Gender dynamics in employment associated with Brazilian international trade in Knowledge-Intensive Services (KIS): an analysis of total and bilateral trade with South America in 2019

Resume

International trade is not neutral concerning gender inequalities that persist in economies. Furthermore, sectoral specialization and trading partners influence the power of international trade to promote socioeconomic development. Recognizing these facts, we analyze the gender dynamics associated with Brazil's total international trade and its trade with South America, using a Brazilian Input-Output Matrix, labor, and trade data for 2019, which is the last year all data is available. This analysis includes both total and knowledge-intensive services trade. Based on this analysis, we identify that Brazilian international trade, particularly in knowledge-intensive services and with South America, presents more favorable dynamics. This includes quality jobs for workers and greater gender equality.

Keywords: International trade; gender inequalities; knowledge-intensive services; jobs; Input-Output Matrix.

JEL: B54-Feminist Economics; F15-Economic Integration; F16-Trade and Labor Market Interactions

Introduction

International trade is not neutral despite gender inequalities that persist in economies. Depending on how women and men insert themselves into society, an intensification or retraction of export and import flows in an economy can affect them differently. Furthermore, various social markers, such as educational level, age, having or not having children and their age, and the obligations imposed on women in households and communities, also intersect with gender and help determine the impacts of international trade perceived by women (Azar *et al*., 2009; Fontana, 2009).

International trade or trade policies, as well as macroeconomic policies in general, can both generate gender inequalities and modify them (Azar et al., 2009). Consequently, changes in international trade can directly or indirectly impact gender inequalities, calming, reinforcing, or perpetuating them.

The paid labor market is one of the privileged *loci* to discuss the impacts of changes in international trade flows on society and the well-being of its population. This occurs because, in a country, part of the jobs is associated with trade flows, whether those generated by exports or threatened by imports. On the one hand, the production of exported goods and services generates direct[1] and indirect jobs,[2] and, on the other hand, the sectors most sensitive to import competition may contract, threatening the jobs associated with them (Economic Commission for Latin America and the Caribbean [ECLAC], 2021b; Fontana, 2020). It is no coincidence that one of the privileged topics in international trade literature is the relationship between foreign trade and the labor market (Çağatay, 2005).[3]

This is also valid when analyzing the literature on the relationships between trade and gender: studies on female employment are the most numerous among the limited literature on trade and gender in general. But the analyses, in general, do not consider or do not focus on trade in services. However, this type of trade has gained importance in recent decades, partly associated with the advancement of Global Value Chains (GVC). According to WTO (2019), for example, trade in services has experienced an average annual growth of 5.4% between 2005 and 2017, exceeding the average of 4.6% recorded in merchandise trade in the same period.

The services are heterogeneous and include very different characteristics regarding work qualification requirements, knowledge, and articulation with other activities, specially manufacturing. Araújo et al (2023), for example, argue, based on the contributions of Andreoni (2020), Rodrik (2014) and Zysman et al. (2011), that the so-called modern services have reinforced the dynamizing and disseminating role of technical progress that the manufacturing industry plays given the complementarity of both activities. Technological advances in modern services and high-tech industries drive productivity, manufacturing growth, and structural change (Pereira et al., 2023).

Recognizing these facts, the objective of this work is to propose a knowledge-intensive services (KIS) classification for the Brazilian productive and employment structure, estimate

[1] The direct jobs are those in the export sector.

[2] Indirect jobs are those induced in other sectors, given the production of intermediate inputs that aim to satisfy the demand of the export sectors that make up their productive chain.

[3] Other channels are the consumption of public and private goods and services (Fontana, 2020; Joekes, Frohmann and Fontana, 2020) and the unpaid labor market (Castilho; Ferreira, 2022; ECLAC, 2022).

and analyze the content and profile of female and male employment associated with the Brazilian international trade in KIS in 2019, seeking to answer whether gender inequalities in the Brazilian labor market are reproduced in this context. Given the importance of South America (SA) as a Brazilian trading partner (a partner that is the destination of approximately 11.9% of Brazilian exports and the origin of 10.1% of its imports), we will also compare the volume and employment profile associated with total international trade with that related to bilateral trade with South America.

1. Importance of the service sector and the differences between traditional services and KIS

In the past, services used to be considered non-tradable activities. However, since the 1990s, trade in services has grown faster than in goods – particularly telecommunications and business services.[4] This fact is due to the expansion of information and communication technologies (ICT), which allow the digitalization and international marketing of various services without the need for physical proximity between producers and consumers (Alvarez et al., 2020; ECLAC, 2017; Gereffi et al., 2009; World Trade Organization [WTO], 2019).

The expansion of GVCs relies heavily on a variety of business services. Although most of these services are not directly marketed, they are responsible for adding value to the products that are exchanged and play an essential role in connecting international production networks, especially in the initial phases (Research and Development - R&D - and innovation) and ends of the chains (marketing and sales). In addition, services such as accounting, other business processes, and logistics also impact all value chain segments (ECLAC, 2017).

Changes in the structure of production in economies since the end of the last century, driven by the profusion of GVCs, have intensified the interconnection between the service sector and industrial and agricultural activities. On the one hand, services have become the link of numerous manufacturing supply chains. On the other hand, the success of many of these chains depends on a base of services that range from R&D in the initial stages of the product

[4] It is important to note that although total trade in services has grown at a faster rate than the trade in goods, this is mainly due to the expansion of KIS trade, the definition of which will be presented later (ECLAC, 2017; Loungani and Mishra, 2014).

to distribution and repair in its final stage (Loungani and Mishra, 2014; International Labour Organization [ILO], 2020).

As a result of these transformations, the outsourcing of several activities that were previously carried out within an organization/company has occurred, the separation between industry and commerce has become more tenuous, and the service content in manufacturing production has grown significantly – throughout which is conventionally called the "servitization" of manufacturing (ILO, 2020). In other words, instead of "selling products", companies start selling "an integrated combination of products and services that provide value" (Baines et al., 2011).

