Gendered Effects of Sanctions on Manufacturing Employment: Evidence from Iran*†

Firat Demir

The University of Oklahoma
Dodge Family College of Arts and Sciences
Department of Economics
436 CCD1, 308 Cate Center Drive
Norman, OK 73072
Email: fdemir@ou.edu

Saleh S. Tabrizy‡

The University of Oklahoma
Price College of Business
Tom Love Division of Entrepreneurship and Economic Development
Price Hall 3005D, 1003 Asp Ave.
Norman, OK, 73019
Email: tabrizy@ou.edu

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‡ Corresponding author. Email: tabrizy@ou.edu; Tel: +1 (405) 325-1638.

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Abstract

International sanctions have significant economic effects with long-lasting negative consequences for human development. However, academic research on the gendered effects of sanctions is scarce. In fact, most work on sanctions have been either gender-neutral or gender-blind. This article examines the labor market effects of economic and non-economic sanctions, imposed by the United States and the United Nations, on male and female employment in manufacturing industries in Iran. The empirical analysis is based on four-digit industry-level employment data from 102 manufacturing industries between 1995 and 2014. Our main findings suggest that international sanctions have disproportionate effects on male and female employment. Particularly, we find that sanctions hurt female employment significantly more than male employment. This effect is further compounded in industries that are more capital intensive, where labor compensation has a relatively low share in value added. Furthermore, in industries with relatively high reliance on imported inputs, female employment suffers more from sanctions.

Keywords: International sanctions; Female employment; Gender; Manufacturing sector; Iran

JEL Codes: F51; J23; O14

1. Introduction

International sanctions have been widely used in modern times and their use has increased recently, particularly those imposed by the US (Hufbauer et al., 2007: 20-41). While sanctions are employed to alter a specific set of policies or actions in a target country, mostly directed to the ruling government, they can have broader impacts over and beyond their officially announced goals. Those impacts may be gender-biased. In a recent opinion article, for example, Moaveni and Tahmasebi (2021) describe how recent sanctions and their aftermath have affected the middle-class women in Iran—in doing so, they describe how sanctions have altered the life of a female language teacher and imposed limitations on business opportunities that were previosuly available to a female publisher and an independent filmmaker.

Sanctions are already shown to have adverse effects on democracy and human rights (Wood, 2008; Peksen, 2009; Peksen and Drury, 2010; Escribà-Folch and Wright, 2010), public health (Peksen, 2011; Allen and Lektzian, 2013), life expectancy (Gutmann et al., 2021), childhood mortality, maternal mortality, and malnutrition in babies (Ali and Shah, 2000), along with income inequality and poverty (Choi and Luo, 2013; Afesorgbor and Mahadevan, 2016; Neuenkirch and Neumeier, 2016; Lee, 2018). They also have adverse effects on economic growth (Neuenkirch and Neumeier, 2015), international trade (Caruso, 2003; Yang et al., 2004; Afesorgbor, 2019; Felbermayr et al. 2019; Crozet and Hinz, 2020), capital flows (Besedeš et al., 2017), foreign direct investments (Mirkina, 2018), and banking (Hatipoglu and Peksen, 2018), as well as exchange rate volatility (Dreger et al., 2016; Wang et al., 2019; Laudati and Pesaran (2021)). Taken together, these findings suggest that sanctions impose significant human and social costs, in addition to direct economic and political costs. Moreover, these costs are not evenly distributed, with the least privileged and most vulnerable segments of the society bearing a larger share of the burden.

We hope to contribute to this literature by exploring the gender-biased effects of international sanctions on male and female employment in the manufacturing sector. Despite a multitude of papers studying various macro and microeconomic effects of sanctions, we do not yet have a satisfactory answer to the question of gendered employment effects of sanctions. Furthermore, most work on the economic effects of sanctions are gender-blind even though there is significant evidence suggesting that sanctions hurt women disproportionally more (Ali and Shah, 2000; Drury and Peksen, 2014; Gutmann et al., 2021). Given the importance of increasing female employment for equality, fairness, social justice, and sustainable development and the presence of a multitude of barriers that are already in place against female labor force participation, it is of paramount importance to determine if sanctions affect female employment differently.[1]

In this paper, therefore, we drop the assumption of gender-neutrality and examine the gendered effect of sanctions on male and female manufacturing employment in Iran, which has been subjected to a large number sanctions since the late 1970s.[2] Compared to other countries under sanctions, we may expect the gendered effects to be further aggravated in Iran given the extent of economic, societal, and institutional barriers against women's economic participation (Moghadam, 1991; Cesari and Casanova, 2017; Farahzadi and Rahmati, 2020).

Our focus on manufacturing is motivated by the central role that this sector plays in productivity growth, human capital accumulation, women's empowerment, and gender equality (Mammen and Paxson, 2000; Heath and Mobarak, 2015; Majlesi, 2016; Getahun and Villanger, 2018). Despite its significant benefits, female employment in developing countries is the lowest in the

[1] Gender equality is one of the 17 sustainable development goals of the UN: https://sdgs.un.org/goals

[2] See Maloney (2015, ch. 9) and Katzman (2019) for a detailed history and an exhaustive list of the contemporary sanctions imposed on Iran.

manufacturing sector, reaching around 17% of female employment in 2019, compared to 31% in agriculture and 52% in services (World Bank, 2021a). Furthermore, in both developed and developing countries and across every geographical region the share of female employment in industry is one half to one third of the male employment, due to institutional, structural, and societal factors (World Bank, 2021a). Therefore, if sanctions have any adverse gendered employment effects, we are likely to detect it in the manufacturing sectors.

Our empirical analysis is based on four-digit industry-level employment data from Iran's manufacturing sector between 1995 and 2014. We take into account the US sanctions as well as the UN Security Council resolutions and sanctions that were imposed on Iran during this period. Our findings reveal a gendered effect: sanctions have a significantly negative effect on female employment growth but not on male employment. The economic magnitude of this effect is also quite significant. The point estimates suggest that an additional economic sanction leads to a 2.4% decline in manufacturing sector female employment. We further find that the adverse effect on female employment is stronger in industries that are less labor intensive and rely more on other inputs, including capital. Also, the industries that rely heavily on imported inputs are found to suffer more from sanctions, and therefore display deeper female employment contraction.

The rest of the paper is organized as follows. Section 2 introduces the main hypotheses of interest and discusses the theoretical channels. Section 3 presents the empirical methodology and data, followed by empirical results in Section 4. Section 5 discusses the extensions, and Section 6 concludes.

2. Gendered Labor Market Effects of Sanctions

Sanctions can be considered as external negative shocks that generate sector-specific or economy-wide business cycles. However, as Buck et al. (1998) already noted, most work on sanctions have been macro, state-centric, and either gender-neutral or gender-blind. Particularly, the academic research on

the gendered labor market effects of sanctions remains scarce despite a large body of evidence showing that sanctions indeed hurt women disproportionately more.

Exploring the gendered employment effects of business cycles, researchers typically rely on three hypotheses developed by Rubery (1988) and Humphries (1988). The *substitution* hypothesis suggests that employers are likely to substitute female labor force for male labor force to lower their variable cost during recessions. In contrast, the *buffer* hypothesis suggests that the female labor force are more likely to be laid off during recessions as they are considered less attached to the labor market. Female employment evolves in a counter-cyclical fashion under the substitution hypothesis, but in a pro-cyclical fashion under the buffer hypothesis. The third hypothesis relates to *gender segregation* such that there exist intransigent gender-specific occupations. As a result, the demand for female labor force is linked to the demand for female-dominated occupations. Périvier (2014) argues that these three hypotheses, theoretically speaking, can be simultaneously valid. In practice, however, Bansak et al. (2012) suggest that the buffer hypothesis appears to dominate the other two during downturns, interrupting the growing similarities between female and male employment patterns.

As for sanctions, Drury and Peksen (2014) argue that there are three channels through which they can have a gender-biased economic effect: *i*) discrimination in hiring, promotion, and dismissals; *ii*) adverse effects on export-oriented jobs that are likely to hire relatively more female employees (Ross, 2013); and *iii*) adverse effects on an array of "women-friendly" policies (including education, health care, childcare and maternity leave) that contribute positively to female employment. Through these three channels, sanctions can hurt female employment disproportionally more. In their empirical analysis, they find supportive evidence for these effects, showing that sanctions have a significant negative effect on female economic rights and labor force participation. They also find that the gender-biased effects amplify as GDP shrinks under sanctions. Furthermore, by limiting economic competition and openness, sanctions can aggravate gender-based discrimination; this could in part be

inferred from the otherwise positive effects of trade liberalization and foreign direct investment on gender inequality (Potrafke and Ursprung, 2012; Ouedraogo and Marlet, 2018), which are reversed under sanctions.[3]

In contrast, Gutmann et al. (2019) suggest that sanctions may improve women's economic rights. They argue that the "added worker" effect (e.g., Majbouri, 2016) may provide an incentive for non-working women to join the labor market which may, in return, improve women's economic rights. Nevertheless, the shift in labor supply resulting from a greater female labor force participation may not lead to an increase in equilibrium female employment in industries where women are less likely to be employed; e.g., capital-intensive industries (Kucera and Tejani, 2014; Tejani and Milberg, 2016). This may also be the case for industries that rely heavily on imported inputs to which access is more limited under international sanctions. Besides, there are also significant demographic effects; Gutmann et al. (2021), for example, report that the UN and US sanctions have larger adverse effects on female life expectancy and are not "gender-blind".

Furthermore, Devin and Dashti-Gibson (1997) suggest that sanctions imposed on Yugoslavia during its disintegration and civil war increased the probability of female unemployment. They argue that many of the industries in which women were more likely to be employed (including trade, catering, and tourism) were affected severely by the sanctions and the political crisis. Al-Jawaheri (2008, ch. 3) also reports detailed accounts of gender-biased effects of UN-backed international sanctions against Iraq from 1990 to 2003, showing significant reductions in female labor force participation and

[3] Similarly, Pieters (2018) argues that by expanding competition, trade liberalization can lower gender-based discrimination, as it becomes too costly for firms to discriminate against women. See Black and Brainerd (2004) and AlAzzawi (2014) for empirical analyses of this point.

earnings. Similarly, Seekins (2005) argues that the US sanctions against Burma had an adverse effect on female employment, particularly in textile and garment industries.

Observing female employment and other covariates in more than 100 four-digit industries in the manufacturing sector from 1995 to 2014, we contribute to this literature by exploring the gendered equilibrium effect of sanctions on Iran in a broad range of industries with varying reliance on labor input and imported intermediate inputs. As noted earlier, these gendered effects are likely to be aggravated in Iran given the presence of significant entry barriers against female employment (Moghadam, 1991; Cesari and Casanova, 2017; Farahzadi and Rahmati, 2020). Furthermore, as Ross (2008) suggests, female employment in oil exporting countries, like Iran, is likely to suffer from an "oil curse" (Gelb, 1988) through two major channels.[4] First, oil producing industries tend to be highly capital-intensive, limiting their employment generating potential. Second, through the Dutch disease, the oil sector crowds out non-resource intensive tradable sectors, whose share of female employment is usually higher than that of the oil sector, limiting the female employment prospects.

A few studies examine the employment effects of sanctions in Iran. Exploring macro-level variations, Laudati and Pesaran (2021, pp. 39-40) find that employment in Iran contracts faster than other countries in the Middle East and North Africa—this greater contraction is, in part, resulting from sanctions. Nosratabadi (2019) also reports that sanctions have a significant adverse effect on industry-level demand for labor. This adverse effect appears to be more pronounced in industries that are less productive and serve mostly the domestic market. He also finds that, as a result of sanctions,

[4] Crude petroleum, refined petroleum, and petroleum gas made up for about 73% of Iran's exports in 2018 (Observatory for Economic Complexity, 2020). For a discussion of macroeconomic dependence of Iran's economy on oil price fluctuations, see Farzanegan (2011) and Esfahani, Mohaddes, and Pesaran (2013).

industry-level labor demand shifted away from non-production workers to skilled production workers. This change, in return, increased the wage premium associated with higher skill levels.

Further, as for the gendered employment patterns, Laudati and Pesaran (2021, pp. 39-40) find that female labor force participation rate in Iran declines more than the male participation. Taheri and Guven-Lisaniler (2018) document similar adverse effects. Also, Payetakhti Oskoye and Tabagchi Akbari (2016) report adverse employment effects for the female employees who are engaged in teaching or administrative services.[5]

Our study contributes to this literature by exploring the gendered effects of sanctions on manufacturing employment in a wide range of industries in Iran. We consider a cumulative count of US and UN sanctions using an exhaustive list of measures that were imposed on Iran between 1995 and 2014. Our cumulative count improves the measurement of sanctions and the enormous strain that they put on Iran's economy. Employing industry-level data, we explore the heterogeneity of the gendered employment effects, showing that female employment suffers more in those industries that rely less on labor input (e.g., capital intensive industries), and more on imported inputs. Our heterogeneity analysis offers new insights into the channels through which sanctions affect female employment in targeted countries.

[5] These papers are part of a growing literature that explore the effects of sanctions on economic variables in Iran, including production (Askari et al., 2001; Torbat, 2005; Farzanegan, 2011; Dizaji and van Bergeijk, 2013; Farzanegan et al., 2016; Gharehgozli, 2017; Esfahani, 2020; Laudati and Pesaran, 2021), international trade (Esfahani and Rasoulinezhad, 2017; Haidar 2017; Felbermayr et al., 2019; Dadpay and Tabrizy, 2021), exchange rate and inflation (Laudati and Pesaran, 2021), and overall welfare (Khabbazan and Farzanegan, 2016; Gharibnavaz and Waschik, 2018; Salehi-Isfahani, 2020).

This paper also improves our understanding of the dynamics of female employment in Iran. Among various determinants of female labor market dynamics, previous studies suggest that the decreasing fertility rate and increasing educational attainment (Esfahani and Shajari, 2012; Moeeni, 2019), reservation wage and marital status (Majbouri, 2015), discrimination (Farahzadi and Rahmati, 2020), economic crisis (Majbouri, 2016), and changes in public policy (Moeeni and Tanaka, 2020) have significant effects on female labor force participation and employment status in Iran. Complementing these studies, our findings highlight the importance of sanctions in explaining the variations in female employment in Iran's manufacturing sector.

3. Data and Empirical Methodology

3.1. Data

To examine the effects of sanctions on female and male manufacturing employment, we use the cumulative number of sanctions imposed on Iran by the US and the United Nations Security Council (UNSC) between 1995 and 2014. The time dimension is conditioned by the availability of industry-level employment data. The data for the cumulative count of sanctions is from Katzman (2019), and its measurement is motivated by Lee (2018) who employs a similar method.

We classify sanctions on Iran into three groups: economic, non-economic, and nuclear-related. For this classification, we rely on the dominant theme of the sanctions and, in part, the descriptions given by Katzman (2019). The first group directly affects economic activities, including trade, foreign investment, banking, and shipping. They either target a specific industry, such as the petroleum industry, or an array of economic activities. Unlike the first group, the other two groups do not directly affect economic activities. Particularly, the second group of sanctions are concerned with non-economic measures, including military, political, or social affairs. And the third group includes nuclear-related resolutions that were adopted by the UNSC.

In 2010, for example, there were three sanctions against Iran: two of them, UNSC Resolution 1929 and US Public Law 111-195, introduced new limitations against an array of economic activities, while the other one, US Executive Order 13553, included non-economic measures. Given their nature, we classify UNSC Resolution 1929 and US Public Law 111-195 as economic measures and US Executive Order 13553 as non-economic.[6] When constructing the sanctions variable for a given year, because of their delayed effects, we consider the sanctions imposed in the fourth quarter of the previous year and the first three quarters of that year.[7] In case any further sanctions are imposed in the fourth quarter, we count them as part of the measures that are effective for the next year.

