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Mathilde Muñoz

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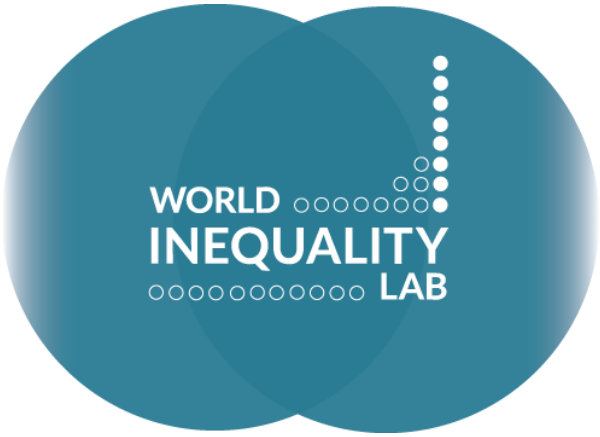

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TRADING NON-TRADABLES: THE IMPLICATIONS OF EUROPE'S JOB POSTING POLICY*

Mathilde Muñoz

Abstract

This paper examines the labor market implications of the EU posting policy, a large temporary migration program facilitated by the liberalization of the free provision of services in Europe. Posting allows EU firms to send ("post") their employees abroad to export customer-facing services. Combining administrative data and quasi-experimental policy variation, I find that the policy permanently increased total factor mobility in Europe without crowding-out of traditional migration. This result suggests that unrealized gains from trade in factor services remained despite the absence of regulatory barriers to trade and migration in the EU. Furthermore, posted workers are mostly sent from low-wage countries to perform manual tasks in sectors formerly insulated from trade, and they represent a substantial share of EU migrant workers. In receiving countries, posting had persistent negative effects on employment for domestic workers in the more exposed sectors and local labor markets, but it had no effects on domestic wages. In low-wage sending countries, firms in formerly "non-tradable" sectors experienced increased sales, profits and tax payments when exporting services through posting. Posted workers earn more once sent abroad but remain paid at lower wages than comparable domestic workers in the receiving country. Wage gains for posted workers are mostly explained by minimum wages enforced by the EU policy, highlighting the role of labor market regulations in shaping the way gains from globalization are shared between labor and capital-owners in origin countries.

Key words: International integration, Temporary migration, Trade and labor markets, Redistribution

JEL: F13, F16, F14, F22, J61

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I Introduction

Despite the expectation that free migration would lead to wage equalization, the EU still experiences low cross-border migration rates and significant wage disparities (Dorn and Zweimuller, 2021). Most assessments of European labor market integration focus on how much workers move from one country to work and live in the other. Free movement of workers, however, is just one of the four freedoms on which the EU's single market is based, along with free movement of goods, capital and services.

Posting is defined by the World Trade Organization as one of the four ways to trade services across countries ("*mode* IV"). It was liberalized in the EU in 1959 as the outcome of the free provision of services and broadly consists of temporary contracts performed locally by foreign firms. Under the posting policy, a firm in France is allowed to subcontract a service to a firm located in Poland. Posted workers stay formally employed by the Polish (sending) firm but cross the border to perform the activity at the French (receiving) client job site. Unlike standard trade, the service exported by Poland is produced on France's territory. Unlike standard migrants, posted workers have no employment contract in France, pay their social security taxes in Poland and are mostly regulated by the Polish labor code, except for minimum legal wages.

The general argument behind the posting policy is that the cross-border provision of services is needed to bring the benefits of a more competitive market for services. Free trade, the first economic freedom, enables EU companies to access foreign markets, but trade costs can be close to infinite for services that require face-to-face contact, for instance plumbing or driving (Grossman and Rossi-Hansberg, 2008; Blinder and Krueger, 2013). Free movement of workers and capital provide more direct means to trade factor services in the EU but require that firms open new establishments and set-up new employment contracts in each of the markets they wish to serve. Instead, posting allows firms to carry their activity abroad without formally moving their workers or their establishment.

Posting, which was originally intended as a trade policy, has resulted in a new form of temporary migration with exporting firms serving as intermediaries. Outside Europe, temporary migration schemes are common practices and constitute the lion's share of cross-border labor movements (Mobarak, Sharif and Shrestha, 2023). Prominent examples include the H2-A and H2-B visas in the U.S., or the *Kafala* system in the U.A.E. Like posting, those schemes are viewed by receiving governments as a flexible way to import foreign labor while limiting the amount of benefits and rights granted to temporary migrants. Posting takes this logic further, by fully outsourcing foreign workers' legal employment and supervision to the exporting firm located abroad.

Over the years, posting of workers has come to symbolize the tensions between social and economic pillars of EU integration. In theory, a single market for services should allow receiving firms and customers

to access cheaper services, sending firms to access new markets, and posted workers to benefit from higher wages. Sending countries argue that posting is essential to exploit their comparative advantage in sectors usually sheltered from export opportunities, allowing their companies to gain market shares abroad while avoiding tax revenue and human capital losses associated with out-migration. However, mounting protests from local workers and governments in importing countries suggest the alleged benefits of this policy may not be uniformly shared. Specifically, there are concerns that posting creates unfair competition and lowers labor standards, an issue that has already been raised in other guest worker programs (ILO, 2017).[1] Against this backdrop, the lack of reliable data on posting flows has been an obstacle to the assessment of the welfare impacts of this economic freedom.

I fill this gap by gathering social security information on workers posted abroad. To track the cross-border provision of services in Europe, I collect social security posting forms aggregated at the bilateral level for all EU countries. To measure granular exposure of workers and firms to posting, I further assemble administrative registries on posted workers. In two receiving countries (France and Belgium), I use linked employer-employee data merged with information on a firm's use of posted workers. In two sending countries (Luxembourg and Portugal), I use firm-level tax returns merged with information on the provision of posting services abroad.

Armed with these datasets, I answer three questions raised by the liberalization of posting in Europe: (i) Was posting successful at increasing trade in factors in the EU? (ii) In receiving countries, how were wages and employment of local workers affected? (iii) In sending countries, how were gains shared between workers and firms?

The first finding is that formerly non-tradable services are effectively traded in substantial amounts through posted workers. Despite the absence of regulatory barriers to trade and migration in the single market, posting flows within the EU are large and have doubled since 2005. Cross-border service contracts supplied through posting currently represent 27% of service trade flows in the EU, or almost 2% of EU GDP. The number of workers posted abroad each year is 1.1 million (in full-time equivalents), which is 60% larger than the number of EU workers moving through free movement of workers in a given year. International migration rates, the usual metric used by researchers to assess the state of EU labor market integration (Farhi and Werning, 2014; Caliendo et al., 2021), are under-estimated when posted workers are not accounted for. Cross-border supply of services thus increasingly contributes to total trade in factor services in the single market: in 2016, posted workers represented 13% of the total EU migrant workforce, and 26% of the stock of EU migrants who moved in the past ten years.

[1] In a recent controverse, the French president Emmanuel Macron depicted the posting policy as "betrayal" of EU values. Outside the EU, guest workers programs have been called "repugnant transactions" (Clemens, 2018) but are also viewed by some as one of the most powerful anti-poverty tools (Weyl, 2018).

Posting occurs in sectors commonly insulated from international trade, such as construction, cleaning or truck driving, and 75% of posting contracts are performed by blue-collar workers. While the analysis of export opportunities generally focuses on manufacturing businesses (Bernard et al., 2007), temporary employment agencies or construction firms in fact export substantially through posting. Posting also allows exporting firms to reduce the fixed costs of migration typically incurred by workers and facilitates the export of firm-specific capital, including management services, alongside their employees.

To better understand the finding that posting survived, and even thrived, despite open borders in the EU, I study how the expansion of posting to low-wage Eastern European countries between 2004 and 2013 shaped the mobility of factors within the EU. Using a dynamic difference-in-differences model around the differential timing of liberalization across country pairs, I find a 500% increase in job postings in the year of the liberalization event. I then study the interaction between posting and other economic freedoms in the EU by exploiting the fact that posting and free movement were not liberalized the same year for the same country pairs. I find no evidence that the liberalization of posting in a given country pair decreased migration between those countries, which confirms that posting liberalization had limited crowding-out effect on free movement. Conversely, bilateral posting flows did not decrease after that free movement was liberalized, indicating that posting was not used as a "back door" migration channel. That posting is not diminished by, and does not diminish, conventional migration between EU countries suggests that most workers who are posted face barriers to conventional migration that are prohibitive. This finding is also consistent with larger monetary gains via posting than free movement. Either the productivity of posted workers is complementary to sending-country firms' capital, or firms pay lower taxes and are subject to less labor market regulations under posting.

The second finding is that the posting expansion had negative employment effects for the most exposed domestic workers in receiving countries. I combine the large and permanent supply shock caused by the eastwards expansion of the posting policy with French administrative data on posting inflows at the local and sectoral level. I exploit variation in past relationships with suppliers of posting services to measure the initial exposure to the policy shock across French provinces. While following parallel trends during the ten years preceding the reform, domestic employment in exposed sectors and high exposure provinces decreases differentially by 3% after the shock relative to less exposed labor markets, while domestic wages remain unaffected. Part of the employment effect is driven by lower employment for existing immigrants, emphasizing that workers who moved through traditional migration channels faced increased labor market competition after the expansion of posting. Similar to what follows more standard trade shocks (Autor, Dorn and Hanson, 2013), I find no evidence that local labor markets adjustment to the shock occurred

through increased geographic mobility or sectoral reallocation but rather through lower labor force participation of domestic workers. Overall, the employment consequences of posting have similar magnitude to those documented in comparable institutional contexts, such as temporary migration schemes that restrict the ability for migrants to reside in destination markets (see Dustmann, Schönberg and Stuhler, 2017, in Germany) or to change employers in destination countries (see Doran, Gelber and Isen, 2022, in the U.S.).[2]

I then explore employment and wage-setting responses at the receiving-firm level. Using an event study design comparing firms that start purchasing posting services to future adopters, I show that receiving firms scale down their domestic employment by 16% after they start purchasing posting services, while wages of incumbent workers remain unchanged. I then show that posted workers are paid 30% less than comparable domestic workers at the same workplace, a within-firm wage penalty twice as large as that for domestic temporary agency workers. My estimates imply that posted workers receive only 10% of the workplace-specific pay premia earned by local workers in receiving firms, revealing that pay policies differ dramatically for posted and domestic workers operating at the same job site. The wage mark-down imposed on posted workers is larger than what has been estimated for immigrants (Dostie et al., 2021), or workers outsourced domestically (Drenik et al., 2023), and it is consistent with temporary migration schemes leading to monopsony power in migrant labor markets (Naidu, Nyarko and Wang, 2016). Posted workers are bound to their exporting firm, work in segmented labor markets, and have reduced labor protection. These factors explain why wage setting differs in posted and domestic contracts and emphasize the importance of institutional details in shaping how migration policies affect (or do not affect) labor markets.

A key feature of the posting arrangement is that the client firm cannot simply pay the exporting firm for the service of recruiting workers; rather the client firm must hire the exporting firm as a contractor. The last part of the paper investigates how the gains from posting contracts are shared between exporting firms and posted workers in sending countries. Exploiting firm-level data from a major sending country, Portugal, I use an event study design comparing firms posting services abroad to either matched control firms in sectors without posting opportunities or to future posting firms. Firms witness a significant scale-up in activity once they access foreign markets through posting—with sales rising by 56%, and employment by 30%—immediately after they start providing services abroad. This large export-mobility surplus is unequally shared between workers and capital-owners: profits increase by 37% after a posting event while wages rise by 14%. The posting arrangement thus enables sending country firms to capture some of the

[2]In contrast, most studies of conventional migration flows find no crowd-out effects for natives (Card, 2001; Ottaviano and Peri, 2012; Ottaviano, Peri and Wright, 2013), especially when migrants perform different tasks than natives (Peri and Sparber, 2009; Beerli et al., 2021) or can be automated (Clemens, Lewis and Postel, 2018). Crowd-out effects have however been documented for previous migrants (d'Amuri, Ottaviano and Peri, 2010) and in occupations with limited tradability (Burstein et al., 2020) or low productivity spillovers (Cortés and Pan, 2014).

producer surplus from immigration.

The posting policy also allows sending governments to tax the gains from immigration, whereas under conventional migration, those revenues would be directed to the receiving countries. Sending firms pay 45% more social security contributions and 35% more corporate taxes at home when they start supplying services abroad. Other forms of migration also generate higher incomes for migrants (Clemens, 2011; Dustmann and Preston, 2019), but remittances do not directly fund social security systems and public goods in origin countries (Yang, 2011; Bhagwati, 1976). The fiscal externality of posting is thus closer to that of conventional trade. To gauge the magnitude of the gains triggered by posting, as compared to trade in goods, I benchmark these results against the effect of exporting goods among manufacturing firms that I estimate in the same dataset. I find that firms' growth from posting opportunities are similar in magnitude to the gains from exports of goods, the usual focus of industrial policy. But posting firms are smaller, younger and less capital intensive than commonly studied manufacturing exporters, distinguishing the distributional implications of posting from more traditional trade policies.

The benefits of posting in sending countries cannot be fully captured by sending firms, because the EU policy constrains exporting firms' wage setting during the posting contract. Exploiting variations in the enforceability of minimum wage laws within and across countries, I show that posted workers earn higher wages abroad only when the minimum wage law is binding for the exporting firm. This sheds light on two potentially relevant mechanisms for trade and migration policies. First, the distribution of the benefits of trade to workers in exporting countries may not always be ensured, but it can be improved by linking access to foreign markets to fair pay policies at the exporting firms. Second, the increasing presence of migration intermediaries, as highlighted by Fernando and Singh (2021), raises the concern that firms could capture most of the immigration surplus. In the context of posting, prevailing minimum wages were key to secure higher wages for posted workers.

The main contribution of this paper is to describe how factor mobility contributes to the international integration of labor markets. While trade and migration can in theory be seen as substitutes (Mundell, 1957), the presence of non-traded sectors limits the scope for factor price equalization through trade, meaning that free migration should generate additional gains even when trade is free (Helpman and Krugman, 1985). The scale and rise of posting flows after their liberalization shows that the potential for additional factor mobility remained even in a context of free trade and unrestricted migration. Trade in goods and services and conventional capital and labor flows were thus insufficient to integrate labor markets within the EU.

The posting policy introduced a mechanism of international integration that falls just between free trade (where wages are fully set in exporting countries) and free migration (where wages are fully set in desti-

nation countries). In practice, wages of posted workers are close to fixed at the prescribed policy level and do not vary across firms. The posting arrangement enabled firms to pay posted workers lower wages than domestic workers but these wage reductions were bounded by legal wage floors enforced by the regulation.

The posting arrangement also allowed sending country firms to capture some of the surplus that under other forms of temporary migration would flow to receiving country firms or to migrants themselves. In standard analyses of how the benefits of immigration are shared between capital and labor (Borjas, 1999), capital in the sending country is hurt by migration abroad. Instead, posting generates higher profits for exporting firms and higher tax revenues for sending countries.

While posting has significantly contributed to intra-EU factor mobility in the past decade, factor movements have not yet reached a scale sufficient to eliminate wage disparities between EU countries. If building the "United States of Europe" (Head and Mayer, 2021) remains a distant goal, the introduction of posting nevertheless highlights the tension between the social and economic objectives of EU integration. Posting successfully enhanced factor mobility in the EU, although it remains unclear whether this expansion was mostly driven by lower migration frictions, complementarity between posted workers and sending country firms' capital, or lower labor regulations under the scheme. What emerges as a clearer picture is that posting redistributed market shares and tax revenues from high to low-wage countries, which allowed posted workers to earn higher wages but also enabled firms to capture part of the benefits from immigration.

The rest of the paper is organized as follows. Section II describes the policy rules and the datasets. Section III describes the nature of work arrangements intermediated by posting. Section IV documents the contribution of posting to trade in factors in the EU. Section V explores the consequences of posting for firms and workers in receiving countries. Section VI estimates gains in sending countries. Section VII concludes.

II Institutional Framework and Data

II.I The European Laboratory: EU Posting Policy

The posting policy in the European Union (EU) was liberalized in 1959 to facilitate the free provision of services. Its aim is to promote a more competitive market for services in Europe by enabling cross-border trade. According to standard trade theory, trade is essentially the exchange of embodied factor services, and trade in goods and factors are substitutes. While free movement of goods, the first economic freedom in the EU, enables indirect trading of factors, it is not practical for services that cannot be exchanged electronically due to high trade costs. Free movement of workers and capital, the third and fourth economic freedoms in

the single market, offer a more direct approach to trade factor services in the EU, but require companies to establish new employment contracts and open new establishments in every destination market they serve. The posting framework was established to address this challenge and allow EU companies to carry out their activities abroad without having to formally move their workers or establishments to the member state where their clients are located.

The process of posting allows companies located in one EU member state to directly send their employees to perform a service contract in another member state. The services are accounted for in the home country's production even though they are being performed abroad. The policy is designed to regulate temporary services between member states, though there is no legal limitation on the duration of posting assignments. The exporting firm must however have a "substantial" activity in the home country.[3] Posting can involve employees posted by their permanent employer, a temporary employment agency, or between companies in the same group. Firms can also hire workers specifically for posting, and self-employed individuals can also post themselves abroad. While receiving countries do not have the right to refuse foreign service suppliers from the EU, they can ensure that posting policy rules are followed.

The rules surrounding the posting of workers in the European Union (EU) dictate the taxes and regulations applicable to posted workers while they are on assignment abroad. Payroll taxes and labor regulations are determined by the sending country, where the posted workers are formally employed. For example, if a Polish firm sends its employees to France, it will pay payroll taxes in Poland and will still be subject to the labor code in Poland, not France. Exemptions from payroll taxes in the receiving country are granted for a limited time. Until 2010, it was 12 months; from 2010 to 2020, it was 24 months; and since 2020, it has been 18 months. These exemptions can be renewed if there is a two-month break between two posting assignments involving the same worker, sending firm and client.