In the past, services were often seen as a part of the economy that was immune to significant improvements in productivity through technology or reorganization, sometimes seen as a hindrance. However, services are now postulated to be important regarding productivity growth and promoting greater dynamism in economies. The growth of this sector has generated transformations in the structure of the labor market, in the division of tasks, in its nature, and its geographical distribution (Zysman et al., 2011).

According to Loungani et al. (2017), it is still too early to determine whether the catalysts for growth and development are shifting from manufacturing to services or whether trade in services could support a future wave of globalization, trade, and growth. However, rapid inter- and intra-sector resource reallocations offer new investment opportunities in various tradable service activities.

This is a complex issue, and it deserves to be analyzed with caution. According to Rodrik (2014), on the one hand, the growth of economies is linked to the development and accumulation of two factors, human capital, and institutions (from now on, capabilities), which end up being a slow and prolonged process. On the other hand, it is also linked to structural change by expanding higher-productivity industries or transferring labor from lower-productivity activities to "modern" activities. Although productivity in the sophisticated services sector depends on the set of capabilities of the economies, in the case of the manufacturing sector, productivity also depends on an unconditional component.[5] In

[5] According to RODRIK (2014), there is a natural tendency for formal manufacturing industries in developing countries to achieve higher levels of productivity over time, regardless of favorable circumstances or specific policies. This suggests that certain formal manufacturing industries have a kind of internal drive that helps them

other words, in the case of manufacturing, countries with low productivity can also experience growth in the absence of capabilities (Rodrik, 2014). The problem here is that this context can lead to poverty traps and coordination failures, which prevent modern activities from taking off (Murphy et al., 1989; Rodrik, 1996; Sachs et al. 2004 as cited in Rodrik, 2014).

For low-income economies, which generally have low skills and weak governance, the most viable growth trajectories are reallocating labor to organized manufacturing and convergence within manufacturing. However, this trajectory finds limits on the technological frontier due to the need for more training in the countries. In more mature growth phases, economic performance will increasingly depend on broad-based capabilities that benefit the manufacturing and modern services sectors. In this context, deindustrialization represents a minor threat to these economies since displaced labor can be absorbed by high-productivity services with little cost to economic growth or equity (Rodrik, 2014).

However, Rodrik (2014) indicates that this win-win scenario often does not hold, even in the most advanced economies, and the situation worsens in middle-income countries. There is a growing interconnection between services and the production of goods. They play an increasingly important role in the global competitiveness of manufactured products, especially in "industry 4.0". In this constantly evolving manufacturing environment, services such as software development, big data analytics, and cloud computing play a crucial role in adding value to manufactured products. Even in less technological sectors, such as natural resources and less advanced manufacturing, different intermediate services play an increasingly important role in differentiation and value creation (ECLAC, 2017).

In Brazil, from the point of view of added value, trade flows, and the labor market, the services sector stands out for its importance to the economy. In 2019, the industry was responsible for more than 70% of the country's gross value added and, respectively, 12.0% and 20.3% of total exports and imports.[6]

According to the WTO (2019), trade in services, like trade in goods, brings advantages for society: it facilitates a more efficient allocation of resources, encourages greater economies

progress, even in unfavorable environments such as poor governance or inadequate policies. However, the author also notes that conditional convergence, which considers factors such as more vital institutions and policies, occurs even faster.

[6] Data from SISCOMEX and SISCOSERV.

of scale, contributes to accelerated economic growth, improves the competitiveness of local companies, and promotes inclusion in terms of skills and the location of economic activity. Furthermore, Ahmed (2013) points out that the growing importance of services is also reflected in labor market statistics since human capital is one of the most fundamental components in the context of services worldwide.

For women, the expansion of the service sector can positively impact job opportunities, as the aggregate service sector tends to show higher participation of women compared to manufacturing or agriculture (WTO, 2019). In Brazil, for example, the services sector concentrated 85.7% and 61.3% of the jobs of women and men in 2022. In addition, women represented 51.1% of people employed in the services sector, while they represented only 19.4% and 34.2% in agriculture and industry.[7]

However, it is necessary to consider that the services sector includes many subsectors, quite heterogeneous among themselves in terms of productivity, knowledge required for its execution and jobs generated. That is, although some service subsectors, such as architecture, engineering, and R&D, demand more qualified workers, the same is not true for Food services, for example. In turn, in the Brazilian case, in 2022, women represented only 37.4% of people employed in Architecture, Engineering and R&D Services and 55.5% in Food Services. It is worth highlighting that female participation in the service subsectors ranged between 8.9% (Land Transportation) and 75.1% (Education) in 2022.[8]

Lassman and Mulder (2021) also point out this for the Latin America and the Caribbean (LAC) case, although the service sector has a greater presence of women compared to other economic sectors such as manufacturing and agriculture, this pattern is not repeated in the same way between the different subsectors of services. In LAC, women constitute more than 50% of jobs in traditional services, but around 40% in the so-called KIS. On the other hand, the proportion of female employment is approximately 30% in manufacturing and below 20% in agriculture.

According to the Organisation for Economic Cooperation and Development [OECD] (1999), KIS are activities that intensively use high technology and/or demand skilled labor to take advantage of technological innovations. In general, the classifications converge in stating that

[7] Data from Continuous National Household Sample Survey (PNAD Contínua, in Portuguese acronym).
[8] Op cit.

KIS cover a wide range of areas, such as business, finance, technology, insurance, pensions, professional, R&D, and telecommunications services. In contrast, some examples of more traditional services are government services, transportation and tourism (ECLAC, 2017; Loungani and Mishra, 2014). However, as pointed out by Loungani et al. (2017), the line between traditional service activities and KIS is currently very blurry, and the trend is for it to become even more blurry, with many traditional services becoming KIS. As Rodrik (2014) points out, as economies develop, activities become more complex, and the dualism between traditional and modern sectors disappears.

