA	Panama	1.5%	BIL, LAIA
Belgium	1.4%	EU	Italy	1.3%	EU
Panama	1.3%	BIL, LAIA	Mexico*	1.3%	BIL, PA, LAIA

Source: Authors Calculations based on Peruvian customs data.

Note: BIL stands for bilateral, EU stands for European Union, LAIA stands for Latin American Integration Association, AND for Andean Community, PA for Pacific Alliance, countries with * are also GSTP members.

Table 3.3 Correlations Matrix: RCA indicators (2004-2016 yearly data) (ISIC Divisions level)

	ISIC_D_1	ISIC_D_2	X-Share	RCA_HAN	RCA_CEPII
ISIC_D_1	1				
ISIC_D_2	0.9948	1			
Share	0.8021	0.8021	1		
RCA_HAN	0.5955	0.5913	0.5106	1	
RCA_CEPII	0.4757	0.4755	0.3724	0.8069	1
RCA_COST	0.4869	0.4868	0.3933	0.809	0.9843

Source: Authors Calculations based on COMTRADE data and own regressions.

Note: ISIC_D_1 is the standard Balassa; ISIC_D_2 is the Proudman Redding extension; RCA_HAN is the gravity measure based on Hanson et al. approach, RCA_CEPII is the gravity measure based on Leromain and Orefice approach, RCA_COS is the gravity measure based on Costinot et al. approach.

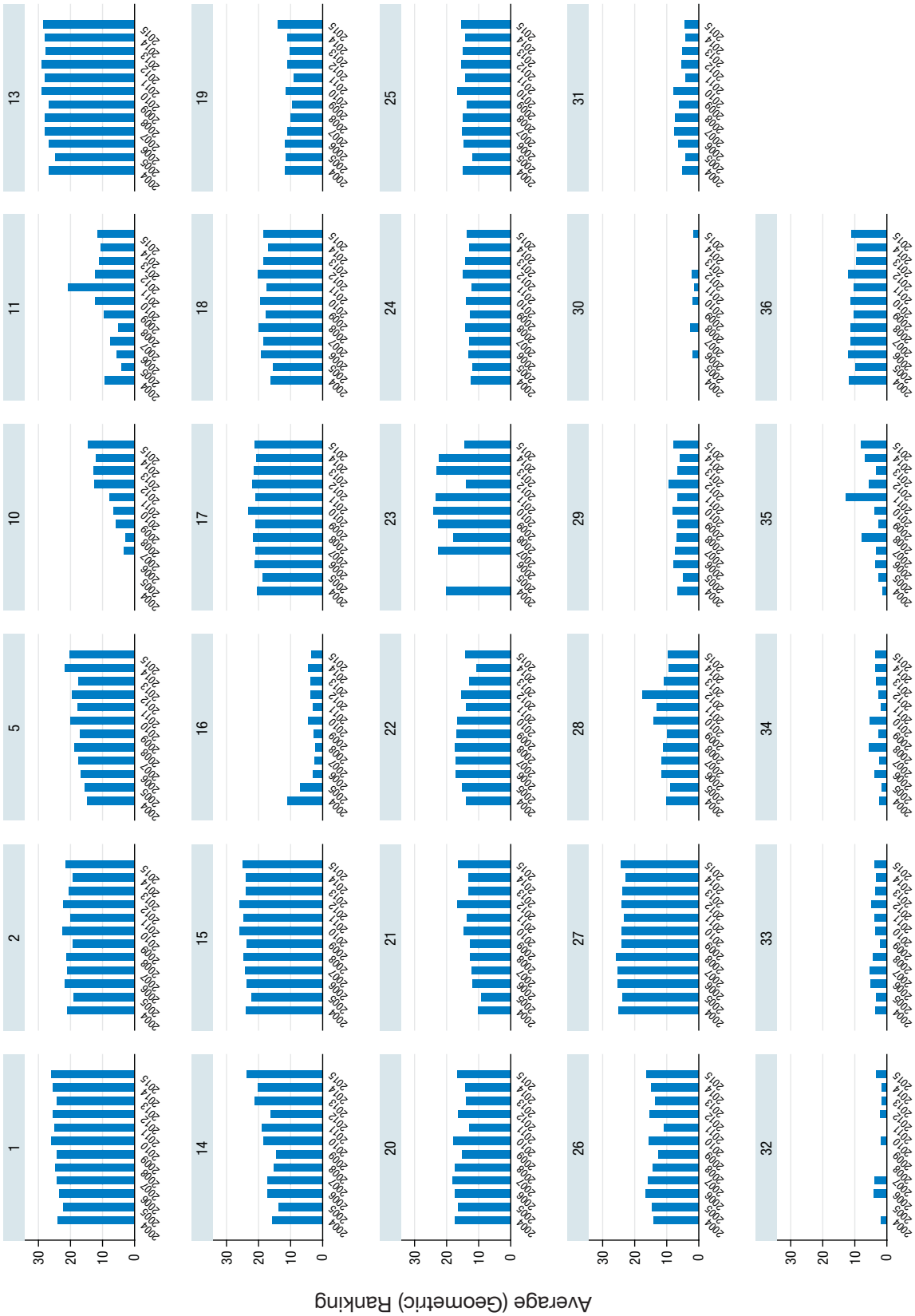
Table 3.4 Correlations Matrix: RCA indices (2004-2015 averages) (ISIC Divisions level)

	ISIC_D_1	ISIC_D_2	Share	RCA_HAN	RCA_CEPII
ISIC_D_1	1				
ISIC_D_2	0.1871	1			
Share	0.405	0.7563	1		
RCA_HAN	0.327	0.8019	0.7022	1	
RCA_CEPII	0.2963	0.6503	0.4767	0.8748	1
RCA_COST	0.2746	0.6432	0.4927	0.8609	0.9831

Source: Authors Calculations based on COMTRADE data and own regressions.

Note: ISIC_D_1 is the standard Balassa; ISIC_D_2 is the Proudman Redding extension; RCA_HAN is the gravity measure based on Hanson et al. approach, RCA_CEPII is the gravity measure based on Leromain and Orefice approach, RCA_COS is the gravity measure based on Costinot et al. approach.

Figure 3.1 Yearly RCA overall index (2004-2015)



Source: Authors calculations based on COMTRADE data and own regressions.
Note: Sector description is provided in Appendix B.

and statistically significantly different from zero. Coefficients are in general relatively high. Coefficients are even higher and less dispersed when computed for period averages of RCA measures as shown in Table 3.4. We further observe that gravity based measures closely relate to each other with coefficients of correlation above 0.8 in all cases.

Five RCA measures have been selected to assess comparative advantage at the sectoral level, namely ISIC_D_1, ISIC_D_2, Share, RCA_HAN and RCA_CEPII. These five measures are synthetized in a unique indicator that corresponds to the geometric mean of the rank obtained by each industry for each RCA measure. The weighting approach selected here may not be the most appropriate and further work could be dedicated to identify a more relevant one. However, it remains relatively neutral. Indeed, geometric means are generally preferred to arithmetic means in order to minimize the influence of outlying figures. Results are reported in Figure 3.1 for yearly data and Figure 3.2 for period averages. Both tables generate the same set of industries/sectors with an above average RCA performance. These industries are mining and petroleum extraction as far as non-manufacturing activities are concerned. Tobacco products, paper and paper products, chemicals and chemical products, machinery, communication equipment, precision instruments, motor vehicles and furniture constitute those manufacturing sectors/industries with RCA composite index values higher than average. It should be noted that these are industry/sector level estimates and aggregated results may hide product specific behaviour that could only be captured within a more exhaustive and precise analysis.

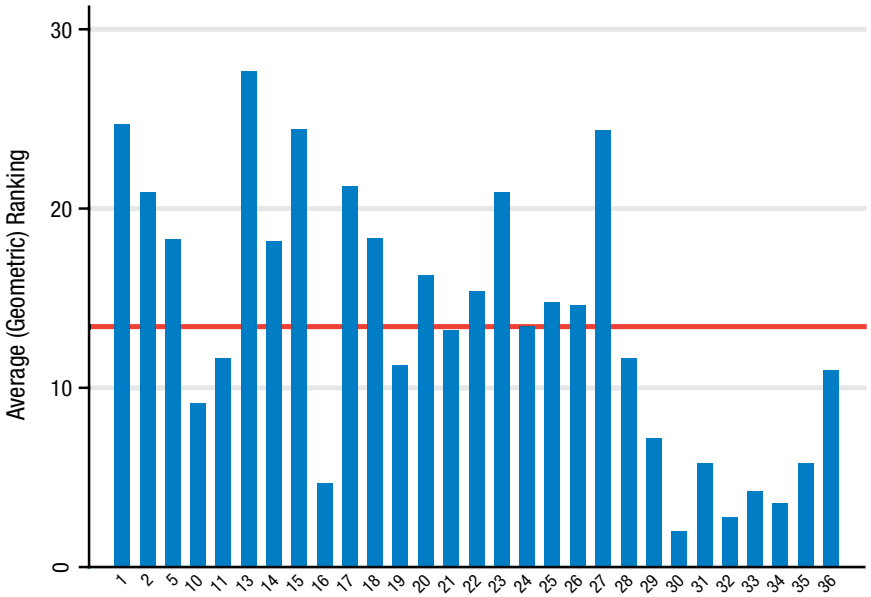
4.1.2 Implementation of Step 3: assessing labour market frictions

This step is dedicated to a precise analysis of the labour market looking at possible differences across sectors along several dimensions but with a particular attention paid to workers status. Information collected in the surveys allows us to identify several groups of informal workers as well as the last sector of activity of unemployed workers.

Data

Data come from the Peruvian labour force survey (**Encuesta Nacional de Hogares**/ENAHO) from 2007 to 2016. The data provides detailed information about the composition of the household, and the market (and non-market) activities of its members. In particular, individuals are asked whether they have a salaried job, or work as independent workers (i.e. the self-employed). Salaried individuals are then asked whether they have a contract, and whether the

Figure 3.2 RCA overall index: 2004-2015 period average



Source: Authors calculations based on COMTRADE data and own regressions.
Note: Sector description is provided in Appendix B.

Table 3.5 Labour Force Sectoral Composition (ISIC rev. 3.1)

Sector	Share 2004	Share 2010	Share 2015
Agriculture	32.4%	24.8%	24.9%
Forestry & logging	0.2%	0.2%	0.2%
Fishing & aquaculture	0.6%	0.5%	0.6%
Mining & quarrying	0.8%	1.2%	1.4%
Basic and fabricated metals, computer, electronic, electrical, optical, machinery	1.1%	1.1%	1.3%
Chemicals and chemical products	0.3%	0.3%	0.3%
Coke and refined petroleum products	0.0%	0.0%	0.0%
Food & beverages	1.8%	2.7%	2.3%
Furniture, other manuf. n.e.c., recycling	1.6%	1.3%	1.0%
Leather and related products	0.5%	0.5%	0.5%
Motor vehicles, trailers and semi-trailers	0.1%	0.2%	0.1%
Other non-metallic mineral products	0.3%	0.5%	0.3%
Paper and paper products	0.1%	0.0%	0.1%
Printing and reproduction of recorded media	0.4%	0.5%	0.3%
Rubber and plastic products	0.2%	0.1%	0.2%
Textile	1.5%	1.3%	1.0%
Tobacco	0.0%	0.0%	0.0%
Wearing apparel	1.6%	1.8%	1.8%
Wood and products of wood and cork, articles of straw	0.3%	0.4%	0.3%
Electricity, gas, water supply, sewerage	0.2%	0.2%	0.2%
Construction	3.7%	5.5%	6.6%
Wholesale/retail, repair of motor vehicles	19.1%	19.2%	18.4%
Hotels and restaurants	5.6%	7.0%	7.0%
Land transport	4.7%	5.6%	6.4%
Post and communication	0.6%	1.0%	0.7%
Sea/air transport	0.6%	0.9%	0.9%
Financial intermediation	0.4%	0.7%	0.8%
Real estate activities	3.7%	4.2%	4.6%
Public administration	3.1%	4.3%	4.3%
Education	5.3%	5.3%	5.1%
Social and health services	1.8%	1.9%	2.3%
Other social and community services	3.3%	3.7%	3.5%
Household activities	4.0%	3.1%	2.5%

Source: Authors' calculations based on ENAHO data.

firm they work for is registered with the competent authorities.[33] Independent workers are also asked whether their business is registered. We use these two sources of information to identify formal and informal workers. According to the ILO (2003) definition, salaried workers without a contract constitute informal workers working outside the informal sector. Unregistered independent workers constitute the rest of the informal labour market.

