# Labor Market Competition and Its Effect on Firms and Local Communities

Samuel Dodini, Katrine Løken, and Alexander Willén*

October 2024

**Abstract**

We examine the impact of a sharp increase in labor market competition on the entire ecosystem of local communities, leveraging a labor demand shock in Norway that raised real wages and incentivized increased worker commuting from Sweden. By linking individual-level register data across both countries, we demonstrate that these worker reallocations have dramatic and persistent effects on both sending and receiving communities. In Sweden, the local population declined and inequality rose as increased competition from Norwegian firms forced local businesses to exit, downsize, and reduce average wage markdowns. In contrast, Norwegian firms benefited from hiring equally productive Swedish workers at lower costs while some Norwegian workers experienced spatial displacement to nearby regions. Notably, high-skilled workers lost their skill premium due to the influx of positively selected Swedes.

**JEL Codes: J24, J31, J42, J61, J62**
**Keywords: Labor Market Competition, Outside Options, Labor Mobility, Inequality, Community Development**

*Dodini: Federal Reserve Bank of Dallas (samuel.dodini@dal.frb.org). Løken: Department of Economics, Norwegian School of Economics (katrine.loken@nhh.no). Willén: Department of Economics, Norwegian School of Economics, UCLS, and CESifo (alexander.willen@nhh.no). This project was partially funded by the Research Council of Norway through its Centers of Excellence Scheme, FAIR project no. 262675, and through its Young Researcher Scheme, grant no. 334912. The views expressed in this paper are those of the authors and do not necessarily reflect those of the Federal Reserve Bank of Dallas or the Federal Reserve System.

## 1 Introduction

Workers are becoming increasingly mobile both within and across countries. This shift is primarily driven by reduced legal barriers, improved transportation infrastructure, rapid technological advancements, and globalization. Rising labor mobility intensifies competition for workers in local markets from nearby regions and countries. However, even though increased competition can boost economic efficiency, it also raises concerns about those left behind and the impact of this competition on local communities.

The impact of a sharp increase in labor competition from nearby regions on local communities is unclear. On one hand, increased competition makes it more difficult for local communities to retain talent. This can threaten local businesses by reducing labor supply and increasing labor costs. In addition, this can lead to population decline as job options dwindle. On the other hand, better commuting opportunities may attract new residents, increase local product demand, and boost local tax revenue through higher wages and new arrivals. The overall effect of labor competition on communities depends on the characteristics of commuting workers and how businesses respond to intensified competition and worker mobility.

This paper offers novel evidence on the effects of a sharp increase in labor market competition on the entire ecosystem of local communities, encompassing both sending and receiving areas. First, we comprehensively examine the impacts of increased labor competition on overall community development, measured through labor market outcomes, equality and distributional effects, business activity, population growth, and community resources. We then disaggregate the data to the firm level and disentangle the role of firms in driving the aggregate community effects we observe. We pay particular attention to how firms adjust their production processes and strategies to remain competitive. In a time of growing global and regional market integration, rising inequality, and shifting demographics, understanding the impact of geographic labor market competition on workers, firms, and communities is crucial—especially as national authorities are beginning to set up specialized commissions tasked with injecting competition into local labor markets.[1]

To address these questions, we leverage a labor demand shock in Norway, triggered by a sharp rise in oil prices and a rapid expansion of its oil sector. This shock, which occurred between 2005 and 2009, resulted in a widespread and dramatic increase in real wages and incentivized greater worker movement from neighboring Sweden as the returns from commuting improved.[2] This shock is particularly interesting because labor mobility and cross-border commuting were already well established before the boom. However, the surge in real wages in Norway increased the return to commuting from Swedish communities near the border (despite stable macroeconomic conditions in Sweden), pulling workers into Norway rather than pushing them out of Sweden. For

[1] See, for example, the 2022 Economic Report of the President of the United States.

[2] Until 2005, Norway's economic performance largely mirrored that of Sweden and the OECD, but it dramatically outperformed the rest of the world during these four years.

Swedish communities near the border, the improved job opportunities in Norway can be seen as a labor demand shock that increased competitive pressures over labor for local firms. For Norwegian communities near the border, it represents a more traditional labor supply shock caused by an inflow of Swedish commuters. Importantly, only Swedish communities near the Norwegian border were affected by the improved labor market climate in Norway; others were too far away to be impacted. Similarly, only Norwegian communities near the Swedish border experienced large inflows of new commuters. The highly localized nature of the labor shock enables us to leverage a difference-in-differences framework to identify causal effects. With access to rich register-based data, we can track individuals across the border, enabling us to provide unique and novel insights into the effects of cross-border competition on workers, firms, and communities in countries with similar institutions and languages.

The main takeaway from this paper is that labor demand shocks that increase workers' outside wage options in nearby locations can have dramatic and persistent effects on both sending and receiving communities and send ripple effects across all segments of society, even in countries where automatic stabilizers are designed to blunt the impact of local economic shocks. To support this conclusion, we present four sets of results.

First, we confirm that Norway's 2005-2009 macroeconomic shock led to a significant response from Swedish workers. In the years following the shock, the number of Swedes commuting to Norway doubled, accounting for 10 percent or more of the workforce in Norwegian border municipalities by 2009. Although there is some variation in who responded, the increased opportunities were relevant to Swedes across all major industries near the border.

Second, using rich municipality-level data, we analyze the aggregate community effects of the shock on both sides of the border. On the Swedish side, there was a large increase in the share of workers commuting to Norway, which caused a substantial drop in the share of individuals working in the local communities. However, this shift had little effect on the overall employment rate of residents in Swedish communities. The spatial reallocation of their workplace from Sweden to Norway led to an average earnings increase of six percent, primarily benefiting those who decided to begin commuting. Most of the wage gains are concentrated among top earners, leading to a significant rise in local income inequality.

Contrary to these concentrated earning gains for commuters, Swedish border municipalities experienced sharp declines in population, workforce size, and the number of firms. The population and workforce size effects are driven by non-commuting residents migrating to other parts of Sweden in search of better opportunities. This outcome presents a puzzle, as the Norwegian boom should have incentivized Swedes to relocate closer to the border for commuting opportunities. We explore two mechanisms that may explain this puzzle: (1) the significant increase in income inequality may have made these areas less attractive, and (2) the sharp decline in business activity in these areas – driven by the commuting-induced labor shortage – may have eliminated job oppor-

tunities for non-commuters and forced them to search for jobs elsewhere. Our findings strongly support the latter explanation as firms on the border closed their doors, reducing the number of available jobs.

On the Norwegian side, we observe a small overall change in resident employment rates within the border municipalities. Overall, average annual earnings for domestic resident workers declined by a moderate amount, driven almost entirely by a significant negative earnings effect near the top of the distribution. This led to a reduction in income inequality in Norwegian border municipalities. Despite these changes, there is no impact on population size, the number of total workers, or the number of firms. Displacement appears to be spatial in nature: domestic workers in Norwegian border municipalities, especially those near the top of the distribution, found work in neighboring municipalities.

Third, we disaggregate the data to the firm level to examine the role of firms in driving the aggregate effects that we find. On the Swedish side, in an attempt to retain workers, firms marginally increase wages (for incumbent workers in particular). However, these increases seem insufficient to retain these workers, or the wages may have been too high to be sustainable. This is because, alongside these wage changes, we observe substantial declines in both the number of workers at the firm and total firm production as measured by value added. Because higher-skilled workers in the Swedish border regions are the ones who capitalize on the Norwegian boom by commuting, there is a significant drop in productivity at Swedish firms and a notable decline in average wage markdowns. The less-productive workers who remain at the firm after the shock are paid marginally more for significantly lower output. The combined effect of these cost increases and productivity losses is a sharp increase in the likelihood that firms exit the market, taking the jobs with them.

In contrast, on the Norwegian side, firms replace some domestic workers with Swedish commuters, mostly via incumbents leaving the firm. Domestic workers experience lower earnings, while total value-added remains constant. Lower personnel costs for the same output mean that the labor share of revenues declines. Thus, greater shares of income flow to capital owners, and firms that hire Swedish commuters are better off.

Fourth, we integrate firm and municipality-level data to examine whether local goods and services in Sweden are affected. We analyze sales revenue for local goods and services, house prices, and the tradable goods sector, which is less influenced by local demand changes (see Beaudry et al. (2012)). Our analysis reveals no changes in total sales revenue for local goods or house prices in Swedish communities. Additionally, firm effects in the tradable goods sector are similar to our baseline results across all sectors. These findings are important because the impact of increased competition on the local goods market is theoretically ambiguous. Higher earnings from increased commuting could boost local spending. Conversely, population decline could reduce demand for local goods and services. Although a potential effect on the goods market does not undermine our

identification strategy (it merely represents a mechanism for our effects), the absence of significant market changes strongly suggests that the main driver of our effects is not changes in demand for goods and services.[3]

Our findings highlight the vulnerability of local communities to relatively modest shocks that can occur for a range of different reasons, such as the construction of transportation links across communities, the establishment of new businesses in specific regions, and changes in competition policies or migration policies. Prior work has looked at the effect of outside options on workers (e.g., Schubert et al. (2020); Caldwell and Danieli (2024)) and the effect of wage legislation on firms (e.g., Harasztosi and Lindner (2019)). However, prior research has not been able to provide a unified framework for understanding the interconnectedness and fragility of the community's ecosystem when one specific aspect of it (i.e. competitive wage pressure) is being pushed out of its equilibrium. This finding has important policy implications for the design of effective community stabilization policies and the decision of when to intervene in response to local economic shocks. For example, our results suggest that caution is warranted regarding policies attempting to increase community well-being through increased spatial competition for workers. Automatic cross-municipality financial balancing systems such as those in Sweden do not appear sufficient to prevent the negative effects of labor shocks on communities if the negative effects arrive through the channel of decreasing business activity and lower firm productivity.

By providing a unified framework for understanding the interconnectedness and fragility of the local community system, we contribute to the existing literature in several ways.

First, there is a new and growing literature exploring the impact of cross-border commuting on sending regions. Bütikofer et al. (2022) investigate how access to larger labor markets affects wages, employment, and income inequality, focusing on the opening of a bridge between Sweden and Denmark. They find that increased commuting raised average wages but also widened local income inequality and the gender gap. Unlike their study, which analyzed the effects of gaining access to a larger market that was previously inaccessible due to the presence of an ocean, we focus on the effect of increased spatial labor competition across regions in which labor mobility and cross-border commuting were already well established. Additionally, Bütikofer et al. (2022) do not examine firm responses or consider firms as a key mechanism in understanding the community effects.

Hafner (2021) examine the French labor market after a reform that lifted commuting restrictions to Switzerland. This analysis is similar to Bütikofer et al. (2022) in that it expanded labor market access to previously inaccessible regions. The authors find population growth in affected French areas, with firms expanding to manage increased worker competition, avoiding the negative community effects seen in our study. A key difference between Hafner (2021) and the current

[3] A related literature, such as Autor et al. (2016) and Autor et al. (2021) examines the long-term effects of trade exposure, particularly the China shock, on U.S. regions. As shown by these results, trade and changes in local goods and services are unlikely to explain our findings.

paper is that the reform in Hafner (2021) did not directly alter wage differentials, while our study focuses on significant changes in competitive wage pressures for Swedish firms. Additionally, their reliance on aggregated data limits analyses of cross-border worker flows and within-firm responses.

Dicarlo (2022) studies cross-border commuting from Italy to Switzerland after commuting restrictions were eased, with wage differentials more similar to our post-shock differences between Norway and Sweden. They find that greater access to the Swiss labor market led to firm exits on the Italian side while surviving firms adapted to increased competition. However, their focus is limited to the sending country and does not connect firm-level changes to wider regional outcomes.

We advance this literature by examining the impact of labor market shocks in a context that has several key advantages: (1) We analyze the same economic shock in both the sending and receiving countries, offering a comprehensive view of its cross-border impacts; (2) our approach examines multiple adjustment margins—worker flows, firm behavior, and community outcomes—to reveal how firms respond to labor supply and competition shocks and their role in shaping local development; (3) we isolate a pure commuting shock, free from confounding factors like housing prices or local demand shifts that typically accompany migration; (4) our shock stems from changes in financial incentives for commuting, not legal policies that remove commuting restrictions, providing a more nuanced and broadly applicable model for understanding shifts in labor competition across borders; (5) most importantly, our paper extends beyond the literature on border effects and is applicable to any emergence of wage differentials across space—with or without borders. These shifts can occur across cities, metro areas, regions, or countries, i.e. *any geography* that is spatially connected. As such, the results are not only important for understanding the implications of cross-country labor competition for the development of economic regions, but also for understanding shifts in regional development within countries, how changes in relative economic performance across space may shape worker allocation and regional equality, and what that means in terms of local labor market policies.

Second, there is a large literature examining the effect of immigrants on native employment and wages (e.g. Johnson, 1980; Grossman, 1982; Borjas, 1987; Card, 1990; Friedberg, 2001; Borjas, 2003; Ottaviano and Peri, 2012; Foged and Peri, 2016; Dustmann et al., 2016; Friedberg and Hunt, 2018; Piyapromdee, 2021). The general conclusion from these studies is that migration flows may have an effect on the labor market outcomes of natives, but that this impact is relatively small. Our results for the Norwegian border regions relate directly to this work in general, and to Beerli et al. (2021) and Dustmann et al. (2017) in particular.[4] While previous studies provide valuable insights

[4]Dustmann et al. (2017) examines the impact of an immigration-induced labor supply shock from the Czech Republic on local wages and employment of native workers in Germany, showing a moderate wage decline and sharp employment drop. We find similar patterns for native workers in our setting and replicate their finding that the negative employment effect on natives is driven by a greater outflow of natives from affected border areas. Beerli et al. (2021) analyzes the effects of EU workers on Swiss natives, finding wage increases, particularly for highly educated commuters, due to rising labor demand and firm growth. This wage increase was driven by a simultaneous rise in labor demand, with both the size and productivity of incumbent firms increasing, along with a surge in firm entries. In Norway, we observe comparable benefits for incumbent firms from Swedish commuters, but with weaker effects and

into the impact of migrants on natives, they often focus on average effects through a competitive market framework, overlooking the role of firms, labor market power, and economic inequality, dimensions that we pay particular attention to in our analysis.

Third, we also relate to a rich literature focusing on the relationship between outside options and worker wages (e.g., Schubert et al. (2020); Caldwell and Danieli (2024); Caldwell and Harmon (2019)) as well as on firm power and labor market concentration (e.g., Schubert et al. (2020); Azar et al. (2020); Qiu and Sojourner (2019); Rinz (2018); Prager and Schmitt (2021); Azar et al. (2022); Benmelech et al. (2022); Marinescu et al. (2021); Hershbein et al. (2018); Bassanini et al. (2024); Dodini et al. (2024)). While these papers have been essential in understanding the benefits of increased labor competition for individual workers, this is only one piece of the puzzle. Labor competition affects all segments of society—including firms and communities—often in complex and opposing ways. To fully comprehend the consequences of labor market competition, it is crucial to examine the entire local ecosystem.

We thus advance this literature by examining how an exogenous shift in worker outside options from a labor demand shock to a neighboring labor market impacts the entire local economic system, tracing the aggregate effect on local development as well as the mechanisms through which these effects operate. Furthermore, the heterogeneity analysis by pre-shock labor market concentration reveals the importance of understanding market structures when analyzing shocks to labor demand that affect workers' outside options and local competition.

Lastly, several research strands examine how changes in wage legislation impact employment levels (e.g., Neumark and Wascher (2008); Cengiz et al. (2019); Sorkin (2015); Aaronson et al. (2018)), the mechanisms behind these effects, and their distributional consequences (e.g., Harasztosi and Lindner (2019); Azar et al. (2019); Cengiz et al. (2022); Dustmann et al. (2022)). In our case, the macroeconomic climate in Norway effectively raised the local wage floor for Swedish workers across various occupations along the Sweden-Norway border. Unlike the smaller, temporary shocks examined in earlier studies (Sorkin, 2015; Aaronson et al., 2018), our setting involves a large and relatively permanent shock, with long-term effects observed over a decade. In addition, there are key differences between a real demand shock driven by changes in wage differentials and workers' outside options and an artificial wage increase mandated by legislation. Artificial wage hikes target specific worker types, affecting only a subset of labor costs, while a shock to outside options impacts workers across the entire wage distribution, complicating firm responses and input substitution. Our study advances the literature (e.g., Mayneris et al. (2018); Hau et al. (2020); Riley and Bondibene (2017); Azar et al. (2019)) by offering new evidence on how broader wage shifts influence firm behavior and performance.

no evidence of increased firm entries.

