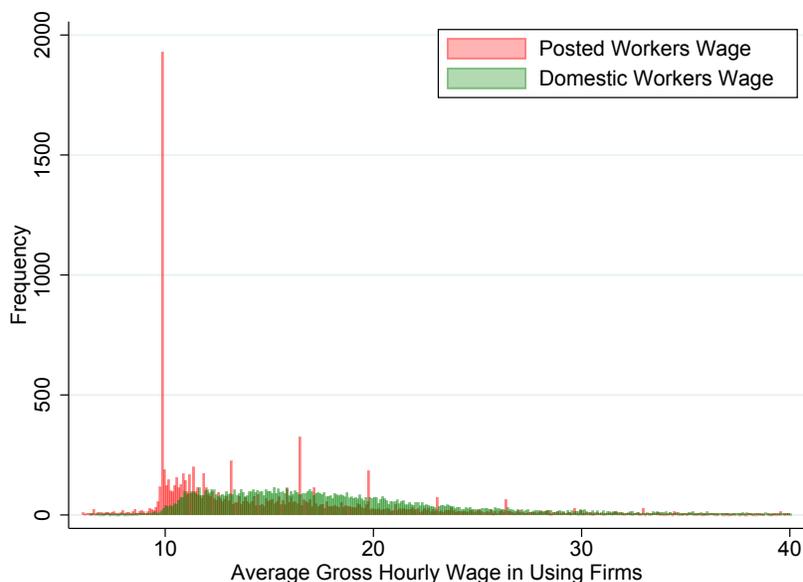


Appendix (for Online Publication)

A Additional Tables and Figures

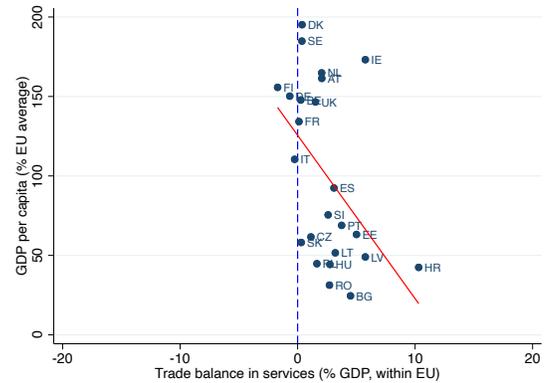
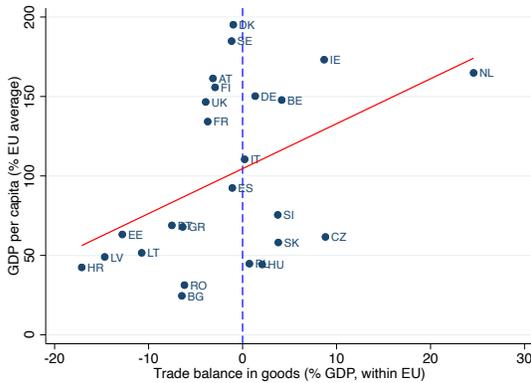
Figure A.1: Wages Paid by Exporting and Domestic Firms in France



Notes: This figure shows the distribution of wages paid by foreign firms to their employees posted to France (red histogram) and wages paid by French firms importing posting services to their domestic French workers (green histogram) for year 2018. Data on posted workers' wages paid by exporting firms comes from the administrative posting form SIPSI that foreign firms must file when supplying physical services in France. Data on domestic workers' wages comes from administrative matched employer-employee data in France (DADS) that I matched to French firms' ID that appear as customers (importing firms) in the SIPSI dataset.

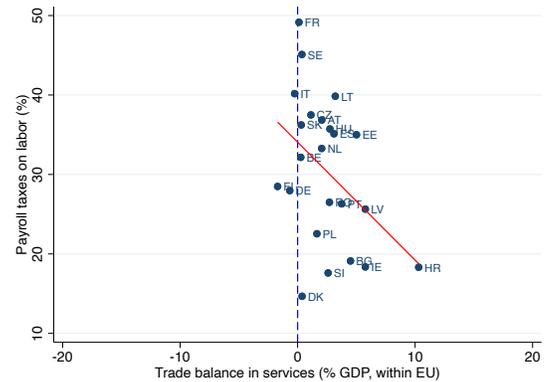
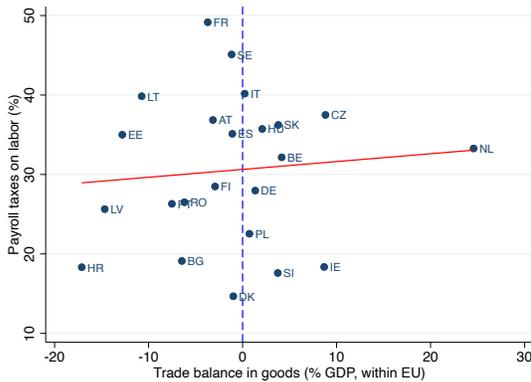
Figure A.2: Comparative Advantage in (All) Services and Taxes on Labor