[33] About 70% of workers without a contract work for an unregistered company. In addition, 99% of individuals who work for an unregistered company do not have a contract.

The informal labour market is strongly heterogeneous, especially with regards to the characteristics of independent workers. Many workers deliberately chose to become independent informal sector workers by weighing the costs and benefits of operating in the formal sector. Other individuals however are excluded from the formal sector. Exclusion can happen because of rigidity in the formal sector rationing the number of formal vacancies for instance. If workers excluded from the formal labour market are not entitled to unemployment benefits, they may decide to become self-employed workers in order to earn some wage. Such distinction is important as these workers who voluntarily exit the formal market differ from those who are excluded from it. The former are typically older, more educated, have work experience in the formal sector, have more human capital, and probably better access to credit. The ENAHO data allows us to (imperfectly) identify these two groups of workers. Independent workers are asked the main reason why they chose to become self-employed workers. We define voluntary self-employed workers those who answer "because I want to be independent" to this question, and the reluctant self-employed workers those who answer "by economic necessity" or "because I can't find a salaried job". A significant share of respondents gave the answer "to earn some, or a higher wage". This answer is not precise enough and does not allow us to allocate these respondents to either group of self-employed workers. We group these workers with those who responded choosing self-employment by family tradition or for other reasons. Finally, the data allows us to identify another category of informal workers: the unpaid family contributors.

We define unemployed workers as active individuals (i.e. not studying) without a job and willing to work, which closely corresponds to the official statistics. Unemployed individuals are also asked to report the industry in which they were previously working. This gives us information (although partial) about the level of sectoral unemployment. We include this information in the analysis whenever possible.

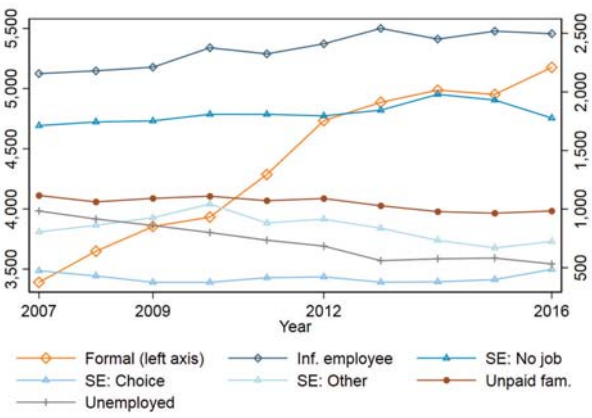
Stylized facts

Several stylized facts about employment, unemployment and informality can be established using the ENAHO data.

As shown in Table 3.5 the largest sector in terms of employment in 2016 is agriculture representing about 25 percent of the total labour force. It is followed by the wholesale/retail and repair of motor vehicles sector with a share labour of 18.4 percent. Amongst manufacturing sectors the food and beverages sectors employs 2.3 percent of the total labour force and the wearing apparel sector 1.8 percent. Strongest progressions between 2004 and 2016 are found for the construction sector (+ 78 percent), followed by the mining and quarrying sector (+ 75 percent) and the land transport sector (+ 36 percent). As to manufactures, the food and beverages sector shows the highest growth rate (+28 percent).

Another prominent fact is that most of the labour force is still informal. Although the share of informal labour has declined over the last decade it is still at 53% in 2016. In addition, the share of informal *employees* among informal workers has increased. This fact underlines the necessity to take into consideration informality when assessing the employment effects of some policy reform. In Figure 3.3 we plot the evolution of each category of workers over the period 2007-2016. The number of formal employees is reported on the left axis. It rose from about 3,4 million workers in 2007 to 5.21 million workers in 2016. Despite the strong increase in the number of formal workers, they still accounted for less than half of the active labour force in 2016 (42% in 2016, compare to 32% in 2007). Put differently, the share of informal labour has declined from almost 68% to 58% over the decade. The largest group of informal workers is that of informal employees, with around 2.5 million workers in 2016. Their number has increased slightly over the decade. Combined with the overall decline in the share of informal workers, informal employees account for about 39% of informal workers in 2016, compared to less than 35% in 2007. The second largest group is

Figure 3.3 Formal and informal labour: 2007-2016
(thousands of workers)



Source: Authors' calculations based on ENAHO data.

that of self-employed workers who can›t find a salaried job (i.e. the reluctant entrepreneurs). Their number is very stable, at around 1.8 million, or about 28% of the informal workers population. The third largest group is comprised of the unpaid family workers, whose share of informal workers has been declining from 18% in 2007 down to 15% in 2016. Voluntary self-employed workers represent the smallest group in the informal workers. Their number is relatively stable over time, slightly below half a million workers, or about 6.5% of the informal population.

Unemployment in the non-agricultural sector has also declined over the period, from 9% in 2007 to around 4% in 2017.

We further find a strong sectoral component to informality, and to self-employment as shown in Table 3.6. Some sectors exhibit a high degree of informality (agriculture, fisheries, manufacturing, construction, wholesale and retail, hotels, transport), while others do not (finance, real estate, public administration, education, health). We also observe that besides agriculture and fisheries self-employed workers are mostly found in wholesale and retail, hotel and restaurants, and transport activities. The latter are essentially non-tradable sectors.

The household and community services, and hotel and restaurants are the sectors with the highest unemployment rate (respectively 9% and 7%), compare to an overall 4% unemployment rate for the whole economy in 2016 (not accounting for the agricultural sector). Sectors with low unemployment rate include the financial intermediation, education, or social and health services.

Informality is pervasive in small firms as the majority of the labour force in small firms is informal. However, larger firms also employ informal labour, in the form of informal employees. The size of the firm in which individuals work is reported in the ENAHO data. We split firm size according to the traditional threshold of 5 employees used to define informality in most countries. By definition, self-employed workers fall into the category of small firms. In 2016, the average share of workers in small firms was 58%. Results are represented in Figure 3.4. We observe that formality in firms with less

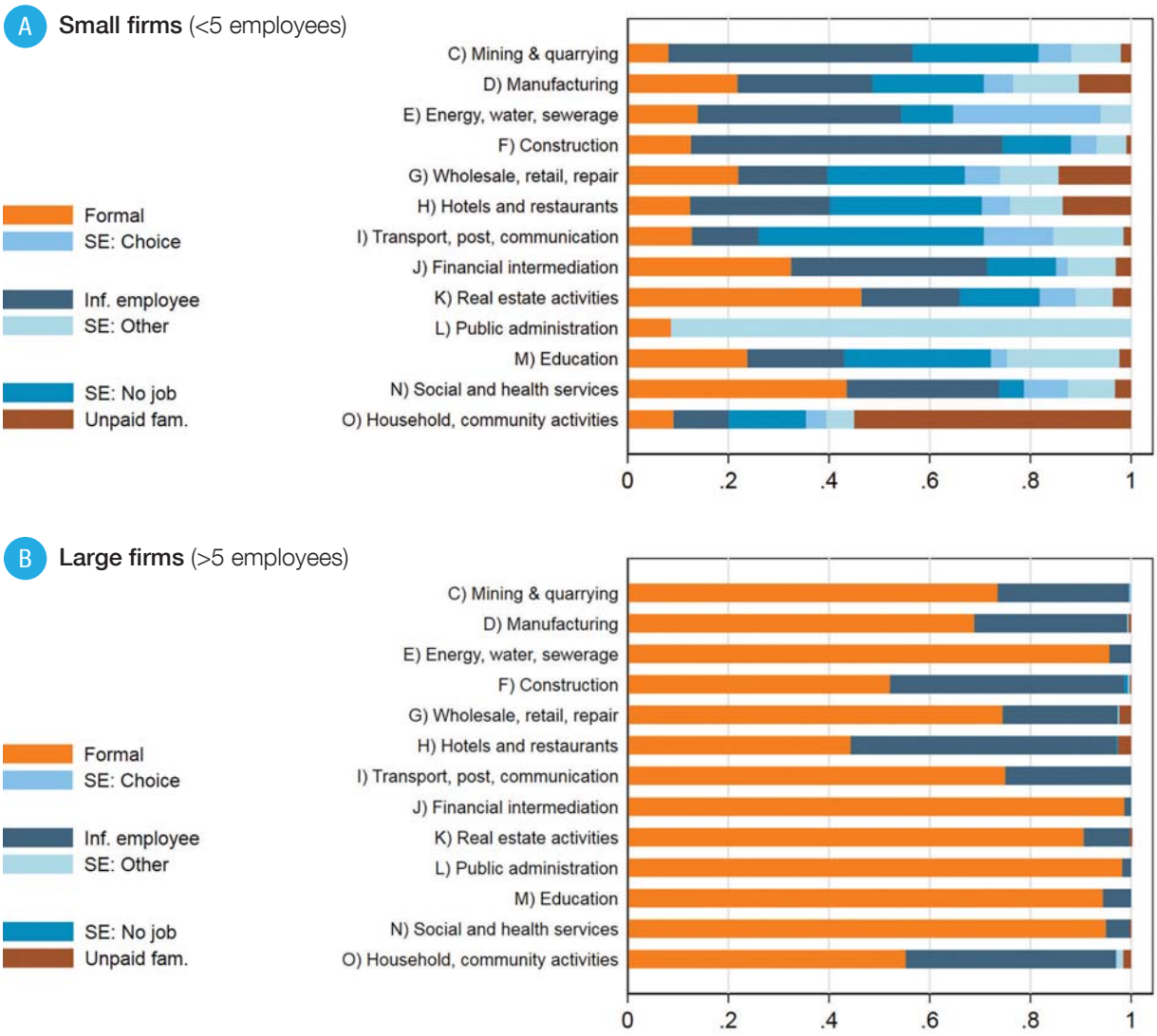
Table 3.6 Sector Composition in 2016: Informality (%) and Unemployment (%)

Sector	FORMAL	INFORMAL						UNEMP.
		Total	Empl.	SE:No-job	SE:Choice	SE:Other	Unpaid fam.	
Agriculture	0.26	0.71	0.29	0.24	0.15	0.02	0.19	0.02
Forestry & logging	0.33	0.68	0.47	0.15	0.05	0.03	0.198	0.01
Fishing and Aquaculture	0.25	0.75	0.36	0.22	0.15	0.02	0.1	0.01
Mining & quarrying	0.6	0.37	0.29	0.04	0.01	0.02	0	0.04
Manufacturing	0.41	0.54	0.27	0.12	0.03	0.07	0.06	0.05
Energy, water, sewerage	0.89	0.09	0.06	0.01	0.02	0	0	0.03
Construction	0.27	0.69	0.54	0.08	0.03	0.04	0.01	0.03
Wholesale, retail, repair	0.31	0.64	0.18	0.21	0.05	0.09	0.11	0.04
Hotels and restaurants	0.18	0.75	0.31	0.22	0.04	0.08	0.11	0.07
Transport, post, communication	0.27	0.71	0.16	0.33	0.1	0.1	0.01	0.03
Financial intermediation	0.93	0.06	0.04	0.01	0	0.01	0	0.02
Real estate activities	0.71	0.26	0.13	0.06	0.03	0.03	0.01	0.03
Public administration	0.95	0.01	0.01	0	0	0	0	0.04
Education	0.88	0.09	0.06	0.02	0	0.01	0	0.02
Social and health services	0.82	0.16	0.1	0.01	0.02	0.02	0.01	0.02
Household, community activities	0.18	0.74	0.16	0.11	0.03	0.04	0.39	0.09

Source: Authors' calculations based on ENAHO data.

Note: Total is the share of informal labour in total labour; Empl. is the share of informal employment; No-job is the share of self-employed in subsistence activities; Choice is the share of voluntary self-employed; Unpaid is the share of unpaid family workers; Unemp. Is the unemployment rate.