## 2 Institutional Background

### 2.1 Cross-Border Commuting

The border between Norway and Sweden is 1,619 kilometers long and represents the longest land border in Europe. The border follows the drainage divide in the Scandinavian mountains between the rivers that flow to the Norwegian Sea and Skagerrak and the rivers that flow to the Baltic Sea (with a few exceptions).

Both Norway and Sweden are members of the Schengen Area, which means that there are no immigration or passport controls along the border. However, only Sweden is part of the European Union and the associated free trade agreement. There are, therefore, customs checks between Norway and Sweden all along the border to enforce different VAT requirements, excise taxes, and tariffs or quotas on certain goods and services.[5] Since 1959, a shared surveillance agreement has allowed customs officers from each country to act on behalf of the other. There are 41 road crossings and 4 railway crossings between the two countries.

Swedish citizens are particularly mobile within the Nordic region, and 80 percent of all cross-border commuting in the Nordic region is driven by Swedish citizens commuting to Denmark and Norway. Both Norway and Denmark offer large labor markets with high wages a short distance from the Swedish border. The commuters tend to be young, highly educated, higher-income, single, and male, often seeking higher wages and improved job opportunities. Commuters are found across all industries. Very few Norwegians commute to another Nordic country for work (less than 2,000). The average commuting stint to Norway is 3.8 years. For those working exclusively in Norway, the average commuting stint is 2.3 years.[6]

Cross-border commuting has been an integral part of the pan-Nordic competitiveness strategy for several decades. Since 1954, individuals have been allowed to move between countries without work permits, and even before then, there was a substantial exchange of labor across the border.[7] In terms of institutional barriers, Sweden and Norway are very similar with respect to labor market design, education systems, and welfare policies. In addition, the Swedish and Norwegian languages are closely related, and there are few language barriers to working in the other country.[8]

Tax and welfare systems in the Nordic region require workers to pay taxes and receive welfare benefits—such as pensions, unemployment benefits, parental leave, and sick leave—in the country

[5] Even before entering the Schengen area in 2001, there were no passport controls between Sweden and Norway due to the countries' participation in the Nordic Passport Union. That the flow of goods differs from the flow of labor is a strength of using this setting to study labor market competition.

[6] See this report from Nordic Labour Journal.

[7] Even with open borders, mobility frictions can still hinder the equalization of wages and labor supply across national boundaries. Factors such as migration barriers, home country bias, and commuting distances all pose significant challenges. For instance, in the US, experiments show that workers are willing to forgo 16-19% of their income to avoid relocating across state borders, all else being equal (Wilson, Forthcoming). Similarly, despite fewer legal or administrative obstacles, wage differentials persist across various international borders, such as those between Switzerland and Germany, Sweden and Denmark, France and Germany, and France and Spain (e.g. Dicarlo (2022); Beerli et al. (2021); Bütikofer et al. (2022)).

[8] As an example, Norwegian law allows university teaching in Swedish.

where they are employed. This applies to all cross-border commuters, with one exception: workers who live in a border municipality on one side of the border and work in a border municipality on the other side pay income taxes in their country of residence.

### 2.2 The Norwegian Economic Boom

After decades of relatively parallel per capita GDP growth trends between Norway and Sweden, Norway experienced a disproportionate increase in GDP between 2005 and 2009. This divergence was not due to poor economic performance in Sweden but rather due to Norway significantly outperforming the rest of the OECD. As shown in Panel A of Figure 1, Norway's per capita GDP grew over 30 percent faster than Sweden's during this period, after which the relative growth rates of both countries stabilized. The primary drivers of Norway's accelerated growth were the sharp rise in oil prices from 2004 to 2008 (see Panel A of Figure A1) and the rapid expansion of its oil sector (see Panel B of Figure 1). This growth was particularly concentrated in Norway's western and northern regions and positively influenced the broader economy.

Our analysis focuses on the border areas of western Sweden and eastern Norway, excluding workers and firms tied to Norway's oil sector. Although the oil industry played a significant role in Norway's macroeconomic growth, it represented only 7% of total employment by the end of our study period (von Brasch et al., 2018). The highest concentrations of oil-related employment were in municipalities along Norway's west coast, such as Sola (16 percent) and Stavanger (14 percent). As a result, industry-specific local employment shocks are unlikely to affect our treatment and control areas in the far east of Norway (Ekeland, 2017). Furthermore, our identification strategy controls for broad macroeconomic shocks at the national level and the use of detailed synthetic control methods produce robust results. Moreover, the inclusion of Bartik-style industry shock controls does not alter our findings. We discuss this in detail in Section 3.

The economic boom in Norway during 2005-2009 led to a sharp decline in unemployment (Figure 1, Panel C) and a substantial rise in wages (Figure 1, Panel D). This wage growth was not confined to specific occupations or industries but applied broadly across all job classes in the country. One key factor behind this widespread wage increase is Norway's national sectoral collective bargaining system, where the export-oriented industrial sector negotiates wages first (Bhuller et al., 2022). As a major member of this sector, the oil industry played a pivotal role in driving favorable wage agreements over this time period. Other sectors typically use the industrial sector's outcomes as benchmarks for their own negotiations, resulting in significant wage spillovers whenever the industrial sector performs well (Dale-Olsen, 2024). Additionally, the oil sector accounts for 25% of Norway's GDP and 35% of state revenues. Although petroleum revenues are gradually phased into the economy through specific fiscal rules, the 2005-2009 boom likely stimulated demand across all sectors via increased government spending and increases in aggregate demand. By the end of this period, the unemployment rate gap between Norway and Sweden had widened significantly and the within-occupation wage gap across the two countries had grown dramatically.

Norway's rapidly expanding economy created sharp increases in labor demand for Norwegian firms, making it advantageous for Swedes to commute across the border for work. This labor demand shock can also be viewed as a shock to labor market competition in Sweden, as Swedish firms–particularly in municipalities near the Norwegian border–faced intensified competition for domestic workers. The subsequent inflow of Swedes into the Norwegian economy represents a more traditional labor supply shock to Norwegian border municipalities.[9]

Previous research has demonstrated that Swedish workers are highly responsive to economic opportunities in neighboring countries (e.g., Bütikofer et al. (2022)). Norway's economic boom during the 2005-2009 period likely spurred a significant increase in Swedish cross-border commuters. To provide preliminary evidence of this response, Figure 3 shows the number of Swedes working in Norway from 2001 through 2014.

Panel A illustrates a stable inflow of commuters from Sweden to Norway between 2001 and 2005, with an annual average of 30,000 workers crossing the border for work. However, this number rapidly increased starting in 2005, reaching approximately 60,000 by 2009. The worker flows depicted in Figure 3 strongly aligns with the divergent economic trends between the two countries shown in Figure 1. Panel B shows changes in commuting as a share of workers in our treatment and control areas introduced in Section 4.1.

Panel C highlights the percentage point change in the share of workers commuting from Sweden to Norwegian border municipalities between 2005 and 2013, revealing sharp increases.[10] Panel D shows the municipalities on the Swedish side of the border from which commuters originated, indicating the percentage point change in the share of total workers commuting into Norway. Together, these figures demonstrate that the majority of commuting increases occurred between municipalities directly on the border. Due to the tax rules in both countries, these Swedish commuters pay income taxes in Sweden rather than Norway.

Conceptually, the fact that more Swedes began commuting is an indication that the wage differential surpassed their reservation wage net of commuting costs. Alongside this action, as long as Norwegian firms can pay marginal Swedish commuters less than their Norwegian counterparts, Norwegian firms would be happy to hire equally productive commuters, even if that means paying a compensating differential above what a Swedish firm could pay.

[9]The effects of the financial crisis and Great Recession were very mild in Scandinavia and only impacted the markets for a few quarters in 2009 and 2010. This is after the major oil shock in Norway, and after the change in labor supply and demand on the border had completed their phase-in period. Therefore, it is unlikely that the effects we observe are driven by the financial crisis. Additionally, when we control for Bartik-style exposure to industry-specific shocks, our results remain nearly identical.

[10]Some municipalities in our control group on the Norwegian side exhibit significant changes due to large ski resorts, indicated by red dots. Swedes who work in these resorts during the ski season while maintaining their primary residence in Sweden are counted as commuters. Excluding these municipalities from our analysis does not affect the results. High commuter shares in certain towns in central Norway are due to their particularly small base populations.

## 3 Data

### 3.1 Overview

Our primary data come from administrative registers at Statistics Sweden and Statistics Norway, covering all individuals aged 16 to 65 from 2001 to 2014. The demographic data include age, gender, marital status, family composition, education, and residence. Socioeconomic data cover employment, occupation, industry, annual earnings, and social welfare participation.

We link our individual-level data to firms using detailed employer-employee registers, providing information on the firms where individuals work. This includes data on the firm's value-added, productivity, size, location, industry, and sector. The data cover the private sector, so firm performance information is unavailable for public sector establishments.

We utilize a unique agreement between Sweden and Norway that created a database on worker flows and commuting between the two countries in an effort to better coordinate tax administration. This data, covering 2001-2013, provides individual-level information on Swedish residents' labor market activities in Norway, including employment, earnings, industry, and municipality of work. These data are linked to our main data via social security numbers shared between the two national statistical agencies.

Our data enable us to analyze how the initial shock to the cross-country earnings gap and the subsequent labor supply shock affect individuals, firms, and local communities in both countries. Table A1 presents summary statistics for individuals (Panel A), local communities (Panel B), and firms (Panel C) on the Swedish side, while Table A2 provides the same for Norway.[11] Since we use a difference-in-differences design, we do not require treatment and control groups to be identical, only that they would have trended similarly in the absence of the shock (something we study in great detail in Section 4.2).

### 3.2 Sample Construction

In theory, the growing Norwegian economy created improved labor market opportunities accessible to all Swedes willing to commute, exposing all of Sweden to the Norwegian labor market shock. The main challenge with our analysis is, therefore, to identify observational units in Sweden that are more or less exposed to this shock. This will allow us to define a clear set of treatment and control units through which we can then disentangle the causal effect of increased competition.

To define treatment and control units, we rely on prior research showing that commuting costs rise sharply with distance (e.g., Le Barbanchon et al. (2021)) and that local labor market shocks in Scandinavia typically do not have spatial spillover effects that extend far geographically (e.g., Bütikofer et al. (2022)). Thus, areas closer to the border are likely more impacted by the shock than those farther away, providing a natural basis for categorizing treatment and control units.

[11] Note that firm statistics are not weighted by size, so individual and firm-level statistics may differ. In our firm-level estimates, we use the universe of firms for every outcome for which we have data and note that information on firm value added is not available for some firms in Sweden for whom we have worker-firm matches in the labor registers. Restricting the sample only to firms with complete data has no impact on our results.

To assess the impact of increased competition, we compare Swedish (Norwegian) municipalities bordering Norway (Sweden) with those that do not. In our main specification, our treated municipalities are border municipalities in populous counties (the largest geographic subdivision of Sweden) on the southern end of the country, which excludes the very sparsely populated northern municipalities. Control municipalities are in counties adjacent to the treatment counties, creating a spatial buffer to avoid direct effects from the border. These control areas are geographically close to the main treatment municipalities, but still sufficiently far from the border to not be directly affected by the shock. Figure 2 visually shows these municipalities for Norway (Panel A) and Sweden (Panel B). Our main analysis includes 65 Swedish municipalities and 95 Norwegian municipalities from 2001 to 2014. Across both panels, the treatment and control groups closely follow the commuting patterns in Panels C and D of Figure 3.

The municipalities used as controls in our baseline estimation are non-randomly selected. To ensure this does not influence our findings, we present sensitivity analyses where we randomly alter the set of non-border control municipalities 200 times, keeping the total number of control municipalities constant. We also show results when including all non-border municipalities as controls. Additionally, we explore how our estimates change by redefining and expanding the treated areas. We also perform a placebo treatment exercise. Finally, we present results using a synthetic difference-in-differences design.[12] Taken together, these sensitivity analyses show that our findings are robust regardless of how the treatment and control units are defined.

### 3.3 Outcomes in Sweden

Local Communities: We begin our analysis by examining the aggregate effects of the labor demand shock that affected labor competition in Swedish communities on the Norwegian border. We focus on three key margins of adjustment: labor market effects (employment in Norway, employment in Sweden, overall employment, unemployment benefits, and earnings), equality (p10, p50, p90), and community growth (population, number of workers, and number of firms). The labor market analysis examines the shock's impact on employment and wages, the equality analysis assesses its effects across the income distribution, and the community growth analysis studies population and business development. Additionally, we present evidence on total municipal income, tax revenue, social support payments, and per capita municipal income.

Firms: This analysis focuses on how increased labor demand and wage competition from Norway influence earnings, wage markdowns, employment, value-added, productivity, and the risk of firms exiting the market. We also examine effects on firms with varying levels of pre-shock labor market power. Value-added is defined as the total increase in value produced by the firm during

[12] To construct the synthetic difference-in-differences estimate, we match regions based on their outcomes during the pre-shock period (2001-2004) and adjust these outcomes for demographic factors (age, gender, education) and labor market activity (share of workers in Sweden's main sectors: manual, services, and public). We include all non-border municipalities in Sweden, excluding those in the treated group's county and the three largest metropolitan areas (Stockholm, Gothenburg, and Malmö), in the donor pool. Results remain consistent when residualizing on other factors or relaxing donor pool restrictions.

the year, calculated by subtracting the costs of all purchased goods and services that were used as inputs in the production from the value of the actual production carried out by the firm. Earnings represent the average annual salary of all workers at the establishment. The number of employees is the average number of full-time equivalent workers reported in the companies' annual reports. Wage markdowns are measured as the gap between the average value-added per worker and their average annual earnings.

### 3.4 Outcomes in Norway

Using Norwegian administrative data, we construct an analytical sample and a set of outcomes on the Norwegian side that resemble the analysis on the Swedish side as closely as possible. In this subsection, we therefore only describe the small differences in the definitions of the outcome variables we use.

At the individual level, we use each resident's place of birth to track trends in the share of workers that are foreign-born across municipalities to ensure that the localized labor market competition shock is coming through commuters rather than differential migration across municipalities in Norway. At the firm level, we lack disaggregated data on wages paid to commuters from Sweden. We also cannot identify exactly which firms employ these commuters. We can, however, observe employer-firm links for all workers who are residents on the Norwegian side regardless of their migration background. We use these links to construct a measure of total "domestic workers" connected to the firm. Importantly, we can also observe total personnel costs for the firm as reported to tax authorities, which includes wages paid to commuters from Sweden. Using this information, we can measure the possible displacement of domestic workers in favor of Swedish workers depending on the relative changes in these two variables. We also can use this measure to capture the labor share of revenues, which reflects a composite of labor costs dedicated to both domestic workers and commuters relative to their total output.[13]

### 3.5 Theoretical Expectations

From a theoretical standpoint, the effect of an increase in Swedish commuters on domestic Norwegian workers is relatively straightforward: an increase in cross-border work commuting (without an increase in local product or housing demand from immigration) would generate a rightward shift in labor supply and put downward pressure on Norwegian wages. If Swedish workers are willing to accept wages that are lower than their Norwegian counterparts at roughly similar levels of productivity – which is likely given the large within-occupation wage differential across the two countries and the relatively worse labor market options in Sweden – Norwegian firms and owners in the border regions would reap the benefits of cheaper labor while Norwegian workers would be displaced and experience reduced earnings relative to the controls.

[13] We do not distinguish between full-time and part-time workers in these links, so a portion of any measured effects could be driven by, for example, a decrease in hours for domestic workers or eliminating a part-time position for a domestic worker.

The effects on Swedish communities are theoretically ambiguous. On the one hand, Swedish workers now have better outside options and can increase both earnings and employment by engaging in cross-border commuting. These wage gains could increase local product demand in the Swedish communities. In addition, the improved return to cross-border commuting could attract additional workers to these areas that might be eager to take advantage of these opportunities. In this case, our estimates would be positive for earnings, the number of workers, and population. On the other hand, the large positive shock to commuting increases the wage pressure on Swedish firms and forces them to raise wages as a means to retain workers. Even if firms are able to match Norwegian wages (which is unlikely given the large within-occupation wage gap), this will raise labor costs, generate negative employment effects, and potentially put firms out of business. As job opportunities decrease, workers and their families might respond by relocating to another municipality, leading to lower local aggregate income, lower tax revenue, and more fragile communities. Our estimates would be negative for these outcomes.

# 4 Empirical Method

## 4.1 Estimation Strategy

Our analysis utilizes a conventional difference-in-differences framework, comparing changes in the outcomes of treated municipalities (and their firms) with changes in the outcomes of control municipalities and firms after 2004.

