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Gender and Monetary Policy: Labour Impacts of Exchange Rate Shocks

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Abstract
This paper examines how women and men's labour respond differently to monetary policy changes, particularly exchange rate policy. The study leverages the unexpected unpegging of the Swiss franc from the Euro in 2015, which led to a significant appreciation of the Swiss franc. This currency appreciation increased women's work volume relative to men's. The effect is especially pronounced among the least educated women, who act as a labour buffer and are most responsive to macroeconomic fluctuations, underscoring the nuanced gender effects of monetary policy. (JEL: E52, J16, B54, J21)

1. Introduction

In the context of recent inflation hikes, scrutiny of the effectiveness and trade-offs between different monetary policy tools is gaining renewed urgency. Although monetary policy typically targets price and currency stability, these policy measures are formulated and implemented within a specific set of distributive relations and institutional structures, thus inevitably having repercussions for social outcomes (Elson and Cagatay, 2000). Anticipating potential distributional outcomes is central to guiding the economy in the most efficient and equitable manner.

Distributional effects of monetary policy have recently gained attention. Much of the literature has focused on the unequal effects of monetary policy by class (e.g. Andersen et al. (2023); Bonifacio et al. (2022); Gornemann et al. (2021)) and race (e.g. Bartscher et al. (2022); Gerardi et al. (2023)) leaving the distributional impact by gender still relatively unexplored. Due to structural gender inequalities in the labour market, women and men may be differentially

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affected by monetary policy (Braunstein and Heintz, 2008; Seguino and Heintz, 2012). This can be attributed to segregation across industries and occupations, and the constraints women face in the labour market (including implicit bias), as well as within the household (Seguino, 2020). Ex ante, it is unclear how these forces will coalesce, potentially reshaping the distribution of work, money and, ultimately, well-being in society. Within the household, meanwhile, monetary policy might have non-negligible effects on bargaining and allocation of labour and resources. It is crucial for policy makers to be aware of these distributional outcomes in order to effectively pre-empt the implications of their policy choices on the economy and strive towards social justice.

This paper sheds light on the impact of monetary policy on labour market outcomes by gender. The setting of the paper is an exogenous exchange rate shock, namely the Swiss National Bank's unexpected decision to unpeg the franc from the euro in 2015 (Swiss franc shock). This exogenous exchange rate shock resulted in a large and sudden appreciation of the franc, thereby affecting the competitiveness of Switzerland's export sector. The natural experiment allows a direct causal link to be drawn between policy choices made by the central bank and the economic reactions of individuals and firms.

This paper is able to provide a comprehensive picture of the distributional gender effects of monetary policy by exploring the impacts of this policy at the individual, household, and firm level, which is the novel contribution of this paper. The distributional gender impacts of monetary policy have seldom been explored at this level of disaggregation and completeness, partly because of the granularity of the data required for such an analysis. Indeed, a comprehensive analyses requires information on both firms (labour demand side) and households (labour supply side), as well as gender disaggregated data within the household to speak to the gendered effects. This paper uses granular, employer-employee matched data, which enables the comparison of individuals and firms over time. In addition, labour force survey data, which contains gender disaggregated information and includes a panel dimension, allows for investigation of how household level outcomes and time use dynamics evolve. Lastly, the richness of the data and the economy wide coverage enables the creation of a regional level exposure measure. Hence it is possible to investigate wider impacts on local labour markets extending beyond industries directly impacted and allowing for spillover effects within households.

The identification strategy exploits a triple difference approach. The three dimensions are time (pre and post shock), level of exposure to the shock (by industry or local labour market) and the distributional dimension of interest (gender). Exposure to the shock is proxied by trade intensity, allowing for a comparison of the labour market outcomes of men and women in affected industries (or labour markets, following the approach by Autor et al. (2013)) before and after the exchange rate shock. This natural experiment setting is preferable to exploiting exchange rate fluctuations over time, as the latter is endogenously determined by wider economic conditions. In contrast, the

unexpected timing of the Swiss National Bank's decision to unpeg the currency enables the isolation of the shock's impacts from pre-existing labour market trends. It is thus possible to draw inferences about the potential consequences of adjusting exchange rates in the context of an otherwise stable economic environment.

The findings indicate that women increased their working hours following the currency unpegging, alongside a decline in gender employment ratios in exposed firms. At the intensive margin, women in exposed industries work approximately half an hour per week more (0.06 standard deviations) as a consequence of the shock, while for men, there is no statistically significant change. Meanwhile, at the extensive margin, there is a decline in the number of women relative to men in exposed firms (0.07 standard deviations), meaning that higher working hours for women may indicate a heavier workload being distributed among fewer employees.

Heterogeneity analysis shows that the overall increase in working hours is driven by women with lower levels of education. In particular, those with only the compulsory level of schooling work approximately one and a half additional hours per week, while no statistically significant change is observed for their more highly educated counterparts. These results are consistent with the paper by Goldberg and Tracy (2001) who find that least educated women are most affected by exchange rate fluctuations. Further, it is notable that those without Swiss citizenship are overrepresented in this low-education group.

The findings could be explained by adjustments at the supply or on the demand side of the labour market, or an interaction of the two. Indeed, as sectors adjusted their labour demand in response to the Swiss franc shock (Colella, 2021), this may have disproportionately impacted women. On the other hand, there could have been spillover effects within the household on the supply side, whereby women are increasing their employment in response to a change in the employment of their partners.

Further analysis points towards the results being driven by the demand side. If the increased labour supply of women was driven by a substitution of labour within the household, overall household labour supply should stay roughly constant, as the increase for women should counterbalance a decrease for men. This paper explores this by exploiting the household level labour supply data constructed using the labour market survey. Findings indicate an increase in the number of dual full-time working households in exposed regions, suggesting that women have increased their employment level without their partners decreasing theirs. Secondly, in the household redistribution scenario, a woman's industry should be of lesser importance than the industrial composition of her region, which would capture the likelihood of their partner being affected. However, a regression including a measure of both direct and spillover effects demonstrates that the results are driven by direct exposure. This combined evidence implies that the increase in women's average employment is a result of firms adjusting their workforce composition in response to the margin squeeze.

Heterogeneity analysis provides further evidence that results are driven by changes in labour demand at the firm level. In response to the Swiss franc shock, firms sought to decrease costs; they could do so either by firing workers, decreasing wages, or increasing working hours (keeping overall pay constant) and many opted for the latter (Handelszeitung, 2015). Given that women are more likely to work part-time, the margin of adjustment for their labour is larger. Indeed, heterogeneity analysis indicates that results are driven by employees who worked part-time before the shock. Moreover, descriptive analysis linking changes in company-level export volumes to changes in the female workforce confirms a negative elasticity of women's labour: as export volumes decline, women's labour increases. This implies that a negative export shock—such as the Swiss franc shock—is associated with a rise in women's labour. The analysis also suggests that firms can adjust women's labour with a less than proportionate change in costs. Finally, analysis of the volume of unpaid work shows no statistically significant decline for women working in exposed industries, meaning that their increased employment levels was not accompanied by a redistribution of unpaid work.

This paper adds to the literature on distributional impacts of exchange rate movements (e.g. Cravino and Levchenko (2017); Colella (2021)) and, specifically, to that which outlines labour outcomes by gender, for example by affecting female labour market participation (Erten and Metzger, 2019), job flow or transition rates (Goldberg and Tracy (2001); Veeramani and Banerjee (2022)) and the gender pay gap (Munyo and Rossi, 2015). While the papers focusing on distributional outcomes by gender rely on exchange rate fluctuations over time, this paper explores the impact of an exchange rate policy. Moreover, due to the richness of the available data, this paper adds to the finding of Veeramani and Banerjee (2022) paper, demonstrating that the adjustment of women's labour - women acting as a buffer workforce - can occur at the intensive, as well as extensive margin of employment. It also shows that the Swiss franc shock led to shifts in labour demand in sectors beyond manufacturing, such as services sectors, in which there is often a higher share of women. Indeed, results seem to be particularly driven by female intensive sectors, such as accommodation and food, and wholesale and retail. Yet, even within female intensive sectors, employment increases more for women, meaning that the results are not only driven by sectoral differences. Finally, the richness of the data allows for a particularly detailed analysis of the mechanisms driving the results, as it is possible to compare outcomes at the individual, household and firm level.

While the nuances and specifics of gender inequality is context specific and the constraints and opportunities women face will differ by institutional setting, what appears common across all, is that women's situations, economic and

beyond[1], are particularly sensitive to macro-economic fluctuations. Switzerland is a country that shares many labour market features with Germany, such as wage bargaining at the industry level, but is more closely aligned with liberal labour markets, like the UK and US, in terms of employment protection and family policy (McDonald, 2020). Consequently, insights from this paper can be gained that may be relevant for different institutional settings.

The remainder of the paper is structured as follows: after providing some contextual background on the Swiss franc shock and gender inequality in Switzerland in Section 2, Section 3 outlines the data sources and provides summary statistics. Section 4 introduces the main empirical specification. The results are then presented in Section 5. Section 6 explores intersectional dynamics through heterogeneous outcomes by educational level. Section 7 dives deeper into the mechanisms. In Section 8, the paper explores inter- and intra-sectoral gender differences. The paper concludes with a discussion in Section 9.

2. Background

2.1. The Swiss Franc Shock

In 2015, the Swiss National Bank unexpectedly lifted the currency floor against the Euro, which had been introduced in 2011 to address appreciation and deflationary pressures (Funk and Kaufmann, 2020). This led to an approximately 15 percent appreciation of the Swiss franc (the Swiss franc shock), within an otherwise relative stable economic environment (Funk and Kaufmann, 2020; Mirkov et al., 2016). The appreciation took the markets by surprise but was considered permanent (Colella, 2021). As a small, open economy, the Switzerland is highly integrated into global value chains; as such, the competitiveness of Swiss goods and services in the export market and import competing market is a function of the exchange rate. The appreciation of the Swiss franc in 2015 thus impacts firm profits and, consequently, employment and wages. Indeed, existing research has illustrated that the Swiss franc shock had a negative impact on income and employment and led to upskilling in the manufacturing sector (Funk and Kaufmann, 2020; Colella, 2021; Egger et al., 2018). This paper expands on the existing literature by investigating the potential distributional impacts of this monetary policy decision.