There is a range of classifications proposed for the analysis of service subsectors, some based on their functionality (cost or added value), destination (final consumption or companies), and technological standard, among other possibilities (Arbache, 2014; Baines et al., 2011; Eichegreen and Gupta, 2013; Loungani et al., 2017; Machado et al., 2015; United Nations, 1991). In this work, we will focus on the analysis of knowledge-intensive services versus traditional services, based on a classification proposal designed for the Brazilian productive and employment structure, but based on several contributions consolidated in the literature, which will be presented in section 2.3.

On the one hand, it is important to emphasize that both traditional services and KIS have an important role in GVCs. Transportation services, telecommunications, finance, and water and electricity distribution, generally known as infrastructure or production services, play critical roles in the functioning of the entire economy. Furthermore, services such as education and health have an essential impact on factors of production, such as work, whose productivity depends, among others, on their level of education, skills, and health (WTO, 2019). On the other hand, it is essential to recognize that the growth trajectory of nations is conditioned by the type of service that is developed, its competitiveness, and its degree of link with the industry (Pereira et al., 2023).

The disaggregation of services has opened niches that can be exploited by developing economies (Loungani and Mishra, 2014), and KIS are configured as a highly dynamic sector, constituting a valuable opportunity to expand the export of services in developing countries (Gereffi et al., 2009). Furthermore, in the scope of KIS, workers' skills constitute an essential basis for expansion in value chains (Alvarez et al., 2020).

However, as Araújo (2023) pointed out, based on the contributions of Amsden (2001), poor and developing countries must first strengthen their manufacturing industry before moving towards high-tech sectors. History shows that no country has achieved high incomes without industrialization. Therefore, deindustrialized economies must recover their manufacturing industry before moving toward advanced manufacturing and service technologies.

Currently, the global panorama is configured with a duality. On the one hand, developed nations generate highly specialized services associated with the use of advanced technology and are closely linked to other economic segments. On the other hand, a group of developing countries produce low-tech services with little international competitiveness and are oriented mainly toward their internal market (Pereira et al., 2023).

While in developed countries, the expansion of KIS is based on their achieved industrial maturity (Rowthorn and Ramaswamy, 1999; Palma, 2005, 2008 and 2019 as cited in Pereira et al., 2023), in developing countries, this process is earlier. In the second group, the share of the manufacturing industry in Gross domestic product (GDP) began to decline before these countries reached the level of per capita income of developed countries or were able to create an "endogenous core of technical progress" (Pereira et al., 2023).

On the one hand, in the context of developed countries, the relative decline in industry's share of GDP led to the emergence of a KIS sector that is intertwined with industry. This sector, highly dependent on qualified labor and focused on exports, experiences a constant process of technological innovation and increased productivity. On the other hand, in developing countries, deindustrialization coincided with the expansion of the KIS and traditional sectors (Pereira et al., 2023).

International trade of services and KIS is highly concentrated in 10 economies. In the case of KIS, no country in LAC was among the leading exporters or importers in 2016. These were, respectively, the United States, the United Kingdom, Germany, France, Ireland, the Netherlands, India, Japan, China, and Luxembourg in the case of exports, and the United States, Ireland, Germany, France, the Netherlands, Japan, China, the United Kingdom, Singapore and Switzerland in the case of imports. Brazil, for its part, occupied the 22nd position in the ranking of exports and 18th in imports this same year, making it the largest exporter and importer of KIS in LAC (ECLAC, 2017).

In general, the performance of Latin America and the Caribbean is weak compared to developed countries and developing Asian countries (ECLAC, 2017). In 2019, service exports in LAC mainly comprised traditional services: 68% were traditional services, and 32% were KIS. On the other hand, the situation is different in Asian countries and developed nations. In Asia, KIS represented 51% of exports in 2019, while in developed countries, they reached 61% (Lassman and Mulder, 2021).

Furthermore, in most Latin American countries, there is a lack of progress in both the conceptualization and implementation of policies that boost KIS exports, especially regarding their institutional structure and management approach. Although KIS are currently the fastest-growing sector in global trade, there is a risk that the region will fall behind in this trend due to the lack of an effective promotion system supported by solid governance (Alvarez et al., 2020).

2. Methodology

The methodology is divided into three sections: the first two focuses on estimating the content and quality of employment associated with international trade, and the third is concerned with exposing the KIS classification adopted in this work.

2.1 Employment content

The methodology used to calculate the employment content associated with total and bilateral Brazilian exports and imports with South America is based on studies such as Kupfer et al (2003), Castilho (2007), ECLAC (2021a; 2021b; 2022) and Ferreira (2022) and will be detailed below, as well as the data sources.

The data sources used were:

1) Brazilian Input-Product Matrix (2019), at current prices, prepared by Alves-Passoni; Freitas (2020);
2) Vector of total Brazilian occupations, according to activities (2019), from the System of National Accounts/IBGE;
3) Vector of total Brazilian exports of goods and services net of CIF/FOB adjustment, available in the table “Uses of goods and services” (2019), of the System of National Accounts/IBGE;

4) Gross vector of Brazilian production at current prices, according to activities (2019), from the System of National Accounts/IBGE;
5) Statistics of the Brazilian labor market (2019), available in the PNAD Contínua;
6) Statistics of Brazilian exports and imports of goods (2019), available in SISCOMEX;
7) Statistics of Brazilian exports and imports of services (2019), available in SISCOSERV.

The year chosen to calculate the employment content was 2019, since it is the last year all the necessary data is available. The calculation of the employment content of exports covers both employment directly associated with exports and indirect employment used in the production of inputs used in production associated with exports. To calculate the employment related to exports, it is first necessary to calculate the direct labor coefficient:

$$n_{67x1} = e_{67x1} \text{ Ø } v_{67x1} \quad (1)$$

Where:

n_{67x1} = direct work coefficient, according to the 67 activities.

e_{67x1} = total occupations, according to activities.

v_{67x1} = gross production value at current prices, according to activities.