A. Trade Balance in Goods and GDP/Capita **B. Trade Balance in Services and GDP/Capita**

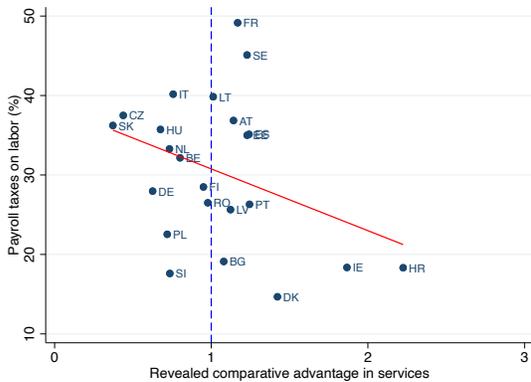


C. Trade Balance in Goods and Labor Taxes

D. Trade Balance in Services and Labor Taxes

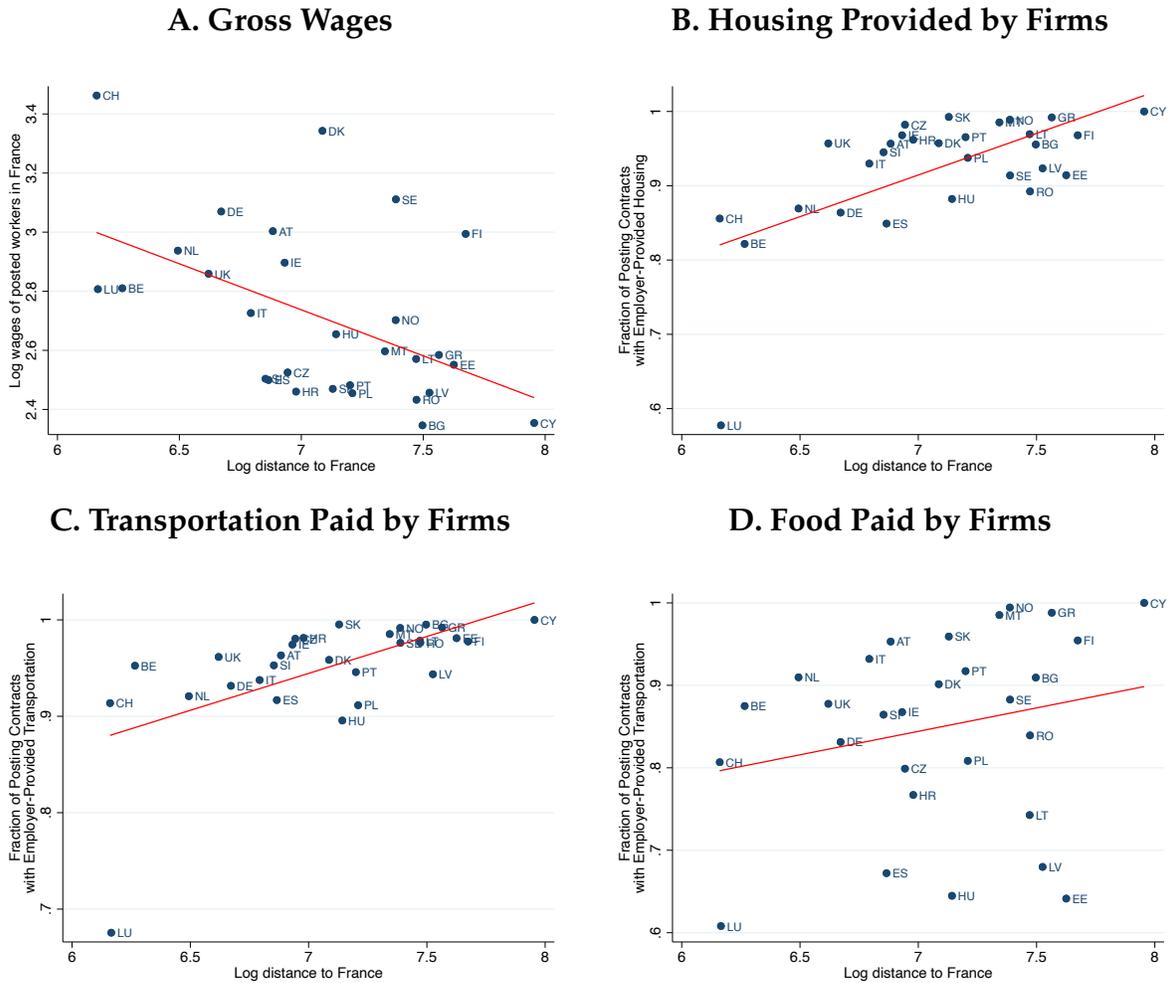


E. RCA in Services and Labor Taxes



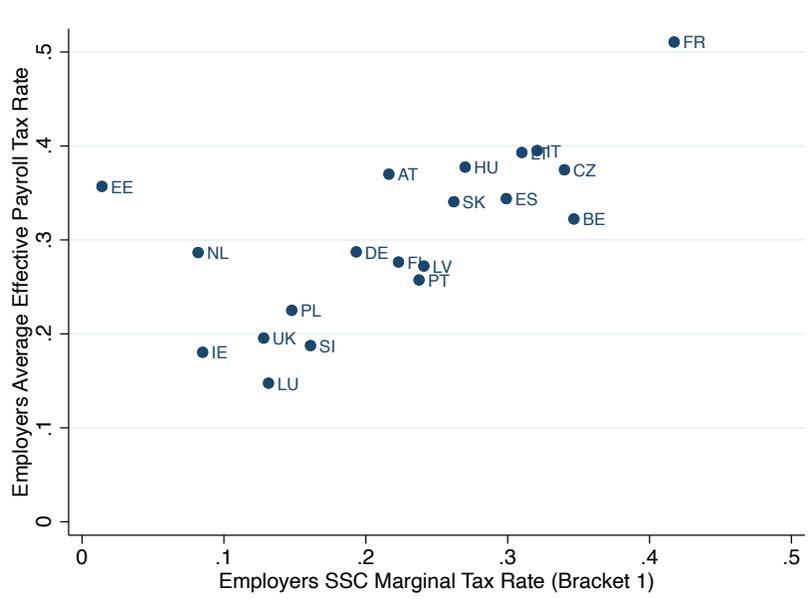
Notes: This figure shows correlations between a country measure of competitiveness in goods and services in 2014 (trade balance) and measures of income and labor taxes. Panel A and B relate trade balances to GDP per capita (relative to the EU average). Panel C and D relate trade balance to employers' payroll tax rates. Panel E relates a country relative advantage in services (RCA ratio) to payroll tax rates. Small EU economies with extremely large trade balances (Luxembourg, Malta and Cyprus) have been excluded from the figure.

Figure A.3: Compensating Differentials Paid by Exporting Firms in France



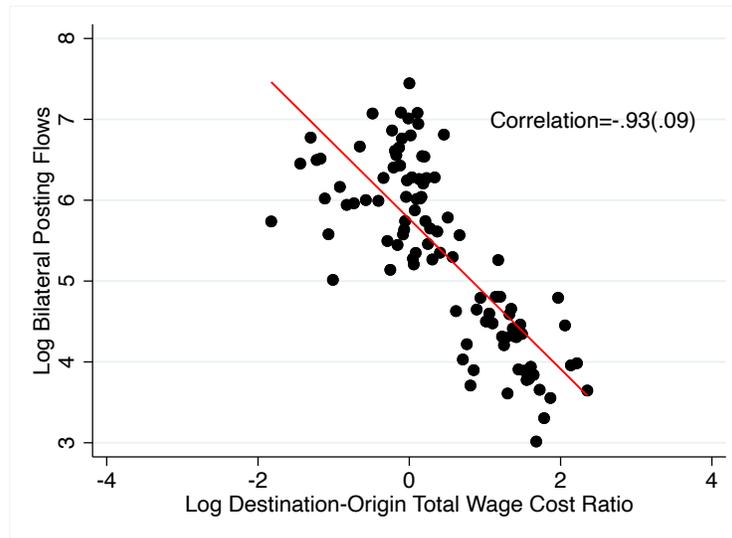
Notes: This figure illustrates variations in wages for workers posted to France, based on the distance of their home country from France. Panel A shows the relationship between wages paid to workers sent from a given origin country to France and the log distance between that origin country and France. Panel B, C and D focus on non-monetary compensating differentials by looking at the fraction of posting contracts with employer-provided housing (Panel B), transportation (Panel C) and food (Panel D) for each origin country.

Figure A.4: Employers' Marginal Payroll Tax Rate vs Effective Payroll Tax Rate



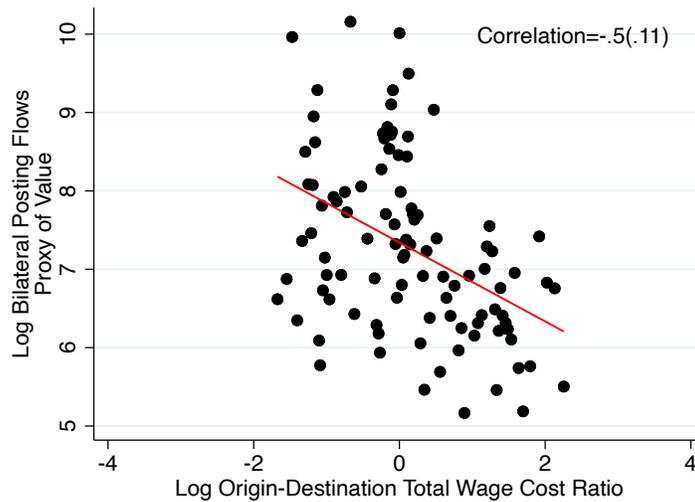
Notes: This figure shows the correlation between measures of the effective payroll tax rate computed by Eurostat (social security contributions and other labor taxes paid by employers net of subsidies for employers), and the social security contribution marginal tax rate faced by employers provided by the OECD taxing wages database. Only EU countries in the OECD can be included in that figure.