As illustrated in Figure 1, the Norwegian economy began diverging from the rest of the OECD in 2005 and eventually reached a new steady state in 2009. This suggests that the effects likely increased gradually from 2005 and were fully phased in by 2009. To capture this, we start by estimating non-parametric event study models to trace the treatment effects over time. While the models vary slightly depending on the unit of observation (firm or municipality), the general estimating equation is as follows:

$$Y_{it} = \alpha + \sum_{t=2001}^{t=2014} [\delta_t(Treat_{it})] + Z'\gamma + \varepsilon_{it}, \tag{1}$$

where $Y_{it}$ represents an outcome of observational unit $i$ —which may be a firm or a municipality —at time $t$. $Treat$ is a binary variable taking the value of one if the observational unit is located in a border municipality. The $\delta_t$ coefficients trace out any pre-treatment relative trends (for $\delta_{2001}$ through $\delta_{2004}$) as well as any time-varying treatment effects (for $\delta_{2005}$ through $\delta_{2014}$). We omit $\delta_{2004}$ such that all coefficients are relative to the year prior to the onset of the shock. Standard errors are clustered at the municipality level.[14]

[14] Our results are robust to using the wild cluster bootstrap method, which rules out possible inference issues related to cluster imbalance (see Appendix Tables A3 and A4). The reporting structure for firm-level variables in Norway and Sweden is such that certain local establishments have workers spanning multiple municipalities. In the firm-level analyses, we, therefore, weight exposure in treatment/control areas by the share of a firm's total workers residing in the treatment/control municipalities and cluster the standard errors at the municipality-firm level for the firm analysis. However, over 90% of the observed firm units have the entirety of their employment within the same municipality.

In terms of the fixed effects in the $Z$ vector, all specifications include year ($\gamma_t$) and municipality ($\rho_m$) fixed effects. The time fixed effects eliminate any macroeconomic shocks that affect all municipalities in the same year from biasing the results. The municipality fixed effects absorb any systematic differences across municipalities that are constant over time. In our firm-level regressions, we also include a set of firm fixed effects to net out any time-invariant systematic differences across firms.

In auxiliary analyses, we augment our main municipality-level model with two Bartik-style controls: (1) an industry control that interacts the industry-specific employment share in the municipality with national employment growth in that industry from 2004, and (2) a demographic control that interacts the share of workers that are immigrants from the (EU25) 25-country expanded European Union (excluding the Nordic countries) with national growth in non-Nordic EU25 migrants after 2004. These controls account for predicted industry composition changes and regional in-migration due to the 2004 EU expansion, ensuring our core findings are not biased by these factors.

To parsimoniously summarize the large set of coefficients obtained through Equation 1, we also present results from a simplified difference-in-differences framework:

$$\begin{aligned} Y_{it} =& \alpha_i + \beta_1 Treat_m + \beta_2 PhaseIn_t + \beta_3 FullExposure_t \\ &+ \beta_4 (Treat_m \times PhaseIn_t) + \beta_5 (Treat_m \times FullExposure_t) + Z'\gamma + \varepsilon_{it}, \end{aligned} \tag{2}$$

where $PhaseIn_t$ is a dummy variable equal to one for observations in 2005 through 2009—the years during which we see a large divergence between the economic performance of Norway and the rest of the OECD. $FullExposure_t$ is a dummy variable equal to one for observations after 2009—the year after which the full divergence has taken place. The coefficients of interest in Equation 2 are thus $\beta_4$ and $\beta_5$, providing us with average effects of the commuting shock during the phase-in period ($\beta_4$) as well as during the full exposure period ($\beta_5$). All other variables are defined as above.

Causal identification from Equations 1 and 2 requires that outcomes in treated and control municipalities would have trended similarly absent the shock (the common trends assumption). This assumption is important, because the estimation framework leverages the evolution of the outcomes in the control group to infer what would have happened in the treatment group without the shock. Additionally, identification requires no other contemporaneous policies or shocks coinciding with the Norwegian boom that occurred in the Swedish border municipalities relative to the Swedish control municipalities.

The results from Equation 1 help us examine if our data are consistent with the first assumption. Specifically, the $\delta_t$ coefficients trace out any pre-treatment relative trends (for $\delta_{2001}$ through $\delta_{2004}$), allowing us to study to what extent trends in Swedish border municipalities prior to the boom

matched those in the control municipalities.

In Section 6, we subject our analysis to a rich set of robustness checks to provide additional support for our required assumptions. We present sensitivity analyses where we randomly alter the set of non-border control municipalities 200 times, keeping the total number of control municipalities constant. We also show results when including all non-border municipalities as controls. Additionally, we examine how our estimates change by redefining and expanding the treated areas. We also perform a placebo treatment exercise in which we examine the distribution of coefficients when we randomly assign treatment status to the non-treated units. Finally, we present results using a synthetic difference-in-differences design. Taken together, these sensitivity analyses show that our findings are robust regardless of how the treatment and control units are defined; the results are robust to any type of constellation of control municipalities —whether we choose them ourselves or allow for algorithmic construction of the controls.

With respect to other events that occurred contemporaneously with the shock in Norway and that could theoretically differentially affect our treatment and control groups, we note that no other local policies were implemented in the period 2005-2009 that could plausibly explain the rapid rise of Swedish cross-border workers that we observe. Additionally, border areas on the Swedish side were not disproportionately impacted by migrant inflows following the 2004 EU expansion, and our main results hold even when incorporating Bartik-style immigration controls. Robustness tests, including randomizing control municipalities and expanding the treatment area, further support the claim that differential shocks to the treatment or control areas are not driving our findings.

### 4.2 How Large Was the Swedish Labor Supply Response?

Leveraging the Norwegian macroeconomic boom as a labor demand shock that raised real wages, incentivized increased worker commuting from Sweden, and injected a sharp increase in labor competition in Swedish border communities requires evidence that the shock indeed led to a significant increase in workers from Swedish border communities commuting to Norway. In this subsection, we present evidence of the commuting response.

First, Panel A of Figure 3 shows the annual number of Swedes earning labor income from Norway between 2001 and 2014. This descriptive plot shows raw commuting trends. Before the 2005 shock, around 30,000 Swedes worked in Norway annually. After the shock, the number of Swedes working in Norway rose sharply each year from 2005 to 2009. Following 2009, as Norway's economy stabilized, Swedish commuting also stabilized but at a much higher level, with the number of Swedes working in Norway doubling over these four years.

Second, Panel B of Figure 3 shows trends in the likelihood of Swedes working in Norway for both the control and treatment groups. The figure presents three core results: (1) both groups exhibit relatively flat trends before the Norwegian macroeconomic shock. (2) the share of Swedes in the treatment group working in Norway gradually increased until 2009, when the shock is con-

sidered to have ended.[15] By then, an average of 12 percent of the local populations in Swedish border municipalities were working in Norway (see Panel B of Figure 3). (3) there is no significant change in the share of Swedes from the control group working in Norway during this period.

Third, Panel C of Figure 3 shows the Norwegian municipalities and counties with the largest increase in Swedish commuters during the sample period, while Panel D shows the Swedish municipalities and counties with the largest outflow of workers to Norway. The Norwegian economic shock created localized commuting responses on the Swedish side, with the most significant changes in municipalities near the border. Most commuters went to nearby municipalities in Norway just across the border, as commuting costs increase with distance. The results are encouraging, as they highlight that most of Sweden was unaffected by the Norwegian boom, allowing us to identify credible counterfactuals.

Fourth, on the Norwegian side of the border, a simple comparison between the treatment and control groups further validates our findings. By 2013, near the end of the sample period, Swedish commuters constituted an average of 2 percent of the total workforce in control municipalities, while in treatment municipalities on the border, they accounted for over 11 percent of workers on average. This highlights how localized the labor market integration and competition were during the sample period.

Collectively, these four pieces of evidence provide strong evidence of an increase in local labor competition in Swedish border municipalities driven by the expansion of workers' labor market opportunities in Norway and significant labor supply responses from Swedish commuters. These factors increase competitive pressure on Swedish firms.

## 5 Results

### 5.1 Local Communities in Sweden

Our core findings from the Swedish border communities analysis using Equation 2 are shown in Table 1. We present results from three different margins of adjustments: labor market outcomes (employment in Norway, employment in Sweden, overall employment, unemployment benefits, and earnings), inequality (earnings effects at the 10th, 50th, and 90th percentile of the income distribution), and municipality population and business activity (number of workers, and number of firms). The corresponding event studies are shown in Figure 4 for key outcomes, with additional outcomes in Appendix Figure A2 (Figure A3 for Norway). The figures show little evidence of different pre-treatment trends in treatment and control areas for any of the outcomes we consider.

In terms of labor market outcomes, Panel A of Table 1 (column 1) shows a significant 415 percent increase in Norwegian employment for Swedish residents relative to the pre-shock mean. Figure 4 shows that this effect grows over time and stabilizes in 2009, when Norway's dispropor-

[15] In Appendix Table A5 we show that the increase in commuting activity in treatment versus control areas applies broadly to all industries (ranging from 1.6 to 6.1 percentage points increase in commuting by an average of 3.2 percentage points).

tionate rate of economic growth ended. By the end of our analysis period, about 3.5 percent of the Swedish border population works in Norway. Column (2) shows that the drop in Swedish employment is smaller than the increase in Norwegian employment, while column (3) suggests a slight, though statistically non-significant, overall increase in employment rates for residents. Column (4) reveals a small reduction in the rate of unemployment benefits take-up. Overall, these employment effects suggest that the Norwegian labor demand shock generated significant incentives for Swedish residents on the border to commute to Norway, shifting employment in the Swedish communities to employment in the nearby Norwegian communities, with a very small suggestive overall effect on employment rates. Column (5) of Panel A shows that the employment shifts result in a significant 6 percent earnings increase for Swedish residents compared to the pre-shock mean.[16] To facilitate the interpretation of the earnings results, note that 1 USD during our time period was equivalent to approximately 10 SEK/NOK. As with the employment effects, Figure 4 shows that this earnings growth developed gradually and stabilized in 2009. Taken together, Panel A highlights that workers in Swedish border municipalities experience substantial labor market gains due to increased labor competition among firms arising from the demand shock in Norway.

Given the nature of the shock, and the positive selection of commuters across various characteristics, it is likely that the average earnings effect in Panel A masks substantial effect heterogeneity across the income distribution.[17] To examine this in detail, Panel B shows the earnings effect on the 10th, 50th, and 90th percentile of the income distribution. We observe a substantial increase in earnings at the 90th percentile (7 percent relative to the pre-shock mean), a smaller effect at the 50th percentile (4 percent relative to the pre-shock mean), and no effect at the 10th percentile. The event studies in Figure 4 show that these effects develop over time, with the full exposure effect being nearly 100 percent larger than the phase-in effect.[18]

After having examined the labor market and inequality effects of the Norwegian labor demand shock on Swedish border municipalities, we turn to analyze the effect on the number of people, the number of workers, and the number of firms in these border communities.[19]

Column (1) of Panel C documents a sharp decline in the population of Swedish border municipalities, with Figure 4 showing a gradual development over time. By the end of the sample period, these municipalities had lost about 5 percent of their populations. As shown in column (2) of Panel C (and in Figure 4) most of the population decline is driven by a fall in the number of workers

[16] Using log earnings suggests identical percent effects, with a coefficient on the full exposure variable of 0.06 and a standard error of 0.012.

[17] Appendix Table A6 shows that Swedish commuters during the sample period were more likely to be male, hold a college degree, and have higher annual earnings while being less likely to be married or have children.

[18] In Appendix Table A7, we analyze the impact of these differential effects across the income distribution using conventional inequality measures: the 90-10, 90-50, and 50-10 gaps. The results confirm that the labor demand shock significantly increased income inequality among Swedish residents, driven mainly by accelerated income growth for those at the top of the pre-shock income distribution.

[19] We present these findings with variables measured in levels; we show robustness to using Poisson transformations in Table A8.

in these areas. That the effect on the overall population is larger than the effect on the number of workers is likely due to workers relocating together with their families.

The population decline in Swedish municipalities is not driven by an outflow of Swedish workers to Norway, mostly because the incentives to move to Norway from a border municipality in Sweden are limited. The commuting distance is short, it is considerably more expensive to live in Norway, and workers have established social networks in Sweden. Rather, as we show in Appendix Figure A4, the individuals who leave the Swedish border municipalities move to other Swedish municipalities with no particular mass in specific municipalities.[20] Furthermore, the types of municipalities they move to remain constant before and after the shock (Appendix Figure A5). In other words, the number of out-movers increases substantially, but there is no systematic change in their destinations after the shock.

The population effects present a puzzle. Despite the Norwegian boom providing strong incentives for Swedish residents to move to border communities and take advantage of higher wages in Norway, the net outflow remains large and positive, indicating that more people are leaving these areas than moving in. There are at least two potential mechanisms that can explain this result. First, the heterogeneous effects across the income distribution shown in Panel B of Table 1 suggest that the labor demand shock's benefits were unevenly distributed. While higher-income Swedish workers successfully converted the Norwegian labor demand shock into wage increases, lower-income workers did not. Instead, they faced rising inequality and a relative decline in income compared to the wealthier segments of their communities, potentially leading to negative welfare effects that made staying in these areas less appealing. Second, Norwegian labor demand shock has shifted many skilled workers from Swedish to Norwegian border municipalities, removing key labor resources from Swedish firms. If Swedish firms cannot replace these workers with equally skilled substitutes or manage rising production costs due to labor shortages and increased wage competition with Norwegian firms, they may be forced to exit the market. Since firms are vital to local community development, a reduction in business activity could trigger a snowball effect, further exacerbating population decline in these areas.

In columns (3) through (6) of Panel C, we show that the increased competition led to a reduction in the number of establishments present in Swedish border municipalities.[21] The event study in Panel F of Figure 4 confirms this effect for firms with more than three workers, with a time pattern consistent with the other outcomes discussed earlier. Notably, firms across the entire size distribution were impacted, with slightly larger firms experiencing the biggest effects relative to baseline. These findings suggest that many Swedish firms struggled to reallocate resources and absorb the pressure of keeping up with higher-paying Norwegian firms, leading to increased mar-

[20] In Appendix Figure A4, we also show that (1) people in the treated areas do not disproportionately move to our control areas and (2) there is no reallocation from the buffer zones to the treatment areas on the Swedish side.

[21] In auxiliary analysis, we find that these effects are primarily driven by firm exits, with no notable change in the entry margin

ket exits. In Section 7, we will further explore the role of firms in shaping the overall effects on Swedish communities.[22]

When interpreting the community effects in this section, it is important to consider that part of these effects may result from compositional changes in the population of Swedish border municipalities. Increased competition from Norwegian firms has led to both labor market reallocations and population outflows to other parts of Sweden. Therefore, studying how this has altered the composition of the population is crucial for understanding the mechanisms behind the observed effects, but also as outcomes of independent interest. Table 2 presents results from our main difference-in-differences analysis, examining various population characteristics (education, gender, age, marital status, and number of children). Interestingly, there are few signs of significant compositional changes, with the only notable shift being a disproportionate decline in the proportion of married individuals. Thus, the population outflows from the border regions appear to be fairly evenly distributed across education levels and other characteristics.

### 5.2 Local Communities in Norway

Our core findings from the community analysis on the Norwegian side of the border follow the same structure as that on the Swedish side of the border, and the main difference-in-differences estimates are shown in Table 3.

In terms of aggregate labor market outcomes, Panel A of Table 3 shows no effect on the total employment rate in the Norwegian border municipalities when we include resident and commuter labor. The event study in Figure 5 confirms that there are no time-varying effects missed by the difference-in-differences design and that there are no pre-treatment trends that may bias our findings. However, columns (2) and (3) reveal important worker reallocations. Column (2) shows a significant 2.1 percentage point reduction in domestic resident employment rates relative to the pre-shock mean, while column (3) indicates a 160% increase in Swedish commuters as a share of domestic workers. This suggests that the supply shock of Swedish workers led to a shift away from domestic employees towards Swedish workers. The event studies in Figure 5 show these effects grew over time and stabilized in 2009, similar to the pattern observed in Sweden.

