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# Are Global Value Chains Women Friendly in Developing Countries?

Evidence from Firm-Level Data

*Marize Kalliny*

*Chahir Zaki*



**WORLD BANK GROUP**

Middle East and North Africa Region

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## Abstract

Despite the efforts made to increase women's inclusion in the economy, they are still underrepresented in trade in general and in global value chains in particular. Thus, this paper aims at examining the impact of global value chains on women's trade participation as entrepreneurs and employees. It also analyzes how this effect is moderated through external (gender provisions in trade agreements) and internal (investment climate variables) factors. The analysis uses firm-level data for 154 developing economies and emerging markets with a special focus on the Middle East and North Africa region, being one of the regions with the lowest female labor force participation. The main findings show that global value chains integration increases the likelihood of being a female owner and the share of

female employees, especially production ones. A less robust negative effect is found for the impact on being a female top manager. These effects are moderated by the inclusion of gender provisions in trade agreements and by the characteristics of the investment climate (especially tax policy, access to finance, and corruption). These results remain robust after controlling for the endogeneity of global value chains using an instrumental variable approach and a propensity score estimation method where the treatment is being part of a global value chains. Thus, global value chains can be perceived as a tool that boosts women's empowerment in emerging economies, especially in the Middle East and North Africa region.

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# Are Global Value Chains Women Friendly in Developing Countries? Evidence from Firm-Level Data<sup>1</sup>

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## 1. Introduction

Women have always played a significant and pivotal role in the economy through their remarkable presence in business, agriculture, industry and even through their unpaid care work. Despite the efforts made to increase women's inclusion in the economy, around 2.4 billion women do not have access to equal economic opportunities as men according to the World Bank's Women, Business and the Law report (2022). Furthermore, based on a report published on women by the United Nations Development Programme (UNDP), women perform 66% of the world's work, produce 50% of the food, but earn only 10% of the income. In addition, different stages of the production process are increasingly being fragmented across different countries through global value chains (GVCs), especially in emerging economies. For this reason, this study attempts to assess the impact of GVCs on women's empowerment in international trade.

Indeed, in recent years, the world has witnessed a growing interest in the impact of globalization on economic patterns in general and gender equality in particular. A significant focus has been on the gender impact of GVCs as they have proven their power to generate employment, drive development, and increase income. These value chains can help women by providing more income that can support their economic empowerment but can also downgrade them to poorly paid and undervalued jobs. Hence, considering gender issues and addressing them is critical in order to take advantage of the potential of GVCs, which, in turn, guarantees a better achievement of sustainable economic and social goals by 2030.

In the previous literature, the relation between women's empowerment and international trade was ambiguous. The first strand of studies was in line with the neoclassical theory based on Becker (1959) and according to which discrimination is costly. Hence, the increase of industry competitiveness due to trade participation reduces the incentives to discriminate against women especially in concentrated industries than in competitive ones. For instance, Boler et al. (2015) use matched employer-employee data from the Norwegian manufacturing sector and prove that trade participation has narrowed the gender wage gap in exporting firms relative to non-exporters. Similarly, Juhn et al. (2014) and Black and Brainerd (2004) reach the same conclusion using various datasets. Nevertheless, contradictory results have been proven in other studies. For instance, in a study based in India, Taiwan, and China, Berik et al. (2004) show that competition resulting from international trade increases wage discrimination against female workers, which does not go in line with the neoclassical theory. Moreover, using difference-in-difference estimation and data from the Demographic Census for 1991 and 2000 fielded by the Brazilian Census Bureau, Gaddis and Pieters (2017) show that trade liberalization decreased the male and female labor force participation rate. The effect is significantly larger on men, which means that liberalization reduced the gender gap in employment and participation rates. Nevertheless, the results show no evidence that women got any benefit from the competitive effects of liberalization as their employment and participation rate did not increase relative to those of men. The literature also shows that the limited or negative employment effect was due to other concomitant factors such as the effect of anti-sweatshop activism (Harrison and Scorse 2010) and the constitution of minimum wage for export tariff privileges (del Carpio et al 2015). By studying the opposite dimension of the subject, Karam and Zaki (2021) argue that female labor participation in the MENA region has a positive significant impact on both trade margins. Furthermore, their results show that female ownership positively affects the probability of exports of large firms.

Regarding the relation between GVCs and women's empowerment, some strands of the literature studied the impact of GVCs on gender wage disparity. For instance, Deb (2021) uses the Trade in Value Added Database (TiVA) by the Organization for Economic Co-operation and Development (OECD) and conclude that neither backward nor forward linkages were able to improve the relative wages of female workers in India. Nevertheless, Jenkins (2005) confirmed that women wages and working conditions are better in GVCs. Furthermore, few papers have discussed the impact of GVCs on women's employment in general. GVC participation has been proven to increase female employment especially for developing countries (Shepherd and Stone, 2013; Bamber and Staritz, 2016).

Yet, it is important to note that the impact of GVCs on female empowerment can be moderated through several external and internal factors. At the external level, the scope of drafting of regional and bilateral trade agreements has been largely expanded to accommodate several Sustainable Development Goals. A large set of agreements prioritized environmental matters through the inclusion of climate change and environmental protection provisions (Martínez-Zarzoso, 2018). Labor rights related provisions also gained a large interest as starting from 2016, more than 136 countries negotiated at least one free trade agreement (FTA) that encloses labor rights related provisions (ILO, 2017; Harrison, 2019). However, only few strides have been made in order to include more gender related provisions in FTAs since among all FTAs in force, only 20% of them include explicit chapters or clauses that endeavor to achieve gender equality and to empower women (Monteiro, 2021). Similarly, according to the gender and trade report (UNCTAD, 2020), only 74 out of 500 RTAs (around 15%) include provisions that prioritize gender issues. Yet, it is worth mentioning that it is not the number of provisions or length of chapters including gender considerations that matter but their enforcement. Bahri (2021) shows how some RTAs such as Canada-Chile and Canada-Israel Agreements include whole chapters that address gender issues; however, there is a lack of legal obligations that ensure their proper implementation. Conversely, other RTAs such as the Stabilization and Association Agreement between the European Communities and the Republic of Montenegro, where gender provisions are included in the chapter on development and not standalone chapters for gender issues, are more efficient due to the existence of strong legal obligations that enforce the parties to respect the clauses and to stop any discrimination based on gender. At the internal level, and given the discrimination against women on the labor market, they might face more barriers when it comes access to finance, permits to start a business, tax policy, etc. This is why it is important to see how the effect of GVCs on women's empowerment is moderated by the obstacles they might face.

Against this background, there are no previous empirical studies, to our knowledge, that tackle the impact of GVCs on women's entrepreneurship in developing countries and especially the Middle East and North Africa (MENA) region, which is characterized by both low female labor force participation and low integration into GVCs. In addition, no empirical studies have been conducted to assess the impact of gender provisions on women's engagement in international trade in the MENA region. Indeed, compared to the other regions, the MENA region is ranked the lowest in the world for attaining gender equality based on the World Economic Forum's Global Gender Gap Report (2021). Moreover, based on the Women Peace and Security (WPS) Index, the MENA region's performance was very poor as it comprises 12 of the 25 worst performing countries globally (Danon and Collin, 2021). Therefore, the contribution of this paper is twofold. First, it focuses on the impact of GVCs on women's trade participation as entrepreneurs and employees.

Second, we analyze how this effect is moderated through external (gender provisions in trade agreements) and internal (investment climate variables) factors. To do so, we use firm-level data for 154 developing economies and emerging markets with a special focus on the Middle East and North Africa region. Our main findings show that GVC integration increases the likelihood of being a female owner and the share of female employees, especially production ones. A less robust negative effect is found regarding the impact on being a female top manager. These effects are moderated by the inclusion of gender provisions in trade agreements and by the characteristics of the investment climate (especially tax policy, courts, access to finance and corruption). These results remain robust after we control for the endogeneity of GVC using an instrumental variable approach and a propensity score estimation method where the treatment is being part of a GVC. Thus, GVCs can be perceived as a tool that boosts women's empowerment in emerging economies, especially in the MENA region.

The remainder of the paper is organized as follows. Section 2 presents the data we use and some stylized facts on GVCs and women's participation. Section 3 is dedicated to the methodology and the econometric specification. Section 4 presents the empirical results. Section 5 provides robustness checks. Section 6 concludes and provides some policy implications to increase women's employment through trade and GVC channels.

## **2. Data and Stylized Facts**

To explore the nexus between firms' integration into GVCs and women's trade participation as entrepreneurs and employees, firm-level pooled data from the WBES is used. These surveys cover a broad range of business environment topics such as access to finance, trade, corruption, competition, and infrastructure for 143,598 firms in 154 developing economies and emerging markets. The manufacturing and services sectors are the primary business of interest in these surveys conducted in a range of time that varies from 2006 to 2021 (see Appendix 1). The objective of this section is to provide some descriptive statistics related to the nexus between GVCs and women's participation.

To define GVCs, we follow the definition of DAVIS and ZAKI (2020) where the least strict definition includes firms that export and import simultaneously (GVC1). Second, two stricter definitions are related to firms who are simultaneously exporters and importers and have either an international certification (GVC2) or a share of its capital owned by a foreign firm (GVC3). The strictest definition combines the four criteria altogether (GVC4). This variable is a dummy variable that takes a value of one if the firm is part of a GVC and zero otherwise. Based on these definitions, around one-third of firms are part of GVCs with most of them being two-way traders and only 2.3% that are two-way trader, have a foreign capital and an international certification (see Table A1 in Appendix 3). It is important to note that these two definitions help us measure GVC participation at the extensive margin level, not the intensive margin one.

At the regional level (see Figure A1 in Appendix 3), Europe and Central Asia (ECA) is the most integrated region in GVCs (for all definitions) and South Asia the least integrated one. The MENA region, while being slightly better than South Asia, is still far from other top performers such as ECA and Latin American and the Caribbean. This confirms previous findings of the literature on GVCs in the MENA region that is characterized by an unfriendly business climate (DAVIS and

Zaki, 2020), political connections (Kruse et al., 2021 and Aboushady and Zaki, 2022) and the presence of different trade barriers (whether tariffs or non-tariff measures, see Karam and Zaki (2021)).

As it was mentioned before, this paper attempts to examine the nexus between women’s labor participation and GVCs integration. LAC has the highest share of full-time female employees followed by EAP and ECA and on the other extreme South Asia and the MENA region. In addition, for all the regions production workers are much higher than non-production ones (see Table A2 in Appendix 3). While the former are mainly working in the manufacturing sector, the latter are in the services one. This is confirmed by Table 1 that shows that being integrated in a GVC is positively associated to a larger number of females, whether production or non-production workers but more production ones. This result applies to the different GVCs definitions bearing in mind that for the most restrictive definition, the results are also driven by the firm size (as larger firms are more likely to be part of GVCs). Such a positive association is rather good news given that GVCs should mainly take place in the manufacturing sector, which is likely to create more jobs for female production workers (blue collars) that are abundant in emerging economies.

Table 1. The Average Number of Female Employees and GVCs

	GVC1		GVC2		GVC3		GVC4	
	No	Yes	No	Yes	No	Yes	No	Yes
Female Employees	19.81	43.19	20.60	79.27	21.12	87.86	21.30	108.81
Female Production Workers	14.35	72.83	21.45	85.13	23.95	129.54	26.50	126.43
Female Non-Production Workers	5.30	18.48	6.20	25.86	7.66	28.18	7.90	35.07

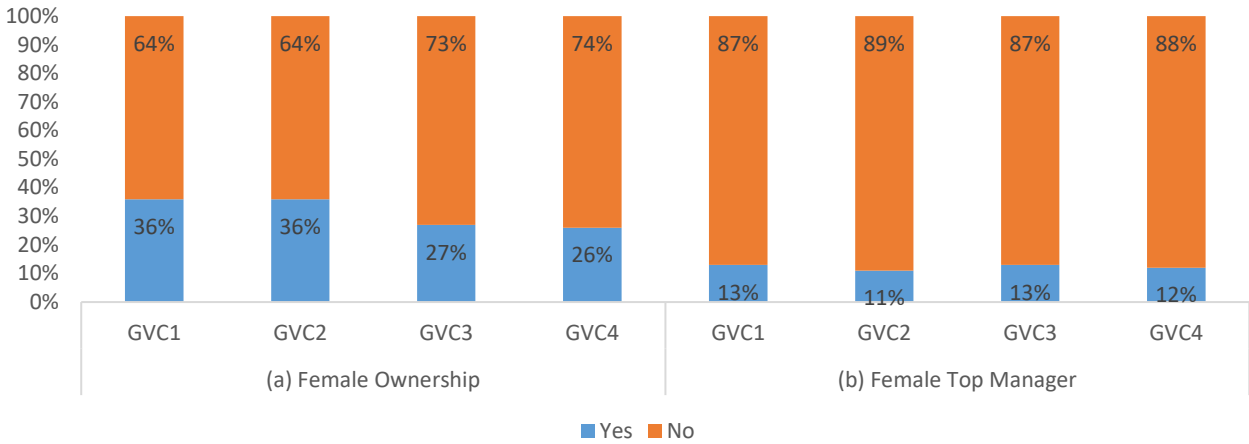
Source: Constructed by the authors using the WBES.

Note: GVC1 refers to firms that export and import simultaneously, GVC2 = GVC1 + international certification, GVC3= GVC1+ share of its capital owned by a foreign firm, GVC4 combines the four criteria altogether.

Yet, it is important to look at women’s participation from a broader lens by taking into consideration, not only female workers, but whether the owner or the manager of the firm are females. These two measures can give a clearer picture of women’s empowerment as they are associated to more female power within the firm. Thus, Figure 1 compares firms that are part of GVCs whose owner or manager are women. Three remarks are worth mentioning. First, generally, the share of firms that are owned or managed by females is limited, compared to those owned or managed by males. Second, females that own a firm that is part of a GVC are higher than those who just manage it. This is closely related to the concept of empowerment as it captures the effect on women’s empowerment more than management given that the manager is, at the end of the day, an employee in the firm that takes orders from the owner, while the owner is an entrepreneur that takes financial and business risks on his/her own (Karam and Zaki, 2021). Third, these shares decrease with more restrictive definition of GVCs (for ownership it decreased from 36% to 26% of firms and for management from 13% to 12%).



Figure 1. Share of Female Ownership and Management in Firms integrating into GVCs

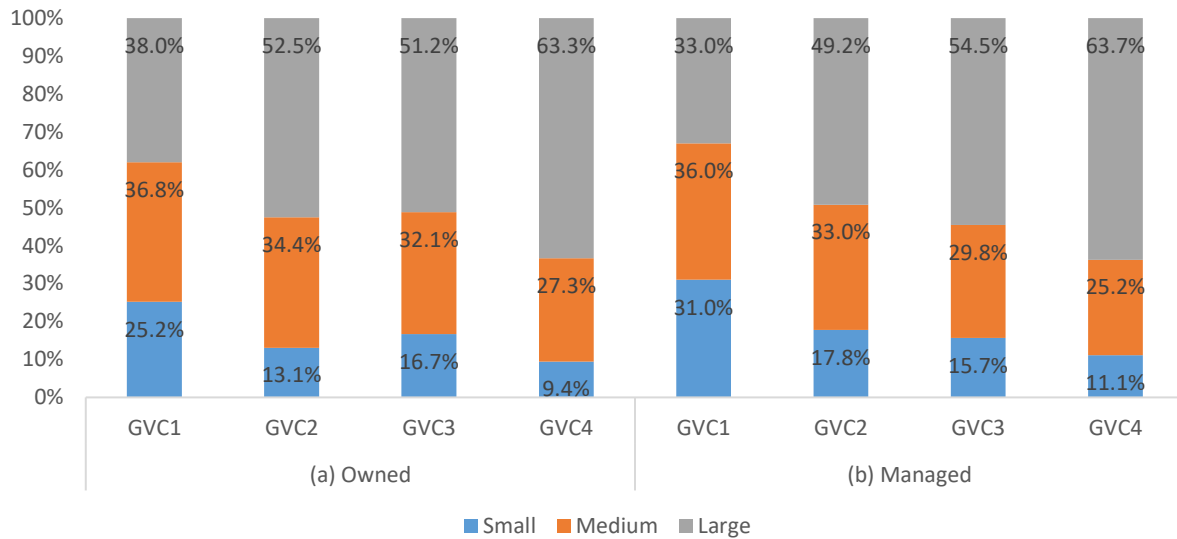


Source: Constructed by the authors using the WBES.