Figure A.5: **Weighting Posting Flows by Wages in the Origin Country**



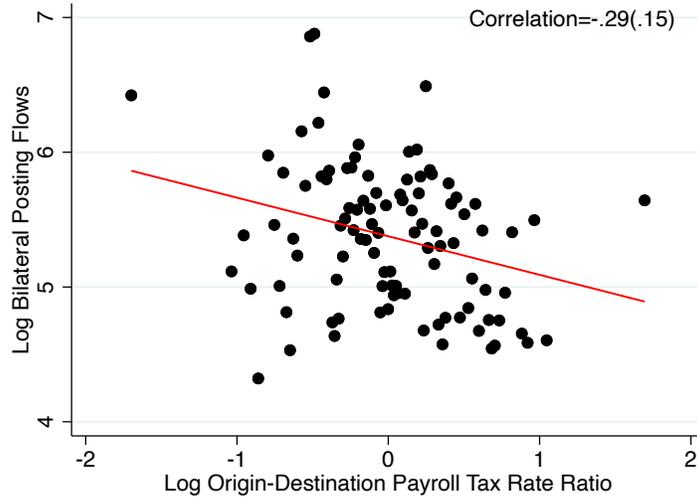
Notes: This figure shows the baseline correlation between log of bilateral posting flows and log of total wage cost differentials, weighting bilateral posting flows by the average wage in the exporting country.

Figure A.6: **Using Expenditures-Equivalent Measures of Bilateral Posting Flows**



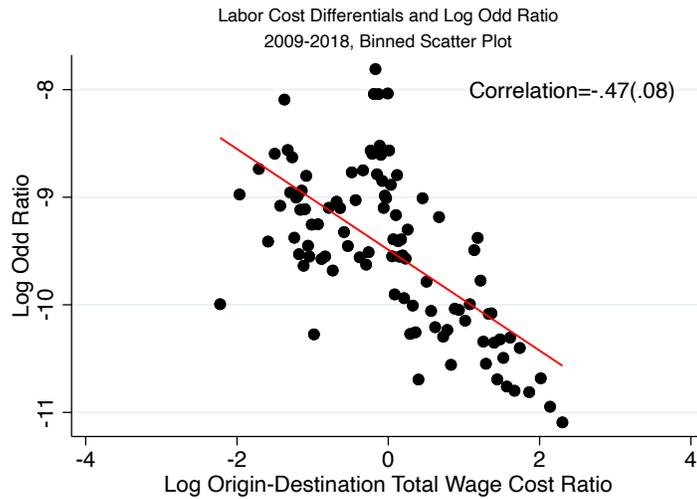
Notes: This figure shows the baseline correlation between log of bilateral posting flows and log of total wage cost differentials, replacing the number of workers sent from one country to the other by average duration of posting contracts and the average labor cost paid to those workers (which also appears in the x-axis measure).

Figure A.7: Payroll Tax Rates Differentials



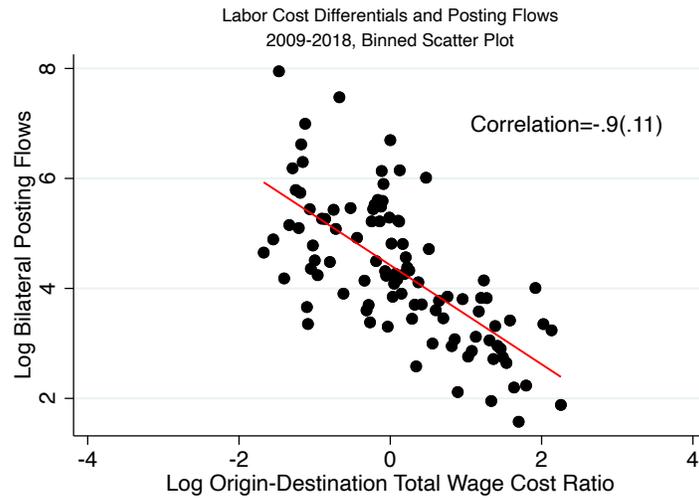
Notes: This figure shows the correlation between log of bilateral posting flows and log of the payroll tax rate ratio as a measure of differences in labor cost between two countries.

Figure A.8: Log-Odd Ratios



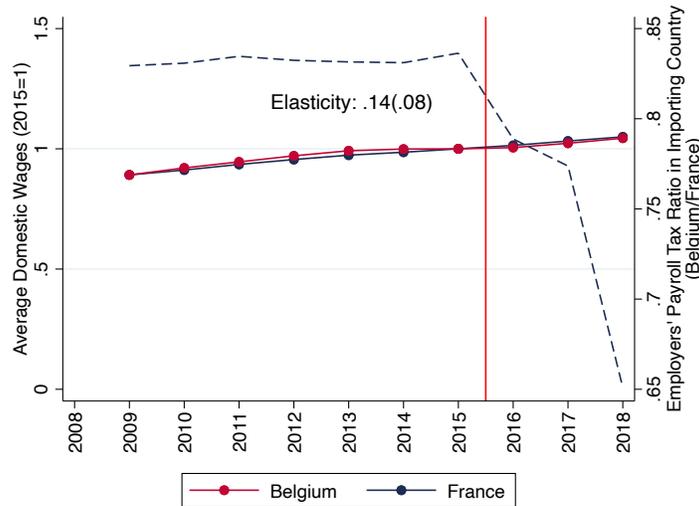
Notes: This figure shows the correlation between log of odd ratios ($\log(S_{ijt}) / \log(S_{jjt})$) and log of the labor cost differential between country i and country j .

Figure A.9: **Weighting Posting Flows by Duration of Posting Contracts**



Notes: This figure shows the correlation between log of bilateral posting flows and log of total wage cost differentials, weighting observations by the average duration of posting assignments.

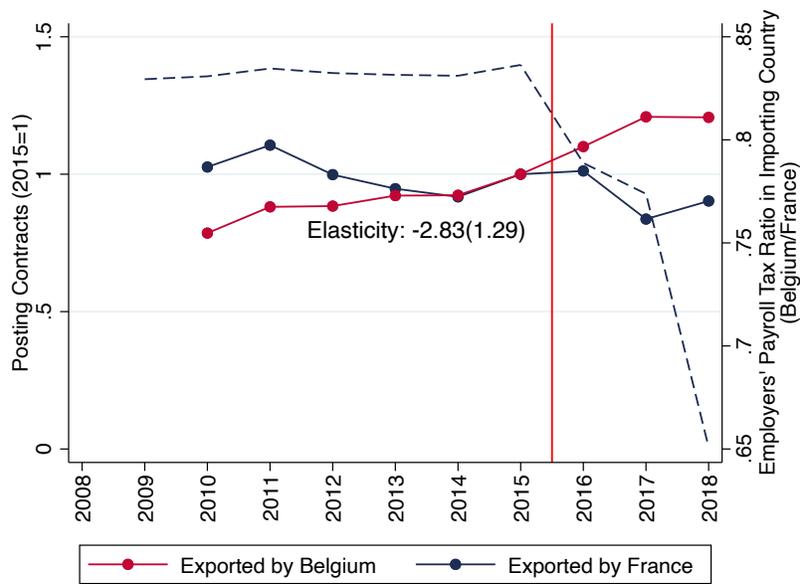
Figure A.10: **Effect of a Payroll Tax Cut in Belgium on Gross Wages**