The results in Panel A of Table 3 confirm a large inflow of Swedish commuters to Norwegian border municipalities in response to the shock. To further explore spatial displacements and spillovers, Table 4 presents two additional findings. In Panel A, we show reduced inflows to the border municipalities. In Panel B, we find that domestic Norwegian workers are more likely to

[22]The increased labor competition likely affects public budgets in Swedish border municipalities as well. In Panel A of Appendix Table A7, we show a significant decline in total wage income due to fewer workers, impacting local tax revenues and social support equalization from the central government. While there are reductions in both sources of revenue, the effect on tax revenues is particularly strong. The overall effect of this is a large decline in total funding to the Swedish border communities that will likely have implications for new investments and developments. On a per capita basis (Table A7, Panel B, Columns 4 and 5) the decline in tax revenue is not large or significant, and most of the decline is offset by a marginal but not statistically significant increase in social support spending per capita. The Scandinavian social support equalization scheme likely mitigates some of the competition's impact on communities, and in regions and countries without such schemes, the effects could be even greater.

work in buffer zone areas—municipalities adjacent to the treated border areas (but not included in the control group). These results suggest a spatial displacement pattern among domestic workers, with fewer moving to border municipalities and an increased likelihood of commuting from border municipalities to other municipalities. Overall, while there is no significant effect on total employment, there is clear evidence of worker reallocations caused by the inflow of Swedish commuters. Inflows of domestic labor were redirected away from border municipalities to buffer areas, border residents' average earnings declined marginally, and (particularly) top earners were spatially displaced. This is consistent with standard economic theory for a labor supply shock in which demand for other goods and services is held constant, as is the case given the institutional context of the commuting shock.

Similar to the analysis on the Swedish side, the average effects in Panel A of Table 3 may mask effect heterogeneity across the income distribution. Swedish commuters tend to be positively selected from the top of the income distribution (see Table A6). This may lead to greater displacement effects among higher-income Norwegian workers due to the disproportionate increase in competition in that part of the income distribution.

In Panel B of Table 3, we explore the impact of the shock on the earnings of Norwegian domestic workers at the 10th, 50th, and 90th percentiles of the pre-shock income distribution. There is little effect on earnings at the 10th percentile, while workers at the 50th percentile experience small, suggestive negative earnings effects (a 0.8 percent reduction relative to the pre-shock mean, significant only during the phase-in period). In contrast, workers at the 90th percentile see large and significant earnings reductions of 2.6 percent.[23]

After having examined the effect on labor market outcomes and inequality, we turn to analyze the effect of the shock on the population, workforce, and number of firms in the Norwegian border communities.[24] The results in Panel C of Table 3 show no impact on the population size, number of workers, or number of operating firms of various sizes in the Norwegian municipalities. Although there are no detectable effects on the number of firms, this shift may still affect firms' production and operations by providing access to a cheaper, high-quality labor source, a key input in the production process. We explore this in more detail in Section 7.

### 5.3 Summarizing the Community Effects

When analyzing the overall labor market responses to the demand shock in Norway, a clear pattern emerges: Swedish workers begin to commute from municipalities near the Norwegian border to Norwegian municipalities on the other side of the border. Meanwhile, Norwegian workers, particularly those in the top quartile of earners, relocate their workplace from Norwegian border municipalities to nearby areas. Although the effects on overall employment rates on either side of

[23] In Appendix Table A9, we show results for the 90-10 gap, the 90-50 gap, and the 50-10 gap. These results confirm that this shock reduced income inequality in Norway, driven by a reduction in earnings for workers at the top of the income distribution.

[24] We show robustness to using Poisson transformations in Table A10.

the border are relatively small, the spatial reallocations and earnings effects on high-income workers have significant implications for local inequality and the socioeconomic conditions of residents in the affected communities.

On the Swedish side, local inequality rises sharply, primarily due to earnings gains among workers at the top of the income distribution. Additionally, firms in Swedish border municipalities struggle to cope with the rising wage pressure, reduced labor supply, and selective out-migration of high-skilled workers, leading many firms to exit the market. This decline in business activity is accompanied by a significant population drop, driven by non-commuting Swedish workers and their families relocating to other parts of Sweden.

Conversely, on the Norwegian side, local inequality decreases, an effect exclusively driven by compression at the top of the income distribution caused by heightened competition for high-quality jobs. There is no significant impact on population dynamics or firm exit/entry rates. This observation suggests that the primary mechanism for population decline on the Swedish side is firm exit, which drives the increased outflow of workers despite the concurrent incentive for individuals to migrate into these areas to benefit from employment opportunities in Norway while residing in border regions on the Swedish side.

## 6 Robustness: Community Results

To ensure that our findings are not driven by specific aspects of our research design, we conduct a comprehensive set of robustness and sensitivity analyses. These analyses fall into four categories: testing the robustness of results with different control units, applying alternative estimation methods to strengthen causal identification, ruling out alternative explanations, and examining potential spatial spillover effects. We discuss each of these in detail below.

### 6.1 Selecting the Control Group

**Changing the Control Group.** A challenge with our estimation approach is selecting the control group. The control municipalities we use in our core specification are located in counties (the largest geographic subdivision of Sweden) that border the counties where the treatment municipalities are situated but are separated by a buffer of untreated municipalities in the treatment counties (Figure 2). This setup ensures a spatial buffer between the treated and control municipalities. We chose these control municipalities because they are geographically close to the treatment municipalities but are sufficiently distant from the border to remain unaffected by the labor demand shock on the Norwegian side of the border. For example, to drive from any of these control municipalities to the Norwegian border would take more than 4 hours.

Since the control group is non-randomly selected, we conduct a permutation exercise. In this exercise, we randomly assign 60 Swedish (79 Norwegian) municipalities, excluding border areas, to the control group.[25] We repeat this 200 times (with replacement) and re-estimate our main results

[25] We chose 60 municipalities in Sweden (79 in Norway) to match our baseline estimates where we have 60 (79) municipalities in the control group.

for each alternative control group, plotting the distribution of coefficients. The results are shown in Figure A6 for Sweden and Figure A7 for Norway across six key outcomes. The figures plot the coefficients from the "full exposure" values from Equation 2 and add vertical lines representing our baseline estimates.

For Sweden, Figure A6 demonstrates that our core findings hold when using alternative control groups, as all 200 coefficients are statistically significant. However, the point estimates vary slightly. While our core results for employment in Norway (Panel A), total employment (Panel B), and total wage (Panel C) are close to the median of the coefficient distribution from the 200 alternative specifications, the estimate for the 90th percentile (Panel D) is on the higher end, and our baseline estimates for population (Panel E) and number of firms (Panel F) appear slightly conservative compared to these permutations.

For Norway, the alternative control group permutation exercise suggests that our core results may be somewhat conservative for the 90th percentile (P90), earnings, number of firms, and population. This is expected, as the positive macroeconomic shock we analyze originated on the Norwegian side of the border and may have been unevenly distributed, with larger impacts in areas of significant natural resource growth but stagnant population (mainly in the northern and western regions). This is why our core analysis focuses on control municipalities in the eastern and southern parts, where the shock's impact is more comparable to the treatment region. Expanding the control group to areas that experienced stronger shocks leads to increased treatment effects, as anticipated.

**Expanding the Control Group.** In addition to randomly reassigning municipalities to the control group, we re-estimate our main specification using all non-border municipalities as controls, with and without the largest metropolitan areas (Stockholm, Gothenburg, Malmö in Sweden; Oslo, Bergen, Trondheim in Norway). This approach creates a control group more distinct from the treatment group relative to our preferred specification but helps determine whether border municipalities followed a different outcome trajectory than the rest of the country after the Norwegian labor demand shock. It also rules out the idea that our control municipalities are experiencing any unique but unmeasured positive shocks of any kind relative to the rest of the country. The results are presented in Table A11 for Sweden and in Table A12 for Norway.

For Sweden, adjusting the control group to include all municipalities except the three largest metropolitan areas (Panel A) does not impact our main estimates. However, when the metropolitan areas are included (Panel B), the effects on population and number of firms increase slightly, likely due to differing population growth trends in these areas. For Norway, including municipalities from the western and northern regions amplifies the treatment effects, similar to our findings in the control group permutation test, as these areas may have disproportionately benefited from the macroeconomic growth shock during this period.

### 6.2 Alternative Identification

**Synthetic Difference-in-Differences.** The goal of the permutation exercise is to ensure that our results are not driven by the specific choice of control units. Another way to explore this is by applying a synthetic difference-in-differences approach (Arkhangelsky et al., 2021), which extends the logic of the synthetic control method (Abadie et al., 2010) to a difference-in-differences setting. In a two-way fixed effects model with unit and time fixed effects, this method creates a synthetic weighted average of the pre-treatment outcomes from control units to match the trends of treated units in the pre-treatment period and then examines changes in these weighted averages after treatment.

Instead of directly matching covariates in the treatment and control areas before treatment, the synthetic difference-in-differences method matches pre-treatment outcome *trends* after accounting for covariates in the pre-treatment period. Our covariates include demographic factors (age, gender, education) and the share of workers in key industrial sectors–manual sectors like manufacturing and construction, services, and public–during 2001-2004. We include all non-border municipalities in Sweden that are not in counties bordering Norway as part of the donor pool, excluding the largest metropolitan areas (Stockholm, Gothenburg, Malmö). The same is done for Norway, excluding Oslo, Bergen, Trondheim, and three municipalities representing the largest employment centers for the oil sector (Stavanger, Hammerfest, Kristiansand). The results are consistent even when adjusting the covariate mix or donor pool restrictions.[26] In the model, we exclude the "phase in" period and report the "full exposure" coefficients to align with our main approach.

For Sweden, the synthetic difference-in-differences approach produces estimates similar to our core findings, though the negative effects on population and firms are slightly larger, consistent with our permutation exercise, which suggested our core estimates may be somewhat conservative (Appendix Table A13). For Norway, the synthetic difference-in-differences results closely match our baseline, with nearly all estimates within one standard error of the main model. As in Sweden, the baseline model may be on the conservative side (Appendix Table A14).

**Dosage Design.** On the Swedish side, we can use individual commuting data to estimate which municipalities in the treatment group were later more exposed to the shock due to pre-shock differences in the baseline propensity to commute among their residents. This allows us to estimate a dose-response difference-in-differences model, utilizing variation in treatment exposure rather than assuming all treatment municipalities were equally affected based on demographics and industry composition.

To perform this exercise, we first restrict our sample to individuals who are located in our main treatment municipalities in the year prior to the shock (2004). We then estimate a linear probability model of commuting using the following pre-shock variables as predictors: age (bins), gender, marital status, presence of children under the age of 18, industry of work, education, total

[26] We use Arkhangelsky et al. (2021)'s bootstrap procedure for inference.

wage, and cross-border commuting status. Next, we use these estimates to calculate the average predicted post-shock commuting probability within each of our treatment municipalities. Finally, we estimate a modified version of our main specification in which we interact the phase-in and full-exposure dummies with this predicted dosage variable rather than with a dummy that treats all municipalities in the treatment group as identical.

The results in Table A15 exhibit strikingly similar patterns to the main findings. This is reassuring, suggesting that those areas in the treatment group that likely experience a greater outflow of workers in response to the shock also experience the largest effects due to the shock. To interpret these briefly, in Panel A, a 10 percentage point increase in the predicted share of workers within a border municipality commuting to Norway raises average earnings by 12,300 SEK. In Panel C, the population of the municipality declined by approximately 570 people and 360 workers. The number of firms decreased by approximately 25. These effects are remarkably similar in scale to the effects in Table 1.

### 6.3 Alternative Explanations and Falsification

**Industry Compositions.** A possible threat to our interpretation of the estimates being driven by increased demand for - and competition over - labor, is potential changes in industry composition directly affecting firms and (indirectly) communities. We approach this concern with two pieces of evidence and show that this is unlikely to drive our findings. First, we show that industry compositions between the treatment and control groups both on the Swedish and Norwegian side are remarkably similar at baseline. These results are shown in Table A16 and A17. Second, we construct a Bartik-style shift-share industry control that interacts the industry-specific share of total employment in the municipality with the national growth in employment in that industry from the year before the shock (2004). This control is intended to capture any ex-ante predicted shocks to industry composition over time and ensure that our core findings are not biased by such phenomena. The results are presented in Table A18 for Sweden and Table A19 for Norway. The tables show that our findings are robust to controlling for possible changes in industry compositions over time, suggesting that this is not biasing our findings. Given the nature of the shock (a highly localized labor market shock) and the fact that the industry composition is very similar at baseline, this result is expected.

**European Union Expansion.** Another potential threat to our identification is the 2004 EU expansion, which admitted 10 new member states and allowed free movement across the region, leading to a large inflow of workers from Eastern Europe. If differential immigration from these new member states occurred between our treatment and control groups, it could bias our results. We address this concern with two analyses. First, we show that the number of non-Nordic EU25 workers entering our treatment and control areas remained similar throughout the analysis period in Sweden (Panel A of Figure A8).[27] While other parts of Sweden saw a sharp rise in EU25 workers,

[27] We use this designation of EU25 countries because we cannot isolate the exact country of origin for immigrants

the increase in our sample areas was smaller and consistent across treatment and control groups. This is because most new migrants settled in large metropolitan areas, which are excluded from our analysis. The same is true in Norway (Panel B), where the migration effects of EU expansion were mostly felt in areas outside our treatment and control areas. Treated municipalities had a slightly smaller influx of workers after EU expansion despite parallel trends and similar levels before 2005. This is likely a direct result of the differential influx of Swedish commuters, consistent with the spatial diversion of worker inflows away from border municipalities (see Table 4).[28] Second, we construct a Bartik-style control, interacting the non-Nordic EU25 share of employment in 2004 with national EU25 migrant growth post-2004. Results in Table A20 for Sweden and Table A21 for Norway closely match our baseline findings, suggesting that the EU expansion is not a significant concern.[29]

### 6.4 Demand for Goods and Services

During the period of rapid growth in Norway, one might expect that higher-income Norwegians might increase their purchases of Swedish goods and services due to cross-border differences in the relative costs of goods, boosting demand and profits for local businesses in Swedish border areas. This could mute any potential negative effect of increased labor market competition on local firms and cause our estimates to constitute lower bounds. However, there is no evidence of significant changes in cross-border trade between border and non-border municipalities on either the Swedish (buyer destination) or Norwegian (buyer source) side (Figure A9). This may be due to the relatively stable exchange rate and inflation during this period which kept cross-border shopping incentives constant (Panel B of Figure A1). While there is some increase in trade in Strömstad compared to other border trade destinations, this occurs post 2009—after the Norwegian economy and the Swedish commuting rates had already stabilized—making it inconsistent with the timing of our observed effects. This provides strong support for our effects identifying local labor shocks rather than spillover effects from product demand.

It is important to note that while the Norwegian macroeconomic shock affects the labor market rather than the goods market, there could still be general equilibrium effects on the goods market in Sweden. If Swedish workers earn more as a result of commuting, they are likely to increase spending, which could increase demand for local goods and services, potentially muting any observed negative impacts on firms and local community development. Conversely, if the shock causes population flight, local demand could decline, amplifying any negative impacts on firms and communities. This is not a concern for identification but rather a potential mechanism underlying our

in the data on the Swedish side.

[28] Estimating our difference-in-differences model on the share of non-Swedish resident immigrants yields a significant point estimate of -0.014, indicating possible displacement of non-Swedish immigrant inflows.

[29] In Norway, we can isolate immigration from the 10 EU expansion states rather than relying on coarser measures of the 25 EU states. As on the Swedish side, these Bartik controls do not impact our results. Thus, the gap between treatment and control groups in non-Swedish immigrant inflows in Norway likely results from the influx of Swedish commuters, not external factors. Our results are also robust to directly controlling for demographic and skill composition (Appendix Table A22).

results. In Section 8, we explore this in detail, including a firm-level analysis for companies in the tradable goods sector, which are less influenced by local demand changes (see Beaudry et al. (2012)).

**Placebo Estimates.** In addition to examining robustness to the choice of control municipalities, exploring alternative identification approaches, and studying potential confounders, we also conduct a series of placebo tests. To do so, we generate 50 quasi-random clusters of fake treatment municipalities (random selection with replacement) from the pool of municipalities that are not in our main treatment group and not in our main control group. Similar to before, we also exclude the three metropolitan areas of Stockholm, Gothenburg, and Malmö. Using these 50 placebo treatment groups, we then re-estimate our main specification and plot the distribution of the estimates.

The results from this exercise are presented in Figure A10 with respect to Sweden, and show that our baseline estimates are always at the tails of the distribution. This demonstrates that our core results cannot be replicated when selecting a random set of non-border municipalities to treatment, further strengthening the causal claims we make in the paper.[30] A similar exercise with the same conclusion for Norway is shown in Figure A11.

### 6.5 Spillovers

In the main analysis, we focused on the populous border municipalities in southern Sweden as the treatment group to capture the areas most affected by the shock. However, it is important to explore whether the sparser northern border municipalities were also impacted and whether there are spillover effects to nearby municipalities that do not border Norway.