Note: GVC1 refers to firms that export and import simultaneously, GVC2 = GVC1 + international certification, GVC3= GVC1+ share of its capital owned by a foreign firm, GVC4 combines the four criteria altogether.

When we look at the relationship between female participation, firm size, and GVC integration, two remarks are worthwhile. First, for large firms and the strict definition of GVC, females (whether they are owners or managers) tend to be under-represented. Second, generally, for less restrictive definitions of GVC, we do not observe significant differences between small, medium, and large firms when it comes to female ownership and management. As for regional differences, Figure 3 shows that females are doing better in terms of ownership compared to management when it comes to GVC integration. Indeed, for all GVC definitions in different regions, the share of firms that are part of GVCs and that are owned by females is greater than the one of firms managed by females with a slightly lower figures for the most restrictive definition (GVC4) as it is shown in Figure 2. In addition, for the most restrictive definition, EAP followed by SAR are the best performers whereas MENA and LAC are the worst in terms of female ownership and management (see Figure 3). This is due to the low labor cost that helps develop value chains, especially in the textile and garments sector (Kumar, 2017). Indeed, South Asia has the second-highest level of GVC exports out of total exports among developing regions, chiefly thanks to final and intermediate apparel products (Lopez-Acevedo et al., 2017). This is why, as it was mentioned before, the MENA region’s problem of women’s participation is also reflected in their integration into GVCs as owners or managers.

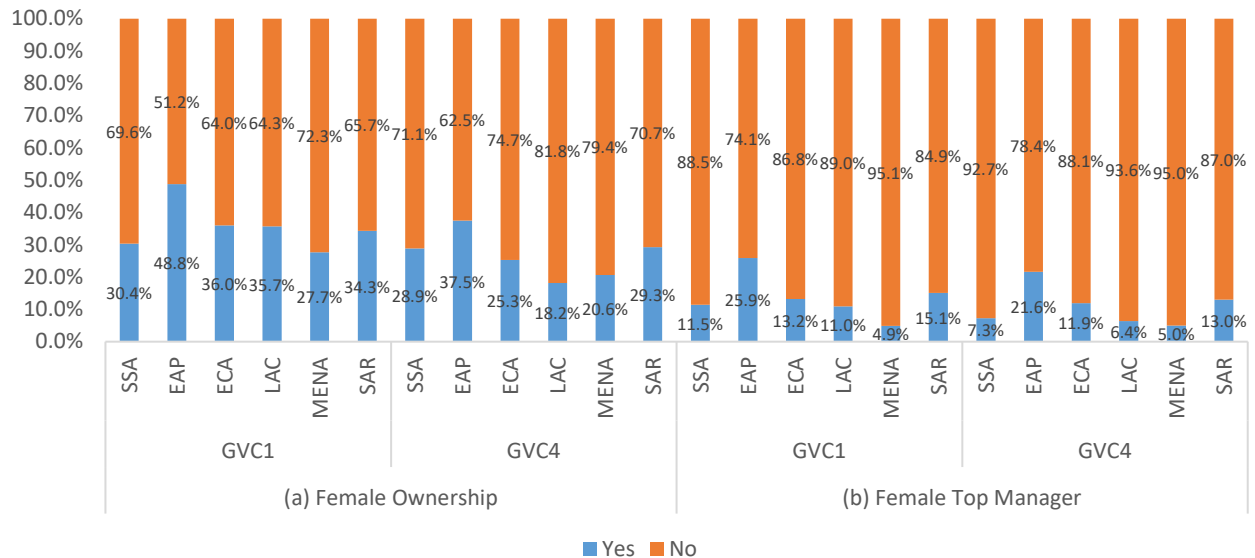
Figure 2. The Percentage of Firms Owned/ Managed by Female integrating into GVCs, by size



Source: Constructed by the authors using the WBES.

Note: GVC1 refers to firms that export and import simultaneously, GVC2 = GVC1 + international certification, GVC3= GVC1+ share of its capital owned by a foreign firm, GVC4 combines the four criteria altogether.

Figure 3. The Percentage of Firms Owned/ Managed by Female integrating into GVCs, by region

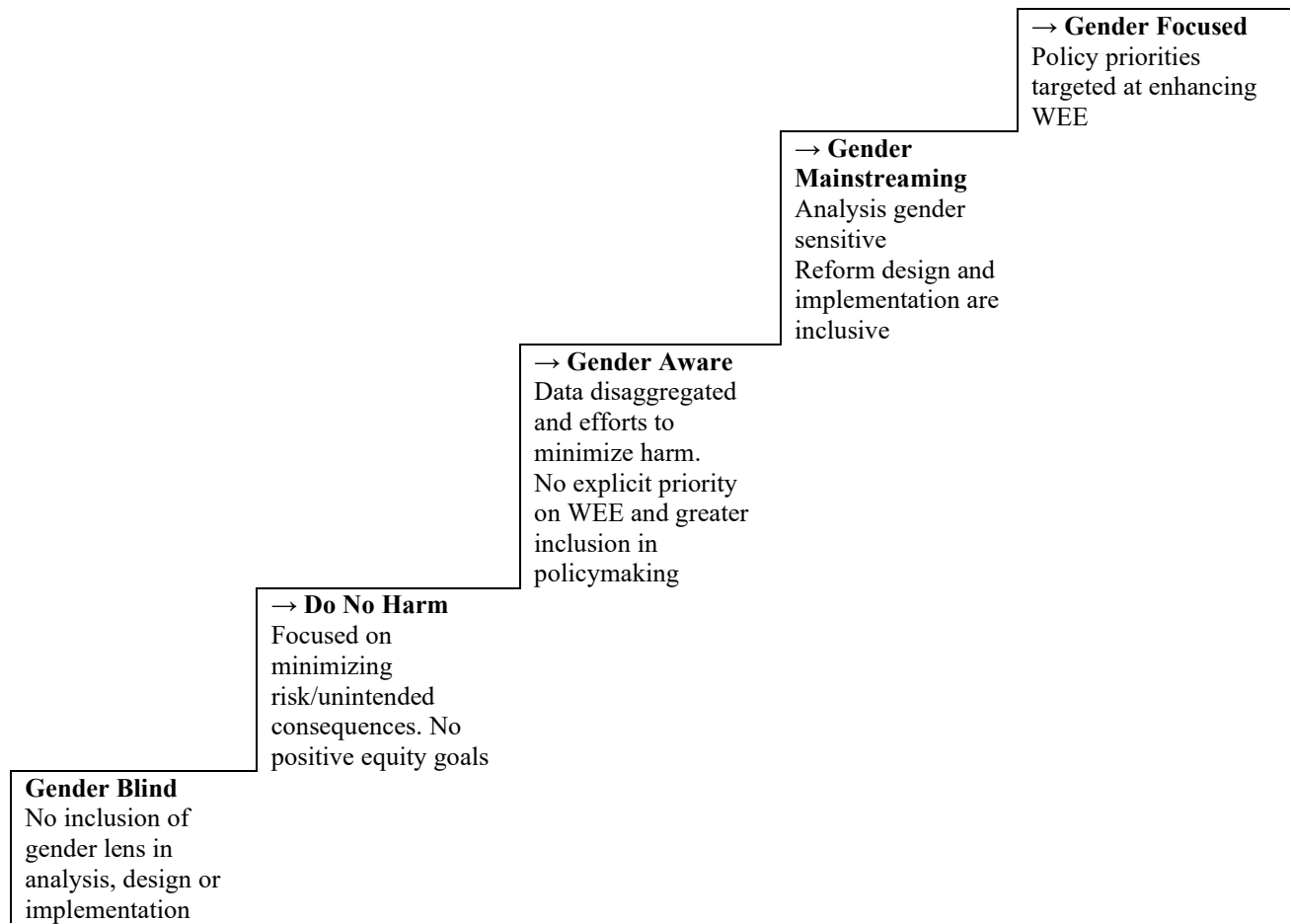


Source: Constructed by the authors using the WBES.

Note: SAR stands for South Asia, MENA Middle East and North Africa, EAP East Asia and Pacific, SSA Sub-Saharan Africa, LAC Latin America, and the Caribbean and ECA Europe and Central Asia.

We argue that the effect of GVC on women’s participation is moderated through internal and external factors. Generally, both factors might be gender blind as rules and regulations (to start a business or in trade agreements) do not have a gender lens (see Figure 4). However, their impact differs across individuals, and must be either gender mainstreamed or gender focused to improve women economic empowerment in a more explicit way. This is the case of gender provisions in trade agreements or rules that might be more gender-friendly.

Figure 4. Levels of Gender Inclusion in Business Environment Reform



Source: ILO (2021).

Note: WEE stands for Women Economic Empowerment.

At the internal level, Table 2 presents the share of firms reporting each variable as the biggest obstacle. A large heterogeneity is observed across different regions. For instance, while firms report that access to finance is a major obstacle in Sub-Saharan Africa, those in the MENA region complain mainly about business licensing, permits, corruption, and political instability. In Latin America, business and licensing, crimes and disorder, customs and trade regulations, and practices of the informal sector seem to be major obstacles. Finally, in Europe and Central Asia, problems related to inadequately educated workforce, labor regulations, tax rate, and administration are onerous. Obviously, such problems that affect the business environment might also hinder women’s participation. This is why we take different obstacles into consideration to see how they can amplify the impact of GVC on women’s participation.

Table 2. Percent of Firms Choosing Their Biggest Obstacle (%)

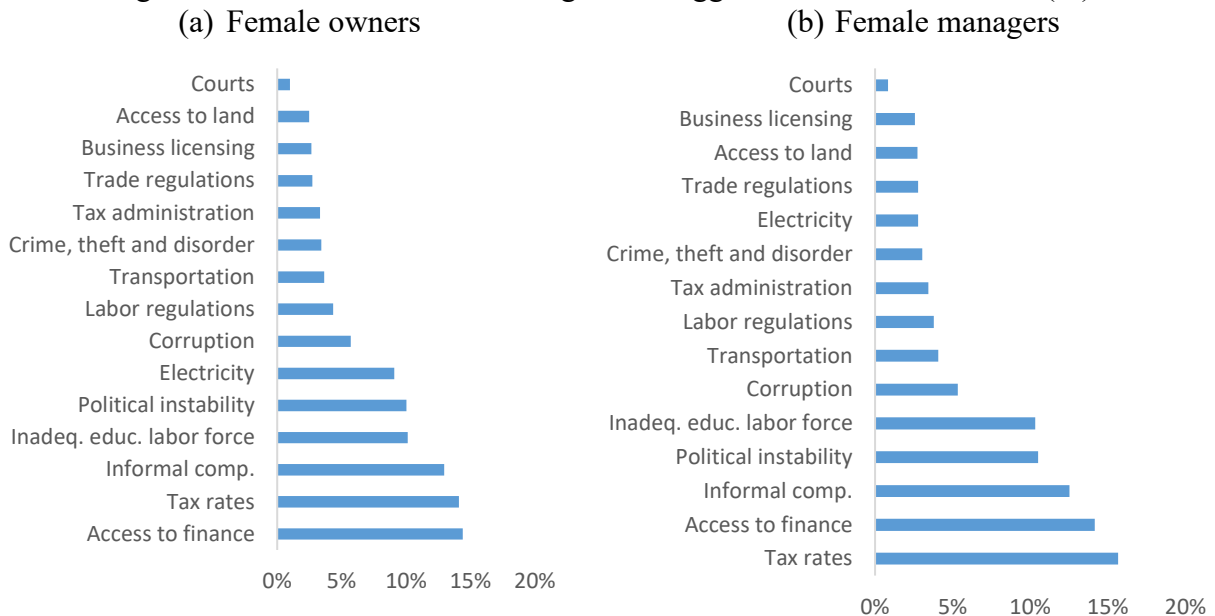
	All Countries	EAP	ECA	LAC	MENA	SAR	SSA
Access to finance	14.2	13.6	9.4	9	12.1	12.1	23.9
Land	2.9	5.6	1.7	1.4	1.5	4.6	4.3
Business licensing and permits	2.5	2.8	2.7	4.4	3.5	1	1.4
Corruption	6.5	6.6	3.8	9.7	9.7	10.5	7.3
Courts	0.9	0.8	1.2	1	1	0.4	0.6
Crime, theft, and disorder	2.9	3	1.7	6.7	1.6	2.7	3.3
Customs and trade regulations	3.3	2.9	2.6	4.2	3.4	1.8	4.5
Electricity	8.4	6.5	3.5	5.4	10.9	21.8	13.9
Inadequately educated workforce	10.3	7.6	19.7	7.8	8.8	2.9	1.8
Labor regulations	3.5	2.9	5.3	4.5	2.4	4.8	1
Political instability	11.9	15.3	9	11.1	19.5	20.7	10.8
Practices of the informal sector	11.5	14.4	11.6	17.4	6.8	4.6	10.6
Tax administration	3.9	2.4	4.5	4.4	2.7	2.2	4.3
Tax rates	13.2	10.6	18.6	10.9	11.7	6	9.7
Transportation	3.8	5	4.8	2.2	4.3	3.7	2.6

Source: Constructed by the authors using the WBES.

Note: EAP stands for East Asia and Pacific, ECA Europe and Central Asia, LAC Latin America and the Caribbean, MENA Middle East and North Africa, SAR South Asia and SSA Sub-Saharan Africa.

When the gender dimension is considered, some obstacles turn to be more impeding than others. As such barriers are primarily faced by owners and managers, we do not include in this part female employees. Thus, Figure 5 shows that access to finance, tax rates, practices from informal competitors, political instability, inadequately educated labor force and corruption are the highest obstacles for firms that either owned or managed by women. In addition, electricity turns to be impeding for firms that are owned by women. This is why, we are going to focus only on these barriers in the empirical part, as it will be shown later.<sup>4</sup>

Figure 5. Percent of Firms Choosing Their Biggest Obstacle and Gender (%)



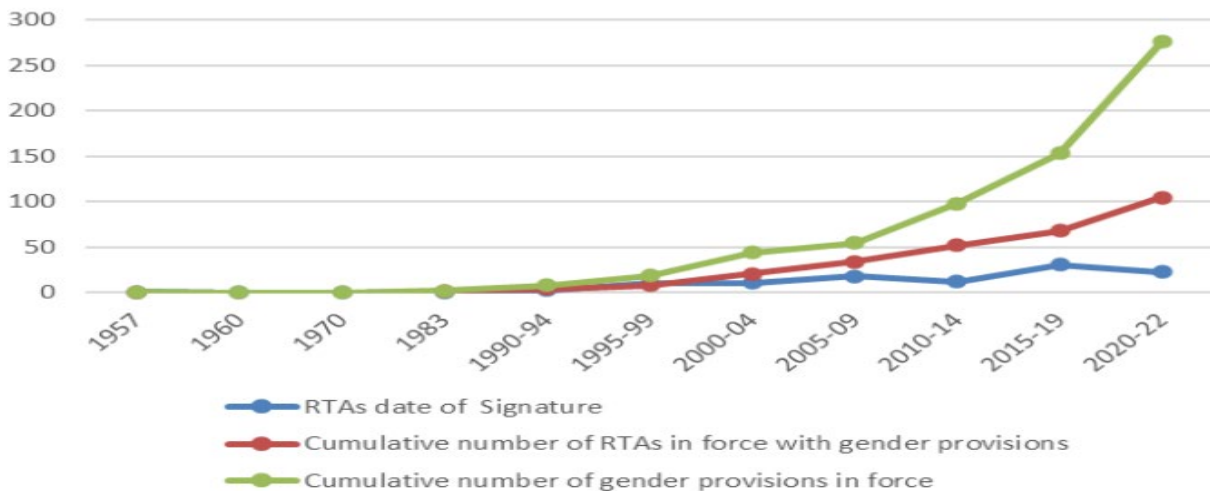
Source: Constructed by the authors using the WBES.