Exchange rates determine the relative prices of foreign and domestic goods and can thereby induce structural change in the economy (Erten and Metzger, 2019). This is because exchange rate policy has different effects on industries depending on their exposure to trade, productivity, and price

1. See Munyo and Rossi (2015) on the exchange rate and domestic violence.

FIGURE 1. Exchange rate Euro vs. Swiss franc, 2014-2016

Source: European Central Bank (2025)

elasticity of demand and supply, potentially leading to compositional effects and reallocation of resources between sectors (Baggs et al. (2009); Alexandre et al. (2011); Nucci and Pozzolo (2010); Manalo et al. (2015). Currency appreciations also increase competitive pressure which, in turn, can induce productivity gains and force industrial restructuring in ways that disproportionately impact certain groups. This paper highlights how the choices made by monetary policy makers (who are predominately male (OMFIF, 2022)[2]) have distributional outcomes, which should be monitored, deliberated, and discussed.

Ex-ante, the nature of such distributional outcomes by gender is ambiguous. Men and women tend to be concentrated in different export-oriented sectors — for instance, men are more likely to work in manufacturing, while women are overrepresented in sectors such as retail and hospitality. The industries in which men and women are respectively concentrated may have responded differently to the shock. Moreover, within sectors, female-dominated jobs may have been unevenly affected by firm-level restructuring. In addition, women's labour market participation is known to respond to that of their partners, suggesting that intra-household spillover effects may also play a role.

2.2. Gender Inequality in Switzerland

Despite the significant progress made in terms of political rights for women in Switzerland since the introduction of suffrage in 1971, economic gender inequality is high for European standards. Switzerland ranks 3rd lowest in Europe in term of Gender Overall Earnings Gap (GOEG), which stood at 43% in 2018 (BFS, 2022a). Across the three indicators comprising the GOEG (labour market participation, earnings per hour and hours worked), Switzerland

2. There is a strand of literature looking into the role of women in monetary policy setting, see for example Masciandaro et al. (2023); Charléty et al. (2017)

exhibits a particularly large gender gap in hours worked; 58.6% of women work part time compared to 18.2% of men in 2021 (BFS, 2022b). There is also a high level of gender segregation across industries, with only 30% of manufacturing employees being women compared to a female share of 75% in human health and social work in 2019 (own calculations using the Statistics of Company Structure, STATENT). There is a correspondingly high gender segregation across occupations, with women making up 70% of admin and retail employment but only 33% in management positions (BFS, 2020). These structural inequalities imply that women and men will experience, and contribute to, economic fluctuations in different ways.

3. Data and Summary Statistics

Industry level net export exposure is calculated based on OECD Inter-Country Input Output tables, which contain annual bilateral trade data (exports and imports) for both trade in goods and services across 44 industries. This data is used to calculate the net export intensity of industries in Switzerland. Regional level exposure is calculated using the Statistics of Company Structure (STATENT) dataset from the Swiss Federal Statistics Office, which contains annual employment data on the universe of Swiss firms by industry and municipality (which can be aggregated to local labour markets). The employment numbers enable the apportioning of net export intensity of industries to local labour markets.

Individual level labour outcomes are measured using the Swiss Earnings Structure Survey (ESS) from the Swiss Federal Statistics Office, which is a biannual survey of roughly 50k enterprises covering approximately 2 million employees. [3] The dataset contains information on the employees of the surveyed companies, which can be matched over time using their national insurance number. For smaller firms, information on all employees is provided, whilst for larger companies, details on a random selection of employees are requested. This dataset was linked over time to create a panel employer-employee matched dataset covering the years 2012, 2014, 2016 and 2018. Table 1 provides summary statistics by industry exposure and gender. Of note is that employees in exposed industries work more, are less educated and are more likely to be on a temporary visa (all statistically significant at the 1% level).

Household labour supply is measured using the Swiss Labour Force Survey the Swiss Federal Statistics Office, which is collected quarterly and follows individuals for four interview waves over a 1.5-year period. Importantly, this survey asks individuals about the labour supply of their partner, which can be

3. Only employees are surveyed in this data and there are consequently no unemployed persons captured. For more information, please refer to this website: https://www.bfs.admin.ch/bfs/en/home/statistics/work-income/surveys/ess.html

Table 1. Summary Statistics by Industry Exposure and Gender

	Exposed Industry		Non-Exposed Industry	
	Men	Women	Men	Women
Gross income	6574.44	4146.05	6515.40	4314.32
	(3053.4)	(2632.5)	(2986.7)	(2593.1)
Degree of employment (100%=full-time)	0.94	0.73	0.90	0.66
	(0.184)	(0.310)	(0.226)	(0.303)
Tertiary education	0.16	0.09	0.23	0.21
	(0.365)	(0.291)	(0.418)	(0.410)
Swiss citizen or permanent resident	0.81	0.85	0.83	0.89
	(0.391)	(0.356)	(0.378)	(0.315)
Married	0.54	0.49	0.55	0.51
	(0.498)	(0.500)	(0.498)	(0.500)
Age	41.70	40.37	41.79	41.86
	(11.45)	(11.72)	(11.57)	(11.55)
N	1,904,254	1,278,632	1,630,539	1,860,828

Notes: Mean values reported; standard deviations in parentheses. Source: ESS 2012–2018. Estimates are weighted mean coefficients. Exposed industries are defined as those with net export exposure above the median in 2014. Gross income refers to monthly gross income and is not standardised to full-time equivalent employment. Tertiary education, married, and Swiss citizen/permanent resident are dummy variables. The latter equals one if the individual has Swiss citizenship or a C-permit (permanent residency). The sample includes individuals between the ages of 15 and 64.

used to calculate the combined household labour supply. Roughly 150 thousand individuals were interviewed in the timeframe of interest for the study (2014-2016), however, only roughly 40 thousand individuals are observed at least once in 2014 (pre-shock) and once in 2015 (post). To assess the representativeness of the panel subsample, summary statistics for 2014 are provided in Table 2. The panel sample is more educated and female than the full sample, but the difference is small in magnitude. Every three years, the Swiss Labour Force Survey also collects data on time use.

Table 2. Summary Statistics, Full Sample vs. Panel in 2014

	Full Sample	Panel	T-test
Tertiary education	0.32	0.33	***
	(0.003)	(0.004)	
German region	0.71	0.70	
	(0.003)	(0.004)	
French region	0.24	0.25	
	(0.003)	(0.003)	
Italian region	0.04	0.04	
	(0.001)	(0.001)	
Female	0.48	0.50	***
	(0.004)	(0.004)	
Employed	0.79	0.79	
	(0.003)	(0.003)	
Age	39.83	40.05	
	(0.107)	(0.110)	
N	27,296	29,413	

Notes: Mean values reported; standard deviations in parentheses. Source: Swiss Labour Force Survey 2014. Estimates are weighted mean coefficients. Age restricted to individuals between 15 and 65. Tertiary education is a dummy variable equal to one if an individual has a tertiary education. "Employed" includes self-employed individuals. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

4. Empirical Specification

This paper exploits variation in exposure to trade to estimate the distributional impacts of the Swiss franc shock on labour market outcomes (employment and earnings) by gender using the Swiss Earnings Structure Survey and the Swiss Labour Force Survey. Using a triple difference approach, this paper estimates the impact of the transition from a fixed to a floating exchange rate on employment outcomes. The three dimensions of the triple difference are time (pre and post the shock), level of exposure to the shock (trade intensity by industry or local labour market) and gender.

4.1. Measuring Exposure

Individuals can be exposed to the Swiss franc shock either because they work in an industry with a high share of net exports in 2014 (i.e. the year before the shock) or because they live in a local labour market[4], within which a high share of individuals are employed in export heavy sectors. The industry level exposure is used when considering individual level labour outcomes, whilst

4. Local labour markets are characterised by a certain level of spatial homogeneity and can be treated as small labour market areas with functional orientation towards regional centres. For more information see: https://www.bfs.admin.ch/bfs/en/home/statistics/territory-environment/nomenclatures/regions-ms.html

regional exposure is used when looking at household labour supply to allow for spillover effects within the household.

For each industry, net export exposure before the shock is calculated as follows:

$$X_{j,2014} = 100 \times \frac{\sum_p \text{export}_{p,j,2014} - \sum_p \text{intermediate imports}_{p,j,2014}}{\text{Output}_{j,2014}} \quad (1)$$

where j represents the industry and p denotes the trading partner.[5] Imports attributed to final demand by consumers (as opposed to intermediate inputs used in production) are excluded.

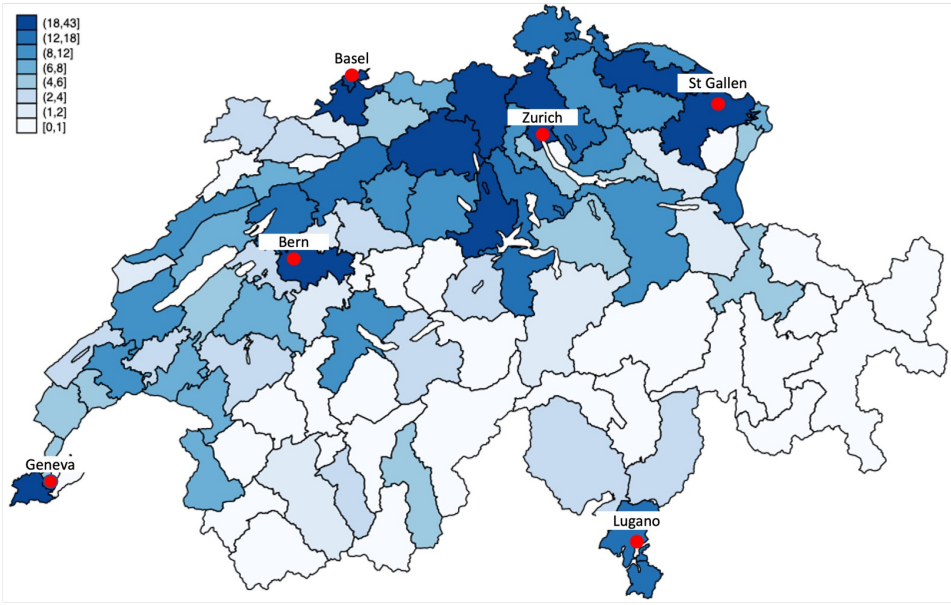
The regional exposure levels are calculated following the approach of Egger et al. (2018), apportioning net exports to regions based on their share of national employment in each industry, as follows:

$$X_{m,2014} = \sum_j \left(\frac{L_{m,j,2014}}{L_{j,2014}} X_{j,2014} \right) \quad (2)$$

where j=industry, m= local labour market and L=number of employees (full time equivalent). This measure apportions industry level exposure to exchange rate fluctuations to local labour markets in proportion to the share of the industry employment located in that local labour market (Autor et al., 2013); intuitively, if a local labour market has a high share of export-oriented industries, it will be more strongly affected by changes in export competitiveness. Figure 2 depicts the geographical distribution of trade exposure by local labour market in 2014, whereby darker blue indicates a higher level of trade exposure.