Motivated by Lee (2018), among others, we use the cumulative number of sanctions in a given year as our sanctions variable. Normalizing the number of sanctions in 1994 to zero, our cumulative count includes sanctions that were imposed on Iran between 1995 and 2013. It also takes into account sanctions that were lifted by the US as part of the Joint Plan of Action in 2014.[8] At any given period, therefore, our cumulative count measures the existing sanctions prior to that period along with the newly added sanctions.

We first consider the total cumulative count for economic, non-economic and nuclear-related sanctions together. Next, we test the effects of economic sanctions separately. While the total count captures the overall strain of sanctions on Iran, the economic sanctions capture the economic effects

[6] In Appendix Table A1, we provide a full list of sanctions that are included.

[7] As discussed in Section 5, our results are not sensitive to this time window.

[8] The Joint Plan of Action (JPOA) was an interim agreement between Iran, China, France, Germany, Russia, the UK, and the US. Iran limited its nuclear activities under JPOA. In return, the US suspended three economic sanctions that were previously imposed on Iran in 2005, 2012, and 2013 (Dadpay and Tabrizy, 2021). See Table A1 for more information.

more directly. However, the two variables are highly correlated (around 0.96). As expected, they are also highly correlated with the total crude oil exports of Iran, suggesting that they adequately capture the cost of international sanctions. In Table 1, we present the evolution of total sanctions, economic sanctions, and crude oil exports in Iran. Accordingly, the unconditional correlation between the cumulative count of (economic) sanctions and the quantity of crude oil exports is around (-0.84) -0.77 (also, see Figures A1 and A2 in the Appendix).

<Insert Table 1 Here>

To measure industry-level manufacturing employment, we rely on UNIDO's INDSTAT4 2016 (ISIC Revision 3) database (UNIDO, 2018) and examine 102 four-digit industries from 1995 to 2014 (the full list is reported in Appendix Table A2). Figure 1 plots the time series for the share of female employees in total number of employees in Iran's manufacturing sector: while there were less than seven female employees per 100 employees in the manufacturing sector in 1995, it increased to around 10 by 2007 and remained stable thereafter (also see Appendix Tables A3-A4).

We observe significant cross-industry heterogeneity in production and (female) employment. Figure 2 shows the relative importance of different two-digit industries in manufacturing output, employment, and female employment. For this visualization, we first aggregate the four-digit information to two-digit levels. We, then, compute the time-varying shares of a given two-digit industry in, say, manufacturing output, and after that take the median shares to measure the relative importance of a given two-digit industry:

$$\text{Share}_{\text{qi}} = \text{Median}\left(\frac{\text{q}_{\text{it}}}{\sum_{\text{j}=1}^{\text{n}} \text{q}_{\text{j,t}}}\right) \quad (1)$$

where $q_{i,t}$ is the total output of industry *i* at time *t*, and *n* is the total number of industries. $Share_{qi}$ is the time-invariant median output share of industry *i* in total manufacturing output. We repeat the same exercise for time-invariant median shares in total employment ($Share_{li}$) and female

employment ($Share_{fi}$). We plot the obtained industry-specific medians in Figure 2, sorted by the relative importance of two-digit industries in manufacturing output.

<Insert Figures 1 & 2 Here>

Figure 2 suggests that motor vehicles, trailers and semi-trailers (ISIC 34), chemicals and chemical products (ISIC 24), basic metals (ISIC 27), food products and beverages (ISIC 15), coke and refined petroleum products (ISIC 23), and other non-metallic mineral products (ISIC 26) have relatively large shares in Iran's manufacturing output with their median shares exceeding 5%.[9] As for the median shares in total employment, Figure 2 shows the relative importance of the food products and beverages industry (ISIC 15) along with other non-metallic mineral products (ISIC 26), motor vehicles, trailers and semi-trailers (ISIC 34), and textiles (ISIC 17). Their median share in manufacturing employment ($Share_{li}$) is greater than 10%.

Figure 2 also shows that female employment is disproportionately high in the food products and beverages industry (ISIC 15) along with textiles (ISIC 17) and chemicals and chemical products (ISIC 24). Their median share in manufacturing female employment ($Share_{fi}$) is greater than 10%. These industries are followed by non-metal minerals industry (ISIC 26), electrical machineries (ISIC 31), motor vehicles, trailers and semi-trailers (ISIC 34), and machinery and equipment n.e.c. (ISIC 29); their median share in manufacturing female employment is between 10% and 5%.

To limit the effect of outliers, we drop observations with employment growth rates that are in the bottom and top one percentiles of the distribution. Figure 3 shows the histogram for the trimmed distribution of female and male employment growth in manufacturing industries, suggesting that

[9] These industries have the highest share in manufacturing value added. Also, we should note that we only observe the manufacturing activities in the production of coke and refined petroleum products (ISIC 23) but not the extraction of crude petroleum and natural gas (ISIC 11).

female employment has on average increased at a faster pace than male employment during the sample period. However, the dispersion of the growth rates for female employment is larger. Detailed summary statistics are provided in Table 2.

<Insert Figure 3 and Table 2 Here>

3.2. Benchmark Specification

We use Eq. (2) as our benchmark regression function. It is based on a standard dynamic labor demand model, similar to the one discussed in Cahuc et al. (2014, pp. 135-138):

$$\Delta e_{it} = \gamma e_{it-1} + \alpha s_t + X'_{(i)t}\beta_1 + \beta_2 t + T'\beta_3 + \eta_i + \varepsilon_{i,t} \qquad (2)$$

where e_{it} is the (log) level of female or male employment in four-digit industry *i* at time *t*, and s_t is our sanctions variable (also in log).[10] Delta is the first difference operator. $X'_{(i)t}$ is a vector of aggregate and industry specific control covariates. Variable t is the time trend, and vector T includes time dummies. Together, they control for trend changes in employment growth as well as time-specific shocks to employment that are not caused by sanctions or other covariates. Parameter η_i represents industry fixed effects, controlling for time-invariant but industry-specific variations in employment growth, and $\varepsilon_{i,t}$ is the error term.

As for the regressors, variable s_t is the (log) cumulative sum of the US and UN sanctions at time *t* and includes economic sanctions, non-economic sanctions, and nuclear-related UNSC resolutions. We also separately test the effect of economic sanctions. Treated as external adverse shocks, our key hypothesis implies that sanctions negatively affect employment growth for female and

[10] In terms of sign and significance, the results remain intact if we do not put our sanctions measure in log. Detailed results are available upon request.

male labor force. We, therefore, test for: $H_0^{\alpha}: \alpha \geq 0$ vs. $H_1^{\alpha}: \alpha < 0$. We also compare our estimation for parameter α in female employment growth equation with the estimation in male employment equation. We expect the adverse effects of sanctions to be more pronounced for female employment growth. This, in part, results from the empirical dominance of the buffer hypothesis, which suggests that decreasing economic dissimilarities between female and male employees is interrupted significantly during a downturn (e.g., Bansak et al., 2012). Such interruptions may be even more aggrevated in Iran considering the presence of significant entry barriers against female employment (e.g., Farahzadi and Rahmati, 2020). $X'_{(i)t}$ includes (log) average real wages and (log) real output (in domestic currency) in industry *i* at time *t*. It also includes (one plus) (log) real interest rate in the manufacturing sector, (log) real net earnings from oil exports (in domestic currency), and (one plus) (log) share of services sector in total value added. We jointly control for wages and the manufacturing sector's real interest rate, as they both affect the conditional demand for labor. We further control for output as another determinant of labor demand. We choose these covariates relying on a two-factor production function with constant elasticity of substitution (Cahuc et al., 2014, pp. 113-118).

Similar to the employment data, the industry-level output and wages are from UNIDO (2018) and are deflated using the producer price index (CBI, 2019a). We obtain the industry-level measure of wages by dividing the industry-level cost of wages and salaries by the total number of employees in a given industry. However, because the cost of wages and salaries are not separated by gender in the dataset, we use the same industry-specific average wage measure in both female and male employment regressions.

The manufacturing real interest rate (r_t) is calculated using a nominal measure of manufacturing interest rate and the producer price index (CBI, 2019a and 2019b):

$$r_t = \frac{(1 + i_t) \times P_t}{P_{t+1}} - 1 \qquad (3)$$

where i_t is the nominal rate and P_t is the PPI (Blanchard et al. 2010, pp. 291-295). The median (mean) manufacturing real interest rate between 1995 and 2014 is equal to 0.63% (-0.62%), and its interquartile range is equal to 8.85% (the standard deviation being equal to 7.70%). As the price measure for a substitutable factor of production, an increase in real interest rate is positively associated with labor demand. Also, reflecting the real return on capital, the neoclassical macroeconomic theory often assumes a positive relationship between real interest rate and productivity (Romer, 2006, Chapter 2; Rachel and Smith, 2015), which may also motivate this positive relationship.

As for the (log) real net revenue from oil exports, the "oil curse" is likely to have a negative effect on female employment in oil exporting countries. As discussed earlier, Ross (2008) highlights two main channels for this: the high capital intensity of oil production and the Dutch disease. He suggests that these factors may disproportionately affect female employment in oil rich countries. To control for this structural effect, it is important that we control for the variations in oil exports. We use the estimations by the US Energy Information Administration to measure Iran's real net revenue from oil exports in US dollars (EIA, 2018).[11]

The share of services in value added controls for inter-sectoral heterogeneity in employment characteristics for men and women in Iran. Particularly, compared to industrial sectors, female employment in services in Iran, as in other MENA countries, is higher and has been increasing during the period analyzed (World Bank, 2021a). It is, therefore, important that we control for the pull forces behind this increase. We rely on the World Bank (2019) to measure the share of services in value

[11] Measured in 2017 constant prices, the median (mean) real net revenue of Iran from oil exports between 1996 and 2014 is equal to $49.85 billion ($48.78 billion), and its interquartile range is equal to $37.56 billion (the standard deviation being equal to $24.01 billion). In the regression analysis, we use the domestic currency equivalents based on average annual exchange rate (CBI, 2020).

added. The median (mean) share of the services sector in value added between 1995 and 2014 is 49.5% (50.2%), and the interquartile range is 2.96% (the standard deviation being equal to 2.4%).

3.3. Industry Heterogeneity

The benchmark specification in Eq. (2) assumes that labor market responses to international sanctions are homogenous across different industries. We extend our benchmark specification and explore how industry heterogeneity conditions the impacts of sanctions on employment in Iran. Particularly, we focus on two industry-specific factors: the degree of labor intensity and the level of imported input dependency. As discussed in Section 2, we expect sanctions to have a larger negative effect on female employment in industries that are less labor intensive. The same is true for industries that are more dependent on imported inputs.

Existing evidence suggests that the degree of labor intensity causes a gendered pattern of employment as women are less likely to be employed in capital intensive industries (Kucera and Tejani, 2014; Tejani and Milberg, 2016). Based on these findings, and as discussed earlier, Cohn (2017) argues that capital intensity of production may create a labor cost buffer that would provide less incentive for firms to save on their production cost by hiring female employees. In line with Ross (2013), Cohn (2017) also suggests the abundance of petroleum wealth may create a similar buffer, affecting female employment negatively. Taken together, we expect that as the share of labor compensation in value added declines (e.g., as industries become more capital-intensive), the negative effect of sanctions on female employment increases.

As for the reliance on imported inputs, the existing empirical evidence suggests that greater access to imported intermediate inputs can positively contribute to female employment in developing countries. Exploring trade liberalization in Mexico during the 1990s, for example, Juhn et al. (2013 and 2014) find that liberalization-induced technology upgrading increases the employment of female

blue-collar workers by facilitating technological upgrading and lowering the need for physically demanding skills. Also, exploring trade liberalization in Indonesia during the 1990s, Kis-Katos et al. (2018) suggest that input tariff reduction increases both labor force participation and hours worked by female employees. They also find that trade liberalization stimulates expansion of female-intensive sectors and lowers sectoral gender segregation. Sanctions are likely to limit access to imported intermediate inputs and, considering the aforementioned findings, may have a larger adverse effect on female employment in industries that heavily rely on those inputs.

We test these two hypotheses in Eq. (4):

$$\Delta e_{it} = \gamma e_{it-1} + \alpha_1 s_t + \alpha_2 (s_t \times \zeta_i) + \alpha_3 \zeta_i + X'_{it}\beta_1 + \beta_2 t + T'\beta_3 + \eta_i + \varepsilon_{i,t} \quad (4)$$

where ζ_i is an industry-specific and time-invariant variable, measuring either the reliance of industry *i* on labor input (ζ_i^{labor}) or the reliance of that industry on imported inputs (ζ_i^{imp}).

To measure labor intensity (ζ_i^{labor}), we first aggregate four-digit industry-level data on wages and value added into two-digit and calculate total nominal labor compensation and total nominal value added for each year. Next, we divide the total nominal labor compensation by the total nominal value added, calculating the relative size of labor compensation in value added. We then take the median of this variable to generate an industry-specific and time-invariant measure of labor intensity, as shown in Eq. (5):

$$\zeta_i^{labor} = Median\left(\frac{Wages_{it}}{ValueAdded_{it}}\right) \quad (5)$$

where ζ_i^{labor} is the time-invariant measure of the relative importance of labor input in a given two-digit industry.

Figure 4 shows the distribution of the measure in Eq. (5) across two-digit industries in Iran. As expected, the production of refined petroleum products (ISIC 23), chemicals and chemical products (ISIC 24), basic metals (ISIC 27), and motor vehicles, trailers and semi-trailers (ISIC 34) are

more capital intensive as they rely relatively less on labor input. The reliance on labor input for these industries does not go beyond 23%, suggesting that more than three quarters of their value-added go to non-labor factors of production, e.g. capital.

<Insert Figure 4 Here>

For the imported input share variable (ζ_i^{imp}), we use data from Iran's input-output tables for 2011/12 (which is the most recent). We compute the share of a given two-digit industry in the aggregate intermediate goods imports (SCI, 2020b).[12] For a given two-digit industry, we divide the amount of imported intermediate inputs by the sum of all imported intermediate inputs, as shown in Eq. (6):

$$\zeta_i^{imp} = \frac{ImportedInputs_i}{\sum_{j=1}^{n} ImportedInputs_j} \tag{6}$$

Given the aggregate amount of imported inputs, an increase in this measure implies greater reliance on imported inputs. Figure 5 shows the distribution of the measure in Eq. (6) across two-digit industries and suggests that motor vehicles, trailers and semi-trailers (ISIC 34) has by far the largest share in imported intermediate inputs in Iran: 23.75%. It is then followed by the production of basic metals (ISIC 27), food products and beverages (ISIC 15), and chemicals and chemical products (ISIC 24), each with a share greater than 10%.

<Insert Figure 5 Here>

[12] The input-output table is based on the data for the year 1390 in Iran's official calendar, which includes part of 2011 and part of 2012 in the Gregorian calendar. The SCI has reported five input-output tables, 2011/12, 2001/02, 1991/92, 1986/87, and 1973/74. The table for 2011/12 was updated in 2018. Also, beyond the two-digit level, these input-output tables are not compatible with the industrial classification in INDSTAT4. The Appendix Table A5 provides details about its calculation.

3.4. Methodology

We estimate Eqs. (2) and (4) using the system GMM method developed by Arellano and Bover (1995) and Blundell and Bond (1998). The main parameters of interest relate to the effects of sanctions on the growth rate of female and male employment. Conditional upon other covariates, the effects of sanctions on female and male employment are well-identified as the variations in sanctions are exogenous to the variations in industry-level employment. The lagged level of (log) employment controls for the dynamic adjustment in labor demand growth (Bond et al., 2001). The short run dynamics may result from adjustment costs, expectation formation, or decision processes.