<sup>4</sup> The results of other barriers are available upon request.

In addition, at the external level, having a gender provision in an RTA that takes into account gender issues and include an explicit mention of gender, sex, women, girls, the international instruments promoting women’s rights (such as the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW), the Beijing Declaration and Platform for Action for the Rights of Women and Girls, the Buenos Aires Declaration on Trade and Women’s Economic Empowerment or the UN Sustainable Development Goal 5 on gender equality (SDG 5)) can increase women’s participation, and thus might amplify the positive effect of GVC. Figure 6 shows that the number of trade agreements including such provisions has been increasing significantly since 2000. Yet, it is important to note that, while the inclusion of such provisions is necessary, it might not be sufficient with a weak enforcement.

After presenting these different stylized facts, the next section provides empirical evidence on the association between women’s participation and GVCs integration.

Figure 6. Evolution of RTAs with Gender Provisions over Time



Source: WTO (2022).

### 3. Methodology

Using the WBES, we examine the impact of firms’ integration into GVCs on women’s empowerment as follows:

$$Female_{ijcgt} = GVC_{ijcgt} \lambda + X_{ijcgt} \rho + \zeta_t + \gamma_c + \theta_j + \delta_{ijcgt} \quad (1)$$

Where *Female* is measured by three variables: first, whether the top manager of the firm is female (dummy variable equals to one and zero otherwise); second, whether the owner of the firm is female (dummy variable equals to one and zero otherwise); third, the number of full-time female employees (we also distinguish between the proportion of permanent full-time female production and non-production workers). *GVC* is measured using several dimensions: export status, import status, international certification, and type of ownership, as it has been explained before. The first definition (*GVC1*) is the most lenient as it encloses firms that are exporters and importers at the

same time. The second definition (GVC4) is stricter as it combines the four dimensions together: firms that are simultaneously exporters and importers, that also have an international certification and a foreign ownership of its capital (Dovis and Zaki, 2020). The subscripts  $i, j, c, g$  and  $t$  denote firms, sector, country, region and year respectively.

$X_{ijcgt}$  is a vector that includes firms' characteristics that are expected to affect female entrepreneurs and women's participation in the workforce of the firm such as firms' age, size, share of government ownership and city of operation.  $age_{ijcgt}$  is the difference between the survey year and the year in which the establishment began operation.  $govown_{ijcgt}$  is the share of government ownership that is likely to attract women given that public employment is more women friendly than private one.  $maincity_{ijcgt}$  is a dummy variable that takes the value 1 if the firm is operating in the main business city and is expected to positively affect women's participation due to agglomeration economies.  $size_{ijcgt}$  is a categorical variable that takes the value 1 for small firms, 2 for medium firms and 3 for large ones. Large firms get advantage of their size and engage in economies of scale which, in turn, allows them to enjoy lower costs of production and might hire more women. Appendix 2 summarizes the definition of different variables.

Given that we pool data for different countries and years, we include year, country, and sector fixed effects ( $\zeta_t, \gamma_c$  and  $\theta_j$ ) to control for unobservables.  $\delta_{ijcgt}$  is the disturbance term. Our estimations are run using a pooled Ordinary Least Squares (OLS) estimation method (when the dependent variable is a continuous variable, namely share of females' workers) and a Linear Probability Model (when the dependent variable is binary, which is the case of a female manager or a female owner).

We extend the analysis in three ways. First, we investigate whether the impact of firms' integration into GVCs on female participation is conditional on some external factors such as gender provisions in RTAs. The literature on the efficiency of gender provisions in regional trade agreements (RTAs) is relatively scarce. Hence, there is little empirical evidence that supports the idea that gender-related provisions or labor provisions with clauses related to gender equality significantly promote gender equality and women's empowerment in the workplace. In that vein, López Mourelo and Samaan (2018) run a difference-in-differences model using the Cambodian Socioeconomic Survey (CSES) conducted by the National Institute of Statistics of the Ministry of Planning over the period 1993-2012 in order to assess the average effect of the 1999 Cambodia-US Bilateral Textile Agreement (CUSBTA) on the gender wage gap. The CUSBTA encloses labor provisions, which mainly aim to improve working conditions through two main pillars. First, the elimination of discrimination between employees and especially those based on gender basis. Second, the reduction of gender-wage gap. The results of the study show that labor provisions decrease gender wage gap and gender discrimination in workplace only in the textile sector. However, the gap is still increasing in the other manufacturing sectors that are not concerned by these provisions. Furthermore, the impact of these provisions is proven to be significant and important only during the period of the agreement and while the International Labor Organization (ILO) is monitoring the proper implementation of these provisions. However, the impact of the provisions starts to decrease during the post-agreement period. In our paper, the impact of gender related provisions in RTAs is studied using the World Trade Organization (WTO) database that compiles provisions related to women's empowerment and gender equality. In this dataset,

provisions are filtered by parties, date of signature, date of entry into force and the type of gender issues they address.

The second extension pertains to internal factors measured by the investment climate variables. Indeed, females might face more barriers because of discrimination in access to finance, access to land, etc. This is why we make use of firms' own perception regarding the main obstacles affecting their operation by identifying each problem as the main obstacle. As it was mentioned before, we focus on the most impeding barriers, namely, access to finance, tax rates, practices from informal competitors, political instability, inadequately educated labor force, corruption, and electricity. These obstacles are expected to have a negative impact on women's engagement in international trade as well as their integration into GVCs (Christian et al., 2013; Staritz and Reis, 2013; Barrientos, 2014; Doss, 2014; Bamber and Staritz, 2016). Since the time dimension in the WBES is very weak, the inclusion of firm-level fixed effects will not be possible. Therefore, following Dosis and Zaki (2020), firms' perception about obstacles to doing business is calculated using industry, country, and year averages minus firms' own responses to control for endogeneity.

The third extension checks the robustness of our results in two ways. First, a Propensity Score Matching (PSM) model that solves for endogeneity is estimated. This method assumes the conditional exogeneity of the treatment (GVCs participation in our case) or the selection on the observables only as it consists of finding a proper counterfactual group by matching a firm participating into GVCs with a non-participant firm with similar pre-intervention characteristics. The average treatment effect (ATE) will be estimated as follows:

$$Female_{ijcgt} = E(Y_{ijcgt} / T_{ijcgt} = 1, X_{ijcgt}) - E(Y_{ijcgt} / T_{ijcgt} = 0, X_{ijcgt}) \quad (2)$$

where  $Female_{ijcgt}$  is the outcome measured using four dimensions: if the firm's owner is female, if the top manager is female, the number of full-time female employees and the proportion of permanent full-time female production and non-production workers.  $T=1$  if the firm is receiving the treatment (participating in GVCs in our case) and 0 if not. The vector  $X_{ijcgt}$  represents the observables that are similar between the treatment and control group such as firm's age, size, share of government ownership and city of operation in addition to the dummies mentioned before.

Yet, as PSM is based on observables, the endogeneity that is due to unobservables is not controlled for. This is we rely on an Instrumental Variable approach (IV) to control for the endogenous characteristics of firms' integration into GVC. The IV must satisfy two main criteria. First, it must be highly correlated with the endogenous variable (GVC in our case). Second, it should not be correlated with the error term and does not affect women's participation directly. Following Dosis and Zaki (2020), a shift-share of GVC aggregated by country-year-sector-geographical zone (where the firm is located) minus the firm's own performance is used as an instrument. GVC corrected from individual firm idiosyncrasies is expected to affect firms' trade performance without having any direct impact on women's participation.

The endogeneity problem is tackled following a Two-Stage Least Squares (2SLS) technique. The first stage predicts GVCs as follows:

$$GVC_{ijcgt} = \text{Ln}(age)_{ijcgt} \alpha + \text{Ln}(govown)_{ijcgt} \beta + \text{maincity}_{ijcgt} \tau + \text{size}_{ijcgt} \xi + \text{shift\_share\_GVC}_{ijcgt} \nu + \zeta_t + \gamma_c + \theta_j + \epsilon_{ijcgt} \quad (3)$$

Where  $shift\_share\_GVC_{ijcgt}$  is a shift share of firms' integration into GVCs calculated using industry, country, year, and geographical zone averages minus firms' own performance.  $\epsilon_{ijcgt}$  is the error term. Different tests are performed to assess the validity and the strength of the instruments.<sup>5</sup>

## 4. Empirical Results

Our empirical analysis focuses on women's participation measured by three variables: whether the owner is a female, whether the manager is a female and the share of females in the total number of workers. For each variable, we will run two different sets of regressions for two definitions of GVCs (GVC1 and GVC4): first, we run the regressions for all the regions (including the MENA region) as it is shown in Table 3a). Second, we run the same regressions but for the MENA region only (see Table 3b).

The extensions mentioned above are presented as follows: first, we show how GVC impact on women's participation is moderated by gender provisions in trade agreements (in Table 4). Second, we examine how GVC impact is moderated by some internal factors that affect the investment climate (for all regions in Table 5); and for the MENA region in Table 6. Finally, we control for the endogeneity of GVCs using a PSM approach (Table 7) and an IV estimation method (Table 8).

### 4.1. Gender and GVCs<sup>6</sup>

Table 3 presents our baseline regression. Regarding our control variables, larger, older firms, located in the main city and having a higher share of government ownership are more likely to be owned by females for all the regions (Table 3a) and the MENA region (Table 3b). Larger firms are generally better performing, listed and might have a diverse board. Li and Chen (2018), using a panel data from listed non-financial firms in China, find that gender diversity in the board has a positive impact on firm performance. Similar results are confirmed by Said et al. (2021) for Egyptian firms. As per the sector of operation, a higher share of government ownership increases the likelihood of female ownership. Generally, the public sector remains a larger employer of women than the private one. In addition, females also enjoy a higher wage premium in the public sector compared to those employed in the private sector.

As per our variable of interest, Tables 3a (overall) and 3b (MENA region) shows that the least restrictive definition of GVC is positively associated with a higher probability of having a women as the owner of the firm or with the share of female employees (especially production ones) whereas a deeper integration into GVC (GVC4) reduces the probability of female ownership. In addition, GVC integration exerts a negative impact on the likelihood of a women being the top manager of the firm (for GVC1) and an insignificant impact with the stricter definition (GVC4). Three remarks are worth mentioning. First, there are fundamental differences between female owner and manager given that an owner physically owns the business, while the manager is an employee of the business and works for the owner. In addition, the owner is more affected by

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<sup>5</sup> The minimum Eigenvalue is higher than all the critical values at 10% and the p-value is significant at 1%. Therefore, we reject the null-hypothesis according to which the instruments are weak.

<sup>6</sup> Regressions for Non-Production Workers are presented in Table A3 (Appendix 4).



profits and losses, while the manager earns a salary and is not affected by external conditions or fluctuating sales. Management is also operational in the sense that it is concerned with the ongoing activities of the business (Woods and Joyce, 2003). Thus, from an empowerment perspective, being an owner gives more power to a woman, compared to the management position. This is why our results show that GVC might be associated to more empowerment given the positive effect on female ownership, whereas the one for top management is negative.

Second, GVC can also improve women's participation as it increases the share of female employees. While this is rather good news, this result must be cautiously analyzed as we do not measure the quality of jobs associated to these GVC. For instance, on 24 April 2013, the collapse of the Rana Plaza building in Dhaka, Bangladesh, raised several issues regarding the supply chain of garments and the working conditions associated to them (Koenig and Poncet, 2022). Indeed, the collapse of this building that housed five garment factories killed more than a thousand people and injured more than 2,500. This is why, while GVC can improve job creation (Kumar, 2017), job quality is still questionable.

Third, most of the emerging economies are abundant in blue collar or production employees. In addition, most of the sectors where they have a comparative advantage (processed food, textile, ready-made garments) are intensive in blue collar workers. Thus, the positive effect of GVC on female production workers can help address the Sustainable Development Goal number five (promoting gender equality) by increasing female labor force participation, especially for production ones. This result corroborates the results of Guha-Khasnobis et al. (2022) who find that, in India, stronger forward linkage has created employment opportunities for the unskilled workers. In the same vein, Kumar (2017) show that lower skilled, young, female workers account for the largest share of jobs that are created in labor-intensive value chains (especially, apparel, footwear, and electronics).

When the regressions are run separately for the MENA region (Table 3b), the positive effects on female owners and female employees are confirmed but with higher magnitudes, especially for production workers. This is in line with the findings of Aboushady and Zaki (2021a) who argue that exports and innovation in core production techniques increase the demand for skilled production (blue-collar) workers in the manufacturing sector rather than non-production workers (white collars). However, a major problem in the MENA region is limited employability and skill shortages in blue-collar workers. Additionally, female workers are concentrated in low value-added sectors and in the informal sector. Therefore, inclusive trade policy that promotes GVCs needs to be coupled by public private cooperation to enhance vocational training and improve the skills of blue-collars, especially women (Aboushady and Zaki, 2021b). This will help address the low female labor force participation that has been well-documented in the literature on the MENA region (Assaad and Artz, 2005 and Assaad and Krafft, 2015, Assaad and Boughazala, 2018).

Table 3. GVCs and Female Labor Force Participation – Baseline Results

(a) All regions included								
Variables	Female Ownership		Female Top Manager		Female Employees		Female Production Workers	
	GVC1	GVC4	GVC1	GVC4	GVC1	GVC4	GVC1	GVC4
Ln(Age)	0.047*** (0.003)	0.047*** (0.003)	-0.005** (0.002)	-0.005** (0.002)	0.075*** (0.008)	0.077*** (0.008)	0.014 (0.010)	0.019* (0.010)
Ln(Gov own.)	0.015*** (0.004)	0.015*** (0.004)	0.0005 (0.003)	0.0003 (0.003)	0.015 (0.014)	0.017 (0.014)	0.081*** (0.019)	0.083*** (0.019)
Main city	0.015*** (0.004)	0.015*** (0.004)	0.011*** (0.003)	0.011*** (0.003)	0.114*** (0.010)	0.115*** (0.010)	-0.033** (0.015)	-0.024 (0.015)
Medium	0.002 (0.003)	0.004 (0.003)	-0.033*** (0.003)	-0.034*** (0.003)	0.997*** (0.009)	0.998*** (0.009)	0.717*** (0.011)	0.755*** (0.011)
Large	0.003 (0.005)	0.013*** (0.005)	-0.053*** (0.004)	-0.055*** (0.003)	2.462*** (0.020)	2.460*** (0.020)	2.189*** (0.021)	2.271*** (0.020)
GVCs	0.013*** (0.004)	-0.098*** (0.011)	-0.011*** (0.003)	-0.006 (0.008)	0.093*** (0.014)	0.424*** (0.059)	0.323*** (0.017)	0.402*** (0.044)
Constant	0.163*** (0.009)	0.165*** (0.009)	0.194*** (0.007)	0.193*** (0.007)	0.839*** (0.024)	0.841*** (0.024)	0.552*** (0.032)	0.579*** (0.032)
Country dum.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dum.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector dum.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	83,949	83,949	84,341	84,341	41,224	41,224	41,234	41,234
R-squared	0.115	0.116	0.099	0.099	0.548	0.548	0.498	0.495

(b) MENA region								
Variables	Female Ownership		Female Top Manager		Female Employees		Female Production Workers	
	GVC1	GVC4	GVC1	GVC4	GVC1	GVC4	GVC1	GVC4
Ln(Age)	0.037*** (0.006)	0.036*** (0.006)	3.85e-05 (0.004)	-3.26e-07 (0.004)	0.067*** (0.024)	0.072*** (0.024)	-0.069*** (0.023)	-0.064*** (0.023)
Ln(Gov own.)	-0.017 (0.011)	-0.016 (0.011)	-0.005 (0.005)	-0.005 (0.005)	0.074 (0.056)	0.082 (0.055)	-0.010 (0.065)	-0.013 (0.065)
Main city	0.023*** (0.008)	0.024*** (0.008)	0.019*** (0.005)	0.018*** (0.005)	0.200*** (0.033)	0.209*** (0.033)	-0.035 (0.033)	-0.030 (0.034)
Medium	0.023*** (0.080)	0.027*** (0.008)	0.0005 (0.005)	-0.0001 (0.005)	0.848*** (0.030)	0.857*** (0.030)	0.448*** (0.025)	0.497*** (0.025)
Large	0.047*** (0.011)	0.061*** (0.011)	-0.009 (0.006)	-0.011* (0.006)	2.311*** (0.067)	2.320*** (0.066)	1.449*** (0.051)	1.578*** (0.051)
GVCs	0.031*** (0.011)	-0.070** (0.029)	-0.007 (0.006)	-0.003 (0.017)	0.228*** (0.043)	0.753*** (0.236)	0.417*** (0.045)	0.645*** (0.153)
Constant	0.047** (0.019)	0.051*** (0.019)	0.050*** (0.012)	0.049*** (0.012)	0.445*** (0.073)	0.447*** (0.073)	0.602*** (0.073)	0.619*** (0.073)
Country dum.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dum.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector dum.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,714	11,714	11,730	11,730	4,857	4,857	6,863	6,863
R-squared	0.109	0.109	0.019	0.019	0.503	0.503	0.471	0.465

Robust standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Considering the sectoral activity of firms, the regressions for all the regions (Table A4a in the appendix) and for the MENA region (Table A4b) show that firms operating in the textile and garments sector are more likely to have a female owner and manager as well as a higher number of female production workers. Moreover, female employees are hired intensively in firms operating in leather sector. In the MENA, textile and leather seem to be the most female intensive, while the other sectors have a negative bias against women. These results are in line with the findings of Frederick et al. (2022) who argue that female employment is highest in apparel manufacturing sector. They find that textiles and leather sectors are the most important employer of women across developing countries as the percent of all female employment working in textiles

and leather ranges from 2% in the Arab Republic of Egypt to 16% in Cambodia. As for the interaction with GVCs, textile and leather sectors integrating into GVCs hire more women and are likely to have a female owner or manager. This can be due to the fact that the increase of industry competitiveness (especially that several emerging countries have a comparative advantage in these sectors) due to trade participation reduces the incentives of these firms to discriminate against women (Becker, 1959).