5. A robustness check of the results of the main specification using export exposure, as opposed to net export exposure, can be found in Appendix 10.3.

FIGURE 2. Trade exposure by local labour market, 2014



Source: OECD Inter-Country Input Output Tables 2014. STATENT 2014.

4.2. Main Specification: Triple Difference

This paper employs a triple difference approach to estimate the impacts of the Swiss franc shock. The triple difference estimator allows for the analysis of distributional impacts by gender. The specification is as follows:

$$\begin{aligned} Y_{ifjt} = \tau_t + \lambda_f + \beta_1 T_t + \beta_2 T_t x_{j,2014} + \beta_3 g_i x_{j,2014} \\ + \beta_4 T_t g_i + \beta_5 T_t g_i x_{j,2014} + C_{it} + \varepsilon_{ifjt} \end{aligned} \tag{3}$$

where Y_{ifjt} denotes the employment outcome (income and employment level), with i indexing individuals, f firms, j industries, and t years. τ_t and λ_f are time and firm fixed effects, respectively; T_t is a post-shock dummy (=1 if year $>$ 2015); $x_{j,2014}$ is the pre-shock industry exposure of firm f[6]; g_i is the gender of individual i; and C_{it} is a vector of controls. β_2 captures the impact of the shock on men; β_5 captures the differential effect by gender. Standard errors are clustered at the industry level. The sample includes employees in firms observed in both 2014 and 2016.

6. A binary, rather than continuous, measure is used for ease of interpretation.

5. Main Specification: Results

This section outlines how the Swiss franc shock affected labour outcomes of workers in trade exposed industries. It starts with the results using a difference-in-differences approach, pooling women and men together. This is followed by the triple difference specification outlined above.

Table 3 indicates the difference-in-differences results. Column (1) shows the impact on logged standardised income, column (2) the degree a worker is employed, where 100% indicates full-time employment (in Switzerland usually 42 hours per week). Results show that individuals in exposed industries are working more at the intensive margin (equivalent to 0.04 standard deviations[7] or 15 minutes per week), which may be explained by firms increasing working hours in an effort to counter the margin squeeze (Handelszeitung, 2015).[8] Indeed, work productivity for exposed industries increased by 4% between 2015 and 2016 compared with -1% for non-exposed.[9]

7. The independent variable is residualised with respect to the firm fixed effects and controls to isolate relevant variation in the treatment, as proposed in Mummolo and Peterson (2018)

8. Appendix Table 11 indicates the results using individuals fixed effects. In this specification, there is no statistically significant effect. The difference to the results in Table 3 may be explained by shifts in labour demand at the firm level. In the specification using individual fixed effects, individuals followed over time may have changed firms.

9. Own calculations based on growth and productivity data from the Federal Statistics Office.

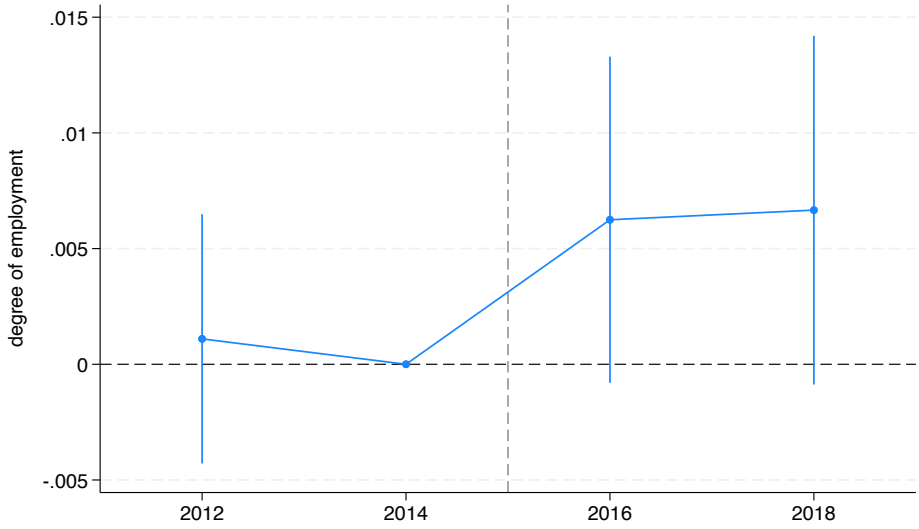
Table 3. Difference-in-Difference

	(1) Log(std. income)	**(2)** Degree of employment
post	0.02140***	-0.00576***
	(0.00452)	(0.00136)
post × high industry	0.00372	0.00611*
	(0.00550)	(0.00319)
Y mean	8.84	0.87
Firm FE	✓	✓
Year FE	✓	✓
Observations	2,313,715	2,320,864
R-squared	0.560	0.400

Source: Swiss Earnings Structure Survey 2012, 2014, 2016 and 2018. *Notes*: Standard error in parentheses; p<0.1* p<0.05, ** p<0.01, *** Time and firm fixed effects are included. Standardised income is standardised to full time equivalent employment. The top 1% of this variable was dropped, explaining the smaller number of observations. Controls include age, gender, education, marriage status. Standard errors are clustered at the industry level. The sample is limited to individuals between the age of 15 and 64 working in firms observed in both 2014 and 2016.

To test for parallel trends, the event study in Figure 3 displays the coefficients of the treatment interacted with each year rather than the post dummy. The year before the shock (2014) is omitted. A statistically significant coefficient prior to the shock would threaten the parallel trends assumption, as it would point towards a pre-existing divergence between treatment and control groups.

FIGURE 3. Event Study – Difference-in-Difference Coefficients



Notes: 95% confidence intervals shown. Coefficients are from the interaction between industry exposure (dummy=1 if above the median in 2014) and the year. 2014 is omitted as the baseline period, i.e., before the Swiss franc shock in January 2015. Time and firm fixed effects are included. Controls include age, gender, education, and marital status. Standard errors are clustered at the industry level. The sample is restricted to individuals aged 15–64 in firms observed in both 2014 and 2016.

In the next step, the distributional impacts by gender are estimated using the triple difference specification 3 in Table 4. This specification indicates statistically significant differences by gender in the degree of employment (see triple interaction term, marginal effect 0.01**, 0.06 standard deviations[10] or approximately half an hour per week). For men there is no statistically

10. The independent variable is residualised with respect to the firm fixed effects and controls to isolate relevant variation in the treatment, as proposed in Mummolo and Peterson (2018)

Table 4. Triple Difference

	(1) Log(standardised income)	(2) Degree of employment
post	0.0215***	0.00169
	(0.00442)	(0.00215)
post × high industry	0.00558	-0.00019
	(0.00463)	(0.00285)
post × high industry × female	-0.00526	0.0112***
	(0.00916)	(0.00334)
Marginal effect (women)	0.00	0.01**
	(0.00967)	(0.00440)
Y mean (women)	8.76	0.76
Firm FE	✓	✓
Year FE	✓	✓
Observations	2,313,715	2,320,864
R-squared	0.561	0.400

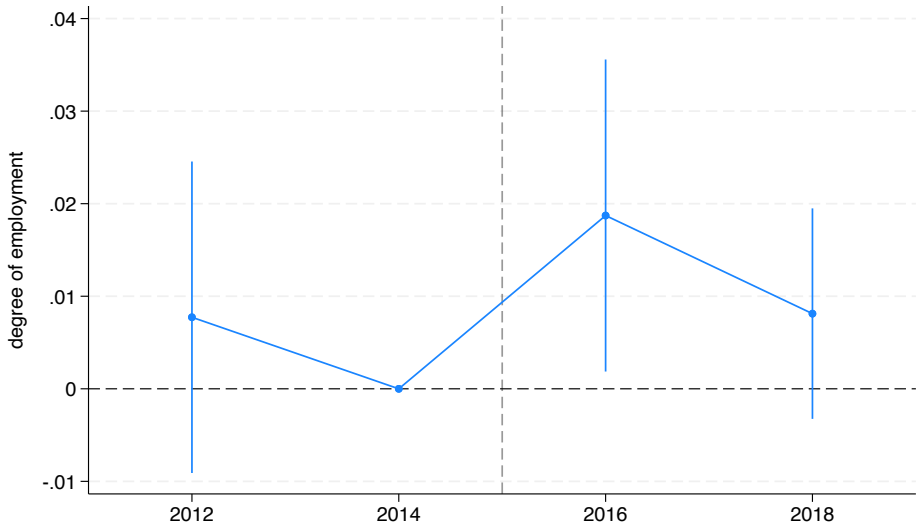
Source: Swiss Earnings Structure Survey 2012, 2014, 2016 and 2018.
Notes: Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Time and firm fixed effects are included. Standardised income is adjusted to full-time equivalent employment. The top 1% of this variable were dropped. Controls include age, education, residency, and marriage status. Standard errors are clustered at the industry level. The sample is limited to individuals aged 15–64 in firms observed once in 2014 and 2016.

significant change.[11] The event study in Figure 4[12] suggest that this is a short-run adjustment, as the effects disappear within three years. These results are similar when using different measures of export exposure (Appendix 10.3 and 10.4). They are also robust to the exclusion of local labour market regions at the national borders (Appendix 10.5). The change in women's labour could either stem from a change in the demand for women's labour or a reallocation of supply within the household, whereby women may be increasing their labour supply to compensate for their partner's job losses. The drivers of these results are explored further in the mechanisms section.

11. Using individual fixed effects (Appendix Table 12), there is no statistically significant difference between outcomes for women and men. This implies that there is no statistically significant difference in outcomes by gender for those employees who remain in the sample. As this dataset does not include the unemployed, no conclusions can be drawn about individuals who exit the sample. The difference to results in Table 4 may be explained by the fact that the firm fixed effects specification allows for changes in the composition of a firm's labour force in response to the shock.

12. Event studies for the post x high industry interaction term can be found in Appendix Figure 7.

FIGURE 4. Event study – Triple difference coefficients



Notes: 95% confidence interval. Coefficients plotted are from the interaction between the exposure of the industry of the firm (dummy=1 if above the median in 2014), the year and a female dummy. 2014 is omitted, i.e., the period before the Swiss franc shock in January 2015. Time and firm fixed effects are included. Controls include age, education, residency and marriage status. Standard errors are clustered at the industry level. The sample is limited to individuals between the age of 15 and 64 seen at least once in 2014 and once in 2016.