To prevent social dumping and avoid distortion of competition, the EU has granted posted workers a legal right to basic minimum conditions in the receiving countries. Since 1996, posted workers have been entitled to minimum legal wages, maximum working hours, and basic safety regulations in the receiving country. For instance, posted workers employed by a Polish firm cannot be paid below the minimum legal wage in France when posted to France.[4] However, regulations related to bonuses, overtime pay or severance payment rules do not apply. In receiving countries without a generally applicable minimum legal wage or for self-employed workers, the minimum wage is set in the home country. Since 2020, posted workers must receive the same pay as domestic employees at the receiving firm and are further protected by some collective labor agreements. This reform was introduced under the lead of French President Em-

[3]The EU jurisprudence establishes that at least 10% of firms' activity should be performed in the country of origin.

[4]The minimum wage paid to posted workers is in addition to transportation, housing and other costs related to working abroad that must be covered by the exporting firm.

manuel Macron, following a political backlash against the posting scheme in Europe.

II.II Posting: a Joint Trade and Temporary Migration Program

The export of services through posted workers is known as mode IV supply in the World Trade Organization's (WTO) framework for trade in services. Policies that enable mode IV service trade must be negotiated as part of the multilateral General Agreements on Trade in Services (GATS). Because of the unique intersection of foreign service provision and consumer location in mode IV, these negotiations focus on migration rules and labor regulations for foreign employees. This has made mode IV liberalization one of the most controversial issues in the trade of services. Developed countries have opposed inward worker movement through mode IV, claiming that it undermines their ability to regulate migration flows, while developing countries have pushed for liberalization, which would give their workers and firms the opportunity to supply services in wealthier nations (Bhagwati, Panagariya and Srinivasan, 2004). Recently, many trade agreements, from the Asia Pacific Economic Cooperation (APEC) to U.S.-Mexico-Canada Agreement (USMCA), have proposed liberalizing posting as a way to pursue international integration, following the EU example.

While posting was designed as the outcome of service trade liberalization, it is effectively a migration program. The main differences between migration and posting are summarized in Table A.1. Unlike standard immigrants, posted workers move temporarily, do not benefit from most benefits and rights in the destination country, and do not bring their family with them because they are not allowed to integrate their receiving country's labor market. Unlike immigrants, posted workers have no employment contract nor tax liability in the receiving country and thus do not appear in standard immigration statistics.

Posting is closer to temporary migration programs that impose limitations on the maximum duration of stay and the amount of rights and protection granted to short-term migrants. Such schemes have been implemented in many other areas of the world, and the most prominents ones are summarized in Table A.2. Among those programs, posting is one of the less regulated in terms of scope and the amount of labor market protections granted to foreign workers. For instance, compared to posting, which is free from regulatory barriers, both the U.S and Canada impose quotas, sectoral restrictions or labor market tests. These restrictions naturally limit the size of temporary migration in their labor markets. Temporary migration schemes also generally impose equal treatment between local and guest workers. Even if temporary migrants are willing to work for less than existing workers, the H2-B and H2-A programs in the U.S, or the TFW scheme in Canada, set prevailing wage requirements to ensure that foreign workers are not paid less than existing

workers in similar jobs.[5] In contrast, before 2020, only minimum legal wages were binding for posted workers. Outside Europe, temporary migrants are also subject to the entire labor code of the destination country, while only *"basic minimum"* rights are binding for posted workers. If posted workers do not benefit from equal treatment in terms of labor laws, they get to keep their right to health, unemployment and retirement insurance in their origin country. In contrast, other schemes often imply that migrants must switch social security regimes when they move abroad. Furthermore, while guest workers must sometimes pay fees to recruitment agencies or to travel (Gibbons et al., 2019), the EU's posting policy requires that mobility costs such as transportation, housing, and food are covered *in addition* to the minimum legal wage paid to posted workers during their contract abroad.

An important difference is that posted workers remain formally employed by the exporting firm located abroad, meaning that their home country collects their social security contributions and taxes even while they are working abroad. This difference creates two major conceptual distinctions between posting and other temporary migration programs. First, posted workers are considered to belong to their home country's labor market, as defined by EU law as the "habitual place of work". While other forms of guest work also restrict the ability of workers to change employers in the destination country, posting creates a fully segmented labor market for posted workers. Second, the idea behind cross-border service provision is that, in theory, the origin country's specific technology and expertise can be traded along with its workers. For example, cross-border service contracts can involve the transfer of management and human resource services or a firm's proprietary knowledge for finding projects abroad and assembling teams of experienced workers. Increasingly, migration flows are facilitated by recruitment agencies that match workers with employers before the mobility event (ILO, 2017). Posting takes this a step further by viewing foreign workers as inputs of the exporting firm, including while they are on assignment abroad.

II.III Measuring Cross-Border Service Trade Through Posting in Europe

The lack of evidence on posting can be traced to the absence of reliable data to measure these flows. I discuss the administrative datasets on postings within the EU that allow me to fill this gap.

II.III.I Europe-Wide Dataset on Bilateral Posting Flows

I build a dataset based on administrative social security forms E101/A1 issued for each posting assignment within the EU. This certificate is a mandatory document that posted workers must hold during their assign-

[5] In the U.S., the L visa also allows multinational firms to have workers from their foreign establishments work in the U.S. for a period of 3 months to several years. This arrangement can only be used for managers in the U.S. but is conceptually very close to posting. In 2019, around 160,000 L visas were issued.

ment to prove their affiliation to their sending country's social security system.[6] One posting form identifies simultaneously a flow of a worker moving abroad and a service contract export. The posting forms are issued by sending countries and are linked to the service contract: a unique worker may be linked to several posting forms. I also collect information on the duration of posting contracts to measure posting flows in full-time equivalents.

Using exhaustive information on posting forms issued each year collected from the European Commission, I build the matrix of bilateral posting flows from 2005 to 2019. That dataset allows me to recover information on bilateral trade-in-services in Europe, overcoming two major measurement challenges usually faced by trade economists. First, unlike for standard exports, these forms do not have a minimum reporting threshold: I thus have limited missing flows in my dataset. Second, while services' transactions are often poorly measured due to their intangible nature, payroll tax information on posted workers helps reconstruct reliable administrative records of trade in services.

While social security forms enable researchers to measure posting in employment terms, a measure of the monetary value of the associated cross-border services contracts is still missing. The price charged for cross-border services includes the compensation of posted workers, which we could estimate using micro datasets on posted workers' wages. But there are other components billed by the exporting firms that we do not observe due to a lack of data on international service contracts. I address this issue by using the "balance of payment" (BOP) methodology, which is commonly used by central banks and international organizations. This methodology assigns trade flows measured by BPM6 sectors to each mode of supply (mode I, II, and IV) using sector-specific shares from the MSITS (2010).[7] For example, construction services can only be supplied through mode IV and are fully allocated to this mode in the classification. However, this measurement approach has a limitation in that the sector-specific mode of supply shares are measured in contexts where mode IV is heavily restricted, such as between EU and non-EU members or within NAFTA. Hence, the BOP methodology underestimates the prevalence of mode IV within the EU where posting is fully liberalized, particularly in sectors where several modes of supply co-exist (WTO, 2004).

II.III.II Country-Level Micro Data on Posting

To measure granular exposure of firms and workers to the posting policy, I complement the EU-wide posting dataset with micro administrative data on posting in six countries.

[6] The lack of form leads to a fine, and social security contributions to be paid in both sending and receiving countries. The E101/A1 dataset does not record postings from outside the EU, but those flows are small. The forms can be issued for workers posted to one country (article 12) or more (article 13-14) (see Appendix F.2 and De Wispelaere and Pacolet, 2019).

[7] Those shares are based on small surveys and expert assessments.

Administrative Registries of Posted Workers in Receiving Countries Linked employer-employee data in receiving countries allow me to study the consequences of posting for domestic workers. I use administrative registries on incoming posted workers in receiving countries where these datasets are available: France and Belgium, which are the top second and third importers of posting services.[8]

All firms that post their employees to France (respectively, Belgium) are required to file a DPD/SIPSI (respectively, LIMOSA) posting form.[9] If the form is missing, both sending and receiving firms are liable to sanctions and fines and the posting assignment is interrupted. For France, I observe all received posting forms by province-year-sector from 2000 to 2015 and disaggregated forms for 2017-2020. For Belgium, I use disaggregated posting forms for 2010-2020. While the LIMOSA and DPD/SIPSI are separate datasets, they have the same structure and are based on similar reporting requirements, hence why I describe them in the same paragraph below.

In each dataset for the two receiving countries, I use the unique receiving firm identifier to link posting registries with linked employer-employee data on domestic workers. I can identify which firm or private customer purchased a service performed by a foreign supplier of services and also which foreign firm and posted workers performed that contract. I have detailed information on the exporting foreign firm, the posted worker, and the posted worker's contract. The final datasets allow me to observe jointly posted and domestic workers' hours of work, tenure, wages, occupation, workplace and demographics.

To summarize, I observe: (i) local-sectoral-year imports of posting services in France from 2000 to 2015, (ii) all granular purchases of posting services by French firms from 2017 to 2020 with detailed information on domestic, posted workers and posting contracts and (iii) all granular purchases of posting services by Belgian firms from 2010 to 2020 with detailed information on domestic, posted workers and posting contracts. The datasets are described in Online Appendix Sections F.5 and F.7.

To extend the coverage of my datasets, I further collect data on postings to Germany and Austria, the first and fourth receiving countries of posted workers. In Germany, all companies posting workers in the construction sector must file a form to the national fund for holiday leave, SOKA-BAU. I use data from SOKA-BAU on all workers posted to the construction sector in Germany since 2000. In Austria, all companies that post workers in the construction sector must also file a form to the national building union BUAK. I use data from BUAK on all workers posted to the construction sector in Austria since 2006.

Administrative Registries of Posted Workers in Sending Countries To study both sides of exposure to posting, I also use firm-level administrative data in sending countries.

[8]Similar administrative registries exist in other receiving countries, but those datasets are either not available for researchers or are not numerized. Those forms complement the A1 social security forms that need to be filed for each posting contract.

[9]Those reporting requirements apply to all foreign firms, including those located in non-EU countries.

To obtain granular data on posting companies and their performance, I exploit administrative tax data on firms in Portugal, one of the top exporters of posting services. The dataset provides detailed information on firms' five-digit sector code, wages, employment, investments, sales, and other balance sheet components. Each year, firms established in Portugal report to the tax administration the amount of services performed abroad by the geographical market of destination. I use this information to identify the universe of Portuguese firms that supplied posting services in another EU country between 2006 and 2017. Because the dataset does not distinguish between mode I and mode IV supply of services at exporting firms, I apply the BOP methodology described in Subsection II.III.I to select the 5-digits sectors that can only export through mode IV.[10] This methodology induces a lower bound on the selection of exporting firms, as posting can occur in other sectors, like IT services, where mode IV cannot be separately identified from exports through electronic means (mode I).

Although central banks typically lack the means to verify the accuracy of the BOP methodology, I can compare it to my other datasets on posting in Europe. In France, the top destination country for postings from Portugal, my micro dataset shows that roughly 75% of postings contracts performed by Portuguese companies are in a NACE code that is selected through this methodology. The EU-wide dataset on posting forms further indicate that workers posted from Portugal account for 1% of Portuguese employment, while firm-level mode IV exports computed through the BOP methodology account for 1.2% of Portuguese GDP. Overall, those comparisons suggest that in the context of Portugal, there is limited under-measurement bias of mode IV from the BOP methodology. The Online Appendix Section F.4 provides more detail on the dataset.

I also use administrative employer-employee data on all workers employed in Luxembourg merged with information on posting social security forms at the worker level for 2002-2019. Because this dataset is directly linked to social security forms issued for posting, I can observe posting exports in sectors where different modes of supply co-exist. For all job spells in Luxembourg, I also observe detailed information such as wages, tenure, hours of work, employer's two-digit sector code and employee demographics. However, this dataset has no information on other exports of services, exports of goods, and firms' balance sheets. This dataset is described in Online Appendix Section F.6.

III What Work Arrangements Are Intermediated by Posting?

I now use my datasets on posting in Europe to document the nature of labor arrangements under posting.

[10] Those sectors are listed in Online Appendix Table C.12.

III.I Measuring Globalization Through Posting

I start by assessing the current magnitude of posting flows in Europe. Data on mode IV service exports within the EU in 2017 indicate that posting transactions are worth around 280 billion euros, which accounts for 27% of within-EU trade in services and roughly 10% of within-EU manufacturing trade (Figure A.1, Panel A). Those exports are as large as financial and ICT services between European countries, which are the usual focus of trade in service agreements. Overall, these numbers suggest that almost 2% of EU GDP is additionally traded through the posting policy.

As explained before, the monetary value of posting contracts can be biased by measurement errors. I build a more accurate picture using statistics on the number of workers involved in posting contracts, adjusting for the duration of posting assignments. Figure I, Panel A, shows that the number of workers moving each year through cross-border supply of services is large, and has been increasing in the past decade. The number of posted workers (in full time equivalents) rose from less than 300,000 workers in 2005 to almost 2 million in 2019, and most of this increase occurred after the EU enlargement of 2004.[11]

The comparison between posted workers' flows and traditional EU immigrants is shown in Figure I, Panel B and C. In 2016, the number of posted workers was 60% greater than the number of working-age individuals who migrated through free movement that year. International migration rates, the standard measures used to assess the state of EU labor market integration, are underestimated if posting flows are not considered. However, to accurately measure the contribution of cross-border services to overall labor mobility in the EU, posted workers flows must be compared to the total immigrant workforce, including all foreign EU citizens in a given point of time. In 2016, posted workers (in full-time equivalents) accounted for 13% of the total European migrant workforce and 26% of the stock of EU migrants who moved in the past decade. In countries such as France, Belgium, Sweden or Finland, the contribution of posting to the EU immigrant workforce is higher, exceeding 20% (Figure A.2). The impact of posting on total factor mobility is also more significant when focusing on recent EU immigrants (Figure A.3).

III.II How is Posting Different from Conventional Trade?

Using data on posting contracts in France, the second importer of posting services in the EU, Figure III shows that 35% of the contracts performed by posted workers occurs in the construction sector, 35% in manufacturing services (e.g., welding, electronic installation, mechanic or pipe-fitting), 18% in business services (e.g., driving, cleaning or food catering), and 10% in agriculture.[12] Those affected jobs are mostly

[11] Section IV will study in detail the effects of the EU enlargement on posting flows.

[12] The numbers for the entire EU are similar (Figure B.4). Only 22% (56%) of posting contracts involve firms buying posting services in the same five-digit (two-digit) sector as their main sector (Figure C.16).

manual services requiring face-to-face contact (Table C.9): blue-collar workers account for 65% of all workers posted abroad (75% when including technicians) and 58% of all posting contracts (Figure D.25). As a result, net receiving countries are located in the West and North of Europe, while net senders are mostly Eastern and Southern European countries (Figure B.4, Panel B). The intensive use of the posting scheme since 2004 led to a large relative international integration of sectors usually viewed as "non-tradable." The gap between trade in customer-facing services and trade in remote services is less than 15% in Europe, but 65% in the NAFTA (Figure C.23), revealing the scope for service trade expansion in free trade areas where posting remains restricted.[13]

Following the type of jobs offshored through posting, firms in sectors usually defined as "non-tradables" are in fact internationally integrated. Using micro data on firms located in Portugal, Figure IV shows that the share of exporting firms in those sectors is large: 34% for temporary employment agencies, 29% for road transport, 15% for building completion, and 7% for residential construction. As a consequence, cross-border provision of services represents a sizable share of sending countries' economic activity in those sectors. The weight of posting exports in total sectoral turnover is 28% for the road transport industry, 25% for floor covering, 19% for temporary employment agencies and 13% for painting. In contrast, exports of goods represent less than 2%, on average, of those firms' sales, confirming that these sectors would be sheltered from export opportunities in the absence of posting.

III.III How is Posting Different from Conventional Migration?

III.III.I Lower Migration Fixed Costs and Frictions

While free movement is guaranteed in the EU single market, non-policy barriers to migration can be sufficiently high such that the scope for cross-border labor movement remains. For instance, searching for work opportunities abroad requires specific knowledge about the foreign country, leading immigrants to face unemployment spells or skills "mismatch" (Dustmann, Frattini and Preston, 2013). Those costs are presumably increasing with the number of destinations considered: a given worker in Poland will most likely not be able to search simultaneously in every possible country. Firms can solve this issue if endowed with a technology that is efficient at searching service contracts abroad or at matching employees with foreign demand. There are also initial fixed migration costs that are usually borne by migrants, such as administrative costs or the expenses required to travel, to settle and to start a professional activity abroad. Firms can centralize these fixed costs and experience increasing returns in the international mobility of their workers.

To understand whether posting lower migration costs, I start by discussing the characteristics of posted

[13] For the interested reader, the size of variable and fixed trade costs in posting trade is documented in detail in Online Appendix Section C.2.

workers and traditional migrants in France and Belgium. By comparing these two groups, I gain insight into which workers self-select into posting. On average, migrants are 24 years old when they move to their destination country, while posted workers are 38 years old. Only 2% of posted workers have a tertiary education compared to 30% for immigrants. Older and less educated workers may face greater mobility barriers, such as language difficulties or financial constraints, which could explain why they choose posting instead of free movement. To further assess the size of mobility costs in posting, I examine the frequency of posting contracts. In a given year, half of posted workers are sent to multiple countries by their employer. This high frequency of posting makes it difficult to substitute with traditional migration. Finally, employers directly paid for transportation costs in 85% of posting contracts recorded in France (in 80% of contracts for housing and 50% for food expenses), which is evidence that exporting firms bear these costs.

To explore more systematically how migration frictions contribute to the use of posting over traditional migration, Online Appendix Figure B.10 correlates measures of posting expansion with measures of labor market rigidities faced by immigrants. I focus on flows from low wage Eastern European countries that joined the EU in 2004. I measure the relative expansion of posting in a given receiving country as the ratio of posted workers *inflows* from new member states (henceforth NMS) after EU accession and the total number of NMS migrants who arrived in the country since 2004. A high ratio means that post-2004 changes in the stock of NMS workers (immigrants and posted workers) occurred through posting rather than free movement. I use two measures of labor market rigidities for immigrants. The first one is the difference between unemployment rates of foreign and native workers in a destination country. The second measure is the difference in overqualification rates between foreigners and natives. This rate is the share of tertiary educated workers employed in an occupation that does not require a tertiary degree and is a proxy of skills mismatch. There is a strong positive correlation between posting expansion and the degree of labor market rigidities faced by immigrants. Countries where immigrants face high degrees of labor market exclusion and skills mismatch such as France and Sweden, are also countries where more than 90% of all NMS workers arrived since 2004 are posted workers. On the other hand, the United Kingdom and Ireland sourced most of their NMS workforce through free movement, not posting, and have higher levels of labor market integration for immigrants.