To this end, we have estimated a series of regressions in which we first expand the treatment group to include all border municipalities (including those in the sparse northern area), all municipalities in the counties that our main treatment municipalities are located in (including those municipalities in the counties that are not on the border), all municipalities in all border counties (including those in the north), all municipalities in the counties that our main treatment municipalities are located in except our main treatment municipalities, and all municipalities in all border counties except those that are at the border. The idea behind this analysis is to examine how pervasive the effects are as we gradually move away from the most affected areas, both in terms of assessing the likely validity of our estimation strategy (the further away from the border, the smaller we expect the effects will be) and in examining potential spillover effects. The results are shown in Figure A12 for Sweden and in Figure A13 for Norway.

In Sweden, the results illustrate the gradual expansion of the treatment group to encompass all border municipalities leads to slightly muted commuting effect but otherwise very similar estimates as our baseline estimates. The results further show that there are some small commuting and wage effects on municipalities that are not on the border. However, these effects are significantly smaller

[30] This exercise also provides strong non-parametric evidence of statistical significance regardless of the asymptotics of the clustering structure or spatial correlation of the errors, as might be a concern with spatial units that are located next to each other.

than our baseline results and do not translate into significant effects on population and number of firms. This demonstrates how localized the labor demand shock was, helps strengthen the SUTVA assumption underlying our core estimation approach, and suggests that our selected set of control and treatment municipalities are appropriate. This result is also interesting from a policy perspective, highlighting the very local nature of labor market shocks and the implications for community development.

In Norway, the treatment effects when we include all border municipalities in the analysis are generally marginally smaller than when we use our base treatment municipalities. When including the entirety of border counties in the analysis or for other configurations, the estimates are typically not statistically different from zero. Notably, when using municipalities in border counties that are not actually touching the border as treatment units, there is some evidence of possible spatial spillovers for some outcomes, consistent with Table 4: the sign of the effects from our main treatment group often flip (spillover 1 and spillover 3). This result underscores that our exclusion of non-border municipalities in border counties in our treatment and control groups (giving us a spatial buffer between the two) is appropriate.

## 7 Mechanism: Firm Responses

A key result we find for Swedish communities is a decline in business activity due to increased labor demand and competitive pressures from Norwegian firms. In this section, we present our firm-level analysis to better understand how firms were affected by the labor demand shock on the Norwegian side of the border and how this influenced worker movements both across and within communities on both sides of the border, as well as the population decline on the Swedish side.

### 7.1 Swedish Firms

Table 5 presents our difference-in-differences estimates for Swedish firms across three adjustment margins: workers and earnings (Panel A), entrants and incumbents (Panel B), and value added and productivity (Panel C). To further explore the mechanisms behind these effects, we also provide evidence on capital intensification, revenues, and production scale-up (Appendix Table A23). Appendix Figure A14 shows event studies for the firm outcomes, with little evidence of pre-trends that could bias the results. The time patterns align with our core community findings, showing small effects in the early years as commuting increased gradually, and stronger effects during the full exposure period when commuting impacts peaked.

In terms of workers and earnings, Column (1) of Panel A shows that Swedish firms lost workers due to increased labor market competition from Norwegian firms. During the full exposure period, average firm size in Swedish border municipalities declined by 7 percent compared to the pre-shock mean. Column (2) indicates that many firms were unable to absorb the higher labor costs needed to retain workers in the face of competition from Norwegian firms, leading to a 21 percent increase in firm exits during the full exposure period compared to the pre-shock mean. Column (3) of Panel A shows that workers who remained in Swedish firms saw an earnings increase of about 2

percent in the full exposure period, although the difference-in-differences estimate is noisy. Event studies in Figure A14 provide more precise evidence of this earnings effect at the end of the sample period.

This average pay increase masks important compositional changes to the workforce. As shown in Table A6, commuters to Norway were disproportionately higher earners in 2004. Estimating our base difference-in-difference model by subgroup, those above their municipality's median income experienced a 6% earnings increase compared to 1% for those below the median. This suggests that the workers who remained at Swedish firms had lower pre-shock earnings and potentially lower productivity. Thus, productivity-adjusted earnings likely increased by more than shown in Column (3), reflecting firms' efforts to retain workers by raising wages and reducing average labor markdowns in response to the competition from Norway (see below).

To better understand the turnover changes faced by Swedish firms in border municipalities, Panel B examines the effects on both incumbents and new entrants. Columns (1) and (2) show that both the number of new entrants and incumbents declined, by 13 percent and 3 percent, respectively, compared to the pre-shock mean. This indicates that the high turnover rate results from both fewer new entrants and more frequent exits of incumbent workers.[31] In Columns (3) and (4), we break down the wage effects from Panel A into earnings for new entrants and incumbents. The slight earnings increase seen in Panel A, confirmed through event studies in Figure A14, is driven entirely by incumbent workers. This suggests that firms in Swedish border areas are raising wages to retain their productive workers, preventing them from commuting to Norway.

If the average worker earns slightly more due to the Norwegian labor demand shock (or at least not less), but the quality of the remaining workers declines (as indicated by the positive selection of commuters discussed earlier), their earnings relative to their productivity would have increased substantially. This would lead to higher labor costs for firms relative to their overall production and productivity, helping to explain the sharp increase in firm exit rates shown in Panel A of Table 5. To examine this further, Panel C of Table 5 looks at value added and productivity effects. Column (1) shows a decrease in firms' overall value-added, while Column (2) confirms this reduction on a per capita basis, with a significant 12 percent drop. This suggests that workers at the Swedish firms are earning slightly higher nominal earnings but are of lower quality. Thus, their earnings relative to productivity have risen considerably due to the increased competition for labor from Norway. To measure the cost per unit of labor quality more directly, Column (3) examines the average markdown: the gap between per capita value-added and average worker earnings. This markdown shrinks sharply after the labor demand shock, indicating that firms are now paying wages closer to the marginal revenue product of labor. This shift is driven by both a reduction in labor quality

[31] The number of workers is measured as the average number during the calendar year using firm accounting data, while the number of entrants and incumbents is based on flows over the year as of November, using employer-employee matched data. Therefore, results in Panel A column (1) are not directly comparable to those in Panel B columns (1) and (2).

and an increase in average earnings, meaning that firms are reallocating some of their quasi-rents back to workers. This provides insight into the strategic decisions firms are making in response to the new competition and helps explain the sharp increase in firm exits observed in the previous section. These results are consistent with models in which upward pressures on wages lead to reallocations of labor, decreases in employment, and firm exit such as the typical minimum wage model in competitive labor markets.

Finally, in Appendix Table A23, we also examine how firms respond through capital use, net revenues, and production scaling. While there is no significant effect on capital use (a noisy 10 percent decrease relative to the pre-shock mean), we observe an 18 percent drop in the total value of firm inventories, which measures the value of final goods held for future sales. This indicates a considerable long-term scale-down effect. In terms of net revenues, we find a significant 12 percent decline.

To what extent are these results influenced by pre-existing market structures on the Swedish side? According to prior research (e.g., Dodini et al. (2023); Silliman and Willén (2024)), the level of labor market competition that Swedish firms faced before the shock likely affected their ability to respond. To explore this, we construct labor market concentration indices (using the Herfindahl-Hirschman Index for employment by 3-digit occupation in each municipality) and re-estimate the results for firms with linear interactions for HHI in 2004 using a modified version of Equation 2 in which we include a simple interaction for treatment and a post indicator.[32]

The results from this exercise are in Table 6. Most of the average firm response is driven by firms in more concentrated local labor markets. First, the result in column 1 shows that firms in more concentrated markets lost more workers than firms in more competitive markets in response to the rise in the Norwegian wage rates. All else equal, this is expected if firms in more concentrated markets pay a lower wage (relative to the workers' productivity) such that the incentives to commute to Norway are stronger for workers at these firms.

Second, in terms of average pay, while the interacted estimates are not statistically significant, the point estimates suggest that firms in competitive markets drive the majority of the average earnings effect we find. To some extent, this is a surprising result, as we would expect monopsonistic employers to be able to afford greater wage increases due to the existence of supernormal profits. At the same time, monopsonistic firms are also more likely to be able to absorb cost increases without having to adjust their production processes and may therefore be willing to endure the labor supply reduction without adjusting wages.

Third, we find that firms in concentrated markets experience much greater reductions in value-added per worker and a more substantial decline in markdowns. In other words, firms in concen-

[32]Border municipalities are relatively self-contained labor markets: before 2005, 85 percent of workers in the treated municipalities worked in their municipality of residence, with only 5 percent commuting to another border municipality. Thus, the municipality level is a suitable market definition in this setting. Our decision to focus on HHI calculated at the 3-digit occupation level is guided by prior work in this area (e.g., Azar et al. (2020)).

trated markets lose their more productive workers at higher rates but do not pay the remaining workers any less. Thus, while it may look like firms in concentrated markets are not responding on the wage margin (column 2), they are actually doing so once the earnings have been adjusted for the productivity of the remaining workers.

Finally, column (5) shows that the entire firm exit effect is loading on firms in competitive markets, in which the labor costs have gone up even though they are not making any supernormal profits on the labor side (and therefore are likely to go into debt). This set of results is consistent with theories on monopsony power (Manning, 2003a) in which firms with monopsonistic power are able to absorb some of the increasing costs by reallocating quasi-rents to workers, thereby avoiding firm exit. An interesting implication of the labor demand shock in Norway, therefore, appears to be a transition towards more concentrated labor markets on the Swedish side. This may have important implications for long-run market dynamics.

### 7.2 Norwegian Firms

Our core findings from the firm-level analysis on the Norwegian side of the border are summarized in Table 7. Similar to the Swedish analysis, we present the difference-in-differences estimates for Norwegian firm outcomes and focus on three adjustment margins: workers and earnings (Panel A), entrants and incumbents (Panel B), and value added and productivity (Panel C). Event studies for these firm outcomes are shown in Appendix Figure A15.

In terms of workers and earnings, Column (1) of Panel A shows that Norwegian firms significantly reduce the number of non-commuter employees by around 10 percent relative to the pre-shock mean. While we cannot directly link Swedish workers to specific Norwegian firms, the community-level analysis shows that the employment rate for domestic Norwegians falls by a relatively small amount and is offset by commuting to neighboring municipalities. Swedish workers commuting to Norway increased by over 400 percent, and the average firm size on the Swedish side declined by 7 percent. Therefore, the reduction in domestic employment seen in Column (1) likely reflects the substitution of Norwegian workers with Swedish commuters. Column (2) of Panel A shows no significant effect on firm exits, consistent with the null effect on the number of operating firms in Norwegian border municipalities found in the community-level analysis. Finally, Column (3) reveals a significant drop in the average pay for domestic resident workers in Norwegian border firms, with earnings decreasing by approximately 3 percent relative to the pre-shock mean by the end of the analysis period, likely due to the influx of Swedish commuters.

To better understand the turnover and earnings changes experienced by Norwegian firms due to the influx of Swedish commuters, Panel B examines the effects on both incumbents and new entrants. Columns (1) and (2) show that the reduction in domestic employment is driven by an increased exit rate of incumbent workers, rather than a decline in new entrants. This aligns with the spatial reallocation of workers to buffer zones, as shown in Table 4 and discussed in Section 3.2. However, both new hires and incumbents experience earnings reductions. This suggests that

Norwegian firms lower domestic wages in response to the shift in labor supply. This is expected, as the inflow of Swedish commuters intensifies job competition and exerts additional downward pressure on wages, likely due to Swedish commuters having a lower reservation wage. This is similar to the case of immigrants in general (Hirsch and Jahn, 2015), and theories and evidence that commuters may not be fully compensated for their commutes (Manning, 2003b). This is also consistent with the typical predictions of a labor supply shock when demand for goods and services is held fixed, which is expected given that we examine a commuting shock rather than a migration shock.

In Panel C of Table 7, we explore the impact of the increased inflow of Swedish commuters on value added and productivity. While there is no significant change in the total value added at Norwegian firms (Column 1), Column (2) shows that value added per domestic worker rises by 43,000 NOK, which is an 8.5 percent increase from the pre-shock mean. Additionally, Column (3) shows that the gap between value added per domestic worker and the average annual earnings of domestic workers grew by nearly 30 percent, suggesting that Norwegian border firms maintain similar value-added levels while reducing personnel costs due to the influx of cheaper Swedish commuters. Consistently, Column (4) shows that personnel costs (which include the cost of wages to Swedish commuters) as a share of total operating revenues drop by about half a percentage point, indicating an increase in the capital share of income.

Overall, these results indicate a significant substitution of domestic workers with Swedish commuters, leading to a reduced overall wage bill without a decline in value added. Norwegian firms benefit from the labor supply shift by maintaining the same level of production while paying significantly less for the output, capitalizing on the lower labor costs brought by Swedish workers.

### 7.3 Summarizing the Firm Effects

When comparing firm responses on both sides of the border to the demand shock in Norway and the inflow of Swedish commuters, a clear pattern emerges.

On the Swedish side, increased competition from Norwegian firms leads Swedish firms to re-optimize by reducing their size and increasing wages slightly for those who remain, even though these workers are less productive. Declines in value added per worker and average markdowns, especially in concentrated markets, point to a scaling down of operations, supported by the significant drop in firm inventory values. Firms in competitive markets attempt to raise wages to compete, but this results in increased firm exits due to the lack of supernormal profits to absorb rising labor costs. These results align with monopsony power theories, where firms with market power can absorb rising costs by reallocating quasi-rents to workers and avoid exiting the market.

In contrast, Norwegian firms benefit from attracting higher-productivity Swedish workers, which allows them to reduce domestic wages and substitute costly domestic labor. As a result, Norwegian firms maintain the same level of output while lowering costs and decreasing the labor share of revenue, consistent with Swedish commuters having a lower reservation wage.

Overall, Norwegian firms gain from this labor supply shift, consistent with standard theory regarding labor supply shocks when product demand is held fixed. In general, the effects on communities are relatively modest and do not significantly impact Norwegian regions at a broader level, though workers in direct competition with Swedish commuters (i.e. higher-income domestic workers) do experience displacement and some reduction in earnings. On the Swedish side, however, the increased competition leads to substantial and lasting negative effects on the number of firms, workers, and population size.

## 8 The Goods Market

As shown in Figure A9, the Norwegian shock affects the labor market, not the goods market. However, there could still be an indirect impact on Sweden's goods market in general equilibrium. Higher earnings for Swedes may increase local demand, potentially offsetting the effects on firms and community development. Conversely, population decline could reduce demand for local goods and services, amplifying the impact on firms and community development. The potential impact on Sweden's goods market in general equilibrium does not threaten our identification strategy, as our aim is to assess the overall impact of increased labor market competition on local communities. However, the goods market may play a significant role in the effects we observe. To explore this, we conduct a series of supplemental analyses to better understand the goods market's role in driving our results.

First, we examine the impact of increased labor market competition on sales revenue in the retail, hotel, and restaurant industries (which we call "local goods") across control and treated areas to assess how local demand for goods and services has shifted in response to the shock. This is important because our analysis shows two opposing forces affecting local demand: rising earnings and declining population. Second, we analyze house prices in treatment and control areas to gain further insight into how the labor demand shock in Norway affected local prices in Sweden. This is relevant because wealthier individuals can afford higher property prices, while population decline could drive prices down. Lastly, following insights from Beaudry et al. (2012) and Caldwell and Danieli (2024), we re-estimate firm effects focusing on firms producing tradable goods more likely to be sold outside the region. This helps isolate the competition effect by excluding firms less affected by changes in local demand.

The results from our supplemental analyses on house prices and local goods sales revenue are shown in Table A24, and the effects on firms in the tradable goods sector are shown in Table A25. We find no effect on the aggregate sales revenue of firms producing locally consumed goods and services, indicating that increased income from commuting and population decline offset each other. We also find no effects on house prices, suggesting that the rise in disposable income is counterbalanced by population decline and growing inequality. Finally, the impact of increased competitive pressure on Swedish firms in the tradable goods sector is similar to the overall effect in all sectors. Overall, these analyses strongly suggest that the goods market is not the main channel

through which our observed effects operate, offering new insights into the relationship between labor market competition and local community development.

## 9 Discussion

This paper provides novel evidence on the consequences of labor market competition on the entire ecosystem of local communities, examining the impact across all segments of society using unique features of the Scandinavian labor market as a basis for analysis. Identifying variation is obtained from a shock to labor demand in Norway, which raised real wages and drove an increase in commuting from Sweden to Norway, thereby generating a substantial increase in competition for Swedish labor on the border.

The main takeaway from this paper is that labor demand shocks that increase workers' outside wage options in neighboring locations can have dramatic and persistent effects on both sending and receiving communities and send ripple effects across all segments of society, even in countries where automatic stabilizers are designed to blunt the impact of local economic shocks. Specifically, we show that Swedish firms respond to increased competitive pressure by raising wages relative to productivity in an attempt to retain their workforce. The remaining and newly hired workers tend to be of lower quality, leading to decreased value added per worker and a higher likelihood of firm exits. These negative effects spill over into the communities, causing population declines, reduced business activity, increased inequality, and greater reliance on central government support. These effects persist for at least a decade after the shock.