## 4.2. Moderating Factors<sup>7</sup>

The previous analysis is extended by examining how the effect of GVC on women's participation can be moderated through internal and external factors.

### 4.2.1. Gender Provisions in Trade Agreements

As it was mentioned before, while the global economy witnessed a proliferation of gender provisions in regional trade agreements, only 20% of them include explicit chapters or clauses that endeavor to achieve gender equality and to empower women (Monteiro, 2021). This might make GVC integration more women friendly and thus might increase women's participation in international trade through several channels. First, gender inequalities and discrimination against women are the most addressed issues in RTAs as they guarantee equitable access for men and women to opportunities generated by the RTA. Second, some provisions address the participation of women in economic activities, while fewer provisions promote women's access to productive resources, such as credit and financial services, land, and technology as they might affect their participation in international trade. Finally, a handful of provisions address issues related to women's leadership and decision-making roles (WTO, 2022).

Table 4a shows the results of GVC, gender provisions, and their interaction on women's participation for all countries. The positive effect of GVC on female owners and female employees is still confirmed in most of the regressions, with an insignificant impact on GVC4 (mainly due to a limited number of firms who are deeply integrated into GVCs). Moreover, gender provision *per se* exert a positive impact on female ownership and employees, and a negative impact on managers and production workers. As per the MENA region, Table 4b shows that gender provisions' impact remains positive for female employees. In contrast, it becomes non-significant for the other variables measuring female empowerment. When GVCs are interacted with gender provisions, we also find an insignificant effect in the MENA region. This might be due to the *de jure* inclusion of gender provisions in trade agreements without real enforcement. Indeed, the number of provisions or length of chapters including gender considerations matter much less than their enforcement. In addition, the vast majority of gender provisions are non-binding in nature. This is why it is important to distinguish whether such provisions are enforced or not or are subject to a dispute settlement mechanism or not.

In a nutshell, the positive effect of gender provision on female owners and employees is thus promising given that trade policy-related factors could be mobilized to make GVC more women friendly. Yet, more efforts are needed to make such provisions better enforceable and monitored.

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<sup>7</sup> Regressions for Non-Productions Workers are presented in Table A5 (Appendix 4) and Table A17 (Appendix 5).

Table 4. GVC, Female Labor Force Participation, and Gender Provisions in RTAs

(a) All Regions								
Variables	Female Ownership		Female Top Manager		Female Employees		Female Production Workers	
	GVC1	GVC4	GVC1	GVC4	GVC1	GVC4	GVC1	GVC4
(1)GVC	0.038*** (0.009)	-0.046 (0.032)	0.001 (0.006)	-0.001 (0.015)	0.131*** (0.024)	0.463*** (0.101)	0.378*** (0.056)	0.525*** (0.068)
(2)Gender Provisions	0.050*** (0.007)	0.050*** (0.007)	-0.048*** (0.006)	-0.048*** (0.006)	0.066*** (0.014)	0.065*** (0.013)	-0.246*** (0.028)	-0.232*** (0.029)
GVC*Gender Prov.	-0.001*** (0.0002)	-0.001*** (0.001)	-0.0004*** (0.0001)	-0.0001 (0.0003)	-0.001** (0.001)	-0.001 (0.002)	-0.002** (0.001)	-0.003** (0.001)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	83,949	83,949	84,341	84,341	41,227	41,227	41,237	41,237
R-squared	0.116	0.116	0.100	0.099	0.548	0.548	0.499	0.495
(b) MENA region								
Variables	Female Ownership		Female Top Manager		Female Employees		Female Production Workers	
	GVC1	GVC4	GVC1	GVC4	GVC1	GVC4	GVC1	GVC4
(1)GVC	0.0770** (0.0312)	-0.0453 (0.0684)	0.00582 (0.0137)	-0.00854 (0.0437)	0.299*** (0.0736)	0.427 (0.361)	0.556*** (0.101)	1.061** (0.445)
(2)Gender Provisions	0.00585 (0.00891)	0.00377 (0.00923)	0.00417 (0.00311)	0.00349 (0.00246)	0.114*** (0.0402)	0.111*** (0.0393)	0.0116 (0.0374)	-0.00751 (0.0458)
GVC*Gender Prov.	-0.00393 (0.00881)	-0.000245 (0.0158)	-0.00295 (0.00394)	0.00352 (0.0113)	0.00269 (0.0244)	0.155 (0.128)	-0.0217 (0.0371)	-0.0926 (0.0938)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,714	11,714	11,730	11,730	4,861	4,861	6,864	6,864
R-squared	0.064	0.060	0.011	0.010	0.456	0.454	0.472	0.465

Robust standard errors clustered by country and year in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Notes: - We control for firms' age, size, city of operation and the share of government ownership.

- Country dummies have been removed from panel (b) given the high collinearity between countries and provisions. Moreover, our sample drops when we focus only on the MENA region.

- The intercept is included.

#### 4.2.2. Internal Factors

In addition to external factors, there is growing evidence that an adverse business environment impedes firms' performance and hence negatively affect women's participation. Thus, the impact of GVC on women can also be moderated through the characteristics of the investment climate. This can be explained by two main reasons.

Investment climate affects trade performance and GVC integration. Dovis and Zaki (2020) show that the number of days that are required to pay taxes, the number of procedures that are necessary to register property, and the time to export and to import have a significantly negative relationship with the likelihood of a firm's integration into a GVC. In the same vein, Aboushady and Zaki (2019), using the WBES for Egypt, show that access to finance, tax payments and competition from the informal sector affect the firms' decision to become exporters, which is a part of GVCs. Second, several constraints hinder women's participation. Indeed, ILO (2021) argues that women's access to finance and markets, their land and property rights, and business registration and informality are key issues to be addressed to increase women's participation in the labor market. In addition, the World Bank's Women, Business and the Law index providing the link between legal gender equality and women's economic inclusion shows that the MENA and South Asia regions have the lowest index score (World Bank 2020b). The workplace indicator shows that, in many countries, the law does not prohibit gender-based employment discrimination that

covers mainly four areas: the existence of limited laws that stipulate equal remuneration, laws that hinder women from working similar night hours as men, laws that limit female participation in at least one industry or at certain jobs deemed as dangerous specially. Moreover, it shows that many countries such as Egypt, Turkey, Pakistan, and Bangladesh do not allow woman to get a job in the same place as a man. Thus, it is worth investigating how these barriers might reduce the positive impact of GVC on women's participation.

Table 5 shows the impact of GVC, different obstacles and their interaction at the world level. Globally, institutional barriers limit female participation in the workforce. First, female owners are negatively affected by access to finance and by the inadequate educate labor force. Access to finance is of particular importance as World Bank (2021) shows that, although 115 out of 190 mapped economies do not prohibit discrimination in access to credit based on gender (needing husband's approval or signature for financial transactions), female entrepreneurs can still face several discriminatory practices from banks and credit facilities (because of lack of collaterals due to the lack of resources for instance). As per the inadequate labor force, it also exerts a negative impact on female owners, pointing out the skills mismatch that characterizes several developing countries. Finally, it is worthy to note that in most of the cases the interaction of GVC with the obstacles is positive and statistically significant, which shows that GVC firms might face less obstacles (as, on average, they are more productive). Thus, the net effect of GVC on female ownership remains positive and statistically significant.

As per female managers, and in addition to inadequate labor force, political instability and corruption turn to be the most impending barriers, while the rest of the barriers are statistically insignificant. Such a finding has been documented in the literature, as women are perceived as more vulnerable and less likely to know and claim their rights. Thus, this will make them less confident in seeking legal redress and thus subject to abusive corruption. This is why, to empower women at the leadership level, more transparent and enforced rules are needed to have good governance. Access to finance and inadequate labor force are also exerting a negative impact on female employees. Finally, it is important to note that the GVC positive impact on female employees (and for production employees) is attenuated by most of the barriers as the interaction coefficient is negative with access to finance, electricity, and inadequate labor force (for GVC4 at the world level). Such a finding is of particular importance given that, as it was mentioned before, female production workers are abundant and hired intensively in several sectors where the emerging economies and have a comparative advantage. This is why, to increase the impact of GVC on this vulnerable category, it is crucial to improve the business environment. Thus, globally, improving skills to let them better match the labor market demand is a key issue to improve female labor force participation, management, and ownership.

Moving to the MENA region (Table 6), the picture looks slightly different as tax rates have a negative impact on female owners and female employees. There is strong evidence that tax policy has a gender bias (Stotsky, 1996 and AWID, 2013). Indeed, even if tax systems do not include explicit gender biases, there are several implicit biases in dealing with tax collectors, tax procedures, and fair implementation of rules. One of the important barriers that affects female managers and production employees in the competition coming from the informal sector. The latter is still a major problem in the region. Indeed, cheaper products offered by the informal sector may harm the performance of formally registered firms, and thus affect women's employment, namely

managers and production employees. Most of the interaction between GVC and such barriers are not statistically significant.

Table 5. Female Labor Force Participation, GVCs and Barriers – All regions

	Finance	Tax.Rates	Pol. Inst.	Corrup.	Comp.	Elec.	Inad.Edu	
(a) Female Ownership								
GVC1	(1) GVC	-0.0154 (0.0121)	0.0174 (0.0143)	-0.0126 (0.0123)	-0.0144 (0.0110)	0.000437 (0.0128)	0.00378 (0.0145)	0.0281** (0.0124)
	(2) Obstacle	-0.0788* (0.0457)	0.0114 (0.0423)	-0.0160 (0.0433)	-0.0617 (0.0523)	-0.0276 (0.0406)	0.0274 (0.0385)	-0.0724* (0.0395)
	(1)*(2)	0.160*** (0.0543)	-0.0178 (0.0466)	0.104*** (0.0394)	0.125*** (0.0408)	0.0681 (0.0543)	0.0368 (0.0494)	-0.0817 (0.0514)
	Observations	83,896	83,896	83,896	83,896	83,896	83,896	83,896
	R-squared	0.115	0.115	0.115	0.115	0.115	0.115	0.115
	GVC4	(1) GVC	-0.145*** (0.0311)	-0.0469 (0.0410)	-0.111*** (0.0330)	-0.117*** (0.0330)	-0.136*** (0.0302)	-0.0665 (0.0416)
(2) Obstacle		-0.0529 (0.0449)	0.00979 (0.0408)	0.00591 (0.0420)	-0.0399 (0.0519)	-0.0202 (0.0393)	0.0342 (0.0377)	-0.081** (0.0382)
(1)*(2)		0.317** (0.139)	-0.228* (0.124)	0.0666 (0.0963)	0.112 (0.108)	0.240 (0.147)	-0.130 (0.132)	-0.364** (0.157)
Observations		83,896	83,896	83,896	83,896	83,896	83,896	83,896
R-squared		0.116	0.116	0.116	0.116	0.116	0.116	0.116
(b) Female Manager								
GVC1	(1) GVC	-0.0192** (0.00861)	-0.00447 (0.00944)	-0.0175* (0.00899)	-0.023*** (0.00843)	-0.0123 (0.00833)	-0.0170 (0.0111)	-0.0122 (0.0102)
	(2) Obstacle	-0.0219 (0.0393)	-0.0235 (0.0348)	-0.0773** (0.0373)	-0.0896** (0.0386)	0.00312 (0.0427)	-0.0228 (0.0311)	-0.0704* (0.0394)
	(1)*(2)	0.0490 (0.0339)	-0.0249 (0.0285)	0.0282 (0.0223)	0.0559** (0.0275)	0.00969 (0.0346)	0.0253 (0.0337)	0.00989 (0.0431)
	Observations	84,287	84,287	84,287	84,287	84,287	84,287	84,287
	R-squared	0.099	0.099	0.099	0.100	0.099	0.099	0.099
	GVC4	(1) GVC	0.00141 (0.0152)	0.0161 (0.0182)	0.00753 (0.0154)	0.0106 (0.0158)	0.00932 (0.0154)	0.0186 (0.0223)
(2) Obstacle		-0.00961 (0.0395)	-0.0248 (0.0346)	-0.0705* (0.0374)	-0.0767** (0.0389)	0.00867 (0.0411)	-0.0138 (0.0306)	-0.0699* (0.0401)
(1)*(2)		-0.0454 (0.0679)	-0.0971* (0.0554)	-0.0629 (0.0403)	-0.0924* (0.0509)	-0.0918 (0.0702)	-0.102 (0.0677)	0.0219 (0.0776)
Observations		84,287	84,287	84,287	84,287	84,287	84,287	84,287
R-squared		0.099	0.099	0.099	0.099	0.099	0.099	0.099
(c) Female Employees								
GVC1	(1) GVC	0.0913** (0.0376)	0.131*** (0.0370)	0.0467 (0.0352)	0.0448 (0.0348)	0.0831** (0.0378)	0.0694* (0.0373)	0.0570 (0.0386)
	(2) Obstacle	-0.568** (0.243)	-0.240 (0.228)	-0.0555 (0.205)	-0.241 (0.233)	-0.405 (0.245)	0.558*** (0.213)	-0.826*** (0.271)

(1)*(2)	0.0149	-0.158	0.196*	0.225*	0.0579	0.108	0.201
	(0.160)	(0.136)	(0.114)	(0.116)	(0.156)	(0.130)	(0.172)
Observations	41,200	41,200	41,200	41,200	41,200	41,200	41,200
R-squared	0.548	0.548	0.548	0.548	0.548	0.548	0.548
(1) GVC	0.589***	0.421***	0.459***	0.433***	0.424***	0.618***	0.677***
	(0.102)	(0.116)	(0.111)	(0.0964)	(0.109)	(0.115)	(0.144)
(2) Obstacle	-0.550**	-0.267	-0.0307	-0.212	-0.392	0.585***	-0.784***
	(0.244)	(0.224)	(0.207)	(0.234)	(0.248)	(0.210)	(0.277)
(1)*(2)	-0.972**	0.0159	-0.168	-0.0473	0.00781	-0.895**	-1.373**
	(0.437)	(0.393)	(0.497)	(0.453)	(0.553)	(0.397)	(0.582)
Observations	41,200	41,200	41,200	41,200	41,200	41,200	41,200
R-squared	0.548	0.548	0.548	0.548	0.548	0.549	0.549

(d) Female Production Workers

(1) GVC	0.339***	0.529***	0.298***	0.366***	0.379***	0.310***	0.377***
	(0.0530)	(0.113)	(0.0730)	(0.0523)	(0.0923)	(0.0748)	(0.0673)
(2) Obstacle	0.257	0.537***	-0.295	0.412*	-0.117	0.151	0.602***
	(0.206)	(0.192)	(0.220)	(0.236)	(0.220)	(0.197)	(0.230)
(1)*(2)	-0.0835	-0.784**	0.0974	-0.186	-0.304	0.0499	-0.287
	(0.220)	(0.336)	(0.339)	(0.261)	(0.352)	(0.318)	(0.234)
Observations	41,205	41,205	41,205	41,205	41,205	41,205	41,205
R-squared	0.498	0.499	0.498	0.499	0.498	0.498	0.499
(1) GVC	0.411***	0.390***	0.453***	0.437***	0.371***	0.453***	0.592***
	(0.0921)	(0.102)	(0.0850)	(0.0858)	(0.0914)	(0.104)	(0.0969)
(2) Obstacle	0.211	0.274	-0.243	0.381	-0.239	0.160	0.585**
	(0.206)	(0.220)	(0.232)	(0.258)	(0.249)	(0.174)	(0.227)
(1)*(2)	-0.0681	0.0491	-0.245	-0.213	0.189	-0.210	-1.005**
	(0.451)	(0.413)	(0.299)	(0.329)	(0.395)	(0.391)	(0.451)
Observations	41,205	41,205	41,205	41,205	41,205	41,205	41,205
R-squared	0.495	0.495	0.495	0.495	0.495	0.495	0.495

Robust standard errors clustered by country and year in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Notes: i) Each regression controls for firms' age, city of operation and share of government ownership

ii) All the regressions include country, year, sector, and size fixed effects.

iii) Country-year-sector averages are used to reduce the risk of endogeneity between the business environment and firm-level.

iv) Each column for each GVC definition represents a separate regression.

v) All the variables are in log.

vi) The intercept is included.