Figure 3.4 Formal and informal workers by sector and firm size (2016)



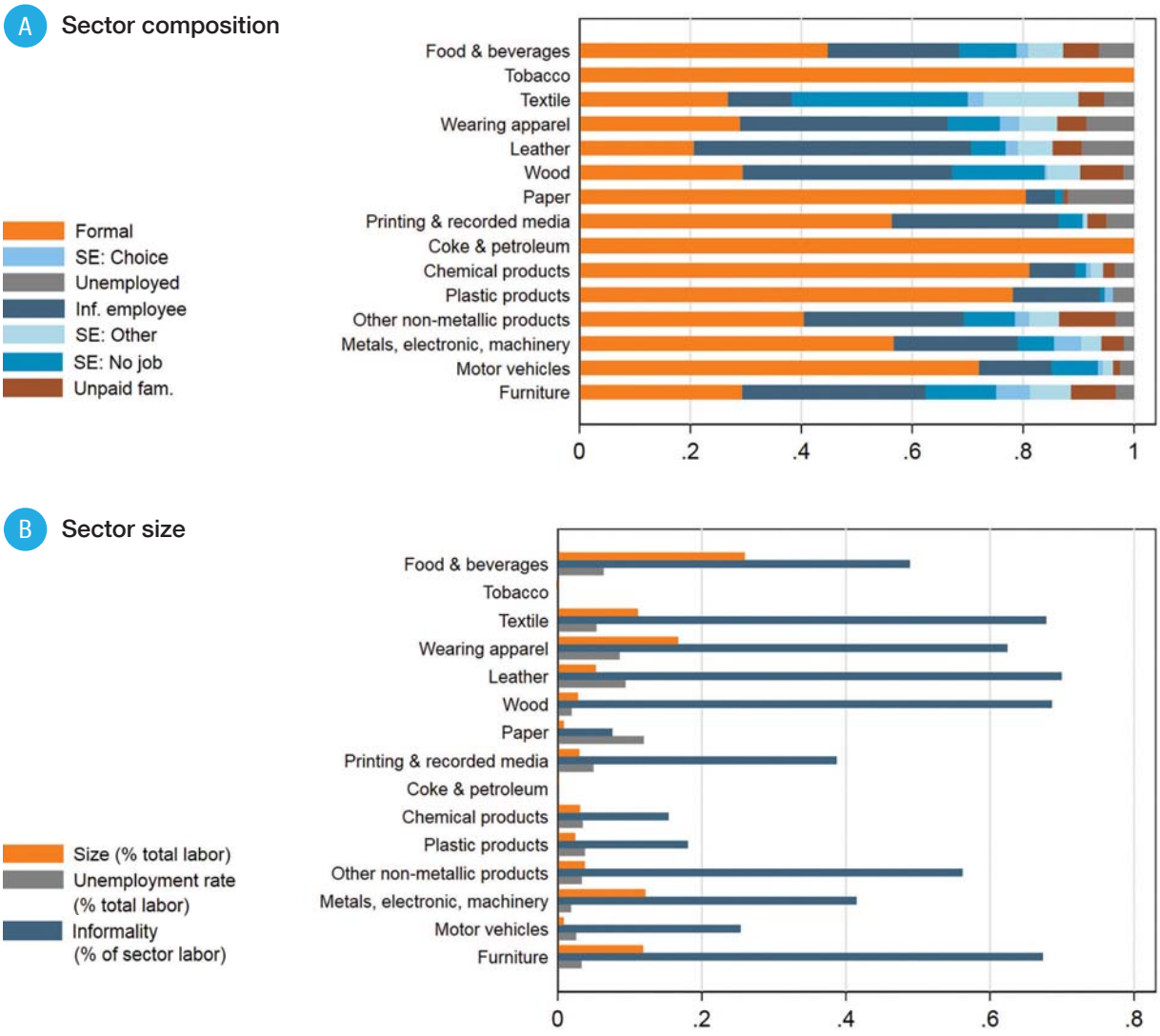
Source: Authors' calculations based on ENAHO data.

than 5 employees is far from the norm. On average, 82% of individuals working in small establishments are informal. In some sectors, informality mostly takes the form of informal employees (Construction, or social and health services), while in other sectors, informality takes the form of informal independent workers. For instance, in small manufacturing firms, 77% of workers are informal, 27% are informal employees, 40% are self-employed individuals, and 10% are unpaid family workers. In the transport sector, 86% of workers are informal. Most of them are independent workers: 45% by necessity; 14% by choice, and 14% for other reasons. Only 13% work as informal paid employees.

There is a strong heterogeneity across manufacturing industries in terms of informality incidence and type of informality. Results are represented in Figure 3.5. Some sectors show very high levels of informality.

For instance, about 67-70% of the labour force in the textile, leather, wood, or furniture sector is informal. Within those sectors, the type of informality also differs. In the textile industry, the majority of informal workers are independent workers who chose this status because they fail to find a formal job (32% of the labour force of this industry). In the leather or wood sector, the majority of informal workers are informal employees rather than independent workers. Sectors showing small rates

Figure 3.5 Formal and informal workers by manufacturing industries (2016)



Source: Authors' calculations based on ENAHO data.

of informality include chemical or plastic products, motor vehicles, or the paper industry. In those sectors, informal workers are mostly informal employees.

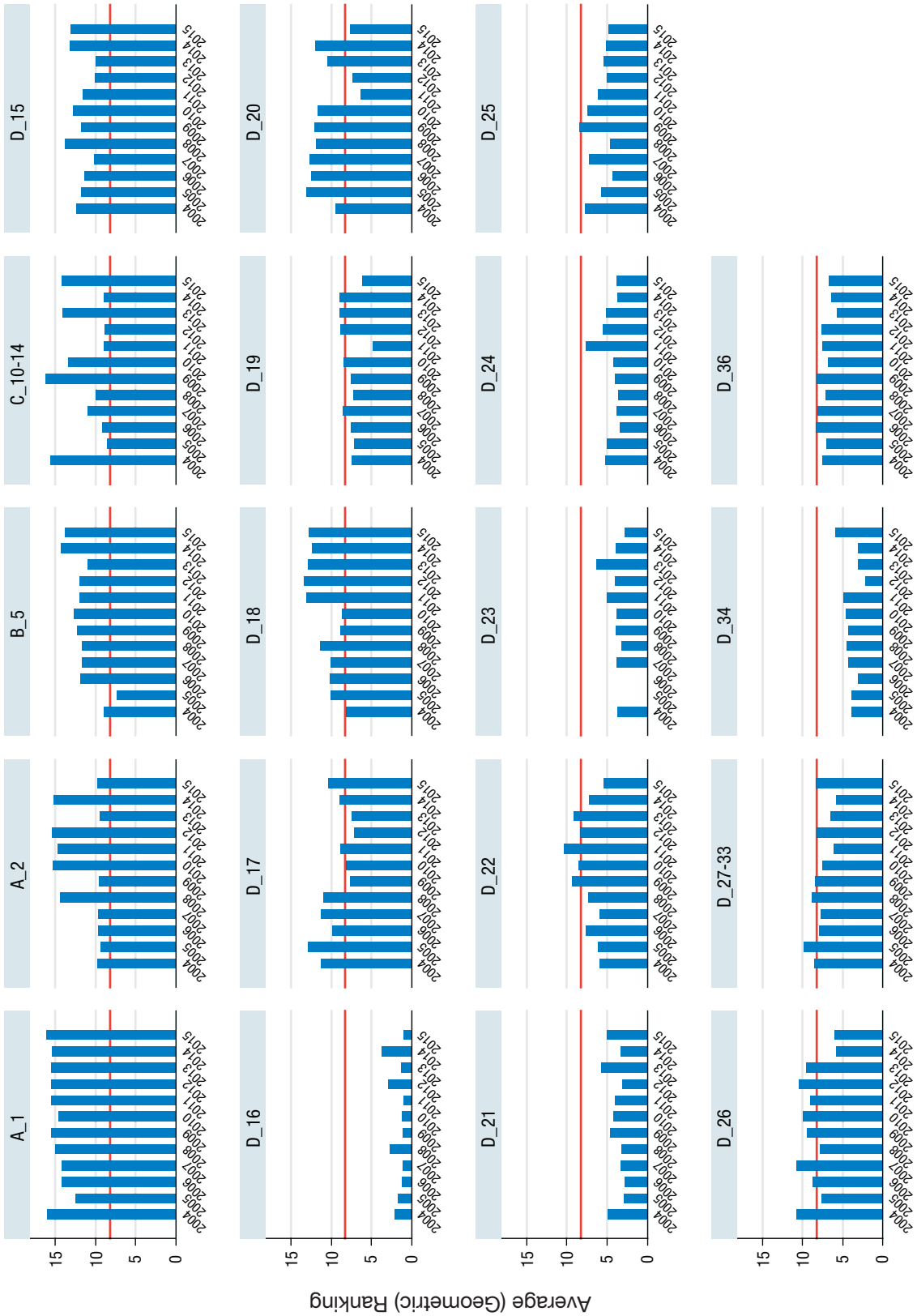
The average unemployment rate of the manufacturing sector is 5%. Some sectors exhibit a higher than average unemployment rate. For instance, we observe 9% unemployment in the wearing apparel industry, or 12% unemployment in the paper industry.

4.1.3 Implementation of Step 4: The RCA-Labour-market nexus

This step is at the core of the approach adopted so far. The goal is to identify those sectors characterized by relatively high comparative advantage and by a labour market with low frictions that is with relatively low unemployment and informality rates. As mentioned previously and as unveiled by the analytical work on informality reviewed in Chapter I, informality refers to informal employees independently of whether they are in formal or informal firms. In the Peruvian context informal employees correspond to employees without a contract.

As mentioned in the previous section the analysis is undertaken at the division level of the ISIC classification. Information does exist at the group level of the classification and analysis could be easily extended. However, for the sake of clarity and keeping in mind that this exercise is mostly illustrative we will limit the

Figure 3.6 Geometric Averages of RCA and Labour Market rankings (2004-2015)



Source: Authors' calculations.
Note: Sector description is provided in Appendix B.

set of sectors. Merging employment with trade data de facto limits the set of sectors to manufactures (10 to 36), agriculture (1 and 2) and fisheries (5). Services could be included in principle if traded. However, the analytical framework would have to be adapted as producing and trading services do not necessarily respond to the same incentives than production and trade in manufactures do. As a consequence we adopt a more conservative approach and associate services essentially with non-traded and non-tradable products. Trade effects may transpose to these sectors via some secondary demand effects as discussed in the review of the literature.

Eventually we end up with 29 sectors for which the full set of information is available over a period of twelve consecutive years from 2004 to 2015.

Figure 3.6 reports average yearly scores for each sector represented in the analysis. The red horizontal line refers to the median over the whole period. Note that median and mean values are equal to 8.25 and 8.29 respectively. Seven sectors outperform and have always scored below the period median. Extraction of petroleum is the only non-manufacture industry/sector amongst this group. The other industries/sectors include manufacture of tobacco products, manufacture of paper and paper products, manufacture of vehicles, manufacture of coke, refined petroleum products and nuclear fuel. Manufacture of leather and of all sorts of machinery, equipment and instruments could also be included in that group. All these sectors if shocked positively via some trade reform should a priori positively affect conditions prevailing on the labour market. Our results further indicate that a negative price shock to agricultural and fisheries sectors may affect adversely the labour market. As to manufactures, the lowest scores are obtained the food and beverages sector and the wearing apparel sector.