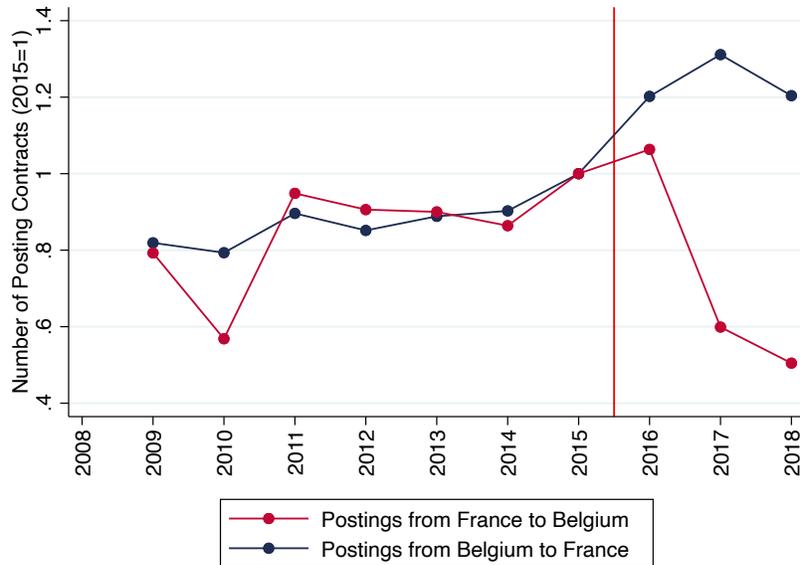
Notes: This Figure repeats the difference-in-differences analysis of the Belgian tax shift reform, using average gross wages instead of posting flows as the outcome variable, in Belgium and France.

Figure A.11: Effect of a Payroll Tax Cut in Belgium on Exports of Posting Services

A. Exports of Posting Services from Belgium vs France

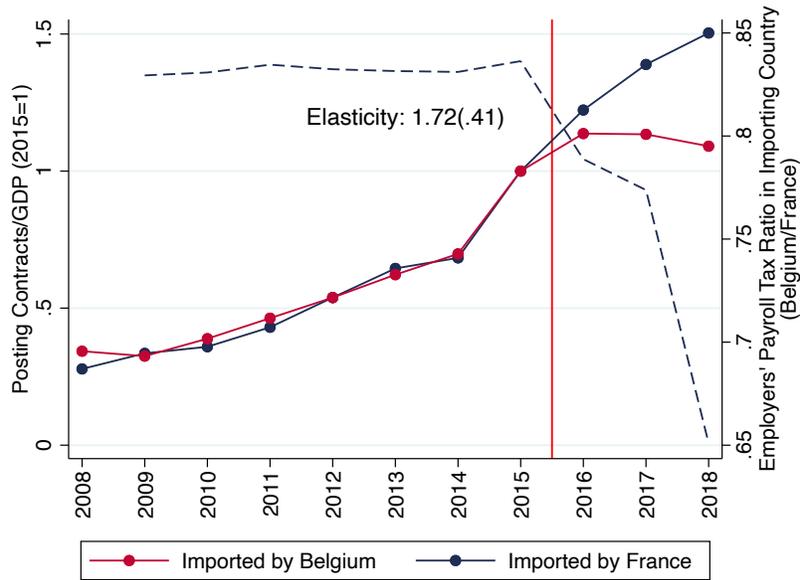


B. Bilateral Trade in Posting Services Between France and Belgium



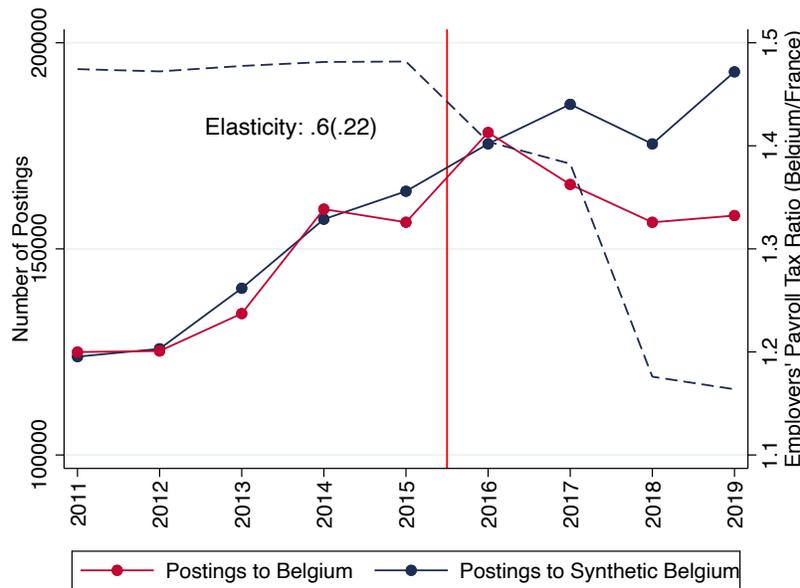
Notes: This Figure repeats the difference-in-differences analysis of the Belgian tax shift reform, using exports of posting services from Belgium and France as an alternative outcome variable. Exports of posting services are measured from the EU-wide dataset available from 2009 to 2018 as described in the text. The elasticity in Panel A is computed from a 2SLS regression as described in the text.

Figure A.12: Adjusting for Changes in Aggregate Demand After the Reform



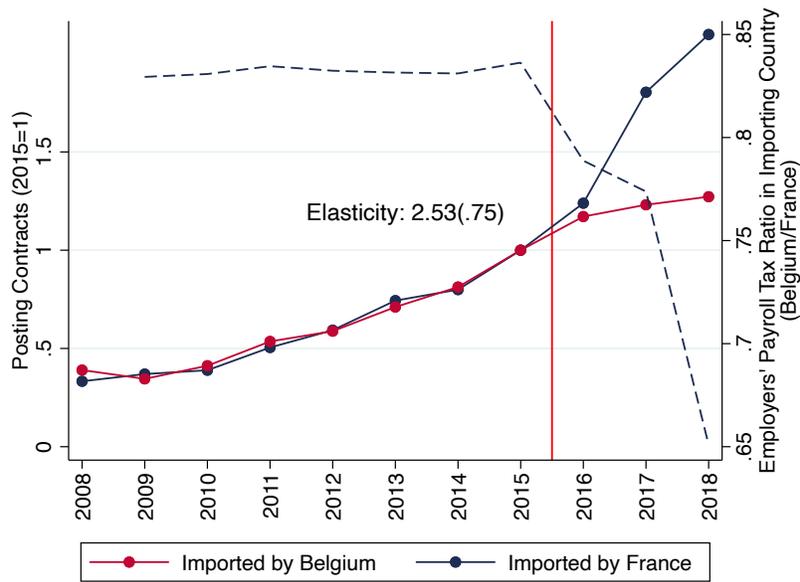
Notes: This Figure repeats the difference-in-differences analysis of the Belgian tax shift reform, using posting imports divided by GDP, in Belgium and France.