Table 6. Female Labor Force Participation, GVCs and Barriers – MENA region

	Finance	Tax.Rates	Pol. Inst.	Corrup.	Comp.	Elec.	Inad.Edu.	
(a) Female Ownership								
GVC1	(1) GVC	-0.0312 (0.0264)	-0.073*** (0.0230)	-0.00214 (0.0388)	-0.00956 (0.0373)	0.0297 (0.0357)	-0.0194 (0.0261)	0.0285 (0.0185)
	(2) Obstacle	-0.126 (0.0819)	-0.234** (0.0903)	0.0158 (0.103)	-0.0172 (0.0788)	-0.0365 (0.0718)	-0.151 (0.0892)	-0.00455 (0.0990)
	(1)*(2)	0.251*** (0.0845)	0.416*** (0.0842)	0.0777 (0.0706)	0.110 (0.0836)	0.00616 (0.140)	0.185** (0.0693)	0.0164 (0.109)
	Observations	11,712	11,712	11,712	11,712	11,712	11,712	11,712
	R-squared	0.110	0.111	0.109	0.109	0.109	0.110	0.109
	GVC4	(1) GVC	-0.172*** (0.0541)	-0.142** (0.0648)	-0.0885 (0.0963)	-0.0992 (0.0815)	-0.120 (0.0764)	-0.118** (0.0573)
(2) Obstacle		-0.0763 (0.0867)	-0.160* (0.0912)	0.0337 (0.102)	0.00850 (0.0829)	-0.0363 (0.0741)	-0.118 (0.0895)	-0.00169 (0.0874)
(1)*(2)		0.451** (0.176)	0.281 (0.253)	0.0449 (0.193)	0.0793 (0.196)	0.214 (0.321)	0.184 (0.195)	0.148 (0.218)
Observations		11,712	11,712	11,712	11,712	11,712	11,712	11,712
R-squared		0.109	0.109	0.109	0.109	0.109	0.109	0.109
(b) Female Top Manager								
GVC1	(1) GVC	-0.0328 (0.0199)	-0.0324* (0.0186)	-0.0119 (0.0210)	-0.0218 (0.0195)	-0.0324* (0.0175)	-0.0223 (0.0144)	-0.034*** (0.0105)
	(2) Obstacle	-0.0487 (0.0491)	-0.0802 (0.0625)	-0.0421 (0.0704)	0.0470 (0.0497)	-0.142*** (0.0324)	-0.0407 (0.0422)	-0.0202 (0.0781)
	(1)*(2)	0.105 (0.0660)	0.103* (0.0582)	0.0125 (0.0403)	0.0409 (0.0426)	0.112 (0.0660)	0.0576 (0.0437)	0.164*** (0.0576)
	Observations	11,728	11,728	11,728	11,728	11,728	11,728	11,728
	R-squared	0.019	0.019	0.019	0.019	0.020	0.019	0.020
	GVC4	(1) GVC	-0.0681 (0.0400)	-0.0835* (0.0481)	-0.0223 (0.0566)	-0.0689 (0.0537)	-0.0931 (0.0631)	-0.0142 (0.0231)
(2) Obstacle		-0.0309 (0.0493)	-0.0639 (0.0594)	-0.0402 (0.0695)	0.0522 (0.0482)	-0.127*** (0.0319)	-0.0298 (0.0396)	0.0222 (0.0706)
(1)*(2)		0.285* (0.165)	0.309 (0.199)	0.0451 (0.112)	0.176 (0.139)	0.379 (0.271)	0.0411 (0.106)	-0.0483 (0.179)
Observations		11,728	11,728	11,728	11,728	11,728	11,728	11,728
R-squared		0.019	0.019	0.019	0.019	0.020	0.019	0.019
(c) Female Employees								
GVC1	(1) GVC	0.217* (0.110)	0.0746 (0.111)	0.151 (0.112)	0.182** (0.0866)	0.174** (0.0816)	0.197** (0.0789)	0.177* (0.0876)
	(2) Obstacle	1.055*** (0.313)	-0.766** (0.362)	0.701* (0.356)	0.187 (0.430)	0.385 (0.357)	0.0464 (0.463)	-0.612 (0.514)
	(1)*(2)	0.0457 (0.360)	0.654 (0.387)	0.184 (0.219)	0.127 (0.193)	0.250 (0.281)	0.129 (0.230)	0.335 (0.383)
	Observations	4,857	4,857	4,857	4,857	4,857	4,857	4,857



	R-squared	0.504	0.504	0.504	0.503	0.504	0.503	0.504
GVC4	(1) GVC	0.584 (0.453)	0.194 (0.714)	0.419 (0.683)	0.598 (0.487)	0.348 (0.479)	1.014** (0.374)	1.655** (0.777)
	(2) Obstacle	1.066*** (0.321)	-0.666* (0.359)	0.765** (0.355)	0.288 (0.442)	0.438 (0.327)	0.0985 (0.448)	-0.484 (0.498)
	(1)*(2)	0.903 (2.439)	2.308 (2.558)	0.994 (1.885)	0.486 (1.695)	1.839 (2.251)	-1.199 (1.545)	-4.934 (2.999)
	Observations	4,857	4,857	4,857	4,857	4,857	4,857	4,857
	R-squared	0.503	0.503	0.503	0.503	0.503	0.503	0.503
(d) Female Production Workers								
GVC1	(1) GVC	0.241 (0.186)	0.172 (0.170)	0.369 (0.231)	0.266 (0.207)	0.307* (0.152)	0.160 (0.150)	0.294*** (0.0929)
	(2) Obstacle	-0.218 (0.509)	-0.784 (0.467)	-0.698 (0.496)	-0.176 (0.535)	-1.047** (0.506)	-0.663** (0.298)	-0.114 (0.337)
	(1)*(2)	0.694 (0.592)	0.965 (0.638)	0.114 (0.434)	0.405 (0.468)	0.441 (0.521)	0.888** (0.417)	0.725 (0.495)
	Observations	6,861	6,861	6,861	6,861	6,861	6,861	6,861
	R-squared	0.472	0.472	0.472	0.472	0.472	0.473	0.472
GVC4	(1) GVC	0.698** (0.295)	0.238 (0.368)	0.652 (0.480)	0.688* (0.402)	0.840** (0.384)	0.386 (0.317)	0.881*** (0.315)
	(2) Obstacle	0.00541 (0.511)	-0.719 (0.460)	-0.672 (0.541)	-0.0633 (0.543)	-1.026* (0.516)	-0.537* (0.290)	0.144 (0.394)
	(1)*(2)	-0.222 (1.247)	1.560 (1.344)	-0.0109 (1.088)	-0.112 (0.986)	-0.806 (1.174)	0.956 (1.155)	-1.156 (1.146)
	Observations	6,861	6,861	6,861	6,861	6,861	6,861	6,861
	R-squared	0.465	0.466	0.465	0.465	0.466	0.466	0.465

Robust standard errors clustered by country and year in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Notes: i) Each regression controls for firms' age, city of operation and share of government ownership

ii) All the regressions include country, year, sector and size fixed effects.

iii) Country-year-sector averages are used to reduce the risk of endogeneity between the business environment and firm-level.

iv) Each column for each GVC definition represents a separate regression.

v) All the variables are in log.

vi) The intercept is included.

## 5. Robustness Checks<sup>8</sup>

As it was mentioned before, we use a PSM<sup>9</sup> (see Table 7) where the treatment is being part of a GVC. Clearly, this method assumes that the selection to be treated (being part of GVC) is based on observables only. The average treatment effect shows that the positive effect on female ownership (for GVC1), female employees and female production workers and the negative one on female top manager (for GVC1) are similar to those of the baseline regression (in Table 3). Matching statistics and the results are presented in Appendix 4. Tables A9-A15 shows that there is a high level of common support for the two definitions of GVC and for the total sample and the MENA region. This is also confirmed by Figure A2 and A3. Thus, our PSM results converge to those of the baseline.

Table 7. GVCs and Female Labor Force Participation – PSM

	(a) All regions							
	Fem. Ownership		Fem. Top Manager		Fem. Employees		Fem. Prod. Workers	
	GVC1	GVC4	GVC1	GVC4	GVC1	GVC4	GVC1	GVC4
ATE	0.028*** (0.0066)	-0.026 (0.0435)	-0.007 (0.005)	0.021 (0.030)	0.088*** (0.027)	0.539*** (0.108)	0.274*** (0.027)	0.241** (0.126)
ATT	0.011** (0.006)	-0.096*** (0.012)	-0.012*** (0.004)	-0.007 (0.009)	0.107*** (0.023)	0.435*** (0.094)	0.337*** (0.031)	0.333*** (0.062)
Observations	83,949	83,949	84,341	84,341	41,227	41,227	41,237	41,237
	(b) MENA region							
	Fem. Ownership		Fem. Top Manager		Fem. Employees		Fem. Prod. Workers	
	GVC1	GVC4	GVC1	GVC4	GVC1	GVC4	GVC1	GVC4
ATE	0.012 (0.012)	-0.091** (0.041)	-0.021*** (0.005)	-0.029** (0.013)	0.235*** (0.079)	0.236 (0.351)	0.250*** (0.062)	0.110 (0.302)
ATT	0.036*** (0.014)	-0.056* (0.033)	-0.005 (0.006)	-0.003 (0.019)	0.260*** (0.069)	0.650* (0.350)	0.490*** (0.106)	0.435** (0.222)
Observations	11,714	11,714	11,730	11,730	4,861	4,861	6,864	6,864

Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Note: All the regressions include country, year and sector dummies.

Moving to the second robustness check, an Instrumental Variable approach (IV) is used in order to control for the endogenous characteristics of firms' integration into GVC. A shift-share of GVC aggregated by country-year-sector-geographical zone minus the firm's own integration into GVC is used as an instrument. GVC corrected from individual firm idiosyncrasies is expected to affect firms' trade performance without having any direct impact on women's participation. Table 8 shows that our results regarding the positive effect on female ownership and female production workers are robust and become stronger. Hence, our previous estimates of GVC must be interpreted as lower bounds due to the downward bias resulting from the endogeneity problem. Moreover, the effect of GVC on top management is still insignificant. When the same IV approach is applied to the MENA region, we find a positive effect of GVC on female owners and female workers (especially production ones), with an insignificant impact on female managers. This

<sup>8</sup> Results of IV-First Stage are presented in Table A6 in Appendix 4. Results of IV regressions for Non-Production Workers are presented in Table A7.

<sup>9</sup>To check the robustness of the results, propensity scores are estimated using alternative matching methods with different choice of bandwidths (Kernel pair matching with replacement and cross validation with respect to the means of x). Matching statistics and the results are presented in Appendix 5.

provides evidence for the causal link between GVC and female empowerment (measured by ownership and employment).<sup>10</sup>

Table 8. GVCs and Female Labor Force Participation – IV Approach

(a) All regions								
Variables	Fem. Ownership		Fem. Top Manager		Fem. Employees		Fem. Production Workers	
	GVC1	GVC4	GVC1	GVC4	GVC1	GVC4	GVC1	GVC4
Ln(Age)	0.047*** (0.003)	0.047*** (0.003)	-0.005** (0.002)	-0.005** (0.002)	0.076*** (0.008)	0.080*** (0.008)	0.007 (0.011)	0.023** (0.012)
Ln(Gov own.)	0.015*** (0.004)	0.016*** (0.004)	0.001 (0.003)	0.001 (0.003)	0.014 (0.012)	0.010 (0.012)	0.082*** (0.016)	0.085*** (0.017)
Main city	0.015*** (0.004)	0.015*** (0.004)	0.011*** (0.003)	0.011*** (0.003)	0.112*** (0.010)	0.108*** (0.011)	-0.044*** (0.015)	-0.028* (0.016)
Medium	0.00136 (0.004)	0.00482 (0.004)	-0.0347*** (0.003)	-0.0336*** (0.003)	0.995*** (0.010)	0.978*** (0.012)	0.654*** (0.020)	0.703*** (0.022)
Large	0.009 (0.007)	0.017 (0.011)	-0.056*** (0.006)	-0.050*** (0.009)	2.459*** (0.017)	2.381*** (0.029)	2.024*** (0.042)	2.013*** (0.085)
GVC	0.019 (0.020)	-0.143 (0.136)	0.001 (0.016)	-0.072 (0.109)	0.130 (0.0816)	3.297*** (0.895)	0.767*** (0.102)	2.965*** (0.820)
Observations	82,937	82,937	83,307	83,307	40,812	40,812	40,628	40,628
(b) MENA region								
Variables	Female Ownership		Female Top Manager		Female Employees		Fem. Production Workers	
	GVC1	GVC4	GVC1	GVC4	GVC1	GVC4	GVC1	GVC4
Ln(Age)	0.036*** (0.006)	0.039*** (0.007)	-0.002 (0.004)	0.003 (0.004)	0.059** (0.025)	0.081*** (0.027)	-0.066*** (0.025)	-0.018 (0.034)
Ln(Gov own.)	-0.018 (0.011)	-0.017 (0.011)	-0.006 (0.007)	-0.008 (0.007)	0.053 (0.042)	0.092** (0.043)	-0.015 (0.044)	-0.080 (0.059)
Main city	0.020** (0.008)	0.023*** (0.008)	0.016*** (0.005)	0.016*** (0.005)	0.163*** (0.036)	0.202*** (0.033)	-0.045 (0.034)	-0.041 (0.040)
Medium	0.011 (0.010)	0.0238*** (0.009)	-0.00554 (0.006)	-0.00407 (0.005)	0.796*** (0.038)	0.835*** (0.037)	0.330*** (0.045)	0.452*** (0.042)
Large	0.00530 (0.022)	0.0358 (0.029)	-0.0283** (0.013)	-0.0413** (0.018)	2.209*** (0.066)	2.245*** (0.094)	1.062*** (0.105)	1.187*** (0.150)
GVC	0.156*** (0.059)	0.349 (0.476)	0.0524 (0.036)	0.523* (0.296)	1.051*** (0.354)	3.559 (2.831)	1.320*** (0.232)	6.101*** (2.029)
Observations	11,610	11,610	11,626	11,626	4,820	4,820	6,797	6,797

Standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Note: - All the regressions include country, year, and sector fixed effects.