Ø = cell by cell division

To calculate direct employment associated with exports, the diagonalized matrix of the direct labor coefficient is multiplied by the column vector of exports:

$$ED_{67x1} = n_{67x1} \otimes x_{67x1} \quad (2)$$

Where:

ED_{67x1} = direct employment associated with exports, according to activities.

x_{67x1} = total exports of goods and services net of CIF/FOB adjustment, according to activities.

$\otimes$ = cell-by-cell multiplication

Indirect employment associated with exports is that associated with domestic inputs used in exported goods and services. To calculate it, you must first estimate the total production associated with exports, as follows.

$$Q^{X}_{67x1} = \{(I - A^{d})^{-1}\}_{67x67} * \ x_{67x1} \quad (3)$$

Where:

q^{X}_{67x1}= national production (direct and indirect) associated with exports.

$\{(I - A^{d})^{-1}\}_{67x67}$= inverse Leontief matrix.

Then, total employment (direct and indirect) is calculated by applying the employment coefficient to the national production associated with exports.

$$ET_{67x1} = N_{67x67} * Q^{X}_{67x1} \quad (4)$$

Where:

N_{67x67} = matrix whose values on the main diagonal correspond to the direct work coefficient, according to activities.

Where total employment, ET, corresponds to the sum of direct jobs (ED) and indirect employment (EI) associated with exports. That is, the EI can be obtained in the following way:

$$EI_{67x1} = ET_{67x1} - ED_{67x1} \quad (5)$$

Using this methodology, we find the national jobs (direct and indirect) associated with the total exports of the economy in question, according to activities.

To differentiate the portion corresponding to the employment of men and women, it is necessary to harmonize the System of National Accounts (level 67) with the Continuous PNAD (domiciliary CNAE 2.0) classification. Following this harmonization, the data is now classified into 56 activities.[9] In this way, direct, indirect, and total employment associated with exports, initially estimated according to 67 activities, is added according to 56 activities.

[9] Before harmonizing the classifications, the domiciliary CNAE 2.0 was made compatible with the 2-digit CNAE 2.0.

Subsequently, the weight of each sex is applied to the work content associated with each activity in the column vectors:

$$ED^{f}_{56x1} = weight.fem_{56x1} \otimes ED_{56x1} \quad (6)$$

$$EI^{f}_{56x1} = weight.fem_{56x1} \otimes EI_{56x1} \quad (7)$$

$$E^{f}_{56x1} = weight.fem_{56x1} \otimes E_{56x1} \quad (8)$$

Where:

$weight.fem_{56x1}$ = female participation in total employment in each activity, according to the PNAD Contínua.

ED^{f}_{56x1} = female employment directly associated with exports, according to activities.

EI^{f}_{56x1} = female employment indirectly associated with exports, according to activities.

E^{f}_{56x1}= total female employment associated with exports, according to activities.

The exercise is similar for men.

Likewise, the exercise is analogous to estimating the employment content of business partners. The vector X_{67x1} becomes equivalent to:

$$X\ partner\ _{67x1} = weight.partner_{67x1} \otimes X_{67x1} \quad (9)$$

Where:

$weight.partner_{67x1}$ = weight of the trading partner in total exports, according to activities.

In the case of content threatened by imports, export vectors must be replaced by total and bilateral import vectors.

2.2 Job quality

The data sources used were:

1) Statistics of the Brazilian labor market (2022), available in the PNAD Contínua;
2) Employment content data calculated in section 2.1.

To calculate the average employment profile by activity, an Employment Quality Indicator (EQI) is estimated according to the following criteria: i) income per hour of paid work, ii)

formality, iii) participation of occupations board and management in the occupational structure and iv) years of employment. For all these variables we understand that the higher their values, the better the work characteristics of the workers. O EQI is based on the methodology proposed by Saboia and Kubrusly (2013), from which the following calculation is made for the variables:

$$I_i = \frac{(E_i - E_{imin})}{(E_{imax} - E_{imin})} \quad (10)$$

Were:

E_i = value of the variable chosen for sector i.

E_{imax}= maximum value of the chosen variable among all sectors.

E_{imin} = minimum value of the chosen variable among all sectors.

Finally, these indicators are averaged and the EQI per activity is obtained. The EQI, then, can be compared between sectors and should indicate which sectors have higher-quality jobs for workers.

In this work, we propose that the indicator also be disaggregated by sex. To achieve this, each of the variables that make up the EQI is calculated separately for women and men. In addition, we add a fifth variable, horizontal segregation in the labor market. Therefore, we adjusted the EQI to consider the participation of women and men in each activity.

Finally, we weigh both indicators by the weight of each activity in the employment content associated with the labor market as a whole and with total and bilateral international trade with SA (exports and imports). In this way, we obtain a female and male EQI for five dimensions: total labor market, employment content associated with total exports and with exports destined for the SA, and employment content threatened by total imports and with imports originating in the SA.

2.3 Classification of KIS versus traditional services

The literature presents several proposals to classify knowledge-intensive services versus traditional services, and taking this into account, the objective of this section is to present the classification proposed and adopted in this work based on the classifications already established.

It was decided to start from the classification proposed by Eichegreen and Gupta (2013), adjusting it for the Brazilian case, as shown in Table 1. The choice of that classification as a starting point is due to its classification criteria, which considers the technological standard of the services and the availability of the classification with a disaggregation like the data available to carry out this work. We also consider the proportion of employed people with completed higher education and incomplete primary education in the services analyzed, in addition to trying to dialogue with other classifications, such as Loungani et al. (2017).