6. Heterogeneity by education

Disaggregating the labour force into two groups solely based on gender masks a complex set of intersecting inequalities. This section therefore seeks to unpick the results in Section 5 by exploring heterogeneity by educational background. High skilled workers are more costly and, consequently, labour demand for lower skilled labour is more sensitive to changes in cost and revenue (Goldberg and Tracy, 2001). Women are defined as belonging in the 'minimum education' group if they do not have an educational degree above obligatory schooling. Notable amongst this group is the overrepresentation of those without Swiss citizenship; 47% compared to 27% for the population at large in 2014.[13]

Using a triple difference specification on the female sample, the outcomes for this group are compared to those of women with an educational degree beyond obligatory schooling, as follows:

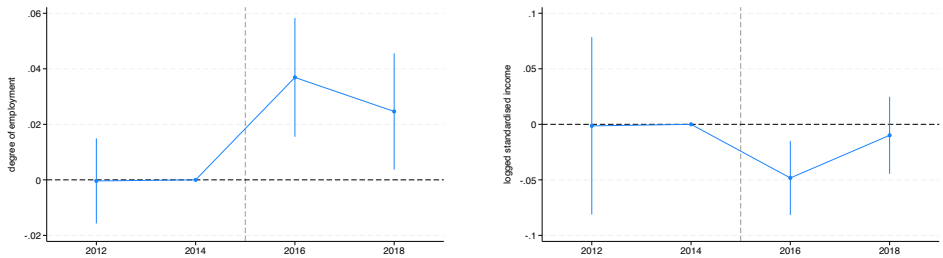
13. Own calculations based on the ESS.

$$\begin{aligned} Y_{ifjt} = \tau_t + \lambda_f + \beta_1 T_t + \beta_2 T_t x_{j,2014} + \beta_3 \,\text{minEducated}_{it} x_{j,2014} \\ + \ \beta_4 \, T_t \text{minEducated}_{it} + \beta_5 \, T_t \text{minEducated}_{it} x_{j,2014} \\ + \ C_{it} + \varepsilon_{ifjt} \end{aligned} \tag{5}$$

The event studies in Figure 5 plot the triple interaction term over time, showing that the increase in degree of employment is driven by those with low levels of education. Moreover, it appears that standardised income is decreasing for these women – in other words, they are working more hours without a commensurate increase in earnings. These results are consistent with the paper by Goldberg and Tracy (2001) who find that least educated women are most affected by exchange rate fluctuations. Further evidence of these dynamics being driven by demand side labour adjustments are provided in the Mechanisms section.

FIGURE 5. Event Study – Triple Difference Coefficients by Education Group

(a) Degree of Employment **(b)** Logged Standardised Income



Notes: 95% confidence interval. Coefficients plotted are from the interaction between the exposure of the industry of the firm (dummy=1 if above the median in 2014), the year, and the minimum education dummy. 2014 is omitted, i.e., the period before the Swiss franc shock in January 2015. Time and firm fixed effects are included. Controls include age, residency, and marriage status. Standard errors are clustered at the industry level. The sample is limited to women between the age of 15 and 64 seen at least once in 2014 and once in 2016.

7. Mechanisms

This section explores the mechanisms underlying the main findings presented in Sections 5 and 6, proceeding in three steps. First, it rules out that the observed patterns are solely the result of labour supply decisions. This is achieved by examining household-level labour supply responses (Section 7.1) and showing that the effects are driven by the industry in which an individual works, rather than by regional spillovers (Section 7.2). These findings suggest that demand-side forces are at play.

Second, the analysis investigates which specific demand-side mechanisms may be driving the results. It tests whether the observed changes stem from an increase in female-dominated occupations within exposed firms or from a growing comparative advantage of women in these firms (Section 7.3).

Finally, the section concludes that the observed effects are driven by women's role as a buffer workforce. Their labour supply offers greater scope for adjustment at the intensive margin, allowing firms to respond to economic shocks by increasing women's working hours (Section 7.4).

7.1. Labour supply: testing for within household substitution

A possible explanation behind women's increased degree of employment outlined in the main results (Section 5) is that women are adjusting their labour supply to counteract a negative employment shock affecting their partner. Using the exposure calculated at the local labour market level (see equation 2) allows for such spillover effects within households. To examine potential evidence of labour supply substitution between partners, an indicator is constructed using the Swiss Labour Force Survey, capturing whether both the respondent and their partner are employed full time.

The following difference-in-difference equation is estimated:

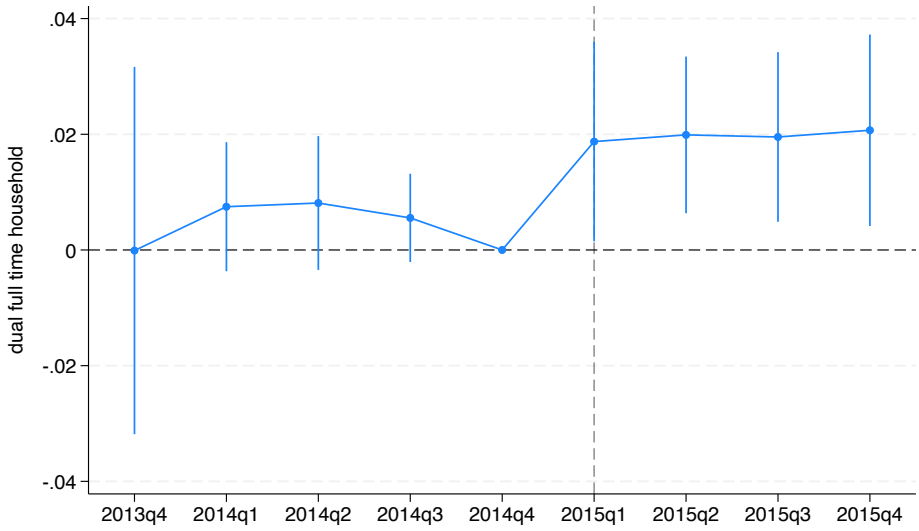
$$Y_{imt} = \lambda_i + \tau_t + \beta_1 T_t + \beta_2 T_t x_{m,2014} + C_{it} + \varepsilon_{imt} \tag{4}$$

where Y_{imt} is a dummy variable equal to 1 if individual i and their cohabiting partner both work full time. τ_t are time fixed effects (quarterly). $x_{m,2014}$ is a dummy variable equal to 1 if the net export exposure of the local labour market m in 2014 is above the median. C_{it} controls for age. Standard errors are clustered at the local labour market level.

Figure 6 indicates the event study including individual fixed effects.[14] The results indicate that individuals in exposed labour markets are more likely to be part of dual full-time earner households. This means that the increase in women's labour supply is not driven by a substitution effect within households but rather has led to an increase in household labour supply.

14. Regression table can be found in Appendix Table 13.

FIGURE 6. Event study – Household labour supply



Notes: 95% confidence interval. Coefficients plotted are from the interaction between high labour market and quarter. Quarter 4, 2014 is omitted, i.e., the quarter before the Swiss franc shock in January 2015. Time (quarterly) and individual fixed effects are included. Age is included as a control. The sample is restricted to individuals between the ages of 15-64. Errors are clustered at the local labour market level.

7.2. Labour demand evidence: own exposure versus spillover effects

This section provides additional evidence that the increase in women's employment is driven by changes in their own workplace rather than spillover effects within households or between industries. Changes in labour supply resulting from a household income shock would be captured by regional spillover effects as opposed to being explained by the exposure of the industry in which the woman herself works. The following analysis therefore distinguishes between exposure driven by the industry an individual works in and potential spillover effects within households or across industries. For this purpose, two distinct measures are created: firstly, the exposure of the industry (k) individual i works in and, secondly, regional trade exposure in which the industry k is excluded, so as to isolate spillover effects. This regional spillover measure is calculated similarly to local labour market exposure (equation 2), however, excluding the industry k (denoted as \{k}) individual i works in:

$$X_{m\setminus\{k\},2014} = \sum_{j\setminus\{k\}} \frac{L_{m,j,2014}}{L_{j,2014}} X_{j,2014} \tag{5}$$

The regression outlined in equation 6 then estimates the impacts of these two channels, i.e. effects resulting from own industry exposure and spillover effects:

$$Y_{ifjmt} = \tau_t + \lambda_f + \beta_1 T_t + \beta_2 x_{j,2014} + \beta_3 T_t x_{j,2014} + \beta_4 x_{m\setminus\{k\},2014} + \beta_5 T_t x_{m\setminus\{k\},2014} + C_{it} + \varepsilon_{ifjmt} \quad (6)$$

where $x_{m\setminus\{k\},2014}$ is a dummy variable equal to 1 if an individual's labour market exposure (excluding their own industry, as calculated in equation 5) is above the median. Control variables include age, education, residency, and marital status. Standard errors are clustered at the local labour market level. The coefficients of interest are β_3 and β_5, which capture the impact of the shock through the direct employment and spillover channel, respectively. The sample is restricted to women.

Table 5 indicates that the increase in employment is driven by women's own exposure rather than spillover effects (0.06 standard deviations or approximately half an hour per week). This further corroborates the theory that the results are not driven by a substitution effect within the household but rather by changes in employment at the firm level. Parallel trends can be found in Figure 8 in the appendix.

Table 5. Own Exposure vs. Spillover Effects

	(1) Degree of Employment
Post × High industry	0.0121***
	(0.00190)
Post × High spillover	-0.00190
	(0.00273)
Y mean	0.75
Firm FE	✓
Year FE	✓
Observations	1,380,228
R-squared	0.361

Source: Swiss Earnings Structure Survey 2012, 2014, 2016, and 2018. Standard errors in parentheses; + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Time and firm fixed effects are included. *High industry* and *high spillover* are dummy variables equal to 1 if above the median, with the latter calculated excluding the industry individual i worked in in 2014. Controls include age, education, residency, and marital status. Standard errors are clustered at the local labour market level. Sample restricted to women aged 15–64 surveyed in both 2014 and 2016.

7.3. Demand-side mechanism: testing for shifts in occupational composition

The evidence provided above points towards the increase in women's work being driven by changes in the demand for labour in industries which were subject to the sudden, exchange rate induced, competitive shock. Colella (2021), which examines the impact of the Swiss franc shock on firm hiring, finds that affected firms sought higher-skilled workers, suggesting an upskilling process triggered by the competitive pressure. In line with this finding, it is possible that this induced a reduction in physically demanding "brawn" jobs, thereby raising the relative productivity of women (Juhn et al., 2014).