- The intercept is included.

## 6. Conclusion and Policy Implications

This paper aims at examining the impact of GVCs on women's trade participation as entrepreneurs and employees. We also analyze how this effect is moderated through external (gender provisions in trade agreements) and internal (investment climate variables) factors. To do so, we use firm-level data for 154 developing economies and emerging markets with a special focus on the Middle East and North Africa region. Our main findings show that GVC integration increases the likelihood of being a female owner and the share of female employees, especially production ones. A less robust negative effect is found regarding the impact on being a female top manager. These effects are moderated by the inclusion of gender provisions in trade agreements and by some characteristics of the investment climate, namely corruption, access to finance and tax policy. These results remain robust after we control for the endogeneity of GVC using an instrumental

<sup>10</sup> Results of the first stage are in Table A16 in Appendix 4.

variable approach and a propensity score estimation method where the treatment is being part of a GVC.

From a policy perspective, this topic is of particular importance as it addresses two important, and correlated, challenges in the MENA region that are low female labor force participation and a weak integration into GVCs. Indeed, if MENA countries are to improve firms' insertion into GVCs, female labor participation can increase given that there are several sectors that are female intensive and that have a comparative advantage in the MENA region such as the textile, ready-made garments, processed food, and electronics sectors. Hence, from the Sustainable Development Goals (SDG) perspective, our paper is related to two goals, namely promoting inclusive and sustainable industrialization, and fostering innovation (SDG9) and promoting gender equality (SDG5).

Yet, to move forward, three recommendations are worth taking into consideration. First, at the conception and the implementation of trade and industrial policies, it is important to mainstream gender as both trade agreements and GVCs can be used as tools to improve women's participation. Yet, given that the majority of gender provisions are non-binding, it is important to have enforcement mechanisms that guarantee the implementation of gender provisions in trade agreements. Second, as the positive impact of GVCs on female owners or female production workers is attenuated by some obstacles (namely corruption, access to finance, and tax policies), it is important to address such barriers to maximize the impact of GVCs. This will require deeper and more structural reforms to improve the business environment. Finally, one of the important obstacles that hinder women's empowerment is inadequate labor force participation. This is why investing in education (especially technical and vocational education for production workers) would provide women with the required skills that are relevant to firms that operate in GVCs.

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## Appendix 1: List of Countries and years of the WBES

Country	Survey years	Country	Survey years
Afghanistan	2008-2014	Congo, Dem. Rep.	2006-2010-2013
Albania	2007-2013-2019	Denmark	2020
Angola	2006-2010	Djibouti	2013
Antigua and Barbuda	2010	Dominica	2010
Argentina	2006-2010-2017	Dominican Republic	2010-2016
Armenia	2009-2013-2020	Ecuador	2006-2010-2017
Austria	2021	Egypt, Arab Rep.	2013-2016-2020
Azerbaijan	2009-2013-2019	El Salvador	2006-2010-2016
Bahamas	2010	Eritrea	2009
Bangladesh	2007-2013	Estonia	2009-2013-2019
Barbados	2010	Eswatini	2006-2016
Belarus	2008-2013-2018	Ethiopia	2011-2015
Belgium	2020	Fiji	2009
Belize	2010	Finland	2020
Benin	2009-2016	France	2021
Bhutan	2009-2015	Gabon	2009
Bolivia	2006-2010-2017	Gambia, The	2006-2018
Bosnia and Herzegovina	2009-2013-2019	Georgia	2008-2013-2019
Botswana	2006-2010	Germany	2021
Brazil	2009	Ghana	2007-2013
Bulgaria	2007-2009-2013-2019	Greece	2018
Burkina Faso	2009	Grenada	2010
Burundi	2006-2014	Guatemala	2006-2010-2017
Cambodia	2013-2016	Guinea	2006-2016
Cameroon	2009-2016	Guinea-Bissau	2006
Cabo Verde	2009	Guyana	2010
Central African Republic	2011	Honduras	2006-2010-2016
Chad	2009-2018	Hungary	2009-2013-2019
Chile	2006-2010	India	2014
China	2012	Indonesia	2009-2015
Colombia	2006-2010-2017	Iraq	2011
Congo, Rep.	2009	Ireland	2020
Costa Rica	2010	Israel	2013
Croatia	2007-2013-2019	Italy	2019
Cyprus	2019	Jamaica	2010
Czechia	2009-2013-2019	Jordan	2013-2019
Côte d'Ivoire	2009-2016	Kazakhstan	2009-2013-2019
Kenya	2007-2013-2018	Romania	2009-2013-2019
Kosovo	2009-2013-2019	Russian Federation	2009-2012-2019
Kyrgyz Republic	2009-2013-2019	Rwanda	2006-2011-2019
LaoPDR	2009-2012-2016-2018	Samoa	2009
Latvia	2009-2013-2019	Senegal	2007-2014
Lebanon	2013-2019	Serbia	2009-2013-2019



Lesotho	2009-2016	Sierra Leone	2009-2017
Liberia	2009-2017	Slovak Republic	2009-2013-2019
Lithuania	2009-2013-2019	Slovenia	2009-2013-2019
Luxembourg	2020	Solomon Island	2015
Madagascar	2009-2013	South Africa	2007-2020
Malawi	2009-2014	South Sudan	2014
Malaysia	2015-2019	Spain	2021
Mali	2007-2010-2016	Sri Lanka	2011
Malta	2019	St Kitts and Nevis	2010
Mauritania	2006-2014	St Lucia	2010
Mauritius	2009	St Vincent and Grenadines	2010
Mexico	2006-2010	Sudan	2014
Micronesia	2009	Suriname	2010-2018
Moldova	2009-2013-2019	Sweden	2014-2020
Mongolia	2009-2013-2019	Tajikistan	2008-2013-2019
Montenegro	2009-2013-2019	Tanzania	2006-2013
Morocco	2013-2019	Thailand	2016
Mozambique	2007-2018	Timor-Leste	2009-2015-2021
Myanmar	2014-2016	Togo	2009-2016
Namibia	2006-2014	Tonga	2009
Nepal	2009-2013	Trinidad and Tobago	2010
Netherlands	2020	Tunisia	2013-2020
Nicaragua	2006-2010-2016	Türkiye	2008-2013-2019
Niger	2009-2017	Uganda	2006-2013
Nigeria	2007-2014	Ukraine	2008-2013-2019
North Macedonia	2009-2013-2019	Uruguay	2006-2010-2017
Pakistan	2007-2013	Uzbekistan	2008-2013-2019
Panama	2006-2010	Vanuatu	2009
Papua New Guinea	2015	Venezuela, RB	2006-2010
Paraguay	2006-2010-2017	Vietnam	2009-2015
Peru	2006-2010-2017	West Bank and Gaza	2013-2019
Philippines	2009-2015	Yemen, Rep.	2010-2013
Poland	2009-2013-2019	Zambia	2007-2013-2019
Portugal	2019	Zimbabwe	2011-2016

Source: Constructed by the authors using the WBES.

## Appendix 2: Variables Definition

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Variable	Definition
Ln (Age)	Ln of the difference between the year in which the most recent survey is released and the year in which the establishment began operation
Ln (Gov own)	Ln of the share of government ownership
Main City	Dummy variable that takes the value 1 if the firm is operating in the main business city
Small	Dummy variable that takes the value 1 if the number of employees is below 20
Medium	Dummy variable that takes the value 1 if the number of employees is between 20 and 99
Large	Dummy variable that takes the value 1 if the number of employees is greater than or equal 100
Female Ownership	Dummy variable that takes the value 1 if the firm has a female owner
Female Top Manager	Dummy variable that takes the value 1 if the top manager of the firm is female
Ln (Female)	Ln of the number of full-time female employees
Ln (Femaleproduction)	Ln of the number of full-time female production workers
Ln (Femalenonprod)	Ln of the number of full-time female non-production workers
GVC1	Dummy variable that takes the value 1 if the firm is exporting and importing at the same time
GVC2	Dummy variable that takes the value 1 if the firm is exporting and importing at the same time and if it has an international quality certification
GVC3	Dummy variable that takes the value 1 if the firm is exporting and importing at the same time and if the share of private foreign ownership of the firm is greater than 10%
GVC4	Dummy variable that takes the value 1 if the firm is exporting and importing at the same time, if it has an international quality certification and if the share of private foreign ownership of the firm is greater than 10%
Gender Provisions	The number of gender-related provisions in regional trade agreements.

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Source: Constructed by the authors using the WBES.

## Appendix 3: Descriptive Statistics

Table A1. Firms integrating into GVCs

	Number of firms	Percentage of total firms
GVC1	28,681	19.97%
GVC2	12,485	8.69%
GVC3	6,083	4.24%
GVC4	3,288	2.29%
Total	50,537	35.18%

Source: Constructed by the authors using the WBES.

Note: GVC1 refers to firms that export and import simultaneously, GVC2 = GVC1 + international certification, GVC3= GVC1+ share of its capital owned by a foreign firm, GVC4 combines the four criteria altogether.

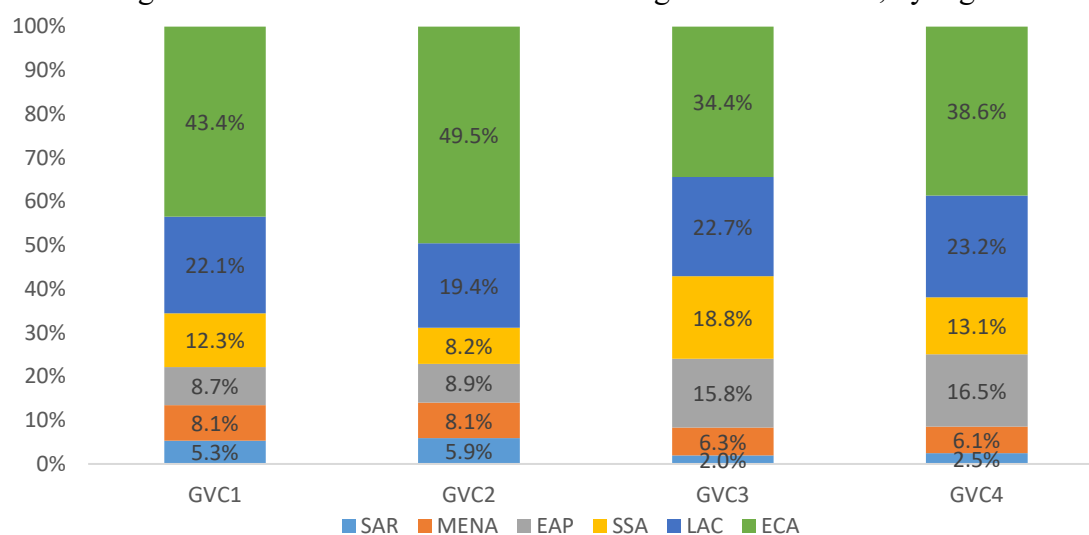
Table A2. The Average Number of Female Employees, by region<sup>11</sup>

Region	Female Employees	Female Production Workers	Female Non-Production Workers
SSA	14.17	14.99	5.10
EAP	28.49	72.15	13.85
ECA	24.09	27.84	8.28
LAC	39.77	25.59	12.98
MENA	11.03	17.55	5.10
SAR	9.33	42	4.25

Source: Constructed by the authors using the WBES.

Note: SAR stands for South Asia, MENA Middle East and North Africa, EAP East Asia and Pacific, SSA Sub-Saharan Africa, LAC Latin America and the Caribbean and ECA Europe and Central Asia.

Figure A1. The Distribution of Firms' integration into GVC, by region



Source: Constructed by the authors using the WBES.

Notes: (i) SAR stands for South Asia, MENA Middle East and North Africa, EAP East Asia and Pacific, SSA Sub-Saharan Africa, LAC Latin America and the Caribbean and ECA Europe and Central Asia. (ii) GVC1 refers to firms that export and import simultaneously, GVC2 = GVC1 + international certification, GVC3= GVC1+ share of its capital owned by a foreign firm, GVC4 combines the four criteria altogether.

<sup>11</sup> Given that some firms might have one of the variables missing, the sum of production and non-production does not necessarily add to the total number of employees.

## Appendix 4: Empirical Results

Table A3. GVCs and Female Non-Production Workers – Baseline Results

Variables	(a) All regions		(b) MENA region	
	GVC1	GVC4	GVC1	GVC4
Ln(Age)	0.102*** (0.00721)	0.105*** (0.00719)	0.0647*** (0.0167)	0.0675*** (0.0168)
Ln(Gov own.)	0.0697*** (0.0153)	0.0706*** (0.0154)	0.151*** (0.0541)	0.150*** (0.0537)
Main city	0.104*** (0.0100)	0.110*** (0.0101)	0.122*** (0.0243)	0.125*** (0.0244)
Medium	0.619*** (0.00763)	0.643*** (0.00747)	0.467*** (0.0181)	0.494*** (0.0177)
Large	1.775*** (0.0142)	1.817*** (0.0140)	1.601*** (0.0392)	1.673*** (0.0379)
GVC	0.229*** (0.0117)	0.446*** (0.0284)	0.227*** (0.0337)	0.336*** (0.114)
Constant	0.125*** (0.0222)	0.142*** (0.0221)	0.00424 (0.0524)	0.0139 (0.0524)
Country dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes
Observations	41,353	41,353	6,863	6,863
R-squared	0.538	0.537	0.469	0.466

Robust standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table A4. GVC & Female Labor Force Participation – by Sector