Eqs. (2) and (4) behave like a standard dynamic equation with levels run on lagged levels (Roodman, 2009, p.100). It is easy to show that the lagged level ($e_{i,t-1}$) is correlated with the fixed effect parameter (η_i), which may cause the well-known dynamic panel bias. The system GMM method helps us correctly identify the parameters associated with lagged levels and endogenous covariates. This method is useful for small *T* and Large *N* panels, which is the case here: our data includes a relatively short time span (1995-2014), but covers 102 manufacturing industries. Plus, since this method employs a levels equation (along with a first-difference equation), it enables us to identify and estimate the parameter associated with our heterogeneity factor; i.e., parameter α_3 in Eq. (4).

In estimating Eqs. (2) and (4), we treat industry-level wages and output together with the share of services in aggregate value added as endogenous to the growth rate of industry-level employment. An unobserved shock to the growth rate of employment in manufacturing industries can affect the wages and output of those manufacturing industries as well as the wages and output of the services sector, leading to changes in the value added in that sector. Other control variables, including real interest rate and real net earnings from oil exports, are assumed to be exogenous to the industry-level employment growth. In order to avoid the problem of too many instruments, we use lagged levels starting from *t-3* as instruments for the first-difference equation, and we use lagged first-differences

starting from *t-2* as instruments for the level equation in our system GMM. Hence, we run the Arellano and Bond test (henceforth, AB test) for the autocorrelation of orders 1, 2, and 3 (Arellano and Bond, 1991). We also use only one instrument for each variable and lag distance, which helps reduce the number of moment conditions (Roodman, 2009).

As reported below, the AB test results suggest that there is no autocorrelation of order two in first-differenced errors when we include only one lagged level for the growth rate of female employment. However, for male employment regression we need to include two lagged levels, otherwise our moment conditions suffer from an autocorrelation of order two.

4. Empirical Results

4.1. Benchmark

In Table 3, we present the regression results from Eq. (2) for female (columns 1-4) and male (columns 5-8) employment growth. For each dependent variable we present four specifications: Columns (1) and (5) are the barebone versions of Eq. (2), and columns (2) and (6) introduce two more control variables: *lnServices* and *lnOilExports*. Columns (3)-(4) and (7)-(8) add our main variables of interest, which are the (log) cumulative count of all sanctions (*lnSanctions*) and the (log) cumulative count of economic sanctions (*lnEconSanctions*).[13] All regressions include a time trend and a vector of year dummies; the latter controls for year-specific shocks to employment that are common among all

[13] As discussed in Section 3.4, we include an additional lag for the level of male employment in columns (5)-(8) to avoid autocorrelation of order two in the moment conditions. Including the additional lag for the female employment regressions would lead to autocorrelation of order two, but still leave the point estimates for the key parameters the same. These estimation results are available upon request.

industries. We also include a fixed effect parameter (denoted by η_i in Eq. (2)), controlling for time-invariant and unobserved idiosyncratic industry-specific characteristics.

Our findings in columns (3) and (4) reveal that both types of international sanctions have had a significant negative effect on female employment growth in the manufacturing sector in Iran.[14] The estimated effects of total sanctions and economic sanctions are quite close with a significant overlap of confidence intervals: [-0.38,-0.04] for the former and [-0.26,-0.03] for the latter (95% confidence level). In contrast, in columns (7) and (8), we do not find any evidence of a similar adverse effect on male employment growth.

<Insert Table 3 Here>

Beyond their statistical significance, the estimated effects of sanctions are also significant economically. The dependent variable of interest, as discussed in Sections 3.1 and 3.2, is the first-difference of (log) female or male employment; i.e., $\Delta e_{i,t} = log(E_{i,t}) - log(E_{i,t-1})$, where $E_{i,t}$ is the number of female or male employees in industry *i* at time *t*. Once we move the lagged level of employment to the right-hand side, Eq. (2) becomes:

$$e_{i,t} = (1+\gamma)e_{i,t-1} + \alpha s_t + X'_{(i),t}\beta_1 + \beta_2 t + T'\beta_3 + \eta_i + \varepsilon_{i,t} \qquad (7)$$

We can, therefore, interpret the α parameter as the sanctions-elasticity of female or male employment. Looking at column (4), the point estimate for α suggests that a one percent increase in economic sanctions decreases female employment by 0.15%. Given that the mean for cumulative

[14] For all of our estimations in Sections 4 and 5, we employ robust standard errors that are consistent in the presence of heteroskedasticity and autocorrelation within panels. See Roodman (2009) for a detailed description of the standard error estimation procedure.

count of economic sanctions is 6.25, imposing a new economic sanction at the mean would be associated with a 2.4% decline in female employment in a given industry and year.[15]

Looking at other variables, we find that real wages have a significantly negative effect on both female and male employment, independent of specification in columns (1)-(8). However, wage elasticity is significantly larger for female employment. For example, our findings in columns (4) and (8) suggest that a 1% increase in industry-level real wages is associated with a 0.44% decline in industry-level female employment, compared to around 0.13% decline in male employment.[16] We also find that increasing the manufacturing sector's real interest rate has a positive effect on both female and male employment, capturing the price elasticity of a substitutable factor of production. Again, comparing columns (4) with (8), we find that a 1% increase in this variable is associated with a 0.30% increase in female employment but 0.26% increase for male employment.

We further find that a positive shock to industry-level real output has a significantly positive effect on female and male employment. In contrast, increasing the share of services in value added has an economically larger negative effect on female than male industrial employment, albeit at a statistically insignificant level. This is consistent with studies showing the gender bias in the services sector in MENA countries, including Iran, where the share of employment is higher (World Bank, 2021a). Lastly, we fail to detect any significant or robust effect from oil exports on female or male

[15] Imposing a new economic sanction at the mean of 6.25 sanctions per year would require a 16% increase in the cumulative count of economic sanctions ($0.16 \times 6.25 = 1$). Considering the point estimate for the elasticity of interest, the newly imposed sanction (i.e., 16% increase in average cumulative count) would be associated with a 2.4% decline in female employment.

[16] As noted earlier, we are unable to measure wages by gender. The above elasticities should, therefore, be interpreted with caution.

employment. Given the highly capital-intensive and male-biased nature of oil production and that we already control for industry fixed effects, this is not a surprising finding.[17]

In short, our results suggest that female employment is relatively more sensitive to changes in factor prices (including wages and real interest rate) than changes in output or sanctions. While the elasticity of female employment with respect to wages and real interest rate are 0.44 and 0.3, this elasticity is only about 0.16 for output and 0.15 for sanctions (Table 3, column 4). As expected, we also find that female employment is relatively more elastic compared to male employment.

Lastly, test results suggest that our moment conditions are valid. For each specification, Table 3 reports the Hansen (1982) test results, supporting the joint validity of the instrument set. The AB serial correlation test also confirms that there is no autocorrelation of order two or higher. We should further note that we limit the number of instruments by using only one instrument for each variable and lag distance (i.e., collapsing the IV vector), as suggested by Roodman (2009).

4.2. Industry Heterogeneity

Table 4 presents the estimated parameters for Eq. (4), using the interaction terms for labor-intensity (ζ_i^{labor}) (columns 1-4) and imported-input intensity (ζ_i^{import}) (columns 5-8) variables. As before, we estimate the effects of total sanctions and economic sanctions on gendered employment growth separately. The results continue to suggest a significant negative effect from sanctions on female employment growth and an insignificant effect on male employment growth. More important, in columns (1)-(4), we find that the negative effect of (economic) sanctions on female employment is weaker in industries that are relatively more labor intensive. While the parameter for the interaction

[17] In the US, for example, the share of female employment in the oil and gas extraction industry was around 22% in 2020. For petroleum and coal products manufacturing, it was around 16% (BLS, 2020).

term between sanctions and labor intensity is greater than zero for both female and male employment, it is significant only for the former. In other words, sanctions hurt female employment more in industries that are less labor intensive. Further, in columns (5)-(8), we find that the (economic) sanctions hurt female employment more in industries that are more dependent on imported inputs. The effect on male employment is again not significant.[18]

<Insert Table 4 Here>

To illustrate the economic significance of these findings, let us consider the results reported in column (2) of Table 4 where we examine the effect of economic sanctions on female employment growth. Given the point estimates for sanctions, -0.281***, and interaction term with labor intensity, 0.396***, we can calculate the predicted effect of sanctions on female employment at different levels of ζ_i^{labor} by comparing, for example, two industries at the opposite tails of the distribution: coke and refined petroleum products (ISIC 23) (ζ_{23}^{labor}=0.085) vs. tobacco products (ISIC 16) (ζ_{16}^{labor}=0.451). The net effect of sanctions on female employment growth is -0.25*** for coke and refined petroleum products and -0.1*** for tobacco products. The Wald test suggests that these two effects are significantly different at 1% level of significance.[19]

[18] These results, except for the interaction term with import intensity (p-value=11.6%), are robust to the inclusion of a control for the Polity index (Center for Systemic Peace, 2021), representing the changes in patterns of political authority in Iran from 1995 to 2014. Appendix Table A6 reports the results.

[19] In the Appendix Figure A3, we visualize the effects from economic sanctions (on fitted values) at varying levels of labor intensity. For this plot, we use the results that are reported in Table 4, column (2). The range of variations in labor intensity is determined by the observed variations for the aforementioned regression.

Likewise, the economic significance of sanctions is quite large for industries that depend heavily on imported inputs. Using the results in column (6), we find that the parameter estimate for economic sanctions is -0.124**, and for the interaction term is -0.46*. Using these values, we can compare two industries with the highest and lowest shares of imported inputs: motor vehicles, trailers and semi-trailers (ISIC 34) ($\zeta_{34}^{imp} = 0.237$) vs. tobacco products (ISIC 16) (ζ_{16}^{imp}=0.002). The net effect of economic sanctions is -0.23* for the former and -0.12* for the latter, which are significantly different at the 10% level.[20]

We also estimate the net effect of sanctions at the average levels of labor intensity and reliance on imported inputs. Based on the point estimates reported in Table 4, we find that for an industry with an average level of labor intensity (ζ_{mean}^{labor}=0.302), the net effect of economic sanctions on female employment is -0.162*** (column 2). Likewise, in an industry with average reliance on imported inputs (ζ_{mean}^{imp}=0.057), the net effect of economic sanctions on female employment is equal to -0.151*** (column 6). Consistent with our earlier results, the effects are statistically insignificant for the case of male employment.

As for other parameter estimates in Table 4, we find that real wages, real interest rate, and real output are significant determinants of female and male employment in Iran. Their effects are of similar statistical and economic significance when compared with the benchmark results in Table 3. Furthermore, we find that the growth rate of female employment is significantly lower (higher) in industries with relatively high reliance on labor input (imported input). Considering the AB test results reported in Table 4, we detect no autocorrelation of order two or three. The Hansen test also supports the validity of our instruments.

[20] We visualize the effects of economic sanctions at varying levels of reliance on imported inputs in Figure A4. For this plot, we use the results from Table 4, column (6).

5. Sensitivity Analyses

In this section, we report the results of a rich battery of robustness tests to check the sensitivity of our findings to sample selection and measurement errors. First, to rule out the possibility that a specific industry is driving the results, we exclude one industry at a time at four-digit and two-digit classification levels and re-estimate Eqs. (2) and (4) for remaining industries. The results are highly consistent with those reported above and are available in the Online Appendix Table OA1.[21] Next, we exclude the two-digit industries with the highest and lowest share of female employment: production of food products and beverages (ISIC 15) and production of wood and wood products (ISIC 20), respectively. We also exclude the two-digit industries with the largest expansion and contraction in female employment: production of rubber and plastic products (ISIC 25) and production of radio, television and communication equipment and apparatus (ISIC 32), respectively. The results are consistent with those reported above (Appendix Table A7, Panels A-D).

It is possible that sanctions affect employment through a longer lag as explored in Escribà-Folch and Wright (2010), who study the effect of sanctions on autocratic stability and survival. To check for this possibility, we re-estimate Eq. (2) using lagged measures of sanctions up to 4 years. We find that sanctions do not affect male or female employment after the initial impact, suggesting a contemporaneous labor market adjustment (Appendix Table A8). This contemporaneous effect is evident in other studies that examine the effects of sanctions on labor market outcomes (e.g., Laudati and Pesaran, 2021, pp. 39-40) or women's economic rights (e.g., Drury and Peksen, 2014). Nevertheless, while the economic impact of sanctions on female manufacturing employment is

[21] This exercise produced 1,488 estimations. Importantly, it entails excluding the refined petroleum industry (ISIC 2320) from our regressions; such exclusion has no impact on key results.

immediate, there might be delayed effects in other sectors, which will hopefully be explored in future studies.

We also experiment with a modified sanctions count. As discussed in Section 3.1, our benchmark sanctions variable for a given year includes sanctions that are imposed in the fourth quarter of the previous year and the first three quarters of that year. To test the robustness of our findings, we modify this measure by including sanctions that are imposed during a given year. Even if a sanction was imposed on the last day of the year, as it was the case with the US Sanctions under US Public Law 112-81 Sec. 1245 (imposed on December 31, 2011), we count that measure as part of the contemporaneous sanctions. We then re-estimate the parameters of Eq. (2) and (4). All of the key parameters retain their sign and significance levels. We repeat this exercise using lagged sanctions up to four years as well and find similar results as before, insignificant lagged effects (Appendix Table A9, Panels A and B).

We further test how industry heterogeneity in exporting activities may condition the effects of sanctions on female and male employment growth. We measure industry-level heterogeneity in exporting activities using two-digit industry exports data from UN Comtrade (WITS, 2021). We find that, unlike male employment, the female employment growth suffers disproportiantely more in industries that have relatively larger shares in Iran's non-oil exports; many of these industries also have a large share in imported inputs. Appendix Table A10 reports the results.

Lastly, we employ a measure of sanctions intensity introduced by Laudati and Pesaran (2021). Counting the number of news articles on Iran's sanctions in six leading daily newspapers (including New York Times, Washington Post, Los Angeles Times, Wall Street Journal, Guardian, and Financial Times), this measure serves as a proxy for sanctions intensity. As expected, the sanctions intensity measure is highly correlated with the cumulative count measures used in this study (0.78 for all sanctions and 0.71 for economic sanctions). Reported in Appendix Table A11, the results suggest that

a 1% increase in sanctions intensity reduces female employment by more than 0.5%; such an increase has no significant effects on male employment, however. The adverse effect on female employment is, again, evident in capital-intensive industries.

6. Discussion

Our findings suggest that international sanctions that were imposed on Iran between 1995 and 2014 had a significant adverse effect on the growth rate of manufacturing female employment, but they had no significant effects on manufacturing male employment. There are, however, three important caveats when interpreting the above findings.

First, our regression analysis relies on industry-level data from the manufacturing sector. The decline in manufacturing female employment growth, resulting from sanctions, may lead to the growth of female employment in other sectors, e.g., services. We do not have access to disaggregated data from different industries in the services sector. We are, therefore, unable to formally test for the above hypothesis. Nevertheless, aggregate figures suggest that the share of female employment in services sector has increased during the time window of our study. In 1995, 47% of female employees were employed in services sector in Iran. Despite declining to about 37% by 2006, this share increased to about 54% in 2014 (World Bank, 2021b). These fluctuations may, in part, result from sanctions. Testing for this hypothesis, however, requires detailed industry-level data from the services sector to which we do not have access. We should also note that the sectoral allocation of jobs matters for long run development and growth. As suggested by McMillan and Rodrik (2011) and Rodrik (2016), for example, the declining share of manufacturing sector employment can lead to a deindustrialization as observed in Latin America whereby the aggregate total factory productivity as well as labor productivity fell. Accordingly, if the newly created service sector jobs, which replace the manufacturing jobs, are mostly in lower skill and lower value added services, this will lead to an overall decline in

productivity and economic growth. The potential for human capital development and vertical/horizontal spillovers as well as increasing returns is also higher in manufacturing industries than in lower skill services.

