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Women in Austrian International Trade

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This study is the first to examine employment effects by gender in Austrian firms and thus provides insight into the role of Austrian firms engaged in foreign trade for women's labour market opportunities and participation in firms. Using a matched employer-employee dataset based on various microdata from the Austrian Micro Data Center (AMDC) of Statistics Austria, the study looks at different indicators and possible differences between female employees in foreign trade-affiliated firms compared to exclusively domestic firms.

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Executive summary (English)

This empirical study provides, for the first time, insights into the role of internationally active firms in shaping the labour market participation and labour market outcomes for women in Austria. Using a newly available matched employer-employee dataset from the Austrian Micro Data Center (AMDC) at Statistics Austria for Austrian private sector firms, the empirical study examines the female employment share and gender pay gap across domestic, exporting, importing, and multinational enterprises (MNEs).

The matched employer-employee dataset excludes public sector employees and includes 21,715 private sector firms over the time from 2013-2020. In these Austrian firms, **on average around 38% of the workforce are female.** However, **the sectoral context is important**. Firms in the services sector, especially in tourism, gastronomy, and real estate, have higher shares of female employment than those in manufacturing and construction, regardless of the firm's international activities.

Internationally active firms, particularly exporters and MNEs in the manufacturing sector, tend to have a moderately higher proportion of women in their workforce than purely domestic firms. Firms that focus exclusively on the domestic market show significant differences in the representation of women in their workforce. While some companies have a negligible share of female employees, others have an exceptionally high share of female employment. Using propensity score matching, which allows for a comparison between international and domestic firms with similar firm characteristics, the study shows that exporters and MNEs, particularly in the manufacturing sector, have a higher female employment share than comparable domestic firms. According to the economic literature, firms that trade with partners in distant locations or across different time zones have typically a greater demand for a more flexible workforce. The analysis reveals that such Austrian exporters and importers have a significantly higher female employment share than similar domestic firms.

The study highlights the potential challenges associated with part-time work. **Domestic firms have a relatively higher share of part-time workers** compared to internationally active ones. In particular, MNEs have a significantly lower part-time share compared to domestic firms, largely due to a significant lower part-time share among female employees. Part-time work, which is more prevalent among female employees, decreases when firms become internationally active. **Firms facing fiercer international competition, which are also more likely to require greater flexibility from their workforce, have a higher proportion of women working full-time**. These findings suggest that firms might need to design employment and part-time working arrangements more flexible.

An increase in full-time employment participation by women is expected to contribute to **a reduction of the gender pay gap**, which represents the difference in annual earnings between males and females. The empirical estimates for the Mincer wage regression show a significant annual wage gap ranging from 9% to 13% between the genders in the Austrian private sector, consistent with prior empirical evidence. For the gender pay gap in Austrian firms, we estimate heterogeneous effects of international activities. In manufacturing industries, the gender pay

gap is relatively large in purely domestically orientated firms, but female employees tend to benefit from working for an Austrian exporting firm. International activities in Austrian manufacturing companies show smaller gender pay gaps between men and women. This suggests that international activities enable women to achieve better labour market outcomes for themselves. However, if a high degree of flexibility might be required by the international active firm, such as working outside regular business hours due to trade partners in different time zones or traveling to distant trade partners, females seem to benefit less than males from an exporter wage premium. The analysis reveals that in the services sector, women who work full-time are less likely to benefit from an exporter's wage premium than men who also work full-time. In services firms, only part-time female employees appear to benefit more in terms of higher wages than men from working in an exporting firm.

Further, **internationally active Austrian firms have been successful in realising a firm-level productivity premium** – both in terms of total factor productivity and labour productivity. However, a negative relationship between the share of female employees and firm-level productivity is estimated. This is consistent with prior empirical evidence. This negative relationship disappears for Austrian firms when considering the extent of employment (i.e., part-time work). Furthermore, when differentiating by skills, the study does not find a negative relationship between the share of highly skilled female employees and productivity for Austrian firms. This relationship does not differ significantly between internationalised and non-internationalised firms.

Thus, by shedding valuable light on the gender pay gap and female employment shares in Austrian firms, this study highlights the **need for targeted policies to address the gender pay gap and ensure fair treatment and equal opportunities for women in the Austrian labour market**, particularly in the context of international activities of firms. Efforts, such as more flexible working arrangements and tailored strategies based on the characteristics and challenges faced by each industry, are needed to increase gender diversity in all types of firms and reduce the gender pay gap.

Executive summary (German)

Diese empirische Studie liefert erstmals Erkenntnisse über die Rolle international tätiger Unternehmen bei der Gestaltung der Arbeitsmarktbeteiligung und der Arbeitsmarktergebnisse von Frauen in Österreich. Unter Verwendung neu verfügbarer Daten des Austrian Micro Data Center (AMDC) der Statistik Austria für österreichische Unternehmen des Privatsektors wurde ein abgeglichener Arbeitgeber-Arbeitnehmer-Datensatz für Österreich erstellt. Dieser ermöglicht den Anteil der weiblichen Beschäftigung und die Geschlechterlücke in der Entlohnung in inländischen, exportierenden, importierenden und multinationalen Unternehmen (MNEs) zu untersuchen.

Der abgeglichene Arbeitgeber-Arbeitnehmer-Datensatz schließt die Beschäftigten des öffentlichen Sektors aus und umfasst 21.715 Unternehmen des privaten Sektors im Zeitraum von 2013 bis 2020. In diesen Unternehmen **sind im Durchschnitt rund 38% der Beschäftigten Frauen.** Allerdings **ist der sektorale Kontext wichtig.** Unternehmen im Dienstleistungssektor, insbesondere im Tourismus, in der Gastronomie und im Immobiliensektor, haben einen höheren Anteil an weiblichen Beschäftigten als Unternehmen im verarbeitenden Gewerbe und im Baugewerbe, unabhängig von den internationalen Aktivitäten des Unternehmens.

In der Regel haben **international tätige Unternehmen, insbesondere Exporteure und MNEs des verarbeitenden Gewerbes, einen etwas höheren Frauenanteil in ihrer Belegschaft** als rein inländische Unternehmen. Unternehmen, die sich ausschließlich auf den heimischen Markt konzentrieren, weisen erhebliche Unterschiede im Frauenanteil in ihrer Belegschaft auf. Während einige Unternehmen einen vernachlässigbaren Anteil an weiblichen Beschäftigten haben, weisen andere einen außergewöhnlich hohen Frauenbeschäftigungsanteil auf. Unter Verwendung der Propensity-Score-Matching-Methode, die einen Vergleich zwischen international tätigen und rein inländischen Unternehmen mit ähnlichen Unternehmensmerkmalen ermöglicht, zeigt die Studie, dass Exporteure und MNEs, insbesondere im verarbeitenden Gewerbe, einen höheren Frauenbeschäftigungsanteil aufweisen als vergleichbare inländische Unternehmen. Unternehmen, die mit Partnern an weit entfernten Standorten oder in verschiedenen Zeitzonen Handel treiben, benötigen laut ökonomischer Fachliteratur typischerweise flexiblere Arbeitskräfte. Die Analyse zeigt, dass solche österreichischen Exporteure und Importeure einen signifikant höheren Anteil an weiblichen Beschäftigten haben als vergleichbare inländische Unternehmen.

Die Studie zeigt mögliche Herausforderungen im Zusammenhang mit Teilzeitarbeit auf. **Unternehmen, die ausschließlich auf den heimischen Markt ausgerichtet sind, haben einen höheren Anteil an Teilzeitbeschäftigten** als international tätige Unternehmen. Insbesondere MNEs haben einen deutlich geringeren Anteil an Teilzeitbeschäftigten als inländische Unternehmen, was vor allem auf einen deutlich geringeren Anteil an Teilzeitbeschäftigten unter den weiblichen Beschäftigten zurückzuführen ist. Die Teilzeitbeschäftigung, die bei weiblichen Beschäftigten stärker ausgeprägt ist, nimmt ab, wenn Unternehmen international tätig werden**. Unternehmen, die in einem stärkeren internationalen Wettbewerb stehen und tendenziell mehr Flexibilität von ihren Beschäftigten verlangen, haben einen höheren Anteil an vollzeitbeschäftigten Frauen**. Diese Ergebnisse deuten darauf hin, dass Unternehmen die Beschäftigungs- und Teilzeitregelungen flexibler gestalten sollten.

Es wird erwartet, dass ein Anstieg der Vollzeitbeschäftigung von Frauen zu einer **Verringerung des geschlechtsspezifischen Lohngefälles**, d. h. des Unterschieds im Jahreseinkommen zwischen Männern und Frauen, beiträgt. Die empirischen Schätzungen der Mincer-Lohnregression zeigen einen signifikanten Unterschied in den Jahreslöhnen und -gehältern zwischen den Geschlechtern in der österreichischen Privatwirtschaft zwischen 9% und 13%. Dies stimmt mit anderen empirischen Studien für Österreich überein. Für das geschlechtsspezifische Lohngefälle in österreichischen Unternehmen werden heterogene Effekte der internationalen Aktivitäten geschätzt. Im verarbeitenden Gewerbe ist das geschlechtsspezifische Lohngefälle in rein inländisch orientierten Unternehmen relativ groß. Frauen profitieren tendenziell von der Arbeit in einem österreichischen Exportunternehmen mit höheren jährlichen Löhnen und Gehältern. International tätige österreichische Unternehmen in der Sachgütererzeugung weisen geringere geschlechtsspezifische Lohnunterschiede zwischen Männern und Frauen auf. Dies trägt dazu bei, die Geschlechterlücke bei der Entlohnung in österreichischen Unternehmen in der Sachgütererzeugung zu verringern. Wenn jedoch international tätige Unternehmen ein hohes Maß an Flexibilität von ihren Beschäftigten einfordern, wie z. B. arbeiten außerhalb der regulären Geschäftszeiten aufgrund von Handelspartnern in unterschiedlichen Zeitzonen oder Reisen zu weit entfernten Handelspartnern, scheinen Frauen weniger als Männer von einem Lohnaufschlag in exportierenden Unternehmen zu profitieren. Frauen, die Vollzeit im Dienstleistungssektor arbeiten, profitieren weniger als Männer von einem Lohnaufschlag durch Exporteure. Hingegen profitieren Frauen mehr als Männer von höheren Löhnen nur, wenn sie in Teilzeit arbeiten.

Zudem weisen **international tätige Unternehmen sowohl eine höhere Gesamtproduktivität als auch Arbeitsproduktivität auf**. Betrachtet man die gesamtwirtschaftlichen Auswirkungen der Erwerbsbeteiligung von Frauen, so zeigt sich jedoch ein negativer Zusammenhang zwischen dem Frauenanteil und der Produktivität auf Unternehmensebene, was mit anderen empirischen Untersuchungen im Einklang steht. Dieser negative Zusammenhang verschwindet für österreichische Unternehmen, wenn das Ausmaß der Beschäftigung (d. h. Teilzeitbeschäftigung) berücksichtigt wird. Auch bei einer Differenzierung nach Qualifikation zeigt sich kein negativer Zusammenhang zwischen dem Anteil hochqualifizierter weiblicher Beschäftigter und der Produktivität in österreichischen Unternehmen. Dieser Zusammenhang zwischen der Produktivität und dem Frauenbeschäftigungsanteil unterscheidet sich nicht signifikant zwischen international tätigen und nicht international tätigen Unternehmen.

Die Analyse des geschlechtsspezifischen Lohngefälles und des Beschäftigungsanteils von Frauen in dieser Studie betont die Notwendigkeit **gezielter Maßnahmen zur Beseitigung des geschlechtsspezifischen Lohngefälles und zur Gewährleistung einer fairen Behandlung und Chancengleichheit für Frauen auf dem österreichischen Arbeitsmarkt**. Um die Gleichstellung in allen Unternehmenstypen zu verbessern und das geschlechtsspezifische Lohngefälle zu verringern, sind Anstrengungen, wie z. B. flexiblere Arbeitsregelungen und maßgeschneiderte Strategien, erforderlich, die auf die Merkmale und Herausforderungen einzelner Branchen abgestimmt sind.

1. Introduction[1]

Women are often treated less favourably than men in many social and economic spheres. The long public debate is also echoed in the scientific literature and has been extensively studied most prominently in labour economics. Among the most well-known measures of gender inequality in an economic context is the gender pay gap, which refers to the observed differences in market wages between men and women. Most of the literature on the determinates of the smaller wages for women focusses on individual employee characteristics only and ignores the role employers (i.e., firms) might play for shaping the gender pay gap.

The increasing availability of administrative matched employer-employee data allows to augment the information on individual workers with firm characteristics and to study the interaction of labour supply and demand factors for the gender pay gap and labour force participation of women. In contrast to research that only concentrates on worker characteristics such data sources allow to test for heterogenous firm effects across gender. Recent studies point to differences between domestically and internationally active firms with respect to female employment and wages. In the international economics literature, the so-called exporter wage premium, which relates to the fact that internationally active firms, i.e. exporters, importers or MNEs, pay higher wages in comparison to similar but only domestically orientated firms, is well documented. In the context of the gender pay gap, it is therefore important to analyse whether the exporter wage premium is equally shared by workers of different gender. In case the exporter premium is unequally shared by different genders and in favour of men, firm characteristics would be a relevant predictor for some part in the gender pay gap.

Against this background, the proposed study provides, for the first time, empirical evidence on the role of internationally active Austrian firms for the labour market participation and outcomes of women within Austrian firms, possible due to the establishment of the Austrian Micro Data Center (AMDC) at Statistics Austria allowing to access the necessary micro This study uses various empirical measures to examine possible differences in the labour market participation and labour market outcomes for female employees in companies with foreign economic activities compared to women working in purely domestically orientated firms. For this purpose, a matched employer-employee dataset is constructed, which links firm characteristics with employee characteristics. Thus, this empirical study focuses on private sector firms and excludes public sector employees. The available private sector company characteristics allow the identification of exporting, importing, multinational and exclusively domestically active companies. Based on detailed information on the employees of the respective firms, an empirical analysis on differences in the employment of women and their renumeration in different types of Austrian firms is conducted.

The empirical evidence offered by this study provides a first descriptive picture on the role of internationally active Austrian firms for labour market participation and labour market

outcomes of female workers in the Austrian private sector. Chapter 2 provides a background discussion on the impact of exporting, importing or being an MNE on female employment and wages in general. According to the economic literature, firms that trade with partners in distant locations or across different time zones have typically a greater demand for a more flexible workforce.

Chapter 3 describes the data and methodologies used to analyse the impact of Austrian private sector firms in international trade on female employment and their labour market outcomes. The constructed matched employer-employee dataset is based on information from different data sources of Statistics Austria, which are linked together for this research project. Specifically, firm-level data from the Statistical Business Register, the Structural Business Survey and the foreign trade statistics are combined to obtain a firm-level dataset on the population of Austrian firms with rich firm-level information. The first two data sources cover all relevant standard firm characteristics like e.g., size, revenues, value added, industry classification. The foreign trade statistics record the cross-border trade volumes of firms broken down by countries of destination and are composed of data from Intrastat for intra-EU trade and Extrastat for trade with non-EU member countries. The combined firm-level dataset is linked to the register-based labour market statistics and the Integrated Wage and Income Tax Statistics, which contain rich information on worker characteristics within Austrian firms.

The heterogeneous impact of Austrian private sector firms on the female employment share and female labour market outcomes are presented in Chapter 4. The study offers an empirical analysis on differences in average firm behaviour across alternative types of firms in Austria. In the first part of the empirical analysis in Chapter 4.1, we study female employment in different types of Austrian firms, accounting as well for differences in the demand for flexibility. We investigate whether the female employment share varies across internationally and domestically orientated firms. In particular, we study whether the proportion of women in internationally active companies is higher than in purely domestically active ones using propensity score matching, which allows a comparison of firms with similar characteristics, except of the international activity. We further differentiate between full- and part-time employment shares.

This part is followed by a systematic empirical analysis of the gender pay gap in annual wages by means of augmented Mincer wage regressions in Chapter 4.2. Mincer wage regressions are standard in the economic literature on the gender pay gap and allow to separate differences into an explained and unexplained part. The latter is often termed as discrimination. The explained part allows to assess the relative importance of observable characteristics for the differences in observed annual wages across employs of different types. These characteristics typically include information on the employees like, education, age, occupation, within-firm tenure and the like. In this study, the worker characteristics will be augmented by firm characteristics like firm size, productivity and, most importantly, information on the international engagement of the firm. Conditional on all worker and firm characteristics the parameter associated with a gender dummy provides an estimate for the average gender pay gap within domestically operating Austrian firms. This dummy variable is further interacted with firm characteristics to provide some evidence on the potentially heterogenous gender pay gap

across different types of firms. Thereby, we estimate the effects of various internationalisation activities of firms for the within-firm gender pay gap in annual wages.

The last set of empirical analyses is presented in Chapter 5, focussing on the potential economic effects of female participation in internationally active firms in Austria. The study puts a specific focus on productivity effects at the firm-level and applies state-of-the-art productivity measures. The main research question in this section asks whether internationally active Austrian firms can profit from an increase in the share of females in their workforce.

The last section concludes and provides some policy recommendations based on the results. With the help of the descriptive evaluation of the role of women in foreign trade carried out in this study and the dataset created particularly for the research question at hand, we are able to provide a first set of "stylised facts" on the role of internationally active firms for the labour market participation and labour market outcomes of women in Austria. Potential follow-up projects can build on the evidence provided by this study and apply causal research designs to dig deeper into the economics mechanisms which are at work. With its data processing and compilation of stylised facts, this study is doing pioneering work not only for Austria, because – up to now – relatively little attention has been paid in the economic literature to the connection between internationalisation efforts, technological developments, gender and working time models also due to a lack of data availability.

2. Background

Despite intense political discussions on gender equality and the supposed consensus that it should be achieved, gender gaps between men and women continue to emerge (see Sevilla, 2020 for a literature review). Among the most often referred indicators is, for example, the "gender pay gap", which has lasting implications on the life span also inducing the so-called "gender pension gap". The gender pay gap is defined as difference in wage earnings between men and woman. In virtually all economies around the world, men tend to earn higher market wages. This observation has triggered a large literature in labour economics studying potential economic and societal forces and circumstances driving the gender-based inequality in labour market outcomes (Kunze, 2018).

According to this literature, the gender pay gap can be partly explained by factors such as e.g., the unequal distribution of family work between the sexes, education, work experience, part-time quotas, occupational choices and marital status (Böheim et al., 2023). Nevertheless, there remains an unexplained part in the gender pay gap which can be interpreted as some sort of "discrimination" against women labour market that cannot be attributed to observable characteristics.

While most empirical studies on the gender pay gap and related questions on discrimination of women in the labour market focus on workers characteristics, relatively little is known about the role firms play in shaping the observed differences in labour market participation and outcomes across gender. This fact is particularly interesting as another strand of the literature has been documenting differences in average wages paid across different types of firms. The firm size premium, for example, is related to the fact that larger firms tend to pay higher wages (see e.g., Troske, 1999). In a similar vein and also partially related to firm size, workers employed in more productive firms also earn higher wages, on average (Berlingieri et al., 2018). This stylised fact is well in line with standard results from neoclassical labour market models.

Heterogeneous firm's models from the international economics literature assume a self-selection of firms into foreign market activities via international trade (e.g., Melitz, 2003) and/or foreign direct investment (e.g., Helpman et al., 2004; Oberhofer and Pfaffermayr, 2012). Heterogeneity is typically modelled in terms of productivity differences. As a consequence, more productive (and larger) domestic firms find it more profitable to enter foreign markets as they are able to either bear the additional trade costs or fixed investment costs to also serving markets abroad. As second, somehow conflicting approach argues in favour of "learning by exporting", where (originally only domestically orientated) firms experience a productivity (performance) increase after entering a foreign market (De Loecker, 2013). In both theoretical cases, internationally active firms are the more productive (and larger) ones, and their workers should profit from increased wages. This phenomenon is also documented in the empirical literature and termed the exporter wage premium (see, e.g., Bernard and Jensen, 1995).

Where we still only have relatively scarce empirical evidence on is the distribution of the exporter wage premium within internationally active firms. The average within-firm wage might be driven by widespread wage dispersion and the overall higher wages might be driven by a small number of very well-paid employees. The available evidence on the within-firm distribution mainly concentrates on skill differences. Egger et al. (2020), for example, estimate

that the average exporter wage premium amounts to around 6% in a linked employer-employee dataset for Germany which is heterogeneously distributed across skill types. Skilled workers are able to materialise a 15% wage premium in exporting firms, while unskilled workers do not benefit from any such premium as compared to unskilled workers employed by purely domestically active firms. In a recent country report for Austria, the OECD (2023) focuses on the role foreign direct investment can play for closing gender gaps and empowering women. This report identifies interesting and relevant policy measures that should be able to contribute to maximising the overall societal benefits from both active and passive investment decisions of Austrian firms. Empirical analyses on the impact of international activities for labour market outcomes of women, therefore, should not only consider international trade but also look at subsidiaries of multinational enterprises. In this study, we aim at contributing to this literature, by studying the potentially heterogenous labour market outcome effects of international activities across gender. The main question, therefore, is whether female workers benefit from working in internationally active firms as compared to being employed by a firm that solely conducts business in Austria. We are interested in whether labour market outcomes for women are, conditionally on all other observable workers characteristics identified in the literature, better or worse in internationally active Austrian firms versus in Austrian firms that only conduct business in Austria.

From a theoretical point of view, this is unclear ex-ante as internationally active firms might have specific demand for workers that could be beneficially or detrimental for women's labour market outcomes. On the one hand and as women are often less flexible in the labour market, international activities of firms may exacerbate the gender pay gap by increasing the value of workers' flexibility to companies. Exporters often demand greater work commitment and flexibility from their workers as they face stronger competition (Kvande, 2009). Bøler et al. (2018), for example, show that an increase in the number of export destinations, the share of exported production or the number of exported product variations is associated with a higher gender pay gap within Norwegian firms. Exporting firms may require or expect their employees to be flexible and available at any time, since they deal with customers in distant and diverse markets. This could lead to a larger gender wage gap, if women have less ability or opportunity to meet such demands or are perceived as less capable by their employers. Working outside normal business hours means that employees may have to adjust their schedules to communicate with clients, suppliers or partners in other countries. This may involve working late at night, early in the morning or on weekends. Traveling is another flexibility demand that employees of international firms may face. Traveling can involve visiting other countries for meetings, negotiations, trade shows or training (Goldin, 2014; Goldin and Katz, 2016). Employees may have to travel frequently, for long periods or on short notice. Bøler et al. (2018) and Goldin (2014) show that indeed the gender wage gap is related to the need for working long hours, travel and to communicate outside the standard business hours in the home country. Employees need to be able to communicate effectively, build rapport, resolve conflicts and negotiate successfully. In socially distant cultures, where women's rights and female labour market participation are often more restricted than in Austria, this may be particularly challenging for women.

Within multinational enterprises (MNEs), recent literature using administrative data is able to identify spillover effects in gender norms that might lead to larger gender pay gaps in Swedish firms. Social skills are essential for employees of international firms, as they have to interact with people from diverse backgrounds and perspectives. Halvarsson et al. (2023) empirically investigate on whether the share of overall employees of Swedish multinational companies working in Estonian subsidiaries has an effect on the gender pay gap at home. The empirical findings suggest that a larger share of workers being employed in the relatively gender unequal economy of Estonia increases the gender pay gap within Swedish multinational cooperations that are running subsidiaries in Estonia. In a similar vein, Halvarsson et al. (2022) find that home country gender norms of foreign investors into the Swedish economy matters. In foreign-owned subsidiaries the gender pay gap is systematically related to that observed in the investors' home countries.

On the other hand, the internationalisation of firm activities can also contribute to a narrowing of the gender pay gap. Increased participation in international trade creates additional growth potentials that can also generate higher demand for women in such firms and the labour market in general, leading to greater participation in the labour market by women (Oostendorp, 2009). Firms participating in international trade are more likely to adopt new technologies in response to increased competition (Aghion et al., 2022), which can affect men and women differently based on the tasks they perform. Women with a comparative advantage in non-physically demanding tasks can become more productive with the adoption of new technologies, leading to higher employment and wages relative to men in certain jobs. Firms in international trade may hire more women as part of their cost minimisation strategy due to stronger competition in international markets. This is based on the theory of competitive advantage, where firms compete based on absolute costs of production. Evidence from China shows that as internationalisation increases, women's labour market participation increases and the gender pay gap decreases in the whole economy (Chen et al., 2013). The authors also find that within firms the gender pay gap is larger in internationally active firms and can attribute to differences in gender-specific productivity. Becker (1971) also argues that increased competition through international trade can reduce costly discrimination and thus narrow the gender pay gap. Kodama et al. (2018) show for Japan that internationally operating companies, i.e., exporters or multinational firms, exhibit more gender equality in employment and wages than domestic, non-exporting firms. When operating in a global setting, the ability to manage relationships with diverse business cultures and traditions becomes crucial, making interpersonal skills indispensable. If women demonstrate a comparative advantage in such skills (Bonfiglioli and De Pace, 2021), females could disproportionately benefit from increased internationalisation.

The investigation of these gender-specific differences in internationally operating companies has not been feasible in Austria so far due to the lack of access to necessary linked employer-employee data with both rich worker and firm characteristics. This study attempts to fill this gap by accessing data from the newly created AMDC, which, for the first time, grants access to administrative micro-level data from Statistics Austria for research purposes.

3. Data and methodology

3.1 Data basis

The analysis of the role of women in international companies in Austria is based on a dataset that combines six data sources from Statistics Austria accessible via the AMDC. Four firm-level datasets and two individual datasets are combined to obtain a matched employer-employee dataset needed for the analysis. Figure 3.1 provides an overview of the different datasets combined. The matched employer-employee dataset contains information on employees of private sector firms and excludes public sector employees.