Using data from the Norwegian side, we show that Norwegian workers are spatially displaced by Swedish workers. This is particularly the case for high-skilled Norwegian workers, who lose their skill premium due to the influx of positively selected high-skilled Swedish workers. These workers are more likely to take up work in neighboring municipalities. Inflows of domestic workers are diverted by Swedish commuting to nearby municipalities. This leads to earnings compression at the top of the income distribution and lower overall income inequality in Norwegian border municipalities. Additionally, Norwegian firms benefit from lower labor costs with similar levels of productivity, resulting in a higher capital share of revenue. This leaves these firms clearly better off compared to a scenario without access to Swedish labor.

In interpreting our findings and applying them to other contexts, it is important to note that our commuting shock came not through a policy change, but arose organically from a shock to labor demand, an increase in wage differentials across the Norwegian border, and a responding labor supply shock from Sweden. We thus significantly advance the existing literature by (1) analyzing both sides of the affected border; (2) examining multiple adjustment windows such as worker flows and community- and firm-level effects; (3) isolating a pure labor supply shock via commuting, which is free from confounders arising from the strong increase in product demand that immigrants bring; and (4) analyzing a shock that occurs frequently, i.e. changes in financial incentives for commuting. Most importantly, our paper extends beyond the literature on border effects and is

applicable to any emergence of labor demand shocks and wage differentials across space—with or without borders. These shifts can occur across cities, metro areas, regions, or countries, i.e. *any geography* that is spatially connected. These results are, therefore, informative about a broad range of labor market settings and regional development patterns within and across countries. Given the dynamic nature of local labor markets and their sensitivity to economic changes, understanding these forces is crucial for predicting and shaping labor market interactions and community growth and development. Additionally, similar effects could arise if policies directly reduce competition barriers, such as competition or migration policies, or changes in currency exchange rates as they also impact wage differentials and workers' outside options.

As national competition authorities push for increased labor market competition across regions, and as governments establish commissions to promote local labor market competition (e.g., the 2022 Economic Report of the President of the United States), it is vital to understand the broader effects on communities. This knowledge will help us grasp the wider implications of labor competition for social cohesion and predict the future of work in a more interconnected world. Our study on the Sweden-Norway border offers a unique opportunity to isolate and identify the effects of labor market dynamics that are relevant regionally and globally. Based on our findings, a promising area for future research is to explore the consequences of these competition dynamics for individual workers (those who benefit, those left behind, and those who move) and their effects on aggregate productivity, allocative efficiency, and economic dynamism.

## References


**Aaronson, Daniel, Eric French, Isaac Sorkin, and Ted To.** 2018. "Industry Dynamics and the Minimum Wage: A Putty-Clay Approach." *International Economic Review*, 59(1): 51–84.

**Abadie, Alberto, Alexis Diamond, and Jens Hainmueller.** 2010. "Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program." *Journal of the American Statistical Association*, 105(490): 493–505.

**Arkhangelsky, Dmitry, Susan Athey, David A Hirshberg, Guido W Imbens, and Stefan Wager.** 2021. "Synthetic Difference-in-Differences." *American Economic Review*, 111(12): 4088–4118.

**Autor, David, David Dorn, and Gordon Hanson.** 2016. "The China Shock: Learning from Labor-Market Adjustments to Large Changes in Trade." *Annual Review of Economics*, 8 205–240.

**Autor, David, David Dorn, and Gordon H Hanson.** 2021. "On the Persistence of the China Shock." *NBER working paper 29401*.

**Azar, José, Emiliano Huet-Vaughn, Ioana Marinescu, Bledi Taska, and Till Von Wachter.** 2019. "Minimum Wage Employment Effects and Labor Market Concentration."Technical report, NBER Working Paper No. 26101.

**Azar, José, Ioana Marinescu, and Marshall Steinbaum.** 2022. "Labor Market Concentration." *Journal of Human Resources*, 57(S): S167–S199.

**Azar, José, Ioana Marinescu, Marshall Steinbaum, and Bledi Taska.** 2020. "Concentration in US labor Markets: Evidence from Online Vacancy Data." *Labour Economics*, 66, p. 101886.

**Bassanini, Andrea, Giulia Bovini, Eve Caroli, Jorge Casanova Ferrando, Federico Cingano, Paolo Falco, Florentino Felgueroso, Marcel Jansen, Pedro S Martins, António Melo et al.** 2024. "Labor Market Concentration, Wages and Job Security in Europe." *Journal of Human Resources*.

**Beaudry, Paul, David A Green, and Benjamin Sand.** 2012. "Does Industrial Composition Matter for

Wages? A Test of Search and Bargaining Theory." *Econometrica*, 80(3): 1063–1104.

**Beerli, Andreas, Jan Ruffner, Michael Siegenthaler, and Giovanni Peri.** 2021. "The Abolition of Immigration Restrictions and the Performance of Firms and Workers: Evidence from Switzerland." *American Economic Review*, 111(3): 976–1012.

**Benmelech, Efraim, Nittai K Bergman, and Hyunseob Kim.** 2022. "Strong Employers and Weak Employees How Does Employer Concentration Affect Wages?" *Journal of Human Resources*, 57(S): S200–S250.

**Bhuller, Manudeep, Karl Ove Moene, Magne Mogstad, and Ola L Vestad.** 2022. "Facts and Fantasies About Wage Setting and Collective Bargaining." *Journal of Economic Perspectives*, 36(4): 29–52.

**Borjas, George J.** 1987. "Immigrants, Minorities, and Labor Market Competition." *ILR Review*, 40(3): 382–392.

**Borjas, George J.** 2003. "The Labor Demand curve is Downward Sloping: Reexamining the Impact of Immigration on the Labor Market." *The Quarterly Journal of Economics*, 118(4): 1335–1374.

**Bütikofer, Aline, Katrine V Løken, and Alexander Willén.** 2022. "Building Bridges and Widening Gaps." *The Review of Economics and Statistics* 1–44.

**Caldwell, Sydnee, and Oren Danieli.** 2024. "Outside Options in the Labour Market." *Review of Economic Studies*.

**Caldwell, Sydnee, and Nikolaj Harmon.** 2019. "Outside Options, Bargaining, and Wages: Evidence from Coworker Networks."

**Card, David.** 1990. "The impact of the Mariel boatlift on the Miami labor market." *ILR Review*, 43(2): 245–257.

**Cengiz, Doruk, Arindrajit Dube, Attila Lindner, and David Zentler-Munro.** 2022. "Seeing Beyond the Trees: Using Machine Learning to Estimate the Impact of Minimum Wages on Labor Market Outcomes." *Journal of Labor Economics*, 40(S1): S203–S247.

**Cengiz, Doruk, Arindrajit Dube, Attila Lindner, and Ben Zipperer.** 2019. "The Effect of Minimum Wages on Low-Wage Jobs." *The Quarterly Journal of Economics*, 134(3): 1405–1454.

**Dale-Olsen, Harald.** 2024. "Technological Development, Market Power, and the Role of Unions."

**Dicarlo, Emanuele.** 2022. "How Do Firms Adjust to Negative Labor Supply Shocks? Evidence from Migration Outflows."

**Dodini, Samuel, Michael Lovenheim, Kjell Salvanes, and Alexander Willén.** 2024. "Monopsony, Job Tasks and Labour Market Concentration." *The Economic Journal*, 134(661): 1914–1949.

**Dodini, Samuel, Anna Stansbury, and Alexander Willén.** 2023. "How Do Firms Respond to Unions?"Technical report, CESifo.

**Dustmann, Christian, Attila Lindner, Uta Schönberg, Matthias Umkehrer, and Philipp Vom Berge.** 2022. "Reallocation Effects of the Minimum Wage." *The Quarterly Journal of Economics*, 137(1): 267–328.

**Dustmann, Christian, Uta Schönberg, and Jan Stuhler.** 2016. "The Impact of Immigration: Why Do Studies Reach Such Different Results?" *Journal of Economic Perspectives*, 30(4): 31–56.

**Dustmann, Christian, Uta Schönberg, and Jan Stuhler.** 2017. "Labor Supply Shocks, Native Wages, and the Adjustment of Local Employment." *The Quarterly Journal of Economics*, 132(1): 435–483.

**Ekeland, Anders.** 2017. "Sysselsatte i petroleumsnæringene og relaterte næringer 2016."Technical report, Statistisk sentralbyrå.

**Foged, Mette, and Giovanni Peri.** 2016. "Immigrants' Effect on Native Workers: New Analysis on Longitudinal Data." *American Economic Journal: Applied Economics*, 8(2): 1–34.

**Friedberg, Rachel M.** 2001. "The Impact of Mass Migration on the Israeli Mabor Market." *The Quarterly Journal of Economics*, 116(4): 1373–1408.

**Friedberg, Rachel M, and Jennifer Hunt.** 2018. "The Impact of Immigrants on Host Country Wages, eEployment and Growth." In *The New Immigrant in the American Economy.*: Routledge, 89–110.

**Grossman, Jean Baldwin.** 1982. "The substitutability of natives and immigrants in production." *The Review*

*of Economics and Statistics* 596–603.

**Hafner, Flavio.** 2021. "Labor Market Competition, Wages and Worker Mobility."

**Harasztosi, Peter, and Attila Lindner.** 2019. "Who Pays for the Minimum Wage?" *American Economic Review*, 109(8): 2693–2727.

**Hau, Harald, Yi Huang, and Gewei Wang.** 2020. "Firm Response to Competitive Shocks: Evidence from China's Minimum Wage Policy." *The Review of Economic Studies*, 87(6): 2639–2671.

**Hershbein, Brad, Claudia Macaluso, and Chen Yeh.** 2018. "Concentration in US Local Labor Markets: Evidence from Vacancy and Employment Data."Technical report, Working paper.

**Hirsch, Boris, and Elke J Jahn.** 2015. "Is There Monopsonistic Discrimination Against Immigrants?" *ILR Review*, 68(3): 501–528.

**Johnson, George E.** 1980. "The labor market effects of immigration." *ILR Review*, 33(3): 331–341.

**Le Barbanchon, Thomas, Roland Rathelot, and Alexandra Roulet.** 2021. "Gender Differences in Job Search: Trading Off Commute Against Wage." *The Quarterly Journal of Economics*, 136(1): 381–426.

**Manning, Alan.** 2003a. *Monopsony in Motion: Imperfect Competition in Labor Markets*.: Princeton University Press.

**Manning, Alan.** 2003b. "The Real Thin Theory: Monopsony in Modern Labour Markets." *Labour Economics*, 10(2): 105–131.

**Marinescu, Ioana, Ivan Ouss, and Louis-Daniel Pape.** 2021. "Wages, Hires, and Labor Market Concentration." *Journal of Economic Behavior & Organization*, 184 506–605.

**Mayneris, Florian, Sandra Poncet, and Tao Zhang.** 2018. "Improving or Disappearing: Firm-Level Adjustments to Minimum Wages in China." *Journal of Development Economics*, 135 20–42.

**Neumark, David, and William L Wascher.** 2008. *Minimum Wages*.: MIT press.

**Ottaviano, Gianmarco IP, and Giovanni Peri.** 2012. "Rethinking the Effect of Immigration on Wages." *Journal of the European Economic Association*, 10(1): 152–197.

**Piyapromdee, Suphanit.** 2021. "The Impact of Immigration on Wages, Internal Migration, and Welfare." *The Review of Economic Studies*, 88(1): 406–453.

**Prager, Elena, and Matt Schmitt.** 2021. "Employer Consolidation and Wages: Evidence from Hospitals." *American Economic Review*, 111(2): 397–427.

**Qiu, Yue, and Aaron Sojourner.** 2019. "Labor-Market Concentration and Labor Compensation." *Available at SSRN 3312197*.

**Riley, Rebecca, and Chiara Rosazza Bondibene.** 2017. "Raising the Standard: Minimum Wages and Firm Productivity." *Labour Economics*, 44 27–50.

**Rinz, Kevin.** 2018. "Labor Market Concentration, Earnings Inequality, and Earnings Mobility." *Center for Administrative Records Research and Applications Working Paper*, 10.

**Schubert, Gregor, Anna Stansbury, and Bledi Taska.** 2020. "Monopsony and Outside Options." *Available at SSRN*.

**Silliman, Mikko, and Alexander Willén.** 2024. "Worker Power, Immigrant Sorting, and Firm Dynamics." *The paper has appeared in a Paper Series: https://openaccess. nhh. no/nhh-xmlui/handle/11250/3139190, NHH Dept. of Economics Discussion Paper*(13): .

**Sorkin, Isaac.** 2015. "Are there Long-Run Effects of the Minimum Wage?" *Review of Economic Dynamics*, 18(2): 306–333.

**von Brasch, Thomas, Håvard Hungnes, and Birger Strø m.** 2018. "Ringvirkninger av petroleumsnæringen i norsk økonomi: Basert på endelige nasjonalregnskapstall for 2015."Technical report, Statistisk sentralbyrå.

**Wilson, Riley.** Forthcoming. "The Isolated States of America: Home State Bias and the Impact of State Borders on Mobility." *Journal of Labor Economics*, URL: https://doi.org/10.1086/732768, DOI: http://dx.doi.org/10.1086/732768.

## Tables and Figures

Table 1: Municipality Response: Sweden

**Panel A: Core Labor Market**

| | Employment Norway (1) | Employment Sweden (2) | Employment Total (3) | Unemployment Benefits (4) | Average Earnings (5) |
|---|---|---|---|---|---|
| Phase In | 0.010*** | -0.008** | 0.001 | -0.015** | 4300.8** |
| | (0.002) | (0.004) | (0.003) | (0.006) | (1924.7) |
| Full Exposure | 0.033*** | -0.018** | 0.008 | -0.021** | 11499.5*** |
| | (0.004) | (0.007) | (0.005) | (0.009) | (3339.3) |
| *Mean* | 0.008 | 0.85 | 0.85 | 0.14 | 181729 |

**Panel B: Equality**

| | P10 (1) | P50 (2) | P90 (3) |
|---|---|---|---|
| Phase In | 236.0 | 2132.4 | 10919.0*** |
| | (126.9) | (1895.7) | (3176.6) |
| Full Exposure | 364.6 | 6804.1** | 22939.2*** |
| | (240.2) | (3210.8) | (5411.3) |
| *Mean* | 35.5 | 191998.2 | 338015.1 |

**Panel C: Municipality Population and Business Activity**

| | Population (1) | Number Workers (2) | Firms 3+ (3) | Firms 5+ (4) | Firms 10+ (5) | Firms 20+ (6) |
|---|---|---|---|---|---|---|
| Phase In | -111.0 | -17.9 | -11.2** | -7.3*** | -1.1 | -0.80 |
| | (77.1) | (64.2) | (4.6) | (2.68) | (1.38) | (1.03) |
| Full Exposure | -552.0** | -323.4* | -24.6*** | -18.7*** | -5.1** | -4.6*** |
| | (176.0) | (215.0) | (172) | (1.21) | (1.62) | (1.37) |
| *Mean* | 14628 | 12308 | 246.1 | 139.8 | 64.3 | 30.2 |

Source: Authors' calculations of Swedish registry data from 2001 to 2014. Observations: 967 for every outcome. Notes: Estimates come from Equation 2 and include fixed effects for municipality and year. Standard errors clustered at the municipality level.

Table 2: Municipality Composition Response: Sweden

| | Low Skill (1) | High Skill (2) | Young (3) | Old (4) | Female (5) | With Children (6) | Married (7) |
|---|---|---|---|---|---|---|---|
| Phase In | 0.002 | -0.002 | 0.001 | 0.002 | 0.002 | -0.001 | -0.022*** |
| | (0.002) | (0.002) | (0.003) | (0.001) | (0.001) | (0.003) | (0.004) |
| Full Exposure | 0.001 | -0.004 | 0.003 | 0.002 | 0.003 | -0.003 | -0.021*** |
| | (0.003) | (0.002) | (0.005) | (0.001) | (0.002) | (0.005) | (0.005) |
| *Mean* | 0.146 | 0.239 | 0.347 | 0.035 | 0.482 | 0.489 | 0.409 |

Source: Authors' calculations of Swedish registry data from 2001 to 2014. Outcomes are measured as shares of total population in each year. Means are calculated in the year prior to the shock (2004). Observations: 967

Notes: Estimates come from Equation 2 and include fixed effects for municipality and year. Standard errors clustered at the municipality level.