Variables	(a) All regions included							
	Fem. Ownership		Fem Top Manager		Fem. Employees		Fem. Production Workers	
	GVC1	GVC4	GVC1	GVC4	GVC1	GVC4	GVC1	GVC4
(1) GVC	-0.020 (0.015)	-0.098*** (0.035)	-0.021** (0.010)	0.0141 (0.0262)	0.228 (0.252)	1.679** (0.793)	0.668*** (0.113)	0.426 (0.376)
(2) Textile	0.074*** (0.010)	0.077*** (0.009)	0.098*** (0.008)	0.093*** (0.007)	-0.133 (0.142)	-0.0126 (0.132)	0.764*** (0.0623)	1.094*** (0.0606)
(3) Leather	-0.046** (0.021)	0.0017 (0.021)	-0.053*** (0.010)	-0.038*** (0.011)	0.754*** (0.245)	0.980*** (0.0848)	-0.156** (0.0706)	-0.178** (0.0693)
(4) Wood	-0.052*** (0.018)	-0.042** (0.017)	-0.053*** (0.013)	-0.049*** (0.012)	-0.809*** (0.185)	-0.807*** (0.185)	-0.467*** (0.0523)	-0.587*** (0.0552)
(5) Publishing	-0.055 (0.037)	-0.048 (0.035)	-0.075*** (0.022)	-0.075*** (0.020)	-0.292* (0.149)	-0.338** (0.133)	-0.148 (0.150)	-0.213 (0.155)
(6) Chemicals	-0.016 (0.015)	-0.006 (0.013)	-0.025** (0.011)	-0.018* (0.010)	-0.462* (0.278)	-0.380 (0.262)	-0.156** (0.0762)	-0.287*** (0.0751)
(7) Rubb&Pla	-0.053*** (0.017)	-0.050*** (0.015)	-0.050*** (0.013)	-0.052*** (0.012)	-0.421 (0.438)	-0.421 (0.436)	-0.224* (0.121)	-0.247** (0.121)
(8) Machinery	-0.117*** (0.012)	-0.103*** (0.010)	-0.088*** (0.009)	-0.086*** (0.007)	-0.65*** (0.153)	-0.779*** (0.131)	-0.620*** (0.0730)	-0.701*** (0.0720)
(9) Fab. Metals	-0.089*** (0.011)	-0.078*** (0.010)	-0.083*** (0.008)	-0.076*** (0.007)	-0.972*** (0.144)	-0.820*** (0.130)	-0.539*** (0.0532)	-0.618*** (0.0567)
(10) Furniture	-0.144*** (0.018)	-0.119*** (0.017)	-0.090*** (0.013)	-0.086*** (0.012)	-0.801*** (0.146)	-0.789*** (0.111)	-0.320*** (0.0913)	-0.358*** (0.0947)
(11) Electro.	-0.096*** (0.022)	-0.088*** (0.019)	-0.083*** (0.018)	-0.073*** (0.016)	-0.789*** (0.279)	-0.787*** (0.278)		
(12) Oth. Man.	-0.060*** (0.007)	-0.047*** (0.006)	-0.053*** (0.005)	-0.045*** (0.005)	-0.350*** (0.0841)	-0.325*** (0.0790)	-0.520*** (0.0402)	-0.551*** (0.0411)
(13) Services	-0.0162** (0.007)	-0.0146** (0.006)	-0.00258 (0.005)	-0.003 (0.005)	-0.192** (0.0768)	-0.189*** (0.0725)	-0.556** (0.0797)	-0.680*** (0.0777)
(14) Wholesale	-0.049*** (0.0127)	-0.042*** (0.0120)	-0.047*** (0.010)	-0.047*** (0.009)	-0.254*** (0.0801)	-0.246*** (0.0758)	-0.242 (0.164)	-0.357** (0.161)
(1)*(2)	0.0254 (0.0210)	0.113* (0.0597)	-0.011 (0.0160)	-0.0733* (0.0433)	0.402 (0.358)	0 (0)	0.661*** (0.150)	0.798* (0.460)
(1)*(3)	0.227*** (0.0597)	-0.0735 (0.0452)	0.104*** (0.0343)	-0.0116 (0.0287)	0 (0)	0 (0)	-0.355 (0.269)	2.411*** (0.633)
(1)*(4)	0.0485 (0.0490)	-0.220*** (0.051)	0.0191 (0.0323)	-0.137*** (0.0484)	0 (0)	0 (0)	-1.339*** (0.201)	-1.315** (0.556)
(1)*(5)	0.0290 (0.116)	-0.0762 (0.0497)	-0.0199 (0.0272)	0.0121 (0.0331)	-0.481 (0.312)	0 (0)	-0.535 (0.885)	1.782*** (0.404)
(1)*(6)	0.0495* (0.0290)	0.117* (0.0638)	0.0396* (0.0209)	0.0177 (0.0475)	0.974** (0.452)	0 (0)	-0.830*** (0.211)	0.214 (0.669)
(1)*(7)	-0.000906 (0.0371)	-0.0454 (0.0742)	-0.00354 (0.0247)	-0.0465 (0.0531)	0 (0)	-0.185 (0.832)	-0.396 (0.386)	1.145* (0.660)
(1)*(8)	0.0394* (0.0225)	-0.0367 (0.0498)	0.0188 (0.0148)	-0.0131 (0.0350)	-0.626** (0.318)	0 (0)	-0.685*** (0.216)	0.0955 (0.723)
(1)*(9)	0.0446* (0.0233)	-0.0378 (0.0546)	0.0320** (0.0151)	-0.0231 (0.0361)	0.344 (0.329)	0 (0)	-0.962*** (0.228)	-0.392 (0.707)
(1)*(10)	0.137*** (0.0456)	0.230 (0.178)	0.0150 (0.0282)	-0.0513 (0.0403)	-0.123 (0.311)	0 (0)	-0.879* (0.513)	0 (0)
(1)*(11)	0.00799 (0.0400)	-0.0318 (0.0675)	0.0390 (0.0331)	-0.0304 (0.0584)	0 (0)	-1.394 (1.018)		
(1)*(12)	0.0460*** (0.0162)	-0.0308 (0.0383)	0.0342*** (0.0114)	-0.0119 (0.0287)	-0.130 (0.263)	0 (0)	-0.336*** (0.127)	-0.153 (0.452)
(1)*(13)	0.0142 (0.0163)	0.0453 (0.0440)	-0.0132 (0.0116)	-0.0412 (0.0323)	-0.173 (0.252)	-1.828** (0.806)	-0.443** (0.216)	0.00548 (0.389)
(1)*(14)	0.0319 (0.0328)	-0.212*** (0.0383)	-0.0102 (0.0197)	-0.0148 (0.107)	-0.127 (0.259)	-1.286 (0.795)	-0.177 (0.686)	3.109*** (0.440)
Observations	83,949	83,949	84,341	84,341	41,227	-0.727	6,864	6,864
R-squared	0.111	0.111	0.090	0.090	0.528	(0.872)	0.478	0.456

(b) MENA region								
Variables	Female Ownership		Female Top Manager		Female Employees		Female Production Workers	
	GVC1	GVC4	GVC1	GVC4	GVC1	GVC4	GVC1	GVC4
(1) GVC	0.0388 (0.0301)	-0.0352 (0.0787)	-0.00345 (0.0147)	0.0286 (0.0477)	0.120 (0.448)	1.013*** (0.297)	0.668*** (0.113)	0.426 (0.376)
(2) Textile	0.00911 (0.0187)	0.0302* (0.0172)	0.0180 (0.0123)	0.0234** (0.0106)	0.435 (0.438)	0.726* (0.402)	0.764*** (0.0623)	1.094*** (0.0606)
(3) Leather	-0.00764 (0.0238)	0.0153 (0.0241)	-0.026** (0.0126)	-0.0243** (0.0118)	0.936** (0.395)	1.112*** (0.210)	-0.156** (0.0706)	-0.178** (0.0693)
(4) Wood	0.00446 (0.0205)	-0.0007 (0.0197)	-0.0150 (0.0116)	-0.0138 (0.0107)			-0.467*** (0.0523)	-0.587*** (0.0552)
(5) Publishing	0.0405 (0.0635)	0.0423 (0.0622)	0.0167 (0.0403)	0.0143 (0.0377)	-0.400* (0.230)	-0.325 (0.220)	-0.148 (0.150)	-0.213 (0.155)
(6) Chemicals	0.0404 (0.0247)	0.0245 (0.0216)	0.00497 (0.0148)	0.0103 (0.0132)	-0.385 (0.234)	-0.316 (0.222)	-0.156** (0.0762)	-0.287*** (0.0751)
(7) Rubb&Pla	0.0401 (0.0465)	0.0721 (0.0456)	0.0405 (0.0325)	0.0275 (0.0278)	0.349 (0.221)	0.416** (0.207)	-0.224* (0.121)	-0.247** (0.121)
(8) Machinery	-0.0215 (0.0198)	-0.0200 (0.0194)	-0.0175 (0.0127)	-0.0209* (0.0109)			-0.620*** (0.0730)	-0.701*** (0.0720)
(9) Furniture	0.000521 (0.0208)	0.00501 (0.0203)	-0.00651 (0.0127)	-0.00624 (0.0117)			-0.539*** (0.0532)	-0.618*** (0.0567)
(10) Elect.	-0.0173 (0.0359)	-0.0159 (0.0351)	0.0132 (0.0244)	0.0107 (0.0227)	-0.480** (0.243)	-0.412* (0.233)	-0.320*** (0.0913)	-0.358*** (0.0947)
(11) OtherMan.	0.0163 (0.0138)	0.0165 (0.0129)	-0.00255 (0.00809)	0.00197 (0.00723)	-0.260 (0.245)	-0.115 (0.224)	-0.520*** (0.0402)	-0.551*** (0.0411)
(12) Services	0.0142 (0.0118)	0.00990 (0.0114)	0.0160** (0.00767)	0.0147** (0.00710)	-0.0605 (0.220)	0.0216 (0.204)	-0.556*** (0.0797)	-0.680*** (0.0777)
(13) Wholesale	0.0337 (0.0251)	0.0298 (0.0229)	-0.00478 (0.0138)	-0.00635 (0.0119)	-0.0620 (0.224)	0.0110 (0.209)	-0.242 (0.164)	-0.357** (0.161)
(1)*(2)	0.0571 (0.0422)	0.142 (0.109)	0.0224 (0.0234)	0.0410 (0.0736)	0.957 (0.801)	0 (0)	0.661*** (0.150)	0.798* (0.460)
(1)*(3)	0.134 (0.0845)	-0.154* (0.0835)	0.00498 (0.0307)	-0.0292 (0.0494)	0 (0)	0 (0)	-0.355 (0.269)	2.411*** (0.633)
(1)*(4)	-0.0525 (0.0616)	-0.23*** (0.0819)	0.00326 (0.0267)	-0.0686 (0.0501)			-1.339*** (0.201)	-1.315** (0.556)
(1)*(5)	-0.0332 (0.231)	-0.201** (0.0998)	-0.0570 (0.0423)	-0.0865 (0.0605)	0 (0)	0 (0)	-0.535 (0.885)	1.782*** (0.404)
(1)*(6)	-0.0950* (0.0491)	-0.133 (0.0985)	0.0106 (0.0287)	-0.0772 (0.0494)	1.648*** (0.455)	0.745** (0.319)	-0.830*** (0.211)	0.214 (0.669)
(1)*(7)	0.253* (0.133)	0.719*** (0.0911)	-0.0286 (0.0670)	0.405 (0.352)	0 (0)	0 (0)	-0.396 (0.386)	1.145* (0.660)
(1)*(8)	-0.00438 (0.0570)	-0.0275 (0.140)	-0.0186 (0.0182)	-0.0392 (0.0487)			-0.685*** (0.216)	0.0955 (0.723)
(1)*(9)	0.0406 (0.0693)	0.118 (0.298)	-0.00412 (0.0271)	-0.0577 (0.0499)			-0.962*** (0.228)	-0.392 (0.707)
(1)*(10)	-0.00377 (0.137)	-0.183** (0.0851)	-0.0526* (0.0274)	-0.0876* (0.0525)	1.469*** (0.458)	0.560* (0.325)	-0.879* (0.513)	0 (0)
(1)*(11)	-0.0191 (0.0352)	-0.115 (0.0953)	0.0102 (0.0173)	-0.0878* (0.0481)	0.231 (0.496)	-1.36*** (0.380)	-0.336*** (0.127)	-0.153 (0.452)
(1)*(12)	-0.0254 (0.0357)	-0.0976 (0.0984)	-0.0196 (0.0179)	-0.0306 (0.0688)	0.127 (0.450)	-0.209 (0.415)	-0.443** (0.216)	0.00548 (0.389)
(1)*(13)	-0.0272 (0.0551)	-0.30*** (0.0943)	-0.0114 (0.0234)	-0.0840 (0.0525)	-0.00772 (0.457)	-1.056** (0.412)	-0.177 (0.686)	3.109*** (0.440)
Observations	11,714	11,714	11,730	11,730	4,861	4,861	6,864	6,864
R-squared	0.108	0.107	0.016	0.017	0.496	0.495	0.478	0.456

Robust standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Note: - All the regressions control for firm's size, age, share of government ownership and city of operation.

- Country and year fixed effects are included.

- The intercept is included.

Table A5. Gender Provisions, GVCs and Female Non-Production Workers

	(a) All regions		(b) MENA	
	GVC1	GVC4	GVC1	GVC4
(1)GVC	0.229*** (0.0296)	0.448*** (0.0541)	0.358*** (0.088)	0.096 (0.229)
(2)Gender Provisions	-0.121*** (0.0250)	-0.113*** (0.0253)	0.026 (0.045)	0.010 (0.051)
GVC*Gender Prov.	2.24e-05 (0.000429)	-4.01e-05 (0.000829)	-0.020 (0.022)	0.074* (0.056)
Country dummies	Yes	Yes	No	No
Year dummies	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes
Observations	41,356	41,356	6,864	6,864
R-squared	0.538	0.537	0.469	0.466

Robust standard errors in parentheses, clustered by country and year, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Note: - We control for firm's age, size, main city and the share of government ownership.

- The intercept is included.

Table A6. IV Approach – First Stage

Variables	(a) All regions		(b) MENA region	
	GVC1	GVC4	GVC1	GVC4
IV:Shift_Share_GVC	0.481*** (0.008)	0.227*** (0.010)	0.404*** (0.022)	0.168*** (0.026)
Ln(Age)	0.015*** (0.002)	-0.001 (0.001)	0.001 (0.006)	-0.007*** (0.002)
Medium	0.084*** (0.003)	0.012*** (0.001)	0.092*** (0.007)	0.007** (0.003)
Large	0.251*** (0.004)	0.073*** (0.001)	0.306*** (0.010)	0.056*** (0.003)
Main city	0.010*** (0.003)	-0.0001 (0.001)	0.015** (0.008)	0.002 (0.003)
Ln(Gov own)	0.013*** (0.003)	0.002 (0.001)	0.012 (0.010)	0.005 (0.004)
Country dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes
Observations	82,937	82,937	11,610	11,610
Underidentification test P-Val	0.000	0.000	0.000	0.000
Cragg-Donald Wald F-statistic	3849.44	518.03	334.91	41.36

Standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Notes: - The intercept is included.

- The minimum Eigenvalue is higher than all the critical values at 10%.

## Appendix 5: Propensity Score Matching

Table A7. First Stage – Probit Estimation

Variables	(a) All regions		(b) MENA region	
	GVC1	GVC4	GVC1	GVC4
Medium	0.436*** (0.013)	0.613*** (0.036)	0.526*** (0.036)	0.612*** (0.121)
Large	1.048*** (0.016)	1.374*** (0.037)	1.258*** (0.043)	1.396*** (0.122)
Main city	0.130*** (0.014)	0.077*** (0.030)	0.138*** (0.037)	0.125 (0.083)
Ln(Age)	0.063*** (0.010)	-0.064*** (0.021)	0.018 (0.028)	-0.222*** (0.065)
Ln(Gov own)	0.063*** (0.013)	0.049*** (0.022)	0.038 (0.040)	0.074 (0.066)
Country dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes
Observations	84,292	77,973	11,446	10,220

Standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Note: The intercept is included.



## [1] Nearest Neighborhood Matching Method

Figure A2. Overlap (common support) of propensity scores between the treated and untreated group

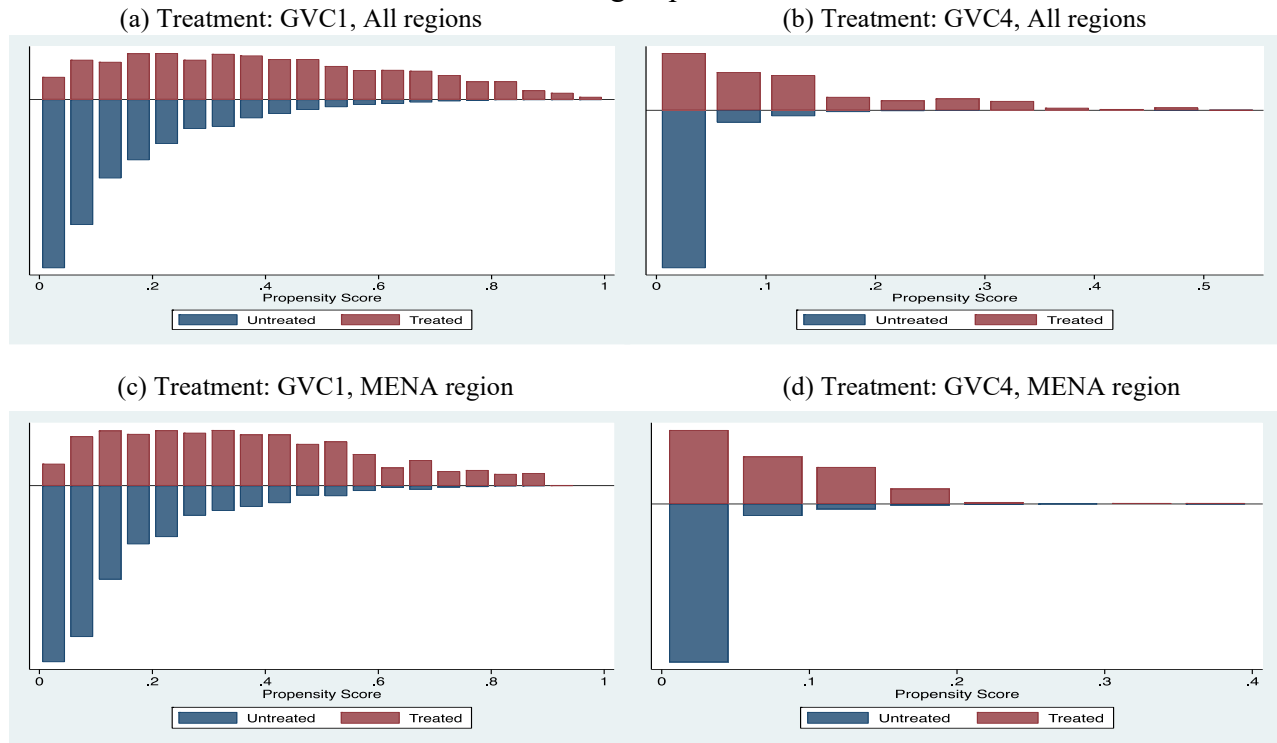


Table A8. Common Support, Outcome: Female Ownership

(a) GVC1, All regions

Treatment assignment	Common support On support	Total
Untreated	66,790	66,790
Treated	17,097	17,097
Total	83,887	83,887