Second, since we have access to industry-level data, we are unable to distinguish between the employment effects of sanctions for different occupations. At a given four-digit industry, we observe the annual variations in total employment and female employment. We do not observe the employment figures by occupation type. Hence, we are unable to test whether sanctions have heterogenous gendered effects on different types of occupations. Such test would require more detailed data.

Lastly, while we accounted for both the number of sanctions as well as their intensity, we have not compared the gendered effects of sanctions with those of "targeted" sanctions. While the existing research raises serious questions about the "smartness" of targeted sanctions and whether they eliminate any such negative externalities or unintended consequences, we have not explored these questions in this paper.[22] We hope future research will shed light on these issues.

7. Conclusion

By exploring the gendered employment effects of sanctions, this study contributes to the literature on sanctions and their socio-economic effects. We find that international sanctions imposed on Iran

[22] No matter how well-designed or micro-focused sanctions are, there are always "casualties", who tend to be the least privileged and most vulnerable segments of the society. Furthermore, the broader literature on "smart" or "targeted" sanctions provides inconclusive results as to their overall effectiveness as well as the degree of negative externalities on non-targeted groups (Cortright et al., 2002; Drezner, 2003; Early and Schulzke, 2019; Peksen, 2019).

between 1995 and 2014 led to a significant reduction in the growth rate of female manufacturing employment. In contrast, we do not observe such reduction in male manufacturing employment. These effects can partly explain the significant slowdown in the increasing share of female labor force in total manufacturing employment in Iran during this period. We also find that the magnitude of this adverse effect is significantly higher in industries that are less labor-intensive and more dependent on imported inputs. These results complement the findings in a growing number of studies that highlight the broad and heterogenous impacts of international sanctions. As highlighted by Hufbauer et al. (2007), sanctions appear to have a wide range of effects beyond the intended goal of changing the behavior of target countries; we show that gendered employment effects are among those consequences.

Our findings have significant policy implications as they show that sanctions are not gender-blind and significantly hurt female employment in the manufacturing sector. Our results, therefore, call for attention to the potential bias introduced by assuming homogeneous and non-differential effects of sanctions on economic activities in target countries.

For future research, we recommend further examination of the gendered effects of sanctions using firm-level data. Despite extracting information from four-digit industry classifications, we are unable to take into account the firm-level variations including size, ownership, management, export status, or access to credit. Incorporating these covariates and exploring firm-level heterogeneity may improve our understanding of gendered employment effects of sanctions. They may also allow researchers to explore the impact of sanctions on gender wage gap. Equally important, future research may unmask the employment dynamics in the services sector in response to increase in international sanctions. As indicated previously, female employment in the services sector has increased in Iran during the timeframe of this study. Although we control for this increase (in aggregate terms), it is equally important to examine the effects of sanctions on employment in the services sector alone.

Future research may also explore the gendered effects of sanctions on informal employment. In our dataset, we do not observe the variations in informal employment in Iran. Assuming that formal and informal employment react to sanctions in a similar way, as examined by Farzanegan and Fischer (2021), we can interpret our findings as lower-end estimates. However, if sanctions lead to a move to informal employment, then the net effects will be more complicated: while some of the lost formal jobs will move to the informal sector, there will be net welfare losses for workers (because of lost wages and benefits and other costs involved with informality). Furthermore, if women are more likely to move to the informal sector, then we expect the gendered effects of sanctions to be further aggravated. This may, in particular, be the case for an unskilled labor force with relatively low educational attainment. A similar problem exists for labor reallocation from manufacturing to service industries. While we cannot directly test the net employment effect of sanctions in this paper, any reallocation from manufacturing to services is likely to be welfare reducing as these are mostly lower value added and lower skill intensive services. As a result, and consistent with the findings for Latin American countries (e.g., McMillan and Rodrik, 2011; Rodrik, 2016), we expect a decrease in overall productivity as well as human capital formation and skills upgrading, which are likely to widen existing gender gaps in the labor market.

As is all case studies, we should also caution for the external validity of our findings and highlight the need for further country studies. Given the uniquness of sanctions on Iran in terms of their intensity and coverage, the gendered effects of sanctions may differ in other countries.

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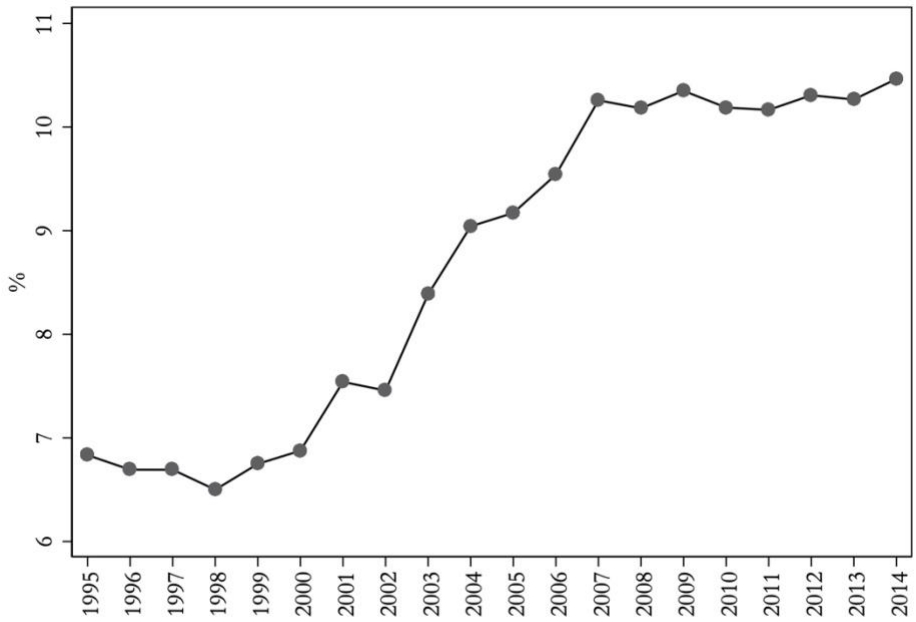
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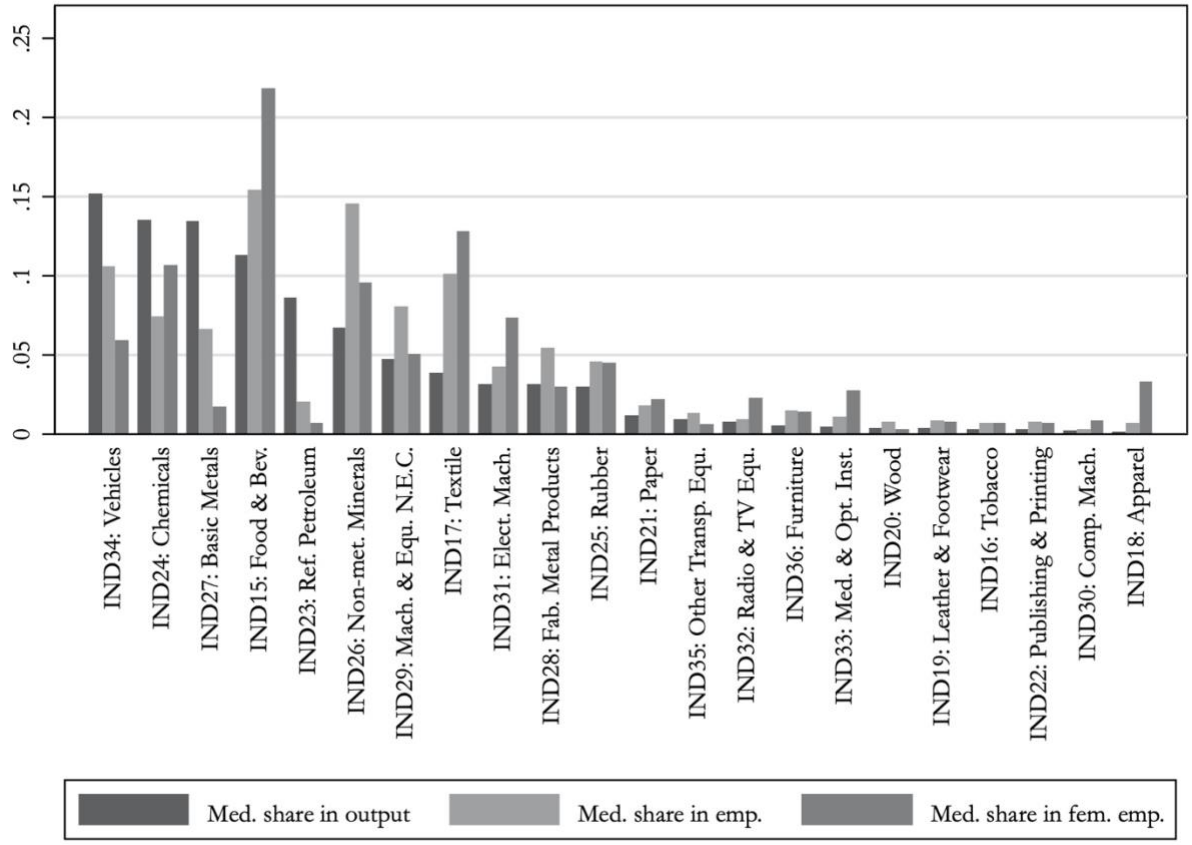
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Figure 1: Time series for the share of female employment in total manufacturing employment



Source: Authors' calculation based on INDSTAT4 2016 ISIC Revision 3 (UNIDO, 2018)

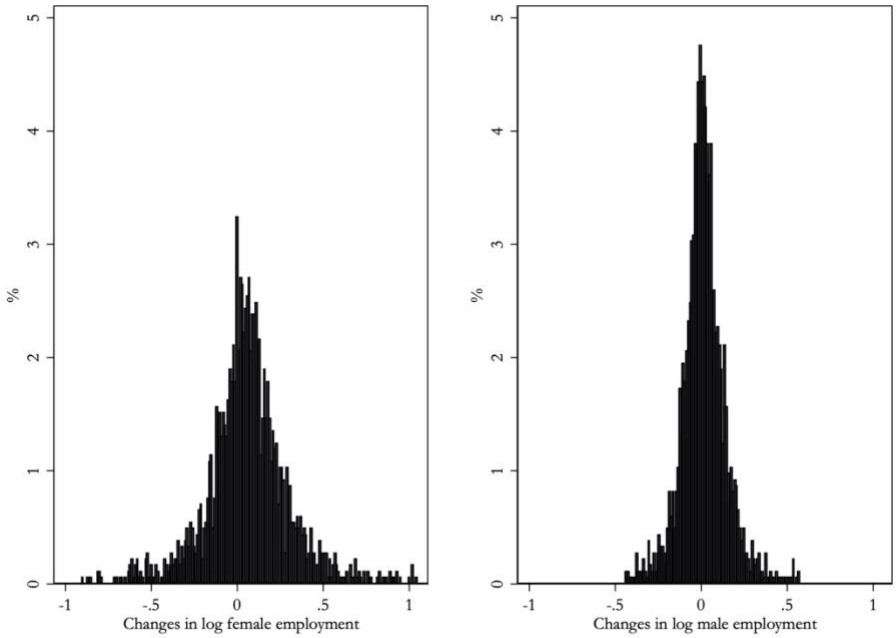
Figure 2: Industry-specific median shares in output, employment, and female employment



Notes: Median share in output is measured using Eq. (1). Median shares in employment and female employment are measured in a similar fashion.

Source: Authors' calculation based on INDSTAT4 2016 ISIC Revision 3 (UNIDO, 2018)

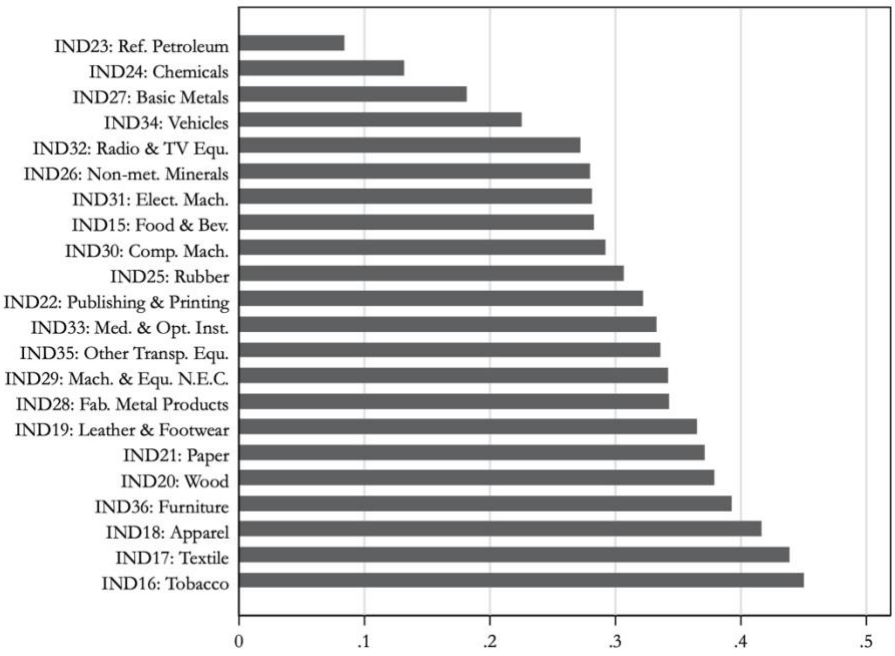
Figure 3: Histograms for annual growth rates in industry-level female and male employments



Notes: The growth rates are computed for four-digit industries.

Source: Authors' calculation based on INDSTAT4 2016 ISIC Revision 3 (UNIDO, 2018)

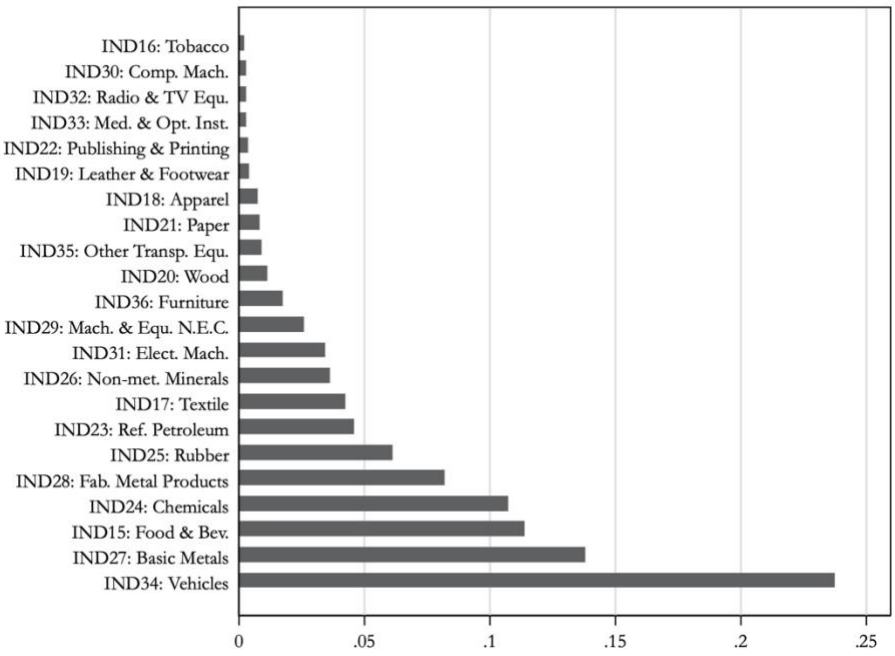
Figure 4: Industry-specific median shares of labor compensation in value added



Notes: Median share of labor compensation in value added is measured using Eq. (5).