Notably, in some services, there is a divergence between the proposed classification and the classification used as a base. In the case of Artistic, creative, and performing activities, the classification used in this work brings together a set of services: i) Artistic, creative, and entertainment activities; ii) Activities linked to cultural and environmental heritage; iii) Gambling activities and betting, iv) Sports activities and v) Physical conditioning activities services ii), iii), iv), and v), although not included in Table 1, are classified as traditional services by Eichegreen and Gupta (2013), therefore, the proposed classification would be in line with this, considering the classification of most of the sub-sectors covered.

Regarding Other administrative activities and complementary services, Eichegreen and Gupta (2013) consider two subsectors: i) Services for building and landscaping activities, classified as traditional service, and ii) Office services, administrative support, and other services provided to companies, classified as modern service. In the Brazilian case, Other administrative activities and complementary services include a series of services, including i) Cleaning and support services for buildings, except condominium buildings, ii) Condominium buildings, iii) Landscaping activities, iv) Services office and administrative support, v) Teleservice activities, vi) Event organization activities, except cultural and sports activities and vii) Other service activities provided mainly to companies. Among these, we believe that only office and administrative support services could be classified as a KIS, depending on the activity to which they are associated. Furthermore, compared to the service sector aggregate, we consider the low proportion of people with completed higher education and the high proportion of people with incomplete primary education. Therefore, we choose to classify it as a traditional service.

Legal, accounting, consulting, and corporate headquarters activities, in turn, are disaggregated into two subgroups by Eichegreen and Gupta (2013), i) Legal, accounting, and

auditing activities, considered a traditional service, and ii) Company headquarters and business management consulting activities, considered a modern service. Considering the aggregate activity, we chose to continue with the classification of KIS, considering the high proportion of people with completed higher education in this activity and the irrelevant presence of people with incomplete primary education.

Finally, Publishing and publishing integrated into printing and Education are classified here as KIS, to the detriment of traditional services, since we understand that they are sectors made up of workers who mostly have completed higher education. In addition, they include several activities that require knowledge-intensive work.

Table 1. Proposed classification of KIS in the Brazilian case

Services *Harmonized classification between CNAE domicilio, CNAE 2.0 y SCN*	**Proposed Classification**	**Technological Standard**	**Education** *(% of employed people by educational level, 2022)*	
	Traditional services/ KIS	**Traditional/Modern** (Eichengreen y Gupta, 2013)	**Incomplete primary education**	**Complete higher education**
Electricity, gas and other services	Traditional services	Traditional	6%	40%
Water, wastewater and waste management	Traditional services	Traditional	35%	13%
Trade (wholesale and retail) and repair of motor vehicles and motorcycles	Traditional services	Traditional	42%	6%
Ground transportation	Traditional services	Traditional	24%	8%
Aquatic transport	Traditional services	Traditional	22%	24%
Storage, auxiliary transportation and mail activities	Traditional services	Traditional	14%	18%
Accommodation	Traditional services	Traditional	16%	15%
Food	Traditional services	Traditional	25%	7%
Real estate activities	Traditional services	Traditional	5%	35%
Other administrative activities and complementary services	Traditional services	Traditional/Modern	21%	12%
Surveillance, security and investigation activities	Traditional services	Traditional	12%	6%
Public administration, defense and social security	Traditional services	Traditional	8%	43%
Membership organizations and other personal services	Traditional services	Traditional	16%	13%
Artistic, creative and performing activities	Traditional services	Modern	9%	35%
Public and private health	Traditional services	Traditional	4%	45%
Air Transport	KIS	Modern	2%	41%
Editing and editing integrated into print	KIS	Traditional	2%	62%
Television, radio, film and image and sound recording/editing activities	KIS	Modern	5%	45%
Telecommunications	KIS	Modern	2%	22%
Development of systems and other information services	KIS	Modern	1%	62%
Financial intermediation, insurance and complementary pensions	KIS	Modern	1%	62%
Legal, accounting, consulting and corporate headquarters activities	KIS	Traditional/Modern	1%	70%
Architecture, engineering, technical testing/analysis and R&D services	KIS	Modern	3%	65%
Other professional, scientific and technical activities	KIS	Modern	3%	50%
Non-real estate rentals and management of non-financial intangible assets	KIS	Modern	11%	23%
Education	KIS	Traditional	4%	63%

Source: Author's elaboration based on Eichegreen and Gupta (2013) and Pnad Contínua.

2. Gender dynamics in employment associated with Brazilian international trade of KIS

In 2019, there were 14.2 and 11.5 million national jobs associated with Brazilian exports and imports, equivalent to 14.9% and 12.1% of employment in the Brazilian economy. In the case of women, there were 3.5 million employed in jobs associated with exports, representing

only 25.0% of employment in this dimension and equivalent to approximately 8.7% of women employed in jobs throughout the labor market. Thus, female underrepresentation in employment associated with exports is even more substantial than in the labor market, where women represented 42.8% of employed people in 2019 (Table 2).

On the other hand, female participation is more significant in jobs threatened by imports, corresponding to 30.6% of the 11.5 million jobs mentioned. This amount corresponds to approximately 3.5 million women, equivalent to 8.7% of female employment in the economy. Thus, for women, the employment balance associated with international trade in 2019 was only 31,202 jobs, representing just 0.1% of female employment in the Brazilian economy (Table 2).

In the case of men, there were 10.6 million jobs associated with exports and 8.0 million threatened by imports, corresponding to 19.6% and 14.7% of total male jobs. Unlike women, the net employment balance related to international trade in 2019 is more significant, with 2.7 million net jobs representing 4.9% of total male jobs (Table 2).

In bilateral trade with South America, the scenario is a little different. The employment content associated with exports to South America corresponded to 12.8% and 11.2% of female and male jobs related to total exports. In the case of the employment content threatened by imports from South America, this amount corresponds, respectively, to 10.7% and 12.7% of the employment content threatened by total imports. This scenario results in a positive balance of jobs for women and men, which, in the case of women, is higher than the balance associated with total international trade (Table 2).