Figure 3.1: Data sources of the constructed matched employer – employee dataset
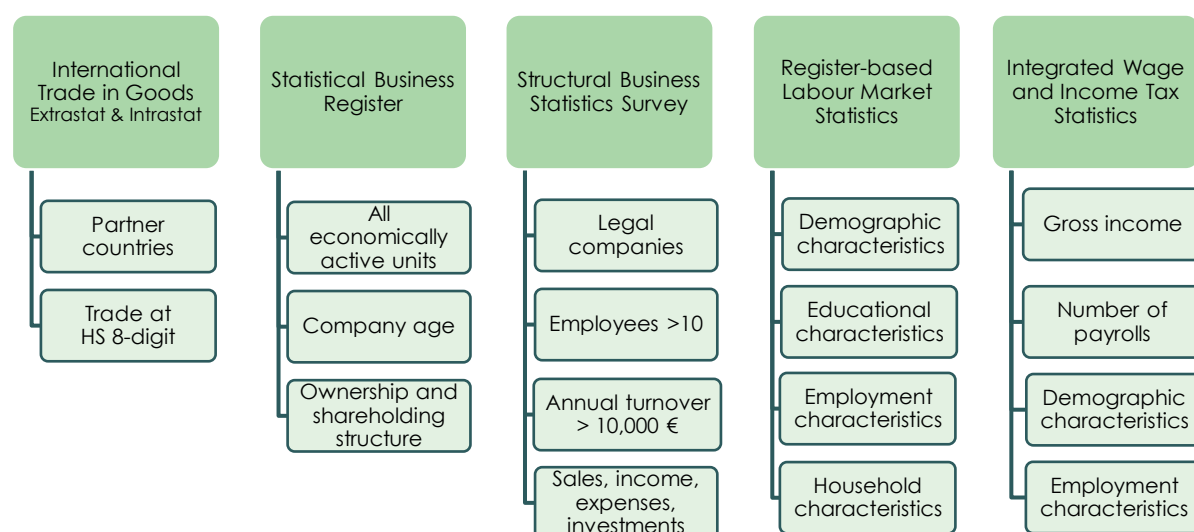
Source: AMDC, WIFO presentation.

Information on firm-specific cross-border trade is available via the foreign trade statistics. The foreign trade statistics built off two different administrative sources, namely Extrastat and Intrastat, which both include the whole population of Austrian firms involved in foreign trade. The two sources only differ by partner countries involved in any cross-border trade transaction for Austrian firms. Extrastat records the flows of goods with non-EU (third) countries and is based on official customs data. Intrastat records trade flows with partners (other firms, final customers) located in EU Member States. This data is collected via compulsory declarations by the involved firms. The foreign trade statistics at company-level not only provide information on the country of origin or destination and the value of the goods, but also detailed product-level information on the goods traded based on the HS 8-digit level. Note that the foreign trade statistics takes only physical movements of goods that cross Austrian borders into account, services exports are therefore to a large extend not covered.

The Statistical Business Register ("Statistisches Unternehmensregister der rechtlichen Einheiten") represents the population of all enterprises available for empirical analyses with enterprise

characteristics for about 660,000 Austrian firms. It contains information on the age of the enterprise as well as on the ownership and participation structure.

Data from the Statistical Business Register is linked to information from the Structural Business Statistics Survey ("Leistungs- und Strukturerhebung") conducted by Statistics Austria via a unique firm identifier. The Structural Business Statistics Survey forms the basis for officially reported aggregated statistics and the underlying micro-level data allows for a detailed analysis of productivity dynamics in Austria at the firm-level. The sample comprises firms that carry out market-oriented activities and report a turnover of at least 10,000 € and at least 10 employees. It thus covers all larger firms, except for micro-enterprises, whose contribution to the overall economy is estimated in Austria. In 2017, the dataset covered approximately 72.8% of the total number of persons employed in Austrian private firms. This does not consider self-employment or non-market activities, such as the public sector. We only consider firms in the primary sample of the Structural Business Statistics Survey. Note that the sample size varies across years, since not the same number of firms always meet the survey thresholds in all years.

After merging these four different data sources, we obtain a rich dataset of Austrian firms that are actively and passively involved in international trade activities. Further, the dataset also allows to identify purely domestically orientated firms. To study the research questions on the impact of internationalisation of firms on labour market outcomes for woman, the rich firm-level dataset is supplemented with detailed information on the firms' employees. These are from the Register-based Labour Market Statistics ("Abgestimmte Erwerbsstatistik"), which contains information regarding demographic characteristics such as gender, age, nationality, educational information (e.g. highest completed education), employment characteristics (e.g. part-time and full-time work) as well as family and household characteristics (e.g. number of children). In order to investigate possible wage differences, information from the Integrated Wage and Income Tax Statistics ("Integrierte Lohn- und Einkommensteuerstatistik") is also added to the dataset. The latter source contains, among other things, information on gross and net income as well as the number of payrolls available for each employee. The resulting final matched employer-employee dataset covers the years from 2013 to 2020, as for this time span all necessary data sources provide overlapping information[2].

Note that we only consider firms in our analysis for which we observe at least 90% of the total number of employees to avoid an unbiased estimate of the female employment share and other employment characteristics of each firm. This reduces our sample size but ensures an unbiased calculation of the employment structure of Austrian firms.

Thus, our matched employer-employee dataset used in the analysis contains a sample of maximum 105,502 observations of firms over all sample years, covering 21,715 different firms. On average, we observe firms for 4.2 years. Due to our methodological approaches, in many specifications we rely on firms that are observed at least in two consecutive years, reducing

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[2] The period is limited by the availability of data in the Statistical Business Register from the year 2013 (until 2022) and the availability of the performance and structural statistics (from 2008) until the year 2020. Foreign trade statistics are available from 2012 until 2021. A large part of the research questions is carried out based on the combined dataset from all sources.

the sample in many specifications to 81,937 observations[3]. We consider firms as manufacturing firms if they operate in the manufacturing sector, i.e. sector "C" according to the General Industrial Classification of Economic Activities in the European Communities (Nomenclature Générale des Activités Économiques dans les Communautés Européennes, NACE) containing NACE rev. 2 2-digit industries from 10 to 33. We have 21,445 observations of 5,043 different firms in the manufacturing sector. In the services sector, defined by NACE rev.2 2-digit industries from 45 to 82, we have in total 64,976 observations, covering 13,828 different firms.

Appendix 8.1 provides more information on the respective data sources used and the construction of the matched employer-employee dataset.

3.2 Methodology and variable description

To analyse the relation between international activities and female labour market participation and labour market outcomes, typical key figures from labour market research, such as the gender pay gap, are calculated and examined in even more detail on the basis of the detailed matched employer-employee dataset. Descriptive statistics include, for example, the share of women in different employment categories. The rich personal characteristics also allow separate and detailed evaluations according to educational level, origin or family type. Standard descriptive statistics, such as means, variances, shares, etc., are graphically processed in the study according to the latest methods of data science. Further, regression analyses are performed to analyse the difference on labour market participation and labour market outcomes between employees working in domestic firms compared to internationally active firms. In the subsequent chapters, Chapter 4 and Chapter 5, the used methodology is briefly explained before the results of the respective analysis are presented and discussed. In the following, we briefly define the main variables used in the various empirical analysis.

3.2.1 Firm characteristics

The company characteristics serve as a basis for the typification of companies, for example, according to international versus national activity, which is relevant for the comparison. In addition, company characteristics such as size in terms of the (log) number of annual average full-time equivalent employees, (log) annual sales, age of the firm based on the founding year of the firm, industry at NACE rev.2 2-digit level and region at NUTS 3 level are used for evaluations but also as control variables in the regression analyses.

International firms: exporter, importer, and multinational enterprises

For the purpose of our analysis, we exclude marginal and minimal export and import activities. Specifically, firms are considered exporters only if their exports account for at least 10% of their overall sales, while importers are identified if their imports constitute at least 10% of their overall

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[3] Figure 8.1 in the Appendix compares our reduced sample used in the main specifications with firms occurring at least in two consecutive years and no other important firm characteristic missing with the full sample of firms containing more than 220,026 observations in the matched employer-employee dataset. As can be seen, the distribution of the two samples is not significantly different from each other. Using the reduced sample, however, provides more robust and more representative regression results.

intermediate inputs. Based on this, we define an indicator variable that indicates the exporter status of a firm. If the firm exports more than 10% of its overall sales, the dummy variable for exporter takes on the value one. In similar veins, we generate a dummy variable for the importer status. It is noteworthy that a significant proportion of Austrian firms engage in minimal export or import activities relative to their total sales or intermediate inputs used in production. Although the number of firms commencing export or import operations increases over time, the export and import shares remain relatively constant. Overall, Austrian firms export to 180 different countries and import from 195 countries[4]. The majority of the trade, however, takes place with trade partners in the neighbourhood, particularly with Germany and Italy. Note that the foreign trade statistics take only physical movements of goods that cross Austrian borders into account, services exports are therefore to a large extend not covered.

To measure if a firm is a multinational enterprise, we combine information from the Business Registry to obtain an indicator for multinational enterprises (MNEs). We consider a firm as multinationally active firm if it has close international business linkages. Thus, we define a firm as MNE if it has its headquarter location outside of Austria, if it has a daughter in a foreign country, a business location in a foreign country or is part of a global business group.

Measurements for flexibility demands of international firms

As discussed in Chapter 2, one of the challenges that employees of internationally active firms face is the need to be flexible in their work arrangements. Exporting firms often operate in different time zones, markets and cultures, which require employees to adapt to various situations and demands. Some of the flexibility demands that employees may encounter are working outside normal business hours, traveling and social skills. These flexibility demands can be especially challenging for women, who may face additional barriers such as gender stereotypes, or discrimination on the labour market. Women may also have more responsibilities or expectations at home or in their communities, particularly if they have children, which can limit their availability or mobility for work-related activities.

To account for different flexibility demands of exporters and importers, the information on trade partners was merged with the gravity dataset from the Centre d'Études Prospectives et d'Informations Internationales (CEPII; Conte et al., 2022). This allows us to identify firms with trade partners that are located more than 1,200 kilometres away, exhibit a time difference of over 4 hours, or possess a comparatively lower index score of social connectedness to Austria.

To disentangle the effect of international firms on female labour market participation and wages, we define several variables as indicators for flexibility demands. Time differences are measured by the GMT offset of the trade partner in hours. Firms with business partners that operate in locations with a time difference of more than 4 hours might find it more difficult to employ fewer flexible employees, particularly females working part-time. With part-time working hours of – on average – 4 hours per day, it is challenging to find common business hours with business partners that are located more than 4 hours apart. To measure the requested

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[4] For more information on the export pattern of Austrian firms, see Stehrer (2023).

time flexibility, we define indicator variables that take on the value one if the average time difference to all export or import partners of the firm is larger than 4 hours and zero otherwise.

To measure the flexibility demand related to travel, we define indicators that are one if the average distance to the export destination countries, or import partner countries, of the firm is larger than 1,200 km and zero otherwise. We measure distance by the distance between the main economic centres of the trade partners. If the average distant to all trade partners is large, this might impose a disadvantage for female workers. Traveling a distance of more than 1,200 km is difficult in one day and requires a higher flexibility from employees. Traveling to such distant destinations for business, e.g. a business travel to Lisbon, Portugal, typically require an overnight stay, making such business trips more difficult for females, particularly with young children or if working part-time. Moreover, the larger the distance to trade partners, the more complex is the international transaction with respect to e.g. shipping arrangements, customs and transport.

The social distance to a trade partner is measured by the scaled social connectedness index[5] (Bailey et al., 2018) between countries. We consider a country having a weaker level of social interconnectedness with Austria if the level of social connectedness is one standard deviation lower than the mean social connectedness of all Austrian trading partners. In addition, we define indicator variables taking on the value one if the average social connectedness index of the export and import partners is one standard deviation lower than the mean social connectedness index of all firms with all trade partners and zero otherwise.

Total factor productivity

Total factor productivity not only determines export and import behaviour, but it also affects labour demand and labour market outcomes. We therefore estimate total factor productivity as a measure of productivity that attempts to control for potential bias arising from this endogeneity. Cognizant of the extensive and growing discussion on the estimation of total factor productivity (Ackerberg et al., 2015; Levinsohn and Petrin, 2003; Olley and Pakes, 1996; Wooldridge, 2009; Syverson, 2011; Kaus et al., 2020), we use a Cobb-Douglas production function approach and follow Friesenbichler et al. (2023) who have used the Structural Business Survey data to study the role of different types of capital in production functions across sectors and types of firms.

In our study, we divided the sample into manufacturing and services sectors, and utilised a Levinsohn-Petrin estimator (Levinsohn and Petrin, 2003) with intermediate inputs as a proxy for productivity, accounting for potential collinearity issues using a correction proposed by Ackerberg et al. (2015). The estimation of total factor productivity is explained in detail in Appendix 8.1.2.

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[5] The social connectedness index is based on the intensity of social connections measured by the relative probability that two individuals across two countries are friends with each other on Facebook. The social connectedness index includes 185 countries. It excludes countries where Facebook is banned or only has a few active users.

3.2.2 Employee characteristics

The rich employment characteristics allow separate and detailed descriptive evaluations and are essential as control variables or for calculating the unexplained share of wage differences between the sexes. We examine whether and to what extent the employment structure of females in internationally active firms differs from those of domestic firms accounting for differences in demographic characteristics. In our analysis, we define an indicator variable for the gender that is one for female employees and zero for male employees.

For each employee, we distinguish between full-time and part-time employment relationships based on the information from the Integrated Wage and Income Tax Statistics. According to Statistik Austria, an employee works full-time if the employment exceeds 36 hours per week[6], else it is considered to work at least partial part-time. Weekly hours worked less than 30 hours per week are considered part-time. Based on this information, we define an indicator variable that is one if an employee worked most of the year part time and is zero otherwise.

To distinguish high-skilled and low-skilled employees, we generate an indicator variable that takes on the value one if the respective employee has a tertiary education degree and is zero otherwise. Further, we use educational occupations to account for occupational-specific characteristics. We use the International Standard Classification of Education (ISCED) to group individuals according to their field of highest educational attainment[7].

Additionally, information on the worker's age and work experience is considered in our analysis. The age variable is calculated based on the birth year of each individual. Only individuals aged between 15 and 65 who are in active and permanent employment are included in our sample[8]. To measure work experience, we use the information on the year of the highest educational degree, e.g. a high school diploma or bachelor's degree and subtract this from the actual year of the observation. We assume that the person subsequently worked after it obtained its degree. We correct the experience indicator by measurable disruptions from work like being unemployed[9]. Further, to account for the parenthood, particularly for female employees, we take into account whether the employee has at least one child. Particularly, we consider children of the age of 6 or younger since children in that age group require more care and supervision work, often done by women.

For the analysis of the wage, we use annual gross wages. The annual wage of an employee is her/his yearly net gross earnings from working, which is attributed to the main firms the

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[6] Note that we do not know the hours worked, we only have information about whether a person worked (mainly) full-time or (mainly) part-time in a year. On average in 2019, employees in part-time worked 18.3 hours per week (Statistik Austria, 2020).

[7] Details on this variable are provided in Appendix 8.1.5.

[8] The employee needs to work in a firm for at least 90 days and he/she is observed as well in previous or consecutive years in the sample. This adjustment allows to take employees leaving or entering the firm into account but excludes workers that are only employed for a short term, non-permanently.

[9] These correction possibilities are limited to the period from 2013 to 2021.

employee is working for[10]. The wage of each employee was adjusted to a yearly wage in case the extent of employment was less than 365 days (or 366 days in leap years). We differentiate between employees working full-time and part-time (i.e., less than 30 hours). Since information on the hours worked are disclosed, we unfortunately cannot estimate full-time equivalent wages.

Employment structure in Austrian firms

Based on this individual employee information, we can construct various indicators of the employment structure for each employer. We obtain the female employment share as percentage share of females among the total workforce of the firm. Moreover, we determine the part-time employment share, which indicates the proportion of part-time workers in relation to the total workforce of the firm. We further consider separately the fraction of males or females working part-time in relation to the total workforce of the firm.

Comparison of the AMDC matched employer-employee dataset with the employment information of the Central Association of Austrian Social Insurance Authorities

Many studies for Austria on gender inequality within the Austrian labour market are based on employment information provided by the Central Association of Austrian Social Insurance Authorities (Hauptverband der österreichischen Sozialversicherungsträger). The social insurance dataset encompasses all insurable employment contracts, this includes, among others, recipients of childcare benefits, civil service participants, freelancers or pensioneers working part-time, who are all excluded from our sample. The dataset comprises information on individuals and measures the proportion of female employees as the share of women among all insured employees, regardless of the employer. As the dataset from the Central Association of Austrian Social Insurance is based on insurable employment contracts, the dataset also covers short-term employment and employment in the public sector.

In contrast, the employment data used in this study as well as the extent of employment are sourced from the Integrated Wage and Income Tax Statistics, which can only be matched with available private sector firm information of the Statistical Business Register and the Structural Business Survey. Individuals with more than 10 employment contracts in a year are excluded from our analysis to obtain unbiased results. Further, only individuals aged between 15 and 65 are considered in our sample. Using the AMDC matched employer-employee dataset, we consider in our analysis only permanent and active employment relationships (minimum of 90 days employed and employment in the previous or subsequent year) in Austrian private firms. In our analysis, we include only firms with an annual turnover of at least 10,000 €, at least 10 observed employees and for with we observe at least 90% of all employees.

Note that the (sector-specific) aggregates of the statistics based on the social insurance dataset double count individuals that have more than one employer. To avoid this multiple counting of individuals, we concentrate on employment at the firm-level, and examine the employment share of women in Austrian firms.

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[10] See details on corrections of the net earnings in Appendix 8.1.4. A larger fraction of employees in Austria, particularly part-time employees, has multiple pay checks within a year. Further, the hours worked are not reported such that we cannot calculate hourly adjusted wages. Therefore, in most of our analyses, we consider only wages of employees working full-time.

Further, we assess the share of employees with a university degree, which represents the percentage of workers with a tertiary degree in the firm's total workforce. Similarly, we calculate the share of females with a university degree as the respective percentage of female workers with such qualifications among the total female employment in the firm.

Furthermore, we consider the share of employees with children aged 6 or younger, which represents the number of employees with young children relative to the total number of employees in the firm. Specifically, we focus on females with children aged 6 or younger and define the female employment share of employees with young children as the percentage of female workers with such family responsibilities among the total employment.

Lastly, we determine the average age of employees by calculating the mean age of the entire workforce within the firm.

4. Female employment in Austrian firms

Women are still underrepresented in many Austrian firms. Using the matched employer-employee dataset, we provide evidence on the role of internationally active Austrian firms for women's labour market participation and opportunities within firms. The analysis excludes the public sector and only considers active and permanent employment relationships.

4.1 Female labour market participation

We start with an analysis of the female employment share of Austrian firms in international markets. The female employment share is measured as the proportion of women in the total workforce in an Austrian private firm.

Table 4.1: Employment structure of Austrian firms

	Female share	Female share, full-time	Female share, part-time	Male share, part-time	University degree	Kids <=6 years	Average age	Female wage	Male wage
Domestic firms									
Mean	39.6	32.2	16.7	4.9	10.8	14.4	38.8	21,597.0	40,161.5
Standard deviation	25.4	24.6	16.0	7.4	17.4	8.3	5.0	15,491.4	25,728.8
Median	34.4	25.0	11.8	2.4	3.5	13.9	38.9	18,871.8	34,366.5
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	20.6	0.0	0.0
Maximum	100.0	100.0	97.0	78.9	100.0	75.0	56.5	644,476.1	667,688.3
Observations	68,892	68,892	68,892	68,892	68,892	68,892	68,892	68,793	68,785
Exporter									
Mean	31.9	25.5	11.0	3.1	10.4	15.3	40.0	25,328.8	47,907.3
Standard deviation	19.8	18.8	10.9	4.7	13.1	7.2	4.0	11,732.7	17,190.4
Median	26.8	20.0	7.7	1.6	6.0	15.0	40.3	24,410.9	45,366.8
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	22.9	0.0	0.0
Maximum	100.0	100.0	91.1	66.0	92.3	60.0	54.6	151,265.3	382,245.7
Observations	13,045	13,045	13,045	13,045	13,045	13,045	13,045	13,040	13,043
Importer									
Mean	35.5	28.9	13.1	3.3	9.2	14.8	40.1	25,227.6	47,721.4
Standard deviation	22.4	21.8	13.7	5.3	12.3	7.5	4.4	14,165.2	20,562.4
Median	29.9	22.2	8.7	1.5	5.3	14.4	40.4	23,424.3	44,306.1
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	21.1	0.0	0.0
Maximum	100.0	100.0	97.0	72.2	92.9	66.7	56.3	535,373.1	434,381.1
Observations	21,263	21,263	21,263	21,263	21,263	21,263	21,263	21,252	21,248
MNEs									
Mean	37.3	31.1	13.1	3.7	18.3	15.5	39.8	29,238.7	56,710.9
Standard deviation	22.5	21.7	13.4	5.9	20.2	7.2	4.5	18,143.5	31,499.8
Median	33.0	25.6	8.9	1.8	9.6	15.2	40.1	26,737.8	50,639.2
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	21.1	0.0	0.0
Maximum	100.0	100.0	97.0	78.9	100.0	60.0	55.3	644,476.1	581,853.8
Observations	20,482	20,482	20,482	20,482	20,482	20,482	20,482	20,469	20,477
All firms									
Mean	38.4	31.2	15.8	4.6	10.7	14.6	39.0	22,191.7	41,396.1
Standard deviation	24.8	23.9	15.4	7.1	16.8	8.1	4.9	15,018.0	24,730.4
Median	32.6	24.0	10.7	2.2	4.0	14.3	39.2	19,828.3	36,306.8
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	20.6	0.0	0.0
Maximum	100.0	100.0	97.0	78.9	100.0	75.0	56.5	644,476.1	667,688.3
Observations	81,937	81,937	81,937	81,937	81,937	81,937	81,937	81,833	81,828

Note: The group of domestic firms consists of firms that do not export and are no MNEs. The table shows unweighted statistics pooled across firms and time.
Source: AMDC, WIFO presentation.

Table 4.1 provides a summary statistic of the employment structure in Austrian firms according to their international activity. In the estimation sample, across all sectors and all firms, on

average around 38% of the workforce are females. Domestic enterprises tend to have on average a higher proportion of women in their workforce than exporters, importers, or multinationals. The median share of women working full-time is 24% across all sectors and all firms. For domestic firms, we observe a significantly higher mean and median share of employees working part-time compared to international firms[11]. The mean of the share of employees with young children is with a share of around 15% significantly higher in international firms compared to domestic firms. However, the medians do not display significant difference in the proportion of employees with children aged 6 or younger in the total workforce between domestic and international firms. The age structure of employees in Austrian firms shows an ageing workforce, with the average age of the workforce in Austrian firms being 39 years. Men earn on average in all sectors significantly more than females.

Table 8.1 in the Appendix provides a detailed summary statistic of the employment structure of Austrian manufacturing firms. The low representation of females among the workforce is particularly present in the Austrian manufacturing sector. In the manufacturing sector, the employment share of women is particularly low. The mean female employment share in manufacturing is 32%, while the median is around 24%. The median of the female share of employees working full-time in the manufacturing sector is 18%. The median of the female share of employees working full-time in the manufacturing sector for exporters is with 17% around 1.5 percentage points lower than the employment share of females working full-time in non-exporting firms.

Nevertheless, focusing only on measures of centrality might not be sufficient since – as the summary statistics indicate by the differences in means and medians – the distribution of the female employment share in Austrian firms is skewed and differs across international activities[12]. The distribution of the female employment share in Austrian firms across firms that are purely domestic, export, import or are multinationals is illustrated in Figure 4.1. Indeed, the distribution of the female employment shares differs significantly when comparing international and domestic firms.

For purely domestic firms, the graph displays two peaks. The first peak occurs at a female employment share of 13%, with approximately 20% of firms falling within this range. This suggests that a significant proportion of domestic firms has a relatively low female representation in their workforce, with only a small fraction of firms exhibiting a higher female employment share. The second peak occurs around 68% of the female employment share, but with a smaller proportion of firms, around 12%. This suggests that there is a subset of domestic firms with a relatively high female employment share.

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[11] Note that due to distributional properties and data imperfections, the full-time and part-time employment shares do not need to add up across firms. The arithmetic mean and the median of the proportion of female employees must be smaller than the sum of the proportion of women in full-time and part-time work (and greater than or equal to the individual values of the proportion of women in full-time and part-time work), with an increasing (or constant) standard deviation.

[12] The distribution of the proportion of women is left-skewed, which means that it has many low values, and also has a high standard deviation and a wide range from 0 to 100.