Source: Authors' calculations based on INDSTAT4 2016 ISIC Revision 3 (UNIDO, 2018)

Figure 5: Industry-specific share in aggregate imports of intermediate products (2011/12)



Notes: The share in aggregate imports of intermediate products is computed using Eq. (6). See the Appendix Table A5 for more details.

Source: Authors' calculation based on Iran's input-output table for 2011/12 (SCI, 2020b)

Table 1: Sanctions, economic sanctions, and Iran's crude oil exports

Year	*Sanctions*		*Economic Sanctions*		*Iran's Crude Oil Exports (million barrels per day)*
	Count	*Cumulative Count*	*Count*	*Cumulative Count*	
1995	2	2	2	2	2.62
1996	2	4	1	3	2.63
1997	1	5	1	4	2.59
1998	0	5	0	4	2.51
1999	0	5	0	4	2.29
2000	1	6	0	4	2.49
2001	1	7	1	5	2.18
2002	0	7	0	5	2.09
2003	0	7	0	5	2.4
2004	0	7	0	5	2.68
2005	1	8	0	5	2.39
2006	2	10	0	5	2.56
2007	3	13	0	5	2.47
2008	1	14	0	5	2.43
2009	1	15	1	6	2.23
2010	3	18	2	8	2.25
2011	2	20	0	8	2.54
2012	7	27	5	13	2.1
2013	5	32	3	16	1.22
2014	-3	29	-3	13	1.11

Notes: For a given year, we count the number of newly imposed sanctions that were put in place by the US or the UNSC in the last quarter of previous year or the first three quarters of that year. We also consider the sanctions that were removed as a result of an interim agreement, preceding the Joint Comprehensive Plan of Action. (See Dadpay and Tabrizy (2021) for a detailed description of the timing of the interim and comprehensive agreements). The term "cumulative count" refers to the cumulative count of (economic) sanctions, excluding those that are removed. See the Appendix Table A1 for a detailed description of the sanctions that are considered for this exercise. Also, see Figures A1 and A2 in the Appendix for a visualization of the above variations.

Source: The data for sanctions are based on Katzman (2019) and authors' calculations. The data for the quantity of crude oil exports are provided by OPEC (2020).

Table 2: Summary Statistics

Variable	*Obs.*	*Mean*	*SD*	*Min*	*Max*
Δ*lnF**	1,797	0.059	0.237	-0.904	1.039
*lnF**	1,797	5.984	1.451	0.000	9.148
Δ*lnM**	1,651	0.017	0.129	-0.437	0.572
*lnM**	1,651	8.560	1.260	4.691	11.584
lnSanctions	1,797	2.322	0.634	1.386	3.466
lnEconSanctions	1,797	1.753	0.437	1.099	2.773
*lnWage**	1,797	18.322	0.351	17.341	19.719
*lnInterest**	1,797	-0.008	0.078	-0.163	0.151
*lnOutput**	1,797	29.073	1.653	24.202	34.674
lnService	1,797	0.407	0.016	0.389	0.452
lnOilExports	1,797	19.383	1.303	17.153	21.018
*LaborInt**	1,797	0.302	0.080	0.085	0.451
*ImportShare**	1,797	0.057	0.053	0.002	0.237

Notes: *lnF* and *lnM* are (log) female and male employment, respectively. *lnSanctions* and *lnEconSanctions* are (log) cumulative counts of all sanctions and economic sanctions, respectively. *lnWage* is (log) real wage, *lnInterest* is (log) real manufacturing interest rate, *lnOutput* is (log) real output, *lnService* is (log) share of the services sector in aggregate value added, and *lnOilExports* is (log) value of real net oil exports revenue. *lnWage*, *lnOutput*, and *lnOilExports* are in domestic currency: IRI rials. *LaborInt* is the time-invariant, industry-specific median share of labor compensation in value added (Figure 4). *ImportShare* is the time-invariant, industry-specific share in total imported intermediate products in the manufacturing sector (Figure 5). Variables with asterisks are measured at industry-level. The number of observations for Δ*lnM* and *lnM* is lower due to the lag structure used in the models for male employment.

Table 3: Effects of Sanctions on Employment Growth

	Female	Female	Female	Female	Male	Male	Male	Male
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
lnE_{it-1}	-0.163**	-0.199***	-0.200***	-0.204***	-0.375***	-0.290**	-0.308**	-0.315**
	(0.069)	(0.067)	(0.067)	(0.064)	(0.128)	(0.136)	(0.124)	(0.129)
lnE_{it-2}					0.210	0.126	0.144	0.148
					(0.137)	(0.139)	(0.130)	(0.133)
$lnSanctions_t$			-0.215**				-0.021	
			(0.086)				(0.042)	
$lnEconSanctions_t$				-0.150**				-0.012
				(0.059)				(0.028)
$lnWage_{it}$	-0.357***	-0.435***	-0.441***	-0.439***	-0.259***	-0.153*	-0.138**	-0.133**
	(0.133)	(0.158)	(0.146)	(0.140)	(0.077)	(0.079)	(0.066)	(0.062)
$lnInterest_t$	0.340***	0.380*	0.329***	0.302***	0.300***	0.350***	0.261***	0.260***
	(0.108)	(0.224)	(0.092)	(0.087)	(0.050)	(0.130)	(0.063)	(0.064)
$lnOutput_{it}$	0.130***	0.159***	0.159***	0.162***	0.148***	0.134***	0.133***	0.135***
	(0.043)	(0.044)	(0.043)	(0.041)	(0.028)	(0.026)	(0.026)	(0.026)
$lnServices_t$		-1.154	-1.997	-1.600		-0.808	-0.875	-0.839
		(1.759)	(1.673)	(1.668)		(0.868)	(0.799)	(0.820)
$lnOilExports_t$		0.159*	0.030	0.011		-0.019	-0.012	-0.015
		(0.082)	(0.052)	(0.050)		(0.046)	(0.026)	(0.025)
Obs.	1797	1797	1797	1797	1651	1651	1651	1651
Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Instruments	73	92	93	93	72	91	92	92
AR(1)	0	0	0	0	0.006	0.003	0.002	0.003
AR(2)	0.171	0.160	0.160	0.159	0.376	0.900	0.807	0.794
AR(3)	0.958	0.894	0.888	0.889	0.513	0.822	0.829	0.840
Hansen	0.111	0.188	0.209	0.162	0.094	0.189	0.209	0.219

Notes: The dependent variable is female and male employment growth. Robust standard errors are in parenthesis. For IVs in the "first-difference" equation, we use lag levels starting from time *t-3*. For IVs in the "levels" equation, we use lagged first-differences starting from *t-2*. To limit the instrument count, we use only one IV for each variable and lag distance, collapsing the IV vector. *E* is the level of female or male employment in industry *i*. *lnSanctions* and *lnEconSanctions* are (log) cumulative counts of all sanctions and economic sanctions, respectively. *lnWage* is the (log) real wages in industry *i*, *lnInterest* is the (log) manufacturing real interest rate, *lnOutput* is the (log) real output in industry *i*, *lnServices* is the (log) share of services in total value added, and *lnOilExports* is the (log) real net revenue from oil exports. *lnWage*, *lnOutput*, and *lnOilExports* are in domestic currency: IRI rials. *lnSanctions*,

lnEconSanctions, *lnInterest*, and *lnOilExports* are treated as exogenous. *Trend* is a time trend. *Instruments* is the number of instruments. *AR(1)*, *AR(2)*, and *AR(3)* are the p-values associated with the AB test for AR(1), AR(2), and AR(3). *Hansen* is the p-value associated with the Hansen test. *** implies p-value<1%, ** implies p-value<5%, and * implies p-value<10%.

Table 4: Sanctions, Employment Growth, and Industry Heterogeneity

	Female	Female	Male	Male	Female	Female	Male	Male
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
lnE_{it-1}	-0.192***	-0.193***	-0.299**	-0.312**	-0.196***	-0.199***	-0.300**	-0.314**
	(0.066)	(0.064)	(0.127)	(0.131)	(0.068)	(0.065)	(0.124)	(0.127)
lnE_{it-2}			0.141	0.151			0.139	0.152
			(0.131)	(0.135)			(0.130)	(0.133)
$lnSanctions_t$	-0.310***		-0.057		-0.203**		-0.015	
	(0.099)		(0.051)		(0.081)		(0.040)	
$lnEconSanctions_t$		-0.281***		-0.064		-0.124**		-0.005
		(0.077)		(0.048)		(0.055)		(0.028)
$lnSanctions_t \times LaborInt_i$	0.226*		0.090					
	(0.120)		(0.079)					
$lnEconSanctions_t \times LaborInt_i$		0.396***		0.152				
		(0.146)		(0.115)				
$LaborInt_i$	-0.755**	-0.881***	-0.131	-0.179				
	(0.330)	(0.318)	(0.244)	(0.255)				
$lnSanctions_t \times ImportInt$					-0.316*		-0.081	
					(0.165)		(0.144)	
$lnEconSanctions_t \times ImportInt$						-0.460*		-0.130
						(0.238)		(0.166)
$ImportInt$					0.817*	0.871*	0.257	0.298
					(0.452)	(0.505)	(0.390)	(0.364)
$lnWage_{it}$	-0.485***	-0.466***	-0.157**	-0.151**	-0.452***	-0.441***	-0.137**	-0.134**
	(0.140)	(0.134)	(0.064)	(0.060)	(0.144)	(0.137)	(0.066)	(0.061)
$lnInterest_t$	0.339***	0.307***	0.263***	0.263***	0.332***	0.304***	0.260***	0.262***
	(0.092)	(0.087)	(0.064)	(0.065)	(0.092)	(0.087)	(0.063)	(0.064)
$lnOutput_{it}$	0.154***	0.155***	0.135***	0.136***	0.158***	0.159***	0.128***	0.129***
	(0.044)	(0.042)	(0.029)	(0.028)	(0.045)	(0.044)	(0.027)	(0.027)
$lnServices_t$	-1.830	-1.477	-0.820	-0.760	-1.966	-1.610	-0.888	-0.828
	(1.665)	(1.650)	(0.823)	(0.840)	(1.678)	(1.666)	(0.807)	(0.819)
$lnOilExports_t$	0.030	0.008	-0.011	-0.015	0.030	0.010	-0.012	-0.016
	(0.052)	(0.050)	(0.026)	(0.024)	(0.053)	(0.050)	(0.026)	(0.025)
Obs.	1,797	1,797	1,651	1,651	1,797	1,797	1,651	1,651
Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Instruments	95	95	94	94	95	95	94	94
Net Sanctions Effect	-0.241***	-0.162***	-0.030	-0.018	-0.221***	-0.151***	-0.020	-0.012
AR(1)	0	0	0.002	0.003	0	0	0.002	0.003
AR(2)	0.169	0.166	0.817	0.768	0.161	0.161	0.836	0.768
AR(3)	0.881	0.882	0.795	0.796	0.892	0.897	0.810	0.799
Hansen	0.236	0.186	0.211	0.234	0.235	0.189	0.239	0.257

Notes: *LaborInt* measures the reliance of industry *i* on labor input (as in Eq. (5)), and *ImpInt* measures the reliance of industry *i* on imported inputs (as in Eq. (6)). The interaction term and industry reliance on labor inputs and imported inputs are assumed to be exogenous in first difference and levels equations. *Net Sanctions Effect* reports the point estimate for the effect of sanctions, evaluated at the mean value for labor intensity or reliance on imported inputs. For other notes and variable definitions,

refer to Table 3. Robust standard errors are in parenthesis. *** implies p-value<1%, ** implies p-value<5%, and * implies p-value<10%.

Appendix for

"Gendered Effects of Sanctions on Manufacturing Employment: Evidence from Iran"

In this Appendix, we first describe the chronology and typology of US and UN sanctions against Iran between 1995 and 2014 (Table A1). We also include a list of four-digits manufacturing industries that are examined in our study (Table A2).

The sample evidence employed in our study is based on the information for manufacturing plants with 10 or more employees. This becomes evident when we compare the *INDSTAT4* data (UNIDO, 2018) with the official aggregate figures that are reported by the Statistical Center of Iran (SCI, 2020a). Tables A3 and A4 offer a detailed comparison. In Table A3, we fully aggregate the number of employees from the entire set of four-digits industries that are included in our dataset (Table A2), and we compare it to the official aggregate employment figures that are reported by the Statistical Center of Iran. We repeat the same exercise for female employees in Table A4. The obtained figures are comparable, suggesting that the *INDSTAT4* dataset is based on the information that the Statistical Center of Iran gathers annually for manufacturing plants with 10 or more employees.[1]

We also report the result of our computations for industry-specific dependency on imported intermediate inputs (Table A5). We further report the results of our sensitivity analyses (Tables A6-A11), as described in Section 5. Lastly, we illustrate the variations in (economic) sanctions and the quantity of crude oil exports in Figures A1 and A2, and we provide the sanctions effects (on fitted values) for varying levels of labor intensity and reliance on imported inputs in Figures A3 and A4.

[1] In an email exchange with UNIDO officials, we confirmed that the industry-level information reported in *INDOSTAT4* were originally provided by the SCI.