To investigate this, a difference-in-difference analysis at the firm level estimates whether there was an increase in female intensive occupations. Female intensive occupations are defined as those occupations (ISCO-08, 2 digit) that had over 50 percent women in Switzerland in 2014, according to the Swiss Earnings Structure Survey. The following regression is estimated:

$$Y_{fjt} = \tau_t + \lambda_f + \beta_1 T_t + \beta_2 x_{j,2014} + \beta_3 T_t x_{j,2014} + \varepsilon_{fjt} \tag{9}$$

where Y_{fjt} is the share of female occupations in firm f at time t, τ_t represents time fixed effects, λ_f represents firm fixed effects, T_t is the shock dummy, and $x_{j,2014}$ is the industry exposure of the firm. Standard errors are clustered at the industry level. Table 6 indicates that there was no statistically significant change in the share of female occupations.

Table 6. Share of Female Occupations

	Share of Female Occupations
Post	-0.00473
	(0.0126)
Post × High industry	0.00560
	(0.0104)
Y mean	0.50
Firm FE	✓
Year FE	✓
Observations	56,426
Number of firms	17,512
R-squared	0.002

Source: Swiss Earnings Structure Survey 2012, 2014, 2016, and 2018. Standard errors in parentheses; + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Time and firm fixed effects are included. High industry is a dummy variable set equal to 1 if above the median. Share of female occupations refers to share of workers in the firm in occupations that had more than 50 percent woman nationwide in 2014. Standard errors are clustered at the industry level. The sample is limited to firms observed both in 2014 and 2016.

Given the lack of statistically significant effects on the share of female intensive occupations, it could be that, within occupations, there was an

increase in the comparative advantage of women. In their paper on the impacts of tariff reductions under the North American Free Trade Agreement, Juhn et al. (2014) show that the lower need for physically demanding skills in blue-collar tasks, as a result of new technologies, increased relative wages and employment of women. Following the same methodology, the following analysis investigates whether a similar dynamic can be detected in this context. The objective is to estimate whether there was a relative increase in women's employment and standardised earnings, which would imply an increase in their comparative advantage. To do so, the following equation is estimated:

$$Y_{fjt} = \tau_t + \lambda_f + \beta_1 T_t + \beta_2 x_{j,2014} + \beta_3 T_t x_{j,2014} + \varepsilon_{fjt} \tag{7}$$

where Y_{fjt} is defined as the ratio of female to male employees and the ratio of female to male standardised average wages of workers in firm f at time t, τ_t represents time fixed effects, λ_f represents firm fixed effects, T_t is the shock dummy, and $x_{j,2014}$ is the industry exposure of the firm. Standard errors are clustered at the industry level.

Table 7 indicates a decline in the number of women relative to men (0.07 standard deviations[15]), while there is no statistically significant change in the wage ratio. These results do not corroborate the narrative that upskilling may have increased the comparative advantage of women in exposed industries. Instead, the decline in the employment ratio points towards women acting as a buffer workforce, which firms adjusted to remain competitive. The next subsection will explore this hypothesis in more detail.

15. The independent variable is residualised with respect to the firm fixed effects and controls to isolate relevant variation in the treatment, as proposed in Mummolo and Peterson (2018).

TABLE 7. Gender ratios in firms

	Employment Ratio	**Average Wage Ratio (Standardised)**
Post	-0.00875	0.00360
	(0.0956)	(0.00737)
Post × High industry	-0.231**	0.00145
	(0.0988)	(0.00917)
Firm FE	✓	✓
Year FE	✓	✓
Y mean	2	0.87
Observations	46,571	46,469
R-squared	0.002	0.000
Number of firms	15,387	15,368

Source: Swiss Earnings Structure Survey 2012, 2014, 2016, and 2018. Standard errors in parentheses; $+p < 0.1$, $^{*}p < 0.05$, $^{**}p < 0.01$. Time and firm fixed effects are included. *High industry* is a dummy equal to 1 if above the median in 2014. *Employment ratio* is the number of women divided by men in a firm. *Average wage ratio* is the average standardised wage for women divided by that for men. Standard errors clustered at the industry level. Sample limited to firms observed in both 2014 and 2016.

7.4. Demand-side mechanism: women's labour as adjustment mechanism

One way in which firms dealt with the margin squeeze was to extend working hours (Handelszeitung, 2015). Given that women are more likely to work part time – 51% of women versus 12% of men - the potential margin of adjustment for their labour is larger.[16] To investigate whether part time employment could be the determining factor in explaining the results, a triple difference regression estimates whether increases in working hours is driven by employees who worked part time in exposed industries before the shock:

$$Y_{ifjt} = \tau_t + \lambda_f + \beta_1 T_t + \beta_2 T_t x_{j,2014} + \beta_3 x_{j,2014}\text{parttime}_{i,2014} + \beta_4 T_t \text{parttime}_{i,2014} + \beta_5 T_t \text{parttime}_{i,2014} x_{j,2014} + C_{it} + \varepsilon_{ifjt} \quad (8)$$

where Y_{ifjt} denotes monthly hours worked, and $\text{parttime}_{i,2014}$ is a dummy variable equal to one if individual i worked part time in 2014 and zero otherwise. τ_t and λ_f are time and firm fixed effects, respectively; T_t is a post-shock dummy (=1 if year $>$ 2015); $x_{j,2014}$ is the pre-shock industry exposure of firm. The sample is restricted to individuals employed in firms observed in both 2014 and 2016.

Table 8 indicates that monthly hours worked has increased for individuals who worked part time in 2014 (0.1 standard deviations) whilst there is no statistically significant increase for those who worked full-time in 2014. This

16. Summary statistics on full-time versus part-time employees can be found in Appendix Table 14.

suggests that the increase in work volume following the Swiss franc shock was driven by part time workers, for whom the scope of increasing working hours was largest and the majority of whom are women. It is cheaper to extend working hours of existing workers than to hire additional workers and, consequently, this may have been the more cost effective way to increase output. In addition, the decline in the gender employment ratio (see Table 7) may imply that the same amount of work is being shared between fewer women, leading to increased workload per woman. Parallel trends can be found in Appendix Figure 9.

TABLE 8. Heterogeneity by part-time employed: monthly hours worked

	Part-time 2014	**Full-time 2014**
Post	0.447	-4.073**
	(0.483)	(1.489)
Post × High industry	3.776**	1.951
	(1.382)	(1.468)
Y mean	114	175
Firm FE	✓	✓
Year FE	✓	✓
Observations	707,509	1,627,975
R-squared	0.328	0.319

Source: Swiss Earnings Structure Survey 2012, 2014, 2016, and 2018. Robust standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Firm and year fixed effects are included. Monthly hours worked includes both salaried and hourly-paid employees. Controls include age, gender, education, residency, and marital status. Standard errors clustered at the industry level. Sample limited to individuals aged 15–64 working in firms observed in both 2014 and 2016.

The results suggest that the demand for women's labour responds differently to changes in export competitiveness compared to the demand for men's labour. This can be examined by estimating labour elasticities with respect to export volumes by gender, using company-level[17] export data[18] merged with the Swiss Earnings Structure Survey (see Appendix Table 15)[19]. This analysis reveals that changes in export volumes have opposing effects on the employment of men and women (measured on a full-time equivalent basis). Specifically, an increase

17. A company includes all firm branches belonging to the same legal entity and is thus a more aggregated unit than the firm, which constists of a single branch. Given that export volumes are provided at the company level, this unit of analysis is more appropriate for this analysis.

18. Provided by the Federal Office for Customs and Border Security for the years 2016 and 2018.

19. Although larger companies only provide information on a subset of their employees, given these are randomly selected, it is possible to evaluate within company changes but not cross-sectional differences.

in export volumes is correlated with a rise in male employment but a decline in female employment. This implies that women's labour is inversely related to a company's export performance, meaning that a negative export shock (such as the Swiss franc shock) would be associated with an increase in women's labour. Additionally, the adjustments in women's labour are not accompanied by statistically significant changes in total women's labour costs, unlike men's labour, which sees cost changes in line with employment adjustments. This finding suggests that companies can adjust women's labour with relatively lower cost adjustments.

In other settings, women have also been found to act as a buffer workforce; Veeramani and Banerjee (2022) find that gross job flows for women in export oriented industries are more sensitive to exchange rate changes than men's. More specifically, they use plant level data from India's manufacturing sector to analyse the effect of industry-level exchange rate fluctuations on job flow dynamics by gender. They highlight that, particularly in contexts of rigid labour markets, women bear a disproportionate share of the adjustment costs to exchange rate fluctuations. This paper contributes to their analysis by investigating these dynamics in the context of exchange rate policy, rather than exploiting exchange rate fluctuations over time. Moreover, the results of the Swiss case illustrate that the adjustments of women's labour do not only occur on the extensive but also at the intensive margin. Finally, this paper captures fluctuations in the entire economy and highlights the importance of extending the analysis beyond the manufacturing sector, especially when interested in the gender analysis.

Despite economic gender equality relying on higher labour market participation of women, both at the extensive and intensive margins, the increased workload that resulted from the Swiss franc shock does not necessarily imply an improvement to women's welfare. More hours in paid employment may add to women's double burden of paid and unpaid work. Although women in Switzerland work fewer paid hours than men on average, they perform more unpaid work (4.1 hours per day for women compared to 2.9 for men in 2016 [20]). An increase in paid hours for women is not necessarily accompanied by a reallocation of unpaid work, coming at the expense of their own-care time. Recent literature on household responses to the Covid-19 pandemic indicates that most of the additional housework fell to women, demonstrating how women's unpaid labour acts as a buffer in the household (Del Boca et al., 2020). Using data from the Swiss Labour Force Survey (2010, 2013, 2016), Table 16 in the appendix indicates no statistical difference in the hours of unpaid work for women in exposed industries after the shock. This suggests no evidence of a redistribution of unpaid labour to accompany the increase in working hours. The result highlights that an increase in the average employment

20. Swiss Labour Force Survey, 2016.

level of women is not unequivocally a positive development; if women approach parity with men in paid working hours while maintaining primary responsibility for unpaid work, the outcome may not be empowering but rather exacerbate women's time poverty. This result underscores a key theme explored in Chapter 4 of this thesis, which redefines the gender pay gap by incorporating unpaid labour, offering a more comprehensive understanding of gender inequality.