Figure A.13: Effect of a Payroll Tax Cut in Belgium: Synthetic Control Method



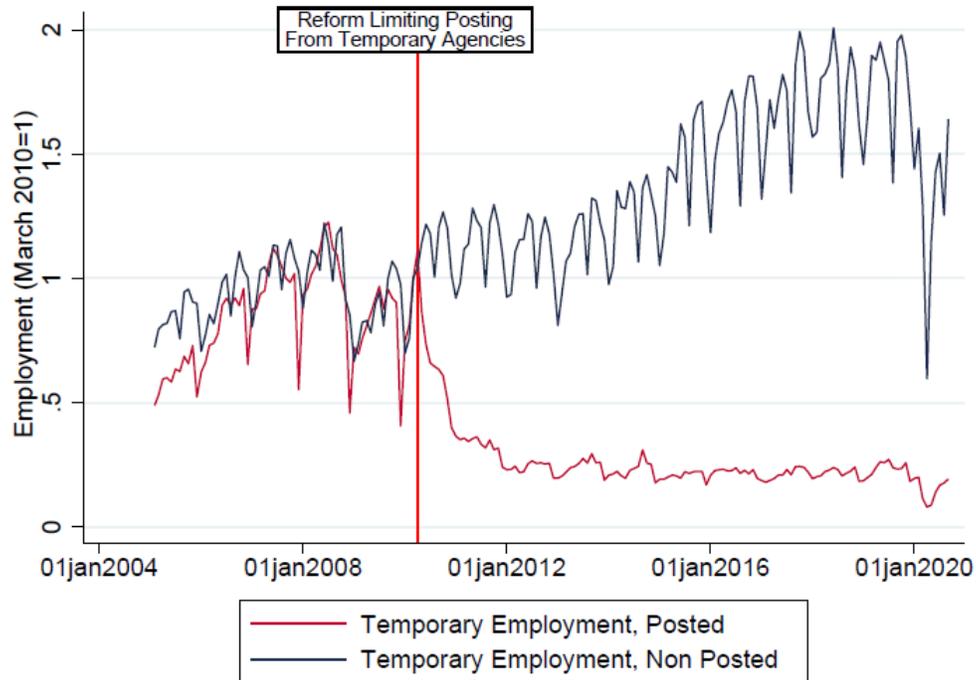
Notes: This Figure repeats the difference-in-differences analysis of the Belgian tax shift reform, using a synthetic control country (Abadie et al., 2010b) instead. The elasticity reported in the figure is computed with respect to the change in payroll tax rate.

Figure A.14: Effect of a Payroll Tax Cut in Belgium on Posting Imports: Raw Series



Notes: This Figure plots raw series non corrected for a potential break in series in 2017 due to a change in reporting system in France. More details can be found in the main text when describing the datasets.

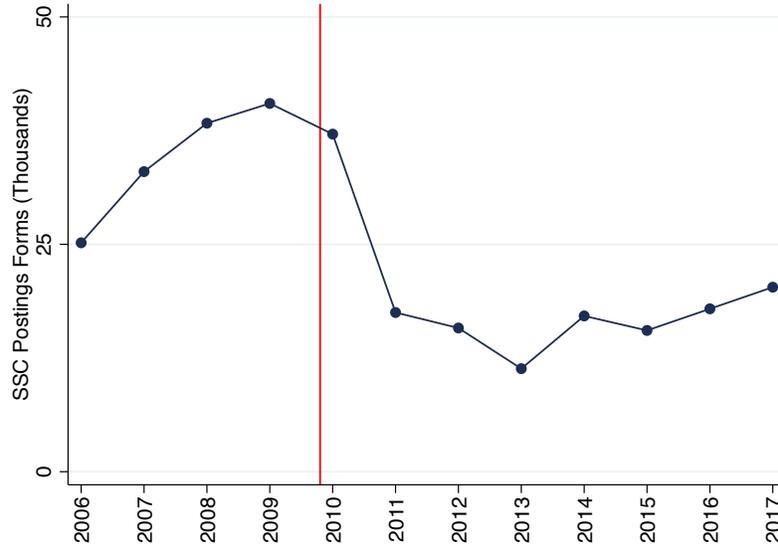
Figure A.15: Exposed Luxembourgish Firms Did Not Anticipate the Tax Shock



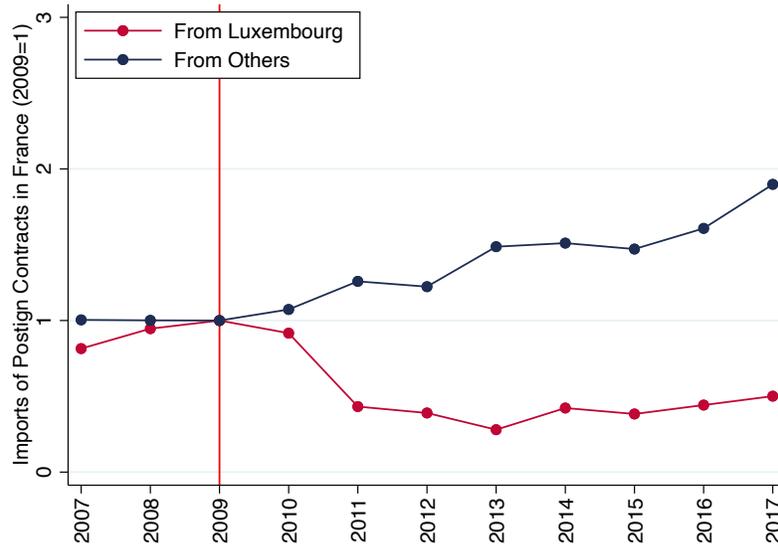
Notes: This figure shows the effects of a EU regulation that imposed destination-based payroll taxation on temporary employment agencies located in border regions posting workers in neighboring countries. The reform is depicted by the vertical red line in May 2010. The figure shows monthly employment stock in Luxembourgish placement agencies for workers posted abroad (red series, treatment) and workers supplying services domestically (blue series, control), before and after the reform.