Table A1: Chronology and typology of US and UN sanctions against Iran (1995-2014)

Year	*Sanctions* [a]	*Count*	*Cumulative Count*
1995	Prohibiting certain transactions with respect to the development of Iranian petroleum resources. US Sanction, Executive Order 12957 March 15, 1995 Classification: economic measures	2	2
	Prohibiting certain transactions with respect to Iran, including imports from Iran, exports to Iran, or investments in Iran. US Sanction, Executive Order 12959 May 6, 1995 Classification: economic measures		
1996	Prohibiting the assistance under arms export control act for countries not cooperating fully with antiterrorism efforts. US Sanction, Public Law 104-132 (Sec. 330) April 24, 1996 Classification: non-economic measures	2	4
	Imposing sanctions against investments in Iran's petroleum sector under Iran and Libya Sanctions Act. US Sanction, Public Law 104-172 August 5, 1996 Classification: economic measures		
1997	Prohibiting certain transactions with respect to Iran, including imports from Iran, exports to Iran, or investments in Iran. US Sanction, Executive Order 13059 August 19, 1997 Classification: economic measures	1	5
2000 [b]	Iran non-proliferation act. US Sanction, Public Law 106-178 March 14, 2000 Classification: non-economic measures	1	6
2001	Prohibition on US assistance and financing for food and drugs sales to Iran. US Sanction, Public Law 106-387 (Sec. 908) October 28, 2000 [c] Classification: economic measures	1	7
2005 [d]	Blocking the property of weapons of mass destruction proliferators and their supporters (few Iranian entities are listed; e.g., Aerospace Industries Organization). US Sanction, Executive Order 13382 July 1, 2005 Classification: non-economic measures	1	8
2006	Concerned by the proliferation risks. UNSC Resolution 1696 July 31, 2006 Classification: nuclear-related resolution	2	10
	The Iran freedom support act. US Sanction, Public Law 109-293 September 30, 2006		

	Classification: non-economic measures		
2007	Concerned by the proliferation risks and Iran's continuing failure to meet the IAEA requirements. UNSC Resolution 1737 December 27, 2006 [e] Classification: nuclear-related resolution	3	13
	Concerned by the proliferation risks and Iran's continuing failure to meet the IAEA requirements. UNSC Resolution 1747 March 24, 2007 Classification: nuclear-related resolution		
	Blocking US-based assets of those threatening the peace and stability of Iraq, including some Iranian officers. US Sanction, Executive Order 13438 July 19, 2007 Classification: non-economic measures		
2008	Concerned by the proliferation risks and Iran's continuing failure to meet the IAEA requirements. UNSC Resolution 1803 March 3, 2008 Classification: nuclear-related resolution	1	14
2009	Barring US banks from handling Iran's U-turn transactions US Sanction, Treasury Regulations [f] November 10, 2008 [g] Classification: economic measures	1	15
2010	Constraining UN sanctions against Iran with respect to an array of economic activities, including banking, trade credits, cargoes inspection, etc. UNSC Resolution 1929 June 9, 2010 Classification: economic measures	3	18
	Amending sanctions that were imposed in 1996 and expanding economic sanctions against Iran. US Sanction, Public Law 111-195 July 1, 2010 Classification: economic measures		
	Blocking property of certain persons with respect to human rights abuses. US Sanction, Executive Order 13553 September 28, 2010 Classification: non-economic measures		
2011	Blocking property of certain persons with respect to human rights abuses in Syria. US Sanction, Executive Order 13572 April 29, 2011 Classification: non-economic measures	2	20
	Blocking US-based properties of those engaged in transnational crime organization US Sanction, Executive Order 13581 July 24, 2011		

	Classification: non-economic measures		
2012	Imposition of certain sanctions with respect to the provision of goods, services, technology, or support for Iran's energy and petrochemical sectors. US Sanction, Executive Order 13590 November 20, 2011 [h] Classification: economic measures	7	27
	Imposition of sanctions with respect to the financial sector of Iran. US Sanction, Public Law 112-81 (Sec. 1245) December 31, 2011 [i] Classification: economic measures		
	Blocking the property of the government of Iran and Iranian financial institutions. US Sanction, Executive Order 13599 February 5, 2012 Classification: economic measures		
	Blocking the property and suspending entry into the US of certain persons with respect to human right abuses via information technology. US Sanction, Executive Order 13606 April 22, 2012 Classification: non-economic measures		
	Prohibiting certain transactions with and suspending entry into the US of foreign sanctions evaders with respect to Iran and Syria US Sanction, Executive Order 13608 May 1, 2012 Classification: economic measures		
	Sanctioning those who conduct or facilitate any transactions with NIOC, NICO, or CBI [j] US Sanction, Executive Order 13622 July 30, 2012 Classification: economic measures		
	Iran threat reduction and Syria human rights act US Sanction, Public Law 112-158 August 10, 2012 Classification: non-economic measures		
2013	Sanctioning the entities who commit censorship US Sanction, Executive Order 13628 October 9, 2012 [k] Classification: non-economic measures	5	32
	Iran freedom and counter-proliferation act US Sanction, Public Law 112-239 (Title XII, Subtitle D) January 2, 2013 Classification: non-economic measures		
	Limiting the CBI's access to hard currency, mostly obtained from exempted oil transactions. US Sanction, Public Law 112-158 [l] February 6, 2013 Classification: economic measures		

	Sanctions on financial transfers as well as Iran's petroleum and automotive sectors US Sanction, Executive Order 13645 June 3, 2013 Classification: economic measures		
	Designating EIKO Entities to be Considered for Executive Order 13599 [m] US Sanction, Treasury Regulations [n] June 4, 2013 Classification: economic measures		
2014	Due to JPOA [o], three set of US sanctions were suspended: Executive Order 13382, an economic measure taken in 2005 Executive Order 13622, an economic measure taken in 2012 Executive Order 13645, an economic measure taken in 2013 November 24, 2013 [p]	-3	29

Notes:

a) We rely on a report by Katzman (2019) to identify the measures that were taken by the US and UN against Iran from 1995 to 2014. We classify the measure types by relying on the dominant theme of the sanctions and, in part, the descriptions given in Katzman (2019).
b) The cumulative count remains at 5 for 1998 and 1999.
c) This public law was passed in October 2000 (within the last quarter of the year), which is why we include it as part of measures taken in 2009.
d) The cumulative count remains at 7 from 2002 to 2004.
e) This resolution was passed in December 2006 (within the last quarter of the year), which is why we include it as part of measures taken in 2007.
f) See Federal Register (2008) for the official notification.
g) This amendment was passed in November 2008 (within the last quarter of the year), which is why we include it as part of measures taken in 2009.
h) These sanctions were imposed starting from November 2011 (within the last quarter of the year), which is why we include them as part of measures taken in 2012.
i) These sanctions were imposed starting from December 2011 (within the last quarter of the year), which is why we include them as part of measures taken in 2012.
j) NIOC stands for National Iran Oil Company, NICO stands for Naftiran Intertrade Company, and CBI stands for Central Bank of Iran.
k) These sanctions were the result of an Executive Order that authorized the implementation of certain sanctions set forth in Public Law 112-158 (Iran threat reduction and Syria human rights act of 2012). Plus, they were imposed starting from October 2012 (within the last quarter of the year), which is why we include them as part of measures taken in 2013.
l) This measure was the result of a provision in Public Law 112-158 (Iran threat reduction and Syria human rights act of 2012) which went into effect in February 2013. See Katzman (2019, p. 24) for details.
m) EIKO stands for an entity called the Execution of Imam Khomeini's Order.
n) See Federal Register (2013) for the official notification.
o) JPOA stands for the Joint Plan of Action, which was an interim agreement between Iran, China, France, Germany, Russia, the UK, and the US. Under this agreement, Iran limited its nuclear activities in exchange for preliminary sanction relief (Reuters, 2013). Ultimately, this agreement led to the Joint Comprehensive Plan of Action (JCPOA). This comprehensive agreement, finalized on July 14, 2015, offered significant sanction relief to Iran. See Dadpay and Tabrizy (2020) for more details about JPOA and JCPOA.
p) This agreement was reached in November 2013 (within the last quarter of the year), which is why we count the sanction reliefs for 2014.

Source: Katzman (2019) and authors' calculations.

Table A2: List of industries that are included in our dataset

Industry Code (ISIC Rev. 3)	*Industry Description*
1511	Processing/preserving of meat
1512	Processing/preserving of fish
1513	Processing/preserving of fruit & vegetables
1514	Vegetable and animal oils and fats
1520	Dairy products
1531	Grain mill products
1532	Starches and starch products
1533	Prepared animal feeds
1541	Bakery products
1542	Sugar
1543	Cocoa, chocolate and sugar confectionery
1544	Macaroni, noodles & similar products
1549	Other food products n.e.c.
1551	Distilling, rectifying & blending of spirits
1554	Soft drinks; mineral waters
1600	Tobacco products
1711	Textile fiber preparation; textile weaving
1721	Made-up textile articles, except apparel
1722	Carpets and rugs
1723	Cordage, rope, twine and netting
1729	Other textiles n.e.c.
1730	Knitted and crocheted fabrics and articles
1810	Wearing apparel, except fur apparel
1911	Tanning and dressing of leather
1912	Luggage, handbags, etc.; saddlery & harness
1920	Footwear
2010	Sawmilling and planning of wood
2021	Veneer sheets, plywood, particle board, etc.
2022	Builders' carpentry and joinery
2029	Other wood products; articles of cork/straw
2101	Pulp, paper and paperboard
2102	Corrugated paper and paperboard
2109	Other articles of paper and paperboard
2211	Publishing of books and other publications
2221	Printing
2320	Refined petroleum products
2411	Basic chemicals, except fertilizers
2412	Fertilizers and nitrogen compounds

2413	Plastics in primary forms; synthetic rubber
2421	Pesticides and other agro-chemical products
2422	Paints, varnishes, printing ink and mastics
2423	Pharmaceuticals, medicinal chemicals, etc.
2424	Soap, cleaning & cosmetic preparations
2429	Other chemical products n.e.c.
2430	Man-made fibers
2511	Rubber tires and tubes
2519	Other rubber products
2520	Plastic products
2610	Glass and glass products
2691	Pottery, china and earthenware
2692	Refractory ceramic products
2693	Struct. non-refractory clay; ceramic products
2694	Cement, lime and plaster
2695	Articles of concrete, cement and plaster
2696	Cutting, shaping & finishing of stone
2699	Other non-metallic mineral products n.e.c.
2710	Basic iron and steel
2720	Basic precious and non-ferrous metals
2811	Structural metal products
2812	Tanks, reservoirs and containers of metal
2893	Cutlery, hand tools and general hardware
2899	Other fabricated metal products n.e.c.
2911	Engines & turbines (not for transport equipment)
2912	Pumps, compressors, taps and valves
2913	Bearings, gears, gearing & driving elements
2914	Ovens, furnaces and furnace burners
2915	Lifting and handling equipment
2919	Other general-purpose machinery
2921	Agricultural and forestry machinery
2922	Machine tools
2923	Machinery for metallurgy
2924	Machinery for mining & construction
2925	Food/beverage/tobacco processing machinery
2926	Machinery for textile, apparel and leather
2929	Other special purpose machinery
2930	Domestic appliances n.e.c.
3000	Office, accounting and computing machinery
3110	Electric motors, generators and transformers

3120	Electricity distribution & control apparatus
3130	Insulated wire and cable
3140	Accumulators, primary cells and batteries
3150	Lighting equipment and electric lamps
3190	Other electrical equipment n.e.c.
3210	Electronic valves, tubes, etc.
3220	TV/radio transmitters; line comm. apparatus
3230	TV and radio receivers and associated goods
3311	Medical, surgical and orthopedic equipment
3312	Measuring/testing/navigating appliances, etc.
3320	Optical instruments & photographic equipment
3330	Watches and clocks
3410	Motor vehicles
3420	Automobile bodies, trailers & semi-trailers
3430	Parts/accessories for automobiles
3511	Building and repairing of ships
3512	Building/repairing of pleasure/sport. boats
3520	Railway/tramway locomotives & rolling stock
3591	Motorcycles
3592	Bicycles and invalid carriages
3599	Other transport equipment n.e.c.
3610	Furniture
3693	Sports goods
3699	Other manufacturing n.e.c.

Table A3: Comparison between the aggregate employment in our dataset and the official figures

UNIDO's INDSTAT4 Information Used in Our Study (UNIDO, 2018)		*SCI's Official Figures (SCI, 2020a)*		
Year in Gregorian Calendar	Total Number of Employees (Million Persons)	Year in Iran's Official Calendar [a]	Year in Gregorian Calendar [a]	Total Number of Employees (Million Persons)[b]
1994	N.A.	1373	1994/95	0.853
1995	0.771	1374	1995/96	0.807
1996	0.798	1375	1996/97	0.846
1997	0.820	1376	1997/98	0.876
1998	0.829	1377	1998/99	0.882
1999	0.834	1378	1999/00	0.883
2000	0.869	1379	2000/01	0.906
2001	0.870	1380	2001/02	0.921
2002	0.963	1381	2002/03	1.053
2003	1.002	1382	2003/04	1.085
2004	1.017	1383	2004/05	1.077
2005	1.003	1384	2005/06	1.061
2006	1.018	1385	2006/07	1.071
2007	1.054	1386	2007/08	1.214
2008	1.204	1387	2008/09	1.261
2009	1.204	1388	2009/10	1.252
2010	1.201	1389	2010/11	1.249
2011	1.192	1390	2011/12	1.243
2012	1.162	1391	2012/13	1.205
2013	1.201	1392	2013/14	1.280
2014	1.242	1393	2014/15	1.309

Notes:

a) The official calendar in Iran is a solar calendar which begins as of March 21st.

b) The official figures are for the total number of employees in manufacturing plants with 10 or more employees.

Source: UNIDO (2018) and SCI (2020a)

Table A4: Comparison between the aggregate number of female employees in our dataset and the official figures for female employment

UNIDO's INDSTAT4 Information (UNIDO, 2018)		*SCI's Official Figures (SCI, 2020a)*		
Year in Gregorian Calendar	Total Number of Female Employees (Million Persons)	Year in Iran's Official Calendar	Year in Gregorian Calendar	Total Number of Female Employees (Million Persons)
1994	N.A.	1373	1994/95	0.055
1995	0.053	1374	1995/96	0.054
1996	0.053	1375	1996/97	0.055
1997	0.055	1376	1997/98	0.057
1998	0.054	1377	1998/99	0.056
1999	0.056	1378	1999/00	0.059
2000	0.060	1379	2000/01	0.061
2001	0.066	1380	2001/02	0.068
2002	0.070	1381	2002/03	0.077
2003	0.080	1382	2003/04	0.089
2004	0.092	1383	2004/05	0.095
2005	0.092	1384	2005/06	0.095
2006	0.097	1385	2006/07	0.100
2007	0.108	1386	2007/08	0.122
2008	0.122	1387	2008/09	0.126
2009	0.125	1388	2009/10	0.128
2010	0.122	1389	2010/11	0.126
2011	0.121	1390	2011/12	0.125
2012	0.120	1391	2012/13	0.123
2013	0.120	1392	2013/14	0.130
2014	0.126	1393	2014/15	0.135

Notes: See the notes in Table A3.

Table A5: Industry-level imported intermediate products (SCI, 2020b)

Industry Code (ISIC Rev. 3)	*Industry Description*	*The Value of Imported Intermediate Products (Billion US Dollars)*
15	Manufacture of food products and beverages [a]	2.48
16	Manufacture of tobacco products	0.05
17	Manufacture of textiles [b]	0.92
18	Manufacture of wearing apparel	0.16
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	0.09
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	0.25
21	Manufacture of paper and paper products	0.18
22	Publishing, printing and reproduction of recorded media	0.09
23	Manufacture of coke, refined petroleum products and nuclear fuel	1.00
24	Manufacture of chemicals and chemical products [c]	2.34
25	Manufacture of rubber and plastics products	1.33
26	Manufacture of other non-metallic mineral products [d]	0.79
27	Manufacture of basic metals [e]	3.00
28	Manufacture of fabricated metal products, except machinery and equipment	1.78
29	Manufacture of machinery and equipment n.e.c.	0.56
30, 32, and 33	Manufacture of computing machinery, electronic equipment (e.g., TV, radio, and communication equipment, etc.), and medical and optical instruments	0.20
31	Manufacture of electrical machinery and apparatus n.e.c.	0.75
34	Manufacture of motor vehicles, trailers and semi-trailers	5.16
35	Manufacture of other transport equipment	0.20
36	Manufacture of furniture and other manufacturing n.e.c.	0.38

Notes:

a) The amount of imported input for this industry is the sum of imported inputs for the production of food products, oils and fats, and beverages.
b) The input imports in this industry includes the imported inputs for the production of general textile products along with carpets and rugs.
c) The input imports in this industry includes the imported inputs for the production of chemicals and pharmaceutical products.
d) The input imports in this industry includes the imported inputs for the production of glass and glass products along with non-metallic mineral products n.e.c.
e) The input imports in this industry includes the imported inputs for the production of basic iron and steel as well as copper, aluminum, and other basic metals.

Source: Authors' computations based on SCI (2020b).