III.III.II Trade in Origin-Specific Capital

Posting was introduced as a way for foreign companies to not only export their employees but also some specific technology and expertise. Cross-border service contracts can involve the transfer of management and human resource services or a firm's proprietary knowledge. For instance, cross-border infrastructure

contracts involve transfers of experience, technology or even reputation that can be firm-specific (Makovšek and Bridge, 2021). Firms' comparative advantage in exporting services can also lie in their ability to retain experienced workers and to export them in teams. Some migration frictions, for instance language barriers, are plausibly easier to overcome if experienced teams of workers move together to perform the job. With free movement, each foreigner could move individually and get hired by the destination client, but this would require important coordination efforts. Instead, the exporting firm provides the commitment that the team of experienced workers will come and work together during the assignment abroad. Micro data on posting contracts corroborate this assumption: posted workers typically work in teams and have been employed with the foreign company for an average of 3 years prior to their posting assignment (Table B.6). Only 10% of posted workers were hired specifically for the posting assignment, hence the foreign firm and its employees have a "usual" employment relationship outside the posting contract. Recruitment agencies intermediate 25% of all posting contracts, which is substantial but confirms that most cross-border service contracts are operated by firms that are more than "match makers."

III.III.III Regulatory Arbitrage

Another factor that could explain the prevalence of posting is regulatory arbitrage. Because posted workers remain formally employed in the origin country, they are subject to different employers' payroll taxes and labor market regulations compared to traditional migrants and local workers. This cost advantage means that posted workers are more valuable (relative to migration) in countries where labor regulations and taxes are high. Figure B.11 correlates posting expansion with measures of employers' labor cost or employment protection in destination countries. Countries where payroll taxes are high sourced most of their NMS-born workers through posting rather than free movement (Panel A). Destination countries with higher collective agreements coverage rates also experienced a larger expansion of postings relative to migration from NMS after the enlargement (Panel B). This result suggests that posting expansion was larger in countries where cost differences between domestic and imported workers were larger. In recent work, Munoz (2023) shows that changes in labor regulations causally affect the demand for posting contracts.[14]

IV Effect of Posting Expansion on Trade-in-Factors within the EU

To better understand how the free provision of services contributed to total trade in factors in the EU, I now study how lifting regulatory barriers for posting affected the scale of factor service trade in the EU as well

[14]Based on a qualitative case-study, Wagner and Hassel (2016) argue that German firms in the meat processing sector have intensively used posting to circumvent the German co-determination system and wage regulations before 2015.

as its interactions with the liberalization of other economic freedoms in the EU.

IV.I Effects of Posting Liberalization on Posting Flows

Identification Strategy I focus on the transition from quasi-autarky to full liberalization of cross-border service trade for 13 new EU member states (henceforth NMS) from 2004 onwards. Postings from non-EU to EU countries face large entry barriers. When a country becomes a EU member, posting restrictions for its firms (work authorizations and licensing) are lifted in all other EU countries. The EU enlargements of 2004, 2007, and 2013 triggered the service trade liberalization for successively 10 (Poland, Lithuania, Hungary, Estonia, Latvia, Slovakia, Slovenia, Czech Republic, Malta, Cyprus), 2 (Bulgaria and Romania), and 1 (Croatia) countries mostly located in Eastern Europe. The lower wages and social security contributions in NMS compared to old EU countries made these countries potentially competitive in supplying posting services. Differences in the timing of liberalization for workers posted from NMS among receiving countries were determined by the European Commission. Austria and Germany were allowed to maintain pre-enlargement entry restrictions for seven years after EU accession events, while all other EU countries had to grant immediate access to services suppliers from NMS. Those reforms are described in Online Appendix Table B.4.

I use a triple differences approach where I compare posting flows from treated versus control origin countries before and after the lifting of entry barriers in destination countries. This approach allows me to control for unobserved posting determinants that vary at the country-by-year level. For instance, one concern is that Poland's EU membership in 2004 may have enhanced its economic relationships with France, which could in turn have increased postings from Poland to France in 2004. Because destination countries lifted posting restrictions for the same origin country in different years, I can control for origin-year fixed effects that filter out the overall effects of the enlargement on postings from NMS. In this example, postings from Poland (versus control origin countries) to France in 2004 can be compared to the same differential posting flows to Germany in 2004, as Germany only lifted all posting restrictions for Poland in 2011.

The timing of posting liberalization was decided by the EC, which limited the concern of endogenously determined liberalization. The EC allowed restrictions in Austria and Germany due to their proximity to NMS, which was seen as a risk factor for heavy competition. If keeping entry barriers is correlated with expecting large posting inflows, it would lead to downward biased estimates. To control for demand shocks that may have influenced the timing of the liberalization, I include destination-year fixed effects. In the same example, this enables me to compare postings from Poland to France in 2004 to postings from Romania to France the same year, exploiting the fact that while Romania and Poland had similar characteristics

(for instance wages and taxes), Romania was only allowed to post workers to France in 2007, not 2004.

The remaining confounding factor concerns bilateral shocks simultaneous to posting expansions. In practice, because the enlargements were heavily anticipated, few policy changes occured exactly in 2004 (respectively 2007 and 2013) beside the expansion of the posting policy itself. More than 90% of bilateral trade tariffs between NMS and EU member states were abolished between 1990 and 1995, and those countries adopted all EU standards in their national law before 2004.[15] Furthermore, trade regulations do not vary at the bilateral level and are therefore systematically absorbed by destination-year and origin-year fixed effects, even if trade costs change around the enlargement. The main source of bilateral shocks comes from changes in immigration rules. Most EU countries implemented safeguard clauses protecting their labor market from NMS immigrants, leading the timing of posting liberalization to differ from the timing of free movement liberalization for the same country-pair. I will use those differences in timing to study the interactions between posting and free movement in the EU.

Online Appendix Figure B.6 illustrates how postings from countries treated by the service trade liberalization event (red series) evolved compared to postings from countries not affected by it (blue series), before and after the reform (vertical red line) for a sub-sample of the liberalization reforms. To observe posting flows from NMS *before* the liberalization, I focus on the receiving countries with a country-level registration tool: France (DPD), Belgium (LIMOSA), Austria (BUAK), and Germany (SOKA-BAU). These countries are the top four importers of posting services in the EU and capture 60% of all inflows.[16] In the six country-level experiments, postings from treated and control countries do not exhibit differential trends before the reform. Panels A, C, and E show that posting flows increase immediately after posting barriers are lifted at EU accession. In countries where restrictions are kept, no differential evolution of posting flows is observed at EU accession, while postings from treated countries start to differentially increase when regulatory entry barriers are lifted later on (Panels B, D, and F). There is no differential increase in postings from control countries around the event, including other NMS not treated by the event, confirming that the jump in treated series is not driven by unobserved demand shocks. To pool all entry reforms, I estimate a dynamic staggered difference-in-differences model:

$$\ln S_{ijt} = \alpha_{ij} + \alpha_{jt} + \alpha_{it} + \sum_{k=\underline{c}}^{\bar{c}} \beta_k D_{ijt}^k + \varepsilon_{ijt}, \tag{1}$$

where S_{ijt} is the number of postings from country i to country j at time t and α_{ij} is an origin-destination

[15] See Article 49 of the Treaty on the European Union (TEU), accession treaties (https://eur-lex.europa.eu/collection/eu-law/treaties/treaties-accession.html) and the "Europe agreements" signed by each of NMS in 1990.

[16] Those datasets record postings from non-EU countries, which avoids biasing my estimates upward (by mechanically recording zero flows pre-liberalization). Online Appendix Figure F.76 shows postings from NMS to all receiving countries using the exhaustive E101/A1 dataset.

fixed effect. The treatment is defined as country i gaining the right to post workers without restrictions to country j at time t. I define the event dummy as $\mathbb{1}.[t = d_{ij} + k]$, where d_{ij} is the year at which country j lifts posting barriers for employees sent from country i. D^k_{ijt} is equal to one for treated country pairs in year k of the liberalization event while is equal to zero for country pairs that are never or yet to be affected by a liberalization reform. I normalize $\beta = -1$, set $\underline{C} = -4$ and $\overline{C} = +8$ and $D^{\overline{c}}_{ijt} = \mathbb{1}.[t = d_j \geq \overline{C}] \times \mathbb{1}.[T_i = 1]$ and $D^{c}_{ijt} = \mathbb{1}.[t = d_j \leq \overline{C}] \times \mathbb{1}.[T_i = 1]$. I estimate Equation (1) using the OLS two-way fixed-effects estimator. The parameter β_k compares postings between country pairs that are treated by a posting liberalization reform in event year k compared to postings between country pairs that are never or yet to be treated by such a reform.

Results I plot the series of estimated β_k and their 95% confidence intervals in Figure II. I find no evidence of differential pre-trends, which confirms that the timing of the liberalization reform is not correlated with differential evolution of postings between control and treated country pairs before all posting restrictions are lifted. The number of postings from countries that benefit from the liberalization reform starts to increase right after the event, indicating that lifting posting restrictions drives the increase in cross-border services supply. The estimated treatment effect grows over time and remains statistically different from zero eight years after the reform. In terms of magnitude, the treatment effect is large and corresponds to a 500% increase of job postings the year of the liberalization event relative to the year before. The coefficients are unchanged by the inclusion of origin-year and destination-year fixed effects. The estimates are similar when using the de Chaisemartin and d'Haultfoeuille (2020) procedure, the PPML estimator (Table B.5) or varying the clustering of standard errors (Figure B.12).

IV.II The Interaction of Posting and Free Movement Liberalizations

The scale of posting expansion naturally raises the question of the interaction between posting and the free movement of workers in the EU.

I start by investigating whether posting of workers expanded differentially in countries that liberalized free movement earlier versus those who liberalized it later. As summarized in Table B.4, the majority of old EU member states implemented temporary immigration restrictions for NMS citizens for up to 7 years after the enlargements. Those temporary restrictions could have led NMS citizens to choose posting because traditional migration was not available. In that case, the scale of posting expansion could be of different magnitude in destination countries where free movement was restricted or not at the time of posting liberalization. To test this hypothesis, I estimate Equation (1) separately for country-pairs where the timing of the liberalization of those two freedoms differs. Figure B.8 shows that the scale of service trade

expansion was of similar magnitude in destination countries that liberalized free movement and mode IV simultaneously (for instance, Germany and Austria) than in countries where free movement was liberalized several years after posting (for instance France or Belgium).

A related hypothesis is that posting was used by NMS workers as a "back door" migration channel before free movement was liberalized. In that case, the expansion of free movement for a given country-pair is expected to have a negative impact on the amount of postings within that same country-pair. I use my initial gravity model to test this hypothesis. The regression model is the same except that the treatment dummy now reflects timing variation in the liberalization of free movement. I must also omit observations that correspond to country-pairs where free movement and posting were liberalized the same year (Austria and Germany), as I cannot separate those events in those countries. Figure B.7 shows that bilateral posting flows did not decrease after that free movement became available. The expansion of posting cannot be rationalized by the fact that NMS citizens were using posting only because immigration was still restricted.

I finally study the impacts of posting liberalization on traditional migration flows. If the expansion of cross-border services occurs at the expense of free movement, it only changes the scope, rather than the scale, of trade in factor services. Given that immigration and posting have different fiscal incidence, a substitution between free movement and posting can result in distributional consequences for EU countries, but it keeps overall labor mobility constant in the single market. I next use my initial gravity model to test bilateral migration flows responses to bilateral posting reforms.[17] Figure B.9 shows that after the expansion of posting within a given country-pair, immigration flows within that pair do not deviate from the pre-reform trend. In the EU context, expanding mode IV did not lead to a crowding-out of free movement but rather generated additional trade in factor services.

That posting is not diminished by, and does not diminish, conventional migration between EU countries suggests that most workers who are posted face barriers to conventional migration that are prohibitive, which is consistent with the findings in Section III.III.I. This lack of interaction between posting and free movement is also consistent with larger monetary gains via posting than free movement, either because the productivity of posted workers is complementary to sending-country firms' capital (as discussed in Section III.III.II), or because firms pay lower taxes and are subject to less labor market regulations under posting, which is consistent with the findings in Section III.III.III. Next, I study how the expansion of trade in embodied factors within the EU has affected labor markets in destination countries.

[17] I measure migration flows using EU-LFS micro-data following Muñoz (2019) and Caliendo et al. (2021), see Online Appendix Section F.3

V Employment and Wages Effects of Posting in Receiving Countries

In this section, I study how posting affects receiving labor markets and domestic workers exposed to these flows and I analyze wage-setting for foreign workers hired under the posting arrangement.

V.I Effects of the Posting Policy on Local Labor Markets

I focus on France, the second largest importer of posting services in Europe, where I am able to measure local labor markets exposure to posting with a longer time period. I observe province $\times$ sector (NACE) $\times$ year posting flows to France from 2005 to 2015, and region$\times$ year before that.[18] I combine the posting dataset with administrative data on employment produced by INSEE (*"emploi salarie localise"*) that measures the number of employees in France by year, NACE 28 sector and province from 1989 to 2015. Posted workers are not accounted for in this dataset because they are employed by foreign firms and do not have a French employment contract. The baseline definition of domestic employment covers all workers employed in the French labor market including immigrants. My main focus is on employment responses, but I will also study wage effects using additional datasets.

V.I.I Identification Strategy

The first dimension of my identification strategy uses the large and exogenous posting supply shock that followed the opening of the French labor market to exporting firms located in NMS countries at the end of May 2004.[19] Posting exposure measured as the number of posting inflows in *total* French employment increased dramatically after 2004-2005, from 0.01% in 2000 to almost 1% in 2015. The supply shock has been exclusively concentrated on a set of sectors . Some jobs require a set of skills, such as language, that make them hardly substitutable with posted workers, while other few occupations are covered by additional licensing for posted workers, for instance nurses, teachers and civil servants. But jobs in sectors like agriculture or construction are exposed to posting competition, as they require little domestic-specific skills and sending countries are relatively well endowed in this type of labor. I focus primarily on employment effects in sectors experiencing a nation-wide non-zero import exposure through posting, but I will systematically present total employment responses to the shock.

Simultaneous shocks to posting openness from NMS are a concern for identification. Regulatory barriers to trade between France and NMS were however lifted between 1990 and 1995, and bilateral regulatory barriers to free movement for NMS were removed in 2008.[20] Labor market integration through other chan-

[18] A province is equivalent in terms of size to community zones in the U.S.
[19] 2004 is only partially treated by the policy shock; the policy was fully phased-out in 2005 ("Circulaire DSS/DACI/2004/181").
[20] Online Appendix Figure D.27, Panel A, shows that immigration from NMS to France was stable around 2004 and 2008.

nels than posting could still increase around 2004. I will thus control for exposure to immigration and trade from NMS to avoid capturing employment responses to other shocks.

Local Exposure to the Expansion Shock The second dimension exploits large spatial heterogeneities in posting exposure that have been persistent over time. The substantial increase in posting imports was not evenly distributed in the French territory. For instance, in 2013, the 15 (over 94) French top importing provinces captured more than 40% of all inflows but represented only 15% of French employment. In those highly exposed provinces, the increase in posting inflows after 2004 represented up to 4% of total pre-reform employment against 0.1% for the least exposed provinces. The standard endogeneity concern is that provinces importing more posting contracts could be exposed to unobserved demand shocks that would be correlated with both demand of domestic and foreign labor services. To tackle this issue, I predict exposure to the policy change using pre-existing trade relationships with foreign suppliers of posting services. The intuition is that provinces located in regions with relatively more pre-existing posting networks should benefit more from the nation-wide supply shock caused by the expansion reform. In the case of cross-border supply of services, persistence arises because of trade costs and frictions that make the diffusion of posting sluggish in the French territory.[21] I observe posting inflows at the region rather than province-level before 2005. To correct this measurement issue, pre-reform imports in a region are apportioned to the province in that region according to its pre-reform share of regional employment:

$$e^{pre}_{p\in r} = \sum_s \frac{Emp^{pre}_{p,s}}{Emp^{pre}_{r,s}} \times \frac{P^{pre}_{r,s}}{Emp^{pre}_{p}} \tag{2}$$

Where, $Emp^{pre}_{p,s}$ is employment of province p in sector s in 2003, $Emp^{pre}_{r,s}$ is employment in sector s in region r the same year, and $P^{pre}_{r,s}$ measures posting inflow to region r in sector s the year before the expansion.[22] Predicted inflows are normalized by pre-reform province's total employment. Variations in e^{pre}_{p} stems from provinces being located in regions with different pre-existing posting relationships, and provinces being differentially exposed to those networks through their predetermined employment composition. In this set-up, and in contrast with shift-share designs exploiting cross-sectional variations in sectoral shares, provinces with similar industry composition have differential exposure to the supply shock because they are located in regions with different pre-existing trade relationships. The resulting exposure measure can be viewed as an exposure index to the shock that is constant over time, as in Choi et al. (2022).

[21] See Online Appendix Section C.2.

[22] There are 4.5 provinces by region on average in France.

Identifying Assumptions The identification strategy rests on two assumptions: predicted exposure to posting (i) is correlated with posting exposure after the shock and (ii) is not correlated with factors that could affect differential evolution in French employment after the reform, without the reform.