As in the case of total international trade, in bilateral trade with South America, there is a solid male overrepresentation in the content of jobs associated with exports, imports, and the trade balance. However, female representation increases when we analyze the jobs related to exports destined for this partner: 27.7% of the jobs generated are occupied by women, compared to 25.0% in the case of total trade. Furthermore, women represent 27.0% of the employment content threatened by imports, a reduction of about the 30.6% they represent in the case of total trade. This translates into progress regarding female participation in the balance of jobs: women correspond, respectively, to 1.2% and 30.9% of the balance of employment associated with total and bilateral trade with South America (Table 2).

Table 2 – Employment content associated with total and bilateral international trade with South America, disaggregated by sex, 2019

Jobs	Amount (1,000 people)	Participation in jobs		Weight on national	
		Women (%)	Men (%)	Women (%)	Men (%)
National jobs throughout the Brazilian economy	94.956	42,8	57,2	100	100
national jobs associated with exports	14.187	25,0	75,0	8,7	19,6
jobs associated with exports to the SA	1.647	27,7	72,3	1,1	2,2
domestic jobs threatened by imports	11.490	30,6	69,4	8,7	14,7
domestic jobs threatened by imports	1.385	27,0	73,0	0,9	1,9
balance of national jobs associated with international	2.697	1,2	98,8	0,1	4,9
balance of jobs associated with bilateral trade with the SA	262	30,9	69,1	0,2	0,3

Source: Author's elaboration. Data: Alves-Passoni and Freitas (2020), PNAD Contínua, SISCOMEX and SISCOSERV.

Regarding the quality of jobs, measured by the EQI based on the remuneration per hour of work, participation in executive and managerial positions, the proportion of people formally employed, low labor rotation, and horizontal gender segregation, the scenario is unfavorable for total international trade. Due to the Brazilian aggregate trade profile, for women and men, the quality of jobs associated with total exports is worse than that of the jobs related to the economy. Furthermore, the quality of jobs threatened by imports is higher than those generated by exports and, in the male case, higher than the quality of jobs associated with the national economy (Table 3).

However, in bilateral trade between Brazil and South America, the scenario is more optimistic: for women and men, the quality of jobs associated with exports is higher than the quality of jobs threatened by imports. Likewise, in the male case, the quality of the exports-related jobs is also higher than those associated with the national economy. Comparatively, to total trade, the quality of employment related to exchange with South American neighbors presents a more favorable profile for Brazil for both women and men. In other words, the quality of jobs associated with exports destined for South America is higher than the quality of employment related to total exports. In comparison, the quality of jobs threatened by imports from South America is lower than those threatened by total imports (Table 3).

Regarding gender inequality, the quality of male jobs associated with the national economy, exports, and imports, whether total or bilateral with South America, is higher than that of female employment (Table 3).

Table 3 – EQI associated with the total economy and total and bilateral international trade with South America, disaggregated by sex, 2022

EQI (2022)		Women	Men
Total Brazil		0,693	0,700
Exports	**Total**	0,589	0,691
	SA	0,613	0,712
Imports	**Total**	0,637	0,720
	SA	0,590	0,692

Source: Author's elaboration. Data: Alves-Passoni and Freitas (2020), PNAD Contínua, SISCOMEX and SISCOSERV.

The aggregate EQI results from the sectoral composition of total and bilateral Brazilian trade, reflecting the relationship between the sectoral EQI and the weight of these sectors in the basket of exports and imports in question. In the case of total Brazilian exports and those destined for South America, the weight of the services sector in generating employment stands out, especially among women. In aggregate terms, this sector presents relatively higher quality for workers.[10] In 2019, this sector was responsible, respectively, for 55.7% and 65.0% of female jobs and 45.3% and 58.9% of male employment associated with total and bilateral exports with South America (Table 4).

However, in the case of jobs threatened by total and South American imports, the majority is also concentrated in the service sector, threatening 69.6% and 60.0% of female employment and 63.8% and 50.2% of male jobs. In the case of total international trade, this scenario culminates in a negative balance of female and male employment associated with this sector, this being much more significant for women. However, the balance in international trade with South America is favorable for women and men (Table 4).

The services sector is one of the sectors in South America that contributes the most to the generation of female and male jobs associated with exports. On the other hand, agriculture is the sector in which this partner contributes the most to the threat of national employment for women and men, and this is one of the sectors with the worst quality for workers. Regarding data, for women, South America represents 15.0% of jobs created in the service sector and 39.7% of threatened jobs in the agricultural sector (Table 4).

[10] It is important to note that only tradable services are considered. Sectors such as domestic services, which are characterized by severe job insecurity, are not included.

It is also important to note both the weight of the industrial sector in the generation of female and male jobs associated with bilateral trade with South America, which exceeds the weight related to total international trade, and the positive balance of female and male employment associated with bilateral trade with South America in this sector, in contrast to the negative balance in the case of total trade (Table 4).

Focusing our analysis on the KIS sector, we demonstrate that, in the context of total international trade, the employment content of female and male workers associated with the exports of these services accounted for 14.3% and 5.6%, respectively, of the total jobs related to all Brazilian exports. In terms of bilateral trade with South America, exports from this sector represented 13.4% and 5.9% of the female and male employment linked to exports to this trading partner, respectively (Table 4).

This sector has a more critical role in generating employment for women than men. Furthermore, in both total trade and bilateral trade with South America, the participation of women is higher than that shown in aggregate trade (46.0% and 46.2% versus 25.0% and 27.7%). However, men continue to be the majority (Table 4).

On the other hand, 20.2% and 11.3% of female and male jobs threatened by total imports are concentrated in the KIS sector, respectively. In the case of imports from South America, the jobs threatened by the flows of these services corresponded, respectively, to 11.6% and 4.9% of female and male jobs threatened by imports. This culminates in a negative employment balance for women and men in total trade but a positive in bilateral trade with South America (Table 4).