Using the above information, we are able to produce a version of Matrix I specific to the Peruvian situation and reported in Table 3.7. The matrix is constructed using period averages. A year-by-year analysis is

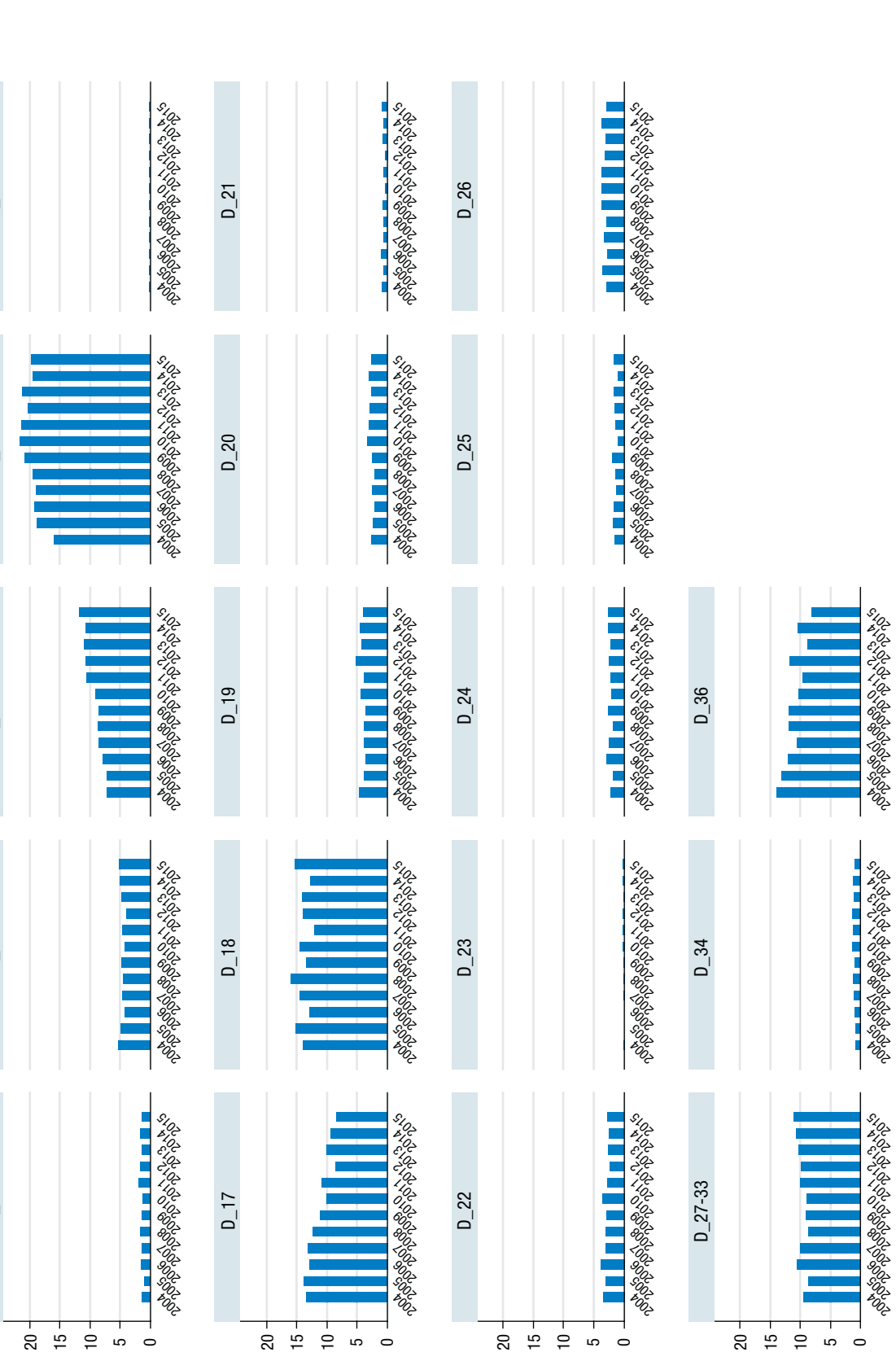
Table 3.7 Labour Market Frictions and RCA

ISIC_Divisions	Frictions	Fric-rank	RCA	RCA-rank	FRIC&RCA	FRIC&RCA-rank
A_1	13.39	19	16.91	18	18.49	19
A_2	11.01	13	13.46	15	13.96	18
B_5	12.44	16	11.00	12	13.86	17
C_10-14	7.82	8	18.19	19	12.33	13
D_15	8.54	9	16.62	17	12.37	14
D_16	**2.42**	**2**	**1.81**	**1**	**1.41**	**1**
D_17	6.94	6	13.80	16	9.80	11
D_18	11.03	14	11.25	13	13.49	15
D_19	**13.29**	**18**	**4.62**	**4**	**8.49**	**10**
D_20	12.47	17	9.26	11	13.67	16
D_21	**2.62**	**3**	**6.57**	**6**	**4.24**	**3**
D_22	**7.37**	**7**	**8.46**	**10**	**8.37**	**8**
D_23	**1.35**	**1**	**13.23**	**14**	**3.74**	**2**
D_24	**3.55**	**4**	**6.47**	**5**	**4.47**	**4**
D_25	**4.63**	**5**	**8.16**	**9**	**6.71**	**6**
D_26	10.45	12	8.01	8	9.80	12
D_27-33	**9.02**	**10**	**6.84**	**7**	**8.37**	**9**
D_34	**9.39**	**11**	**2.06**	**2**	**4.69**	**5**
D_36	**12.40**	**15**	**4.33**	**3**	**6.71**	**7**

Source: Authors' calculations based on Matrix I (section 3) template. Top 10 performing sectors are in bold.

Note: Sector description is provided in Appendix B. The FRIC&RCA column reports the geometric mean of the Fric-rank and the RCA-rank columns and The FRIC&RCA -rank column the corresponding rank. They refer to the Overall_0 and Overall_0 (ranking) columns of Matrix I in section 3.

Figure 3.7 Labour Force in sectors excluding Agriculture (share in Total 2004-2015)



Source: Authors' calculations.
Note: Sector description is provided in Appendix B.

easily implementable. However as the main scope of this exercise is essentially illustrative we only refer to period averages.

Results are presented in Table 3.7. If exports of tobacco products, chemical products, rubber products are positively affected then conditions prevailing on the labour market should be improved. Sectors producing machinery should if positively affected by a trade policy reform may also contribute positively to higher employment rates. On the negative side, the agricultural sector in general the worst performer in terms of our overall indicator. This is not to say that exports of agricultural products should not be promoted but rather that a special attention should be devoted to the various composing sub-sectors.

4.1.4 Implementation of Step 5: identifying employment size effects

This step's goal is to complement step 4 analysis by explicitly considering the distribution of the work force amongst sectors. As mentioned in the previous section and in part II of the document sector size in terms of employment is neither an advantage nor a disadvantage. The role played by this parameter is determined essentially by both the reactivity of the sector to a shock and the sign of the shock a sector faces. If a trade reform affects negatively a relatively large sector then we may expect a relatively large increase in the number of displaced workers with probably severe consequences for the adjustment process if the sector is relatively sensitive to shocks. A relatively small sector in terms of its employment share may be more reactive than a larger one in terms of jobs creation and could create a significant number of positions in the event of a positive shock.

In what follows, a large employment share is considered an advantage. However, the above qualifications should be kept in mind when trying to reach some conclusions in terms of anticipated employment effects.

Figure 3.7 reveals that most sectors preforming well in terms of Overall_0 scores represent a relatively small although not always insignificant share of the labour force. On the contrary, sectors such as agriculture or manufacture of food products and beverages which absorb a large share of the Peruvian labour force do not perform extremely well in terms of our synthetic index. If these latter sectors had to be shocked negatively then expected negative effects would be amplified by a slower adjustment process as more workers most probably would be displaced.

Table 3.8 reproduces Matrix II presented in section 3 for Peruvian data. Once again we opted for time period average figures. Above remarks are echoed by results shown in the table. Interestingly enough, when including size considerations we obtain that agriculture as a whole performs as well as the Tobacco industry in terms of our synthetic indicator Overall_1. If both sectors had to face a positive shock then the employment effect would be also determined by the job creation reactivity to the change induced by the shock, essentially a change in prices. We could still expect agriculture to create a relatively larger number of jobs but more detailed information should be collected to distinguish between agricultural sub-sectors and products.

4.1.5 Implementation of step 5: Exporting firms characteristics

Table 3.9 reports some characteristics and moments of the distribution of exporting firms in the various industries/ sectors. The Tobacco sector appears to be the most concentrated one with only five exporting firms as reported in our data. This clearly reflects the functioning of the domestic market which remains essentially a duopoly between multinationals British American Tobacco and Philip Morris, with 90% and 9% of volume sales, respectively, in 2016 and with no government-owned cigarette producers. Various indicators of dispersion are reported[34] and all take extremely low values for the Tobacco sector in comparison with other sectors. The most populated export segment is the machinery one with about 17 percent of all exporting firms. Textile and wearing apparel account for more almost one fourth of all exporting firms. Firms in the machinery and equipment sector appear to be quite heterogeneous, with dispersion indicators all taking relatively high values. Eleven percent of exporting firms are in the agricultural sector. Dispersion amongst firms in terms of size remains limited.

[34] Dispersion measures indicate the presence of significant outliers as confirmed by the large difference between the mean and the median values of the distribution. The most common measure of dispersion of a frequency distribution is the variance (standard deviation to the square). The Coefficient of Variation is a standardized measure of dispersion that corresponds to the ratio between the mean and the standard deviation of a frequency distribution. Skewness is a measure of the lack of symmetry. A distribution, or data set, is symmetric if it looks the same to the left and right of the center point. The standard normal distribution has a skewness of 3. Kurtosis is a measure of whether the data are heavy-tailed or light-tailed relative to a normal distribution whose kurtosis is thus equal to zero. Data sets with high kurtosis tend to have heavy tails, or outliers and vice-versa.

Table 3.8 Labour market frictions, RCA and labour shares

ISIC_Divisions	FRIC&RCA-rank	share EMP	share EMP-rank	Overall_1	Overall_1 rank
A_1	19	68.40	1	4.36	1
A_2	18	0.47	14	15.87	19
B_5	17	1.48	8	11.66	17
C_10-14	13	2.98	7	9.54	15
D_15	14	6.27	2	5.29	3
D_16	1	0.01	19	4.36	1
D_17	11	3.49	4	6.63	6
D_18	15	4.43	3	6.71	7
D_19	10	1.29	9	9.49	13
D_20	16	0.84	12	13.86	18
D_21	3	0.20	17	7.14	8
D_22	8	0.94	11	9.38	12
D_23	2	0.05	18	6.00	5
D_24	4	0.73	13	7.21	9
D_25	6	0.46	15	9.49	13
D_26	12	1.05	10	10.95	16
D_27-33	9	3.10	6	7.35	10
D_34	5	0.37	16	8.94	11
D_36	7	3.46	5	5.92	4

Source: Authors' calculations based on Matrix II (section 3) template.
Note: Sector description is provided in Appendix B.

As mentioned previously, more dispersion that is more heterogeneity, amongst exporting firms may call for special attention, especially if we also observe the presence of a large number of relatively small producers. In this context, employment effects of negative price shocks could be more severe.

The analysis of exporting firms' characteristics is important in trying to qualify the employment effect of some gains or losses in access to international markets.

A general preliminary assessment and some SDGs considerations

All in all, if Peru had to opt for some trade policy reform the following sectors could be considered as the most pro-employment or most anti-unemployment and anti-informality ones if positively affected by a trade shock: food products and beverages, textiles and wearing apparel, paper and paper products, machinery, furniture and petroleum refinery. Some other sectors do perform relatively well on the RCA-labour market nexus side but remain relatively small with respect to their employment share. A more detailed analysis should be undertaken to appreciate more precisely their employment potential.

The agricultural sector requires a more disaggregated analysis and it might be crucial in terms of employment effects not to expose it to strong negative shocks. The Tobacco sector appears to be of high export potential. However, its production structure calls for some caution when concluding that the promotion of its external performance should be put forward.