To validate this design, pre-existing relationships with suppliers of posting services should not affect future employment trends through other channels than exposure to the posting expansion. While it is hard to directly test this exclusion restriction, several contextual factors help to gauge the credibility of this assumption. First, if my strategy is similar in spirit to studies using past immigrants settlements as predictor of future inflows, I focus on employer-driven temporary contracts. Compared to immigration, the location of posting contracts is less likely to be explained by unobserved current and future factors, such as quality of schools or future employment prospects. Second, because initial exposure to posting is not random, I focus on long-run changes in local employment. The intuition is that posting imports in 2003 could be correlated with a local construction boom that year, but they will be less likely to be correlated with local employment determinants twelve years later. Because sectoral shocks can however persist over time (Amior and Manning, 2018), I will control for a province-level exposure to nationwide sectoral shocks, as well as for a province-level industrial composition before 2004. This will allow me to verify that employment trends after 2004 are not purely driven by declining trends in exposed industries.[23] Third, I observe pre-existing posting relationships in a quasi-autarky framework, where posting represents less than 0.1% of French employment. It is therefore less likely that I will be capturing employment adjustments to pre-reform posting shocks instead of the effects of the liberalization event itself, a concern particularly salient in enclave designs (Jaeger, Ruist and Stuhler, 2018). To test this assumption, I will show that provinces with different initial posting exposure were characterized by similar labor market trends before the expansion. Finally, France exports little posting services, meaning that local positive export shocks will not be a concern.

I can first verify that pre-existing exposure to the posting scheme is a good predictor of a province's actual exposure to the nation-wide liberalization event.[24] Online Appendix Figure D.28 shows that French provinces at the top of the initial exposure distribution also experienced the larger import shocks (relative to their pre-reform employment) after the reform. Provinces initially in the top decile of exposure were on average in the 9th decile of exposure in the 2005-2015 period, while provinces in the bottom 10 remained below the 3rd decile of exposure after 2004. For provinces in the top decile of predicted exposure, posting inflows received between 2003 and 2015 represented on average 1.2% of pre-reform total employment, against 0.27% for the less exposed areas (Table D.15).

[23] Provinces with similar industrial composition have different predicted exposure, which also restricts cross-regional correlation in residuals across observations with similar pre-reform industry composition (Adao, Kolesár and Morales, 2019).

[24] Usually, most studies of trade shocks must rely on sectoral shares to infer trade exposure, see Costinot, Sarvimäki and Vogel (2022) for a discussion.

I observe the evolution of employment in high and low exposure provinces up to 10 years before the reform, hence I can also perform pre-trend tests as suggested by the recent literature on exposure designs (Goldsmith-Pinkham, Sorkin and Swift, 2020; Borusyak, Hull and Jaravel, 2022). Given that my design exploits level differences in pre-existing exposure, I can assess whether it is likely that the shock caused the change in the employment changes or whether there were pre-existing differences in the changes. To address worries of spurious correlation with other local factors, Online Appendix Table D.17 confirms that a province exposure index is orthogonal to province pre-reform changes in working age population, in employment in exposed and sheltered sectors and in unemployment rates before 2004. Provinces initially more exposed to posting relied more on blue-collar workers and less on foreign workers compared to less exposed provinces, albeit those differences are small.[25] One concern is that my estimates could capture the effects of secular trends in employment that are driven by other factors than posting expansion which would be correlated with some of those characteristics. To account for the fact that different pre-liberalization demographics may result in different trends in employment, I will systematically control for those initial characteristics in a flexible manner, allowing their effects to vary over time.

Specification I estimate a dynamic difference-in-differences model where I interact my exposure index e_p^{pre} with year fixed effects:

$$Y_{pt} = \alpha + \lambda_t + \lambda_p + \sum_{k=1993}^{2015} \zeta_k \mathbb{1}_{\{t=k\}} \times e_p^{pre} + \lambda X_{pt} + u_{pt} \tag{3}$$

where Y_{pt} is a given labor market outcome at calendar time t and in province p, λ_t are calendar year fixed effects, λ_p are province fixed effects and X_{pt} includes controls that vary within provinces over time. I cluster the standard errors at the province level and omit ζ_{2003} such that the sequence of estimated ζ_k captures the differential evolution of the outcome in exposed provinces as compared to provinces less exposed to the shock in year k, relative to pre-reform levels.

V.I.II Results

Figure V, Panel A, plots the estimates of ζ_k from Equation (3) where the dependent variable is log employment in exposed sectors. The baseline specification only includes province and year fixed effects. Detecting a non-zero statistically significant relationship between predicted posting exposure and lagged employment growth would raise worries that increased service imports after 2004 is a symptom, rather than a cause, of declining domestic employment in sectors exposed to posting competition. The coefficients be-

[25] The difference in pre-reform share of foreigners is however driven by the Paris region only.

fore the liberalization shock are all indistinguishable from zero and show no negative pre-trends. Starting in 2004, there is a steady decline in the event-study coefficient values, with an estimated effect of roughly -0.11 by 2015. Multiplying this coefficient by 0.52 (the average difference in pre-reform posting imports per worker in percentage points between the bottom 40 and top 10 decile) gives a relative decrease of 5.7 log point ($\approx 6\%$) of exposed employment in more exposed provinces.[26]

To account for potential trends in exposed employment driven by other factors than the posting liberalization, the rest of the series flexibly controls for provinces' demographics and time trends, adding progressively the entire set of controls. The second series adds the 2003 manufacturing share of province employment interacted with year fixed effects. This reduces the estimated coefficient by half and yields a differential decrease in exposed employment in more exposed provinces of about 3.9 log points ten years after the reform. The third serie adds the interaction of year fixed effects with the share of exposed sectors in total employment of a province in 2003.[27] The fourth and fifth series respectively control for the pre-reform share of blue-collar workers interacted with year fixed effects, and the pre-reform share of foreign born interacted with year dummies. Even after allowing pre-reform characteristics to flexibly affect local labor market outcomes after 2004, the effects of the posting liberalization on exposed employment remains negative and significant and stabilizes around a 3.2 log point employment decrease 10 years after liberalization.

The bottom panel of Figure V turns to overall local labor market responses to the liberalization shock. I start by asking whether the posting supply shock induced a reallocation of workers across French provinces. If the mobility response to the liberalization shock is large, it suggests that initial local impacts will rapidly spur across provinces and that the effects of posting on local labor markets are unlikely to be detected. The specification is analogous to the earlier model except that the dependent variable is the log working-age population in the province. The absence of pre-trends is again reassuring, supporting the comparability of provinces with low and high initial use of posting services. The estimated coefficients plotted in the red series show no break in trends in 2004 and are all indistinguishable from zero. Hence, increasing predicted import exposure by 0.52 percentage points differentially decreases the share of exposed employment in total population by 0.62 percentage points after including the full set of controls (Figure D.41).

I then investigate the effects of the supply shock on domestic employment in sectors not directly exposed to posting competition. There is no evidence that higher exposure to the posting supply shock is associated

[26] Moving from the bottom 40 to top 10 of predicted exposure increases predicted postings per worker by 0.52 percentage points (0.53-0.011) and actual imports per worker after the reform by 0.9 percentage points (1.2 - 0.27) (Online Appendix Table D.14, Panel A). Online Appendix Section D.2 plots raw employment trends in top and bottom exposure provinces, and shows a similar 6% relative decline.

[27] The results are similar when controlling for local exposure to nationwide sectoral demand shocks, and to other trade and migration shocks (Online Appendix Figure D.43).

with higher employment growth in those sectors between 2004 and 2015. As a result, *total* employment decreases after the liberalization shock (Figure D.38), but the coefficients become more imprecisely estimated in more recent years as *total* differential employment losses become small in the long run. The net decrease in employment leads to an increase in the share of unemployed working residents in affected provinces, as reported in Figure D.42. The coefficient on the unemployment rate in year 2015 in the preferred specification (≈0.52) is half the coefficient obtained for the share of population employed in exposed sectors (≈-1.3), indicating that part of the adjustment to the shock occurred through movements out the labor force.

2SLS Estimates To leverage observed variations in local posting exposure after the reform, I next estimate a first difference model that correlates 2003-2015 changes in domestic employment and posting inflows:

$$\Delta Y_{pt} = \alpha + \zeta \Delta \ln P_{pt} + \Delta X_{pt} + u_{pt}, \tag{4}$$

In the baseline specification, $\Delta \ln P_{pt}$ measures the average log posting inflows between 2003 and 2015 as a share of total employment in that area in 2003, but I will also present specifications that use levels (ΔP_{pt}). To account for the endogeneity in posting imports, I use predicted exposure as an instrument. The parameter ζ measures the impact of the average inflow of posted workers between 2003 and 2015 on the percent change in employment (or other labor market outcomes) of domestic workers in province p between the two time periods. Guided by the absence of population responses in Figure V, I use the share of the working age population employed in exposed sectors as the main outcome.

The top panel of Table I confirms that higher posting imports per worker (measured in log) after the liberalization shock is systematically associated with a differential decrease in the share of adults working in jobs exposed to posting competition. All 2SLS regressions are just-identified, reducing concerns about statistical inference distorted by weak instruments (Angrist and Kolesár, 2021). Nevertheless I report the p-value of the Anderson-Rubin test, which is fully robust to weak instrumentation. The OLS coefficient is -0.63(0.23), while instrumented coefficients range from -.87(.28) to -1.60(.33). This confirms that naive regressions may be biased upward because of unobserved positive demand shocks in provinces importing more services. Column (2) shows the results from the reduced form specification regressing the change in exposed employment on the exposure measure, which yields a negative and statistically significant estimate of -.46(.11). Column (4) adds controls for the share of exposed employment, manufacturing employment and blue-collar employment in a province's pre-reform employment, addressing the concern that posting imports per worker after 2004 is picking up overall declining trends in jobs exposed to foreign competition. The baseline employment effect in (4) means that a 10 percent increase in posting imports per worker

decreases the share of working-age residents employed in exposed sectors by 0.09 percentage points.[28] Table D.18 presents the 2SLS model using an alternative level-level specification. The employment elasticity is -1.6(.62), meaning that a 1 percentage point increase in (instrumented) posting imports per worker decreases the share of domestic workers employed in exposed sectors by 1.6 percentage point.

I conduct a falsification exercise in order to check that my results capture the effects of exposure to posting after 2004 rather than a long-run common causal factor behind both the fall in domestic employment and increasing inflows of posted workers. In Column (6) and (7), I regress pre-reform changes in exposed domestic employment on post-reform changes in posting inflows. I find no evidence of reverse causality, consistent with the absence of pre-trends in the difference-in-differences analysis.

In the bottom panel of Table I, I turn to the overall local labor market effects of posting. Higher posting imports per worker do not lead to long-term growth in local population or employment in sheltered sectors, similar to the findings of the difference-in-differences analysis. Using additional data on local wages in exposed sectors available from 2003 to 2015, I further show that posting imports had a close to null, and not statistically different from zero, effect on domestic wages. Hence, adjustment to posting mostly occurred through the employment margin, which is consistent with downward rigidities on wages in the EU context (Angrist and Kugler, 2003).

So far, the measure of domestic employment does not distinguish immigrants from natives. However, foreigners represent a sizable share of French employment in the sectors most exposed to posting competition.[29] In Online Appendix Table D.20, I now decompose the effects of posting exposure by citizenship of domestic workers, using decadal censuses. I re-estimate Equation (4) separately for natives and foreigners. Higher exposure to posting reduces employment for natives and foreigners and at similar magnitudes for a one percent (or alternatively unit) change in exposure. Falsification tests presented in columns (4)-(6) further confirm that provinces that imported more posted workers after 2004 were not characterized by differential trends in foreign employment before 2004. Those results thus indicate that the free provision of services may have decreased employment opportunities for existing immigrants employed in more exposed sectors and more exposed labor markets.

In Online Appendix D.3, I use alternative exposure designs, specifications and controls to test the robustness of the results presented in Table I and Figure V and eliminate confounds.

[28] Moving from the 25th to the 75th percentile of exposure to the supply-driven component of posting flows is associated with a 0.9 percentage point decrease in the share of the working age population employed in sectors exposed to posting competition.

[29] See Online Appendix Figure D.26.

V.II Mechanisms: Employment and Wage-Setting at Receiving Firms

To better understand the market-level employment effects in the context of posting, I now explore substitution between local and posted workers at receiving firms and wage differentials between those workers.

V.II.I Employment of Posted and Domestic Workers at Receiving Firms

What do firms do in terms of domestic employment and wages when they start subcontracting services to foreign firms? Receiving firms could replace their own workers with posted workers, leading to negative employment effects at firms that purchase posting services. They could also simultaneously increase posted and domestic employment if, for instance, the alternative source of labor allows them to gain market shares at the expense of their domestic competitors. In that case, one could observe a positive association between using posting services and employing domestic workers at the firm-level, while aggregate employment would decrease at the industry level. Focusing on variations in supply shocks across aggregates such as local labor markets thus does not allow to identify specialization across firms within that aggregate (Card, 2009). Furthermore, as emphasized by Dustmann, Schönberg and Stuhler (2016), this approach can also be sensitive to the definition of those aggregates. I exploit the granularity of receiving firm data to clarify the mechanisms at work in the local labor market analysis.

For consistency, I would like to study firm-level responses to posting in France, but the dataset only has three years of variations in posting purchases (2017-2019).[30] I will instead use Belgium as my main laboratory, leveraging the universe of posting contracts purchased by Belgian firms from 2010-2019 merged with information on firms' domestic employment for the same period. This dataset has 9 years of receiving-firm-level variations in posting purchases. Online Appendix Table C.10 compares the labor markets of France and Belgium to gauge their comparability. Both countries have high levels of hourly wages, minimum legal wages, employers' payroll taxes and weekly hours of work. Receiving firms pay similar gross hourly wages to their domestic workers and have similar median sizes. Wages paid to domestic workers are 20% higher in France and 16% higher in Belgium compared to non-receiving firms in the same sector and year. This suggests that the labor market conditions of the two countries are reasonably comparable.

Estimation Strategy The main identification strategy asks what happens to domestic workers when their employer starts to purchase posting services to foreign companies. I narrow down the analysis to the 11,796 firms that purchase posting services for the first time between 2014 and 2019. That sample restriction lets me select firms that never used posted workers from 2010 to 2014. With this, I can precisely measure a shift in exposure at the extensive margin from non-using to using status. I use an event study design to estimate

[30] Hence, it is harder to precisely measure a shift from non-using to using status in this dataset.

the differential evolution of domestic employment at Belgian receiving firms before and after they first get connected to a foreign supplier of services. I estimate the following specification:

$$y_{it} = \alpha_i + \lambda_{st} + \sum_{k=\underline{T}}^{\overline{T}} D_{it}^{k} \gamma_k + \varepsilon_{it}, \tag{5}$$

where y_{it} is an outcome variable for firm i (in log) in calendar year t and α_i is a firm fixed effect. λ_{st} are three-digit sector $\times$ calendar year fixed effects. The event time dummies D_{it}^{k} are defined as $D_{it}^{k} = \mathbb{1}.[t = d_i + k]\ \forall k \in (\underline{T}, \overline{T})$, $D_{it}^{\underline{T}} = \mathbb{1}.[t \leq d_i + \underline{T}]$, and $D_{it}^{\overline{T}} = \mathbb{1}.[t \geq d_i + \overline{T}]$, where $\mathbb{1}$ is the indicator function and d_i is the first year when firm i starts using posting workers. I normalize $\gamma_{-1} = 0$ and set $\underline{T} = -5$ and $\overline{T} = +5$, and I cluster standard errors at the province$\times$ event time level. The sequence of coefficients γ_k compares the outcomes of receiving firms in event year k to the outcomes of future adopters in the same narrowly defined sector in the year before their event.

By exclusively comparing firms that will eventually rely on posting services between 2014 and 2019, this design rules out selection issues related to the "importer premium" e.g importing firms could be more dynamic than others. A firm's decision to purchase posting services is endogenous and can be correlated with time-varying unobserved shocks that will affect its domestic employment, for instance positive demand shocks. The absence of pre-trends does not rule-out firm-level simultaneous shocks that are both correlated with the offshoring of services and demand of domestic workers. Comparing γ_k for foreign and domestic employment can however provide a first path to shed light on complementarity or substitutability between posted and domestic workers.

Figure VI first displays the estimates of γ_k using domestic employment as the outcome variable. Domestic employment in firms that use and are yet to use posted workers evolves similarly before the event, conditional on firm and three-digit sector $\times$ year fixed effects. This suggests that imports of posting services are not preceded by a differential evolution of domestic employment at receiving firms. Employment of Belgian workers decreases by 2%, on average, the year firms start subcontracting services to posted workers, compared to firms in the same three-digit sector that have not yet imported posting services that same year. The response of employment is amplified over time, with a 17% decrease in domestic employment four years after the event. The results are unchanged when estimating the model with the Borusyak, Jaravel and Spiess (2023) estimator (Figure D.50).

Total employment at receiving firms, including posted workers, increases by almost 50% after the event. This corresponds, on average, to two less domestic workers for six more posted workers. Because those posted workers are formally employed in their origin country, however, the level of employment and social security contributions remains lower in Belgium. The increase in receiving firms' size rapidly decreases

over time. Four years after first importing posting services, overall employment at receiving firms is 7% higher relative to the pre-event level. More post-event observations are ultimately needed to verify if the trend towards full substitution will materialize.

I next use the hourly wage rate (in log) at receiving firms as the outcome variable. Firms do not change their domestic wage rate when they start purchasing posting services, suggesting that most adjustment at receiving firms occurs through employment. This finding is again consistent with the presence of downward rigidities on incumbents' wages at the firm-level.

The wage and employment effects in Figure VI could be caused by unobserved shocks (occurring the year firms start using posted workers) that would affect the employment of domestic workers absent the availability of posting services. To make progress on the interpretation of γ_k, Online Appendix D.4 leverages additional variation in posting exposure across and within firms. I show that the baseline negative employment effects are driven by events when tasks performed by posted and local workers are similar.

V.II.II Wage Setting of Posted and Domestic Workers

I now investigate wage setting for posted workers. I use matched employer-employee data on the universe of job spells in France for 2017-2018 (DADS) that I merge with the universe of posting contracts for the same period. I use the French dataset because the Belgian dataset has no information on wages paid to posted workers during the posting assignment. I start from the universe of posting contracts notified to the French authorities in 2017 and 2018 to trace back the 19,138 French clients that have purchased a posting service at some point in that period and appear in the linked employer-employee dataset. In this section, I measure gross wages for local and posted workers that abstract from payroll taxes paid by employers.