Figure 4.1: Distribution of the female share by different international activities
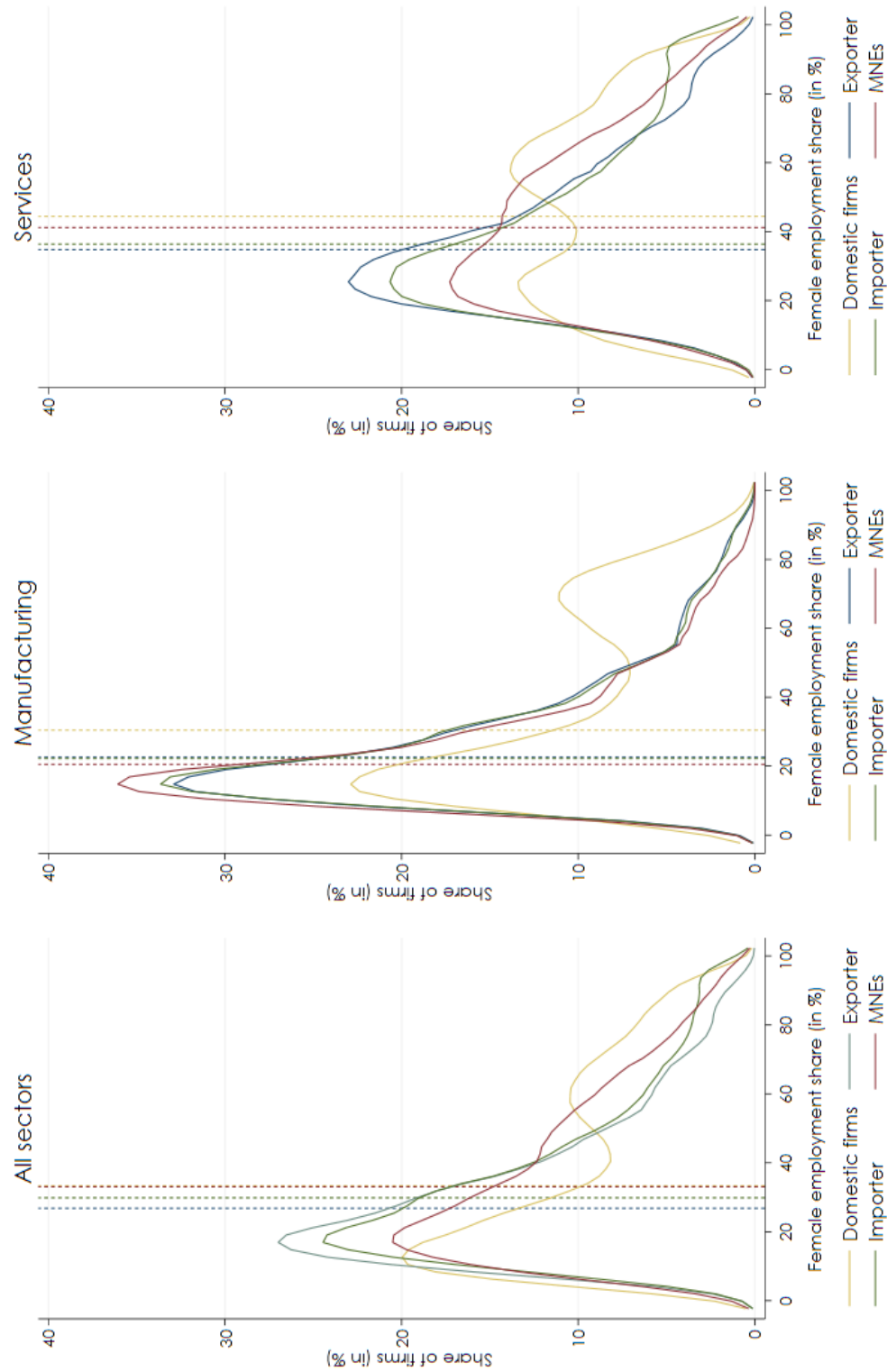
Note: The median of the respective distribution is indicated by the dashed line in the corresponding colour. The graphs show unweighted statistics pooled across firms and time.
Source: AMDC, WIFO presentation.

WIFO

For exporters, the graph shows a single peak at around 18% of the female employment share, with a larger share of firms, around 27%. This peak suggests that, compared to domestic firms, a larger proportion of exporters have a moderate level of female representation in their workforce. The distribution of the female employment share for exporters is skewed to the left, indicating that there are relatively fewer firms with very high female employment shares compared with the distribution for domestic firms. The distributions for importers and multinationals are similar to those for exporters.

The share of women in Austrian private companies is significantly higher in the services sector than in manufacturing or construction. This is true for to exporting, importing and multinational companies as well as domestic firms. In general, despite the wide variation of the female employment share among firms, in the services industries are more firms with higher female employment shares. This is dominated by high female employment shares in tourism and hotels and restaurants and real estate. In particular, there are more domestic enterprises with a higher share of female employment in the services sector. It should be noted, however, that exports and imports of services are not measured by Intra- and Extrastat, which could lead to lower female shares for internationally active enterprises and slightly biased results for the services sector.

Nonetheless, this suggests that, while there are differences between companies, enterprises with international competition have more moderate levels of female employment. Nevertheless, efforts are needed to increase gender diversity among domestic firms, exporters, importers and multinationals, especially in the manufacturing sector.

4.1.1 Firm-to-firm comparison of the female employment share

The female employment share within private sector firms is influenced by various firm characteristics, such as firm size, productivity and sector, which may also affect the participation in international markets. As shown in Table 4.2, exporters and importers are typically larger and more productive compared to domestic firms. It is therefore crucial to take these firm-specific factors into account when comparing domestic enterprises, exporters, importers and multinationals. Furthermore, as can be seen in Table 4.2, in addition to being larger and more productive, MNEs are also much more deeply integrated into global value chains, as evidenced by higher export and import shares compared to only exporting or importing enterprises.

In order to compare the share of female employment in international and domestic enterprises, it is necessary to take into account the factors that determine a firm's status as an exporter, importer or multinational enterprise. Propensity score matching allows such a comparison of the female employment share across firms, independent of firm characteristics such as size, productivity and sector. Propensity score matching is a statistical technique that creates balanced comparison groups of firms by estimating the propensity score, which represents the probability of a firm belonging to a particular group (e.g. exporter, importer, MNE) based on observed characteristics. Thus, propensity score matching compares an international firm to a domestic firm with similar characteristics in all other respects (except international status), i.e. the creation of comparison groups allows an "apples to apples" comparison. The propensity

score matching technique hence allows us to isolate the effect of being an exporter, importer or MNE on the female employment share from the influence of firm-specific factors, and the potential bias caused by different firm characteristics is minimised. We match internationally active firms to at least one similar domestic counterpart according to their size (measured by the logarithm of the number of full-time equivalent employees), their total factor productivity (estimated as described in Chapter 3.2.1), their market potential (measured by the logarithm of annual sales), their age and their sector of activity at the 2-digit NACE level[13]. The international enterprise is then always compared with its domestic counterpart, i.e. exporters are compared with a counterfactual group of similar non-exporters, importers with a reference group of similar non-importers and MNEs with a counterfactual group of similar purely domestic enterprises.

Table 4.2: Summary of characteristics of Austrian firms

	(log) Exports	(log) Imports	(log) Number of employees	(log) Sales	(log) Inter-mediates	(log) Capital stock	Age
Domestic firms							
Mean	0.0	8.0	3.5	8.4	7.7	7.9	27.0
Standard deviation	0.6	7.6	0.9	1.4	1.5	1.5	21.7
Median	0.0	13.0	3.3	8.2	7.5	7.7	22.0
Minimum	0.0	0.0	2.3	-5.1	-0.1	-1.2	2.0
Maximum	19.3	21.8	10.1	17.3	15.2	15.9	156.0
Observations	11,840	20,202	68,892	68,660	68,745	68,298	68,892
Exporter							
Mean	15.7	13.2	4.1	9.6	9.4	8.9	28.2
Standard deviation	1.7	5.8	1.2	1.5	1.5	1.5	17.0
Median	15.6	15.2	3.9	9.5	9.3	8.7	25.0
Minimum	4.1	0.0	2.3	-5.0	1.9	0.6	2.0
Maximum	22.0	22.2	9.1	15.8	15.9	14.8	156.0
Observations	13,045	12,488	13,045	13,045	13,045	12,972	13,045
Importer							
Mean	10.2	15.3	4.0	9.6	9.2	8.6	28.6
Standard deviation	7.8	1.5	1.1	1.3	1.4	1.4	18.1
Median	14.6	15.2	3.7	9.4	9.1	8.3	25.0
Minimum	0.0	7.5	2.3	-0.7	1.4	-0.3	2.0
Maximum	22.0	22.2	9.3	15.8	15.5	15.9	156.0
Observations	16,563	21,263	21,263	21,251	21,263	21,133	21,263
MNEs							
Mean	9.4	11.4	4.2	9.5	9.2	8.7	26.8
Standard deviation	8.2	7.3	1.3	1.8	1.8	1.8	17.5
Median	14.3	15.1	3.9	9.5	9.1	8.5	23.0
Minimum	0.0	0.0	2.3	-5.1	0.0	1.5	2.0
Maximum	22.0	22.2	10.1	17.3	15.9	15.9	156.0
Observations	11,357	14,116	20,482	20,320	20,391	20,198	20,482
All firms							
Mean	8.3	10.0	3.6	8.6	8.0	8.0	27.2
Standard deviation	7.9	7.4	1.0	1.5	1.6	1.5	21.0
Median	13.2	14.1	3.3	8.4	7.8	7.8	22.0
Minimum	0.0	0.0	2.3	-5.1	-0.1	-1.2	2.0
Maximum	22.0	22.2	10.1	17.3	15.9	15.9	156.0
Observations	24,885	32,690	81,937	81,705	81,790	81,270	81,937

Note: The group of domestic firms consists of firms that do not export and are no MNEs. The table shows unweighted statistics pooled across firms and time.
Source: AMDC, WIFO presentation.

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[13] To obtain the propensity scores, we apply a logit model. All international firms are matched to at least one domestic firm with a difference in propensity scores of less than 0.03. The obtained matches satisfy the necessary overlap assumptions and the balancing conditions of the propensity score matching technique. The sample after propensity score matching contains only matched firm pairs, which leads to a reduction in sample size.

Table 4.3 shows in detail the estimated average treatment effects of the treated of exporting, importing and being an MNE on the female employment share, the employment share of females working full-time and the employment share of females working full-time with children aged 6 or younger. The average treatment effect of the treated is the result of the propensity score matching and measures the average treatment effect among those firms that are internationally active and those firms in the reference group with similar characteristics that are not internationally actives. The average treatment effect measures thus the average difference in outcomes after propensity score matching between firms with similar characteristics of which one is exposed to international competition and one not. The difference in percentage points in the respective female employment share can therefore be attributed to the international status of the firm.

Table 4.3: Average treatment effects of international firms compared to domestic firms

		Manufacturing			Services		
		(1) Female share	(2) Female share, full-time	(3) Female share, full-time, kids <=6 years	(4) Female share	(5) Female share, full-time	(6) Female share, full-time, kids <=6 years
Exporter	ATE	2.336***	2.417***	0.565	-3.353***	-3.649***	0.572
	SE	(0.526)	(0.450)	(0.254)	(0.918)	(0.916)	(0.581)
	OBS	26,413	26,412	24,657	78,767	78,739	75,302
Importer	ATE	1.385**	1.518***	-1.042***	-2.026***	-1.557**	0.615
	SE	(0.643)	(0.553)	(0.228)	(0.713)	(0.710)	(0.398)
	OBS	26,412	26,411	24,657	78,777	78,749	75,311
MNEs	ATE	1.326	2.626**	0.476	2.984***	3.851***	0.421
	SE	(1.030)	(1.078)	(0.458)	(0.425)	(0.453)	(0.195)
	OBS	26,413	26,412	24,657	78,777	78,749	75,311

Note: ATE = Average treatment effect; SE = Standard error; OBS = Observations. Robust standard errors clustered at the firm-level in parentheses. *, ** and *** indicate statistical significance at the 10%-, 5%- and 1%-level, respectively.
Source: AMDC, WIFO presentation.

On average, manufacturers that export have a 2.3 percentage point higher female employment share than similar non-exporting firms (Table 4.3, column (1)). Figure 4.2 and Figure 4.3 show the distribution of the outcomes of the female employment share after adjusting for firm characteristics using propensity score matching, for exporters, importers and MNEs compared to their domestic counterparts in the manufacturing sector and in the services sector, respectively. These figures illustrate how the average treatment effect varies across sectors and type of international activity. Note that as result of the adjustment based on firm characteristics, the box plots in these figures exhibit a slightly different distribution than shown in the summary statistic before. Figure 4.2, panel (a), illustrates that exporters in the manufacturing sector have a higher female share than comparable firms that do not export across the entire range of observations. Importers have, on average, a 1.4 percentage point higher female employment share compared to similar firms that do not import (Table 4.3, column (1)). After propensity score matching, the estimated median female employment share of importing firms in the manufacturing sector is 23%, which is around 3 percentage points higher than the median female employment share of non-importing firms (Figure 4.2 , panel (a)). MNEs in the manufacturing sector have on average a 1.3 percentage point higher female employment share and even a 2.6 percentage point higher female full-time employment share (Table 4.3, column (1) and column (2)). Looking at a particularly vulnerable group of

employees, specifically females with children aged 6 years or younger (Table 4.3, column (3) and column (6), and Figure 4.2, panel (c)), reveals that while there is a minor inclination of around 0.5 percentage points for exporters and MNEs to have a higher proportion of women working full-time despite having young children, there is no significant difference in the full-time employment share of women with young children compared to domestic enterprises. In contrast, in importing manufacturing firms the average proportion of women having young children working full-time is around 1 percentage point lower than in non-importing manufacturing firms.

The services sector in Table 4.3 (column (4) to column (6)) and Figure 4.3, however, reveals a different picture when comparing similar firms and considering only exports and imports of goods. Exporters and importers in the services sector have a significantly lower female employment share (Table 4.3, column (4) and Figure 4.3, panel (a)). Compared to non-exporters, exporters in the services sector have on average a 3.6 percentage point lower female share and importers compared to non-importers a 2.0 percentage point lower one. In contrast, MNEs have a 2.9 percentage point higher female employment share than purely domestic firms. However, this is mainly due to the high proportion of women working part-time in the services sector. Looking at women working full-time (Table 4.3, column (5) and Figure 4.3, panel (b)), the discrepancy between importers and non-importers becomes smaller (although still significant). Comparing the female employment share of women working full-time with children aged 6 or younger in Table 4.3, column (6) and Figure 4.3, panel (c), there is a tendency for higher shares in international enterprises of around 0.5 percentage points.

Thus, international competition seems to increase women's participation in the labour market, particularly in manufacturing. More women work full-time in manufacturing than in comparable firms operating only domestically. Furthermore, although the average difference in the average employment share of women with young children in manufacturing and services is small, it is economically significant because the distributions of the female share of full-time working women with children aged 6 or younger in Figure 4.2, panel (c) and Figure 4.3, panel (c) are wider in international firms and more women with young children have the opportunity to work full-time in international firms. This suggests a greater flexibility for employees despite higher flexibility demands from international firms.

In order to shed light on the impact of the flexibility requirements of international firms, we now look at various indicators of the flexibility requirements of international firms and the flexibility requirements of employees in terms of part-time work.

Figure 4.2: Female shares for comparable firms by international activities in the manufacturing sector
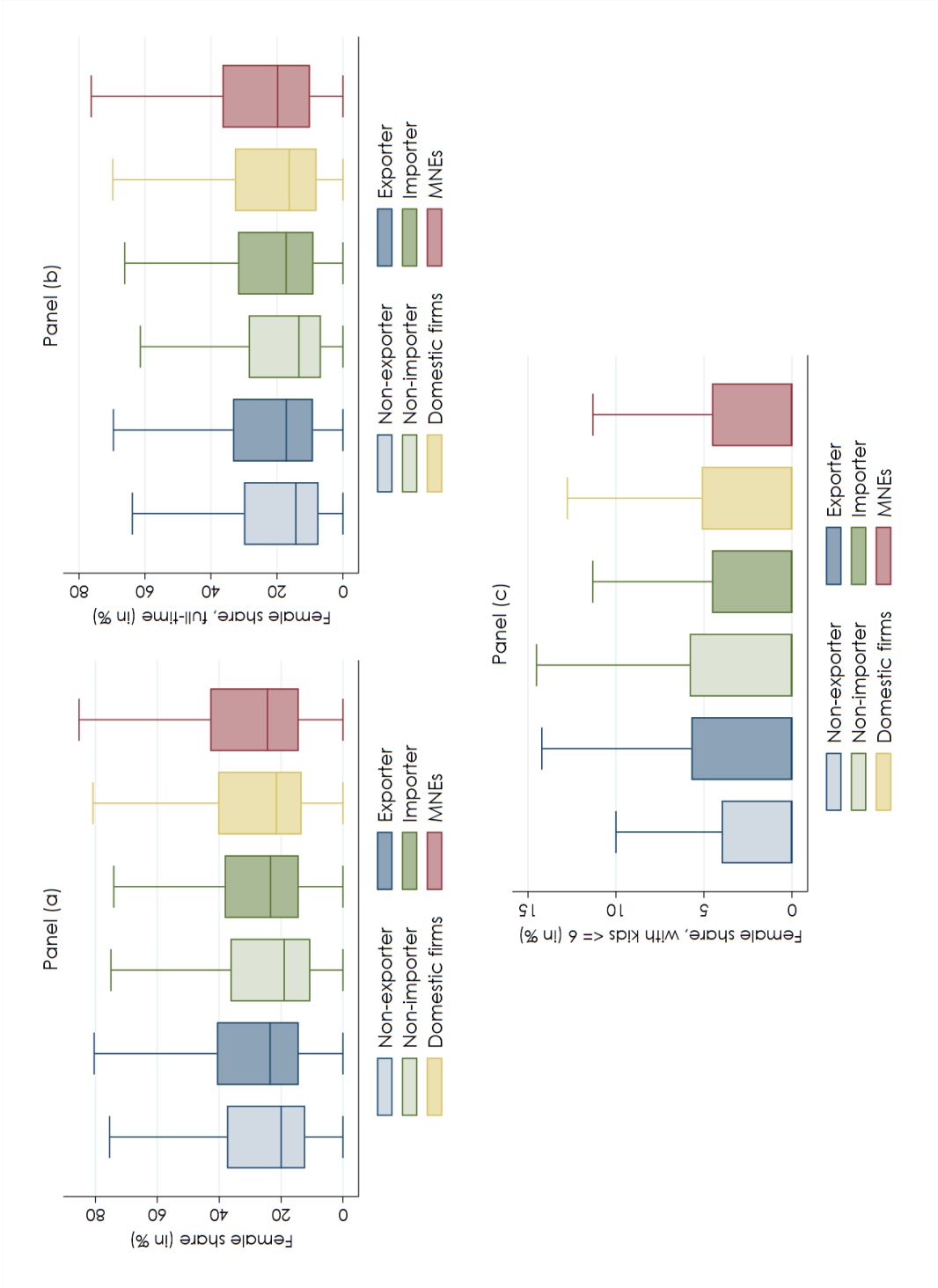
Note: Outliers excluded. Distribution of the potential outcome of the female employment share by firm, differentiated by international activity using propensity score matching.
Source: AMDC, WIFO presentation.

WIFO

Figure 4.3: Female shares for comparable firms by international activities in the services sector
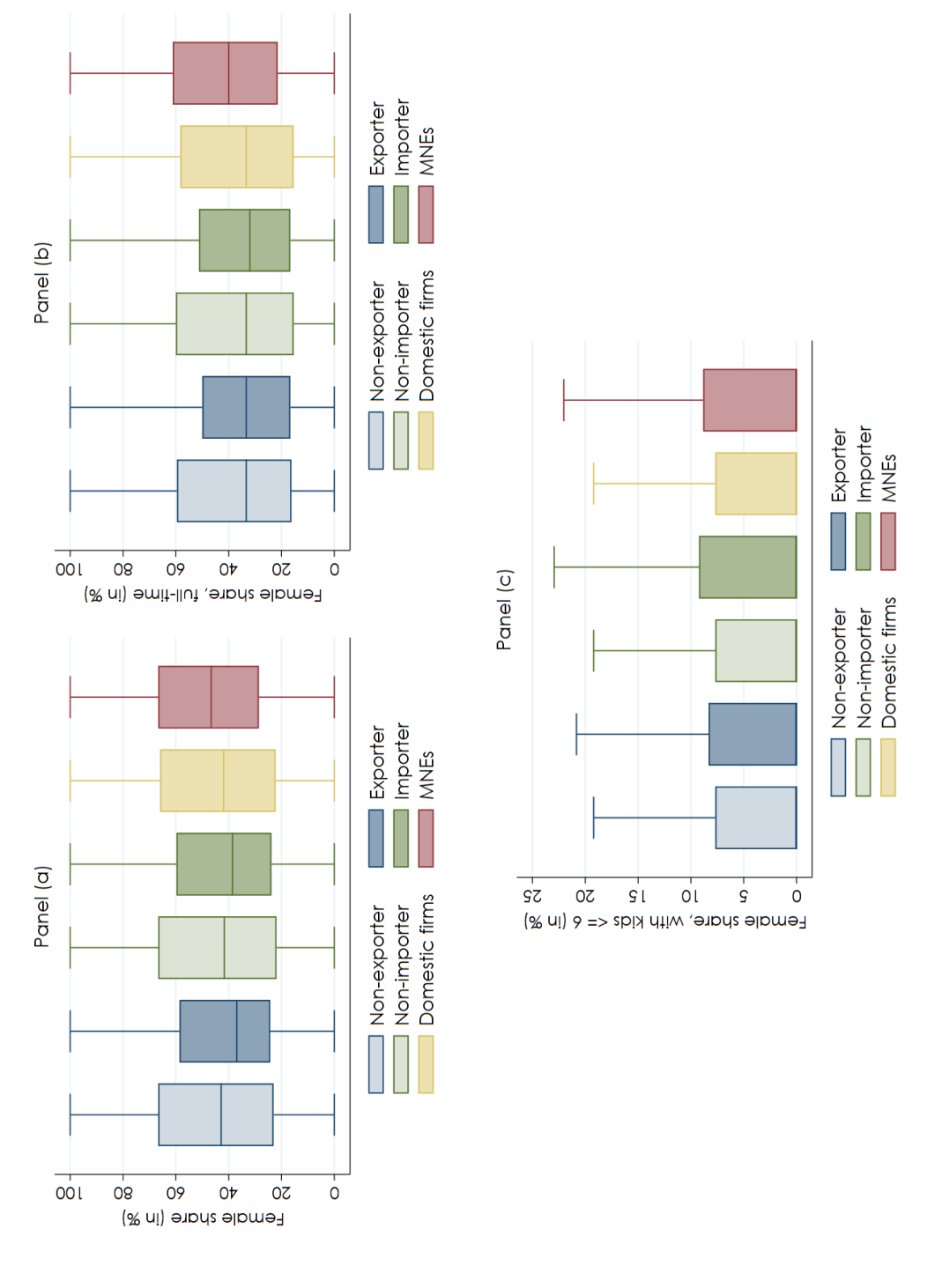
Note: Outliers excluded. Distribution of the potential outcome of the female employment share by firm, differentiated by international activity using propensity score matching.
Source: AMDC, WIFO presentation.

4.1.2 Female employment and flexibility demand by international firms

As outlined in Chapter 2 of the study, international firms, often operate across different time zones, markets, and cultures, requiring employees who are able to organise their work flexibly and respond quickly to diverse situations and demands. This flexibility covers various aspects, including working outside regular business hours, frequent travel, and effective interpersonal skills. Working outside typical business hours entails employees modifying their schedules to accommodate communication with clients, suppliers, or partners located in other countries. In this chapter, we analyse the impact of firms that trade with distant trade partners, with partners in different time zones and with distant cultures (see Chapter 3.2.1 for more details). For this analysis, we consider only the manufacturing sector as the majority of trade in goods takes place in this sector. We use propensity score techniques to create similar reference groups for firms that might have higher flexibility demands, i.e. have distant trade partners, trade across time zones and with socially distant cultures[14]. After propensity score matching, the remaining difference in firm characteristics between the two comparison groups of firms is the international status of the firm and their related high flexibility requirements.

Table 4.4: Average treatment effects of manufacturing exporters and importers with higher flexibility demand on female employment shares

		(1) Female share	(2) Female share, full-time	(3) Female share, full-time, kids <=6 years
+/- 4h exporter	ATE	2.140***	2.446***	0.023
	SE	(0.541)	(0.462)	(0.251)
	OBS	26,413	26,412	24,657
>1,200 km exporter	ATE	4.184**	5.042***	-0.581**
	SE	(2.113)	(1.830)	(0.291)
	OBS	26,413	26,412	24,657
Socially distant exporter	ATE	2.788***	2.572***	0.288
	SE	(0.383)	(0.378)	(0.249)
	OBS	16,388	16,388	15,778
+/- 4h importer	ATE	1.657***	1.379**	-1.028***
	SE	(0.553)	(0.640)	(0.236)
	OBS	26,412	26,411	24,657
> 1,200 km importer	ATE	1.296	1.311	-0.695
	SE	(0.824)	(1.162)	(0.804)
	OBS	26,413	26,412	24,657
Socially distant importer	ATE	4.258***	3.620***	-1.012***
	SE	(0.354)	(0.340)	(0.244)
	OBS	17,250	17,249	16,558

Note: ATE = Average treatment effect; SE = Standard error; OBS = Observations. Robust standard errors clustered at the firm-level in parentheses.*, ** and *** indicate statistical significance at the 10%-, 5%- and 1%-level, respectively.
Source: AMDC, WIFO presentation.

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[14] To obtain the propensity scores, we apply a logit model to estimate the likelihood of a firm being a international active firm with potentially higher flexibility demands controlling for the firm's size (measured by the logarithm of the number of full-time equivalent employees), total factor productivity (estimated as described in Chapter 3.2.1), market potential (measured by the logarithm of annual sales), age and sector of activity at the 2-digit NACE level. All international firms are matched to at least one domestic firm with a difference in propensity scores of less than 0.03. The obtained matches satisfy the necessary overlap assumptions and the balancing conditions of the propensity score matching technique. The sample after propensity score matching contains only matched firm pairs, which leads to a reduction in sample size.

Table 4.4 shows the estimated average treatment effects of the treated for exporters and importers with high flexibility requirements on the female employment share, the employment share of females working full-time and the employment share of women working full-time with children aged 6 or younger. We compare exporting or importing firms that export or import to destinations with an average time difference of at least four hours with similar non-exporting firms or non-importing firms, respectively. Further, we compare exporting or importing firms that export or import mainly from distant destinations to similar non-exporting or non-importing firms, respectively. Additionally, we compare firms that import or export mainly from socially distant countries with similar non-exporting and non-importing firms, respectively. The difference in the female employment share can therefore be attributed to the different flexibility demands of the international trading firm.

Exporters with trade partners with an average time difference of at least four hours have on average a 2.4 percentage point higher employment share of females working full-time than comparable non-exporting firms. Exporters that trade mainly with partners more than 1,200 km away, in contrast, have a 5 percentage point higher employment share of females working full-time, i.e. an employment share of females working full-time that is 2.6 percentage points[15] higher than exporters with closer destinations. Travel requirements and complex trade operations seem to require more flexible full-time employees compared to non-exporting counterparts. Exporters with such requirements also have a 0.6 percentage point significant lower employment share of females working full-time with young children compared to comparable domestic firms and other exporters.