Figure A.16: Effect of the 2010 Reform on French Imports

A. French Imports of Posting Services from Luxembourg Dropped

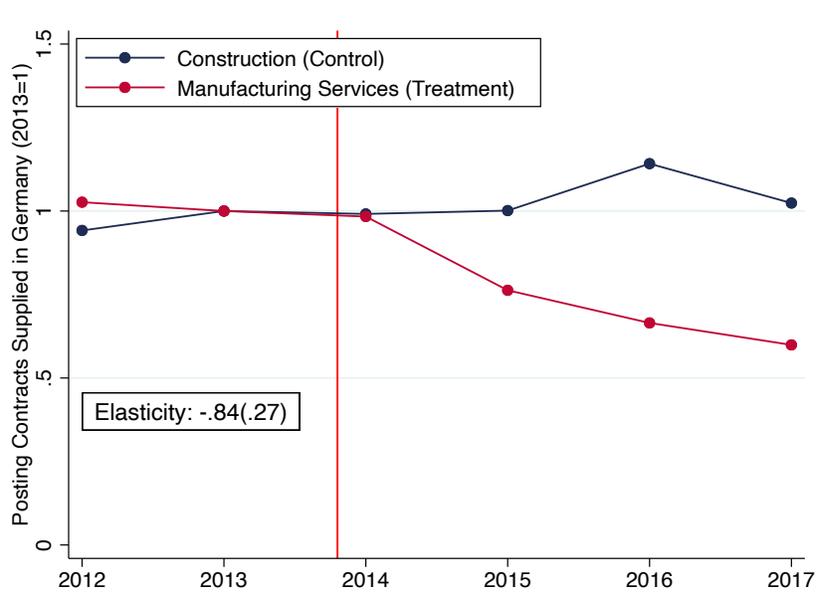


B. French Imports from Other Countries



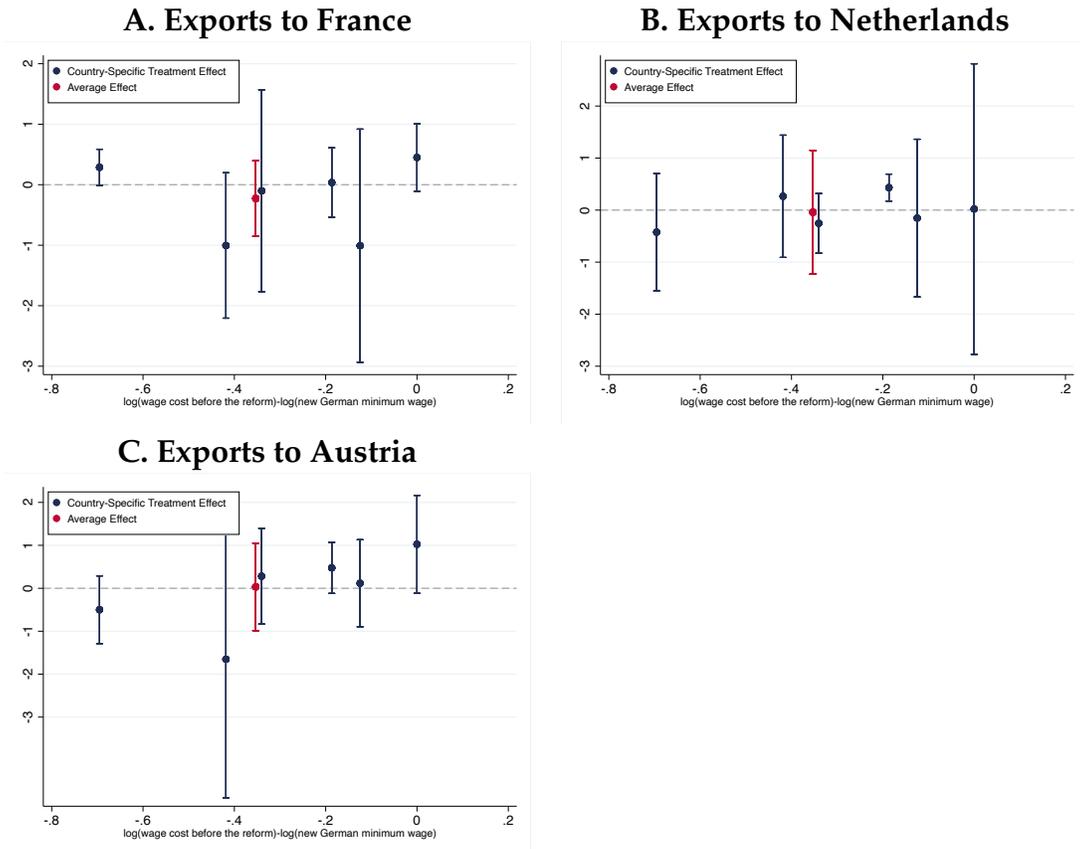
Notes: This Figure shows the effects of the 2010 reform described in the main text on imports of posting services from Luxembourg in France. Panel A shows raw number of imported posting contracts operated by Luxembourgish companies in France. Panel B shows imports of posting contracts in France from Luxembourg (treated, red series) and all other countries but Luxembourg (blue series, control). Series in the bottom panel are all normalized to one in the pre-reform year (2009).

Figure A.17: Effects of the German Reforms Excluding Romania



Notes: This Figure shows the effects of the German 2014-2015 reforms excluding exports from Romania to Germany. The elasticity is estimated from the 2SLS specification described in the main text.

Figure A.18: Placebo Estimates of the German Reform



Notes: This Figure repeats the analysis of trade responses to the German minimum wage reform in treated vs control sector, but in neighboring importing countries that did not change minimum wage requirements for exporting firms in 2014-5.

Table A.1: Additional Gravity Specifications

| | (1) | (2) | (3) | (4) |
|--|-------------------|--|-------------------|-------------------------------|
| Elasticity ($-\theta$) | -1.2*** (.345) | -1.2*** (.204) | -1.1*** (.256) | -1.1*** (.209) |
| Observations | 5,532 | 5,532 | 3,997 | 5,532 |
| Alternative: | Pair Clustering | Destination \times Year, Origin \times Year cluster | Zone Euro only | Adding Multi-Country Flows |

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. This table shows additional specifications for the baseline gravity estimation presented in the main text. The specification is the same than in column (4) of Table 2 but with different inference procedures in column (1)-(2) and excluding countries outside the euro zone in Column (3). Column (4) allocates flows of posted workers with more than one destination country observed for each exporting country each year, to each destination country using bilateral posting shares observed for regular posting flows the same year.

Table A.2: Elasticity of Trade in Goods With Respect to Posting-Specific Labor Costs

| Regressor: $\log(c_{ijt})$ | (1) | (2) | (3) | (4) |
|----------------------------------|-----------------|-----------------|-----------------|--------------|
| Trade in Goods Elasticity | .49*** (.07) | .47*** (.06) | .35*** (.06) | .11 (.10) |
| Observations | 5,400 | 5,400 | 5,400 | 5,400 |
| Origin-Destination FE | Yes | Yes | Yes | Yes |
| Destination \times Year FE | Yes | Yes | Yes | Yes |
| Origin \times Year FE | No | No | No | Yes |
| Estimator | OLS | PPML | MPPML | MPPML |
| Internal Flows | No | No | No | No |

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. This table repeats the estimation strategy presented in Table 2 and described in the main text, replacing the outcome variable by bilateral trade in goods from [Head and Mayer \(2014\)](#). Robust standard errors clustered at destination-year level are in parentheses.

B Additional Institutional Details

The European posting policy is a legal framework within the European Union (EU) that regulates the temporary cross-border movement of workers. This policy allows employees from one EU member state to be temporarily posted to another member state while still being subject to the social security and labor laws of their home country. The primary goal of this directive is to facilitate the provision of services across borders while ensuring fair working conditions for posted workers.

The history of the European posting policy dates back to the 1960s when the EU began working towards creating a single market for services. Freedom to supply services is one of the four pillars of the EU single market and was thus adopted as part of the Rome Treaty. The original legal framework underwent major changes. The first Posting of Workers Directive was adopted in 1996 as a response to concerns that the differences in labor standards and wages across EU member states could lead to unfair competition and exploitation of workers in lower-wage countries. This was in the context of EU enlargement to Spain and Portugal, in particular, where wages and taxes were much lower than in the core of the EU. The primary objective of the directive was to ensure that posted workers benefit from the same core labor rights and working conditions as local workers in the host country. This was however restricted to areas such as maximum working hours, minimum rest periods, minimum paid annual leave, and minimum rates of pay.

The 2004 enlargement of the European Union (EU) marked a significant expansion of the single market. Ten new member states from Central and Eastern Europe joined the EU, which represented roughly 20% of the total EU population at the time. This enlargement brought changes in various EU rules, including those related to the posting of workers. Following the enlargement, workers from the new member states gained the right to post their workers to other EU countries under the framework of the Posting of Workers Directive. This meant that companies from the new member states could send their employees to provide services in other EU countries on a temporary basis; without having to request employment or work authorization in the country of destination.