#1 Receiving Firms Pay High Wage Premia to Domestic Workers Standard cost-saving theories would advocate that firms using posted workers are also firms that face higher wage costs. Table II, Panel A, shows that receiving firms pay on average 20% higher wages to their domestic workers compared to non-using firms in the same sector. This finding holds for different countries and after controlling for a firm's size which could be correlated with access to posting and higher productivity. This wage premium could be due to other unobserved differences across firms. Next, I use wage changes that follow worker moves across employers (Abowd, Kramarz and Margolis, 1999). Those workplace premia can be interpreted as measures of rent sharing that abstract from differences in workers permanent characteristics. I find that pay premia at receiving firms are shifted upward (0.18 wage premium), confirming that high-wage firms are more likely to use posting (Figure D.52).

#2 Posted Workers Receive Lower Pay Premia Than Domestic Workers at the Same Firm Next, I investigate whether posted workers receive lower wages than in-house workers due to lower rent-sharing associated with alternative work arrangements (Katz and Krueger, 2019). I start by estimating the raw wage penalty associated with posting contracts in the sample of receiving firms based on:

$$\ln w_{it} = \rho \times Posting_{it} + \psi_{J_{i(t)}} + \beta X_{it} + \epsilon_{it}. \tag{6}$$

Where w_{it} is wage of worker i at time t when working in firm $J_{i(t)}$, X_{it} are worker characteristics (cubic age and number of hours worked) and $\psi_{J_i(t)}$ is the time-invariant fixed effect for the firm $J_{i(t)}$. The variable $Posting_{it}$ is a dummy equals to one if the worker is posted. The results in Table II, Panel B show that workers hired through a posting contract are paid 30% less despite similar age and work duration. This could be due to specificities of posting such as lower tenure or short-term contracts. In column (2), I augment Equation (6) with an additional indicator variable for working at the receiving firm through a (domestic) temporary agency contract. Both domestic and foreign outsourced workers face a significant wage penalty compared to domestic workers, but the penalty is twice as large for posted workers.[31] This reveals that foreign suppliers of services are located even lower on the wage ladder compared to domestic contractors. Importantly, those wage differences do not account for payroll tax differentials and therefore provide a lower bound for employers' cost differences between domestic and posted labor. Column (3) finally shows that posted workers are paid less than immigrants at receiving firms. Dostie et al. (2021) also find little within-firm wage discrimination between native and immigrants in Canda, which suggests that pay policies within firms may be constrained by labor market regulations. In contrast, posted workers are formally employed abroad, allowing for more wage discrimination as in domestic outsourcing (Dube and Kaplan, 2010; Goldschmidt and Schmieder, 2017; Drenik et al., 2023). Compared to domestic temporary employment agencies, posting firms manage to set the wages of posted workers even lower. This likely occurs because posted workers have lower reservation wage, are bound to their origin firm in the home country and have little information about local working conditions.

The wage penalty presented in Table II could still reflect differences in permanent characteristics, such as productivity, rather than differences in wage setting. To tackle this issue, I follow Drenik et al. (2023) and estimate a model with separate workplace effects by work arrangements for the sample of receiving firms:

$$\ln w_{it} = \alpha_i + \psi^{P_i}_{J_{i(t)}} + \beta X_{it} + \epsilon_{it}, \tag{7}$$

[31] The wage penalty for domestic outsourcing is very close to what Drenik et al. (2023) (Argentina) and Goldschmidt and Schmieder (2017) (Germany) find.

where α_i are worker fixed effects and $\psi^{P_i}_{J_{i(t)}}$ are work arrangement-specific time-invariant firm fixed effects with P_i equal P if worker i has a posting contract and equals R if worker i is a domestic worker. The fixed effects are identified by worker movements between different workplaces in a connected set, but they can now differ across work arrangements. Fixed effects for posted workers are identified as they are observed in multiple receiving firms. One important caveat, however, is that I never observe the same worker in a posting and regular employment contract, so I cannot absorb potential average differences between those contracts. I plot the distribution of workplace effects for posted and domestic workers in Panel B of Figure D.52. Workplace effects for posted workers are shifted downward compared to domestic workers, confirming the findings in Table II. In the sample of receiving firms, the mean wage premium for posted workers is -0.43 relative to the mean of workplace effects of domestic workers normalized to zero.

#3 Surplus-Sharing Between Receiving Firms and Posted Workers is Low Lower levels of wages for posted workers may reflect pay differentiation for domestic versus posted workers. While I previously focused on differences in pay level, I now ask whether these pay premia, whatever their source, are shared with posted workers.

I start by plotting in Panel A of Figure VII the binned scatter plot of the log average wage of posted versus domestic workers at the same workplace (red dots), absorbing five-digit sector fixed effects. The slope is 0.21(.01). Firms that pay their domestic workers at higher wages source services to posted workers that are paid at slightly higher wages by the foreign firm although the correlation is small. To verify if this small slope is driven by tenure differences, I repeat the analysis looking at newly hired domestic workers at the receiving firm (blue dots). The wages of newly hired domestic workers follow very closely the wages of incumbent domestic workers, with a correlation of 0.7. Thus, the small correlation observed for posted workers cannot only be rationalized by lower tenure.[32] I confirm this finding by using the estimated workplace pay premia received by posted workers and comparing those estimates with those of domestic workers at the same workplace:

$$\psi^P_J = \alpha + \rho\psi^R_J + u_J. \tag{8}$$

Panel B of Figure VII shows the binned relationship between domestic and posted workers workplace effects, and confirms the findings using wage correlations.[33] The estimate of ρ is 0.11 (0.01), meaning that

[32] Online Appendix Figure D.54 further shows that newly-hired immigrants also earn wages that follow very closely those of incumbent domestic workers, unlike posted workers.

[33] As noted by Card, Cardoso and Kline (2016) and Drenik et al. (2023), a normalization of workplace effects is necessary to interpret the elasticity as the amount of workplace premia earned by domestic workers that posted workers receive at higher paying firms. I follow their normalization of workplace effects to zero in the lowest decile, which does not affect the estimate of the slope ρ.

the pass-through of the firm-level wage premium to posted workers is essentially nil.[34] When a receiving firm offers a 10% pay premium for its regular workers, the corresponding pay premium for posted workers is 1%. This low correlation indicates unequal rent-sharing between receiving firms and posted workers.

Interpretation of Labor Market Effects in Receiving Countries The expansion of posting led to lower domestic employment in highly exposed sectors and local labor markets while allowing for substantial wage discrimination between posted workers and their domestic counterparts. To put those results into perspective, Online Appendix Table A.3 summarizes the findings of previous studies on temporary migration programs (Panel A) and traditional immigration inflows (Panel B). I will now discuss how the characteristics of posting can account for differences and similarities with these findings.

First, immigrants bring not only their labor supply but also their purchasing power (Farhi and Werning, 2014), but some policies limit the consumption of immigrants in destination markets. For instance, Dustmann, Schönberg and Stuhler (2017) studied a policy that allows Czech workers to temporarily work in Germany but not to reside there. They found significant displacement effects: one migrant crowds out about one native worker. Given that posted workers move for shorter durations, it is likely that their demand spillovers will be lower than those of immigrants.

Second, immigration's effects vary depending on the mix of skills of native and immigrant workers. Most studies find null, or even positive, wage and employment effects for natives (Card, 2001; Ottaviano and Peri, 2012; Ottaviano, Peri and Wright, 2013), especially when immigrants perform different tasks than local workers (Peri and Sparber, 2009; Beerli et al., 2021), or can be easily automated (Clemens, Lewis and Postel, 2018). Crowd-out effects have mostly been found when substitutability with natives is large (d'Amuri, Ottaviano and Peri, 2010; Ottaviano and Peri, 2012), or in sectors where tradability is limited (Burstein et al., 2020). Cortés and Pan (2014) find that foreign nurses in the U.S. fully replace native nurses due to their similarity and small demand spillovers in labor-intensive jobs. On the contrary, Clemens and Lewis (2022) find no crowd-out effects from the H2-B program, where firms can only hire guest workers if no similar U.S. worker is available. The substitutability between posted and domestic workers is potentially larger because posted workers work in teams, are supervised by their usual employer and have prior experience together.

Third, guest worker programs have been scrutinized as potential sources of monopsony power (Gibbons et al., 2019). Amior and Stuhler (2021) argue that if immigration allows firms to set wages below competitive levels, crowd-out of natives may exceed one-for-one. In the U.S., Doran, Gelber and Isen (2022) found more than full displacement effects in firms using the H1-B temporary visa program. This is con-

[34] For comparison, Drenik et al. (2023) find a slope of 0.49 for domestic regular and outsourced workers in Argentina.

sistent with evidence that job mobility restrictions in guest worker programs increase firms' market power (Naidu, Nyarko and Wang, 2016; Hunt and Xie, 2019). Lower wages for migrants can also be explained by lower reference points in origin countries (Albert and Monras, 2022), remittances (Ashraf et al., 2015) or poor information about regulations (Hotchkiss and Quispe-Agnoli, 2009). The wage mark-down on posted workers is indeed larger than for immigrants or workers outsourced domestically. Posted workers are bound to their exporting firm, work in segmented labor markets and have fewer labor protections. These factors can explain the significant wage mark-down in posting. This result also suggests that competition between posting firms is too weak to pull up wages of posted workers as much as for domestic outsourced workers. This likely occurs because the share of posting firms remains small in destination countries, or because the labor market for posted workers remains very segmented.

Without data on sending firms' fees, it is hard to assess whether this wage discrimination benefits receiving firms or is capitalized by foreign firms, for instance through higher prices and profits. In the next section, I focus on how gains from posting are shared between exporting firms and posted workers.

VI Magnitude and Incidence of Posting Gains in Sending Countries

VI.I Effects of Posting on Firms' Performances

The main dataset for the analysis is an administrative tax dataset covering the universe of non-financial corporations established in Portugal merged with exhaustive information on provision of services abroad by Portuguese firms over the period 2006-2017. Portugal provides an ideal laboratory to study the cross-border provision of services because it is a low-wage country relatively well endowed in labor. Hence, it is one of the top exporters of posting services in main receiving countries such as France and Belgium.

I start from the universe of Portuguese firms in sectors for which I can observe all services provided abroad reported by each firm to the tax administration for the period 2006-2017. I focus on firms who have at least a median of three workers across all years of activities.[35] Of these firms, I select the 4,120 firms that started posting workers to another member state between 2010 and 2015. This sample restriction ensures that I can observe treated firms at least four years before the event and two years after. The average (median) posting firm is small, employing a mean of 16 (7) workers in 2009 and operating in the construction of residential buildings (39%), road transportation (19%), electrical installation (5.2%), temporary employment provision (2.5%), and plumbing installation (2.4%). The posting export represents an average (median) of 40% (22%) of the firms' turnover in the first year when they start posting abroad.

[35] Online Appendix Section F.4 describes this sample.

Identification Strategy Using this dataset, I can describe what happens to firms when they take-up mode IV service exports. To do so, I use an event study framework and investigate the effects for firms to supply services abroad for the first time. The empirical specification is

$$y_{it} = \alpha_i + \lambda_{spt} + \sum_{k=\underline{T}}^{\overline{T}} D_{it}^{k} \theta_k + \varepsilon_{it}, \tag{9}$$

where y_{it} is an outcome variable (in log) for firm i in calendar year t and α_i is a firm fixed effect. λ_{spt} are five-digit sector $\times$ district $\times$ calendar year fixed effects. The event time dummies D_{it}^{k} are defined as $D_{it}^{k} = \mathbb{1}.[t = d_i + k]\ \forall k \in (\underline{T}, \overline{T})$, $D_{it}^{\underline{T}} = \mathbb{1}.[t \leq d_i + \underline{T}]$, and $D_{it}^{\overline{T}} = \mathbb{1}.[t \geq d_i + \overline{T}]$, where $\mathbb{1}$ is the indicator function and d_i is the first year when firm i starts posting workers abroad. I normalize $\theta_{-1} = 0$ and set $\underline{T} = -5$ and $\overline{T} = +5$. I cluster standard errors at the province$\times$ event time level to account for spatial correlation in error terms.

The main question that I seek to answer is: how would firms' outcomes evolve in the absence of the export opportunity opened by the posting policy? By only comparing firms that export their services at some point between 2010 and 2015, this design rules out selection biases caused by the better performance of exporting firms. The identification strategy relies on the assumption that, after accounting for time invariant differences between firms and common sector-district-year shocks, firms that will post workers in the future form a credible counterfactual for firms that start posting workers. Interpreting the sequence of estimated θ_k as the effects of the export opportunity requires that firms do not select into posting based on firm-specific shocks that would be correlated with firms' outcomes in the absence of the policy. To gauge whether firm-level shocks simultaneous to the posting event would affect firms' activity absent the event, I will present a battery of additional estimation results.

Figure VIII plots the event study coefficient estimates for firms' total employment, turnover, total hours worked and wage bill, with corresponding estimates displayed in Table E.23. Exporting posting services is associated with a large and permanent expansion in firms' activity. The second year after the first posting export, sales increase by 59% while the total wage bill increases by more than 70% compared to firms in the same district and 5-digit sector that have not yet posted workers that year. In addition to increasing total hours of work, firms also grow at the extensive margin and increase their number of employees by 30%. The increase in sending firms' sales is thus not purely driven by a price effect: firms significantly scale up their use of labor inputs. There is no selection into posting based on past firm performance. It is only after sending firms start supplying their services abroad that they experience strong growth.

I next investigate how this firm-level growth is shared between (i) higher profits for exporting firms' owners, (ii) higher wages for posted workers and (ii) more tax payments for sending countries. Panel A of

Figure IX plots the event study coefficient estimates with 95% confidence intervals for firms' hourly wage rates estimated from Equation (9), with corresponding estimates displayed in Table E.22. Wages of workers in firms that post and are yet to post workers evolve similarly before the event. The wage rate in firms that export services abroad increases in the year of their first export compared to firms that do not export yet and are in the same five-digit sector and province. The relative wage rate increase is 14% two years after the event compared to a pre-event median level of 6.5 euros. The increase in hourly wages is persistent, stable and statistically significant at the 1% level for the five-plus years after the event.

Panel B of Figure IX shows the estimates for sending firms' profits. Profits evolve similarly before the event, and there is a clear jump in earnings the year firms start exporting. Profits increase by 37% in treated firms two years after they start supplying services abroad relative to the pre-posting year and to profits in firms that do not post workers yet. Capital-owners derive profit gains from posting exports that are twice larger than wage gains redistributed to their employees. This effect is even stronger focusing on the permanent exporters of services, which limits noise in the measure of profits (Figure E.58). Because firms increase wage rates and total hours of work after the event, posting is nevertheless associated with an increase in the labor share (Figure E.57).

I then plot in Figure E.55 sending firms' tax payments around the event of the first services export. Social security contributions and corporate income tax payments paid by exporting firms start to increase right after the event. This highlights the tax implications of posting: while immigrants pay taxes abroad, posted workers generate additional tax revenues for origin countries. Immigrants also generate revenues at home (Yang, 2011), but remittances are not directly taxed to fund social security systems and public goods in home countries and, unlike tax payments, are not proportional to wage gains (Clemens, 2018). Those findings rationalize why countries with a comparative advantage in services have traditionally pushed for the liberalization of mode IV (Bhagwati, Panagariya and Srinivasan, 2004), which offers their workers and firms the opportunity to access foreign markets while generating direct tax revenues at home.

To verify that posting is driving the gains rather than unobserved firm-level shocks, I next exploit heterogeneities in duration of posting assignments across firms. I run Equation (9) separately for each of the treatment duration groups and show export gains by posting assignments' duration. The intuition is that differences between a two-year or three-year contract can plausibly be driven by random arrival rates of work opportunities. Figure X shows that firm-level growth is simultaneous to the posting contract but does not last after the firm stops posting services abroad. Those findings corroborate that the posting opportunity is driving the large changes in firm-level outcomes. Online Appendix Section E.1 presents additional robustness tests that vary estimators, control groups and source of identifying variations, including the posting liberalization for NMS countries.

VI.II Comparing Gains from Posting to Gains from Exports in Goods

To put these estimated effects in the perspective of the policy debate, two questions remain to be answered: how large are these gains as compared to more standard trade policies, and who do they benefit?

#1 Posting Generates Similar Micro-Level Growth than Export of Goods I compare the gains from posting with those from manufacturing trade by repeating the analysis on the sample of manufacturing exporters in Portugal. The event is instead defined as the first time a manufacturing firm starts selling goods abroad.[36] Figure E.69, Panels A and B, show that manufacturing exporters experience a very similar scale-up in their activity after they start exporting goods in foreign markets: the effects on firms' growth are not statistically different.[37] Posting thus generates sales and employment gains of similar magnitude than standard exports, the usual focus of industrial policies in low-wage countries. Given the size of those export opportunities, countries with comparative advantage in exporting customer-facing services have large incentives to lift barriers to posting.

#2 Posting Has Different Implications for Investment and Domestic Sales Because sectors that export through posting are specific, increased market shares through posting may have different economic implications than through exports of goods. Figure E.69, Panel C, shows that while posting firms increase their sales abroad when they obtain a first posting contract, they simultaneously *decrease* their domestic sales. In contrast, manufacturing exporters sell more at home after they start exporting goods abroad. A possible rationale for this result is that service suppliers are constrained in their ability to serve both markets once they obtain a contract abroad, while manufacturing firms can smoothly scale up their production. The liberalization of trade in services may thus generate different spillovers for domestic customers because of specific production constraints in service sectors. This finding also goes against interpreting the baseline estimates of θ_k as the effects of unobserved firm-level shocks that would boost firms' outputs in the absence of posting. If that were true, we should expect to see a boost in domestic sales after the first posting export.

In Figure E.60, I find that increases of tangible assets following exports are noticeably larger at manufacturing exporters. Posting firms exhibit a larger stock of assets after exporting services, but the effect is driven by cash holdings, not tangible assets. This is consistent with low capital intensity in services and with manual services being characterized by weaker scope for productivity gains.[38] Those findings suggest that trade in services could have different long-term productivity effects compared to trade policies focused

[36] Online Appendix Figure C.22 documents the first export event for those two samples.

[37] The magnitude of those gains is comparable to the gains documented by Alfaro-Ureña, Manelici and Vasquez (2022) in Costa Rica for joining global value chains using a similar event study approach.