Firms with potentially higher flexibility demand, no matter if importer or exporter, have a significant higher female employment share than comparable similar domestic firms (see Table 4.4 and Figure 4.4 for exporters and Figure 4.5 for importers). Firms with higher time flexibility requirements, i.e. exporters and importers trading with partners with a time difference of more than 4 hours, do not differ significantly from exporters or importers in general. For importers, as shown in Figure 4.5, panel (b), the effect of sourcing from distant origins is not significantly different from other importers.

Exporters that trade a lot with socially distant partners, i.e. those that often have higher gender inequality, have a 2.8 percentage point higher share of women than comparable domestic enterprises. However, they are not significantly different from other exporting enterprises. Importers that source from socially distant countries have a 4.3 percentage point higher share of women, but this is mainly due to a higher share of women working part-time. Such firms also have a significantly lower share of women with young children working full-time (-1.0 percentage point) than comparable domestic firms. Social distance and the associated higher inequality in the country of origin could, thus, lead to some labour market discrimination against women, while exporting to such destinations could mitigate this negative effect.

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[15] This is given by the difference of the ATE for all exporters shown in Table 4.3 and the ATE for distant exporters, i.e. 5.042 minus 2.417.

Figure 4.4: Female shares for comparable firms by exporting activities shaping flexibility demands
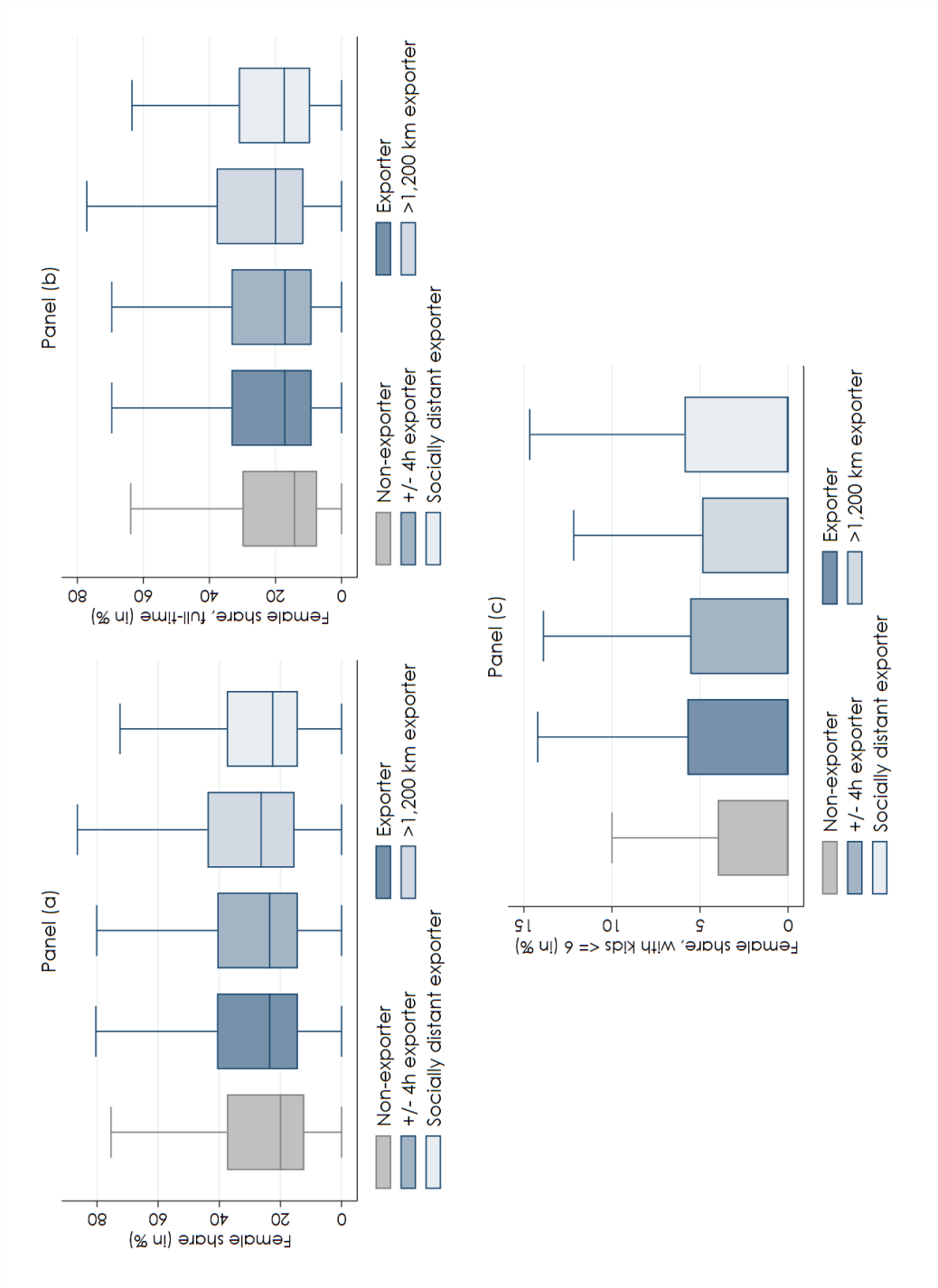
Note: Outliers excluded. Distribution of the potential outcome of the female employment share by firm, differentiated by international activity using propensity score matching. Manufacturing sectors only.
Source: AMDC, WIFO presentation.

WIFO

Figure 4.5: Female shares for comparable firms by importing activities shaping flexibility demands
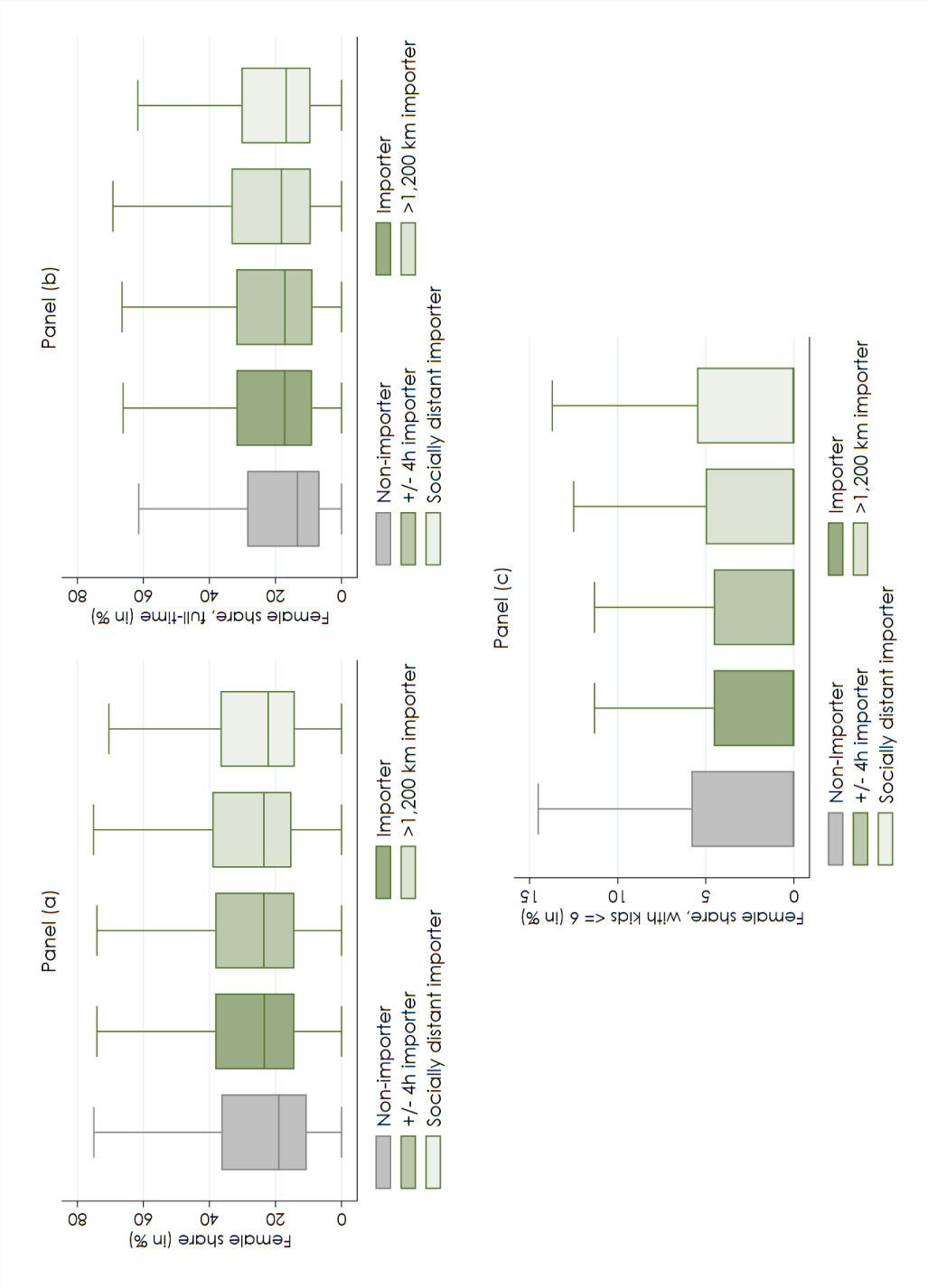
Note: Outliers excluded. Distribution of the potential outcome of the female employment share by firm, differentiated by international activity using propensity score matching. Manufacturing sectors only.
Source: AMDC, WIFO presentation.

WIFO

4.1.3   Female employment and part-time work schemes

Part-time work is widespread among female employees, especially among female employees with young children. In this chapter, we focus on part-time work in Austrian private sector firms. Figure 4.6 shows the distribution of part-time work across Austrian firms in all sectors (panel a), the manufacturing sector (panel b) and the services sector (panel c).

These distribution graphs show that, in general, domestic enterprises have a relatively high share of part-time workers. This is the case for both services and manufacturing. In general, the share of part-time workers is higher in services than in manufacturing. In all sectors, the distributions for exporting firms, importing firms and MNEs are much more skewed to the left, i.e. international enterprises have a high proportion of firms with a relatively low share of part-time employees. For international enterprises, the median share of part-time employees is around 12%, while for enterprises that focus only on the domestic market, the median share of part-time employees is 17%. Part-time working is particularly common in domestic firms in the services sector. On average more than three quarter of the part-time working employees are females, regardless of whether they work for a national or an international firm (see Table 4.1).

As before, the use of propensity score matching techniques allows for a more sophisticated comparison between internationally active firms and similar domestic firms[16]. Propensity score matching equalises the comparison groups and firms can be compared regardless of their size, productivity, and other firm characteristics. In the following, we only consider the manufacturing sector, as most cross-border trade of goods takes place in the manufacturing sector. Table 4.5 shows the corresponding estimated average treatment effects of the treated for international firms.

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[16] To obtain the propensity scores, we apply, as before, a logit model to estimate the likelihood of a firm being an internationally active firm controlling for the firm size (measured by the logarithm of the number of full-time equivalent employees), total factor productivity (estimated as described in Chapter 3.2.1), market potential (measured by the logarithm of annual sales), age and sector of activity at the 2-digit NACE level. All international firms are matched to at least one domestic firm with a difference in propensity scores of less than 0.03. The obtained matches satisfy the necessary overlap assumptions and the balancing conditions of the propensity score matching technique. The sample after propensity score matching contains only matched firm pairs, which leads to a reduction in sample size.

Figure 4.6: Distribution of the part-time employment share by different international activities of firms
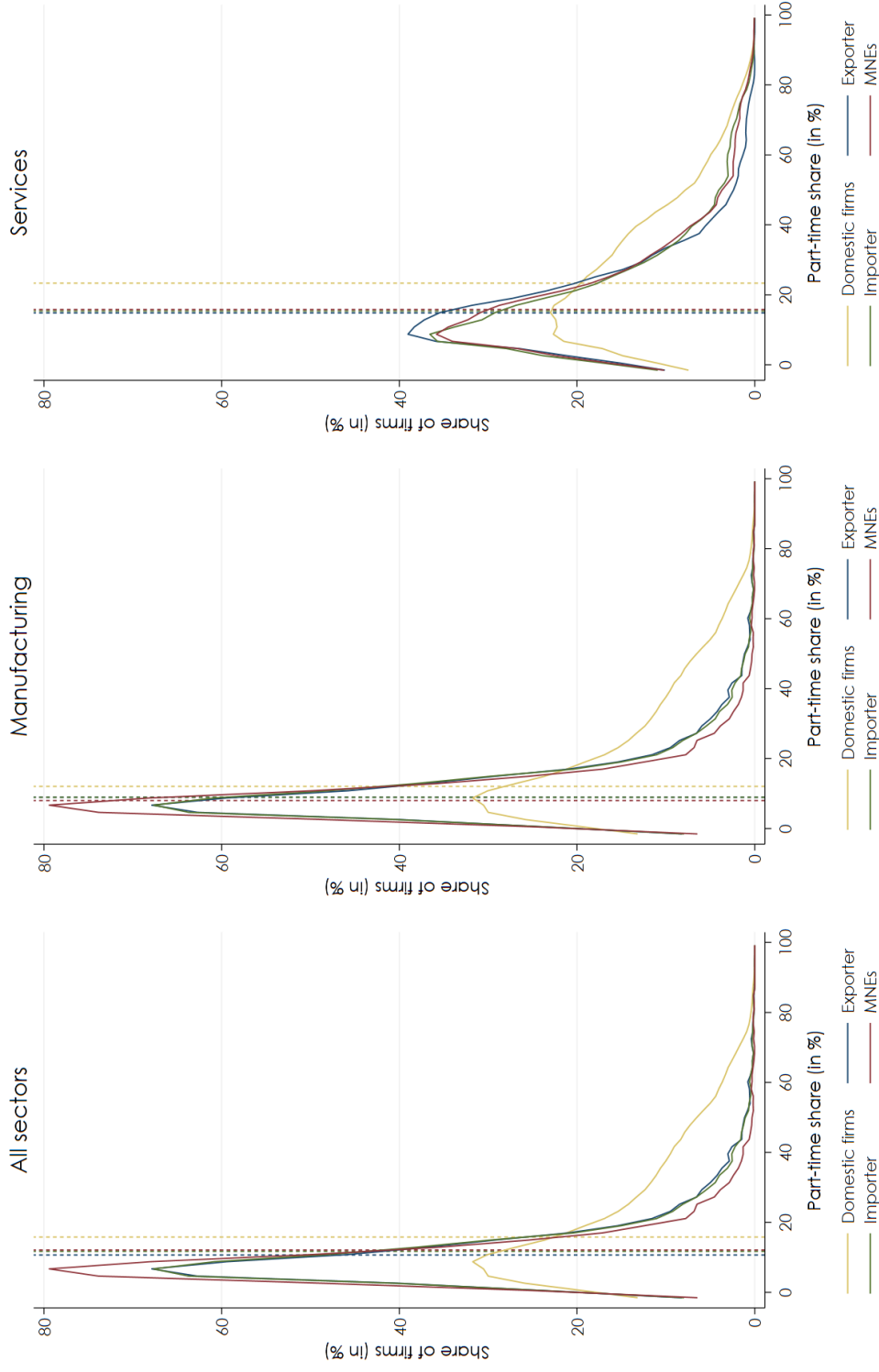
All sectors

Manufacturing

Services

Note: The median of the respective distribution is indicated by the dashed line in the corresponding colour. The graphs show unweighted statistics pooled across firms and time.
Source: AMDC, WIFO presentation.

WIFO

Table 4.5 in connection with Figure 4.7 reveal that the difference in the part-time employment share is rather driven by size, productivity, and other firm characteristics than the exporter or importer status. However, MNEs have a 2.8 percentage point lower part-time employment share compared to purely domestic firms, driven by a 2.1 percentage points lower share of female part-time employees.

Table 4.5: Average treatment effects of manufacturing firms with higher flexibility demand on part-time work

		(1) Part-time share	(2) Part-time share, female	(3) Part-time share, male
Exporter	ATE	0.132	-0.006	0.137
	SE	(0.427)	(0.341)	(0.160)
	OBS	26,412	26,413	26,413
Importer	ATE	-0.355	-0.350	-0.005
	SE	(0.386)	(0.270)	(0.227)
	OBS	26,412	26,412	26,412
MNEs	ATE	-2.816***	-2.082***	-0.734***
	SE	(0.349)	(0.315)	(0.154)
	OBS	26,413	26,413	26,413
+/- 4h exporter	ATE	-0.143	-0.139	-0.003
	SE	(0.429)	(0.341)	(0.162)
	OBS	26,413	26,413	26,413
> 1,200 km exporter	ATE	-0.613	-0.337	-0.276
	SE	(1.236)	(1.220)	(0.173)
	OBS	26,413	26,413	26,413
Socially distant exporter	ATE	0.605**	0.616***	-0.012
	SE	(0.253)	(0.195)	(0.127)
	OBS	16,388	16,388	16,388

Note: ATE = Average treatment effect; SE = Standard error; OBS = Observations. Robust standard errors clustered at the firm-level in parentheses. *, ** and *** indicate statistical significance at the 10%-, 5%- and 1%-level, respectively.
Source: AMDC, WIFO presentation.

In addition, we analyse whether the flexibility requirements of exporting and importing firms have an impact on the share of part-time employees in the firm. Intuitively, higher flexibility requirements, especially in terms of time differences and distance, might require more flexible full-time employees. This is shown in Table 4.5 and Figure 4.8 by a slight decrease in the share of part-time employment for firms that export[17] to partners with a time difference of more than 4 hours or located more than 1,200 km away. However, neither trade with partners with a time difference of more than 4 hours nor trade with distant trade partners have a significant reducing effect on part-time work. Interestingly, trading with socially distant partners, i.e. mainly with trading partners with high inequality, is associated with a 0.6 percentage point higher part-time rate for women. Such firms may be less able to discriminate against women because of the interpersonal skills needed for intercultural communication. Furthermore, with trade partners who might have a more traditional view of women's roles, part-time working schemes might also be less of an obstacle in doing business with socially distant partners.

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[17] The impact of different import origins (not shown) is similar to the impact of different export destinations on the part-time employment share.

Figure 4.7: Part-time shares for comparable firms by international activities of firms
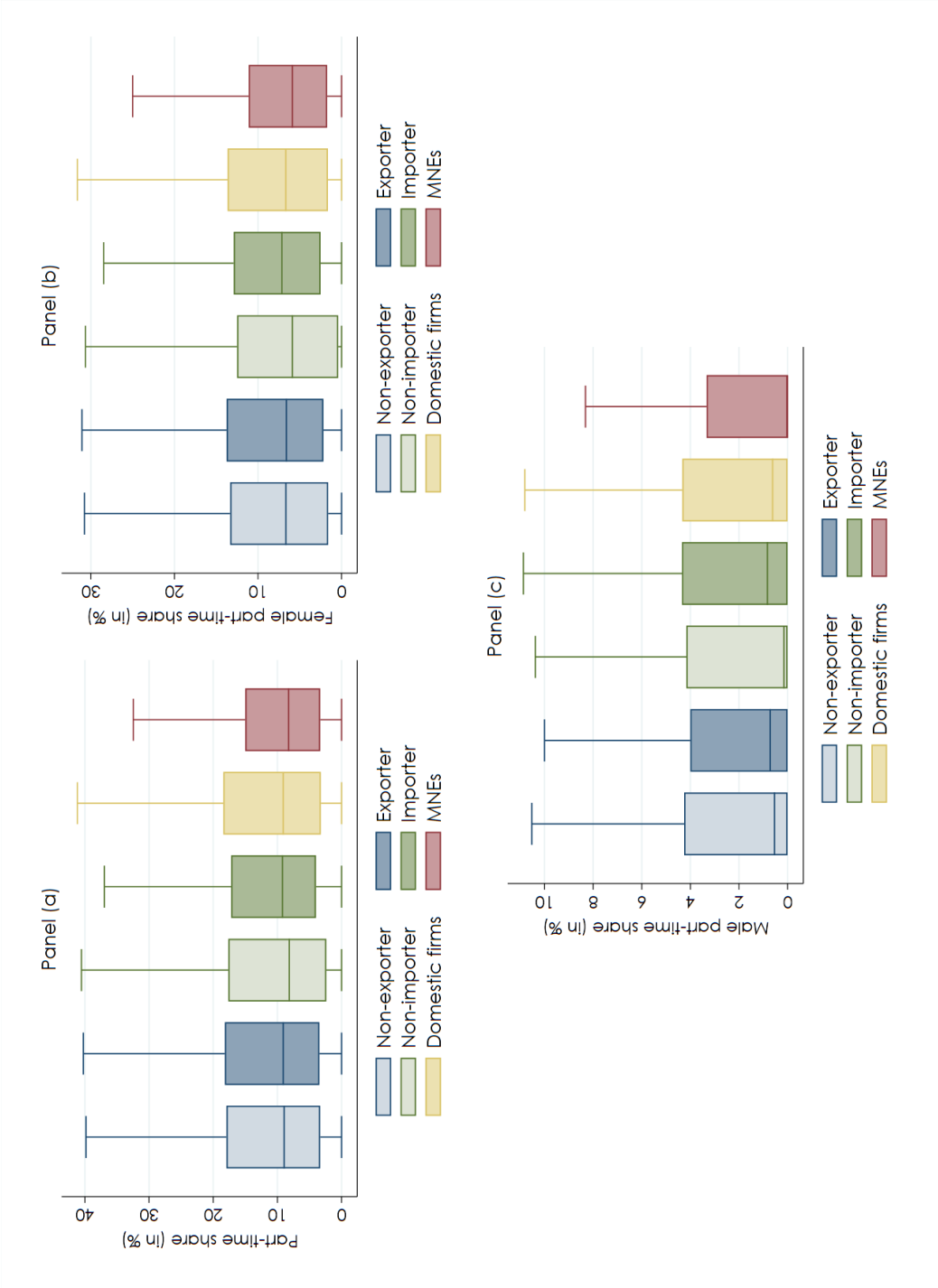
Note: Outliers excluded. Distribution of the potential outcome of the female employment share by firm, differentiated by international activity using propensity score matching. Manufacturing sectors only.
Source: AMDC, WIFO presentation.

WIFO

Figure 4.8: Part-time shares for comparable firms by exporting activities shaping flexibility demands
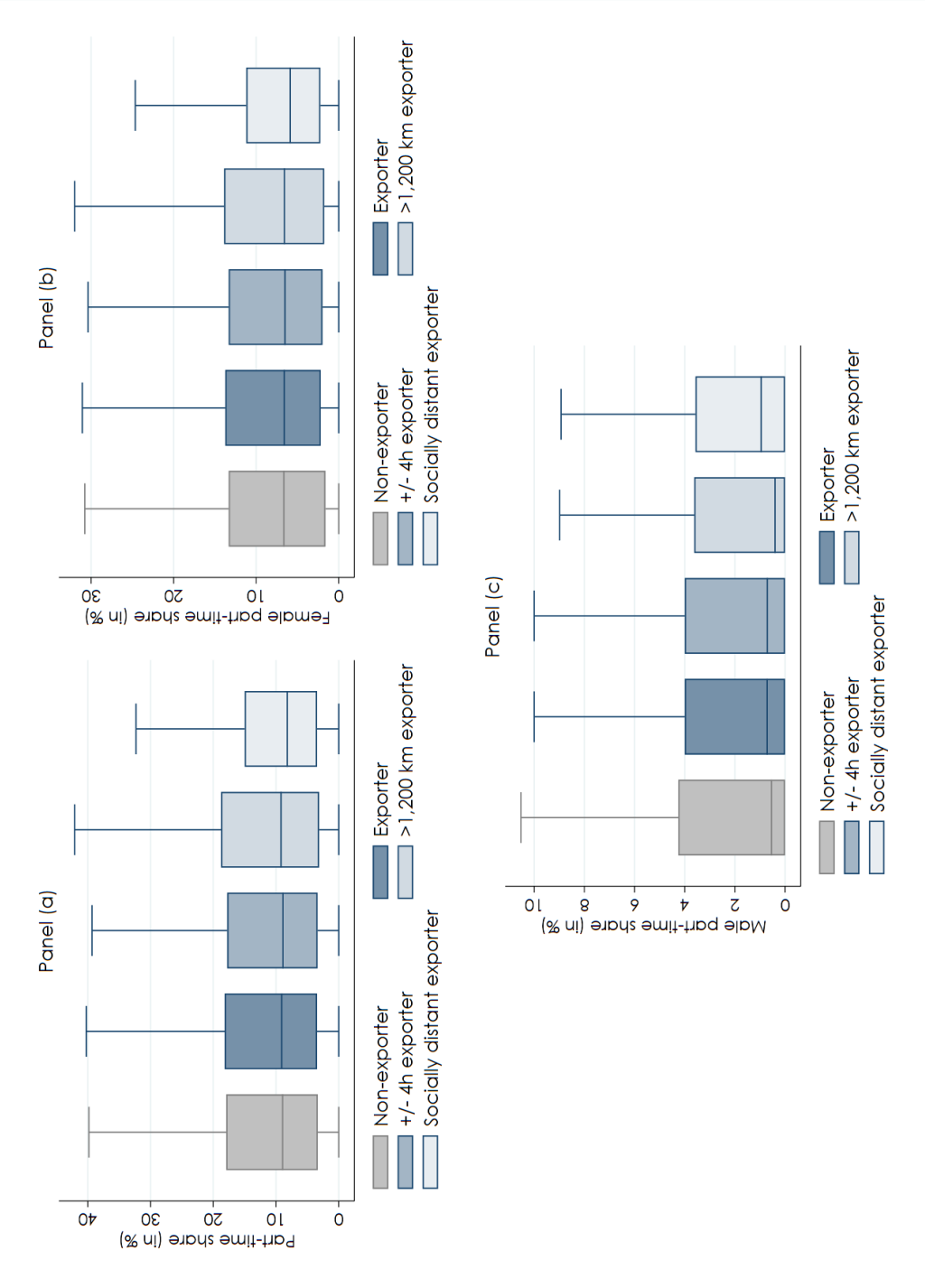
Note: Outliers excluded. Distribution of the potential outcome of the female employment share by firm, differentiated by international activity using propensity score matching. Manufacturing sectors only.
Source: AMDC, WIFO presentation.