As mentioned in the previous section, the framework can be extended to account for additional dimensions of the SDGs such as gender and age. We illustrate this possibility by adding a gender dimension to the

Table 3.9 Exporting firms' sectoral characteristics (2015)

Industry	N	mean	p50	p10	p90	variance	range	Cv (mean/sd)	skewness	kurtosis
A_1 Agriculture	1295	2323131	196990	4995	4582613	7.89E+13	1.66E+08	3.82	10.05	140.20
A_2 Forestry \ logging	127	392853.7	9500	1009	355481	2.98E+12	1.44E+07	4.40	6.05	42.75
B_5 Fishing \ aquaculture	18	73749.74	24131	784	170792	1.71E+10	551589.5	1.77	2.92	11.22
C_10-14 Mining & quarrying	254	4.31E+07	61487	1774	39300000	4.10E+16	2.25E+09	4.70	7.33	66.95
D_27-33 Basic and fabricated metals, computer, electronic, electrical, optical, machinery	2060	4688646	22502	1922	1044667	2.54E+15	1.45E+09	10.75	19.54	463.51
D_24 Chemicals and chemical products	709	1217969	41097	1590	1902474	2.92E+13	7.87E+07	4.44	8.17	87.63
D_23 Coke and refined petroleum products	54	1.72E+07	20085	1050	35700000	3.49E+15	3.04E+08	3.42	3.91	17.21
D_15 Food & beverages	1149	2999252	102051	3424	4359861	2.87E+14	3.76E+08	5.64	13.23	236.66
D_36 Furniture, other manuf. n.e.c., recycling	742	205874.5	8228	948	177701	3.65E+12	4.52E+07	9.28	19.46	431.11
D_19 Leather and related products	536	93190.43	7247	978	130306	2.02E+11	6688409	4.83	10.34	129.96
D_34 Motor vehicles, trailers and semi-trailers	361	256872.7	14195	1500	252110	1.89E+12	1.51E+07	5.36	7.95	70.80
D_26 Other non-metallic mineral products	457	606548.1	5870	940	153706	2.13E+13	7.19E+07	7.61	11.21	147.37
D_21 Paper and paper products	232	275219.2	5915	734	451868	1.49E+12	1.41E+07	4.44	8.14	81.31
D_22 Printing and reproduction of recorded media	301	195955.8	5184	750	85420	2.63E+12	2.48E+07	8.28	12.99	186.13
D_25 Rubber and plastic products	741	679626.2	8160	985	283107	3.15E+13	1.18E+08	8.26	15.52	285.06
D_17 Textiles	1483	570618.4	21607	1730	520241	1.02E+13	6.81E+07	5.60	11.82	189.31
D_16 Tobacco	5	76093.35	64993	24000	179856	3.77E+09	155856.1	0.81	1.11	2.76
D_18 Wearing apparel	1342	353040.5	27637	1787	363047	4.99E+12	5.11E+07	6.33	14.65	275.96
D_20 Wood and products of wood and cork, articles of straw	290	500322.5	15393	915	897339	5.27E+12	2.50E+07	4.59	8.67	86.49

Source: Authors' calculations based on Peruvian Customs' exports data.

statistics discussed previously. Table 3.10 below reports employment, informality and unemployment rates for female workers. Overall women represent 42 percent (last row of column 1) of the labour force working in manufacturing in 2016 according to the ENAHO. Women represent more than half of the labour force in three sectors, foods and beverages (D_15), textiles (D_17) and wearing apparel (D_18).[35]

A priori, there is some correspondence between sectors which are pro-employment if positively affected by a trade shocks and those characterized by a relatively high presence of women. However, indicators reflecting frictions on the labour market (i.e unemployment and informal employment) support a more nuanced picture. The incidence of informal workers is much larger for women than it is for men. Amongst informal female workers, self-employment predominates and in particular what we qualified as subsistence self-employment (column 6). Moreover, unemployment rates are also higher than for men. As a consequence, although a positive trade shock could improve overall job opportunities for women in a sector, the overall female unemployment rate may increase eventually. Other sectors with a more symmetric gender profile such as machinery and equipment (D27-33) may thus be privileged although they involve a relatively smaller share of the labour force. As the purpose of this exercise is purely illustrative a more detailed analysis before reaching any firm conclusion would be necessary.

It is essential to acknowledge the fact that any analysis counting on a framework like the one developed here must be considered as preliminary. In order to be able to appreciate more precisely relevant mechanisms data should be as disaggregated as possible. Nevertheless, important insights could already be generated by any sectoral analysis at any level of disaggregation.

[35] No women appear to work in either the Tobacco (D_16) industry or in petroleum refinery (D_23). As labour force surveys are based on some sampling, it may be the case that no women were interviewed although they may be active within a given sector. This would require some further verification.

Table 3.10 Women Employment (%), Informality (%) and Unemployment (%) in Manufacturing in 2016

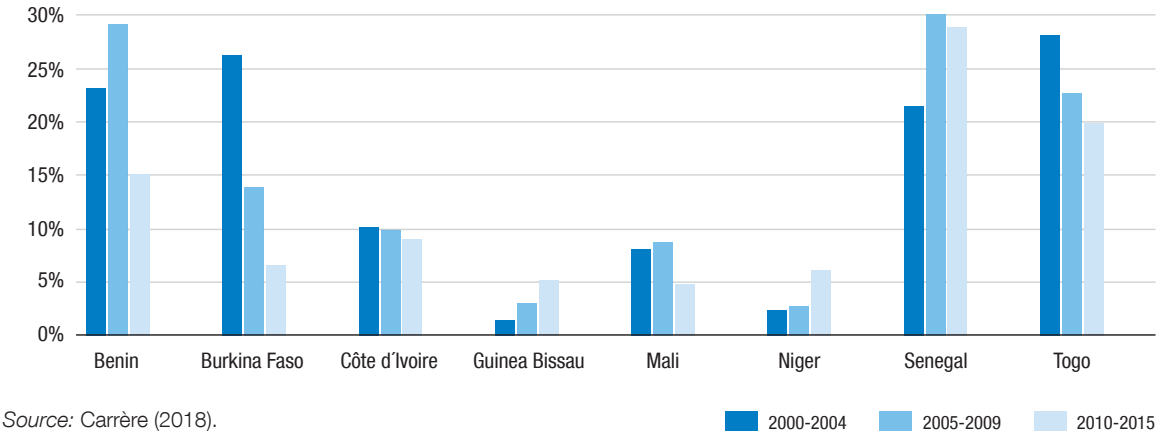
	SHARE	FORMAL	INFORMAL						UNEMP.
			Total	Empl.	SE: No-job	SE: Choice	SE: Other	Unpaid fam.	
D_15	**0.52**	0.31	0.58	0.2	0.15	0.03	0.1	0.09	0.11
D_16	**-**								
D_17	**0.71**	0.17	0.77	0.06	0.41	0.04	0.21	0.06	0.06
D_18	**0.58**	0.23	0.64	0.34	0.12	0.03	0.09	0.05	0.13
D_19	**0.44**	0.14	0.68	0.43	0.07	0.01	0.09	0.08	0.18
D_20	**0.17**	0.13	0.84	0.25	0.21	0	0.07	0.3	0.03
D_21	**0.39**	0.58	0.11	0.05	0.04	0	0	0.02	0.31
D_22	**0.31**	0.51	0.4	0.29	0	0	0	0.11	0.09
D_23	**-**								
D_24	**0.37**	0.79	0.15	0.07	0.03	0.02	0.01	0.02	0.06
D_25	**0.27**	0.5	0.36	0.33	0.03	0	0	0	0.14
D_26	**0.12**	0.13	0.78	0.13	0.06	0	0.11	0.48	0.1
D_27-33	**0.1**	0.52	0.43	0.23	0.03	0.01	0	0.17	0.05
D_34	**0.11**	0.89	0.11	0	0	0	0	0.11	0
D_36	**0.27**	0.23	0.69	0.17	0.16	0.07	0.1	0.18	0.08
Total	**0.42**	0.28	0.62	0.22	0.17	0.03	0.11	0.09	0.1

Source: Authors' calculations based on ENAHO data.

Note 1: Sector description is provided in Appendix B.

Note 2: Total is the share of informal labour in total labour; Empl. is the share of informal employment; No-job is the share of self-employed in subsistence activities; Choice is the share of voluntary self-employed; Unpaid is the share of unpaid family workers; Unemp. is the unemployment rate.

Figure 3.8 WAEMU intra-regional trade (2000-2015)



Source: Carrère (2018).

4.2 Application 2: Regional integration in West-Africa

This application is taken from Carrère (2018). It illustrates the use of core elements of our framework for the assessment of a trade-driven regional integration policy scheme. Countries under scrutiny are all members of the West African Economic and Monetary Union (WAEMU). The inclusion of several countries within the same analysis unavoidably restricts data availability, in particular with respect to the incidence of informal employment, which cannot be addressed in this application. However, it still provides the opportunity to draw some informative and policy-relevant inferences. Major data sources are again COMTRADE and sectoral unemployment estimates taken from Carrère et al. (2016).

Implementation of step 1: definition of policy objectives

WAEMU member states are interested in understanding the consequences of the intensification of the regional integration. In a recent study Carrère (2018) refers to analytical features presented previously to inform possible consequences of an intensification of intra-regional exchanges. Intra-regional trade is not the only component of regional integration in West Africa, but according to recent statistics as reported in Figure 3.8 its potential may have not been fully exploited.

The study then aims at evaluating the relative effect of trade on the unemployment rate of the eight WAEMU countries over the period 2000-2015 and to estimate the extent to which intra-UEMOA trade can have a different impact on unemployment.

Implementation of Step 2: Computation of RCA indicators

Sectors represented are comparable to those represented in application 1. RCA is computed using the standard Balassa index as described in Appendix A. A detailed graphical analysis not reported here because of space limitation, is provided in the reference study.

Two major facts emerge from the analysis. First, countries' comparative advantage is often very concentrated. Few sectors have an RCA indicator greater than 1, i.e. a comparative advantage, and, in most cases, the agriculture sector stands out very strongly. It appears to dominate very largely in Benin (RCA = 7.4 in 2010-2015), Côte d'Ivoire (13.3), Guinea Bissau (21.9) and Burkina Faso (9.6 but 23.6 in 2005-2009). This agricultural sector also appears to be important in the other countries but with an RCA lower than "Other non-metallic mineral products" for Togo, Senegal, "basic metallurgical products" for Burkina Faso and Mali, and "products of refined oil "for Niger. Second, while the sectors represented as the strengths of the countries remain about the same over the period studied, the intensity of their comparative advantage changes. For example, some countries appear to "diversify" slightly in terms of revealed comparative advantage. Benin, Burkina Faso, Togo, Mali and Niger have an RCA indicator in the agricultural sector which has fallen sharply in 2010-2015 (although it remains well above unity) but benefitted from an increase in their comparative advantage in basic metallurgical products for the first three countries, in Textile for Mali and in food products, beverages and tobacco for Niger.

Implementation of Step 3: Assessment of labour market frictions

As already mentioned, there is no cross-country dataset about unemployed and informal workers at the sectoral level. This type of information may be extracted from labour surveys if relevant employment related individual characteristics are included as in the ENAHO case for Peru. However, in most circumstances such refined estimation is not implementable. The alternative is to rely on indirect estimates of labour market frictions. This approach is adopted by Carrère et al. (2016) to compute sectoral unemployment rates. These estimates are based on aggregate unemployment data (at country and year level) as well as employment shares of 24 sectors in a sample of 95 countries over a period 1995-2009. They represent an average tendency across countries and vary at the sector, but not the country level.[36] In order to use these estimates in a multi-country analysis, we rely on the hypothesis that although they are not the same across countries their ranking remains comparable. Average and median values of these unemployment rate estimates are around 15% with a maximum of 25% for the electrical machinery and appliances manufacturing sector, followed by the leather products manufacturing sector. The sector with the lowest estimated labour market frictions labouris the manufacture of "precision instruments, optical and medical".

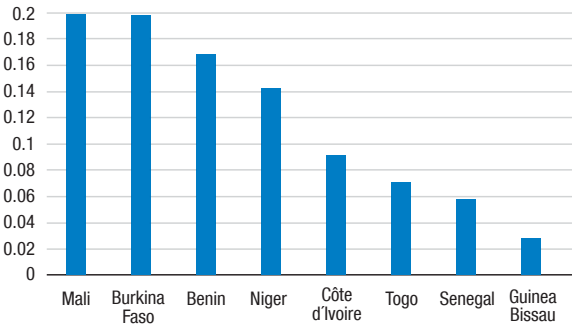
Carrère (2018) adopts these estimates to reflect frictions in the labour market at the sectoral level.