Table 3: Municipality Response: Norway

**Panel A: Core Labor Market**

| | Employment Domestic+ Commuters (1) | Employment Domestic (2) | Commuters/ FT Domestic (3) | Unemployment Domestic (4) | Average Earnings Domestic (5) | Employment Norwegian (6) |
|---|---|---|---|---|---|---|
| Phase In | -0.005 | -0.010*** | 0.011** | 0.001 | -3024** | -0.011*** |
| | (0.004) | (0.003) | (0.005) | (0.002) | (1190) | (0.003) |
| Full Exposure | -0.007 | -0.021*** | 0.048*** | 0.000 | -3338 | -0.023*** |
| | (0.007) | (0.004) | (0.013) | (0.003) | (3044) | (0.005) |
| *Mean* | 0.73 | 0.71 | 0.03 | 0.05 | 340878 | 0.72 |

**Panel B: Equality**

| | P10 (1) | P50 (2) | P90 (3) |
|---|---|---|---|
| Phase In | -1690.6 | -2833.0** | -6896.7** |
| | (1413.8) | (1084.4) | (2649.3) |
| Full Exposure | 351.4 | -2932.4 | -13301.1** |
| | (2166.2) | (2664.6) | (5738.4) |
| *Mean* | 174533 | 326882 | 500843 |

**Panel C: Municipality Population and Business Activity**

| | Population (1) | FT Workers Domestic (2) | Firms 3+ (3) | Firms 5+ (4) | Firms 10+ (5) | Firms 20+ (6) |
|---|---|---|---|---|---|---|
| Phase In | 30.3 | -67.4 | -1.96 | -0.79 | -0.12 | -1.01 |
| | (153.9) | (64.1) | (4.42) | (3.97) | (3.21) | (2.75) |
| Full Exposure | 54.2 | -141.3 | -6.17 | -2.50 | -1.86 | -3.33 |
| | (370.9) | (118.3) | (6.5) | (5.9) | (5.1) | (4.4) |
| *Mean* | 10664 | 3800 | 195 | 146 | 98 | 71 |

Source: Authors' calculations of Norwegian registry data from 2001 to 2014. Observations (mun*year): 1,316 except Panel A column 3, which has 1,144 observations.
Notes: Estimates come from Equation 2 and include fixed effects for municipality and year. Standard errors clustered at the municipality level.

Table 4: Spatial Displacement and Spillovers: Norway

| | FT Workers Domestic | Employment municipality other | Employment Other municipality P75-90 | Inflows | Outflows |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| **Panel A: Treated vs Control** | | | | | |
| Phase In | -44.9 | 0.000 | 0.023*** | -0.008*** | -0.003 |
| | (112.5) | (0.006) | (0.008) | (0.002) | (0.002) |
| Full Exposure | -123.4 | 0.003 | 0.025** | -0.005* | 0.003 |
| | (178.1) | (0.009) | (0.011) | (0.003) | (0.002) |
| *Mean* | 5252 | 0.453 | 0.523 | 0.233 | 0.169 |
| **Panel B: Buffer Zone vs Control** | | | | | |
| | FT Workers Domestic | Employment municipality other | Employment Other municipality P75-90 | Inflows | Outflows |
| | (1) | (2) | (3) | (4) | (5) |
| Phase In | 206.7* | -0.002 | -0.004 | -0.001 | -0.002 |
| | (121.7) | (0.003) | (0.006) | (0.002) | (0.002) |
| Full Exposure | 556.2** | -0.000 | -0.009 | 0.004** | 0.003 |
| | (251.2) | (0.005) | (0.007) | (0.002) | (0.002) |
| *Mean* | 4707 | 0.508 | 0.584 | 0.236 | 0.172 |

Source: Authors' calculations of Norwegian registry data from 2001 to 2014. Observations (municipality by year): 1,316 in Panel A and 1,764 in Panel B.
Notes: Estimates come from Equation 2 and include fixed effects for municipality and year. Standard errors clustered at the municipality level.

Table 5: Firm Response: Sweden

**Panel A: Workers and Earnings**

| | Number of Workers (1) | Firm Exit (2) | Average Earnings (3) |
|---|---|---|---|
| Phase In | -0.192 | -0.000 | -743.593 |
| | (0.123) | (0.002) | (1825.443) |
| Full Exposure | -0.327* | 0.009*** | 3633.630 |
| | (0.192) | (0.003) | (2921.034) |
| *Observations* | 414644 | 514061 | 577998 |
| *Mean* | 5.172 | 0.042 | 185987 |

**Panel B: Entrants and incumbents**

| | Number of Entrants (1) | Number of Incumbents (2) | Average Entry Earnings (3) | Average Incumbent Earnings (4) |
|---|---|---|---|---|
| Phase In | -0.208*** | -0.031 | -5239.39* | -2504.24 |
| | (0.063) | (0.103) | (2794.83) | (2435.03) |
| Full Exposure | -0.300*** | -0.107 | -4.19 | 4366.87 |
| | (0.105) | (0.164) | (4670.97) | (3500.83) |
| *Observations* | 537405 | 537405 | 250370 | 406102 |
| *Mean* | 2.345 | 3.886 | 185865 | 220709 |

**Panel C: Value Added and Distribution of Income**

| | Value Added (1) | Value Added Per Worker (2) | Average Markdown (3) |
|---|---|---|---|
| Phase In | -235.36*** | -44.95*** | -43.46*** |
| | (79.35) | (13.47) | (13.64) |
| Full Exposure | -351.26*** | -71.05** | -73.798** |
| | (130.664 | (30.39) | (30.59) |
| *Observations* | 414644 | 414644 | 414644 |
| *Mean* | 2607.2 | 608.9 | 423.2 |

Source: Authors' calculations of Swedish registry data from 2001 to 2014.
Notes: Estimates come from Equation 2 and include fixed effects for firm, municipality, and year. Standard errors clustered at the firm-by-municipality level. Value added and markdowns are measured in 1,000s SEK.

Table 6: Firm Response by Concentration: Sweden

| VARIABLES | (1) Number of Workers | (2) Average Earnings | (3) Value Added Per Worker | (4) Average Markdown | (5) Pr(Exit) |
|---|---|---|---|---|---|
| Post × Treated | -0.064 | 4329.4 | -16.84 | -21.17 | 0.006 |
| | (0.157) | (3932.6) | (27.15) | (27.53) | (0.004) |
| Post × Treated × HHI | -1.74** | -40738.7 | -340.4** | -299.6* | -0.040* |
| | (0.77) | (29943.6) | (159.0) | (163.9) | (0.021) |

Source: Authors' calculations of Swedish registry data from 2001 to 2014. Observations (firm-municipality-year): 393,647 for every outcome except firm exit, with 353,257 observations.
Notes: Estimates come from a modified version of Equation 2 where we interact treatment with a post-treatment indicator and include fixed effects for firm, municipality, and year. Standard errors clustered at the firm-by-municipality level. Value added and markdowns are measured in 1,000s SEK.

Table 7: Firm Response: Norway

**Panel A: Workers and Earnings**

| | Number of Non-commuter Workers (1) | Firm Exit (2) | Domestic Average Earnings (3) |
|---|---|---|---|
| Phase In | -0.30 | 0.001 | -4.96*** |
| | (0.22) | (0.004) | (1.72) |
| Full Exposure | -0.88** | 0.007 | -10.05*** |
| | (0.37) | (0.005) | (3.07) |
| *Observations* | 261,657 | 246,929 | 261,629 |
| *Mean* | 8.75 | 0.09 | 289 |

**Panel B: Entrants and incumbents**

| | Number of Entrants (1) | Number of Incumbents (2) | Average Entry Earnings (3) | Average Incumbent Earnings (4) |
|---|---|---|---|---|
| Phase In | -0.21 | -0.09 | -1.33 | -5.70*** |
| | (0.16) | (0.10) | (2.67) | (1.86) |
| Full Exposure | -0.21 | -0.68** | -8.64** | -10.25*** |
| | (0.18) | (0.32) | (3.67) | (3.76) |
| *Observations* | 261,657 | 261,657 | 146,137 | 217,429 |
| *Mean* | 1.79 | 6.96 | 233.1 | 304.2 |

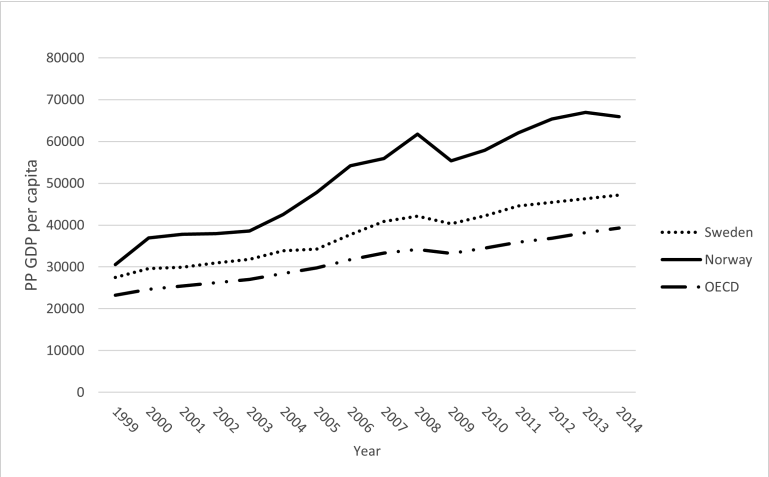
**Panel C: Value Added and Distribution of Income**

| | Value Added (1) | Value Added Per Domestic Worker (2) | Average Markdown (3) | Personnel Share of Revenue (4) |
|---|---|---|---|---|
| Phase In | -347.8 | 11.68 | 16.70 | -0.005** |
| | (287.6) | (24.31) | (24.22) | (0.002) |
| Full Exposure | -253.5 | 43.19* | 53.33** | -0.006** |
| | (654.4) | (22.64) | (22.77) | (0.003) |
| *Observations* | 261,657 | 261,657 | 261,629 | 259,832 |
| *Mean* | 5,892 | 514 | 155.3 | 0.318 |

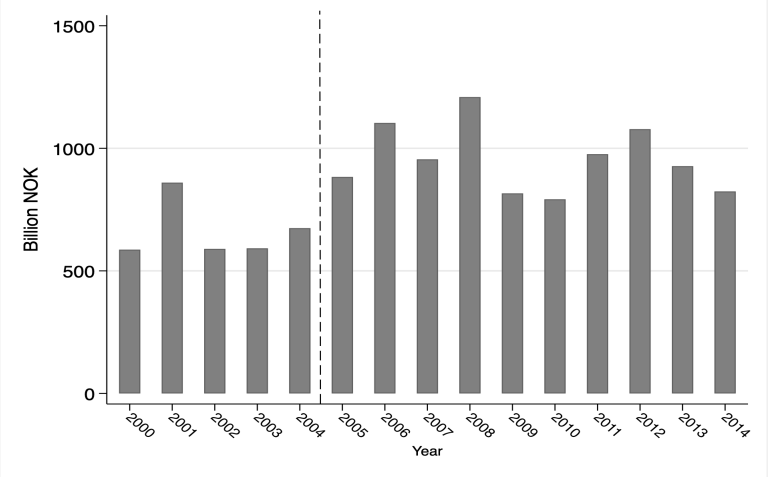
Source: Authors' calculations of Norwegian registry data from 2001 to 2014.
Notes: Estimates come from Equation 2 and include fixed effects for firm, municipality, and year. Standard errors clustered at the firm-by-municipality level. Monetary amounts (e.g. personnel costs, earnings, value added) are in thousands of Norwegian kroner.

Figure 1: Drivers of Commuting Pressure

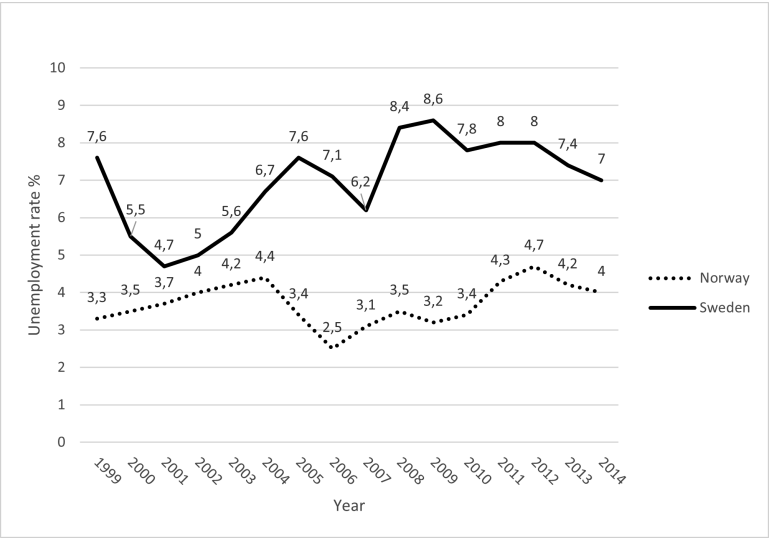
Panel A: GDP Growth



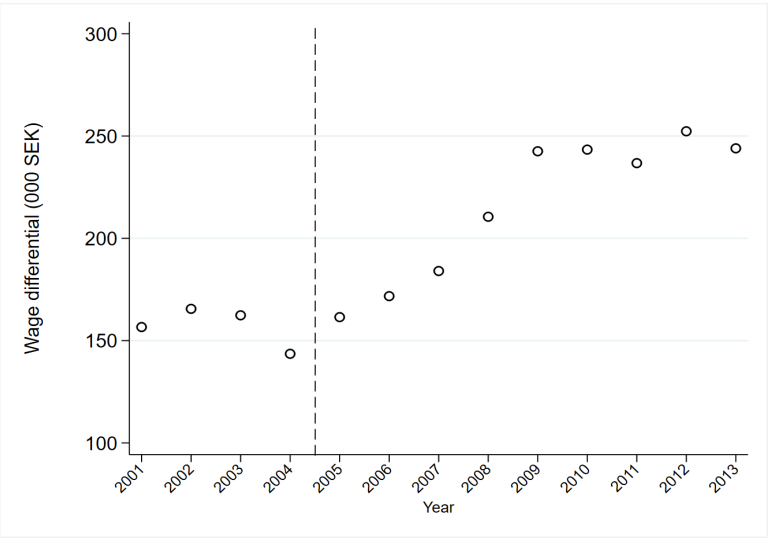

Panel B: Oil Income




Panel C: Unemployment Rates



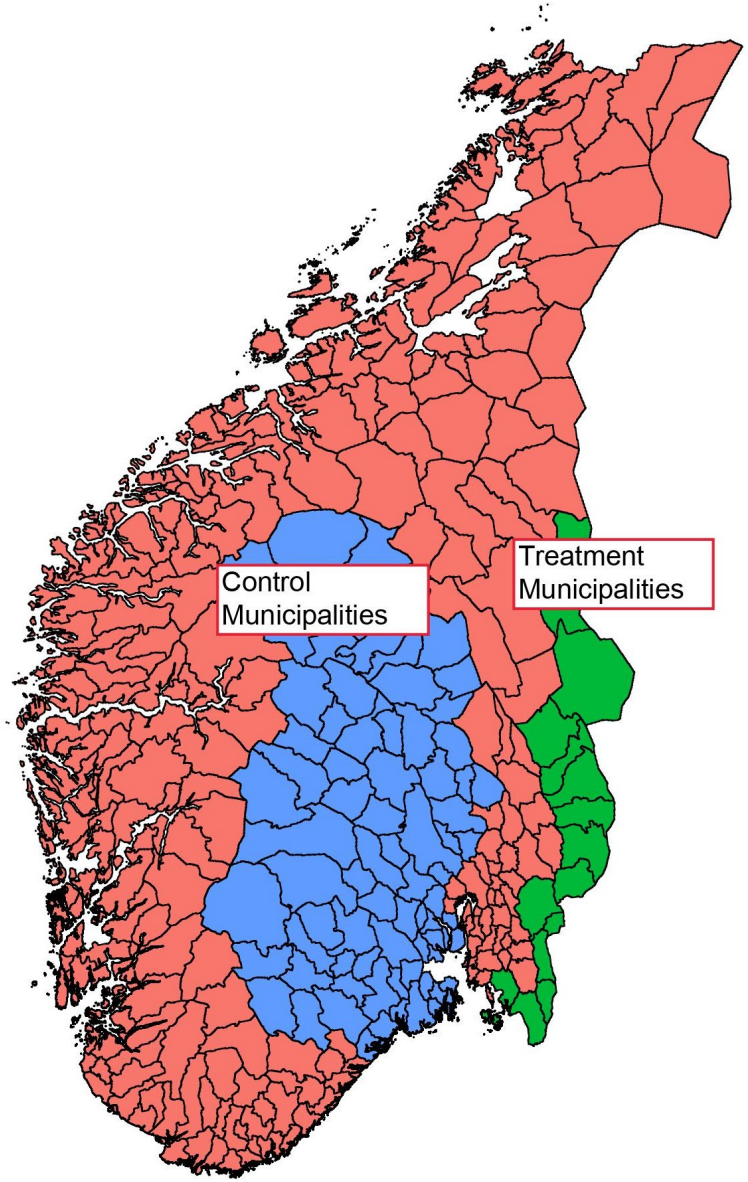

Panel D: Average Within-Occupation Earnings Gap



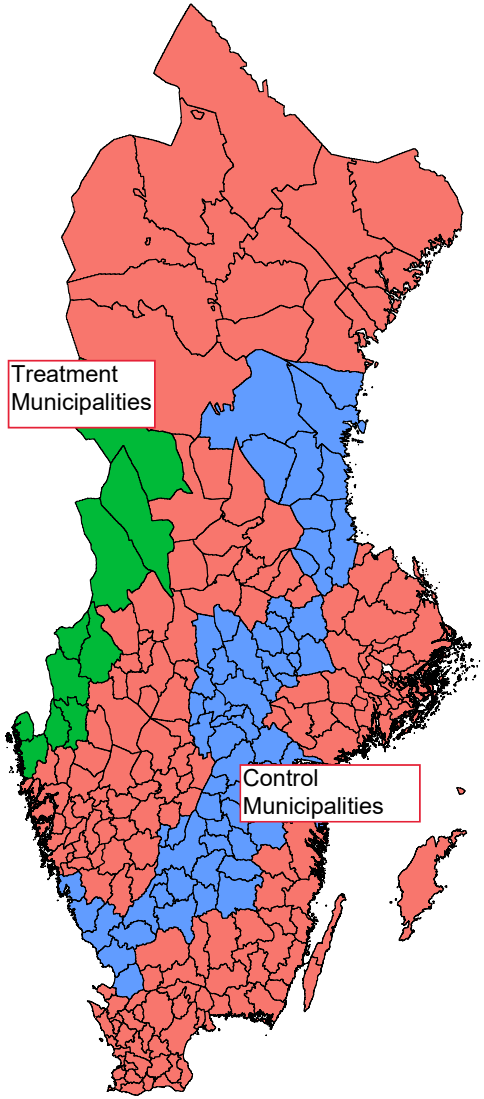

Source: OECD (Panels A and B) and authors' calculations of Norwegian and Swedish register data (Panels C and D).
Notes: Panels C and D adjust are adjusted for contemporaneous exchange rates.