WIFO

4.1.4 Determinants of the female employment share

To further analyse the determinants of the female employment share and the relation between firm characteristics and the female labour market participation in Austrian firms, we follow the literature on female employment (Chen et al., 2013; Kodama et al., 2018; Rocha and Winkler, 2019), and specify the following empirical regression:

$$\text{Female share}_{jrct} = \beta_0 + \beta_1 \text{international}_{jt} + Z_{jt-1}\gamma + \delta_j + \delta_{ct} + \delta_r + \epsilon_{jrct}, \tag{1}$$

where the Female share$_{jrct}$ is the female employment share of total workforce of firm j located in region r operating in sector c in time t. This female employment share depends on a set of firm characteristics Z_{jt-1} and the international status of firm j at time t, international$_{jt}$. The firm characteristics, Z_{jt-1}, include on the one hand characteristics such as the age of the firm, the productivity measured by the growth rate of total factor productivity according to Levinsohn and Petrin (2003), the size measured by the logarithm of the number of full-time equivalent employees, the average labour costs of the firm measured by the logarithm of the average salary as reported by the firms. These variables are lagged by one year to avoid endogeneity problems and multicollinearity. On the other hand, the set of firm characteristics also includes the revealed labour market demands of the firm that are reflected in the current characteristics of the firm's workforce, e.g. the demand for high-skilled workers, measured by the share of workers with university degree, the demand for time flexibility that is characterised by the share of employees working part-time and the adaptability of the workforce, measured by the average age of the workforce. Furthermore, we consider the gender wage ratio between female and male employees within firm j as a determinant of the female employment share, as the wage ratio might provide incentives for females to work in this particular firm. The gender wage ratio is defined as gross annual wage of females relative to the net gross annual wage of males. To minimise potential endogeneity concerns, we lag these control variables by one year. γ is the corresponding parameter vector collecting the effects of the set of firm characteristics. β_0 is a common constant and ϵ_{jrct} is the error term clustered at the firm-level. δ_j, δ_r and δ_{ct} capture firm, region and industry-year fixed effects. The inclusion of firm fixed effects aims at eliminating unobservable time-invariant firm characteristics that might affect the female employment share in each individual firm. The region fixed effects control for time-invariant differences in regional female labour market participation and childcare facilities. The industry-year fixed effects allow us to control for differences in business cycles across Austrian industries measured at the NACE 2-digit level.

Our main variable of interest is the international$_{jt}$ variable, which takes on a value of one if an Austrian firm is engaged in international activities such as exporting, importing or being an MNE. We look separately at the indicators for the exporter status, importer status and being an MNE. Including firm fixed effects[18], the coefficient β_1 informs us about what happens when a firm

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[18] The firm fixed effect is perfectly collinear with the internationalisation indictor for never or always internationally active firms (e.g., always or never exporters). Thus, we rely on changes in the internationalisation status for identification. Hence, the effect of β_1 informs us, what happens when a firm goes international.

becomes internationally active, i.e. starts to export/ import or becomes an MNE. This allows us to ask to what extent internationalisation affects the demand for female labour.

In alternative specifications of Equation (1), we also consider the international status of the firm, which accounts for the demand for high-skilled workers, in order to analyse a dominant channel of labour market demand from international firms. Furthermore, in additional specifications, we also account for the flexibility requirements of international firms, as described in Chapter 3.2.1.

Internationalisation as determinant for the female employment share

Table 4.6 provides the baseline results of the estimation of Equation (1). Our empirical specifications of the determinants of the female employment share is able to explain a large part of the variation in the female employment share across firms. The R^2-measure, a measure for the goodness of fit of a regression, vary between 0.98 for the female employment share across all sectors to 0.60 for the subsample of the share of female full-time employees with young children.

Firstly, in general, firms with a high part-time share have typically also a higher female share. In column (1), the part-time share has a significant positive impact on the female employment share. This aligns with the fact that a prevalence of women works part-time. Holding all other coefficients constant, in a hypothetical firm with 1,000 employees, offering part-time working schemes to 10 employees increases the number of female workers by 1 to 2 more female employees. The higher the part-time share in a firm, the lower the share of females working full-time.

The age structure of employees within the firm does not significantly affect the female share among Austrian firms. The older the workforce on average, the lower the share of females working full-time (column 3), which might be driven by older workers working part-time in partial retirement.

The share of university graduates within a firm is associated with a higher female employment share. If the demand for high-skilled employees increases by 10 percentage points, the female share increases by 2.2 percentage points. Thus, part of the demand for high-skilled workers is covered by females, but to a larger extend by males. Further, firms that pay females significantly less than males have significant lower female shares, i.e. firms with larger gender pay gaps are associated with lower female shares.

Notably, the average labour costs do not influence the female employment share within a firm. However, if females get paid more equally, the share of females in a firm tends to be higher. Further, also the size and productivity do not significantly affect the share of females employed at the firm. Thus, the tale of fast-growing firms employing less females is not visible for Austrian firms.

Turning to our variable of interest, firms that start to export increase their female employment share on average by around 0.3 percentage points. Notably, in additional specification in column (5), we see a particular strong demand for high-skilled female workers for the manufacturing sector. In column (2), we interact the exporter status with the demand for

high-skilled workers measured by the share of the workforce with a university degree. Accounting for this, reveals that though exporters often have a higher demand for high-skilled employees, the additional demand for employees, including female workers, is by a larger extend captured by a relative stronger increase of male workers compared to female workers. Including this channel increases the impact of a higher demand for females when firms start to export to 0.5 percentage points. However, if the newly exporting firm requires more high-skilled workers, this positive effect of being an exporter on the female employment share is reduced.

Table 4.6: Regression results – determinants of the female employment share in Austrian firms

	(1) Female share	(2) Female share	(3) Female share, full-time	(4) Female share, full-time, kids <=6 years	(5) Female share, full-time, manufacturing
Part-time share	0.140***	0.140***	-0.139***	-0.059***	-0.209***
	(0.005)	(0.005)	(0.007)	(0.019)	(0.021)
Average age of the employees	-0.007	-0.007	-0.183***	-0.155**	-0.148***
	(0.019)	(0.019)	(0.023)	(0.068)	(0.047)
Share of employees with university degree	0.022**	0.025**	0.023*	0.023*	0.036***
	(0.010)	(0.010)	(0.012)	(0.012)	(0.012)
Exporter	0.265*	0.453**	0.593***	0.678	0.552*
	(0.145)	(0.205)	(0.230)	(0.311)	(0.317)
Exporter * share of employees with university degree	.	-0.022*	0.023*	0.178***	0.027*
	.	(0.012)	(0.013)	(0.061)	(0.015)
Growth rate of total factor productivity	0.005	0.006	0.006	-0.053	0.016
	(0.036)	(0.036)	(0.045)	(0.134)	(0.081)
(log) Size	0.156	0.158	0.123	1.070	0.330
	(0.193)	(0.193)	(0.229)	(0.704)	(0.553)
(log) Average salary	-0.226	-0.227	-0.641**	0.157	-1.355**
	(0.204)	(0.204)	(0.276)	(0.700)	(0.571)
Wage ratio between females and males	-0.002***	-0.002***	0.004***	-0.002	0.007*
	(0.001)	(0.001)	(0.001)	(0.007)	(0.003)
(log) Age of the firm	0.335	0.334	0.203	-0.711	-0.667
	(0.292)	(0.292)	(0.365)	(1.271)	(0.774)
Constant	34.909***	34.872***	41.854***	7.799	38.615***
	(1.505)	(1.505)	(1.908)	(6.342)	(4.339)
Observations	81,937	81,937	81,937	26,801	16,979
R²	0.981	0.981	0.965	0.604	0.969
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Sector-year fixed effects	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors clustered at the firm-level in parentheses. *, ** and *** indicate statistical significance at the 10%-, 5%- and 1%-level, respectively.
Source: AMDC, WIFO presentation.

Column(3) shows the determinants for the employment share of full-time working females. Firms that start to export increase their employment share of females working full-time by around 0.6 percentage points. They require particularly more high-skilled full-time working employees. Since this is in contrast to the previous result in column (2), this indicates that not just high-skilled employees are required, but high-skilled employees who are able to work full-time.

Moreover, we consider in column (4) the employment share of females that have children of the age of 6 or younger and work full-time. We show that firms starting to export require many high-skilled employees and have a higher share of females with young children working

full-time. This shows on one hand that educated females with young children are more inclined to work full-time compared to less-skilled females and on the other hand, it provides evidence that exporting firms might offer more opportunities to females with young children to be able to participate in the labour market working full-time. Thus, it seems that Austrian exporters might provide more opportunities for flexible work arrangements and might display a less discriminating behaviour regarding the labour market participation of females.

Other internationalisation measures and heterogeneity in demands for flexibility

In this subsection, we provide evidence on alternative measures for internationalisation, indications for flexibility demand for the internationalisation of Austrian firms and conduct some further heterogeneity analysis. The estimates for the female employment share from this subsection are summarised in Table 4.7 and can be compared to the results reported in Table 4.6, column (2) above. The control variables show the same patterns as before. Therefore, in this subsection, we focus only on the different internationalisation activities of the firms and their demands for flexibility.

Column (1) of Table 4.7 shows the relationship between importers and the female employment share. The insignificant coefficient indicates that firms that start to import do not change their demand for female employees, neither for low-skilled nor high-skilled female employees. In contrast, firms that become an MNE, increase their female employment share (column (2)). MNEs are associated with a higher female employment share which directly affects the labour market demand for females. The presence of MNEs may provide additional job opportunities for women and contribute to a higher female labour force participation due to business policies or practices that promote the inclusion of women in their workforce. The impact even increases when interacting the MNE dummy with the demand for high-skilled workers. This implies that particularly university-educated women benefit from the presence of an MNE.

Column (3) to column (5) of Table 4.7 show the results of Equation (1) using alternative internationalisation measures focusing more on the demand for flexibility. Firms that become an exporter with a time difference of on average more than 4 hours to their trade partners have a significant higher employment share of females compared to domestic firms. The impact is weakened when interacted with the proportion of employees with university degree. This indicates that exporters with such time differences may face challenges in accommodating flexible working arrangements or communication needs that disproportionately affect female employees with higher educational attainments. Similar results can also be found for exporters that are on average more than 1,200 km away (column (4)) and socially distant exporters (column (5)).

Additionally, as robustness check, we take the intensity of exporting into account. The more a firm exports, the higher the female share (column (6)).

Table 4.7: Regression results – other internationalisation measures and heterogeneity in demands for flexibility

	(1) Female share	(2) Female share	(3) Female share	(4) Female share	(5) Female share	(6) Female share
Part-time share	0.140***	0.140***	0.140***	0.140***	0.167***	0.167***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.012)	(0.012)
Average age of the employees	-0.007	-0.007	-0.007	-0.007	-0.041	-0.041
	(0.019)	(0.019)	(0.019)	(0.019)	(0.039)	(0.039)
Share of employees with university degree	0.024**	0.016*	0.025**	0.024**	0.046**	0.040**
	(0.010)	(0.010)	(0.010)	(0.010)	(0.019)	(0.020)
Growth rate of total factor productivity	0.005	0.004	0.006	0.005	-0.076	-0.078
	(0.036)	(0.036)	(0.036)	(0.036)	(0.052)	(0.052)
(log) Size	0.163	0.156	0.158	0.158	0.736**	0.727**
	(0.193)	(0.193)	(0.193)	(0.193)	(0.328)	(0.329)
(log) Average salary	-0.224	-0.222	-0.227	-0.224	-0.670*	-0.664*
	(0.204)	(0.204)	(0.204)	(0.204)	(0.362)	(0.362)
Wage ratio between females and males	-0.002***	-0.002***	-0.002***	-0.002***	-0.005**	-0.005**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
(log) Age of the firm	0.335	0.330	0.334	0.332	0.644	0.656
	(0.292)	(0.292)	(0.292)	(0.292)	(0.521)	(0.524)
Importer	-0.005	.	.	.	.	.
	(0.171)	.	.	.	.	.
Importer * Share of employees with university degree (UD)	-0.010	.	.	.	.	.
	(0.010)	.	.	.	.	.
MNE	.	0.300*	.	.	.	.
	.	(0.174)	.	.	.	.
MNE * Share of employees with university degree	.	0.017**	.	.	.	.
	.	(0.008)	.	.	.	.
+/- 4h exporter	.	.	0.465**	.	.	.
	.	.	(0.204)	.	.	.
+/- 4h exporter * Share of employees with UD	.	.	-0.023**	.	.	.
	.	.	(0.012)	.	.	.
> 1,200 km exporter	.	.	.	0.352*	.	.
	.	.	.	(0.184)	.	.
> 1,200 km exporter * Share of employees with UD	.	.	.	-0.021*	.	.
	.	.	.	(0.012)	.	.
Socially distant exporter	.	.	.	.	0.481**	.
	.	.	.	.	(0.215)	.
Socially distant exporter * Share of employees with UD	.	.	.	.	-0.034**	.
	.	.	.	.	(0.013)	.
(log) Exports	.	.	.	.	.	0.024*
	.	.	.	.	.	(0.014)
(log) Exports * Share of employees with university degree	.	.	.	.	.	-0.002*
	.	.	.	.	.	(0.001)
Constant	34.912***	34.996***	34.870***	34.909***	29.420***	29.467***
	(1.505)	(1.502)	(1.505)	(1.504)	(3.047)	(3.048)
Observations	81,937	81,937	81,937	81,937	23,881	23,881
R^2	0.981	0.981	0.981	0.981	0.982	0.982
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Sector-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors clustered at the firm-level in parentheses. *, ** and *** indicate statistical significance at the 10%-, 5%- and 1%-level, respectively.
Source: AMDC, WIFO presentation.

Thus, Austrian firms engaged intensively in international trade, particularly those operating in different times zones, in far distances and with social discrepancies, are on one hand less discriminating, indicated by the positive impact of exporting and MNEs on the female employment share, but on the other hand their flexibility demands seems to put particularly

educated females at disadvantage. This might be due to the fact that particularly workers in managing positions communicate with trade partners, in- and outside business hours and with socially distant trade partners. Managers might be required to be ready to travel to distant trade partners. The need for flexible working hours, frequent communications outside standard working hours and the readiness to travel affect high-skilled female employees disproportionally.

Determinants of part-time work

Since a prevalence of part-time employees are women, we separately look at the determinants of part-time work. To do so, we modify Equation (1) by replacing the female share with the share of employees working part-time in firm j at time t. As additional control variables, we consider the share of employees with at least one child of the age of 6 or younger and take the female share within the firm into account.

Table 4.8 presents the results from this exercise and shows the factors influencing part-time employment and gender disparities. Column (1) focuses on all sectors and the part-time share of Austrian firms in general. Column (2) focuses on the part-time share of firms in the manufacturing sector, column (3) and column (4) look separately at the share of females working part-time and the share of males working part-time. Table 4.8 reveals that particularly the age of employees has a positive significant effect on part-time employment in all sectors. This suggests that older employees are more likely to work part-time. Further, the more females work in the firm, the higher is the part-time share. This is particularly driven by an increase in female part-time workers. Particularly female workers with young children have a high likelihood to work part-time. Having a child aged 6 or younger only significantly affects the female part-time share (column (3)), not the male part-time share (column (4)). The male part-time share decreases the more females are present in the firm (column (4)).

The higher the share of high-skilled employees does not have a significant effect on part-time employment in general, except for male employees. The higher the share of employees with a university degree within a firm, the more males will work part-time (column (4)).

An important incentive to work full-time, is the salary. The higher the average wage in the firm, the lower the share of males working part-time (column (4)). However, for females, the higher the average salary of the firm, the more women work part-time. This might be due to the fact, that often times the high incomes are paid to men, not to women. The less women earn in comparison to men, the higher the likelihood that they tend to work part-time instead of full-time (column (3)).

Turning to the firm characteristics, we see that while the size of the firm per se has no effect on the part-time share of employees (row (5)), high productive firms have a significant lower part-time share (row (6)). Further, older firms are associated with a higher female part-time share, while younger firms are associated with a higher male part-time share (row (8)). This discrepancy might stem from less flexible work arrangements in more established firms, while younger firms are more progressive in allowing more flexible work arrangements. Interestingly, the exporter dummy does not have a significant impact on part-time employment. This implies

that starting to export does not lead to a substantial decrease in part-time employment compared to firms that stay domestic.

Table 4.8: Regression results – determinants of the part-time share in Austrian firms

	(1) All sectors, part-time share	(2) Manufacturing, part-time share	(3) Manufacturing, female, part-time share	(4) Manufacturing, male, part-time share
Average age of the employees	0.116***	0.279***	0.273***	0.007
	(0.025)	(0.053)	(0.040)	(0.033)
Share of employees with university degree	-0.008	0.043	0.005	0.038**
	(0.011)	(0.030)	(0.022)	(0.019)
Exporter	0.132	0.017	-0.038	0.055
	(0.196)	(0.281)	(0.200)	(0.203)
Growth rate of total factor productivity	-0.087*	-0.220***	-0.122*	-0.099**
	(0.048)	(0.084)	(0.067)	(0.050)
(log) Size	-0.270	-0.340	-0.001	-0.339
	(0.241)	(0.527)	(0.424)	(0.296)
(log) Average salary	-0.175	0.740	1.298**	-0.558**
	(0.295)	(0.656)	(0.598)	(0.273)
Wage ratio between females and males	-0.001	-0.022***	-0.022***	-0.001
	(0.002)	(0.004)	(0.003)	(0.003)
(log) Age of the firm	0.262	0.427	1.022*	-0.595*
	(0.379)	(0.722)	(0.562)	(0.361)
Female employment share	0.268***	0.310***	0.423***	-0.113***
	(0.009)	(0.019)	(0.016)	(0.012)
Share of employees with a child <=6 years	0.097***	0.094***	0.101***	-0.006
	(0.006)	(0.014)	(0.011)	(0.009)
Constant	5.136**	-8.411*	-20.067***	11.656***
	(2.084)	(4.612)	(3.912)	(2.199)
Observations	81,937	16,992	16,992	16,992
R²	0.928	0.929	0.950	0.779
Firm fixed effects	Yes	Yes	Yes	Yes
Sector-year fixed effects	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes

Note: Robust standard errors clustered at the firm-level in parentheses. *, ** and *** indicate statistical significance at the 10%-, 5%- and 1%-level, respectively.
Source: AMDC, WIFO presentation.

4.2 Wage effects

In this subchapter, we aim at studying the impact of international activities of Austrian private sector firms for the gender pay gap and annual wages across male and female workers in an econometric manner. We quantify the average gender pay gap in internationally active firms and compare its estimate with one for purely domestically orientated firms. This research question is motivated by the descriptive evidence highlighted above. As can be seen in Figure 4.9, there is a visible wage gap in annual wages between males and females in Austria.

Figure 4.9 shows the median wages for males and females working in international firms compared to domestic firms for different age groups and educational background. The gender wage gap seems to widen over the different age groups. Workers tend to earn higher annual wages in exporting or importing firms or firms being MNEs. Education is an important determinant of the individual earnings, however, the wage gap between female and male university educated individuals is visibly present, in domestic as well as internationally active firms.

Figure 4.9: Annual wages of females and males by age and education
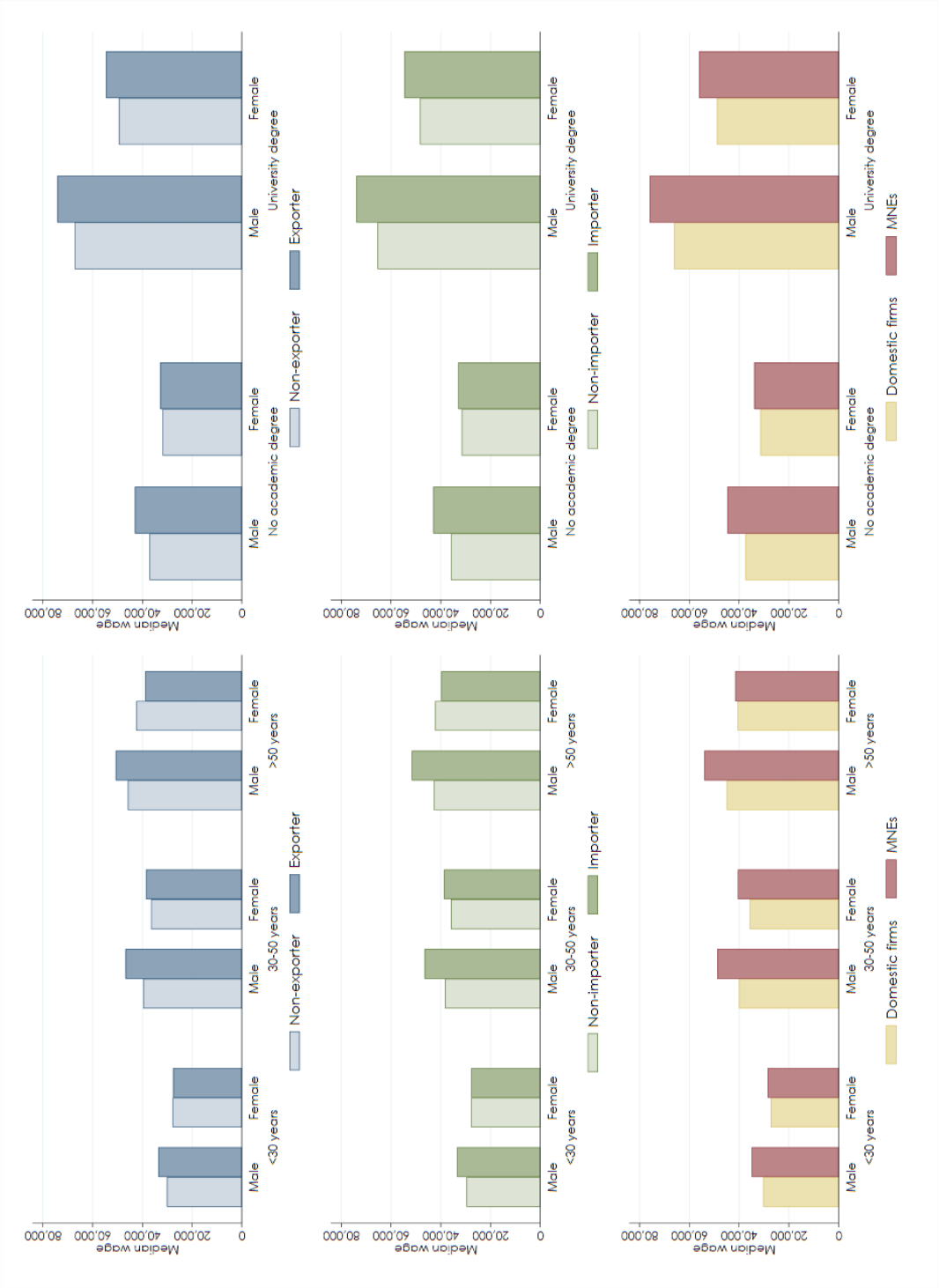
Note: The figures show unweighted statistics pooled across firms and time.
Source: AMDC, WIFO presentation.

WIFO

4.2.1 Mincer wage regressions

In the following, we analyse the gender pay gap and the impact of working in an international firm in more detail by means of Mincer wage regressions. The modelling approach of the gender pay gap dates back to the seminal contribution of Mincer (1958) in which he related (the logarithm) of a worker's annual wage to observable characteristics such as education and experience. The obtained parameter estimates from this regression framework can be interpreted as average wage premia for one more year of education or experience at the labour market. Mincer wage regressions are, in general, not limited to only those two worker characteristics and over the last decades have been extensively used for studying the wage effects of different worker and firm characteristics.

This approach has been especially popular for studying gender differences in paid annual wages known as the gender pay gap. For this purpose, the Mincer wage regression is augmented with a gender dummy. The inclusion of a large list of observable variables together with many fixed effects (e.g., firm fixed effects) for unobservable characteristics aims to make both genders (conditionally) as comparable as possible. The estimated parameter for the gender dummy then informs us about average difference in annual wages paid between men and women with very similar individual characteristics working within the same firms. A negative parameter estimate would provide evidence for a negative gender pay gap from the perspective of female workers, as they are paid lower annual wages in such a case, even if they are comparable to their male colleagues in terms of observable characteristics relevant for individual labour market outcomes.

In the context of this study, we are particularly interested in the effect of international activities of Austrian firms for the gender pay gap. As discussed in the previous chapters, internationally active firms differ in some observable characteristics from purely domestically orientated ones. This might also translate into differences in labour market demand between these two types of firms. We specify the following empirical Mincer wage regression:

$$w_{ijrct} = \beta_0 + \beta_1 gender_i + \beta_2 international_{jt} + \beta_3 gender_i * international_{jt} + X_{it}\alpha + Z_{jt}\gamma + \delta_j + \delta_r + \delta_{ct} + \epsilon_{ijrct}, \qquad (2)$$

where w_{ijrct} is the logarithm of the annual wage of worker i who is employed in firm j that operates in industry c in year t and works in region r[19]. We only include private businesses in the following analysis.