The EU enlargement also triggered the liberalization of migration (free movement of workers) for citizens of new member states. However, transitional arrangements were implemented by several existing EU member states, primarily in Western Europe. These arrangements allowed these countries to restrict the free movement of workers from the new member states for a limited period (up to seven years) after the 2004 enlargement. The idea behind these restrictions was to gradually open up their labor markets to prevent sudden disruptions in local labor markets and to mitigate potential downward pressure on wages. Those so-called “safeguard” clauses were only implemented for traditional migrants, not posted workers, with the exception of Austria and Germany that were allowed to impose transitional measures for the cross-border supply of services too. The timing of the safeguard clauses and of free movement and free posting liberalizations for new member states of 2004 and 2007 is summarized in Table B.3.

In the aftermath of the EU enlargement, a proposal for a new directive for services was introduced. The Bolkestein Directive, formally known as the Services in the Internal Market Directive, was a proposed piece of legislation by the European Commission in 2004. The directive was named after Frits Bolkestein, the European Commissioner for

Table B.3: Liberalization of posting and free movement for Eastern European Countries

| Country | NMS of 2004 | | NMS of 2007 | |
|----------------|-------------|---------------|-------------|---------------|
| | posting | free movement | posting | free movement |
| Belgium | 2004 | 2009 | 2007 | 2014 |
| Denmark | 2004 | 2009 | 2007 | 2009 |
| Germany | 2011 | 2011 | 2014 | 2014 |
| Ireland | 2004 | 2004 | 2007 | 2011 |
| Greece | 2004 | 2006 | 2007 | 2009 |
| Spain | 2004 | 2006 | 2007 | 2009 |
| France | 2004 | 2008 | 2007 | 2014 |
| Italy | 2004 | 2006 | 2007 | 2011 |
| Luxembourg | 2004 | 2007 | 2007 | 2014 |
| Netherlands | 2004 | 2007 | 2007 | 2014 |
| Austria | 2011 | 2011 | 2014 | 2014 |
| Portugal | 2004 | 2006 | 2007 | 2009 |
| Finland | 2004 | 2006 | 2007 | 2007 |
| Sweden | 2004 | 2004 | 2007 | 2007 |
| United Kingdom | 2004 | 2004 | 2007 | 2014 |

Notes: NMS 2004: Poland, Latvia, Lithuania, Slovakia, Slovenia, Hungary, Czech Republic, Estonia; NMS 2007: Romania, Bulgaria.

Internal Market and Services at the time. The proposal aimed to address barriers that hindered the free movement of services across the EU, such as varying regulations and administrative burdens faced by service providers operating in different member states. One of the most controversial aspects of the directive was the "country of origin principle." This principle suggested that service providers should adhere to the regulations and laws of their home country, even when providing services in another EU member state. This approach was intended to simplify the regulatory environment for service providers, but critics argued that it could lead to "social dumping," where companies take advantage of lower standards in their home country to provide services in other member states. In fact, the country of origin principle in the Bolkestein proposal was opposite to the restrictions set by the 1996 directive; and were essentially reverting the minimum wage requirements for sending companies.

The Bolkestein Directive sparked significant controversy and debate across the EU. Critics argued that the country of origin principle could undermine labor standards, workers' rights, and consumer protection in some member states. They expressed concerns that service providers might establish themselves in countries with less stringent regulations to take advantage of lower costs and then provide services in other member states with higher standards. Due to the intense controversy and opposition from several EU member states, the Bolkestein Directive was significantly amended and its scope was narrowed. Essentially, the country of origin principle was removed from the final version of the directive.

The EU Regulation 883/2004, which came into effect in May 2010, introduced changes that impacted posted workers, including those in border regions. This regulation aimed to streamline and clarify the rules regarding social security coordination for individuals moving within the European Union (EU) and the European Economic Area (EEA). It sets new restrictions for payroll taxation for firms engaged in the posting program. Specifically, the authorization to maintain a posted worker under the social security system of their employer's country can only be granted if the posted worker has been affiliated with the social security agency of the sending country for a minimum of one month prior to the posting. Furthermore, a break of two months between two posting contracts is required before the same worker can be posted to the same country. If a worker is posted to its own country of residence, the payroll taxes must also be paid in the country of destination. Furthermore, the principle whereby employees employed by a company operating across a common border of two States had to be subject to the legislation of the Member State in which the company had its registered office is changed by the new regulation (Regulation EC No. 1408/71, June 14, 1971, Article 14b(3), Official Journal of the European Communities, July 5, No. L 149, p. 2). After 2010, the Regulation No. 883/2004 indicates that the common law applies, and thus the law of the place where the employment contract is executed prevails. Furthermore, some exceptions were granted to some sectors. For instance, international transportation has traditionally been excluded from general social security regulations because of the highly mobile nature of the activity (regulation no.1072/2009). This was also true for the 2010 EU regulation: firms operating in the road transportation sector that were potentially exposed to the change in rules were granted a 10-year transitory exemption period.

The 2017 directive concerning posted workers is known as the "Directive (EU) 2017/159 of the European Parliament and of the Council of 19 December 2016 amending Directive 96/71/EC concerning the posting of workers in the framework of the provision of services." This directive amended the original 1996 Posted Workers Directive (Directive 96/71/EC) and aimed to establish more equal working conditions for posted workers compared to domestic workers in the host country. The directive was introduced against the backdrop of growing concerns about social dumping within the EU. The proposal aimed to strike a balance between facilitating the free movement of services and ensuring fair working conditions. The main proposed change was the "equal pay" principle where posted workers should be entitled to equal pay for equal work in the same location. This means that posted workers had to receive the same salary and benefits as local workers for performing the same job. In practice, this means that the destination-specific minimum legal wage requirement is replaced by the destination-specific *prevailing wage*.

Emmanuel Macron, the President of France, played a prominent role in advocating for changes to the Posted Workers Directive within the European Union (EU). His role and actions were part of France's broader efforts to address concerns related to social dumping and the rights of workers in the EU. France, under Macron's leadership, was one of the countries pushing for stricter regulations and a more comprehensive reform of the directive. The French government sought to limit the duration of postings, increase the application of host-country labor laws, and ensure equal pay for posted workers.

C Additional Evidence: Slovenian Posted Bonus

I additionally study the implementation of a reform in Slovenia that decreased the labor cost for workers posted by companies located in Slovenia. The reform was implemented in end of 2012 by a new social security regulation (*ZPIZ-2 par 144*). It establishes that payroll taxes paid by Slovenian firms on posted workers' wages are capped to 60% of the average annual salary in Slovenia after the reform, introducing a large labor cost cut for workers posted by Slovenian suppliers.⁴⁴ The reform introduces a sharp decrease in the social security contribution rate paid by Slovenian employers, of about 40% for workers paid at the average wage level (Figure C.19). According to the theoretical framework, this payroll tax cut should increase trade flows from Slovenia ($dS_{ijt} / d\tau_{it} < 0$).

To estimate the effect of this origin-specific tax cut on posting flows, my empirical strategy is a difference-in-differences where I compare the flows of workers posted from Slovenia affected by the payroll tax cut after 2012 with workers posted from similar countries not affected by the tax cut, within the same receiving country. My control group contains workers posted from other new member states (NMS) of 2004: these countries face the same posting restrictions as Slovenia in all receiving EU countries and are similar in many aspects (geography, development path, industrial specialization). Given that posting flows from Slovenia and other NMS of 2004 are affected by similar shocks, they should have followed similar trends absent the reform's implementation in Slovenia.