Table A6: Key results, controlling for the Polity Index

	Female	Male	Female	Male	Female	Male
	(1)	(2)	(3)	(4)	(5)	(6)
lnE_{it-1}	-0.238***	-0.310**	-0.226***	-0.307**	-0.234***	-0.309**
	(0.064)	(0.129)	(0.063)	(0.131)	(0.065)	(0.128)
lnE_{it-2}		0.151		0.154		0.154
		(0.132)		(0.134)		(0.132)
$lnEconSanctions_t$	-0.149**	-0.013	-0.272***	-0.066	-0.127**	-0.006
	(0.059)	(0.028)	(0.076)	(0.048)	(0.055)	(0.028)
$lnEconSanctions_t \times LaborInt_i$			0.364**	0.152		
			(0.153)	(0.113)		
$LaborInt_i$			-0.870***	-0.201		
			(0.337)	(0.257)		
$lnEcconSanctions_t \times ImportInt$					-0.388 [a]	-0.138
					(0.247)	(0.171)
$ImportInt$					0.914*	0.317
					(0.542)	(0.372)
$lnWage_{it}$	-0.445***	-0.135**	-0.473***	-0.154**	-0.443***	-0.136**
	(0.141)	(0.063)	(0.136)	(0.060)	(0.138)	(0.061)
$lnInterest_t$	0.308***	0.260***	0.314***	0.263***	0.310***	0.263***
	(0.087)	(0.064)	(0.087)	(0.065)	(0.087)	(0.064)
$lnOutput_{it}$	0.171***	0.130***	0.162***	0.131***	0.166***	0.124***
	(0.040)	(0.025)	(0.041)	(0.028)	(0.043)	(0.026)
$lnServices_t$	-1.443	-0.830	-1.316	-0.741	-1.457	-0.820
	(1.653)	(0.822)	(1.633)	(0.841)	(1.649)	(0.821)
$lnOilExports_t$	0.017	-0.015	0.013	-0.016	0.016	-0.017
	(0.050)	(0.024)	(0.050)	(0.024)	(0.050)	(0.025)
$lnPolity_t$	-0.026	0.094***	-0.026	0.093***	-0.025	0.095***
	(0.064)	(0.027)	(0.064)	(0.027)	(0.064)	(0.027)
Obs.	1,797	1,651	1,797	1,651	1,797	1,651
Trend	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Instruments	94	93	96	95	96	95
AR(1) test	0	0.003	0	0.003	0	0.003
AR(2) test	0.169	0.780	0.177	0.745	0.172	0.754
AR(3) test	0.868	0.814	0.864	0.762	0.878	0.774
Hansen	0.167	0.236	0.196	0.250	0.196	0.264

Notes: See the notes in Tables 3 and 4 in the main text. Also, a) p-value=11.6%

Table A7, Panel A: Key results, excluding the two-digits industry with greatest share of female employment (production of food products and beverages, ISIC 15)

	Female	Male	Female	Male	Female	Male
	(1)	(2)	(3)	(4)	(5)	(6)
lnE_{it-1}	-0.198***	-0.202	-0.195***	-0.205	-0.191***	-0.211
	(0.065)	(0.144)	(0.065)	(0.148)	(0.065)	(0.143)
lnE_{it-2}		0.040		0.041		0.055
		(0.153)		(0.156)		(0.154)
$lnEconSanctions_t$	-0.129**	0.009	-0.252***	-0.032	-0.113*	0.008
	(0.062)	(0.027)	(0.081)	(0.051)	(0.058)	(0.028)
$lnEconSanctions_t$xLaborInt			0.367**	0.116		
			(0.144)	(0.119)		
LaborInt			-0.703**	-0.023		
			(0.326)	(0.255)		
$lnEconSanctions_t$xImportInt					-0.471**	-0.133
					(0.231)	(0.187)
ImportInt					1.039**	0.437
					(0.506)	(0.402)
$lnWage_{it}$	-0.325**	-0.077	-0.355***	-0.095	-0.339**	-0.092
	(0.137)	(0.061)	(0.130)	(0.061)	(0.134)	(0.062)
$lnInterest_t$	0.382***	0.268***	0.387***	0.271***	0.385***	0.277***
	(0.097)	(0.071)	(0.097)	(0.073)	(0.097)	(0.072)
$lnOutput_{it}$	0.144***	0.125***	0.147***	0.134***	0.140***	0.118***
	(0.043)	(0.027)	(0.045)	(0.030)	(0.045)	(0.028)
$lnServices_t$	-2.997*	-1.185	-2.841	-1.106	-2.950*	-1.064
	(1.787)	(1.020)	(1.761)	(1.054)	(1.793)	(1.029)
$lnOilExports_t$	0.017	-0.003	0.016	-0.002	0.015	-0.006
	(0.055)	(0.030)	(0.055)	(0.030)	(0.056)	(0.030)
Obs.	1,520	1,391	1,520	1,391	1,520	1,391
Excluded Industry	15	15	15	15	15	15
Trend	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Instruments	93	92	95	94	95	94
AR(1) test	0	0.001	0	0.001	0	0.001
AR(2) test	0.116	0.565	0.114	0.585	0.118	0.652
AR(3) test	0.757	0.862	0.733	0.867	0.763	0.934
Hansen	0.481	0.402	0.512	0.498	0.528	0.661

Notes: See the notes in Tables 3 and 4 in the main text.

Table A7, Panel B: Key results, excluding the two-digits industry with smallest share of female employment (production of wood and wood products, ISIC 20)

	Female	Male	Female	Male	Female	Male
	(1)	(2)	(3)	(4)	(5)	(6)
lnE_{it-1}	-0.268***	-0.310**	-0.259***	-0.308**	-0.266***	-0.310**
	(0.061)	(0.133)	(0.060)	(0.134)	(0.061)	(0.131)
lnE_{it-2}		0.154		0.157		0.158
		(0.137)		(0.138)		(0.135)
$lnEconSanctions_t$	-0.138**	-0.023	-0.228***	-0.071	-0.120**	-0.016
	(0.062)	(0.028)	(0.076)	(0.049)	(0.059)	(0.029)
$lnEconSanctions_t$xLaborInt			0.286*	0.142		
			(0.154)	(0.115)		
LaborInt			-0.499	-0.233		
			(0.354)	(0.255)		
$lnEconSanctions_t$xImportInt					-0.264	-0.129
					(0.246)	(0.166)
ImportInt					0.540	0.333
					(0.581)	(0.355)
$lnWage_{it}$	-0.430***	-0.155**	-0.439***	-0.170***	-0.423***	-0.157**
	(0.149)	(0.064)	(0.143)	(0.062)	(0.147)	(0.063)
$lnInterest_t$	0.307***	0.268***	0.308***	0.271***	0.307***	0.271***
	(0.084)	(0.066)	(0.083)	(0.066)	(0.083)	(0.065)
$lnOutput_{it}$	0.184***	0.129***	0.180***	0.128***	0.182***	0.122***
	(0.039)	(0.026)	(0.040)	(0.028)	(0.041)	(0.027)
$lnServices_t$	-1.141	-0.727	-1.123	-0.660	-1.185	-0.712
	(1.604)	(0.806)	(1.585)	(0.826)	(1.602)	(0.800)
$lnOilExports_t$	0.022	-0.016	0.020	-0.016	0.021	-0.017
	(0.049)	(0.026)	(0.049)	(0.025)	(0.049)	(0.026)
Obs.	1,741	1,606	1,741	1,606	1,741	1,606
Excluded Industry	20	20	20	20	20	20
Trend	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Instruments	93	92	95	94	95	94
AR(1) test	0	0.004	0	0.004	0	0.003
AR(2) test	0.0738	0.765	0.0723	0.734	0.0733	0.729
AR(3) test	0.898	0.948	0.893	0.995	0.906	0.999
Hansen	0.208	0.224	0.207	0.243	0.232	0.235

Notes: See the notes in Tables 3 and 4 in the main text.

Table A7, Panel C: Key results, excluding the two-digits industry with the largest expansion in female employment (production of rubber and plastic products, ISIC 25)

	Female	Male	Female	Male	Female	Male
	(1)	(2)	(3)	(4)	(5)	(6)
lnE_{it-1}	-0.199***	-0.319**	-0.187***	-0.316**	-0.194***	-0.319**
	(0.065)	(0.128)	(0.065)	(0.130)	(0.066)	(0.127)
lnE_{it-2}		0.150		0.152		0.154
		(0.133)		(0.134)		(0.132)
$lnEconSanctions_t$	-0.145**	-0.007	-0.273***	-0.059	-0.120**	-0.001
	(0.060)	(0.028)	(0.078)	(0.048)	(0.056)	(0.028)
$lnEconSanctions_t$xLaborInt			0.387***	0.151		
			(0.146)	(0.115)		
LaborInt			-0.873***	-0.170		
			(0.317)	(0.255)		
$lnEconSanctions_t$xImportInt					-0.449*	-0.121
					(0.238)	(0.166)
ImportInt					0.874*	0.294
					(0.501)	(0.366)
$lnWage_{it}$	-0.426***	-0.128**	-0.453***	-0.145**	-0.428***	-0.128**
	(0.142)	(0.062)	(0.135)	(0.059)	(0.139)	(0.061)
$lnInterest_t$	0.298***	0.269***	0.303***	0.271***	0.300***	0.272***
	(0.089)	(0.065)	(0.089)	(0.066)	(0.088)	(0.065)
$lnOutput_{it}$	0.157***	0.135***	0.150***	0.136***	0.154***	0.129***
	(0.041)	(0.026)	(0.042)	(0.028)	(0.044)	(0.027)
$lnServices_t$	-1.545	-1.047	-1.429	-0.976	-1.556	-1.040
	(1.704)	(0.818)	(1.685)	(0.841)	(1.701)	(0.817)
$lnOilExports_t$	0.016	-0.021	0.013	-0.022	0.015	-0.023
	(0.052)	(0.024)	(0.052)	(0.024)	(0.052)	(0.024)
Obs.	1,740	1,597	1,740	1,597	1,740	1,597
Excluded Industry	25	25	25	25	25	25
Trend	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Instruments	93	92	95	94	95	94
AR(1) test	0	0.003	0	0.003	0	0.003
AR(2) test	0.177	0.761	0.184	0.739	0.179	0.736
AR(3) test	0.932	0.744	0.925	0.705	0.939	0.705
Hansen	0.196	0.182	0.183	0.183	0.221	0.201

Notes: See the notes in Tables 3 and 4 in the main text.

Table A7, Panel D: Key results, excluding the two-digits industry with the largest contraction in female employment (production of radio, television and communication equipment and apparatus, ISIC 32)

	Female	Male	Female	Male	Female	Male
	(1)	(2)	(3)	(4)	(5)	(6)
lnE_{it-1}	-0.193***	-0.324**	-0.181***	-0.325**	-0.188***	-0.321**
	(0.066)	(0.126)	(0.066)	(0.128)	(0.067)	(0.125)
lnE_{it-2}		0.162		0.165		0.165
		(0.130)		(0.132)		(0.131)
$lnEconSanctions_t$	-0.149**	-0.017	-0.282***	-0.073	-0.117**	-0.011
	(0.062)	(0.028)	(0.079)	(0.048)	(0.059)	(0.028)
$lnEconSanctions_t$xLaborInt			0.392***	0.164		
			(0.147)	(0.118)		
LaborInt			-0.882***	-0.184		
			(0.328)	(0.261)		
$lnEcconSanctions_t$xImportInt					-0.549**	-0.112
					(0.232)	(0.170)
ImportInt					1.003**	0.183
					(0.503)	(0.382)
$lnWage_{it}$	-0.456***	-0.131**	-0.488***	-0.150**	-0.458***	-0.134**
	(0.145)	(0.064)	(0.140)	(0.061)	(0.142)	(0.063)
$lnInterest_t$	0.298***	0.258***	0.304***	0.262***	0.300***	0.260***
	(0.089)	(0.063)	(0.089)	(0.064)	(0.089)	(0.063)
$lnOutput_{it}$	0.163***	0.134***	0.154***	0.138***	0.161***	0.128***
	(0.045)	(0.026)	(0.047)	(0.029)	(0.047)	(0.028)
$lnServices_t$	-1.119	-1.055	-0.975	-0.982	-1.127	-1.044
	(1.639)	(0.795)	(1.627)	(0.809)	(1.635)	(0.797)
$lnOilExports_t$	0.012	-0.020	0.008	-0.020	0.011	-0.021
	(0.052)	(0.024)	(0.052)	(0.024)	(0.052)	(0.024)
Obs.	1,752	1,613	1,752	1,613	1,752	1,613
Excluded Industry	32	32	32	32	32	32
Trend	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Instruments	93	92	95	94	95	94
AR(1) test	0	0.005	0	0.005	0	0.004
AR(2) test	0.192	0.699	0.203	0.670	0.193	0.678
AR(3) test	0.960	0.764	0.954	0.733	0.966	0.727
Hansen	0.254	0.282	0.287	0.292	0.287	0.311

Notes: See the notes in Tables 3 and 4 in the main text.

Table A8: The employment effects of lagged sanctions

	Female	Male	Female	Male	Female	Male	Female	Male
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
lnE_{it-1}	-0.196***	-0.295**	-0.212***	-0.279**	-0.166***	-0.341***	-0.153**	-0.218*
	(0.065)	(0.136)	(0.063)	(0.137)	(0.062)	(0.128)	(0.072)	(0.130)
lnE_{it-2}		0.129		0.125		0.193		0.067
		(0.140)		(0.139)		(0.126)		(0.131)
$lnEconSanctions_{t-1}$	-0.164	0.138						
	(0.292)	(0.233)						
$lnEconSanctions_{t-2}$			0.117	-0.070				
			(0.146)	(0.116)				
$lnEconSanctions_{t-3}$					-0.181	0.106		
					(0.286)	(0.207)		
$lnEconSanctions_{t-4}$							-0.109	0.340
							(0.409)	(0.298)
$lnWage_{it}$	-0.435***	-0.155**	-0.327*	-0.153*	-0.397**	-0.170**	-0.474***	-0.184***
	(0.158)	(0.079)	(0.168)	(0.078)	(0.162)	(0.073)	(0.134)	(0.067)
$lnInterest_t$	0.599**	0.169	0.360**	0.318***	0.543***	0.275**	0.622	-0.116
	(0.247)	(0.210)	(0.169)	(0.093)	(0.181)	(0.139)	(0.447)	(0.357)
$lnOutput_{it}$	0.157***	0.137***	0.137***	0.129***	0.135***	0.125***	0.143***	0.130***
	(0.043)	(0.026)	(0.044)	(0.025)	(0.039)	(0.026)	(0.039)	(0.026)
$lnServices_t$	-2.642	0.449	-3.482	0.016	-2.156	-0.127	-1.056	-1.889
	(3.223)	(2.250)	(2.524)	(1.619)	(2.052)	(1.065)	(2.160)	(1.430)
$lnOilExports_t$	0.147*	-0.009	0.068	0.017	0.036	0.049	0.174*	-0.052
	(0.079)	(0.039)	(0.093)	(0.052)	(0.166)	(0.106)	(0.096)	(0.068)
Obs.	1,797	1,651	1,651	1,651	1,563	1,520	1,469	1,429
Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Instruments	93	92	92	92	91	90	90	90
AR(1) test	0	0.004	0	0.004	0	0.004	0	0
AR(2) test	0.161	0.888	0.320	0.909	0.348	0.586	0.239	0.527
AR(3) test	0.895	0.825	0.771	0.804	0.468	0.924	0.584	0.796
Hansen	0.174	0.0817	0.353	0.204	0.202	0.166	0.146	0.183

Notes: See the notes in Tables 3 and 4 in the main text.