[38] I also test how TFP evolved in sending firms in Online Appendix Figure E.56 using methods proposed by Ackerberg, Caves and Frazer (2015).

on capital intensive sectors.[39]

#3 Posting Benefits to Different Firms The incidence of these micro gains from trade also appears to be different because they benefit different firms. Table III, Panel A and Figure E.59, Panel B, describe the average differences between manufacturing exporters and firms that export mode IV services. Those non traditional exporters are smaller and less capital intensive than commonly studied manufacturing exporters. Exported posting services represent on average 40% of the sending firm's sales, while exports of goods account for 20% of total exporters' sales in manufacturing. While almost no manufacturing firms shift their entire activity abroad when starting to export goods, 19% of firms leave the domestic market once they start exporting posting services.

Table III, Panel B, shows that the *exporter premium*, defined as the average difference between exporters' and non-exporters' outcomes within a given sector, is smaller in posting services than in manufacturing. For instance, selection into exporting based on the firms' size is twice as small in posting services. This suggests that fixed costs related to exporting are smaller for services supplied through posting than for manufactured goods. As a result, the share of firms that are able to export in their founding year is also twice as large in posting than in manufacturing.[40] Overall, those figures reveal that posting policies expose a different type of firms with different exporting behavior to international trade compared to the manufacturing sector. Liberalizing posting policies could thus have different distributional implications compared to traditional tariff cuts given that it will expand market shares and profits for different firms.

VI.III The Role of Regulation in Sharing Gains from Posting Between Capital and Labor

Trading factors through posting has a key implication that exporting firms intermediate the wages earned by foreign workers abroad. The EU regulation mandates that exporting firms cannot pay posted workers below the minimum legal wage in the destination country during their posting contract.[41] I now investigate the role of the EU regulation in driving posted workers' wage gains.

I start by comparing wage increases for firms that engage in posting and those that export goods, as posting firms are constrained by destination-level minimum wages while manufacturing exporters are not. Hence I can isolate the specific effects of posting on wage growth while holding constant the size of firm-level growth after the first export. There is no significant wage gain for workers employed at manufacturing

[39] However, compared to manufacturing where quality and innovation proxies are available (Atkin, Khandelwal and Osman, 2017), productivity is harder to measure in services.

[40] Consistent with this finding, Figure E.60, Panel A, shows that manufacturing exporters must pre-invest in machines before being able to reach foreign clients, while services suppliers can sell abroad without differential pre-investments in tangible capital.

[41] This is in addition to compensation for transportation, food and housing during the work abroad.

firms after their firm starts exporting goods and starts experiencing substantial growth (Figure E.69, Panel D). It could be that workers employed at posting firms have structurally higher bargaining power than workers employed at manufacturing firms or that the posting-specific prevailing wage policy explains those differences. I provide supporting evidence for the second explanation in three successive steps, examining variations in the enforceability of minimum wage laws within and across countries.

The ideal test for this mechanism would be to estimate if posted workers' wage gains follow destination-level minimum wages for each posting contract. The firm-level dataset in Portugal does not contain information on the exact destination countries linked to each posting assignment, but I observe the destination of all postings from Portugal in the EU-wide dataset. Figure E.70, panel A, shows that most of the posting services supplied by Portuguese firms are performed in high-wage countries. The average destination minimum legal wage faced by Portuguese firms is 15% higher than the level of wages in Portugal before the event, and almost twice as large as the Portuguese minimum wage. This confirms that the destination-level minimum wage is binding for most exporting firms. To verify this, I re-estimate my baseline specification for firms with wages below or above the destination-level minimum wage index before their first posting export. Figure E.71 shows that only firms with wages below this index increased their workers' wages during the posting assignment.

A second test for this hypothesis would involve accessing export data from a country that is not constrained by this policy. For example, Luxembourg has the highest minimum wage in the EU, meaning that the regulation does not bind for Luxembourgish firms.[42] If wage gains are only explained by destination-specific minimum wage rules, workers posted from Luxembourg should not experience wage gains when abroad. I use administrative data on posting firms in Luxembourg to test this hypothesis. To ensure comparable wage gains in Portugal and Luxembourg, I re-estimate Equation (9) for sending firms in Luxembourg—focusing on firms' scale-up— and compare it to the results from Portuguese exporters. This also allows me to test the robustness of my baseline analysis using a different country and dataset. Figure XI shows extremely similar growth in firms' employment and hours in both countries. I then investigate how this similar scale-up in firms' activity following posting translates into potentially different wage gains in both countries. This exercise holds constant firm-level changes in size while varying the bindingness of the policy. Panel C shows that while Portuguese employees experience a substantial increase in wages after the event, firms based in Luxembourg do not increase their wage rates.

Finally, I use a granular dataset on workers posted to France to show how their wages vary by the country of origin. I find that posted workers' wages tend to cluster around the French minimum wage, with more clustering occurring for workers from low-wage countries (Online Appendix Figure E.72). This

[42] Luxembourg is a net sending country. One reason why Luxembourg is competitive in posting is low payroll taxes (Munoz, 2023).

suggests that the destination-specific minimum wage has a stronger impact on firms from low-wage countries, where the bindingness of the policy is higher. Furthermore, this confirms that the vast majority of workers would be paid at lower wages absent this regulation. This figure also suggests larger wage gains for workers posted from poorer countries, such as Bulgaria or Romania, than the 10-15% increase in wages documented in the Portuguese context.

Overall, this body of evidence supports the idea that the increase in wages for Portuguese posted workers is the result of destination-specific regulation rather than bargaining over surplus sharing between firms and workers. Posting policies, through the unique linkage between service production and consumer location, can shape the way gains from trade are shared between labor and capital owners in low-wage countries. This mechanism also distinguishes posting from more traditional forms of migration. Because wages are paid by the exporting firm, regulation is needed to ensure that part of the gains from trade in factors are redistributed to workers, especially in contexts where firms have wage-setting power.

VII Concluding Remarks

This paper examines the impacts of the EU posting policy, a large trade and temporary migration program facilitated by the free provision of services. The collection of findings outline four main lessons. First, trade in goods and services and conventional capital and labor flows were insufficient to integrate labor markets within the EU. Second, there is enough wage rigidity in receiving countries so that firms can set wages for posted workers below those of comparable domestic workers. As a result, increasing trade in factors leaves domestic wages unchanged but leads to domestic employment responses in the more exposed segments of receiving labor markets. Third, the posting arrangement allows sending country firms to capture part of the gains to immigration from receiving country firms and migrants themselves. Fourth, while the posting policy fostered international integration in formerly non-tradable sectors, the resulting temporary migration flows are still too small to eliminate wage differences between countries. Understanding which policy levers could lift the remaining policy and non-policy barriers to trade and migration, while keeping track of the distributional consequences for workers in the EU, provides an important avenue for future research.

The analysis presented in this paper carries important implications for the design of temporary migration and trade policies, but there are also important contextual factors that limit the external validity of those results. First, posting was introduced along with the other freedoms. The scale of posting expansion, its interactions with traditional migration flows and the type of firms and workers who took-up this trade-migration channel could be different in settings where regulatory barriers to trade and migration remain high. For instance, while the policy shares some characteristics with non-immigrant visas in the U.S., a full

implementation of the EU's policy without free movement would be much harder. Conversely, unrealized gains from cross-border services could be much smaller in settings with lower non-policy barriers to trade and migration such as across states within the United States. Second,the impact of posting on destination and sending labor markets depends on the specific rules and regulations that accompany the liberalization of posting in Europe. Since 2020, posted workers must receive the same pay as local workers and are subject to additional labor regulations. This regulatory change could affect employment outcomes in destination markets and eliminate wage differences between local and foreign workers, leading to different implications for the integration of EU labor markets.

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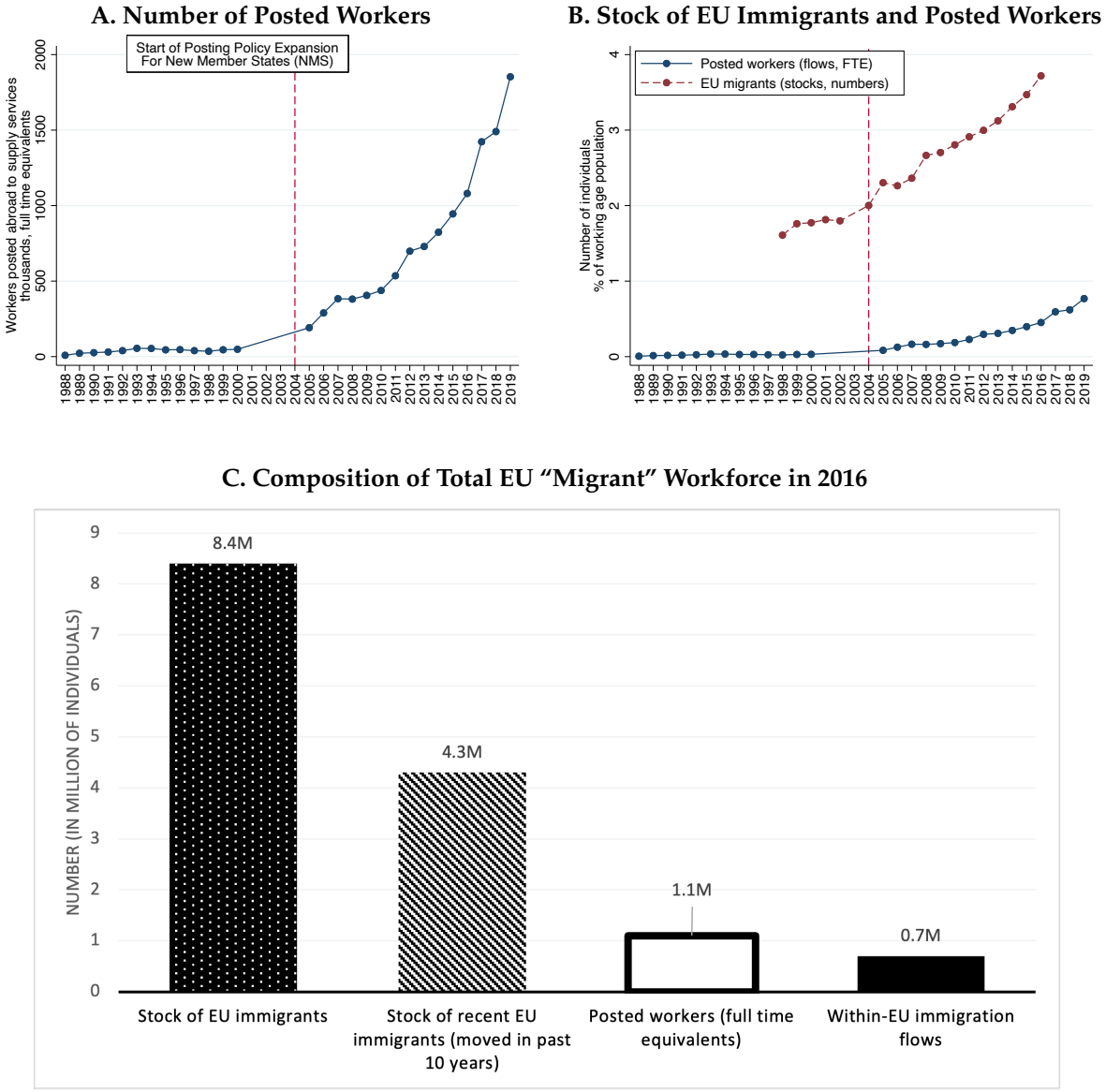
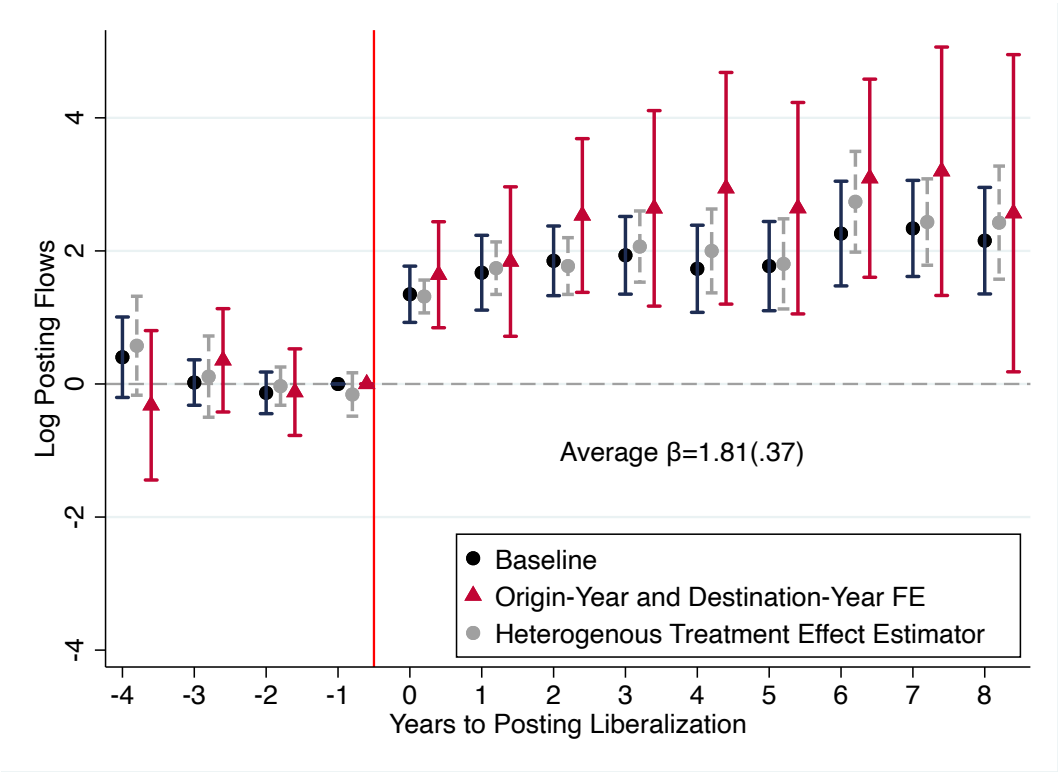
VIII Figures

Figure I: **Contribution of Free Provision of Services to Cross-Border Labor Movements Within the EU**



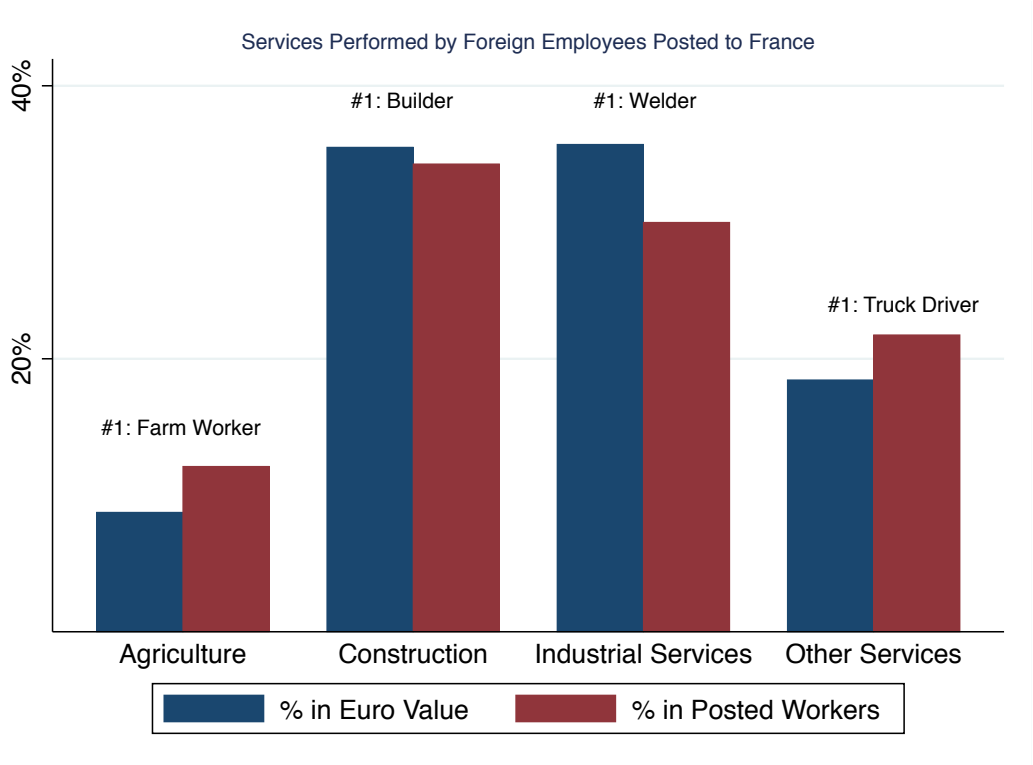
Notes: This figure describes the contribution of the free provision of services, one of the four economic freedoms in the EU, to cross-border labor movements in Europe. Panel A shows the number of posted workers (in full time equivalents) from 1989 to 2019. The red dotted line denotes the start of the expansion of the free provision of services to low-wage countries located in Eastern Europe (New Member States, henceforth NMS). Panel B compares the flows of posted workers (in full time equivalents) to the stock of EU immigrants, defined as the number of individuals who, in a given year, live and work in another member state than their country of citizenship. Panel C breaks down the total EU immigrant workforce in 2016 into various migration channels. Data sources are described in detail in Appendix F.2.