8. A Sectoral Decomposition: Female versus Male Intensive Sectors

Having examined the underlying mechanisms of the results, this sections turns to the role of sectoral composition in shaping the differential labour responses. In examining the aftermath of the Swiss franc shock, the focus was placed on male dominated sectors, such as manufacturing (Egger et al., 2018). Yet other, female dominated, sectors, such as retail and tourism, warrant equal consideration as they are also heavily dependent on the exchange rate and accordingly impacted by the sudden appreciation (see Appendix Table 17 for female share of export heavy industries in 2014). Given the different characteristics of these sectors in terms of profit margins, labour costs, elasticity of demand, as well as the prevalence of part-time work[21], the responses of firms are likely to have differed across sectors. This section will investigate whether the results outlined above are driven by adjustments in female or male intensive sectors.

First, heterogeneity analysis investigates whether the increase in employment and income is driven by workers in female or male intensive sectors, as follows:

$$\begin{aligned} Y_{ifjt} = \tau_t + \lambda_f + \beta_1 T_t + \beta_2 T_t x_{j,2014} + \beta_3 x_{j,2014} \text{female\_intensive}_{j,2014} \\ + \ \beta_4 T_t \text{female\_intensive}_{j,2014} + \beta_5 T_t x_{j,2014} \text{female\_intensive}_{j,2014} \\ + \ C_{it} + \varepsilon_{ifjt} \end{aligned} \tag{9}$$

where $\text{female\_intensive}_{j,2014}$ is a dummy variable equal to one if the female share of employees in industry j in Switzerland in 2014 was at least 50%, and zero otherwise. τ_t and λ_f are time and firm fixed effects, respectively; T_t is a post-shock dummy (=1 if year $>$ 2015); $x_{j,2014}$ is the pre-shock industry exposure of firm.

Table 9 shows that the decrease in standardised income (0.01 standard deviations) and employment levels (0.06 standard deviations, or roughly half an hour less per week) is driven by workers in female-intensive sectors.[22] This

21. In female intensive sectors, the average employment level was 0.73 in 2014, compared to 0.88 in male intensive sectors (own calculations, ESS).

22. Event studies are provided in Appendix Figure 10.

Table 9. Heterogeneity by female intensity of sector

	(1) Log(standardised income)	(2) Degree of employment
post	0.0233***	-0.00592*
	(0.00562)	(0.00329)
post × high industry	0.00521	0.00330
	(0.00702)	(0.00418)
post × high industry × female	-0.00942	0.0104**
	(0.0252)	(0.00483)
Marginal effect (female intensive)	-0.0042*	0.0137***
	(0.00226)	(0.00262)
Y mean	8.84	0.77
Firm FE	✓	✓
Year FE	✓	✓
Observations	2,310,958	2,320,864
R-squared	0.560	0.400

Source: Swiss Earnings Structure Survey 2012, 2014, 2016, and 2018. Standard errors in parentheses; $+p < 0.1$, $^{*}p < 0.05$, $^{**}p < 0.01$. Standardised income is standardised to full time equivalent employment. Controls include gender, age, education, citizenship, and marriage status. Standard errors are clustered at the industry level. The sample is limited to working age individuals in firms observed at least once in both 2014 and 2016.

may imply that the results simply reflect sectoral differences—meaning men and women within female-intensive sectors respond similarly to the shock. However, Table 10, which presents results from the triple difference specification 3 limited to female-intensive sectors, tells a more nuanced story. Within these sectors, it is women whose labour is responding (0.09 standard deviations, or nearly one hour per week).[23] Also in male intensive sectors, women appear to be working more, yet the change is statistically insignificant. Taken together, these findings suggest that women act as a buffer labour force, both across and within sectors.

23. Event studies are provided in Appendix Figure 12.

TABLE 10. Triple difference by gender by sector composition

	Female-intensive sectors	
	(1) Log(std. income)	**(2) Degree of employment**
post	0.0249***	0.00662***
	(0.00336)	(0.00156)
post × high industry	-0.00266	-0.00192
	(0.00479)	(0.00290)
post × high industry × female	-0.00715	0.0203***
	(0.0100)	(0.00537)
Marginal effect (women)	-0.0098	0.0183***
	(0.00568)	(0.00358)
Firm FE	✓	✓
Year FE	✓	✓
Y mean (women)	8.71	0.73
Observations	776,364	771,951
R-squared	0.473	0.333
	Male-intensive sectors	
	(3) Log(std. income)	**(4) Degree of employment**
post	0.0232***	-0.00174
	(0.00693)	(0.00163)
post × high industry	0.00604	0.00166
	(0.00608)	(0.00283)
post × high industry × female	-0.00431	0.00878
	(0.00873)	(0.00836)
Marginal effect (women)	0.0017	0.0104
	(0.01028)	(0.00894)
Firm FE	✓	✓
Year FE	✓	✓
Y mean (women)	8.77	0.80
Observations	1,531,748	1,534,187
R-squared	0.528	0.589

Source: Swiss Earnings Structure Survey 2012, 2014, 2016, and 2018. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standardised income is adjusted to full-time equivalent employment. Controls include age, education, citizenship, and marital status. Standard errors are clustered at the industry level. The sample is limited to individuals aged 15–64 in firms observed in both 2014 and 2016.

9. Conclusion

This paper has explored the distributional effects of the Swiss franc shock in 2015, more specifically, the impact on women's versus men's employment outcomes. The results presented above indicate that women's degree of employment has increased in exposed industries in response to the Swiss franc shock. Heterogeneity analysis indicates that this was driven by a change in the average degree of employment for least educated women. Further results point towards this being a labour demand side effect. Firstly, there is an increase in household labour supply as opposed to a substitution effect whereby women

are compensating for the decline in their partners' employment. Secondly, analysis differentiating between exposure stemming directly from the industry an individual works in and regional spillover effects indicates the employment increase is driven by own exposure.

This paper posits that the results are driven by firms using women's labour as a buffer, which can be adjusted along with changing economic circumstances. Indeed, analysis shows that the increase in monthly hours worked is concentrated among workers who worked part-time before the shock – and these workers are predominantly women. Compositional analysis of firms' workforce further indicates a decline in the gender employment ratio, which could imply that the workload is shared between fewer women. Descriptive analysis of the labour elasticities by gender confirm a negative relationship between the number of full-time equivalent women and export volumes at the company level and suggest adjustments to women's labour has a lower impact on total labour costs than changes in men's labour. Firms' responses to the currency appreciation may, therefore, be one example among many in which women act as a buffer labour force, with their paid and unpaid work serving as the adjustment mechanism to fiscal and monetary policy. Indeed, this is not the first time women have been most exposed monetary policy adjustments in Switzerland; restrictive monetary policy in the 1970s post the Bretton-Woods system lead to particularly large employment losses for women (Halbeisen and Straumann, 2017).

This disproportionate shock could have wider societal implications, triggering changes in intra-household bargaining (Antman, 2014; Pollak, 2005) and household labour allocation. The increase in average employment levels of women may add to women's double burden of paid and unpaid work if not accompanied by a redistribution of unpaid work. Indeed, there is no evidence of a reallocation of unpaid labour, as women working in exposed industries do not exhibit a statistically significant drop in their unpaid working hours. Future research should investigate whether this shock had other distributional impacts in terms of asset accumulation and consumption patterns. Moreover, further research into the nature by which women act as a buffer workforce within firms, as well as within the household, is important, as these forces can have wider implications for inequality within and between households.

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10. Appendix

10.1. Additional Tables

Table 11. Difference-in-Difference – individual fixed effects

	Logged Standardised Income	Degree of Employment
post x high industry	0.00287	-0.00237
	(0.00579)	(0.00596)
Y mean	8.81	0.84
Individual FE	✓	✓
Year FE	✓	✓
Observations	3,102,640	3,102,217
R-squared	0.067	0.005
Number of individuals	958,528	962,056

Source: Swiss Earnings Structure Survey 2012, 2014, 2016 and 2018. *Notes*: Standard error in parentheses; p<0.1* p < 0.05, ** p < 0.01, *** Time and individual fixed effects are included. Standardised income is standardised to full time employment. The top 1% of this variable were dropped. Controls include age, education, gender, whether an individual has Swiss citizenship or permanent residency, and marriage status. Standard errors are clustered at the industry level. The sample is limited to individuals between the age of 15 and 64 seen once in 2014 and once in 2016.

Table 12. Triple Difference – individual fixed effects

	(1) Log(std. income)	**(2)** Degree of employment
post × high industry	0.00221	-0.00307
	(0.00521)	(0.00462)
post × high industry × female	0.00032	-0.00004
	(0.00851)	(0.00470)
Y mean (women)	8.79	0.84
Individual FE	✓	✓
Year FE	✓	✓
Observations	3,102,640	3,102,217
R-squared	0.067	0.005
Individuals	958,528	962,056

Source: Swiss Earnings Structure Survey 2012, 2014, 2016 and 2018. *Notes*: Standard error in parentheses; p<0.1* p < 0.05, ** p < 0.01, *** Time and individual fixed effects are included. Standardised income is standardised to full time employment. The top 1% of this variable were dropped. Controls include age, education, gender, whether an individual has Swiss citizenship or permanent residency, and marriage status. Standard errors are clustered at the industry level. The sample is limited to individuals between the age of 15 and 64 observed once in 2014 and once in 2016.

TABLE 13. Difference in Differences – household labour supply

	(1) Dual full-time working household
post	-0.0290**
	(0.0113)
post × high labour market	0.0125**
	(0.00515)
Individual FE	✓
Quarter FE	✓
Y mean	0.20
Observations	59,151
Individuals	17,756
R-squared	0.003

Source: Swiss Labour Force Survey 2014 to 2016. *Notes*: Standard error in parentheses; p<0.1* p < 0.05, ** p < 0.01, *** Sample includes those individuals between the age of 15 and 64 surveyed at least once in 2014 and once in 2015. Time (quarterly) and individual fixed effects are included. Age is included as a control variable. Standard errors are clustered at the local labour market level.