In line with the definition from above, we use annualised gross wages for all employees based on an available part-time indicator variable differentiated between full-time and part-time workers. β_0 is a common constant and ϵ_{ijrct} is the error term, which is clustered at the job-spell in the econometric estimation. A job-spell is defined as an uninterrupted working relationship of a worker with a single firm. δ_j, δ_r and δ_{ct} denote firm, region and industry-year fixed effects. The first controls for unobservable time-invariant firm characteristics that might affect wage

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[19] More than 57% of employees in Austria work and live in the same region. Additional 17% commute to neighbouring municipalities.

differences in annual earnings across firms. Furthermore, the inclusion of this fixed effects ensures a comparison of workers' annual wages within the same firm when estimating the gender pay gap. The region fixed effects control for time-invariant differences in regional wage and price levels that might be relevant for each worker's outside option. δ_{ct} controls for differences in business cycles across 2-digit NACE industries covered by our matched employer-employee dataset. X_{it} is a vector of observable and time-varying workers' characteristics and includes standard variables from the Mincer wage region literature such as indictors for whether the worker is a parent, obtained a university degree, works part-time or has a migration background. Additionally, this vector also includes information on the worker's age and work experience both in a non-linear fashion (i.e., a quadratic functional form) together with a classification into 10 different educational occupations (see Appendix 8.1.5 for more details on the applied classification). α denotes the respective vector of parameters associated with the worker characteristics. The estimates stored in α allow an empirical quantification of the average wage returns for the different worker characteristics.

In a similar vein, Z_{it} contains firm-specific time-varying control variables that we include on top of the firm fixed effects. The two measures are a firm's revenue and total factor productivity (TFP). TFP needs to be estimated using firm-level data. In the Mincer wag regressions, we use the TPF measure which is based on methodological approach proposed by Levinsohn and Petrin (2003) (see Chapter 3.2.1). These two firm-specific variables aim the control for the firm size wage and productivity wage premia mentioned in Chapter 2, which are captured via the parameter vector γ[20]. The inclusion of the firm fixed effects ensures that we are exploiting within-firm variation over time. The estimates stored in γ thus reflect the average wage effects for workers in firms that vary their size and TFP over time.

The variables of main interest, for the research questions at hand, are explicitly stated in the Mincer wage regression reported in Equation (2). The first one is the gender variable which takes on a value of one for women and zero else. The parameter β_1 measures the average conditional differences in annual wages for women relative to men in domestically active Austrian firms. Whenever the estimate for β_1 is statistically significantly smaller than zero, then Austrian domestic firms pay, on average, lower annal wages for female workers conditional on all other characteristics mentioned in Equation (2). Such a finding would be in line with previous evidence on the gender pay gap. The second dummy variable is firm- and time-specific and takes on a value of one whenever an Austrian firm engages in international activities such as exporting, importing, or being a multinational enterprise. The different internationalisation modes are used subsequentially in our analysis. Due to data quality considerations, we put the focus on the export indicator. The estimate for β_2 quantifies the internationalisation premium for workers in internationally active Austrian firms. The subsequent use of different indicators allows to compare the quantitative magnitudes of different types of international engagement of Austrian firms. It is also crucial to mention that for never or always internationally active firms

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[20] In comparison to many contributions on the firm size and the productivity premia, our approach does not rely on average wages paid by a firm and exploits within-firm variation over time. The across-firm components of the estimates for the two premia measures are already absorbed by the firm fixed effects. We, therefore, expect smaller estimates as compared to contributions relying solely on cross-sectional variation in annual wages.

(e.g., always or never exporters), the firm fixed effect is perfectly collinear with the internationalisation indictor. The econometric identification of the internationalisation wage effect thus solely rests on annual wage dynamics in firms that either start or stop any of the three potential international business activities, respectively. This approach delivers a more credible estimate for the wage effects of international activities, in comparison to a cross-sectional approach which compares wages between internationally active and purely domestically orientated firms. The latter groups are hardly comparable as they might differ in their profitability for serving different markets (see e.g., Melitz, 2003; Helpman et al., 2004).

The variable of most interest is an interaction term between the gender dummy with the internationalisation dummy. The associated parameter β_3 allows to test whether the gender pay gap differs in internationally active Austria firms. The identification of this effect again relies on within-firm variation in wages of firms that either start or stop any of the mentioned international activities. A positive value of the estimate of β_3 would provide evidence for a smaller conditional gender pay gap in internationally active Austrian firms compared to their domestically orientated counterparts. From an econometric point of view, this is the variation one would like to exploit after controlling for unobservable time-invariant firm characteristics by means of firm fixed effects. Economically, the parameter estimate nevertheless allows to draw conclusions on the effect of international activities on the gender pay gap as it provides the best estimate for what would happen in a purely domestically orientated firm, once it decides to internationalise its business activities.

4.2.2 Wage effects for employees in exporting firms

Table 4.9 provides our first set of estimates for the Mincer wage regressions. The empirical specification uses information on a firm's exporter status as indicator for international activities of Austrian firms. In line with the definition applied in previous chapters, this indicator is equal to one whenever firm's export value exceeds 10% of its total revenues and is zero else. Column (1) to column (11) report estimation results for different firm samples and varying working contracts differentiating between full-time and part-time work. Column (1) to (3) report the estimates for a sample only containing full-time workers. Workers only enter the sample when all necessary individual characteristics are available across the various data sources matched in the AMDC. This sample includes all firms where the necessary data on firm size and TFP is available for more than one year during our sample period and varies over time[21]. The resulting sample of full-time workers includes around 2.45 mn worker-year observations.

In column (4) to column (6) we also add all part-time workers to the sample and additionally control for annualised gross wage differences between full-time and part-time workers via the dummy variable denoting part-time work. Column (2), column (5) and column (9) only include workers in manufacturing firms, column (3), column (6) and column (10) include all workers and firms operating in the services industries. In general, we use all worker-year observations related to the main firm, in which workers have been employed within a calendar year. In Column (7)

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[21] For all firms that are only observed once during our sample period or where firm size and TFP is not varying over time, the firm fixed effect is perfectly collinear with the covariates and the observations are dropped in the estimation.

we also add information on firms in which some of the employees have been working for a shorter time than in the main firm each year or have a second part-time job. This provides a robustness check for our approach to only assign firm characteristics of the main employer to the workers in the other samples considered in Table 4.9.

In the last four columns, we only include part-time employees in the analysis. This approach allows to assess whether gender pay gaps in annual wages in domestic and exporting firms are quantitatively different between full-time and part-time workers. Column (8) includes all sectors, Column (11) again also adds information on wages paid for shorter or multiple contracts within a calendar year. Column (9) and column (10) separately study gender pay gaps in domestic and exporting firms being active in either manufacturing or services industries, respectively. The different samples applied aim to shed some light on potentially heterogenous gender pay gap effects of international activities of firms operating in different industries and for employees with different working contracts in terms of hours worked.

Our empirical specifications of the Mincer wage regressions are able to explain a large part of the variation in annual gross wages. The R^2 varies between 0.756 for the sample including full-time workers in all available firms (column (1)) to 0.486 for the subsample of part-time workers in firms that are active in the services industries (column (10)). The estimation results reported in Table 4.9 reveal expected findings for the worker-specific control variables. Employees with children and a migration background are paid lower wages. The wage effect for having children is between -2% and -13% across different subsamples reported in Table 4.9 and is much larger for employees working part-time. The migrant gender pay gap is only negative for full-time work and the samples including all worker and varies between -2.1% to -4.4% across the different samples. By contrast, employees with a migration background working in part-time jobs receive an average annual wage premium of around 3.4% across all firms in the sample. Obtaining a university degree increases average annual wages in Austrian firms by between 20% to 29%. The education wage premium is larger in manufacturing than in the services sector. Experience and age exhibit the expected non-linear effect on a worker's wage. An increase in both working experience and an individual's seniority measured in physical age have a positive effect on the wages paid for employees. The positive experience and age effects, however, decrease with experience and age. These two findings are well in line with the literature. Furthermore, differences in educational occupation also substantially matter for wages paid as indicated by the joint significance of the parameter estimates associated with the ten different educational occupations, that are based on the International standard Classification of Education and Occupational Training[22].

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[22] No reported information on educational occupation together with information on "general education and qualification" form the reference group for this set of dummy variables. The parameter values should be interpreted relative to these two types of occupations. The individual parameter estimates are for brevity not reported in Table 4.9 and Table 4.10. The individual parameter estimates for the educational occupations for Table 4.9 are reported in Table 8.3 in the Appendix. The individual parameter estimates for the educational occupation for Table 4.10 are similar to those reported in Table 8.3 in the Appendix and therefore not shown.

Table 4.9: Mincer wage regression results – wages in Austrian firms

	(1) Full-time, all sectors	(2) Full-time, manufacturing	(3) Full-time, services	(4) Full and part-time, all sectors	(5) Full and part-time, manufacturing	(6) Full and part-time, services	(7) Full and part-time, all sectors, all firms	(8) Part-time, all sectors	(9) Part-time, manufacturing	(10) Part-time, services	(11) Part-time, all sectors, all firms
Gender	-0.097*** (0.002)	-0.130*** (0.006)	-0.092*** (0.002)	-0.095*** (0.003)	-0.131*** (0.006)	-0.094*** (0.003)	-0.095*** (0.003)	-0.038*** (0.007)	-0.120*** (0.022)	-0.031*** (0.008)	-0.038*** (0.007)
Exporter	0.003 (0.002)	-0.009*** (0.003)	0.010*** (0.003)	0.005*** (0.002)	-0.008** (0.003)	0.011*** (0.003)	0.005*** (0.002)	0.005 (0.009)	0.004 (0.024)	-0.020** (0.009)	0.005 (0.009)
Gender * exporter	-0.008** (0.003)	0.031*** (0.006)	-0.023*** (0.006)	-0.012*** (0.003)	0.023*** (0.006)	-0.020*** (0.005)	-0.012*** (0.003)	-0.005 (0.012)	-0.003 (0.027)	0.030*** (0.011)	-0.004 (0.012)
Kids <=6 years	-0.020*** (0.001)	-0.023*** (0.002)	-0.013*** (0.002)	-0.040*** (0.003)	-0.032*** (0.002)	-0.047*** (0.007)	-0.040*** (0.003)	-0.117*** (0.012)	-0.076*** (0.012)	-0.128*** (0.014)	-0.117*** (0.012)
University degree	0.286*** (0.005)	0.303*** (0.006)	0.265*** (0.008)	0.268*** (0.004)	0.287*** (0.006)	0.256*** (0.007)	0.268*** (0.004)	0.205*** (0.007)	0.211*** (0.014)	0.205*** (0.008)	0.204*** (0.007)
Migrant	-0.037*** (0.002)	-0.024*** (0.005)	-0.044*** (0.003)	-0.026*** (0.002)	-0.021*** (0.004)	-0.026*** (0.003)	-0.026*** (0.002)	0.034*** (0.005)	0.019 (0.013)	0.035*** (0.005)	0.033*** (0.005)
Age	0.445*** (0.006)	0.466*** (0.009)	0.440*** (0.010)	0.442*** (0.005)	0.466*** (0.009)	0.422*** (0.008)	0.442*** (0.005)	0.227*** (0.019)	0.281*** (0.017)	0.214*** (0.021)	0.227*** (0.019)
Age²	-0.023*** (0.000)	-0.024*** (0.001)	-0.022*** (0.001)	-0.022*** (0.000)	-0.024*** (0.001)	-0.021*** (0.001)	-0.022*** (0.000)	-0.009*** (0.001)	-0.012*** (0.001)	-0.009*** (0.001)	-0.010*** (0.001)
Experience	0.050*** (0.001)	0.051*** (0.001)	0.050*** (0.001)	0.052*** (0.001)	0.051*** (0.001)	0.053*** (0.001)	0.052*** (0.001)	0.050*** (0.001)	0.048*** (0.002)	0.050*** (0.001)	0.050*** (0.001)
Experience²	-0.003*** (0.000)	-0.003*** (0.000)	-0.002*** (0.000)	-0.003*** (0.000)	-0.003*** (0.000)	-0.003*** (0.000)	-0.003*** (0.000)	-0.002*** (0.000)	-0.002*** (0.000)	-0.002*** (0.000)	-0.002*** (0.000)
Total factor productivity	0.009*** (0.001)	0.013*** (0.002)	0.005*** (0.002)	0.010*** (0.001)	0.014*** (0.002)	0.007*** (0.002)	0.010*** (0.001)	0.012*** (0.004)	0.027*** (0.008)	0.010** (0.004)	0.012*** (0.004)
(log) Sales	0.004*** (0.001)	0.006*** (0.002)	0.003 (0.002)	0.004** (0.002)	0.007** (0.003)	0.002 (0.002)	0.004** (0.002)	0.002 (0.005)	0.009 (0.013)	0.000 (0.005)	0.001 (0.005)
Part-time employment share	.	.	.	-0.599*** (0.008)	-0.603*** (0.014)	-0.601*** (0.011)	-0.599*** (0.008)	.	.	.	.
Constant	7.961*** (0.025)	7.869*** (0.038)	7.997*** (0.043)	7.993*** (0.025)	7.865*** (0.038)	8.088*** (0.039)	7.994*** (0.024)	8.318*** (0.087)	8.076*** (0.150)	8.371*** (0.097)	8.324*** (0.087)
Observations	2,452,505	882,964	1,222,831	2,830,581	945,349	1,522,463	2,856,527	375,169	62,402	300,534	378,532
R²	0.756	0.754	0.753	0.741	0.739	0.733	0.741	0.501	0.515	0.486	0.501
Sector-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Occupational training fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: The fixed effects for occupational training are reported in Table 8.3. Robust standard errors clustered at job spells in parentheses. *, ** and *** indicate statistical significance at the 10%-, 5%- and 1%-level, respectively.
Source: AMDC, WIFO presentation.

WIFO

The estimates for firm productivity and firm size also reveal the expected effects. A 1% increase in a firm's TFP leads to an average annual wage increase of between 0.5% and 2.7%. Increases in firm's revenues have quantitatively smaller effects but are not statistically significant for part-time workers (last four columns of Table 4.9). As we include both full-time and part-time working contracts within firms in the samples for the results reported in column (4) to column (7), we additionally add a dummy variable for part-time work. This dummy controls for systematic differences in annual gross wages stemming from different working hours. The parameter estimates across all four samples are very close to each other and indicate that part-time worker, on average, earn around 60% lower annual wages conditional on the other included individual- and firm-specific covariates.

Turning our attention to the variables of most interest, we consistently find a gender pay gap in Austrian firms which, however, varies across the different samples discussed and is smaller in magnitude when only considering part-time work in non-manufacturing industries. By contrast, the gender pay gap is particularly large in manufacturing industries as reported in column (2), column (5) and column (9). When we have a look at only full-time worker in column (1), the effect for the parameter associated with the gender dummy indicates a gender pay gap in annual wages of 9.7%, which is statistically highly significantly different from zero. Thus, female full-time workers receive around 10% lower annual wages in comparison to their similar male co-workers. In manufacturing industries, the gender pay gap in Austrian domestically active firms increases to -13.1% once we include both full-time and part-time employees. In services industries it is somewhat smaller and amounts to 9.4%, when including all different working contracts (see column (6)). Except for the manufacturing industries, the gender pay gap is much smaller for part-time employees. In the pooled sample containing all part-time workers in all available firms, the gender pay gap amounts to around 3.8%. In services industries the gap is even slightly smaller resulting in a 3.1% difference in annual wages for similar observable characteristics (see column (10)). In contrast to this, in manufacturing industries the estimated conditional gender pay gap for part-time worker is 12% coming relatively close to the gap for full-time workers. Part-time work is not very common in manufacturing industries, as indicated by the relatively small number of observations reported in column (9) and therefore, this large gender pay gap only has a moderate effect on the overall gender pay gap for part-time work, as can be inferred from the estimate reported in column (8). Furthermore, the comparatively small gender pay gap for part-time work is most likely also driven by institutional characteristics of the Austrian labour market including the income tax and social security payment schedules[23].

As mentioned above, in this subchapter we measure a firm's international activity with an exporter dummy, which is equal to one whenever a firm exports at least 10% of its overall production to foreign destinations. The parameters associated with this dummy are thus

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[23] Actual working hours are not reported in the official labour market statistics in Austria. As a result, a more nuanced analysis of differences in part-time work-related wage schemes is not possible.

capturing the average exporter premium for male workers in exporting firms[24]. The evidence for an exporter wage premium in Austrian firms is very mixed. Using only full-time employees from all sample firms, the parameter estimates amount to 0.3% and is statistically not significantly different from zero (see column (1) in Table 4.9). Conditional on the covariates and the fixed effects included in the specification, an average full-time male worker in Austrian firms does not additionally benefit from working in an exporting firm in terms of his annual wage compensation. Over all workers and all firms, we find a positive exporter premium implying a wage increase of 0.5% for male workers. When using the sample of all workers with different types of working hours and restricting the sample to firms from the manufacturing only industries, the exporter wage premium for male workers is estimated to be negative. The obtained parameter value in column (2) indicates a conditional annual wage loss of 0.8%. In Austrian exporting firms active in the services industries, by contrast, the exporter wage premium for male workers is positive with an estimated wage increase of 1.1%. For male part-time worker of Austrian exporting firms, we do not find statistically significant wage effects, except for workers in services firms. For these part-time male workers, we estimate a wage loss of about 2% in exporting firms.

The interaction effect of the exporter dummy with the gender allows to investigate whether female workers are differentially affected by a firm's decision to export. The evidence provided in Table 4.9 points to a heterogenous, but on average, negative effect of exporting for the estimated gender pay gap in Austrian firms. Column (4) reports all jobs in all industries. The exporter wage premium for male workers is positive and amounts to 0.5% (see above). The exporter wage premium for female worker is 1.2% smaller as indicated by the negative and statistically significant parameter estimate. Women working in exporting Austrian firms, on average and conditional on the included covariates and fixed effects, earn around 0.7% lower annual wages in comparison to a situation in which they would work in a non-exporting firm.

This effect is mainly driven by firms operating in services industries. Female workers in exporting services firms receive annual wages that are 2% lower than the wages for their male co-workers and 0.9% lower than for female workers in non-exporting services firms (which is given as overall effect from the parameter values 0.011 and -0.020 in the second and third row of column (6)). For women working in manufacturing industries, the estimate differs substantially. First, we estimate a reduction in the (large) gender pay gap in exporting Austrian manufacturing firms. While the export premium for male workers is negative and amounts to -0.8%, the parameter estimate for the interaction term amounts to 2.3%. The gender pay gap is 2.3% smaller in exporting manufacturing firms in comparison to the estimated gender pay gap in non-exporting firms. Furthermore, in comparison to women working in purely domestically engaged manufacturing firms, annual wages paid for female workers in exporting firms is 1.5% higher, on average. This finding results from the summation of the exporter effect with the exporter-gender interaction term in column (5) of Table 4.9.

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[24] As noted above, due to the inclusion of firm fixed effects, the parameter estimate is identified solely based on firms that switch their export behaviour. Furthermore, the wage premium for women is given by the sum of the effects for male workers plus the effects for the interaction term of the exporter dummy and the gender dummy.

If we focus on full-time and part-time workers in the full sample, the interaction effect is negative indicating a higher gender pay gap of about 0.8%, on average. The negative effect in services firms thus empirically outweighs the positive effect identified in exporting manufacturing firms (column (5) and column (6)). For part-time female workers, the gender pay gap is not systematically different between non-exporting and exporting Austrian firms. In the full sample and for the sample of only manufacturing firms the parameter estimate is quantitatively small and statistically not different from zero. The only exception are Austrian exporting firms in the services industry. Female part-time workers are able to reduce the gender pay gap by around 3% when they work for exporting firms active in services industries. Overall, the gender pay gap among part-time workers in services firms almost fully vanishes in exporting firms. While the gender pay gap is around 3.1% in non-exporting services firms it is reduced to 0.1% in their exporting counterparts. Furthermore, while the exporter premium is negative for male part-time workers in services firms with an estimate of 2%, the premium is positive with a value of 1% for female part-time workers (sum of row (2) and row (3) in column (10)).

To summarise our main findings on the exporter wage premium and the gender pay gap in exporting Austrian firms, the evidence is mixed across industries firms are operating and between full-time and part-time work. This points to heterogenous gender pay gap effects of the internationalisation of Austrian firms. Female workers tend to profit from working for an Austrian exporting firm operating in manufacturing industries and, in case they work part-time, they can also reduce their gender pay gap in firms providing services exports.

4.2.3   Other internationalisation measures and robustness checks

In this subchapter, we provide evidence for alternative internationalisation measures applied to different types of international activities of Austrian firms and provide additional heterogeneity analyses. The estimates are based on the sample including all employees with only one full-time working contract in all available firms across all industries. The estimates are summarised in Table 4.10 and can be compared to the ones reported in column (1) in Table 4.9.

The first two columns of Table 4.10 apply alternative definitions for international actives of Austrian firms. In the first column, we use information on imports instead of exports as the internationalisation indicator. In line with the definition from above, a firm is defined as an importer whenever it imports more than 10% of the overall intermediate inputs used for final production from foreign countries. In the second column, we classify international activities by information on whether an Austrian firm is part of a multinational enterprise. Here we apply the definition presented in Chapter 3. The internationalisation indicator takes on a value of one in case the firm is either the headquarter of a multinational enterprise, has subsidiaries abroad or is a subsidiary of a multinational enterprise, and is zero else.

Table 4.10: Mincer wage regression results – other internationalisation measures and heterogeneity in demands for flexibility

	(1) Full-time, all sectors	(2) Full-time, all sectors	(3) Full-time, all sectors	(4) Full-time, all sectors	(5) Full-time, all sectors	(6) Full-time, all sectors	(7) Full-time, all sectors	(8) Full-time, all sectors
Gender	-0.096***	-0.098***	-0.119***	-0.099***	-0.112***	-0.096***	-0.098***	-0.101***
	(0.002)	(0.002)	(0.015)	(0.002)	(0.006)	(0.002)	(0.002)	(0.004)
Kids <=6 years	-0.020***	-0.020***	-0.019***	-0.020***	-0.019***	-0.020***	-0.020***	-0.018***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
University degree	0.286***	0.286***	0.298***	0.286***	0.298***	0.286***	0.286***	0.294***
	(0.005)	(0.005)	(0.007)	(0.005)	(0.007)	(0.005)	(0.005)	(0.006)
Migrant	-0.037***	-0.037***	-0.034***	-0.037***	-0.034***	-0.037***	-0.037***	-0.036***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
Age	0.445***	0.445***	0.472***	0.445***	0.472***	0.445***	0.445***	0.464***
	(0.006)	(0.006)	(0.009)	(0.006)	(0.009)	(0.006)	(0.006)	(0.008)
Age^2	-0.023***	-0.023***	-0.024***	-0.023***	-0.024***	-0.023***	-0.023***	-0.024***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
Experience	0.050***	0.050***	0.050***	0.050***	0.050***	0.050***	0.050***	0.050***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Experience^2	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Total factor productivity	0.009***	0.009***	0.009***	0.009***	0.009***	0.009***	0.009***	0.009***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
(log) Sales	0.004***	0.004***	0.005**	0.004***	0.005**	0.004***	0.004***	0.003
	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
Importer	0.004***	.	.	.	.	.	.	.
	(0.001)	.	.	.	.	.	.	.
Gender * Importer	-0.008**	.	.	.	.	.	.	.
	(0.003)	.	.	.	.	.	.	.
MNE	.	0.001	.	.	.	.	.	.
	.	(0.002)	.	.	.	.	.	.
Gender * MNE	.	-0.007**	.	.	.	.	.	.
	.	(0.003)	.	.	.	.	.	.
+/- 4h exporter	.	.	0.001	.	.	.	.	.
	.	.	(0.005)	.	.	.	.	.
Gender * +/- 4h exporter	.	.	0.014	.	.	.	.	.
	.	.	(0.015)	.	.	.	.	.
> 1,200 km exporter	.	.	.	0.002	.	.	.	.
	.	.	.	(0.002)	.	.	.	.
Gender * > 1,200 km exporter	.	.	.	-0.006	.	.	.	.
	.	.	.	(0.004)	.	.	.	.
Socially distant exporter	.	.	.	.	-0.000	.	.	.
	.	.	.	.	(0.003)	.	.	.
Gender * Socially distant exporter	.	.	.	.	0.007	.	.	.
	.	.	.	.	(0.006)	.	.	.
+/- 4h importer	.	.	.	.	.	0.004***	.	.
	.	.	.	.	.	(0.001)	.	.
Gender * +/- 4h importer	.	.	.	.	.	-0.008**	.	.
	.	.	.	.	.	(0.003)	.	.
>1,200 km importer	.	.	.	.	.	.	0.004***	.
	.	.	.	.	.	.	(0.001)	.
Gender * >1,200 km importer	.	.	.	.	.	.	-0.006*	.
	.	.	.	.	.	.	(0.003)	.
Socially distant importer	.	.	.	.	.	.	.	0.007***
	.	.	.	.	.	.	.	(0.002)
Gender * Socially distant importer	.	.	.	.	.	.	.	-0.003
	.	.	.	.	.	.	.	(0.004)
Constant	7.961***	7.962***	7.868***	7.962***	7.869***	7.961***	7.961***	7.917***
	(0.025)	(0.025)	(0.039)	(0.025)	(0.038)	(0.025)	(0.025)	(0.034)
Observations	2,452,505	2,452,505	1,397,975	2,452,505	1,397,975	2,452,505	2,452,505	1,631,626
R^2	0.756	0.756	0.755	0.756	0.755	0.756	0.756	0.754
Sector-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Field of occupational training fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors in parentheses. *, ** and *** indicate statistical significance at the 10%-, 5%- and 1%-level, respectively.
Source: AMDC, WIFO presentation.

In the remaining six columns we modify the export and import indicators based on the flexibility requirements as discussed in Chapter 3.2.1. Column (3) only considers exports to at least one trading partner who operates in a time zone with at least 4 hours difference to the one applying to Austria. In the fourth column the export variable takes on a value of one only if the firm exports to at least one large distance country, where the threshold value is defined as a minimum geographical distance to Austria of 1,200 km. The last modification concerns the social connectedness indicator of a country. Here we only consider countries with a value in their social connectedness indicator that is smaller than a one standard deviation in this index as relevant export partners. The results are reported in column (5). This modification is motivated by the idea that countries with lower social connectedness might have a negative impact on the gender pay gap in Austria, as the local social values might be transmitted to Austrian firms being active in these economies (Halvarsson et al., 2023). In column (6) to column (8) we apply the same definitions as in column (3) to column (5) but replace the export indicator by the firm-specific importer information. We study whether longer distance imports both in terms of physical and time distance matter to differing degrees and use the social connectedness indicator of the countries from which Austrian firms import intermediate inputs.