Figure II: **Effect of Posting Liberalization on Cross-Border Supply of Services**



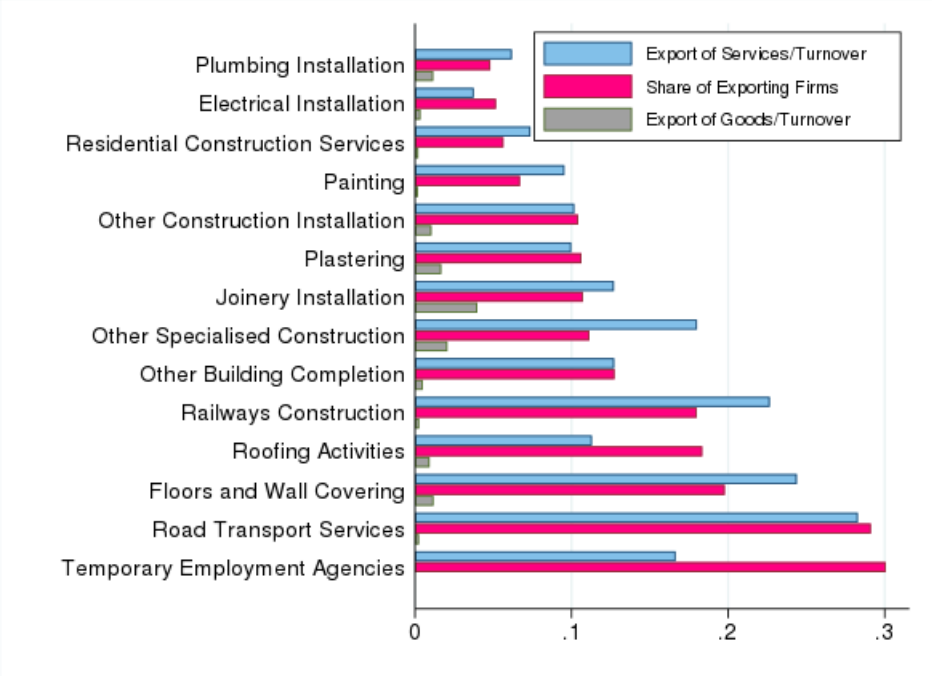
Notes: This figure reports the dynamic effects of posting liberalization in receiving countries on the volume of services performed by posted workers in that country. The event study is restricted to the four main receiving countries for which flows of posted workers can be observed before liberalization in country-level posting registries: Germany (SOKA-BAU), France (DPD/SIPSI), Belgium (LIMOSA), and Austria (BUAK). Those countries account for 60% of all received posting flows in Europe. All sending countries are included. The graph plots β_k coefficients and their 95% confidence interval from the dynamic staggered difference-in-differences Equation (1). The dependent variable is log posting flows from country i to j at time t. The treatment is defined as country i gaining the right to post workers without restrictions in country j at time t. The identifying variation is the liberalization of posting from low- to high-wage countries that followed EU enlargements with staggered timing across origin-destination country pairs described in Online Appendix Table B.4. The coefficient of the year before liberalization β_{-1} is normalized to zero, and standard errors are clustered at the origin-destination level. Hetererogenous treatment effects are computed using the De Chaisemartin and d'Haultfoeuille (2020) estimator. The reported coefficient is the average treatment effect of the posting liberalization over the post-reform period.

Figure III: **Sectoral Composition of Posting Services Imported by France**



Notes: This figure shows the decomposition of posting assignments performed by foreign employees posted in 2019 to France, the second importing country of posting services in Europe. The equivalent of Panel A for all European countries is available in Online Appendix Figure C.24. Top occupations of posted workers are listed in Online Appendix Table C.9. The dataset is described in Online Appendix Section F.5.

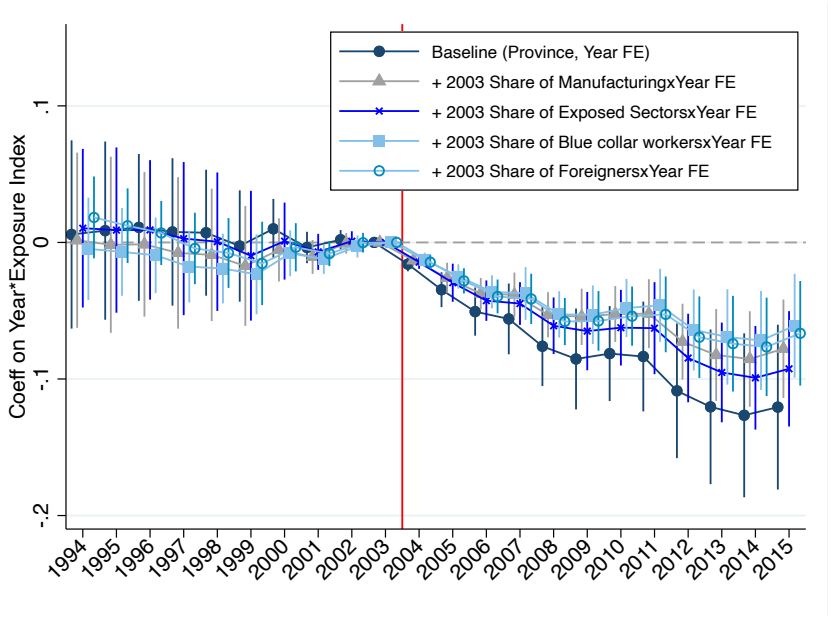
Figure IV: **Sectoral Composition of Posting Services Exported by Portugal**



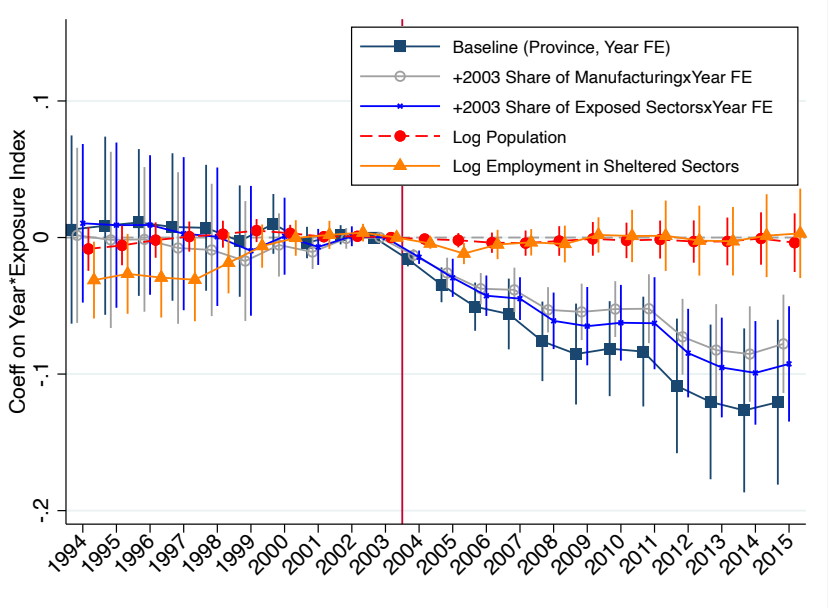
Notes: The Figure shows the amount of services and goods exports in one of the main sending country: Portugal. The pink bar plots, for a given sector and year, the share of Portuguese companies that export their services in another EU country through posting. The histogram then reports the total amount of services exported through posting (pink) and the total amount of goods exported to the EU (grey), all divided by total turnover in that sector.

Figure V: **Effect of the Posting Expansion on French Local Labor Markets**

A. Log Exposed French Employment by Exposure to Posting

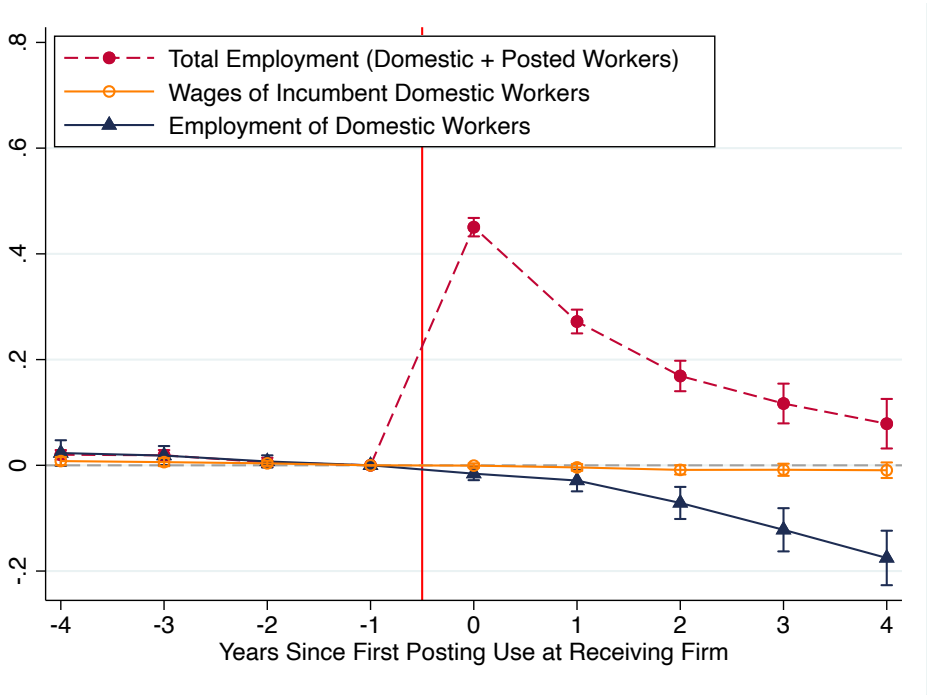


B. Sectoral and Migration Responses to the Shock



Notes: The figure displays the estimates from Equation (3) that capture the differential evolution of domestic employment in French provinces initially more exposed to the expansion of the posting policy. The vertical lines represents 95% confidence intervals computed from robust standard errors clustered at the province level. The policy-shock is the lifiting of posting restrictions for services supplied by low-cost countries in 2004-2005, which is depicted by the vertical red line. The coefficient of the year before the shock ζ_{2003} is normalized to zero. All regressions include calendar year and province fixed effects and are weighted by pre-reform working age population. Each serie progressively adds the set of controls (interacted with year fixed effects) of the serie before. The average difference in the exposure index (pre-existing imports of posting per worker) between the top 10 and bottom 40 exposure provinces is 0.52 percentage points. Panel B repeats the estimation using the log of working age population in a province (red dashed serie) and the log of employment in sectors with zero exposure to posting competition (orange triangle serie) as alternative outcome variables.

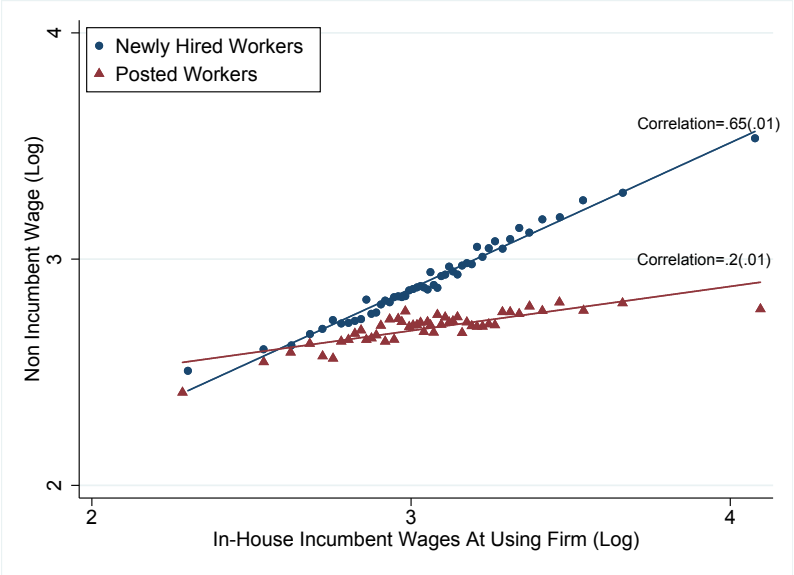
Figure VI: **Employment and Wages At Belgian Receiving Firms After Using Posted Workers**



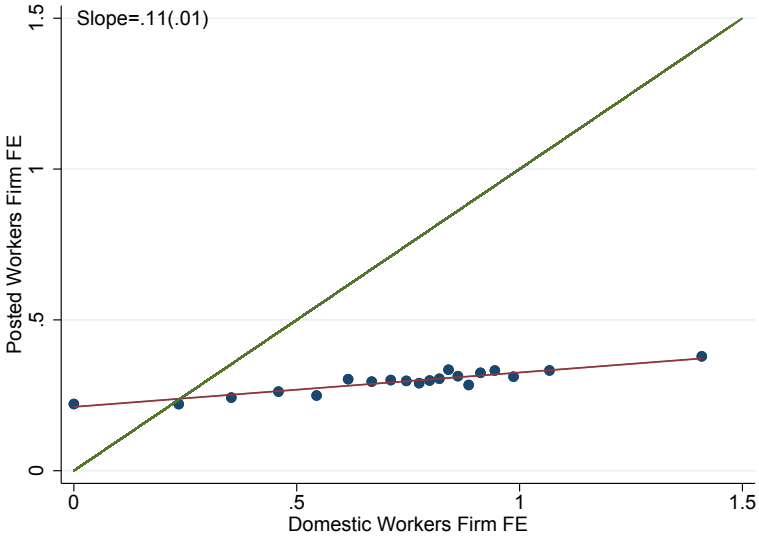
Notes: The figure plots the estimated event study coefficients γ_k from Equation (5) for the period 2008-2019. The event is defined as the first time a Belgian firm buys posting services to foreign suppliers of services. The coefficient of the year before the first posting use γ_{-1} is normalized to zero. The regressions include firm and three-digit sector $\times$ calendar year fixed effects. γ_k compares the outcomes of receiving firms in event year k to the outcomes of future adopters in the same narrowly defined sector, in the year before their event. The vertical line represents 95% confidence intervals computed from robust standard errors clustered at the calendar year $\times$ province level.

Figure VII: **Surplus-Sharing Between Posted Workers and Receiving Firms in France**

A. Relationship Between Domestic Workers' and Posted Workers' Wages

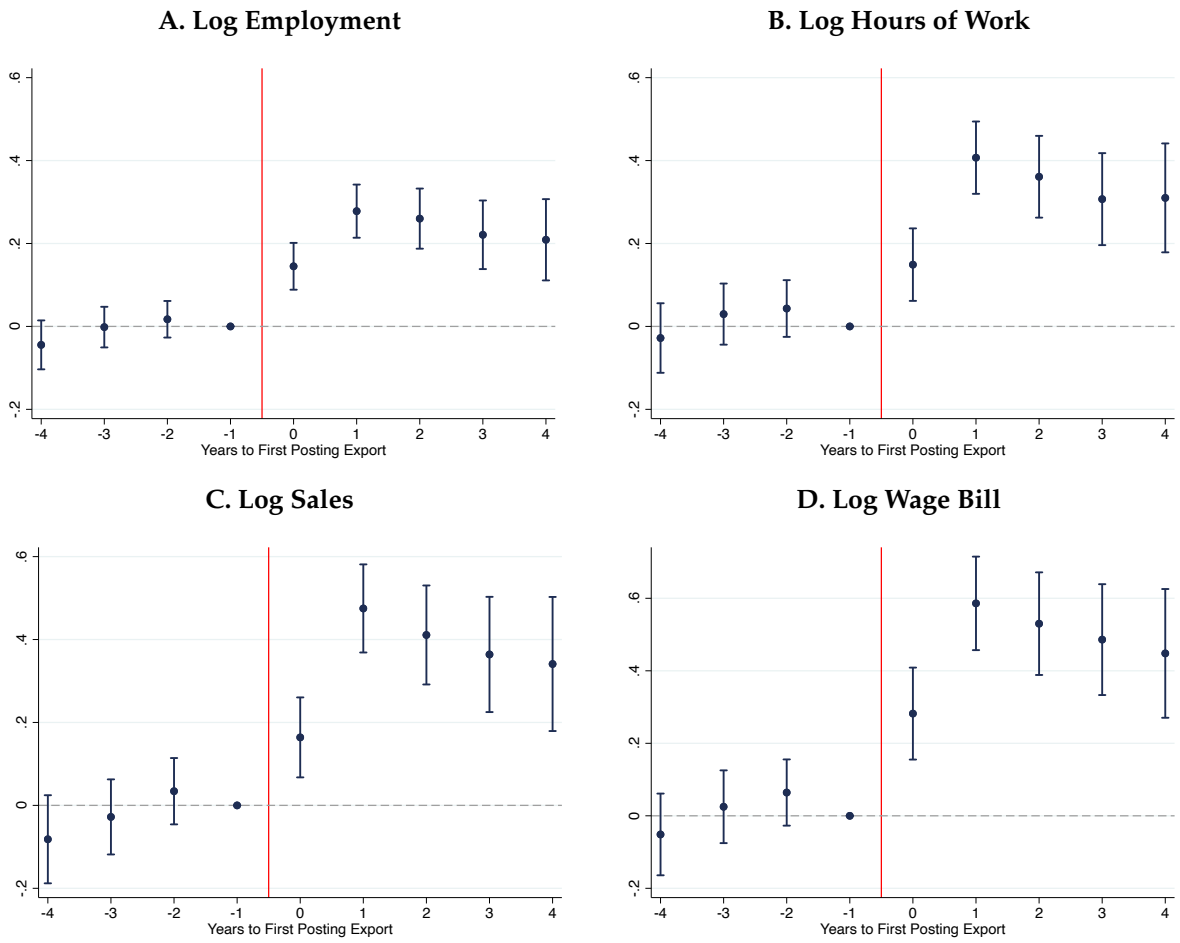


B. Firm-Level Pay Premia Sharing with Posted Workers



Notes: This figure compares posted and domestic workers' wage within a workplace in France. Panel A shows the relationship between incumbent, newly hired domestic, and posted workers' wages at the same workplace (in France) in 2018. It shows the binned scatterplot of log domestic incumbent workers' wage (x axis) against log domestic newly hired workers' wage (blue dots) and posted workers' wage (red dots) for receiving firms, residualized on five-digit sector fixed effects. Panel B shows the binned scatter plot of estimated AKM workplace effects for posted workers against estimated AKM workplace effects for incumbent domestic workers. For visualization, the fixed effects are normalized to zero in the lowest respective deciles, but the normalization does not affect the estimates of the slope. The red line in bottom panel corresponds to the regression described in Equation (8), while the green line depicts the 45-degree line.