TABLE 14. Summary statistics by part-time employment, exposed industries, 2014

	(1) Full-time	**(2) Part-time**	**(3) T-test**
Gross income	6,557.55	2,999.35	***
	(2,801.1)	(2,233.4)	
Degree of employment	1.00	0.51	***
	(0.000)	(0.265)	
Tertiary education	0.14	0.08	***
	(0.347)	(0.268)	
Swiss citizenship or permanent residence	0.81	0.90	***
	(0.393)	(0.305)	
Married	0.50	0.57	***
	(0.500)	(0.495)	
Age	40.70	41.28	***
	(11.34)	(11.76)	
Female	0.27	0.75	***
	(0.445)	(0.433)	
N	559,659	191,489	

Source: ESS 2014. Weighted mean coefficients. Standard errors in parentheses. Exposed industries are those with net export exposure above the median in 2014. Gross income indicates monthly gross income of the employee; this variable is not standardised to full-time equivalent employment. *Tertiary education*, *Married*, and *Swiss citizen or permanent resident* are dummy variables, with the latter set to 1 if an individual either has Swiss citizenship or a C-visa (permanent residency).

Table 15. Labour demand elasticity to export volumes

	Total Labour Cost	**FTE Employees**
log(exports)	0.0276**	1.241***
	(0.0134)	(0.341)
Female workforce × log(exports)	-0.0395***	-2.432***
	(0.00523)	(0.142)
Linear combination	-0.01	-1.19***
	(0.013)	(0.337)
Company FE	✓	✓
Year FE	✓	✓
Y mean	10.17	15.96
Observations	23,567	23,655
R-squared	0.841	0.772

Source: Swiss Earnings Structure Survey and trade data from the Federal Office for Customs and Border Security, 2016 and 2018. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The unit of observation is the company by gender workforce. *Female workforce* is a dummy equal to one for the female workforce and zero for the male. Company and year fixed effects are included. log(exports) refers to the logged value of a company's exports. Standard errors are clustered at the company level. The sample is limited to firms observed in both 2016 and 2018.

Table 16. Difference-in-Difference: Unpaid Labour

	Unpaid Work
post × high industry	0.0393
	(0.101)
Industry FE	✓
Local Labour Market FE	✓
Year FE	✓
Y mean	4.51
Observations	17,359
R-squared	0.276

Source: Swiss Labour Force Survey 2010, 2013, and 2016. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Time, industry, and local labour market fixed effects are included. Controls include family type (whether there is a child under 15 in the household), urban residence, age, tertiary education, and Swiss nationality. The sample is restricted to women aged 15–64.

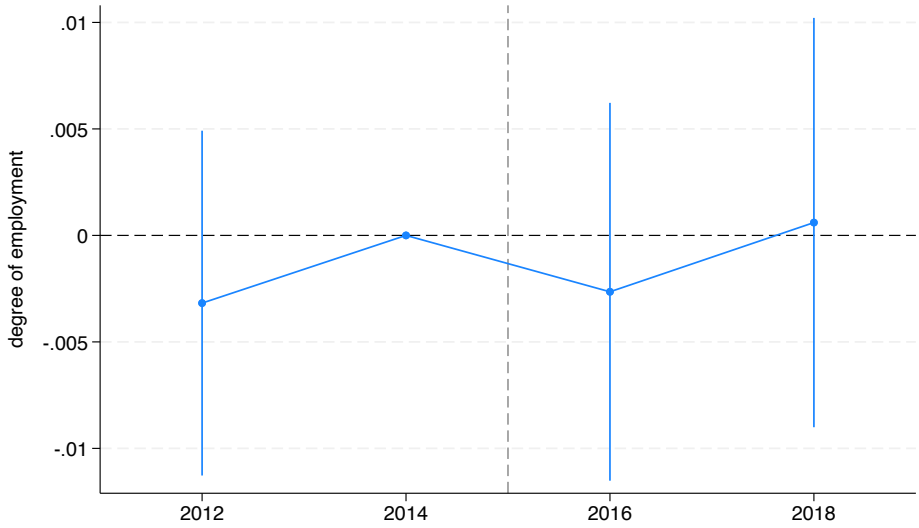
TABLE 17. Female share in net export heavy industries, 2014

Industry	**Female Share**
Pharmaceuticals, medicinal chemical and botanical products	0.42
Rubber and plastics products	0.30
Basic metals	0.15
Computer, electronic and optical equipment	0.40
Electrical equipment	0.27
Machinery and equipment	0.17
Motor vehicles, trailers and semi-trailers	0.18
Land transport and transport via pipelines	0.16
Postal and courier activities	0.46
Food products, beverages and tobacco	0.43
Textiles, textile products, leather and footwear	0.60
Manufacturing; repair and installation of machinery and equipment	0.31
Wholesale and retail trade; repair of motor vehicles	0.50
Accommodation and food service activities	0.55
Publishing, audiovisual and broadcasting activities	0.44
IT and other information services	0.23
Financial and insurance activities	0.41
Arts, entertainment and recreation	0.48

Source: STATENT 2014.

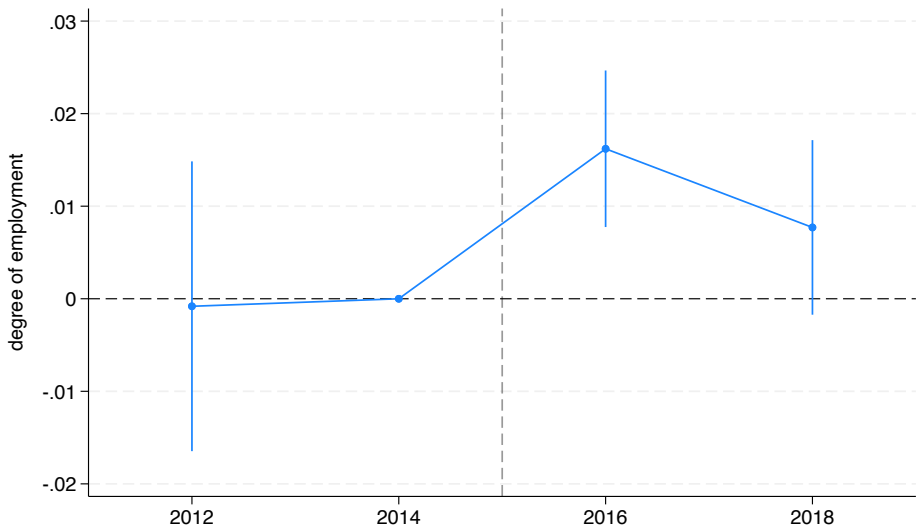
10.2. Additional Figures

FIGURE 7. Event study – Triple difference: coefficient of interaction term between year and industry



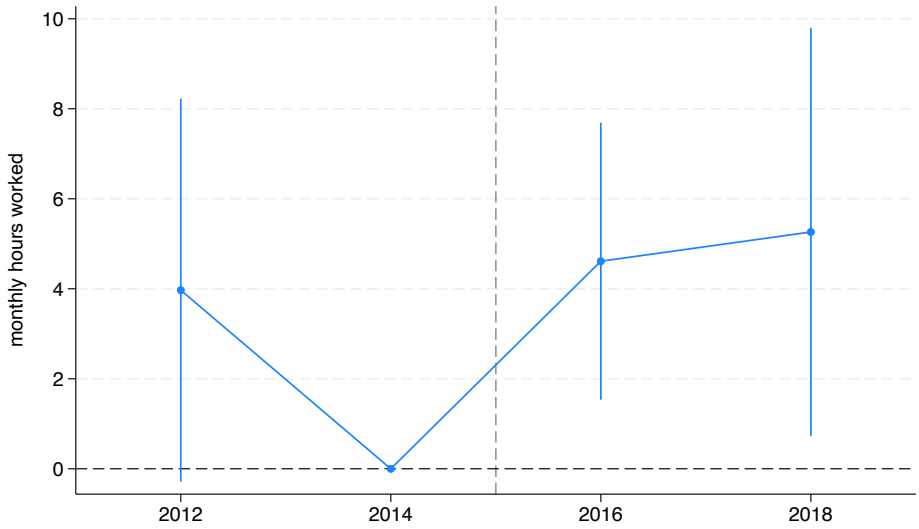
Notes: 95% confidence interval. Coefficients plotted are from the interaction between the exposure of the industry of the firm (dummy=1 if above the median in 2014) and the year. 2014 is omitted, i.e., the period before the Swiss franc shock in January 2015. Time and firm fixed effects are included. Controls include age, education, residency and marriage status. The sample is restricted to individuals between the ages of 15 and 64. Standard errors are clustered at the industry level.

FIGURE 8. Event study – coefficients of interaction term with industry exposure



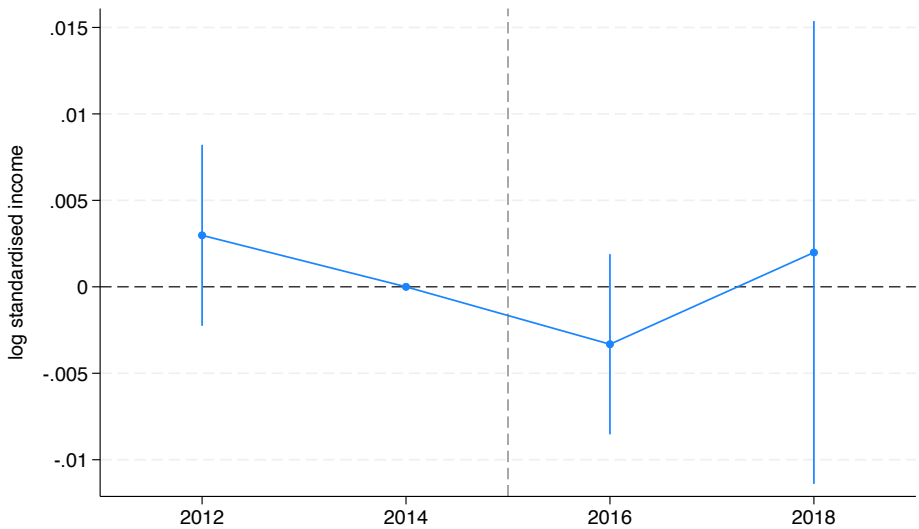
Notes: 95% confidence interval. Coefficients plotted are from the interaction between the exposure of the industry of the firm (dummy variable) and the year. 2014 is omitted, i.e., the period before the Swiss franc shock in January 2015. Time and firm fixed effects are included. Controls include age, education, residency and marriage status. Standard errors are clustered at the local labour market level. The sample is restricted to women between the ages of 15 and 64 who were observed at least once in 2014 and once in 2016.