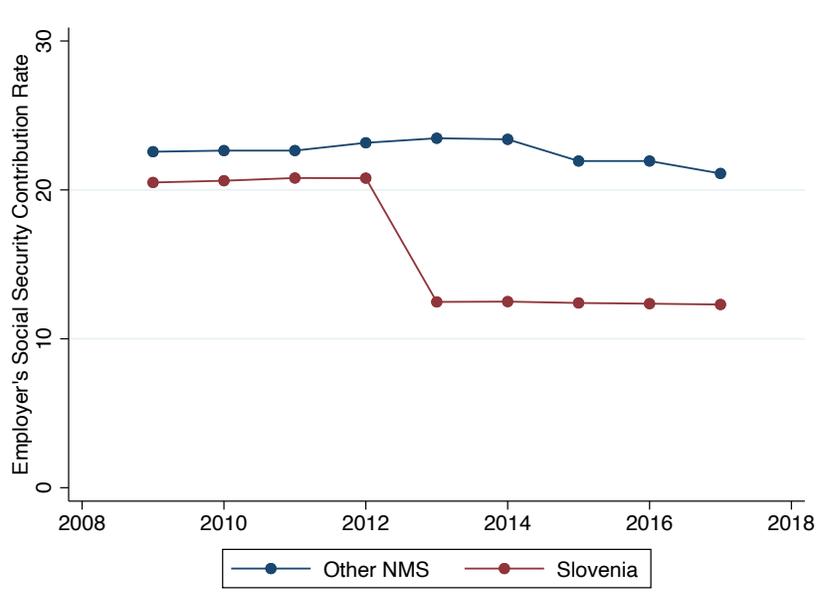
Figure C.20 shows graphically the differences-in-difference setting provided by the reform. The top panel plots the number of posted workers from 2008 to 2017 (normalized to one in 2012 just before the reform implementation) sent by Slovenia (treatment) and by other NMS (control) to Austria, the main receiving country for workers posted from Slovenia. Focusing on the differential evolution of treated versus control flows to the same receiving country allows me to graphically differentiate out the destination-specific term Φ_{jt} that should affect demand for workers posted from Slovenia and other NMS 2004 countries similarly. The figure shows compelling evidence that the number of workers posted from Slovenia increased after the payroll tax cut compared to workers posted from other comparable countries. While the series were following parallel trends before the reform, the number of workers posted from Slovenia to Austria increased threefold five years after the tax cut. Over the same period, posting flows from control countries stayed very stable, suggesting the observed increase in Slovenian postings has been primarily driven by the reform. The reduced-form elasticity of posted worker flows with respect to the origin-based payroll tax rate given by this country-level experiment is large and significant, with a point estimate of -2.3 (0.35) in Austria, -2.2 (0.35) in Germany, and -1.62 (0.24) for all receiving countries, controlling for destination-year fixed effects.⁴⁵ Next, Panel B repeats the difference-in-differences setting using the synthetic control method a la

⁴⁴The effect of this payroll tax cut "posted bonus" has been documented by a worker union (EFBHWW) that filed an official complaint at the European court of Justice in 2019. The complaint against Slovenia argues that this payroll tax cut for workers posted from Slovenia lowers labor cost for Slovenian suppliers and creates unfair competition between European countries.

⁴⁵The corresponding reduced form estimates for the elasticity of posting flows with respect to origin-specific non-wage labor cost component are respectively -1.77 (.23), -1.70(.24) and -1.3(.18), while the elasticity with respect to total wage cost is larger, with a point estimate of -5.5(.72).

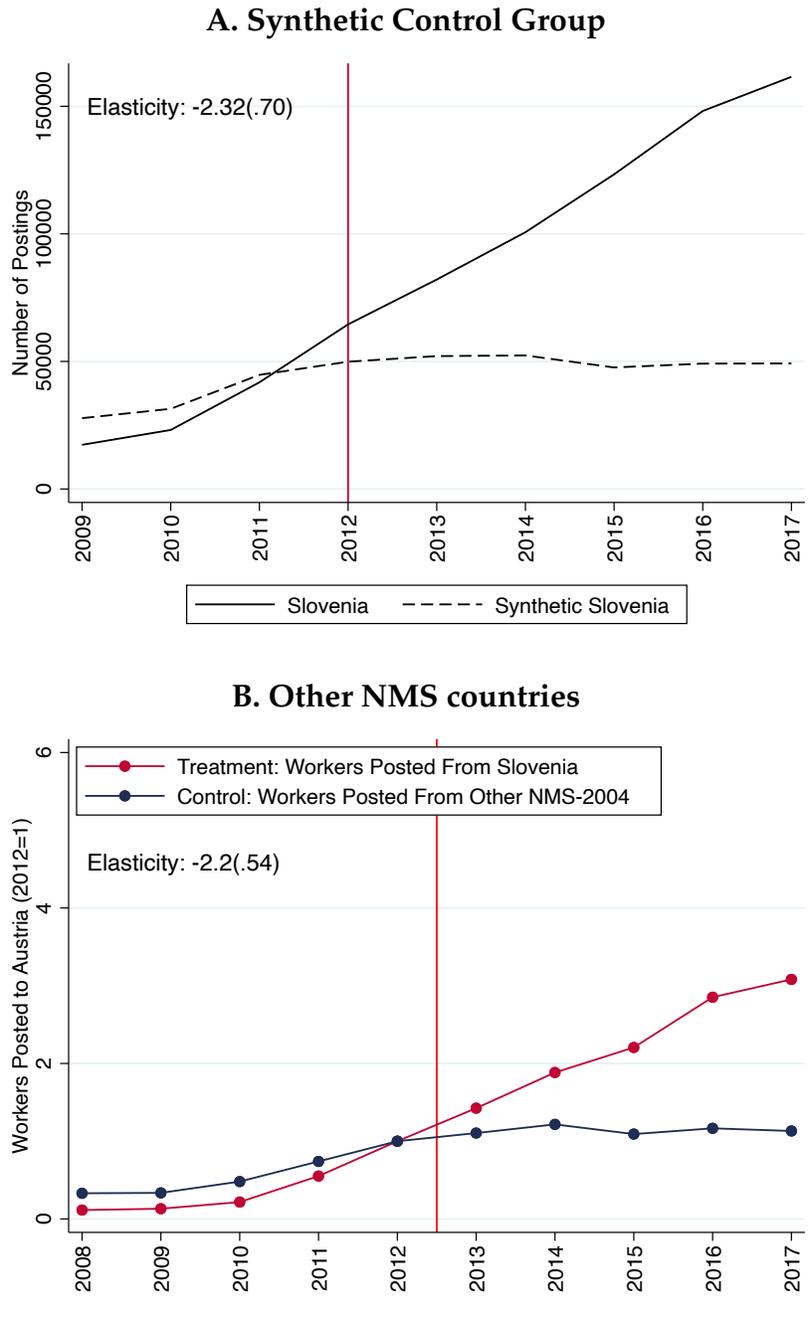
Abadie et al. (2010a) to build an alternative control country, matching on pre-reform trade-migration flows. The figure compares all workers sent from Slovenia to all destination countries, to the number of workers posted from the synthetic country to all destination countries. The results are extremely similar, with an implied reduced form trade elasticity with respect to payroll tax rate in the origin country of -2.3(.71).

Figure C.19: Slovenian Posted Bonus and Payroll Tax Rate



Notes: This Figure shows the evolution of payroll tax rates paid by firms located in Slovenia and other NMS before and after the new social security regulation of 2012.

Figure C.20: Trade Responses to Slovenian Posted Bonus



Notes: This Figure shows the effects of a payroll tax cut for workers posted from Slovenia, on exports of posting services from Slovenia.