The findings from the first two columns of Table 4.10 can be summarised as following. Male full-time workers in Austrian importing firms slightly benefit from an importer wage premium that amounts to an annual gross wage increase of about 0.4%. Female workers in importing firms cannot profit from a similar premium. The conditional gender pay gap in importing Austrian firms is around 0.4% larger than in non-importing firms. Austrian multinational enterprises do not pay higher annual wages to their employees. The parameter estimate associated with this international economic activity is very small and statistically not different from zero. The interaction effect with the gender dummy is significantly negative and amounts to 0.7%. The gender pay gap is thus higher in multinational enterprises and the conditional average payment for women is lower than in lone-standing domestic Austrian firms.

When using the alternative geographical and social connectedness-based firm-specific export measures in column (3) to column (5), we are not able to identify any significant differences between exporting and non-exporting Austrian firms. Trade with partners that are further away both in distance and in time zones as well as exports to countries with a lower level of social connectedness does not induce a systematic exporter wage premium for male workers nor does it affect the gender pay gap for full-time female employees. This is indicated by the statistically insignificant effects associated with the exporter dummy and its interaction term with the gender dummy in column (3) to column (5)[25].

For the last three measures, that apply alternative definitions for importing Austrian firms we find statistically significant and slightly negative effects. Full-time male workers in firms that import from destinations that are further away receive a small but positive importer wage premium. In

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[25] Estimates from non-reported subsample analysis, however, indicate that the positive gender pay gap reducing effect of international activities in Austrian manufacturing firms can also be identified when focusing on firms that trade with countries that have four or more hours differences in their time zones and are socially less connected than the Austrian society. In these two specifications the gender pay gap is reduced by 1.2% and 3.3%, respectively.

column (6) and column (7) the estimated premium amounts to 0.4%. The negative interaction effects with the gender dummy provides some evidence for a larger gender pay gap in long-distance importing firms. The estimated gender pay gap increases by 0.8% (column (6)) and 0.6% (column (7)). The interaction effects also outweigh the positive effect stemming from the importer wage premium and, as a result, women in large distance importing firms are paid lower wages than in the non-importing control group[26].

Finally, imports from socially less connected economies induce a positive importer premium with no systematic difference between both genders in the full sample. Men and women thus tend to profit from imports from such partner economies[27]. This finding cannot confirm the results from Halvarsson et al. (2023), who find negative effects for Swedish foreign direct investment in Lithuania for the gender pay gap in Swedish multinational enterprises investing in this host economy.

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[26] In manufacturing firms this finding is again reversed. Non-reported estimates indicate no importer premium for men in large distance importing firms but a premium for the female workers between 2.6% (geographical distance) and 2% (time zone difference). As a result, the gender pay gap in long distance importing manufacturing firms decreases and, as an additional result, women are paid higher wages in such firms.

[27] In manufacturing firms, the picture is very similar to the other two alternative importer measures. Men are not profiting from imports from socially less connected economies, while women do with an estimated reduction in the gender pay gap amounting to 2.3%.

5. Economic effects of female employment on firm performance

The composition of the workforce is thought to play a critical role in firm performance or productivity, respectively. Productivity is defined as the efficiency with which inputs are turned into outputs. Studies on the impact of the gender distribution in the workforce on productivity come to mixed conclusions, with some papers failing to provide statistically significant results. The empirical economic literature typically associated higher fractions of female employees with lower productivity levels, even though this effect disappears when changes in productivity instead of productivity levels are considered (Haltiwanger et al., 1999; Pfeifer and Wagner, 2014; Galindo-Rueda and Haskel, 2005; Tsou and Yang, 2019).

5.1 Productivity and exporting firms

This subchapter asks if female labour shares systematically affect productivity at the firm-level, and if being an exporting firms moderates such effects. Hence, we estimate the following regression:

$$\text{prod}_{jrct} = \beta_0 + \beta_1 \text{international}_{jt} + \beta_2 \text{female share}_{jt} + \beta_3 \text{female share}_{jt} * \text{international}_{jt} + Z_{jt}\gamma + \delta_c + \delta_t + \delta_r + \epsilon_{jrct}, \qquad (3)$$

where the target variable prod_{jrct} is a productivity measure of firm j located in region r operating in industry c in time t. We use two productivity indicators:

(i) Labour productivity, defined as annual value added per full-time employee. This is a simple measure of productivity but is subject to possible endogeneity bias.

(ii) A canonical total factor productivity (TFP) measure that uses a control function approach to address possible endogeneity issues (see Chapter 3.2.1).

This productivity level depends on female share_{jt}, which is the female employment share of firm j, and the international status of firm j at time t, $\text{international}_{jt}$. The coefficient β_1 thus reflects the premium of being an international firm, while the parameter β_2 shows the impact of the female share on productivity. The interaction of these two, $\text{female share}_{jt} * \text{international}_{jt}$, reveals in its estimate β_3 whether there are differences in the effect of the female share for international firms compared to domestic firms. We further control for a set of firm characteristics Z_{jt}, including the age of the firm in logarithmic form, the average age of the workforce and the share of employees with a university degree. γ is the corresponding parameter vector collecting the heterogeneous firm characteristics. To control for the panel structure of the data, we use the average productivity level in the base period of 2013 and 2014, which we exclude from the sample. β_0 is a common constant and ϵ_{jrct} is the error term clustered at the firm-level. δ_c, δ_r and δ_t capture industry, region and year fixed effects. The analysis focuses on private businesses only.

We estimate two sets of specifications motivated by incomplete information on employers and employees. First, we include only full-time employees in the regression. Second, we include the share of part-time employees as well in the regression. We split the sample into (i) the total private sector, (ii) manufacturing, and (iii) services (excluding utilities and construction).

Table 5.1 shows the regression results for the sample considering only full-time employees. The control variables behave as expected. The coefficients on base year productivity levels are positive and significant, i.e., higher initial productivity levels are associated with higher contemporaneous productivity. The labour productivity specifications also include capital stocks, which are also positively related to productivity. In the full sample covering all industries, an older workforce is positively associated with productivity. This is driven by services firms, while the coefficient becomes insignificant for manufacturing firms. We also observe a productivity premium for firms with a higher share of tertiary educated employees. There is no clear pattern with respect to the age of the firm. The intercept and unreported dummy variables are largely significant.

Table 5.1: Firm productivity, female employees and exporters, excluding part-time employees

	(1) LP All sectors	(2) LP Manufacturing	(3) LP Services	(4) TFP All sectors	(5) TFP Manufacturing	(6) TFP Services
Female employment share	-0.0008***	-0.0018***	-0.0007***	-0.0007***	-0.0016***	-0.0006***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Exporter	0.0809***	0.0674***	0.0943***	0.0556***	0.0562***	0.0600***
	(0.013)	(0.016)	(0.024)	(0.012)	(0.015)	(0.022)
Female employment share * exporter	-0.0004	0.0006	-0.0009	0.0000	0.0006	-0.0001
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
(log) Age of the firm	0.0065	-0.0042	0.0130**	-0.0069**	-0.0157**	-0.0007
	(0.004)	(0.009)	(0.005)	(0.003)	(0.007)	(0.005)
Average age of the employees	0.0020***	0.0013	0.0016**	0.0015***	0.0006	0.0015**
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Share of employees with university degree	0.3778***	0.4072***	0.3371***	0.4157***	0.4600***	0.3785***
	(0.029)	(0.114)	(0.031)	(0.026)	(0.105)	(0.028)
(log) Labour productivity, base year	0.6079***	0.5586***	0.6337***	.	.	.
	(0.011)	(0.025)	(0.013)	.	.	..
Total factor productivity, base year	.	..	.	0.6062***	0.5401***	0.6309***
	.	.	.	(0.010)	(0.023)	(0.011)
(log) Capital stock	0.0183***	0.0230***	0.0131***	.	.	.
	(0.002)	(0.004)	(0.003)	.	.	.
Constant	1.3325***	1.5617***	1.3802***	1.7808***	2.0138***	1.0434***
	(0.057)	(0.126)	(0.088)	(0.044)	(0.095)	(0.071)
Observations	81,653	16,768	50,042	105,502	21,445	64,976
R²	0.529	0.459	0.565	0.481	0.342	0.426
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Note: LP = Labour productivity; TFP = Total factor productivity. This table shows the results for the regressions studying the effect of female and export behaviour on firm productivity. The sample contains only full-time employees. Robust standard errors in parentheses. *, ** and *** indicate statistical significance at the 10%-, 5%- and 1%-level, respectively.
Source: AMDC, WIFO presentation.

Turning to our variable of interest the female employment share is in line with previous findings (Haltiwanger et al., 1999; Pfeifer and Wagner, 2014; Galindo-Rueda and Haskel, 2005; Tsou and Yang, 2019), and therefore negatively associated with productivity. The effect seems to be more pronounced in the manufacturing rather than the services sector. There is no discernible difference between labour productivity and total factor productivity. The productivity estimates suggest an exporter premium. The interaction term between being an exporter and

the share of female employees is insignificant. In other words, exporters do not differ from non-exporters in terms of the relationship between female employment and productivity.

Table 5.2: Firm productivity, female employees and exporters, including part-time employees

	(1) LP All sectors	(2) LP Manufacturing	(3) LP Services	(4) TFP All sectors	(5) TFP Manufacturing	(6) TFP Services
Female employment share	-0.0002	-0.0016***	-0.0000	-0.0002	-0.0014***	-0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Exporter	0.0687***	0.0573***	0.0770***	0.0510***	0.0487***	0.0551**
	(0.013)	(0.017)	(0.026)	(0.013)	(0.017)	(0.026)
Female employment share * exporter	-0.0001	0.0006	-0.0002	0.0001	0.0006	0.0000
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
Part-time share	-0.1290***	-0.0493	-0.1448***	-0.1280***	-0.0450	-0.1420***
	(0.016)	(0.037)	(0.019)	(0.016)	(0.036)	(0.018)
(log) Age of the firm	0.0036	-0.0068	0.0103**	-0.0084**	-0.0166**	-0.0021
	(0.003)	(0.007)	(0.005)	(0.003)	(0.007)	(0.005)
Average age of employees	0.0020***	0.0016	0.0016**	0.0017***	0.0009	0.0018***
	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Share of employees with university degree	0.3667***	0.4115***	0.3247***	0.4123***	0.4613***	0.3744***
	(0.026)	(0.108)	(0.028)	(0.026)	(0.105)	(0.028)
(log) Labour productivity, base year	0.6320***	0.5851***	0.6557***	.	.	.
	(0.010)	(0.024)	(0.012)	.	.	.
Total factor productivity, base year	.	.	.	0.6026***	0.5395***	0.6260***
	.	.	.	(0.010)	(0.023)	(0.011)
(log) Capital stock	0.0160***	0.0186***	0.0119***	.	.	.
	(0.002)	(0.004)	(0.003)	.	.	.
Constant	1.9680***	2.1775***	1.2808***	1.7969***	2.0149***	1.0654***
	(0.053)	(0.114)	(0.083)	(0.045)	(0.095)	(0.072)
Observations	104,844	21,410	64,403	105,544	21,445	65,018
R^2	0.550	0.480	0.587	0.482	0.342	0.428
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Note: LP = Labour productivity; TFP = Total factor productivity. This table shows the results for the regressions studying the effect of female and export behaviour on firm productivity. The sample contains both full-time and part-time employees. Robust standard errors in parentheses. *, ** and *** indicate statistical significance at the 10%-, 5%- and 1%-level, respectively.
Source: AMDC, WIFO presentation.

Table 5.2 examines whether these results are driven by women's self-selection into part-time work. Rather than restricting the sample to full-time employees, we consider all employees, regardless of the temporal extent of their work, and include the share of part-time employees as an additional control variable. Firm-level productivity is lower in firms with a higher share of part-time workers. The coefficients for the share of female employees remain negative, but the coefficients become much weaker in manufacturing and become insignificant in services. The exporter premium is stable.

Since – as we have seen in Chapter 4.1 – the demand for high-skilled employees is higher in internationally active firms, we also investigate whether our results are different for women with a tertiary education. Table 5.3 shows the results for estimating the specification of Equation (3) for using the share of females with tertiary education as indicator for the share of high-skilled female workers. In contrast to our previous specifications, we do not find a negative impact on productivity for the employment share of females with tertiary education. Firms with a

high-skilled workforce are more productive compared to other firms, in the services sector as well as in the manufacturing sector. However, it seems that the gender composition of high-skilled workers does not influence the productivity of a firm. Exporting firms are in this respect not different from non-exporting firms.

Table 5.3: Firm productivity and high-skilled female employment

	(1) LP All sectors	(2) LP Manufacturing	(3) LP Services	(4) TFP All sectors	(5) TFP Manufacturing	(6) TFP Services
Share of females with university degree	0.0189	0.0136	0.0137	0.0089	0.0254	0.0001
	(0.0212)	(0.0271)	(0.0275)	(0.0211)	(0.0559)	(0.0273)
Exporter	0.0604***	0.0666***	0.0660***	0.0683***	0.0668***	0.0626***
	(0.0095)	(0.0121)	(0.0171)	(0.0093)	(0.0118)	(0.0166)
Share of females with university degree * exporter	0.0297	0.0409	-0.0061	0.0218	0.0653	-0.0229
	(0.0511)	(0.0955)	(0.0718)	(0.0505)	(0.0933)	(0.0714)
Part-time share	-0.1202***	-0.0690*	-0.1373***	-0.1300***	-0.0641*	-0.1409***
	(0.0164)	(0.0372)	(0.0191)	(0.0160)	(0.0364)	(0.0187)
(log) Age of the firm	0.0036	-0.0071	0.0118**	-0.0041	-0.0124*	0.0051
	(0.0035)	(0.0075)	(0.0048)	(0.0035)	(0.0074)	(0.0047)
Average age of employees	0.0019***	0.0012	0.0014**	0.0009*	0.0002	0.0005
	(0.0005)	(0.0011)	(0.0007)	(0.0005)	(0.0011)	(0.0006)
Share of employees with university degree	0.3698***	0.4217***	0.3301***	0.3902***	0.4431***	0.3432***
	(0.0337)	(0.1206)	(0.0394)	(0.0333)	(0.1168)	(0.0389)
(log) Labour productivity, base year	0.6344***	0.5884***	0.6560***	.	.	.
	(0.0103)	(0.0244)	(0.0123)	.	.	.
Total factor productivity, base year	.	.	.	0.6102***	0.5624***	0.6308***
	.	.	.	(0.0099)	(0.0235)	(0.0117)
(log) Capital stock	0.0158***	0.0193***	0.0119***	.	.	.
	(0.0021)	(0.0041)	(0.0028)	.	.	.
Constant	1.3143***	1.5564***	1.2673***	0.9159***	1.4092***	0.7742***
	(0.0463)	(0.1063)	(0.0573)	(0.0450)	(0.1038)	(0.0555)
Observations	81,653	16,768	50,042	105,502	21,445	64,976
R²	0.5576	0.4863	0.5920	0.4953	0.3626	0.4368
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Note: LP = Labour productivity; TFP = Total factor productivity. This table shows the results for the regressions studying the effect of female and export behaviour on firm productivity. The sample contains both full-time and part-time employees. Robust standard errors in parentheses. *, ** and *** indicate statistical significance at the 10%-, 5%- and 1%-level, respectively.
Source: AMDC, WIFO presentation.

5.2 Other internationalisation measures and robustness checks

The previous analysis focused on exporting firms. In addition, we re-estimate the specifications of Equation (3) for firms that import or are MNEs, i.e. we use the import and the MNE indicator as our international activity.

The results are comparable to the results for exporter. The negative effects of a higher proportion of female employees seem to be driven by part-time work. There is a premium for importing firms and for multinationals. The interaction effects are negative and largely significant, although the magnitudes of the coefficients are negligible. The results for the control variables are similar to those described above. We also run the regressions in first

differences to obtain results for firm growth. These results are not significantly different from those presented[28].

Table 5.4: Firm productivity, female employees and other internationalisation measures

	(1) LP Full-time	(2) TFP Full-time	(3) LP Full-time	(4) TFP Full-time	(5) LP Full- and part-time	(6) TFP Full- and part-time	(7) LP Full- and part-time	(8) TFP Full- and part-time
Female employment share	-0.0006***	-0.0004***	-0.0008***	-0.0006***	0.0000	0.0001	-0.0002	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Part-time share					-0.1291***	-0.1283***	-0.1240***	-0.1230***
					(0.016)	(0.016)	(0.016)	(0.016)
Importer	0.0880***	0.0819***			0.0979***	0.0903***		
	(0.011)	(0.009)			(0.011)	(0.010)		
Female employment share * importer	-0.0011***	-0.0012***			-0.0012***	-0.0013***		
	(0.000)	(0.000)			(0.000)	(0.000)		
MNE			0.0557***	0.0572***			0.0617***	0.0604***
			(0.010)	(0.009)			(0.010)	(0.010)
Female employment share * MNE			-0.0003	-0.0005**			-0.0005**	-0.0006***
			(0.000)	(0.000)			(0.000)	(0.000)
(log) Age of the firm	0.0061	-0.0076**	0.0073*	-0.0070**	0.0032	-0.0092***	0.0043	-0.0084**
	(0.004)	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Average age of the employees	0.0020***	0.0015***	0.0020***	0.0015***	0.0019***	0.0017***	0.0019***	0.0017***
	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Share of employees with UD	0.3899***	0.4245***	0.3684***	0.4064***	0.3776***	0.4201***	0.3583***	0.4041***
	(0.029)	(0.026)	(0.028)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)
(log) Labour productivity, base year	0.6070***		0.6088***		0.6310***		0.6330***	
	(0.011)		(0.011)		(0.010)		(0.010)	
Total factor productivity, base year		0.6053***		0.6066***		0.6019***		0.6033***
		(0.010)		(0.010)		(0.010)		(0.010)
(log) Capital stock	0.0177***		0.0162***		0.0151***		0.0140***	
	(0.002)		(0.002)		(0.002)		(0.002)	
Constant	1.3326***	1.7742***	1.3542***	1.8393***	1.9686***	1.7856***	2.0469***	1.8510***
	(0.058)	(0.045)	(0.058)	(0.045)	(0.054)	(0.045)	(0.055)	(0.045)
Observations	81,653	105,502	81,653	105,502	104,844	105,544	104,844	105,544
R²	0.530	0.482	0.529	0.482	0.550	0.483	0.550	0.482
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: LP = Labour productivity; TFP = Total factor productivity. UD = University degree. This table shows the results for the regressions studying the effect of female and export behaviour on firm productivity. The sample contains both full-time and part-time employees. Robust standard errors in parentheses. *, ** and *** indicate statistical significance at the 10%-, 5%- and 1%-level, respectively. Source: AMDC, WIFO presentation.

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[28] The results for the regressions on firm growth are available from the authors on request.

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6. Conclusions

This empirical study provides, for the first time, evidence on the role of internationally active firms in influencing women's labour market participation and opportunities within firms in Austria. Motivated by the economic literature, it empirically analyses newly available data from the Austrian Microdata Centre (AMDC). The data enables the construction of a matched employer-employee dataset of employees in 21,715 private sector firms covering the years from 2013-2020. This matched employer-employee dataset is used to empirically examine the female employment share and the gender pay gap in domestic, exporting, importing and multinational enterprises (MNEs).

The findings of the study highlight the prevalent under-representation of women in most Austrian private sector firms, with a mean female employment share of around 38%[29]. However, there are large differences between firms, and a higher proportion of firms in the services sector have higher female employment shares, particularly in the tourism, gastronomy, and real estate. Overall, Austria's private sector is characterised by gender inequalities in terms of labour force participation and labour market outcomes.

The analysis shows that internationally active firms, especially exporters and MNEs, tend to have a more moderate share of women in their workforce compared to purely domestic firms. Using propensity score matching, which allows for a comparison between international and domestic firms with similar firm characteristics, the study shows that in the manufacturing sector exporters and MNEs have a 1.4 to 2.6% higher female employment share than comparable domestic firms. This suggests that international competition enhances women's participation in the labour market, particularly in manufacturing sectors, where more women work full-time than in purely domestic firms. However, the picture is different in services. Only MNEs in the services sector exhibit a higher share of female employment, mainly due to a higher share of women working part-time. Nevertheless, the difference in the mean employment share of females with young children between the manufacturing and services sectors is small, suggesting greater flexibility for employees in firms facing international competition.

The study also explores the relationship between the flexibility demands by international firms and female labour market participation. According to the economic literature, firms that trade with partners in distant locations or across different time zones have typically a higher demand for a more flexible workforce. The analysis reveals that Austrian firms with distant trading partners and partners across different time zones have a 2.1-5.0% significantly higher female employment share than comparable domestic firms. This suggests that international firms are less likely to discriminate against women and offer more attractive work arrangements when it comes to flexibility requirements, such as working outside normal working hours and frequent travel. It seems that in the face of a more intense international competition and the need for greater adaptability from their employees, firms may offer also a higher flexibility in terms of work arrangements to their employees.

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[29] Note that the study excludes the public sector.

Further, the analysis also highlights potential challenges related to working part-time. Domestic firms have a relatively higher share of part-time workers compared to internationally active ones. In particular, MNEs in the manufacturing sector have a 2.8% significantly lower part-time share compared to domestic firms, largely due to a significant lower part-time share among female employees. Full-time work, which is less prevalent among female employees, increases when firms become internationally active. Firms facing fiercer international competition, which are also more likely to require greater flexibility from their workforce, have a higher proportion of women working full-time. These findings suggest that Austrian firms might need to design employment and part-time working arrangements more flexible, particularly for female employees.

Labour market discrimination not only affects the labour market participation of women, but also their labour market outcomes. Therefore, the study also examines the impact of participation of Austrian firms in international markets on the gender pay gap, which represents the difference in annual earnings between males and females. The empirical estimates for the Mincer wage regression show a significant annual wage gap ranging from 9% to 13% between men and women in the Austrian private sector. This is consistent with prior empirical evidence. Additionally, a wage premium for working in an international firm for both genders across different age groups and educational backgrounds can be observed. This study focuses specifically on the impact of international activities of Austrian firms on the gender pay gap in annual earnings. In the Mincer wage regression analysis, an internationalisation dummy variable is used to capture whether a firm engages in international activities such as exports, imports, or multinational networks. An interaction effect between indicators for internationally active Austrian firms and the gender indicator variable allows to examine whether female workers are differentially affected by international activities. The results indicate a heterogeneous effect, but, on average, exporting has a negative impact on the gender pay gap in Austrian firms, i.e. the gender pay gap increases for exporting firms. Female employees in exporting firms, particularly in services, earn lower annual wages than their male counterparts and female workers in domestically oriented firms. In manufacturing firms, the evidence is reversed. The gender pay gap is 2.3% smaller in exporting manufacturing firms in comparison to the estimated gender pay gap in non-exporting firms. In comparison to women working in domestically orientated manufacturing firms, annual wages paid for female workers in exporting firms is 1.5% higher, on average. As a result, women taking up jobs in Austrian manufacturing firms that export to foreign markets are better off in terms of their annual wage payments.

Furthermore, focusing on productivity, the study finds that internationally active firms have a productivity premium between 5-9%, both in terms of total factor productivity and labour productivity. However, consistent with prior empirical evidence, there is a small negative relationship between a higher share of female employees and productivity at the firm-level when only full-time female employees are considered. This negative relationship disappears for Austrian firms when considering the extent of employment (i.e., part-time work). Furthermore, when differentiating by skills, the study does not find a negative relationship between the share of highly skilled female employees and productivity for Austrian firms. Thus, female employment does not have a different impact on the productivity of internationalised firms compared to

non-internationalised firms once it is control for part-time employment. This association is not significantly different between exporting, importing or multinational enterprises.

This study on the role of women in foreign trade, provides a first set of "stylised facts" on the role of internationally active firms for the labour market participation and labour market outcomes of women in Austria. Overall, the Austrian economy is characterised by strong gender inequalities in terms of labour force participation and labour market outcomes. However, internationally active firms, which are more prone to international competition, have a higher female employment share than similar domestic firms, and seem to contribute on average to an increase in the gender pay gap in Austria. The promotion of policies enhancing gender equality to reach the sustainable development goal on gender equality and empowerment in Austria should therefore be a key policy priority.

Nevertheless, it is important to acknowledge the limitations of the study. Although the microdata from the AMDC have enabled the present analysis for the Austrian private sector, limitations related to the data availability remain. A larger fraction of employees in Austria, particularly part-time employees, has multiple pay checks within a year. Unfortunately, we are not able to identify the respective wage the employee is earning from the different firms she/he is working for. This is also true for employees changing jobs within a year. Furthermore, there is no information about the exact number of hours worked. This renders it difficult to adjust the wage earned and calculate a full-time equivalent wage for Austrian employees. To overcome these problems, we focus in our main specifications on the main firm for which an employee works and account only for full-time wages in our main specifications. Nonetheless, our study sheds light on the gender pay gap and the female labour market participation in Austrian private sector firms in international markets.

Another limitation of the study concerns the varying data quality across different sectors and types of international activities. Cross-border activities in the services sector are difficult to report with the same quality as for manufacturing firms. Official statistics on services trade are based on different data sources and the concepts for measuring such activities are still relatively vague compared to the data collection process in manufacturing. Initiatives at the international level on how to improve the reporting of economic activities in the services would therefore, in general, be very welcome to increasing the comparability of empirical findings across sectors.

Yet, the findings of this study emphasise the need for targeted policies to address the gender pay gap and ensure fair treatment and equal opportunities for women in the labour market in Austria, particularly in the context of international activities. The promotion of gender equality should be among the key policy priorities. Based on our findings, several policy recommendations can be made to address the gender imbalances in Austrian firms.