However, no information about sectoral informality is included in the analysis. If informality and unemployment at the sectoral level are closely related, this does not strongly affect the final results.

Implementation of Step 4: The RCA-Labour-market nexus

The approach to assess the nexus between the RCA and the labour market frictions patterns followed in Carrère (2018) is conceptually similar to the one proposed in our framework. However, instead of aggregating rankings across dimensions at the sectoral level correlation coefficients are computed at the country level. The main advantage of the latter approach is not to have to rely on any arbitrary aggregation procedure. However, no detailed sector-level analysis can be undertaken. Figure 3.9 shows that in 2010-2015, all countries have some comparative advantage in sectors with relatively high labour market frictions. Thus, a future development of the sectors corresponding to this comparative advantage pattern to the detriment of other sectors such as agriculture would probably lead, in the long run, to an increase in the aggregate unemployment rate.

Figure 3.9 Correlation between labour market frictions and RCA, WAEMU countries 2010-2015



Source: Carrère (2018).

Implementation of Steps 5 to 7

These steps are not explicitly explored in Carrère (2018). Limited data availability is a major constraint in any multi-country study. However, despite such limitation some policy implications can be inferred from the information revealed in the study. For example, a government that observes a high correlation between comparative advantage and labour market frictions in its country can pay close attention to this link and conduct more in-depth studies when assessing a trade policy change. This example also illustrates the possibility to adapt our framework to some particular situation and account for missing information without compromising the whole investigation.

Implementation of Step 8: reality check and policy options

The policy issue at stake is mainly to understand whether regional integration based on trade intensification is a strategy worth pursuing. To do so, Carrère (2018) re-computes RCA indicators for each sector and country and re-assesses the labour market-RCA nexus focusing exclusively on intra-regional trade flows. These estimates yield labour two

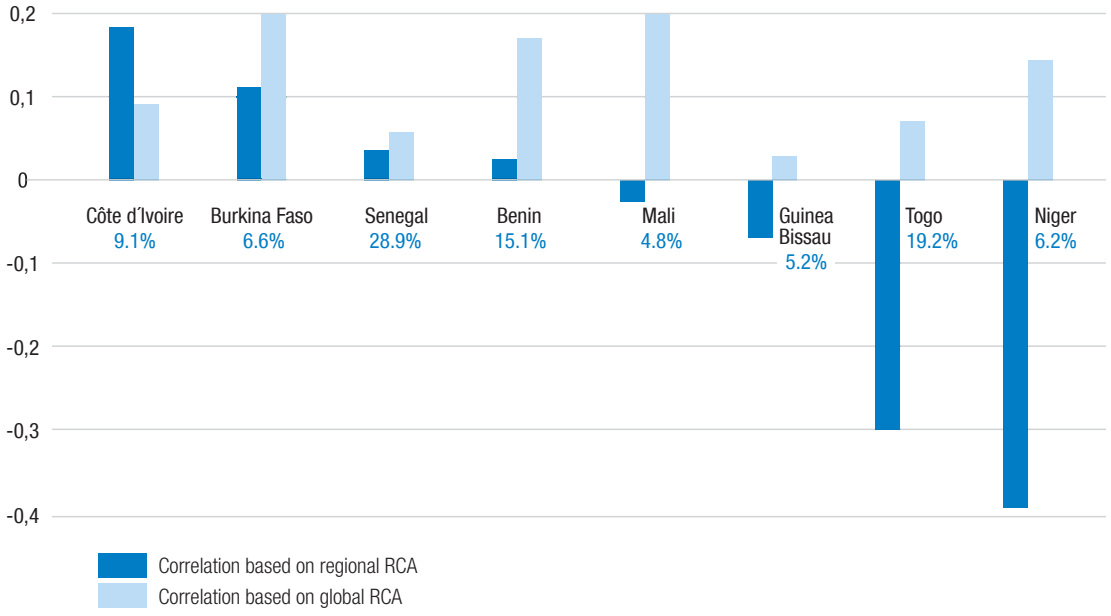
[36] That is, country specific estimates would only be equal to these average values up to a country specific constant reflecting country specific characteristics such as the regulatory framework and up to a time specific constant reflecting time specific conditions applying to each sector such as overall demand.

important insights: First since the member countries of the region share some strong sectors at the global level, the RCA in those becomes less marked when the comparison unit is reduced to the region. For instance, Benin has a comparative advantage in petroleum refinery (sector 23) both at the regional and at the global level. However, given the number of WAEMU countries that also have relatively high shares of this sector in their intra-regional exports, the value of the associated RCA is much lower for Benin (2.2 in 2010-2015 instead of 7.4 at the global level). Similar remarks apply to Niger. At the same time, Senegal and Togo, which also have an RCA in that specific sector globally in 2010-2015, do not seem to benefit at the regional level - the share of their exports in the sector being well above the global average but below the regional average.

While "traditional" comparative advantage sectors may appear less pronounced within WAEMU, new sectors emerge. That is the case for instance of the "Electrical machinery and apparatus" sector (sector 31) and "Radio, television and communication equipment" (sector 32) sectors for Senegal, the "Articles of clothing, furs" (sector 18) and "Other transport equipment" (Sector 35) sectors for Togo, the "Textile" (sector 17) sector for Niger, the "Wood, wooden articles" (sector 24) and "Primer and tanning leather, leather goods and shoes" (sector 19) sectors for the Mali.

This redistribution of the RCA between sectors can therefore lead to significantly different conclusions about the impact that the development of these regional trade flows could have on the labour market of the WAEMU countries. Figure 3.10 shows the existing correlation, for each country, between the frictions of the labour market and, this time, the comparative advantage revealed at the regional level. Countries are ranked in descending order. We observe that for all countries, with the exception of Côte d'Ivoire, the development of intra-regional trade (relative to total trade) would mitigate a possible rise in aggregate unemployment associated with developments in "traditional" sectors (sectors with a strong global R10A).

Figure 3.10 Correlation between labour market frictions and regional RCA, 2000-2015



Source: Carrère (2018).

APPENDIX

A

MEASURING COMPARATIVE ADVANTAGE

One of the most common concepts to determine whether a country could benefit from exporting a specific good is the idea of comparative advantage, first introduced by David Ricardo 200 years ago (Ricardo: 1817). A country has a comparative advantage in producing a good if it is relatively more efficient at producing this good than other countries. In the classic example given by Ricardo (1817), Portugal can produce more units of both cloth and wine per hour than England, so it has an absolute advantage in both. However, Portugal has to give up less units of cloth in order to produce one unit of wine than England, which means that it has as a comparative advantage over England in producing wine. As a consequence, England has a comparative advantage in cloth, as it has to give up less units of wine in order to produce one unit of cloth than Portugal. In other words, England has a lower (higher) opportunity cost of producing cloth (wine) than Portugal, and vice versa. If each country specializes in their domain of comparative advantage, and they start trading with each other, both countries can consume more wine and more cloth than in autarky. Differences in comparative advantage are thus the reason for the emergence of gains from trade in the Ricardian model.

While the theoretical concept is quite clear, especially in the two-goods two-country example, its empirical measurement in a multi-country multi-product setting is more challenging. In practice, various measures have been proposed to capture comparative advantage. The most well-known is the revealed comparative advantage proposed by Balassa (1965), which has since then been used in numerous empirical applications. The Balassa index has been criticized for several of its properties, and attempts to remediate these problems have given rise to a variety of alternative measures.

1. Revealed comparative advantage - relative trade flows

The most commonly used measure of comparative advantage is the Balassa Index of Revealed Comparative Advantage (RCA_BI).

The Balassa index uses sector-level data on trade flows and captures how successful countries are at exporting certain products, as compared to other countries. The index consists of the share of sector s in country c's exports, weighted by the share of this sector in world exports. Formally, it is defined as follows:

$$RCA\_BI_{cs} = \frac{\frac{X_{cs}}{X_c}}{\frac{X_{ws}}{X_w}} = \frac{\frac{X_{cs}}{X_{ws}}}{\frac{X_c}{X_w}}$$

If $RCA\_BI_{cs} > 1$, country c has a revealed comparative advantage in sector s. If $RCA\_BI_{cs} < 1$, it has a comparative disadvantage.

The Balassa index is easy to compute and to understand, and the data required for its computation is widely available for most countries and sectors.

However, there are several reasons why it is not always the best possible indicator of comparative advantage. A first set of concerns relates to its distributional properties. By definition, the Balassa index ranges from 0 to infinity. Hence, the distribution is highly asymmetric. The distribution of non-comparative advantage sectors (values between 0 and 1) is very different from the one of comparative advantage sectors (values 1 to infinity).[37] Therefore, the Balassa index can be used to rank sectors within a country by their comparative advantage, but not to answer questions such as "by *how much* is sector A more competitive than sector B". In addition, the mean of the index can vary from one year to another, which implies that one cannot compare the comparative advantage of sectors within a country over time. Different transformations to improve these distributional properties of the Balassa index include Proudman and Redding (2000),[38] Laursen (2015) and De Benedictis and Tamberi (2001). A second disadvantage of the Balassa index relates to the fact exporter-sector specific factors cannot be disentangled from other factors influencing trade flows, such as importer- or sector-specific factors (e.g. import demand shocks, income effects and the tradability of goods).[39] Finally, the Balassa index is highly sensitive to the set of sectors included in the analysis. Whether one sector is considered as of comparative advantage may depend on the other sectors included in the data. The next section discusses indices that address several of the concerns related to the Balassa index.

2. Revealed productivity derived from gravity regression

In Ricardian theory, comparative advantage is about productivity, or the technology of transforming inputs into outputs. But the Balassa index compares actual trade flows, and may thus be affected by factors which are not exporter-sector specific. It measures how good a country is at *exporting* a certain good, not necessarily how good it is at *producing* it. For example, the Balassa index risks being affected by the trade policy between a country and its partners.

Based on theoretical advances of Eaton and Kortum (2002), a number of recent papers, starting with Costinot et al. (2012), have computed comparative advantage measures that are able to isolate country-sector level productivity by using exporter-sector fixed effects in gravity regressions. Exporter-sector fixed effects are binary variables that take the value 1 if an observation is a trade flow corresponds to a particular exporter and sector. The regression coefficients obtained for these variables capture all exporter-sector characteristics that have an influence on trade flows.[40]

Costinot et al. (2012) build a Ricardian theoretical model allowing for intra-industry heterogeneity in productivity and derive the following equation, which can be estimated quantitatively.

$$\ln x_{ijk} = \delta_{ij} + \theta ln\tilde{z}_{ik} + \delta_{jk} + \varepsilon_{ijk}$$

x_{ijk} are the exports from country i to country j in sector k and δ_{ij} and δ_{jk} are exporter-importer, and importer-sector fixed effects. $\tilde{z}_{ik}$ is the productivity of exporter i in industry k, and θ captures the elasticity of trade flows (i.e. how much they react) to changes in productivity. The authors use data on trade flows and producer price indices to compute the parameter θ. Having a value for θ[41] allows them to construct revealed measures of productivity $\tilde{z}_{ik}$ from the exporter-sector fixed effects from a simple gravity regression

$$\ln x_{ijk} = \delta_{ij} + \delta_{ik} + \delta_{jk} + \varepsilon_{ijk}$$

by computing

$$\tilde{z}_{ik} = e^{\frac{\delta_{ik}}{\theta}}$$

By normalizing this measure for some industry and country it then possible to assess the comparative advantage of some country in some sector with respect to any other country in any sector represented. Hanson, Lind and Muendler (2016) propose a different normalization arguing that because of the presence

[37] The asymmetric distribution can be seen, for example, in the distribution for Peru (graph in next section).

[38] In our application in addition to the standard Balassa RCA index we use its normalized version based on Proudman and Redding (2000) contribution. Their adaptation of Balassa's revealed comparative advantage index allows for its comparison across time and countries.

[39] See for instance Leromain and Orefice (2013) for a detailed discussion.