(b) GVC4, All regions

Treatment assignment	Common support On support	Total
Untreated	75,726	75,726
Treated	1,842	1,842
Total	77,568	77,568

(c) GVC1, MENA region

Treatment assignment	Common support On support	Total
Untreated	9,235	9,235
Treated	2,195	2,195
Total	11,430	11,430

(d) GVC4, MENA region

Treatment assignment	Common support On support	Total
Untreated	10,017	10,017
Treated	187	187
Total	10,204	10,204

Table A9. Common Support, Outcome: Female Top Manager

<b>(a) GVC1, All regions</b>			<b>(b) GVC4, All regions</b>		
Treatment assignment	Common support On support	Total	Treatment assignment	Common support On support	Total
Untreated	67,059	67,059	Untreated	76,103	76,103
Treated	17,220	17,220	Treated	1,857	1,857
Total	84,279	84,279	Total	77,960	77,960

<b>(c) GVC1, MENA region</b>			<b>(d) GVC4, MENA region</b>		
Treatment assignment	Common support On support	Total	Treatment assignment	Common support On support	Total
Untreated	9,246	9,246	Untreated	10,033	10,033
Treated	2,200	2,200	Treated	187	187
Total	11,446	11,446	Total	10,220	10,220

Table A10. Common Support, Outcome: Number of Full-Time Female Employees

<b>(a) GVC1, All regions</b>			<b>(b) GVC4, All regions</b>		
Treatment assignment	Common support On support	Total	Treatment assignment	Common support On support	Total
Untreated	35,900	35,900	Untreated	28,901	28,901
Treated	5,207	5,207	Treated	334	334
Total	41,107	41,107	Total	29,235	29,235

<b>(c) GVC1, MENA region</b>			<b>(d) GVC4, MENA region</b>		
Treatment assignment	Common support On support	Total	Treatment assignment	Common support On support	Total
Untreated	3,954	3,954	Untreated	3,101	3,101
Treated	622	622	Treated	35	35
Total	4,576	4,576	Total	3,136	3,136

Table A11. Common Support, Outcome: Number of Full-Time Female Production Workers

<b>(a) GVC1, All regions</b>			<b>(b) GVC4, All regions</b>		
Treatment assignment	Common support On support	Total	Treatment assignment	Common support On support	Total
Untreated	29,503	29,503	Untreated	37,563	37,563
Treated	11,600	11,600	Treated	1,417	1,417
Total	41,103	41,103	Total	38,980	38,980

<b>(c) GVC1, MENA region</b>			<b>(d) GVC4, MENA region</b>		
Treatment assignment	Common support On support	Total	Treatment assignment	Common support On support	Total
Untreated	5,270	5,270	Untreated	6,147	6,147
Treated	1,575	1,575	Treated	152	152
Total	6,845	6,845	Total	6,299	6,299

Table A12. GVCs and Female Labor Force Participation – PSM

<b>(a) All regions</b>										
	Fem. Ownership		Fem. Top Manager		Fem. Employees		Fem. Production Workers		Fem. Production Workers	
	GVC1	GVC4	GVC1	GVC4	GVC1	GVC4	GVC1	GVC4	GVC1	GVC4
Treatment	0.040***	-0.060***	-0.04***	-0.034***	0.338***	1.157***	0.952***	1.466***	0.870***	1.415***
	(0.004)	(0.011)	(0.003)	(0.009)	(0.018)	(0.067)	(0.017)	(0.043)	(0.012)	(0.031)
Constant	0.309***	0.329***	0.169***	0.160***	1.645***	1.698***	1.151***	1.381***	0.919***	1.136***
	(0.002)	(0.002)	(0.001)	(0.001)	(0.006)	(0.007)	(0.009)	(0.008)	(0.006)	(0.006)
Obs.	83,887	77,568	84,279	77,960	41,107	29,235	41,103	38,980	41,215	39,175

<b>(b) MENA region</b>										
	Fem. Ownership		Fem. Top Manager		Fem. Employees		Fem. Production Workers		Fem. Production Workers	
	GVC1	GVC4	GVC1	GVC4	GVC1	GVC4	GVC1	GVC4	GVC1	GVC4
Treatment	0.111***	0.008	-0.005	-0.0009	0.634***	1.664***	1.250***	1.801***	0.953***	1.290***
	(0.009)	(0.029)	(0.005)	(0.017)	(0.054)	(0.213)	(0.041)	(0.126)	(0.030)	(0.093)
Constant	0.170***	0.195***	0.055***	0.054***	1.206***	1.399***	0.661***	0.962***	0.601***	0.831***
	(0.004)	(0.004)	(0.002)	(0.002)	(0.020)	(0.023)	(0.020)	(0.020)	(0.015)	(0.014)
Obs.	11,430	10,204	11,446	10,220	4,576	3,136	6,845	6,299	6,845	6,299

Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Note: All the regressions include country, year and sector dummies.

Table A13. Common Support, Outcome: Number of Full-Time Female Non-Production Workers

(a) GVC1, All regions			(b) GVC4, All regions		
Treatment assignment	Common support On support	Total	Treatment assignment	Common support On support	Total
Untreated	29,691	29,691	Untreated	37,758	37,758
Treated	11,524	11,524	Treated	1,417	1,417
Total	41,215	41,215	Total	39,175	39,175

(c) GVC1, MENA region			(d) GVC4, MENA region		
Treatment assignment	Common support On support	Total	Treatment assignment	Common support On support	Total
Untreated	5,270	5,270	Untreated	6,147	6,147
Treated	1,575	1,575	Treated	152	152
Total	6,845	6,845	Total	6,299	6,299

[2] Kernel: Pair Matching with Replacement

Figure A3. Quality of Kernel Matching: Cumulative Distribution Functions of Propensity Scores before and after the PSM

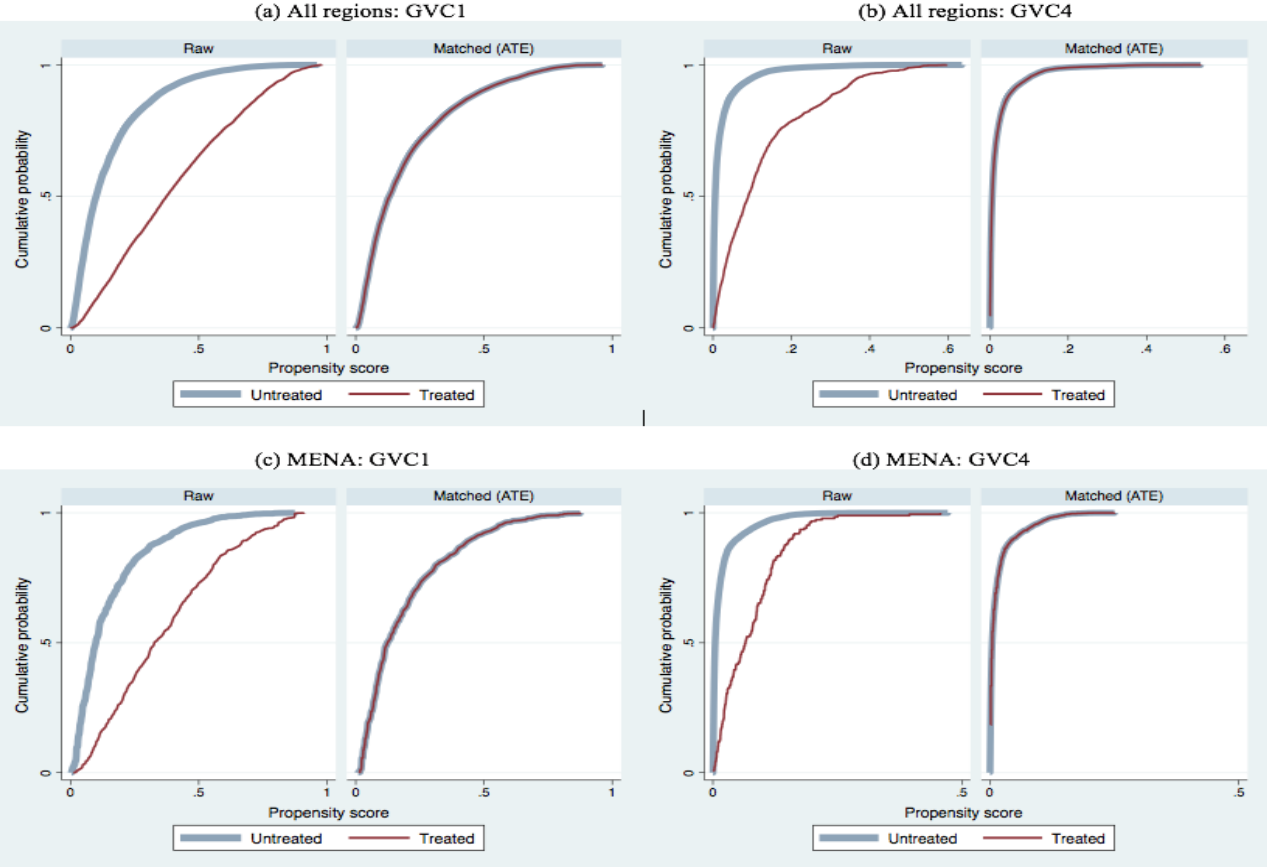


Table A14. PSM – Matching Statistics (Kernel pair matching with replacement)

<b>(a) All regions</b>				
Treatment: GVC1	Matched		Total	Bandwidth
	Yes	No		
Treated	16232	865	17097	0.0002875
Untreated	64300	2552	66852	0.0001005
Combined	80532	3417	83949	
<b>(b) MENA region</b>				
Treatment: GVC1	Matched		Total	Bandwidth
	Yes	No		
Treated	2087	108	2195	0.0012
Untreated	8741	778	9519	0.0008998
Combined	10828	886	11714	
<b>(b) MENA region</b>				
Treatment: GVC4	Matched		Total	Bandwidth
	Yes	No		
Treated	178	9	187	0.0002743
Untreated	9869	1658	11527	0.001471
Combined	10047	1667	11714	

Table A15. GVCs and Female Non-Production Workers – PSM  
(Kernel Pair Matching with Replacement)

<b>(a) All regions</b>		
	GVC1	GVC4
ATE	0.243*** (0.019)	0.491*** (0.118)
ATT	0.206*** (0.022)	0.406*** (0.039)
Observations	41,356	41,356
<b>(b) MENA region</b>		
	GVC1	GVC4
ATE	0.188*** (0.047)	0.341 (0.295)
ATT	0.252*** (0.052)	0.317*** (0.146)
Observations	6,864	6,864

Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Note: All the regressions include country, year and sector dummies.

Table A16. GVCs and Full-Time Female Non-Production Workers – IV Approach

Variables	(a) All regions		(b) MENA region	
	GVC1	GVC4	GVC1	GVC4
Ln(Age)	0.0986*** (0.00726)	0.111*** (0.00851)	0.0659*** (0.0179)	0.107*** (0.0266)
Ln(Gov own.)	0.0708*** (0.0106)	0.0713*** (0.0123)	0.155*** (0.0315)	0.0923** (0.0461)
Main city	0.0986*** (0.0102)	0.105*** (0.0117)	0.117*** (0.0243)	0.110*** (0.0317)
Medium	0.589*** (0.0134)	0.590*** (0.0160)	0.431*** (0.0319)	0.457*** (0.0330)
Large	1.689*** (0.0284)	1.542*** (0.0627)	1.475*** (0.0754)	1.334*** (0.118)
GVCs	0.456*** (0.0694)	3.151*** (0.607)	0.524*** (0.166)	5.147*** (1.599)
Country dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes
Observations	40,750	40,750	6,797	6,797

Standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Note: The intercept is included.

Table A17. Female Non-Production Workers, GVCs and Barriers

	Finance	Tax rates	Pol. Inst.	Corrup.	Comp.	Elec.	Inad. Edu.	
(a) All Regions								
GVC1	(1) GVC	0.277*** (0.0325)	0.311*** (0.0470)	0.229*** (0.0336)	0.264*** (0.0296)	0.299*** (0.0415)	0.259*** (0.0378)	0.285*** (0.0358)
	(2) Obstacle	-0.0342 (0.114)	0.0453 (0.131)	0.00585 (0.120)	0.0534 (0.151)	-0.182 (0.136)	-0.198* (0.112)	0.281** (0.141)
	(1)*(2)	-0.257** (0.125)	-0.313** (0.134)	0.00194 (0.140)	-0.148 (0.130)	-0.377** (0.166)	-0.106 (0.137)	-0.292** (0.133)
	Observations	41,324	41,324	41,324	41,324	41,324	41,324	41,324
	R-squared	0.538	0.538	0.538	0.538	0.538	0.538	0.538
	GVC4	(1) GVC	0.507*** (0.0449)	0.523*** (0.0647)	0.524*** (0.0500)	0.499*** (0.0456)	0.491*** (0.0468)	0.511*** (0.0610)
(2) Obstacle		-0.110 (0.112)	-0.0615 (0.150)	0.0250 (0.134)	0.0251 (0.163)	-0.297* (0.162)	-0.221** (0.104)	0.245* (0.145)
(1)*(2)		-0.411 (0.302)	-0.349 (0.283)	-0.372 (0.238)	-0.315 (0.246)	-0.296 (0.266)	-0.271 (0.203)	-0.834*** (0.264)
Observations		41,324	41,324	41,324	41,324	41,324	41,324	41,324
R-squared		0.537	0.537	0.537	0.537	0.537	0.537	0.537
(b) MENA region								
GVC1	(1) GVC	0.339** (0.140)	0.206 (0.134)	0.255** (0.116)	0.245* (0.138)	0.464*** (0.130)	0.307** (0.139)	0.392*** (0.0908)
	(2) Obstacle	-0.467** (0.190)	-0.133 (0.298)	-0.816** (0.319)	-0.684* (0.336)	-0.227 (0.183)	-0.283* (0.163)	-0.0198 (0.210)
	(1)*(2)	-0.435 (0.397)	0.0825 (0.456)	-0.0635 (0.207)	-0.0464 (0.320)	-0.985** (0.456)	-0.281 (0.332)	-0.972** (0.363)
	Observations	6,861	6,861	6,861	6,861	6,861	6,861	6,861
	R-squared	0.470	0.469	0.469	0.469	0.470	0.469	0.470
	GVC4	(1) GVC	0.643** (0.292)	0.762* (0.428)	0.509 (0.332)	0.632* (0.358)	0.436 (0.387)	0.632* (0.331)
(2) Obstacle		-0.519*** (0.186)	-0.148 (0.258)	-0.833** (0.306)	-0.683** (0.326)	-0.471*** (0.158)	-0.347** (0.160)	-0.190 (0.209)
(1)*(2)		-1.299 (1.006)	-1.610 (1.389)	-0.390 (0.894)	-0.768 (0.971)	-0.414 (1.319)	-1.109 (0.884)	-3.474*** (0.658)
Observations		6,861	6,861	6,861	6,861	6,861	6,861	6,861
R-squared		0.466	0.466	0.466	0.466	0.466	0.466	0.468

Robust standard errors clustered by country and year in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Notes: i) Each regression controls for firms' age, city of operation and share of government ownership.

ii) All the regressions include country, year, sector and size fixed effects.

iii) Country-year-sector averages are used to reduce the risk of endogeneity between the business environment and firm-level.

iv) Each column for each GVC definition represents a separate regression.

v) All the variables are in log.

vi) The intercept is included.