Table 4 – Employment content associated with total and bilateral international trade with South America, by macro sectors, disaggregated by sex, 2019

Sectors	EQI Average (2022)	Women				Men			
		Exports		Imports		Exports		Imports	
		Total	SA	Total	SA	Total	SA	Total	SA
Agriculture	0,348	932.086	41.036	174.822	69.409	3.862.530	170.282	728.866	289.723
Industry	0,423	631.471	118.013	888.094	79.986	1.786.372	306.757	2.042.566	203.836
Construction	0,283	6.767	491	4.484	371	171.163	12.423	113.433	9.396
Services	0,463	1.976.661	296.060	2.448.383	224.672	4.819.585	702.373	5.089.002	507.753
KIS	0,525	508.264	60.890	710.852	43.443	597.655	70.853	902.204	49.501
Tradicional Services	0,373	1.468.397	235.170	1.737.530	181.229	4.221.930	631.520	4.186.798	458.251
Total	**0,427**	**3.546.984**	**455.600**	**3.515.783**	**374.439**	**10.639.651**	**1.191.834**	**7.973.866**	**1.010.708**

Source: Author's elaboration. Data: Alves-Passoni and Freitas (2020), PNAD Contínua, SISCOMEX and SISCOSERV.

Notably, the group classified as KIS is not homogeneous and may present jobs with more or less desirable characteristics for workers. Among these services, Financial intermediation, insurance, and complementary pensions had the highest EQI (0.776), and Other professional, scientific, and technical activities had the lowest indicator (0.365) (Table 5).

In the case of total exports, most of the content of female employment is concentrated in Legal, accounting, consulting, and business headquarters activities (44.2%), Architectural services, engineering, technical testing/analysis, and R&D (13.1%), and Financial intermediation, insurance, and complementary pensions (10.3%). In the case of the employment content associated with trade with South America is not very different; the essential activities are Legal, accounting, consulting, and corporate headquarters activities (38.2%), Non-real estate rentals and asset management non-financial intangibles (11.8%) and Financial intermediation, insurance and complementary pensions (11.1%) (Table 5).

In the male case, the employment content associated with total exports is also concentrated in Legal, accounting, consulting, and business headquarters activities (35.5%), Architectural services, engineering, technical testing/analysis, and R&D (18.7%), and now, the Development of systems and other information services (10.0%) has become one of the three most important activities. It should be noted that this last activity is the KIS with the most significant female underrepresentation in its labor structure: in 2019, women represented only 22.6% of people employed in this sector. In the context of male employment associated with exports to South America, Legal, accounting, consulting, and corporate headquarters activities (31.0%) and Non-real estate rentals and management of non-financial intangible assets (15.9%) continue to be the most critical activities, followed by Other professional, scientific and technical activities (10.6%) (Table 5).

The content of female employment threatened by total imports, Legal, accounting, consulting, and business headquarters activities (29.7%), Non-real estate rentals, and management of non-financial intangible assets (25.6%) and Financial intermediation, insurance, and complementary pensions (12.0%) stand out. In the case of imports from South America, Legal, accounting, consulting, and business headquarters activities (41.4%), Non-real estate rentals and management of non-financial intangible assets (11.7%), and Other professional, scientific and technical activities (11.8%) stand out (Table 5).

For men, in the content of employment threatened by total imports, the most notable are Non-real estate rentals and management of non-financial intangible assets (31.5%), Legal, accounting, consulting, and corporate headquarters activities (22. 1%), and Development of systems and other information services (12.3%). In the case of imports from South America, Legal, accounting, consulting, and business headquarters activities (34.4%), Non-real estate rentals and management of non-financial intangible assets (16.1%), and Other professional, scientific and technical activities (11.9%) stand out (Table 5).

The most significant difference between total trade and trade with South America is found when we analyze the employment balance. For women and men, total international trade only presents a positive employment balance associated with two KIS: Legal, accounting, consulting, and corporate headquarters activities and Architectural, engineering, technical testing/analysis, and R&D services. In a group of 11 services, Legal, accounting, consulting, and head office activities show the 8th EQI, and Architecture, engineering, technical testing/analysis, and R&D services show the 7th EQI (Table 5).

Furthermore, in the female case, the KIS with the highest EQI is precisely the one that presents the second largest negative balance of jobs associated with total international trade: Financial intermediation, insurance, and complementary pensions. The most significant negative balance of female employment was in the Non-real estate rentals and management of the non-financial intangible assets sector. In the male case, Non-real estate rentals and management of non-financial intangible assets are also among the KIS that present the most negative employment balance, and Development of systems and other information services becomes the second activity with the worst employment balance (Table 5).

On the other hand, in bilateral trade with South America, the balance is positive for all the KIS analyzed. For women and men, the sector with the highest balance of jobs is Legal, accounting, consulting, and corporate headquarters activities (Table 5).

There is a remarkable similarity between the sectoral analysis of female and male employment content associated with total and bilateral international trade with South America. The difference in the weight of the KIS subsectors, whether in total or bilateral trade, is ultimately due to the previous horizontal segregation of the Brazilian paid labor market. In fact, in most of the KIS subsectors analyzed, women represent less than 40% of employed people, and only in Education the female participation is enormously higher than

male participation. However, it is worth emphasizing that in the Publishing and publishing integrated into printing and Legal, accounting, consulting, and corporate headquarters activities sectors, women represent 50.2% and 51.4% of employees. Likewise, the presence of women in Financial intermediation, insurance and complementary pensions, and Other professional, scientific, and technical activities is close to 50% (Table 5).