Figure VIII: **Portuguese Sending Firms Expand When Starting to Provide Services Abroad**

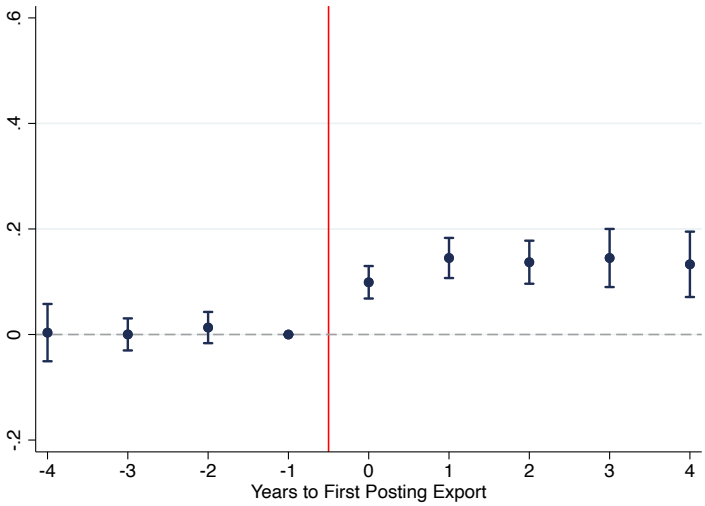


5

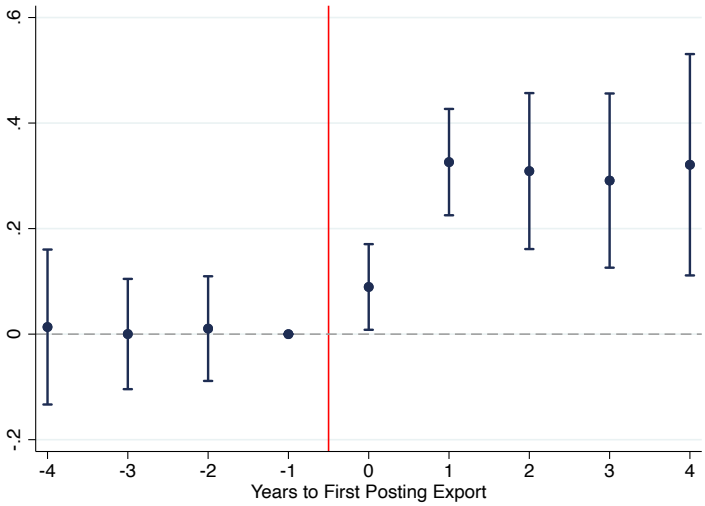
Notes: This figure studies how posting affects sending firms located in Portugal. I use exhaustive administrative tax records of Portuguese firms merged with administrative records of services performed in another EU country from 2006 to 2017 to select the 4,120 firms that start posting workers abroad for the first time between 2010 and 2015. The figure plots the estimated event study coefficients θ_k from Equation (9). The event is defined as the first time a Portuguese firm provides services in another EU country. The coefficient of the year before the first posting θ_{-1} is normalized to zero. The regressions include firm and five-digit sector $\times$ calendar year $\times$ province fixed effects. θ_k compares the outcomes of posting firms in event year k to the outcomes of future posting firms in the same narrowly defined sector and province in the year before their event. The vertical line represents 95% confidence intervals computed from robust standard errors clustered at the event-time year $\times$ province level. The event study coefficients are reported in Online Appendix Table E.23.

Figure IX: **Surplus-Sharing Between Sending Firms and Posted Workers in Portugal**

A. Wage Rate After Provision of Services Abroad

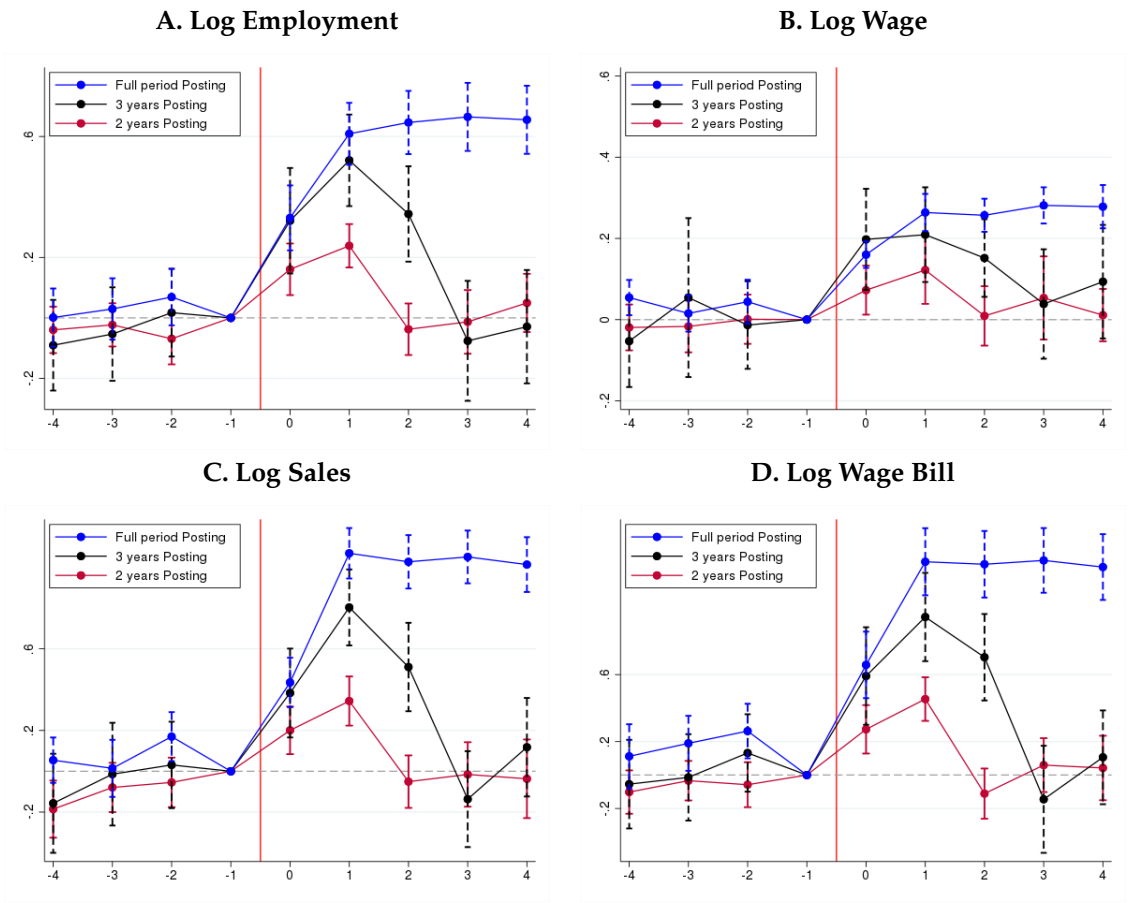


B. Profits After Provision of Services Abroad



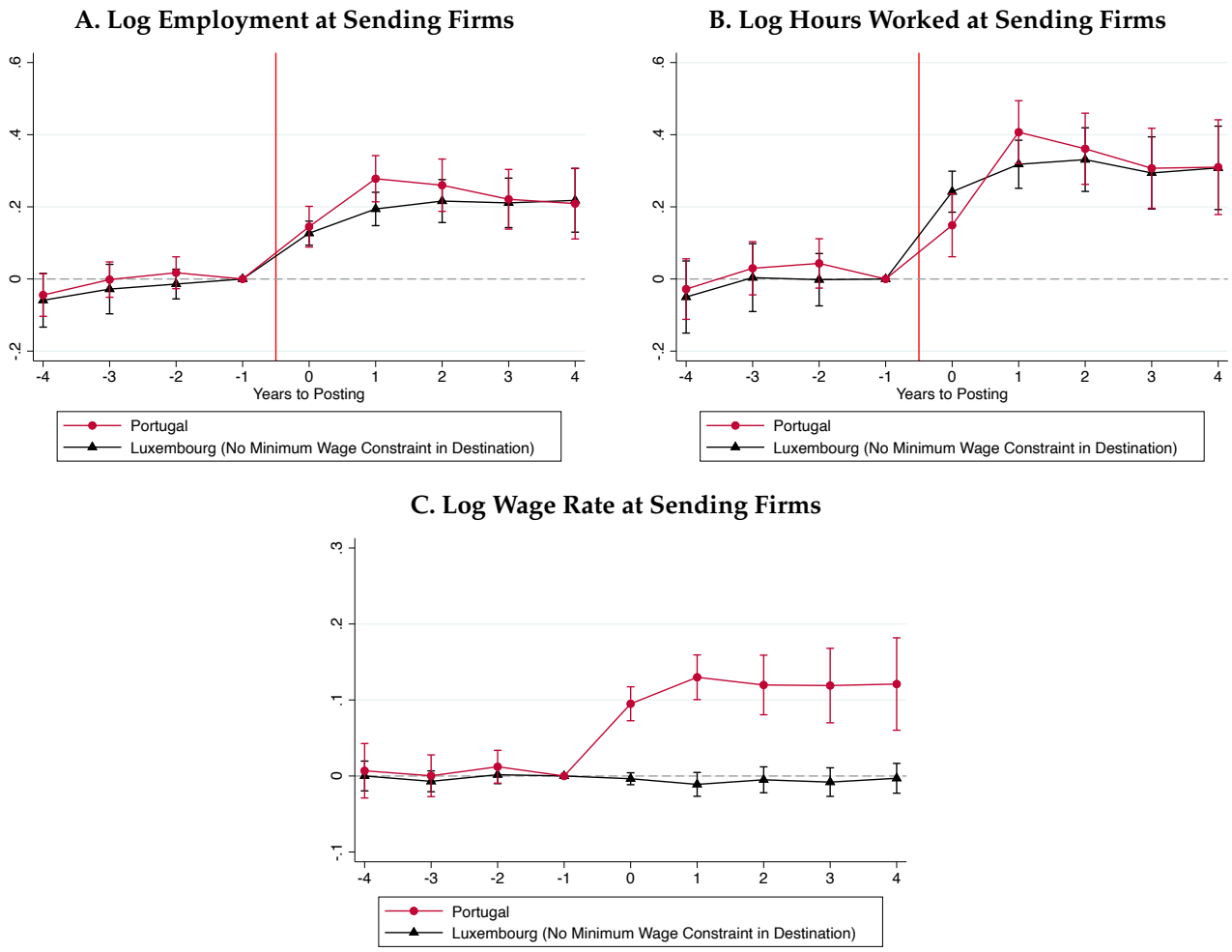
Notes: This figure studies how posting affects sending firms located in Portugal, one of the main suppliers of posting services in Europe. I use exhaustive administrative tax records of Portuguese firms merged with administrative records of services performed in another EU country from 2006 to 2017 to select the 4,120 firms that start posting workers abroad for the first time between 2010 and 2015. The figure plots the estimated event study coefficients θ_k from Equation (9) for the period 2006-2017 where the dependent variable is log hourly wage rate for workers (Panel A) and log profits (earnings before taxes) (Panel B). The event is defined as the first time a Portuguese firm provides services in another EU country. The coefficient of the year before the first posting θ_{-1} is normalized to zero. The regressions include firm and five-digit sector $\times$ calendar year $\times$ province fixed effects. θ_k compares the outcomes of posting firms in event year k to the outcomes of future posting firms in the same narrowly defined sector and province in the year before their event. The vertical line represents 95% confidence intervals computed from robust standard errors clustered at the calendar year $\times$ province level. The event study coefficients plotted in the figure are reported in Columns (1)-(2) of Online Appendix Table E.22.

Figure X: **Export-Mobility Gains in Portugal Start and End With the Posting Contract**



Notes:The figure shows heterogeneity in posting gains by duration of the posting contract abroad. Each line in each panel corresponds to a separate regression, where I split the initial sample of posting firms by duration of their posting contract. See note of Figure VIII for more details. The control group is the sample of firms in the same narrowly defined sector and provinces that are never observed posting workers abroad during the same period.

Figure XI: **Posted Workers' Wage Gains Come From Regulation: Portugal versus Luxembourg**



Notes: This figure compares sending firms' outcomes after a first posting event for firms located in two different countries affected differentially by destination-country minimum wages: Portugal and Luxembourg. Firms located in Portugal must pay their employees at the destination-level minimum wage during the posting contract, while firms located in Luxembourg exporting posting services abroad are not exposed to this regulation (because the minimum wage in Luxembourg is higher than elsewhere). The specification is similar to the one in Figure VIII. I estimate θ_k separately on the sample of posting firms in the exporting country constrained by destination-level minimum wages (Portugal, pink lines) and located in the exporting country not constrained by those prevailing wage rules (Luxembourg, black line).

IX Tables

Table I: **Effect of Posting Imports on French Employment**

Dependent Variable: Change in exposed employment/pop, 2003-2015 (%pts)

	Post-reform: 2003-2015					*Pre-reform: Falsification* 1993-2003	2000-2003
	OLS (1)	RF (2)	IV (3)	IV (4)	IV (5)	IV (6)	IV (7)
Δ log Posting Imports/worker	-.638***	-.462***	-1.604***	-.913***	-.913***	.437	.196
	(.231)	(.117)	(.338)	(.252)	(.245)	(.377)	(.184)
Observations	94	94	94	94	94	94	94
Kleibergen-Paap F stat			19.49	24.82	24.82	24.82	24.82
Anderson-Rubin p-value			.000	.000	.000	.26	.25

Panel B. Dependent Variable:100 × log change in population counts, 2003-2015

	Exposed Emp (8)	Wages (9)	Adult Pop (10)	Sheltered Emp (11)	Unemp Rate (%pts) (12)
Δ log Posting Imports/worker	-3.57**	.78	.851	.699	.582***
	(1.60)	(1.18)	(1.28)	(2.26)	(.150)
Observations	94	94	94	94	94

Notes: *p<0.10, **p<0.05, ***p<0.01. Robust standard errors in parentheses. The table shows the estimates of the regression model relating domestic employment changes in a French province from 2003 to 2015 with changes in posting imports after the liberalization of 2004, which is measured as the 2005-2015 average inflows of posting services per pre-reform total number of worker, in log. To account for endogeneity, imports of posting services after 2004 are instrumented by a province initial exposure to posting (also in log) in Column (3). Only the 94 continental French provinces are included in the analysis. The top panel uses the 2003-2015 change in the share of domestic working age population employed in exposed sector as the outcome variable (in percentage points). Column (2) shows the reduced form relationship between the dependent variable and predicted exposure. Column (4) controls for the pre-reform share of a province employment in exposed sectors, in manufacturing, and in blue collar occupations. Column (5) clusters standard errors at the region-level. Column (6) and (7) show falsification tests performed on pre-reform employment changes. Column (8)-(11) use 100 times log change in population counts (or hourly wage) as dependent variables, while column (12) uses the unemployment rate (in percentage point) as the outcome variable. All columns are weighted by the province adult population at the beginning of the period. Online Appendix Figure D.45 repeats the specification in column (3) deleting one observation at a time. More details in the first stage is presented in Online Appendix Table D.16. The level-level equivalent is presented in Online Appendix Table D.18. Online Appendix Table D.19 shows additional robutness tests.

Table II: **Wage-Setting for Posted and Domestic Workers at French Receiving Firms**

Panel A- Receiving Firm Wage Premium				
	Outcome variable: log hourly wage			AKM workplace effects (ψ_{Ji})
Receiving Firm Dummy	.19***	.13***	.15***	
	(.002)	(.002)	(.008)	$\psi_{Ji}^{receiving=1} - \psi_{Ji}^{receiving=0}$= 0.18
Controls	5D sector FE	5D sector FE	3D Sector	
		log firm size	×Year FE	
Country	France	France	Belgium	
Period	2018	2018	2010-2019	
Panel B- Wage Penalty of Posted Workers				
	Outcome variable: log hourly wage			AKM workplace effects (ψ_{Ji})
Posting Contract Dummy	-.30***	-.34***	-.33***	
	(.004)	(.003)	(.004)	$\psi_{Ji}^{posting=1} - \psi_{Ji}^{posting=0}$= -0.43
Temp Worker Dummy		-.12***		
		(.001)		
Immigrant Dummy			-.07***	
			(.005)	
Controls	Firm,Year FEs	Firm, Year FEs	Firm, Year FEs	
	Age, hours	Age, hours	Age, hours	
Country	France	France	France	
Period	2017-2018	2017-2018	2017-2018	
Panel C- Rent-Sharing Between Receiving Firms and Posted workers				
	Outcome variable: log posted workers' hourly wage			AKM workplace effects (ψ_{Ji})
Log incumbent's wage	.21***	.33***		$\psi_{Ji}^{posting=1} = 0.11\psi_{Ji}^{posting=0} + \epsilon_i$
	(.01)	(.01)		
Controls	5D sector, Year FEs	Year FE		
Country	France	France		
Period	2017-2018	2017-2018		

Notes: The table summarizes findings on wage-setting for posted workers and domestic workers in France. Panel A summarizes the estimated domestic wage premium paid by French companies using posted workers, compared to firms in the same sector and year that do not use posted workers. Column (3), Panel A repeats the same exercise for Belgian receiving firms. Panel B compares the hourly wages of posted and domestic workers performing work at the same workplace in France. Column (2) and (3) of Panel B respectively add a dummy for domestic temporary agency workers and domestic foreign workers. Panel C studies rent-sharing between receiving firms and posted workers in France by showing the correlation between receiving-firm-level pay premium and posted workers' pay premium.

Table III: **Comparison of Trade in Posting Services and Trade in Goods in Portugal**

	Manufacturing	Non-Tradable Services
Panel A- Exports Characteristics	(1)	(2)
Exports in Sales	19%	49%
% Shifting Full Activity Abroad	2%	17%
% Exporting in Founding Year	14%	25%
Panel B- Self-Selection Into Exports		
Log Sales	1.57***	.84***
	(.01)	(.01)
Log Employment	.91***	.63***
	(.01)	(.01)
Log Wage	.18***	.22***
	(.00)	(.00)
Log Capital/Worker	.64***	-.14***
	(.01)	(.01)
Log EBT/Worker	.15***	-.02*
	(.01)	(.01)
Panel C- Effect of First Exports		
Log Sales (Total)	.239***	.411***
	(.038)	(.060)
Log Employment	.125***	.258***
	(.025)	(.036)
Log Domestic Sales	.521***	-.371**
	(.095)	(.160)
Log Tangible Assets	.270***	.143**
	(.047)	(.059)
Log Wage Rate	.001	.137***
	(.013)	(.022)

Notes: The table compares exports of posting services and manufactured goods in Portugal, one of the main sending country in the EU. The top panel summarizes differences in exporting behavior between exporters in manufacturing and services exported through posted workers. Panel B shows self-selection into exporting in the same two sectors. Each row in each column is from a separate regression (one by outcome) that regresses the log outcome of a given firm on an exporter dummy, controlling for for year×5-digit sector fixed effects. The estimated "exporter premium" (average difference between exporters and non-exporters within a given 5-digit sector and year) can be compared between manufacturing (column 1) and mode IV services (column 2). Panel (C) reports the average effects for firms of the treatment "exporting posting services for the first time" in column (2), and of "exporting goods for the first time" in column (1).