[40] For example, the fixed effect for Peru and dairy products will capture whatever Peru's exports of dairy products to all its trading partners have in common, i.e. everything that is not related to the importing country, its demand for dairy products or its commercial relations with Peru.

[41] Their preferred estimate (i.e. 6.53) is in line with previous estimates of this coefficient obtained in the literature using different methodologies.

of the importer-industry fixed effect in the gravity estimation, export capability is only identified up to an industry normalization. Industry export capability of a given exporter is computed as $e^{\delta_{ik}} \Big/ \frac{1}{S}\sum_{i=1}^{S} e^{\delta_{ik}}$

S being the number of countries in the sample used for the estimation of the gravity model. This normalization differences out both worldwide industry supply conditions and worldwide industry demand conditions. The approach by Hanson Lind and Muendler (2016) has the advantage that it does not require data on producer prices, but only trade flows and a number of standard gravity variables to capture bilateral trade cost. Hence, if one wants to estimate comparative advantage for a set of countries for which producer prices are not available, one does not have to rely on elasticity parameters obtained from other data.

Leromain and Orefice (2013) propose to use Costinot et al. (2012) measure of country-sector level productivity using the value for θ they estimated to compute a revealed comparative advantage indicator that captures only exporter-sector level information. To obtain a normalized measure of comparative advantage, they compute the relative productivity of an industry as compared to other industries in the same exporting country $(\frac{\tilde{z}_{ik}}{\tilde{z}_i})$ and weight it by the relative productivity of this industry as compared to all sectors worldwide $(\frac{\tilde{z}_k}{\tilde{z}})$, where $\tilde{z}_i$, $\tilde{z}_k$ and $\tilde{z}$ represent respectively country's i average sectoral productivity, sector k average world productivity and overall world average productivity. Their measure reads

$$RCA\_Cepii_{ik} = \frac{\frac{\tilde{z}_{ik}}{\tilde{z}_i}}{\frac{\tilde{z}_k}{\tilde{z}}}$$

The Cepii index[42] presents several advantages over the Balassa index. First, it isolates the exporter's productivity from confounding factors related to the importer. Second, it has more advantageous distributional properties. It is not only more symmetric than the Balassa index, but, more importantly, more stable over time. Therefore, it can be used to study the evolution of comparative advantage over time. Third, from a theoretical point of view, it is not sensitive to the set of sectors included in the analysis. In the empirical practice, its values can still vary slightly when changing the set of sectors, but much less than those of the Balassa index.

Additional gravity-based approaches to measuring comparative advantage have been developed such as in Levchenko and Zhang (2016). They are not discussed in further detail here, as they are relatively similar to the methods proposed by Costinot et al. (2012) and Leromain and Orefice (2013).

3. Caveats of comparative advantage

It is important that comparative advantage at a particular point in time alone is, generally speaking, not sufficient to orient long-term trade and industrial policy. Other important factors countries have to bear in mind include the terms of trade, i.e. the relative price at which goods are exchanged against each other. These are not stable over time, and may offset the advantages of specializing in a particular sector. Also, comparative advantage is a static concept, but countries' top export products are subject to continuous turnover (Hanson et al.: 2016). Comparative advantage captures a country's current export performance, not potential (it's ex post). Hence, it may fail to identify sectors that have the potential to evolve positively given a country's resources and technologies. Finally, it does not account for market size and structure. Revealed comparative advantage could be the same for a monopolist and a country facing many competitors - but the strategy to expand this export sector might have to be fundamentally different in either of those two situations. Or, a country may be very competitive in a niche product, but since the demand for this good is small, the possibility of expanding exports are very limited.

4. Alternative indicators to capture export potential

In addition to the different indices of comparative advantage, there are a number of alternative measures to identify sectors with export potential. This section briefly outlines a number of them, but they are not discussed in detail in this report.

Decreux and Spies (2016) propose an Export Potential Indicator (EPI) based on the idea of identifying gaps between what countries *could* export and what they *do* export to a particular destination in a particular sector. Like the Balassa and Cepii indices of revealed comparative advantage, the EPI only accounts for products that are already being exported by a country (the *intensive margin*).

Other approaches target the question which products a country could (or should) start exporting

[42] We call this index RCA_Cepii as it was initially proposed in a Cepii working paper.

(the *extensive margin*). For example, Fortunato et al. (2015) and Decreux and Spies (2016) operationalize the concept of the "product space" proposed by Hidalgo et al. (2007). The "product spaces" develops a measure of "proximity" of export products, capturing the idea that countries that export certain products are likely to export certain other products (or be able to do so). However, it is important to keep in mind that all these approaches are originally based on some RCA measures. In other words, potentiality is deduced from existing patterns of RCA across economies.

Cuyers et al. (2012) develop a Decision Support Model (DSM) based on a top-down approach. They start by identifying potential target markets based on macroeconomic characteristics, and successively apply more and more disaggregate filters to take account of factors such as product specificities and internal market characteristics.

Potentially, these alternative approaches can be used to inform a trade and employment policy strategy. Whether this is viable and desirable depends on the availability of data and analytical resources, the goal or intended use of the policy, and the particular country context.

REFERENCE SECTORS IN PRACTICAL APPLICATIONS BASED ON THE INTERNATIONAL STANDARD INDUSTRIAL CLASSIFICATION OF ALL ECONOMIC ACTIVITIES (ISIC 3) REVISION 1

Sections	Sectoral Aggregation	#	Divisions
A - Agriculture, hunting and forestry	A_1 Agriculture	1	Agriculture, hunting and related service activities
	A_2 Forestry & logging	2	Forestry, logging and related service activities
B - Fishing	B_5 Fishing & aquaculture	5	Fishing, aquaculture and service activities incidental to fishing
C - Mining and quarrying	C_10-14 Mining & quarrying	10	Mining of coal and lignite; extraction of peat
		11	Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying
		12	Mining of uranium and thorium ores
		13	Mining of metal ores
		14	Other mining and quarrying
D - Manufacturing	D_15 Food & beverages	15	Manufacture of food products and beverages
	D_16 Tobacco	16	Manufacture of tobacco products
	D_17 Textiles	17	Manufacture of textiles
	D_18 Wearing apparel	18	Manufacture of wearing apparel; dressing and dyeing of fur
	D_19 Leather and related products	19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear
	D_20 Wood and products of wood and cork, articles of straw	20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
	D_21 Paper and paper products	21	Manufacture of paper and paper products
	D_22 Printing and reproduction of recorded media	22	Publishing, printing and reproduction of recorded media
	D_23 Coke and refined petroleum products	23	Manufacture of coke, refined petroleum products and nuclear fuel
	D_24 Chemicals and chemical products	24	Manufacture of chemicals and chemical products
	D_25 Rubber and plastic products	25	Manufacture of rubber and plastics products
	D_26 Other non-metallic mineral products	26	Manufacture of other non-metallic mineral products
	D_27-33 Basic and fabricated metals, computer, electronic, electrical, optical, machinery	27	Manufacture of basic metals
		28	Manufacture of fabricated metal products, except machinery and equipment
		29	Manufacture of machinery and equipment n.e.c.
		30	Manufacture of office, accounting and computing machinery
		31	Manufacture of electrical machinery and apparatus n.e.c.
		32	Manufacture of radio, television and communication equipment and apparatus
		33	Manufacture of medical, precision and optical instruments, watches and clocks
	D_34 Motor vehicles, trailers and semi-trailers	34	Manufacture of motor vehicles, trailers and semi
	D_35 Other transport equipment	35	Manufacture of other transport equipment
	D_36 Furniture, other manuf. n.e.c., recycling	36	Manufacture of furniture; manufacturing n.e.c.

Note: Sectoral aggregation reported in column 2 is the reference set of groups used in applications 1 and 2 in Chapter 3 section 4.

REFERENCES

Acosta P & Montes-Rojas G (2010). Informal jobs and trade liberalization in Argentina. Mimeo.

Alchian A & Allen W R (1964). University Economics. Belmont, CA: Wadsworth Pub. Co.

Alemán-Castilla B, (2006). The effect of trade liberalization on informality and wages: evidence from Mexico. CEP Discussion Paper No. 763.

Alschner W & Seiermann J & Skougarevskyi D, (2017). Text-as-data analysis of preferential trade agreements: Mapping the PTA landscape. UNCTAD Research Paper No. 5.

Antràs P & Garicano L & Rossi-Hansberg E, (2006). Offshoring in a Knowledge Economy. Quarterly Journal of Economics, 121(1): 31-77.

Arvis J-F & Shepherd B., (2016). Measuring Connectivity in a Globally Networked Industry: The Case of Air Transport. The World Economy, 39(3): 369-385.

Arvis J-F & Duval Y & Shepherd B & Utoktham C & Raj A, (2015), Trade Costs in the Developing World: 1995-(2012). DTC Working Paper 15-2.

Artuç E & Lederman D & Porto G, (2015). A mapping of labor mobility costs in developing countries. Journal of International Economics, 95(11): 28-41.

Autor D H & Dorn D & Hanson G H , (2013). The China Syndrome: Local Labor Market Effects of Import Competition in the United States. American Economic Review, 103(6): 2121-2168.

Baldwin R, (2008). Managing the Noodle Bowl. The fragility of East Asian Regionalism. The Singapore Economic Review, 53(03): 449-478.

Baldwin R & Masahiro K, (2013). Multilateralizing Asian Regionalism. ADBI Working Papers 431.

Bhagwati J, (1971). The Generalized Theory of Distortions and Welfare. in Bhagwati et al., Trade, Balance of Payments and Growth: Papers in International Economics in Honor of Charles P. Kindleberger, Amsterdam: North-Holland.

Bernard A B & Jensen J B & Redding S J & Schott P K, (2007). Firms in International Trade. Journal of Economic Perspectives, 21(3): 105-130.

Beverelli C & Neumueller S & Teh R, (2015). Export Diversification Effects of the WTO Trade Facilitation Agreement. World Development, 76(C): 293-310.

Boughner D & de Gorter H & Sheldon I, (2000). The Economics of Tariff-Rate Quotas in the Agricultural Agreement in the WTO. Agricultural and Resource Economics Review, 20: 58–69.

Brecher R, (1974). Minimum Wage Rates and the Pure Theory of International Trade. Quarterly Journal of Economics, 88; 98-116.

Carrère C, (2018). Analyse de la Relation entre Commerce et le Marché de l'Emploi dans l'UEMOA. Document de Travail Politiques de Développement FERDI No.219.

Carrère C & Olarreaga M & Raess D, (2017), Labor Clauses in Trade Agreements: Worker Protection or Protectionism? CEPR Discussion Paper Series No.12251.

Carrère C & Grujovic A & Robert-Nicoud F, (2015). Trade and frictional unemployment in the global economy. CEPR Discussion Paper No.10692.

Carrère C & Fugazza M & Olarreaga M & Robert-Nicoud F, (2014). Trade in unemployment. UNCTAD Policies Issues in International Trade and Commodities Series No.65.

Carrère C & Fugazza M & Olarreaga M & Robert-Nicoud F, (2016). On the heterogeneous effects of trade on unemployment. CEPR Discussion Paper Series No.11540.

Chaney T, (2008). Distorted Gravity: The Intensive and Extensive Margins of International Trade. American Economic Review, 98(4): 1707-1721.

Chen MX & Mattoo A (2008). Regionalism in Standards: Good or Bad for Trade? Canadian Journal of Economics, 41(3): 838–63.

Costinot A & Donaldson D & Komunjer I, (2012). What goods do countries trade? A quantitative exploration of Ricardo's Ideas. Review of Economic Studies, 79:581-608.

Cuñat A & Melitz M, (2012). Volatility, Labor Market Flexibility, and the Pattern of Comparative Advantage. Journal of the European Economic Association, 10:225-254.

Currie J & Harrison A, (1997). Sharing the Costs: The Impact of Trade Reform on Capital and Labor in Morocco. Journal of Labor Economics, 15:S44-S71.

Davidson C & Martin L & Matusz S, (1999). Trade and Search Generated Unemployment. Journal of International Economics, 48(2):271-99.

Davis D, (1998). Does European Unemployment Prop Up American Wages? National Labor Markets and Global Trade. American Economic Review, 88: 478-494.