First, efforts should focus on increasing gender diversity in domestic firms, exporters, importers, and MNEs, particularly in the manufacturing sector. Promoting initiatives to attract and retain female talent, providing equal opportunities for career advancement, and implementing flexible working arrangements can contribute to improving female labour market participation.

Given the flexibility demands of international firms, policies should aim to support and empower female workers to meet these demands effectively. This is particularly relevant for high-skilled female employees which are more likely to be negatively affected by international operations of firms. This could include providing training and resources to enhance employees' flexibility skills, developing policies to address the challenges faced by working parents, and promoting a culture of work-life integration and work-life balance. Such policies shall enable males and females to work full-time while being working parents. Further, improving childcare facilities should make it easier for parents to participate full-time in the labour market. This includes the availability, affordability and quality of childcare in Austria. In addition, promoting the use of family-friendly business practices can support a more gender-equal workforce, particularly among full-time employees. This is important, as gender stereotypes are more prevalent in Austria than in many other EU countries, which leads to a dominance of traditional family models causing gender asymmetries in labour force participation, the extent in labour force participation and wages (OECD, 2023). This can, for example, be achieved by linking existing investment programs and other business support schemes to targets on gender-equal business practices. Another possible way to promote gender equality at the workplace are certification or award schemes for firms, like the "equalitA"[30]. This is a quality label for companies that meet a number of gender equality criteria, such as the representation of women in all departments and at all levels of the firm and measures against gender discrimination. In addition, "equalitA" awards firms implementing innovative solutions to combat gender inequality.

Moreover, given the differences in the labour force participation, the gender pay gap and its interaction with international activities across different industries, industry-specific interventions may be necessary. Policy makers should consider tailoring strategies and support measures based on the specific characteristics and challenges of each industry. Instruments such as the "MINT-Girls Challenge" initiative[31], which aim to encourage young women to pursue careers in natural science, technology, engineering and mathematics. This can be used to make certain occupations and industries more attractive for females in order to achieve a higher share of female employment in these sectors and to achieve greater gender equality across industries.

The empirical evidence provided in this study could be seen as a first insight into female participation in internationally active, Austrian firms. Follow-up research on the potential mechanisms and to better understand the reasons for the heterogeneous patterns would be highly welcome. Designing the most effective policy instruments to address female labour market discrimination in Austria requires a deeper understanding on the underlying mechanisms based on further additional empirical evidence.

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[30] See https://www.bmaw.gv.at/Themen/Wirtschaftsstandort-Oesterreich/equalitA.html (last accessed June 13, 2023).

[31] See https://www.mintgirlschallenge.at/ (last accessed June 13, 2023).

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8. Appendix

8.1 Details on datasets and data preparation

8.1.1 Extrastat and Intrastat

Firm-specific cross-border trade information is available via foreign trade statistics, which are based on two administrative sources: Extrastat and Intrastat. Extrastat records the flows of goods with non-EU countries, while Intrastat records trade flows with partners located in EU Member States. The foreign trade statistics provide detailed product-level information on the goods traded, but only take physical movements of goods into account, so services are largely not covered.

To obtain annual trade flows, the monthly trade values from Intra- and Extrastat at the HS-8-digit product-level were aggregated at the firm-level. Different product varieties were counted at the HS 8-digit product-level for each firm in each year.

Excluded from our analysis are trade activities with countries/country groups that fall under the categories of small island states and overseas territories such as Saint-Barthelemy [BL], Northern Mariana Islands [MP], French Southern Territories [TF]), country aggregates such as Southern Africa [QR], Northern Africa [QP], Melanesia [QW], Australia and New Zealand [QS], Latin America [XL], and Caribbean [XC]), Kosovo [XK], and countries with missing information (QX). The trade flows of the US remote islands (UM) were attributed to the United States, the trade flows with Tokelau (TK) to New Zealand, and the trade flows with the Norfolk Island (NF) to Australia.

8.1.2 Structural Business Statistics

The Structural Business Statistics Survey provides the basis for official aggregated statistics and detailed firm-level productivity analysis in Austria. The sample includes firms with market-oriented activities, a turnover of at least 10,000 €, and at least 10 employees, covering approximately 72.8% of persons employed in Austrian private firms in 2017. Self-employment and non-market activities are not considered. A variety of firm types and legal forms are covered. With respect to the legal form, public limited companies, foreign legal types of firms, charitable foundations or funds (legally defined, also under province law), sole traders (registered or unregistered), European economic interest groups, companies under civil law, cooperatives (Austrian and European), limited liability companies, limited partnerships, general partnerships, European companies (SE), other legal forms, savings banks, mutual insurance associations, and associations are covered.

For our analysis, we only consider firms included in the primary survey of the Structural Business Statistics Survey.

Estimating total factor productivity with the Structural Business Statistics

We use the Structural Business Statistics to compute firm performance indicators. This micro-level register dataset is the basis for official statistics and allow an analysis of productivity dynamics

in Austria. We compute the total factor productivity by specifying the following production function:

$$Y_{jt} = Labour_{jt}^{\beta 1} * Capital_{jt}^{\beta 2} * A_{jt,}$$

where Y is the value added of firm *j* in year *t* measured as gross value added. The labour stock is denoted by $Labour_{jt}$, $Capital_{jt}$ denotes tangible capital. A_{jt} is the error term and denotes the total factor productivity (TFP) of a firm. After logarithmising the production function, we obtain the following estimation equation:

$$y_{jt} = \beta_0 + \beta_1 labour_{jt} + \beta_2 capital_{jt} + \omega_{jt} + u_{jt,}$$

where the variable names starting with a small capital letter denote logarithmic terms. TFP thus comprises $\ln(A_{jt}) + \omega_{jt} + u_{jt}$. The term u_{jt} is a stochastic residual. The term ω_{jt} is a firm-specific productivity component which is observed by the firm but yet unobserved by the statistician. This is the source of endogeneity because firm-specific productivity is the basis for input choice. When productivity shocks occur in profit-maximising firms, they expand their output, which in turn requires additional inputs. The productivity shock is not observed empirically but affects the choice of inputs. This leads to a simultaneity problem in the estimation of the production function, which causes a bias in ordinary least squares estimations.

There is a lot of literature discussing endogeneity issues in estimating production functions that attempt to resolve the correlation between unobservable productivity shocks and input levels. Several control function approaches that exploit the panel structure of the data have addressed identification issues (Ackerberg et al., 2015; Rovigatti and Mollissi, 2018). Cognizant of this literature, we split the sample into a broadly defined manufacturing and services sector and implemented a Levinsohn-Petrin estimator using intermediate inputs as a time-varying proxy for unobservable productivity (Levinsohn and Petrin 2003). The estimator assumes that firms are able to adjust inputs at no cost when subject to productivity shocks. The labour coefficient can be consistently estimated in the first stage only if the free variables show variability independently of the proxy variable. If this is not the case, their coefficients would be perfectly collinear in the first-stage estimation and hence not identifiable. We implement a correction for this simultaneity issue, which was proposed by Ackerberg et al. (2015).

We draw on the variable definitions proposed by Friesenbichler et al. (2023) who have used this data to study production functions across sectors and different types of firms. The target variable is gross value added at the firm-level, which is explained by the firm-specific labour stock in full-time equivalents and tangible capital. The capital stock is not included in the data, which is why proxies based on investments and an initial capital stock are computed. This is done in a stepwise approach. First, information on capital per employee at the NACE rev. 2 2-digit level from the OECD STAN database is used for the year 2012. Second, this capital intensity by industry-level is multiplied by the firm-specific employment information (number of persons employed in full-time equivalents) to obtain a firm-specific initial capital stock for our starting year 2013. Third, annual investments are added, and depreciation is subtracted to

obtain the annual capital stock of the following years. The depreciation rates are obtained from the OECD and allow to vary across NACE rev. 2 2-digit industries.

8.1.3 Statistical Business Register

We derive the age of the firm from the founding data as described in the Statistical Business Register and use the reported sales tax base to approximate for the size of the firm. We use this information instead of the sales reported in the Statistical Business Statistics Survey to have a broader range of firm observations in case we do not control for productivity or other variables restricted to the set of firms covered by the Structural Business Statistics Survey. Further, this allows us to mitigate potential multicollinearity between productivity estimates and the size approximation.

The Statistical Business Register is our main information for a firms" membership in a business group, national or international. The business group characteristics are consistently available only from 2018 onwards. However, information of the founding date allows an extrapolation of the business group variable to prior sample years. Moreover, the Statistical Business Register provides information on the location of mothers, daughters, and affiliates. Based on this information, we consider a firm as multinational active if it has close international business linkages. Thus, we define a firm as MNE if it has its headquarter location outside of Austria, if it has a daughter in a foreign county, a business location in a foreign country or is part of a global business group.

8.1.4 Integrated Wage and Income Tax Statistics

The Integrated Wage and Income Tax Statistics is our primary source for demographic information of individuals. Individuals not included in the analysis:

- individuals with "unknown" individual ID,
- persons not in the age range of 15 to 65,
- persons not active in the workforce (e.g. pensioners, persons with transfer income, unemployed persons, etc.),
- persons that worked less/received an income from working for less than 90 days each year,
- persons with unknown gender,
- persons with unknown age and
- persons with more than 10 pay checks in one year.

Before excluding a person from the analysis, information from the Register-based Labour Market Statistics were used to fill missing observations.

The wage of each person was adjusted to a yearly wage in case the extent of employment was less than 365 days (or 366 days in leap years). The number of pay checks further allows us to differentiate persons working only in one firm from persons working in more than one firm and estimate specifications in which we account only for firm characteristics of the firm from which the employee earns the highest income and works most of the year (i.e. main firm of the

employee). Further, we use information from the Integrated Wage and Income Tax Statistics to differentiate between full-time and part-time employees. Since information on the hours worked are disclosed, we unfortunately cannot estimate full-time equivalent wages.

The Integrated Wage and Income Tax Statistics is our preferred dataset for information on personal characteristics like age or gender and working characteristics like full-time or part-time work.

### 8.1.5 Register-based Labour Market Statistics

The personal characteristics from the Integrated Wage and Income Tax Statistics are supplemented by information on education and household characteristics like the number of children from the Register-based Labour Market Statistics. Further, the information of the Register-based Labour Market Statistics are used to fill missings on gender, age and employment status in case this information is missing in the Integrated Wage and Income Tax Statistics. Further, in case rather static variables like gender switch continuously for one person across time or in case of significant mismatches of rather static personal characteristics like gender or age between the Register-based Labour Market Statistics and the Integrated Wage and Income Tax Statistics, we exclude the respective individuals from our dataset. Note that – due to anonymisation – the age of the Registered-based Labour Market Statistics is only provided in age groups with 5-year intervals.

Further, we use educational occupations to account for occupational specific characteristics. We use the International Standard Classification of Education (ISCED) to group individuals according to their field of highest educational attainment. The educational occupation comprises the following groups: 0 – General education and qualification (which is our reference group); 1 – Education; 2 – Humanities and arts; 3 – Social science, journalism and information; 4 – Business, administration and law; 5 – Natural sciences, mathematics and statistics; 6 – Information and communication technologies; 7 – Engineering, manufacturing and construction; 8 – Agriculture, forestry, fisheries and veterinary; 9 – Health and welfare; 10 – Services.

The Register-based Labour Market Statistics provide a link of each employee to the respective employer. Unfortunately, though we observe employees working in multiple firms or employees that switch jobs, we cannot attribute the respective wage earned and time worked in each firm to each employer. Employees appearing only in one year in the dataset are excluded from our estimation of the Mincer wage regression.

8.2 Additional tables and figures

Figure 8.1: Comparison of the characteristics of the estimation sample and the population of Austrian firms
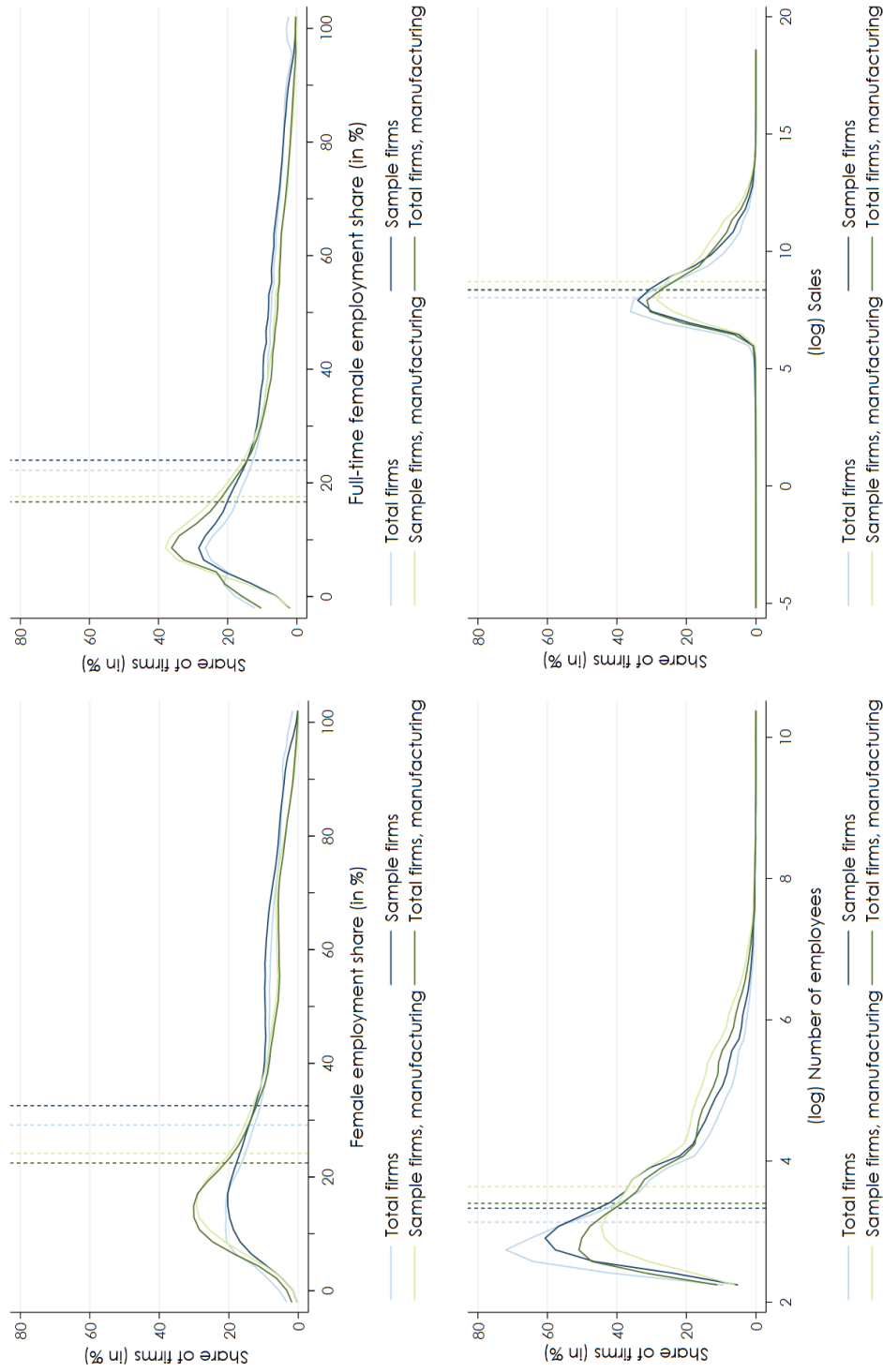
WIFO

Table 8.1: Employment structure of Austrian manufacturing firms

	Female share	Female share, full-time	Female share, part-time	Male share, part-time	University degree	Kids <=6 years	Average Age	Female wage	Male wage
Domestic firms									
Mean	34.7	26.4	15.0	3.7	3.1	13.8	39.7	19,459.9	35,576.4
Standard deviation	24.0	21.6	15.3	5.7	5.8	8.0	4.6	13,052.8	12,133.1
Median	26.3	18.2	9.5	1.4	0.0	13.3	39.9	17,192.7	34,230.7
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0
Maximum	100.0	100.0	85.3	72.2	80.0	60.0	53.8	405,501.8	142,397.7
Observations	8,889	8,889	8,889	8,889	8,889	8,889	8,889	8,878	8,886
Exporter									
Mean	28.1	22.3	9.3	2.8	8.0	15.1	40.1	25,191.5	45,530.6
Standard deviation	18.6	17.3	9.5	4.1	9.5	6.3	3.8	10,598.2	12,623.9
Median	22.6	16.7	6.5	1.6	5.3	15.0	40.3	24,824.1	44,237.0
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	22.9	0.0	0.0
Maximum	95.1	93.3	78.0	66.0	75.0	50.0	53.7	103,024.3	228,071.9
Observations	8,142	8,142	8,142	8,142	8,142	8,142	8,142	8,139	8,142
Importer									
Mean	27.9	22.1	9.2	2.7	7.3	15.3	40.3	25,112.3	45,636.9
Standard deviation	18.5	17.4	9.2	4.1	8.8	6.2	3.7	10,482.6	12,271.0
Median	22.2	16.7	6.5	1.5	4.8	15.1	40.5	24,609.9	44,166.3
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	22.9	0.0	0.0
Maximum	100.0	100.0	84.8	72.2	75.0	57.1	52.9	99,908.3	225,293.3
Observations	8,801	8,801	8,801	8,801	8,801	8,801	8,801	8,795	8,800
MNEs									
Mean	25.8	20.7	7.7	2.3	9.0	15.6	40.5	27,701.4	49,218.9
Standard deviation	17.0	15.9	7.2	3.7	9.7	5.7	3.4	10,068.8	12,555.7
Median	20.5	15.1	5.8	1.4	6.2	15.5	40.7	27,262.8	47,664.7
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	22.9	0.0	0.0
Maximum	94.7	100.0	63.6	66.0	75.0	50.0	52.9	104,899.3	228,071.9
Observations	5,111	5,111	5,111	5,111	5,111	5,111	5,111	5,107	5,111
All firms									
Mean	31.5	24.4	12.3	3.2	5.4	14.4	39.9	22,201.2	40,336.0
Standard deviation	21.8	19.8	13.2	5.0	8.2	7.3	4.2	12,280.0	13,331.9
Median	24.1	17.6	7.7	1.5	3.1	14.3	40.1	21,168.0	39,109.9
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	22.9	0.0	0.0
Maximum	100.0	100.0	85.3	72.2	80.0	60.0	53.8	405,501.8	228,071.9
Observations	17,031	17,031	17,031	17,031	17,031	17,031	17,031	17,017	17,028

Note: The group of domestic firms consists of firms that do not export and are no MNEs. The table shows unweighted statistics pooled across firms and time.
Source: AMDC, WIFO presentation.

WIFO

Table 8.2: Summary of characteristics of Austrian manufacturing firms

	(log) Exports	(log) Imports	(log) Number of employees	(log) Sales	(log) Inter-mediates	(log) Capital stock	Age
Domestic firms							
Mean	0.0	7.6	3.4	8.2	7.6	8.1	27.4
Standard deviation	0.8	7.3	0.8	1.1	1.3	1.0	18.3
Median	0.0	12.4	3.2	8.0	7.4	7.9	24.0
Minimum	0.0	0.0	2.3	1.9	1.7	2.7	2.0
Maximum	15.9	20.1	8.2	14.0	13.8	12.9	154.0
Observations	2,916	3,711	8,889	8,870	8,889	8,862	8,889
Exporter							
Mean	16.1	13.6	4.5	9.8	9.4	9.4	29.6
Standard deviation	1.7	5.5	1.2	1.5	1.6	1.4	17.5
Median	16.0	15.2	4.3	9.7	9.3	9.3	26.0
Minimum	8.1	0.0	2.3	2.7	5.3	3.2	2.0
Maximum	22.0	22.2	9.1	15.8	15.9	14.2	156.0
Observations	8,142	7,865	8,142	8,142	8,142	8,114	8,142
Importer							
Mean	13.7	15.4	4.5	9.8	9.4	9.4	30.3
Standard deviation	6.2	1.7	1.2	1.4	1.5	1.3	18.3
Median	15.8	15.2	4.4	9.7	9.3	9.3	27.0
Minimum	0.0	10.2	2.3	2.7	5.1	3.9	2.0
Maximum	22.0	22.2	9.1	15.8	15.5	14.2	155.0
Observations	8,185	8,801	8,801	8,792	8,801	8,769	8,801
MNEs							
Mean	14.4	14.2	4.8	10.3	9.9	9.8	29.9
Standard deviation	6.2	5.4	1.2	1.5	1.5	1.4	17.0
Median	16.6	15.9	4.8	10.3	9.9	9.8	27.0
Minimum	0.0	0.0	2.3	1.9	3.7	3.9	2.0
Maximum	22.0	22.2	9.1	15.8	15.9	14.2	147.0
Observations	4,713	4,840	5,111	5,109	5,111	5,083	5,111
All firms							
Mean	11.8	11.7	3.9	9.0	8.4	8.7	28.5
Standard deviation	7.2	6.7	1.1	1.5	1.7	1.4	17.9
Median	15.2	14.5	3.6	8.7	8.2	8.4	25.0
Minimum	0.0	0.0	2.3	1.9	1.7	2.7	2.0
Maximum	22.0	22.2	9.1	15.8	15.9	14.2	156.0
Observations	11,058	11,576	17,031	17,012	17,031	16,976	17,031

Note: The group of domestic firms consists of firms that do not export and are no MNEs. The table shows unweighted statistics pooled across firms and time.
Source: AMDC, WIFO presentation.

Table 8.3: Effects of the occupational training in the Mincer wage regression

	(1) Full-time, all sectors	(2) Full-time, manu-facturing	(3) Full-time, services	(4) Full and part-time, all sectors	(5) Full and part-time, manu-facturing	(6) Full and part-time, services	(7) Full and part-time, all sect., all firms	(8) Part-time, all sectors	(9) Part-time, manu-facturing	(10) Part-time, services	(11) Part-time, all sect., all firms
Education	0.366***	0.425***	0.314***	0.303***	0.392***	0.250***	0.304***	0.143***	0.174***	0.139***	0.145***
	(0.010)	(0.017)	(0.014)	(0.009)	(0.015)	(0.012)	(0.009)	(0.013)	(0.033)	(0.014)	(0.013)
Humanities and arts	0.309***	0.435***	0.227***	0.254***	0.405***	0.178***	0.253***	0.094***	0.138***	0.088***	0.095***
	(0.008)	(0.013)	(0.010)	(0.008)	(0.012)	(0.010)	(0.008)	(0.012)	(0.025)	(0.013)	(0.012)
Social sciences, journalism, information	0.320***	0.416***	0.266***	0.262***	0.374***	0.209***	0.261***	0.085***	0.097***	0.084***	0.086***
	(0.008)	(0.014)	(0.011)	(0.008)	(0.013)	(0.010)	(0.008)	(0.012)	(0.028)	(0.012)	(0.011)
Business, administration and law	0.443***	0.492***	0.398***	0.408***	0.473***	0.363***	0.408***	0.254***	0.224***	0.262***	0.254***
	(0.005)	(0.009)	(0.009)	(0.006)	(0.008)	(0.010)	(0.006)	(0.013)	(0.015)	(0.014)	(0.013)
Natural sciences, mathematics, statistics	0.322***	0.380***	0.255***	0.260***	0.362***	0.178***	0.260***	0.067***	0.180***	0.026	0.067***
	(0.009)	(0.016)	(0.011)	(0.010)	(0.015)	(0.010)	(0.010)	(0.015)	(0.028)	(0.016)	(0.015)
Informatics, communication technologies	0.428***	0.475***	0.375***	0.395***	0.460***	0.341***	0.395***	0.248***	0.246***	0.245***	0.248***
	(0.005)	(0.010)	(0.009)	(0.006)	(0.009)	(0.009)	(0.006)	(0.012)	(0.026)	(0.013)	(0.012)
Engineering, manufacturing, construction	0.478***	0.529***	0.397***	0.448***	0.516***	0.361***	0.448***	0.246***	0.294***	0.207***	0.246***
	(0.005)	(0.007)	(0.008)	(0.005)	(0.007)	(0.008)	(0.005)	(0.010)	(0.017)	(0.013)	(0.010)
Agriculture, forestry, fishery, veterinary	0.350***	0.391***	0.304***	0.327***	0.386***	0.275***	0.327***	0.221***	0.277***	0.192***	0.220***
	(0.005)	(0.008)	(0.008)	(0.005)	(0.007)	(0.008)	(0.005)	(0.020)	(0.022)	(0.026)	(0.020)
Health and welfare	0.445***	0.456***	0.418***	0.427***	0.445***	0.403***	0.426***	0.335***	0.268***	0.353***	0.335***
	(0.013)	(0.014)	(0.018)	(0.012)	(0.012)	(0.015)	(0.012)	(0.018)	(0.029)	(0.020)	(0.017)
Services	0.371***	0.402***	0.335***	0.339***	0.389***	0.302***	0.339***	0.192***	0.168***	0.198***	0.191***
	(0.004)	(0.007)	(0.007)	(0.005)	(0.007)	(0.008)	(0.005)	(0.009)	(0.016)	(0.010)	(0.009)
Constant	7.961***	7.869***	7.997***	7.993***	7.865***	8.088***	7.994***	8.318***	8.076***	8.371***	8.324***
	(0.025)	(0.038)	(0.043)	(0.025)	(0.038)	(0.039)	(0.024)	(0.087)	(0.150)	(0.097)	(0.087)
Observations	2,452,505	882,964	1,222,831	2,830,581	945,349	1,522,463	2,856,527	375,169	62,402	300,534	378,532
R^2	0.756	0.754	0.753	0.741	0.739	0.733	0.741	0.501	0.515	0.486	0.501
Sector-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Field of occupational training fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: The reported coefficients complement the results on the Mincer wage regression for wages in Austrian firms shown in Table 4.9. Effects are relative to general education and qualifications. Robust standard errors in parentheses. *, ** and *** indicate statistical significance at the 10%-, 5%- and 1%-level, respectively.

Source: AMDC, WIFO presentation.

WIFO