Table 5 - Employment content associated with total and bilateral international trade with South America, by Knowledge-intensive Services, disaggregated by sex, 2019

Knowledge Intensive Services	QEI Average (2022)	Women			
		Exports		Imports	
		Total	SA	Total	SA
Financial intermediation, insurance and complementary pensions	0,776	52.242	6.729	85.649	4.993
Editing and editing integrated into print	0,650	7.850	2.535	14.762	552
Air Transport	0,586	4.178	471	4.871	239
Television, radio, film and image and sound recording/editing activities	0,562	9.657	1.639	12.397	1.035
Education	0,560	43.464	5.562	58.417	4.228
Development of systems and other information services	0,494	17.551	1.905	32.558	1.314
Architecture, engineering, technical testing/analysis and R&D services	0,472	66.714	4.156	44.859	2.175
Legal, accounting, consulting and corporate headquarters activities	0,470	224.478	23.234	210.947	17.995
Non-real estate rentals and management of non-financial intangible assets	0,437	35.357	7.191	181.978	5.102
Telecommunications	0,398	6.106	923	8.110	664
Other professional, scientific and technical activities	0,365	40.667	6.545	56.306	5.146
Total KIS	**0,525**	**508.264**	**60.890**	**710.852**	**43.443**
Total Services	**0,463**	**1.976.661**	**296.060**	**2.448.383**	**224.672**
Total General	**0,427**	**3.546.984**	**455.600**	**3.515.783**	**374.439**

Knowledge Intensive Services	QEI Average (2022)	Men			
		Exports		Imports	
		Total	SA	Total	SA
Financial intermediation, insurance and complementary pensions	0,776	53.364	6.873	87.487	5.100
Editing and editing integrated into print	0,650	7.773	2.510	14.616	546
Air Transport	0,586	9.437	1.064	11.003	540
Television, radio, film and image and sound recording/editing activities	0,562	17.365	2.948	22.293	1.861
Education	0,560	14.378	1.840	19.324	1.399
Development of systems and other information services	0,494	60.023	6.516	111.346	4.494
Architecture, engineering, technical testing/analysis and R&D services	0,472	111.691	6.958	75.101	3.641
Legal, accounting, consulting and corporate headquarters activities	0,470	212.260	21.969	199.466	17.016
Non-real estate rentals and management of non-financial intangible assets	0,437	55.264	11.240	284.431	7.975
Telecommunications	0,398	9.552	1.444	12.687	1.039
Other professional, scientific and technical activities	0,365	46.548	7.491	64.448	5.890
Total KIS	**0,525**	**597.655**	**70.853**	**902.204**	**49.501**
Total Services	**0,463**	**4.819.585**	**702.373**	**5.089.002**	**507.753**
Total General	**0,427**	**10.639.651**	**1.191.834**	**7.973.866**	**1.010.708**

Knowledge Intensive Services	QEI Average (2022)	Balance			
		Women		Men	
		Total	SA	Total	SA
Financial intermediation, insurance and complementary pensions	0,776	- 33.406	1.735	- 34.123	1.773
Editing and editing integrated into print	0,650	- 6.911	1.983	- 6.843	1.964
Air Transport	0,586	- 693	232	- 1.565	525
Television, radio, film and image and sound recording/editing activities	0,562	- 2.740	604	- 4.928	1.086
Education	0,560	- 14.953	1.335	- 4.946	441
Development of systems and other information services	0,494	- 15.007	591	- 51.323	2.022
Architecture, engineering, technical testing/analysis and R&D services	0,472	21.855	1.981	36.590	3.316
Legal, accounting, consulting and corporate headquarters activities	0,470	13.531	5.239	12.794	4.953
Non-real estate rentals and management of non-financial intangible assets	0,437	- 146.620	2.089	- 229.168	3.265
Telecommunications	0,398	- 2.004	259	- 3.135	405
Other professional, scientific and technical activities	0,365	- 15.639	1.399	- 17.901	1.601
Total KIS	**0,525**	**- 202.588**	**17.447**	**- 304.549**	**21.352**
Total Services	**0,463**	**- 471.722**	**71.388**	**- 269.417**	**194.620**
Total General	**0,427**	**31.202**	**81.161**	**2.665.785**	**181.126**

Source: Author's elaboration. Data: Alves-Passoni and Freitas (2020), PNAD Contínua, SISCOMEX and SISCOSERV.

Conclusions

In the Brazilian case, due to its pattern of productive and commercial specialization and the gender inequalities present in the paid and unpaid labor market, gender dynamics in jobs associated with international trade end up reproducing gender biases and evidencing a situation unfavorable to workers in general.

Female underrepresentation in the labor market is accentuated in the dimension of jobs associated with Brazilian exports, which tend to be concentrated in more masculinized sectors (where women's participation is often made invisible, as is the case of Agriculture). Thus, in this context, women represent only 25.0% of employed people, compared to the 42.8% they represented in the labor market associated with the Brazilian economy in 2019.

Furthermore, in aggregate terms, the quality of these jobs associated with Brazilian exports is lower than that of the jobs related to the economy, and this, in turn, has a worse EQI than that of the jobs threatened by the imports.

Despite this, this work identifies two scenarios in which Brazilian international trade presents more favorable dynamics, either regarding higher quality jobs for workers or greater gender equality: the bilateral trade between Brazil and South America and the KIS trade.

Regarding bilateral trade between Brazil and South America, the participation of women in the employment content associated with exports amounts to 27.7%. It even presents a more outstanding balance of female jobs than in the aggregate case, directly related to the composition of this regional trade. Likewise, the female EQI associated with exports to South America is higher than that associated with the economy and imports.

Another factor we highlight in this work is international trade associated with services, particularly KIS. Services, in general, cover a large part of the jobs related to international trade, with a greater weight in the case of women. These have a higher EQI than the aggregate for the economy and are even higher when analyzing KIS. Furthermore, women now represent 28.1% and 29.0% of jobs associated with total and South American service exports and 46.0% and 46.2% of total KIS exports and KIS exports destined for South America, respectively.

In this sense, we understand that international KIS trade, especially in a regional context, presents an opportunity to stimulate the Brazilian economy. These services can enhance the

productivity of other sectors, such as manufacturing and agriculture, and to promote gender equality in the labor market.

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