Dennis A & Shepherd B, (2011). Trade Facilitation and Export Diversification. The World Economy, 34(1): 101-122.

Disdier A-C & Marette S, (2010). The Combination of Gravity and Welfare Approaches for Evaluating Non-Tariff Measures. American Journal of Agricultural. Economics, 92(3): 713-726.

Dix-Carneiro R, (2014). Trade Liberalization and Labour Market Dynamics. Econometrica, 82(3): 825–885.

Dix-Carneiro R & Kovak B, (2017). Trade Reform and Regional Dynamics. American Economic Review, 107(10): 2908-46.

Dutt P & Mitra D & Ranjan P, (2009). International trade and unemployment: theory and cross-national evidence. Journal of International Economics, 78 (1): 32–44.

Edwards S & Edwards A, (1996). Trade Liberalization and Unemployment: Policy Issues and Evidence from Chile. Cuadernos de Economia, 33: 227-50.

Evenett S J & Fritz J, (2015). Throwing Sand In The Wheels: How Foreign Trade Distortions Slowed LDC Export-Led Growth. CEPR Press, London.

Felbermayr G J & Prat J & Schmerer H-J, (2011). Trade and unemployment: what do the data say? European Economic Review, 55(6): 741–758.

Feenstra R & Hanson G, (1996). Globalization, Outsourcing, and Wage Inequality. American Economic Review, 86(2):240-245.

Fernandes A M & Ferro E & Wilson J S, (2015). Product standards and firms' export decisions. World Bank Policy Research Working Papers Series No.7315.

Fontagné L & Orefice G & Piermartini R & Rocha N, (2015). Product standards and margins of trade: Firm-level evidence. Journal of International Economics, 97(1): 29-44.

Fiess N M & Fugazza M (2012), Informality and Openness to Trade: Insights from Cross-sectional and Panel Analyses. Margin: The Journal of Applied Economic Research, 6(2): 235-275.

Fiess N M & Fugazza M, (2010). Trade liberalization and informality: New stylized facts. UNCTAD Policy Issues in International Trade and Commodities Series No. 43.

Fiess N M & Fugazza M & Maloney W F, (2010). Informal self-employment and macroeconomic fluctuations. Journal of Development Economics, 91(2): 211-226.

Fugazza M, (2018). Connectivity and the margins of trade:evidence from Peruvian exporting firms. UNCTAD Research papers Series, *forthcoming*.

Fugazza M, (2015). Maritime Connectivity and Trade. UNCTAD Policy Issues in International Trade and Commodities Series No. 70.

Fugazza M, (2013). The Economics behind Non-Tariff Measures: Theoretical Insights and Empirical Evidence. UNCTAD Policy Issues in International Trade and Commodities Series No. 57.

Fugazza M & Milet E, (2017).Informality and Unemployment: Evidence from Peruvian Households. Mimeo, University of Geneva.

Fugazza M & Olarreaga M & Ugarte C, (2016). Trading with Hurdles: Too Big to Stumble. UNCTAD Policy Issues in International Trade and Commodities Series No.78.

Gal P N & Hijzen A & Wolf Z, (2013). The Role of Institutions and Firm Heterogeneity for Labour Market Adjustment: Cross-Country Firm-Level Evidence. IZA Discussion Papers No.7404.

Goldberg P & Pavcnik N, (2016). The Effects of Trade Policy. In Handbook of Commercial Policy, Volume 1A 1st Edition Editors: Kyle Bagwell Robert W. Staiger.

Grossman G & Rossi-Hansberg E, (2008). Trading Tasks: A Simple Theory of Offshoring. American Economic Review. 98(5): 1978-1997.

Guasch J L, (1999). Labor market reform and job creation: the unfinished agenda in Latin American and Caribbean countries (Directions in development). The World Bank, Washington D.C.

Han H & Piermartini R, (2016). Trade facilitation does benefit SMEs. WTO staff working paper No 2016-3.

Hanson G & Lind N & Muendler A, (2016). The Dynamics of Comparative Advantage. NBER Working Paperes Series No 21753.

Harris J & Todaro M, (1970). Migration, Unemployment, and Development: A Two-Sector Analysis. American Economic Review, 60: 126–142.

Harrison A & Revenga A, (1998). Labor Markets, Foreign Investment and Trade Policy Reform. In Trade Policy Reform: Lessons and Implications. Edited by J. Nash and W. Takacs, Washington DC: World Bank.

Harrison A & Hanson G, (1999). Who Gains from Trade Reform? Some Remaining Puzzles. Journal of Development Economics, 51: 315-324.

Hart K, (1973). Informal Income Opportunities and Urban Employment in Ghana. Journal of Modern African Studies, 11(1): 61-69.

Hasan R & Mitra D & Ranjan P & Ahsan R N, (2012). Trade liberalization and unemployment: theory and evidence from India. Journal of Development Economics, 97(2): 269–280.

Helpman E & Itskhoki O & Muendler M-A & Redding S, (2013). Trade and Labor Market Outcomes. In Advances in Economics and Econometrics: Theory and Application II, edited by D. Acemoglu, M. Arellano, and E. Dekel. Cambridge University Press, 459-502.

Helpman E & Itskhoki O, (2010). Labour market rigidities, trade and unemployment. Review of Economic Studies, 77(3): 1100-37.

Hoekman B & Shepherd B, (2015). Who Profits from Trade Facilitation Initiatives? Implication for African Countries. Journal of African Trade, 2(1): 51–70.

Hummels D & Skiba A, (2004). Shipping the good apples out? An empirical confirmation of the Alchian–Allen conjecture. Journal of Political Economy, 112(6): 1384–1402.

ILO, (2016). Assessment of labour provisions in trade and investment arrangements. ILO, Geneva.

ILO, (2018). Unemployment rate. Available at: http://www.ilo.org/ilostat-files/Documents/description_UR_EN.pdf.

ILO-WTO, (2009). Globalization and Informal Jobs in Developing Countries. ILO-WTO, Geneva.

Irarrazabal A & Moxnes A & Opromolla L D, (2015). The Tip of the Iceberg: A Quantitative Framework for Estimating Trade Costs. The Review of Economics and Statistics, 97(4): 777-792.

Jensen M & Keyser J, (2012). Standards harmonization and trade: The case of the East African dairy industry. In Cadot, O. and M. Malouche (eds.), Non-tariff measures: A fresh look at trade policy's new frontier. London/Washington, D.C.: CEPR/The World Bank, pp. 187-212.

Johnson S & Kaufmann D & Shleifer A, (1997). The unofficial economy in transition. Brookings Papers on Economic Activity, Fall, Washington D.C.

Kahn R L, (1956). The Prediction of Productivity. Journal of Social Issues, 12: 41–49.

Kee H L & Hoon H T, (2005). Trade, capital accumulation and structural unemployment: an empirical study of the Singapore economy. Journal of Development Economics, 77: 125-152.

Krugman P, (1993). What do undergrads need to know about trade? American Economic Review, 83(2): 23–26.

La Porta R & Shleifer A, (2014). Informality and Development. Journal of Economic Perspectives, 28(3): 109-26.

La Porta R & Shleifer A, (2008). The Unofficial Economy and Economic Development. Brookings Papers on Economic Activity, Fall: 275-352.

Levinsohn J, (1999). Employment responses to international liberalization in Chile. Journal of International Economics, 47(2): 321-344.

Lipsey R & Lancaster K, (1956). The General Theory of Second Best. Review of Economic Studies, 25:11-32.

Maertens M & Swinnen J, (2009). Trade, Standards and Poverty: Evidence from Senegal. World Development 37(1): 161–78.

Maloney W, (2004). Informality Revisited. World Development, 32(7): 1159-1178.

McCaig B & Pavcnik N, (2014). Export Markets and Labor Allocation in a Low-income Country. NBER Working Paper No. 20455.

Melitz M, (2003). The impact of trade on intra-industry reallocations and aggregate industry productivity. Econometrica, 71 (6), 1695–1725.

Melo de J & Shepherd B, (2018).The Economics of Non-Tariff Measures: A Primer. FERDI Working paper P212.

Menezes-Filho N & Muendler M-A, (2011). Labour reallocation in response to trade reforms. NBER working papers series No.17372.

Mesquita M & Najberg S, (2000). Trade liberalization in Brazil: creating or exporting jobs? Journal of Development Studies, 30(3): 78-100.

Mirus R & Smith S, (1997). Canada's Underground Economy: Measurement and Implications. In: Owen, L. and M. Walker, editors. The Underground Economy: Global Evidence of its Size and Impact. Vancouver: Fraser Institute.

Milner C & Wright P, (1998). Modelling Labour Market Adjustment to Trade Liberalisation in an Industrialising Economy. Economic Journal, 108:1468-0297.

Nathanson R, (2011). Growth, economic policies and employment linkages: Israel. ILO Employment Working Paper Series No. 83.

Nigai S, (2016). On Measuring the Welfare Gains from Trade Under Consumer Heterogeneity. Economic Journal, 126: 1193–1237.

OECD, (2009). Is Informal Normal ? Towards More and Better Jobs in Developing Countries You or your institution have access to this content. OECD Development Centre, Paris.

Perry G E & Maloney W F & Arias O S & Fajnzylber P & Mason A D & Saavedra-Chanduvi J, (2007). Informality: Exit and Exclusion, World Bank Latin American and Caribbean Studies, International Bank for Reconstruction and Development / The World Bank, Washington DC, 2007.

Persson M, (2013). Trade facilitation and the extensive margin. The Journal of International Trade & Economic Development, 22: 658–693.

Pessoa J P, (2016). International Competition and Labor Market Adjustment. CEP Discussion Paper Seires No 1411.

Paz L 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: 330–348.

Peters A, (2017). Estimating the Size of the Informal Economy in Caribbean States. IDB Technical Note No.1248.

Rama M, (1994). The labor market and trade reform in manufacturing. In M. Connolly and Jaime de Melo (Eds.): Effects of Protectionism on a Small Country: The Case of Uruguay. World Bank, Washington DC.

Revenga A, (1997). Employment and Wage Effects of Trade Liberalization: The Case of Mexican Manufacturing. Journal of Labour Economics, 15(S3): S20-S43.

Sampson T, (2014). Selection into Trade and Wage Inequality. American Economic Journal: Microeconomics, 6(3): 157-202.

Schneider F & Enste D H, (2000). Shadow Economies: Size, Causes and Consequences. Journal of Economic Literature, 38: 77-114.

de Soto H, (1989). The Other Path: The Invisible Revolution in the Third World. Harper and Row, New York.

Spearot A C, (2013). Variable demand elasticities and tariff liberalization. Journal of International Economics, 89(1): 26-41.

Stolper W F & Samuelson P, (1941). Protection and real wages. Review of Economic Studies, 9(1): 58-73.

Temkin B & Veizaga J, (2010). The Impact of Economic Globalization on Labour Informality. New Global Studies, 4(1), Available at: http://works.bepress.com/benjamin_temkin/1/.

Topalova P, (2010). Factor Immobility and Regional Impacts of Trade Liberalization: Evidence on Poverty from India. American Economic Journal: Applied Economics, 2(4): 1-41.

Trefer D, (2004). The Long and Short of the Canada-U.S. Free Trade Agreement. American Economic Review, 94(4): 870-895.

UNCTAD, (2016). Trading Into Sustainable Development: Trade, Market Access, and the Sustainable Development Goals. Developing Countries in International Trade Series. UNCTAD, Geneva.

UNCTAD, (2008). Review of Maritime Transport 200. UNCTAD, Geneva.

Volpe Martincus C & Carballo J & Graziano A, (2015). Customs. Journal of International Economics, 96(1): 119-137.

Yeaple S R, (2005). A simple model of firm heterogeneity, international trade, and wages. Journal of international Economics, 65 (1): 1-20.

Zi Y, (2016). Trade Liberalization and the Great Labor Reallocation. IHEID Working Papers No.18-2016.

unctad.org/tab

Layout and Printing at United Nations, Geneva – 1811580 **(E)** – June 2018 – 334 – **UNCTAD/DITC/TAB/2017/7**