Table A9, Panel A: Key results, using a modified measure for economic sanctions

	Female	Male	Female	Male	Female	Male
	(1)	(2)	(3)	(4)	(5)	(6)
lnE_{it-1}	-0.199***	-0.307**	-0.191***	-0.298**	-0.195***	-0.301**
	(0.066)	(0.123)	(0.065)	(0.126)	(0.067)	(0.123)
lnE_{it-2}		0.144		0.143		0.141
		(0.129)		(0.131)		(0.129)
$lnEconSanctions_t$	-0.193**	-0.019	-0.288***	-0.090	-0.169**	-0.010
	(0.078)	(0.037)	(0.096)	(0.055)	(0.072)	(0.036)
$lnEconSanctions_t$xLaborInt			0.256*	0.204*		
			(0.154)	(0.114)		
LaborInt			-0.688**	-0.298		
			(0.349)	(0.274)		
$lnEconSanctions_t$xImportInt					-0.418*	-0.170
					(0.226)	(0.176)
ImportInt					0.821*	0.372
					(0.484)	(0.378)
$lnWage_{it}$	-0.453***	-0.140**	-0.483***	-0.159**	-0.452***	-0.140**
	(0.148)	(0.068)	(0.142)	(0.066)	(0.144)	(0.067)
$lnInterest_t$	0.244***	0.253***	0.245***	0.252***	0.246***	0.253***
	(0.081)	(0.062)	(0.081)	(0.063)	(0.081)	(0.062)
$lnOutput_{it}$	0.161***	0.133***	0.153***	0.133***	0.158***	0.127***
	(0.043)	(0.027)	(0.043)	(0.030)	(0.045)	(0.028)
$lnServices_t$	-2.948*	-0.970	-2.929*	-0.962	-2.965*	-0.977
	(1.660)	(0.792)	(1.663)	(0.808)	(1.663)	(0.796)
$lnOilExports_t$	0.042	-0.011	0.042	-0.010	0.041	-0.011
	(0.055)	(0.027)	(0.055)	(0.026)	(0.055)	(0.027)
Obs.	1,797	1,651	1,797	1,651	1,797	1,651
Trend	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Instruments	93	92	95	94	95	94
AR(1) test	0	0.002	0	0.002	0	0.002
AR(2) test	0.160	0.808	0.168	0.799	0.161	0.821
AR(3) test	0.883	0.826	0.886	0.765	0.888	0.797
Hansen	0.216	0.201	0.252	0.205	0.257	0.238

Notes: See the notes in Tables 3 and 4 in the main text.

Table A9, Panel B: The employment effects of lagged sanctions using a modified measure for economic sanctions.

	Female	Male	Female	Male	Female	Male	Female	Male
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
lnE_{it-1}	-0.189***	-0.286**	-0.178***	-0.249*	-0.142**	-0.325***	-0.167**	-0.243*
	(0.062)	(0.136)	(0.058)	(0.133)	(0.065)	(0.119)	(0.073)	(0.130)
lnE_{it-2}		0.121		0.105		0.181		0.098
		(0.139)		(0.138)		(0.117)		(0.130)
$lnEconSanctions_{t-1}$	0.121	-0.119						
	(0.228)	(0.180)						
$lnEconSanctions_{t-2}$			-0.236	0.109				
			(0.224)	(0.179)				
$lnEconSanctions_{t-3}$					-0.598**	-0.069		
					(0.275)	(0.111)		
$lnEconSanctions_{t-4}$							0.317	-0.604
							(0.691)	(0.548)
$lnWage_{it}$	-0.440***	-0.166**	-0.235	-0.136*	-0.424***	-0.129**	-0.430***	-0.197***
	(0.157)	(0.079)	(0.162)	(0.077)	(0.163)	(0.063)	(0.126)	(0.069)
$lnInterest_t$	0.410**	0.342***	0.486***	0.208*	1.029***	0.367**	0.317	0.580**
	(0.197)	(0.108)	(0.157)	(0.115)	(0.374)	(0.150)	(0.377)	(0.264)
$lnOutput_{it}$	0.156***	0.136***	0.117***	0.121***	0.125***	0.118***	0.143***	0.130***
	(0.042)	(0.026)	(0.042)	(0.026)	(0.040)	(0.026)	(0.040)	(0.026)
$lnServices_t$	-0.894	-1.005	-1.472	-1.547	-3.372**	-0.945	-4.443	4.811
	(1.809)	(0.961)	(2.120)	(1.299)	(1.710)	(0.763)	(6.425)	(4.935)
$lnOilExports_t$	0.158*	-0.017	0.038	0.010	0.171	-0.002	0.111	0.073
	(0.082)	(0.045)	(0.090)	(0.049)	(0.105)	(0.044)	(0.102)	(0.066)
Obs.	1,797	1,651	1,651	1,651	1,563	1,520	1,469	1,429
Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Instruments	93	92	92	92	91	90	90	90
AR(1) test	0	0.003	0	0.002	0	0.002	0	0
AR(2) test	0.162	0.919	0.330	0.962	0.357	0.661	0.239	0.699
AR(3) test	0.897	0.810	0.835	0.841	0.464	0.856	0.603	0.868
Hansen	0.208	0.206	0.286	0.187	0.249	0.170	0.148	0.185

Notes: See the notes in Tables 3 and 4 in the main text.

Table A10: The employment effects of sanctions and varying export intensity

	Female	Female	Male	Male
	(1)	(2)	(3)	(4)
lnE_{it-1}	-0.205***	-0.206***	-0.314**	-0.319**
	(0.065)	(0.063)	(0.124)	(0.129)
lnE_{it-2}			0.140	0.142
			(0.128)	(0.132)
$lnSanctions_t$	-0.216***		-0.022	
	(0.083)		(0.041)	
$lnEconSanctions_t$		-0.143**		-0.013
		(0.057)		(0.026)
$lnSanctions_t \times ExportInt$	-0.106 [a]		0.060	
	(0.070)		(0.050)	
$lnEconSanctions_t \times ExportInt$		-0.170*		0.026
		(0.087)		(0.082)
$ExportInt$	0.376*	0.414**	-0.322**	-0.235
	(0.217)	(0.203)	(0.138)	(0.162)
$lnWage_{it}$	-0.456***	-0.448***	-0.136**	-0.136**
	(0.140)	(0.135)	(0.066)	(0.061)
$lnInterest_t$	0.332***	0.304***	0.260***	0.259***
	(0.091)	(0.087)	(0.063)	(0.064)
$lnOutput_{it}$	0.162***	0.164***	0.143***	0.146***
	(0.042)	(0.041)	(0.028)	(0.027)
$lnServices_t$	-1.911	-1.540	-0.886	-0.835
	(1.656)	(1.641)	(0.804)	(0.826)
$lnOilExports_t$	0.032	0.011	-0.011	-0.013
	(0.052)	(0.050)	(0.025)	(0.024)
Obs.	1,797	1,797	1,651	1,651
Trend	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes
Instruments	95	95	94	94
AR(1) test	0	0	0.00221	0.00318
AR(2) test	0.161	0.160	0.832	0.825
AR(3) test	0.876	0.879	0.883	0.886
Hansen	0.210	0.169	0.189	0.214

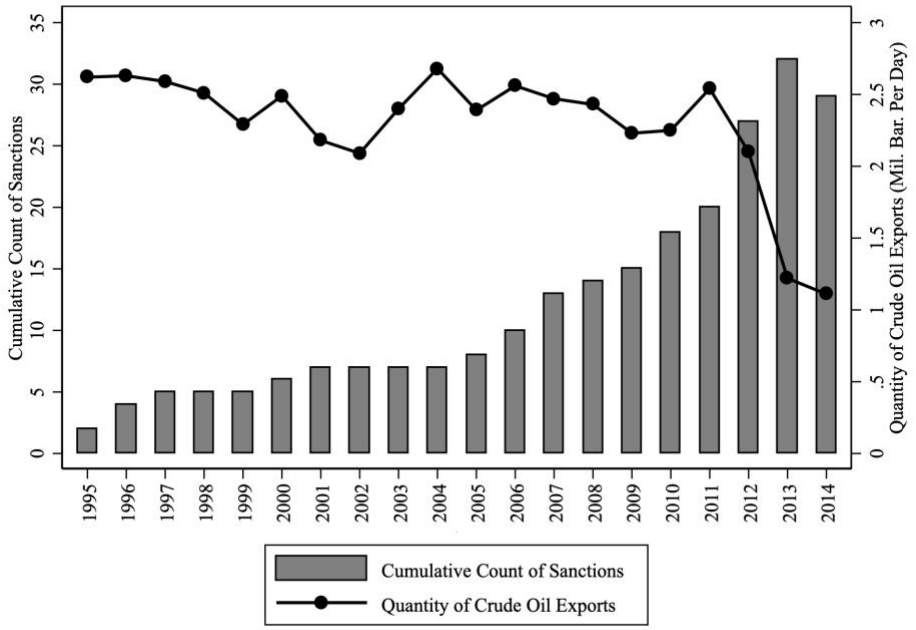
Note: *ExportInt* is computed using UN Comtrade data for 2011 (WITS, 2021). Also, see the notes in Tables 3 and 4 in the main text. Lastly, a) p-value=12.8%.

Table A11: The employment effects of sanctions intensity

	Female	Male	Female	Male	Female	Male
	(1)	(2)	(3)	(4)	(5)	(6)
lnE_{it-1}	-0.202***	-0.305**	-0.194***	-0.298**	-0.205***	-0.302**
	(0.064)	(0.125)	(0.065)	(0.125)	(0.065)	(0.123)
lnE_{it-2}		0.140		0.136		0.139
		(0.131)		(0.131)		(0.130)
$lnSanctionsIntensity_t$	-0.563**	-0.051	-1.098***	-0.129	-0.517**	-0.049
	(0.231)	(0.109)	(0.344)	(0.139)	(0.224)	(0.113)
$lnSanctionsIntensity_t$x*LaborInt*			1.573**	0.216		
			(0.757)	(0.342)		
LaborInt			-0.598*	0.044		
			(0.309)	(0.168)		
$lnEcconSanctions_t$x*ImportInt*					-0.835	0.020
					(0.981)	(0.517)
ImportInt					0.299	0.063
					(0.453)	(0.232)
$lnWage_{it}$	-0.446***	-0.137**	-0.484***	-0.147**	-0.448***	-0.133**
	(0.150)	(0.067)	(0.147)	(0.063)	(0.151)	(0.067)
$lnInterest_t$	0.124	0.241***	0.111	0.236***	0.125	0.242***
	(0.088)	(0.068)	(0.091)	(0.067)	(0.088)	(0.068)
$lnOutput_{it}$	0.161***	0.134***	0.154***	0.135***	0.160***	0.128***
	(0.043)	(0.027)	(0.044)	(0.029)	(0.045)	(0.027)
$lnServices_t$	2.477	-0.481	3.098	-0.352	2.516	-0.525
	(2.659)	(1.296)	(2.602)	(1.305)	(2.660)	(1.302)
$lnOilExports_t$	-0.006	-0.015	-0.011	-0.015	-0.006	-0.015
	(0.049)	(0.024)	(0.049)	(0.024)	(0.049)	(0.024)
Obs.	1,797	1,651	1,797	1,651	1,797	1,651
Trend	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Instruments	93	92	95	94	95	94
AR(1) test	0	0.002	0	0.002	0	0.002
AR(2) test	0.160	0.833	0.164	0.851	0.154	0.839
AR(3) test	0.884	0.839	0.818	0.832	0.878	0.828
Hansen	0.218	0.224	0.275	0.210	0.219	0.256

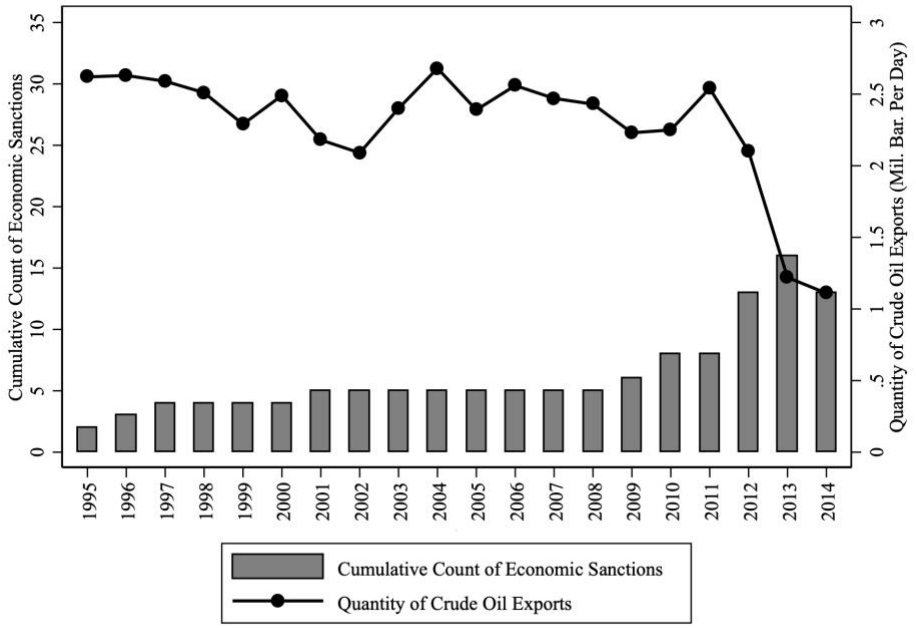
Notes: $lnSanctionsIntensity_t$ is based on sanctions intensity measurement done in Laudati and Pesaran (2021). Also, see the notes in Tables 3 and 4 in the main text.

Figure A1: Sanctions and Iran's crude oil exports



Note: The unconditional coefficient of correlation is about -0.77.

Figure A2: Economic sanctions and Iran's crude oil exports



Note: The unconditional coefficient of correlation is about -0.84.

Figure A3: Sanctions effects at varying levels of labor intensity

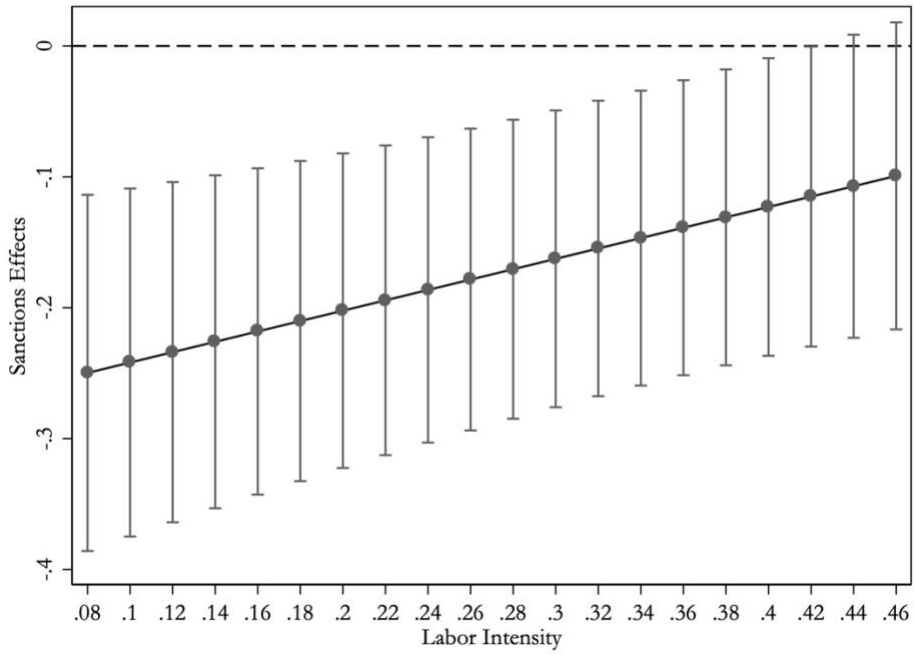


Figure A4: Sanctions effects at varying levels of reliance on imported inputs