FIGURE 9. Event study – triple difference coefficients, part-time employed sample



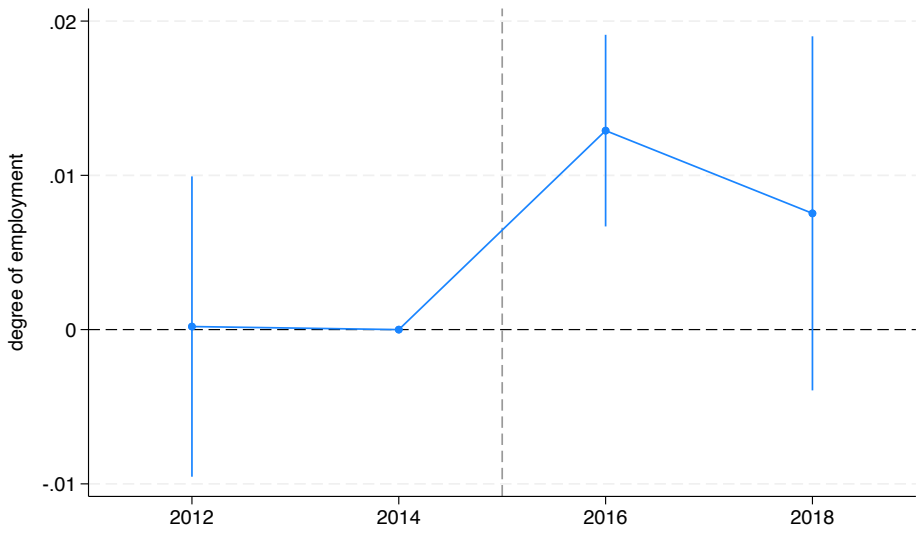
Notes: 95% confidence interval. Coefficients plotted are from the interaction between the exposure of the industry of the firm (dummy variable) and the year. 2014 is omitted, i.e., the period before the Swiss franc shock in January 2015. Time and firm fixed effects are included. Monthly hours worked encompasses both those on monthly contracts and paid on an hourly basis. Controls include age, gender, education, residency and marriage status. Standard errors are clustered at the industry level. The sample is restricted to individuals under the age of 65 who worked part time in 2014 in firms observed in both 2014 and 2016.

FIGURE 10. Event study – female intensive sector (income)



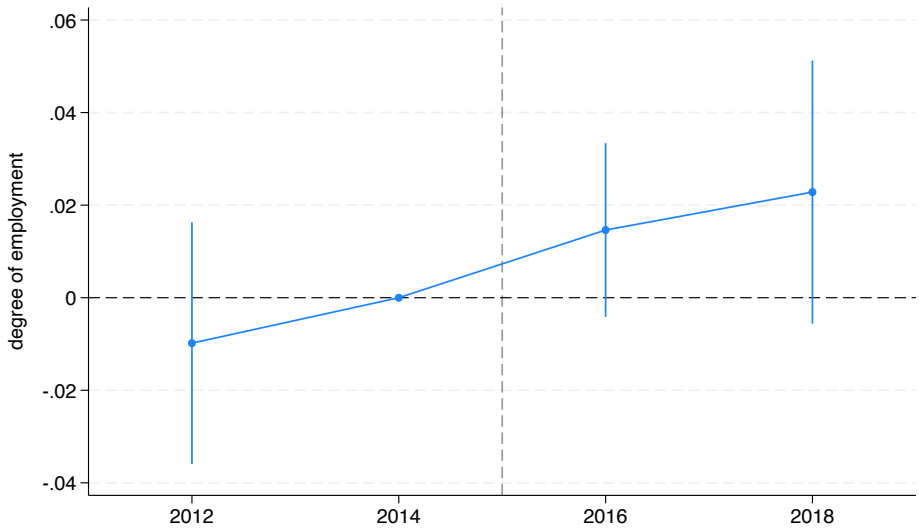
Notes: 95% confidence interval. Coefficients plotted are from the interaction between the exposure of the industry of the firm (dummy=1 if above the median in 2014) and the year. 2014 is omitted, i.e., the period before the Swiss franc shock in January 2015. Time and firm fixed effects are included. Controls include age, gender, residency and marriage status. Standard errors are clustered at the industry level. The sample is restricted to working age individuals in firms observed at both in 2014 and 2016 in female intensive sectors.

FIGURE 11. Event study – female intensive sector (degree of employment)



Notes: 95% confidence interval. Coefficients plotted are from the interaction between the exposure of the industry of the firm (dummy=1 if above the median in 2014) and the year. 2014 is omitted, i.e., the period before the Swiss franc shock in January 2015. Time and firm fixed effects are included. Controls include age, gender, residency and marriage status. Standard errors are clustered at the industry level. The sample is restricted to working age individuals in firms observed at both in 2014 and 2016 in female intensive sectors.

FIGURE 12. Event study – Triple difference coefficients (degree of employment), female intensive sector



Notes: 95% confidence interval. Coefficients plotted are from the interaction between the exposure of the industry of the firm (dummy=1 if above the median in 2014), the year and the female dummy. 2014 is omitted, i.e., the period before the Swiss franc shock in January 2015. Time and firm fixed effects are included. Controls include age, residency and marriage status. Standard errors are clustered at the industry level. The sample is restricted to working aged individuals in firm observed both in 2014 and 2016 within female intensive sectors.

10.3. Robustness check – continuous measure of net export exposure

This section provides robustness checks of the main results outlined in Section 5 using a continuous rather than a binary measure of net export exposure. Regression 10 is run separately on the female and male sample:

$$Y_{ifjt} = \tau_t + \lambda_f + \beta_1 T_t + \beta_2 x_{j,2014} + \beta_3 x^2_{j,2014} + \beta_4 T_t x_{j,2014} + \beta_5 T_t x^2_{j,2014} + C_{it} + \varepsilon_{ifjt} \quad (10)$$

Table 18 indicates that the relationship between net export exposure and degree of employment remains positive for women when including a continuous measure of employment. Table 19 meanwhile indicates a non-linear relationship between net exports and standardised income for men but no impact on degree of employment.

TABLE 18. Continuous measure of exposure – female sample

	Logged Standardised Income	Degree of Employment
post	0.0292***	-0.00115
	(0.00812)	(0.00295)
post × net export exposure	5.93e-05	0.000515*
	(0.000558)	(0.000284)
post × (net export exposure)^2	5.96e-06	-1.21e-05
	(1.38e-05)	(8.55e-06)
Y mean	8.74	0.76
Firm FE	✓	✓
Year FE	✓	✓
Observations	990,464	989,042
R-squared	0.520	0.355

Source: Swiss Earnings Structure Survey 2012, 2014, 2016 and 2018. *Notes:* Standard error in parentheses; p<0.1* p < 0.05, ** p < 0.01, *** Time and firm fixed effects are included. Net export exposure is continuous variables, indicating the exposure of the industry. Controls include age, education, residency and marriage status. Standard errors are clustered at the industry level. The sample is limited to women in firms observed at least once in 2014 and once in 2016.

TABLE 19. Continuous measure of exposure – male sample

	Logged Standardised Income	Degree of Employment
post	0.0159***	-0.00194
	(0.00475)	(0.00155)
post × net export exposure	0.000367*	4.22e-05
	(0.000205)	(0.000107)
post × (net export exposure)^2	-6.56e-06*	-1.36e-06
	(3.69e-06)	(2.61e-06)
Y mean	8.92	0.95
Firm FE	✓	✓
Year FE	✓	✓
Observations	1,242,126	1,250,733
R-squared	0.587	0.334

Source: Swiss Earnings Structure Survey 2012, 2014, 2016 and 2018. *Notes*: Standard error in parentheses; p<0.1* p < 0.05, ** p < 0.01, *** Time and firm fixed effects are included. Net export exposure is continuous variables, indicating the exposure of the industry. Controls include age, education, residency and marriage status. Standard errors are clustered at the industry level. The sample is limited to men in firms observed at least once in 2014 and once in 2016.

10.4. Robustness check – export exposure

To account for the fact that imports became cheaper as a result of the Swiss franc shock, the main specification uses net export exposure, by subtracting intermediate imports from exports. This, however, means that an industry with similar levels of exports and intermediate imports could have a low level of export exposure, despite being integrated into trade. This robustness check therefore calculates export exposure as follows:

$$X_{j,2014} = 100 \frac{\sum_p \text{export}_{p,j,2014}}{\text{Output}_{j,2014}} \tag{11}$$

Table 20 shows that the main results using firm fixed effects are robust to this alternative measure of export exposure.

TABLE 20. Triple difference - export exposure

VARIABLES	Degree of employment (100% = full time)	Logged standardised income
post	0.00183	0.0230***
	(0.00219)	(0.00403)
post × high industry	-0.000397	0.00319
	(0.00285)	(0.00455)
post × high industry × female	0.0118***	-0.00277
	(0.00324)	(0.00894)
Firm YE	✓	✓
Year FE	✓	✓
Y mean – women	0.76	8.74
Observations	2,320,864	2,313,715
R-squared	0.400	0.561

Source: Swiss Earnings Structure Survey 2012, 2014, 2016, and 2018.
Notes: Standard errors in parentheses. + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Time and firm fixed effects are included. Export exposure is a dummy variable equal to 1 if the export exposure is above the median. Controls include age, education, residency and marriage status. Standard errors are clustered at the industry level. The sample is limited to individuals in firms observed once in 2014 and once in 2016.

10.5. Robustness check – exclusion of local labour market at national border

The Swiss franc shock affected workers through the labour market but also by increasing their real wage as imported goods became cheaper. Overall, this should not affect the results of the triple difference, as the increase in real wage would have affected all workers in Switzerland, both in the exporting and domestic sectors. However, some workers live close enough to neighbouring countries to allow them to shop in Euros directly. As a robustness check, local labour markets at the border are thus excluded. This reduces our sample by roughly a third. Table 21 indicates that results of the main specification are similar in magnitude.

TABLE 21. Triple difference - excluding local labour markets at the border

VARIABLES	Logged standardised income	Degree of employment
post	0.0288***	0.00154
	(0.00617)	(0.00276)
post × high industry	0.00342	-0.000103
	(0.00653)	(0.00342)
post × high industry × female	-0.0105	0.0129***
	(0.0108)	(0.00365)
Firm YE	✓	✓
Year FE	✓	✓
Y mean – women	8.73	0.75
Observations	1,507,144	1,214,675
R-squared	0.550	0.403

Source: Swiss Earnings Structure Survey 2012, 2014, 2016, and 2018.
Notes: Standard errors in parentheses. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Time and firm fixed effects are included. Export exposure is a dummy variable equal to 1 if net export exposure is above the median. The sample excludes local labour markets at the Swiss national border. Controls include age, education, residency and marriage status. Standard errors are clustered at the industry level. The sample is limited to individuals in firms observed at least once in 2014 and once in 2016.