Figure 2: Treatment and Control Groups

Panel A: Norway Side



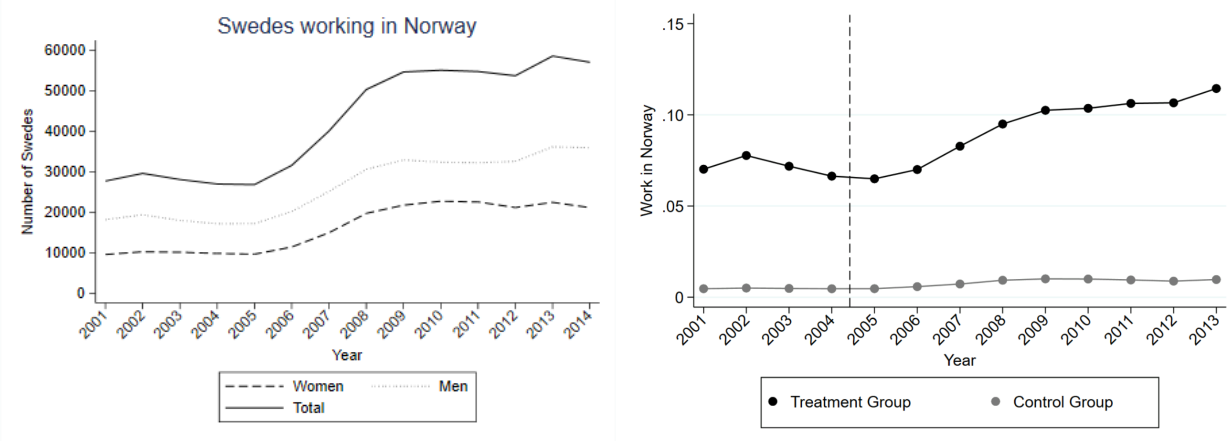

Panel B: Sweden Side



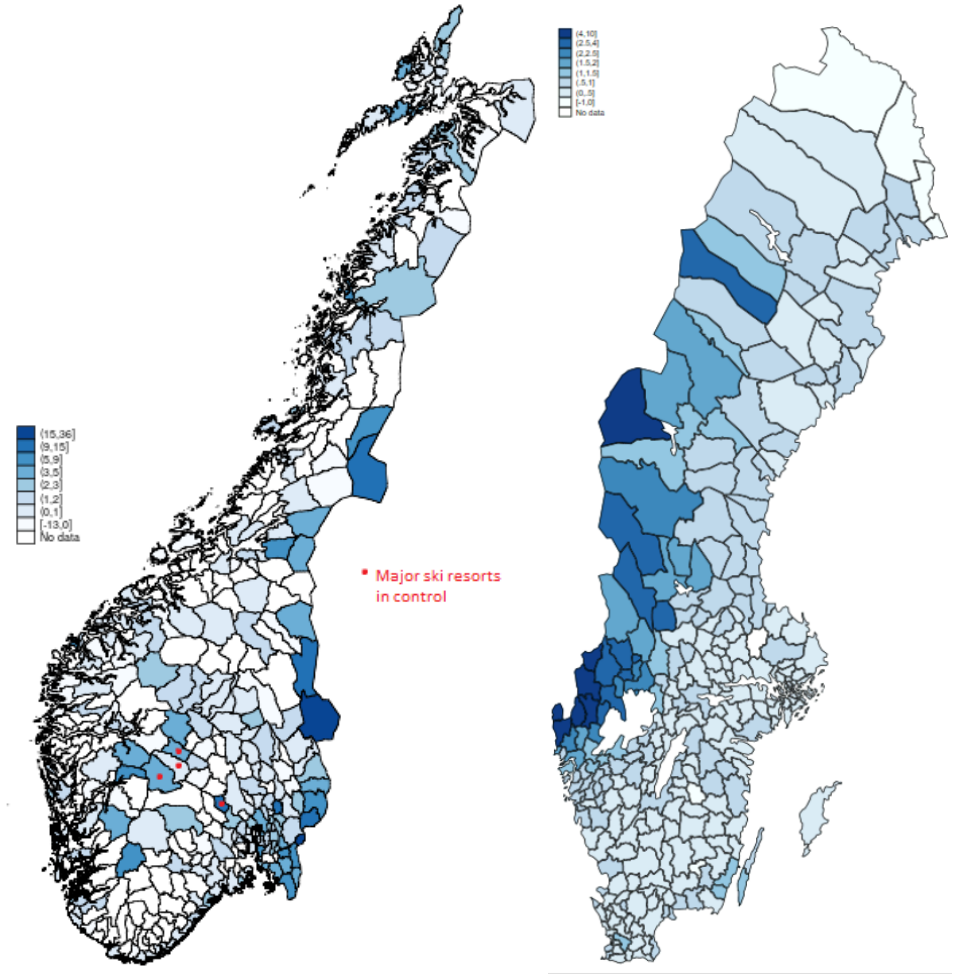

Source: Authors' selection of main treatment and control municipalities.
Notes: Treatment municipalities are municipalities with contact with the border within border counties. Control municipalities are those one county farther from the border.

Figure 3: Commuting Patterns

Panel A: Total Cross-Border Commuters  Panel B: Pr(Work in Norway)

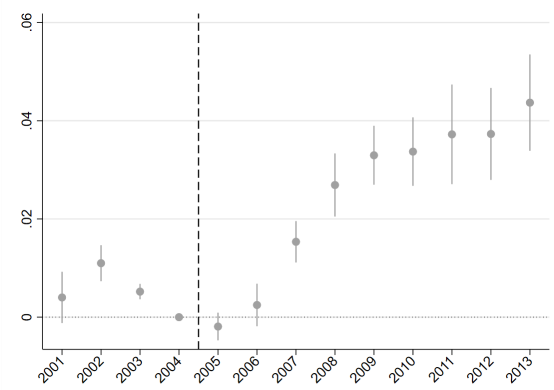



Panel C: Change in Share Swedish Commuters  Panel D: Change in Share Commuting

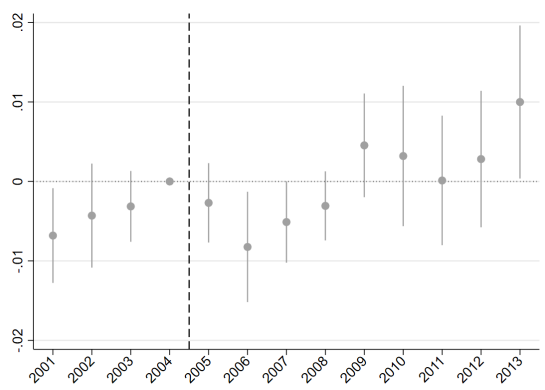



Source: Authors' calculations of Norwegian and Swedish register data.
Notes: Commuter shares in Panels C and D are calculated among all employed workers in our samples in base year 2005. Changes are for the 2005 to 2013 period.

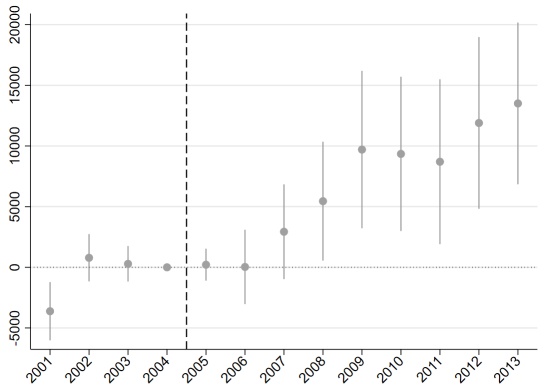
Figure 4: Sweden - Municipalities, Event Studies



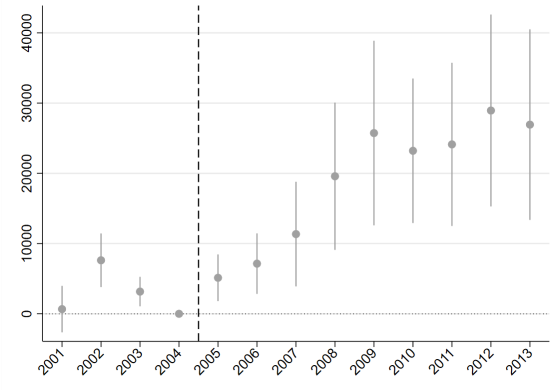

(a) Employment Norway



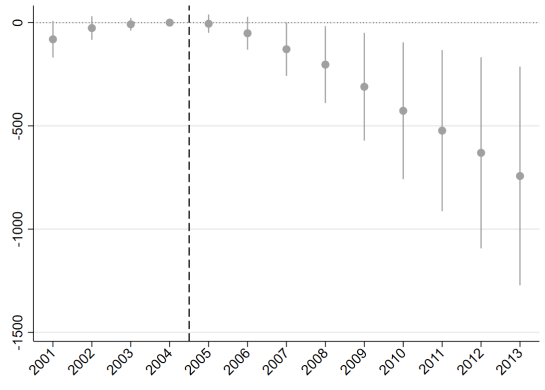

(b) Employment Total



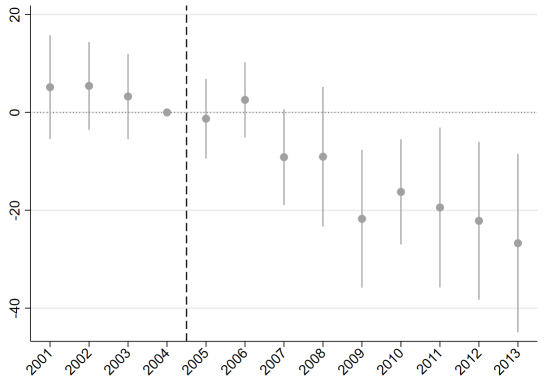

(c) Average Earnings




(d) P90



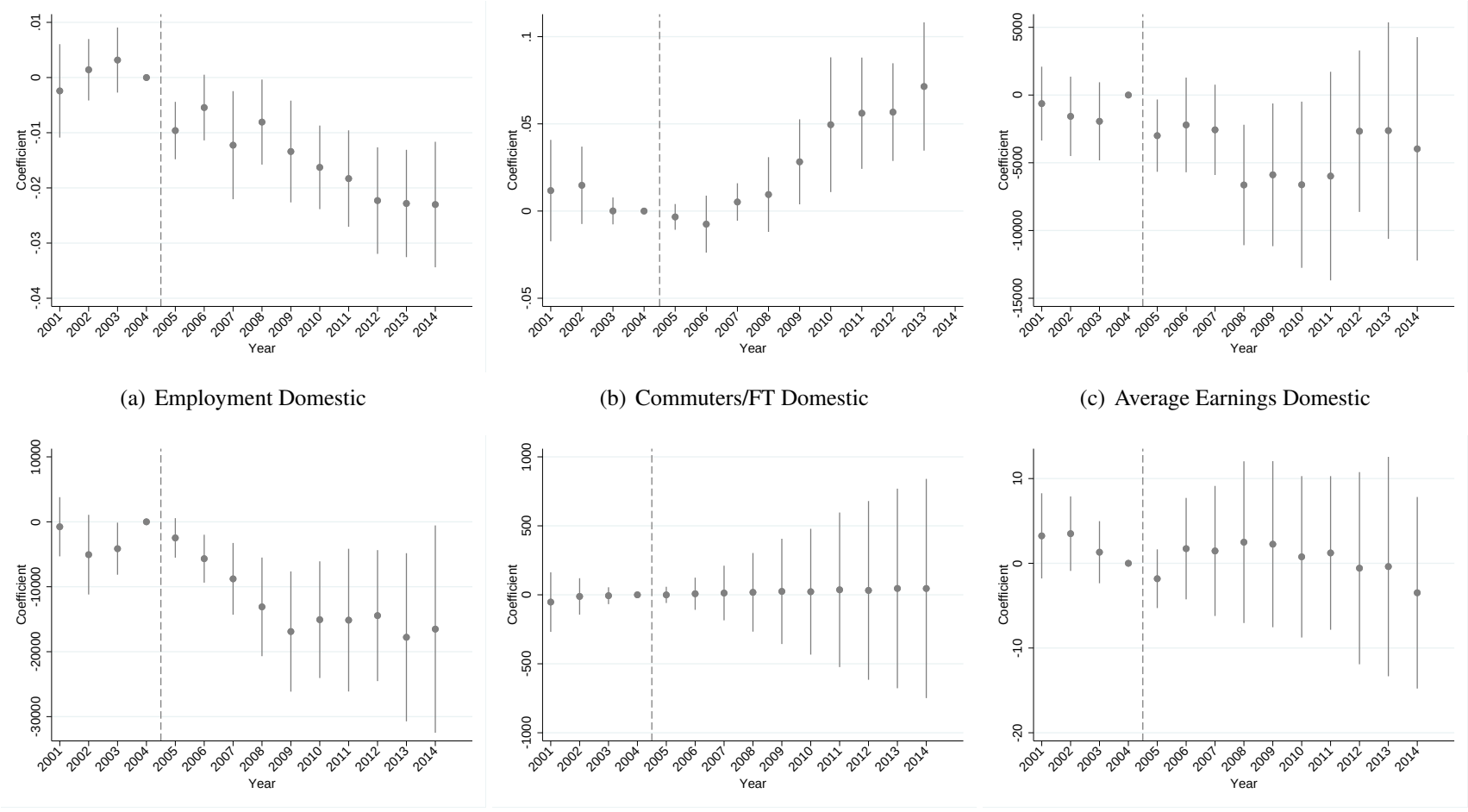

(e) Population




(f) Firms 5+

Source: Authors' calculations of Swedish register data.
Notes: Coefficients from Equation 1. Estimates include fixed effects for municipality and year. Bars represent 95% confidence intervals. Standard errors clustered at the municipality level.

Figure 5: Norway - Municipalities, Event Studies




(a) Employment Domestic

(b) Commuters/FT Domestic

(c) Average Earnings Domestic

(d) P90

(e) Population

(f) Firms 5+

Source: Authors' calculations of Swedish register data.
Notes: Coefficients from Equation 1. Estimates include fixed effects for municipality and year. Bars represent 95% confidence intervals. Standard errors clustered at the municipality level.

# A Online Appendix (not for publication)

Table A1: Sample Summary Statistics - Sweden

| | Panel A: Individual Outcomes | | | |
|---|---|---|---|---|
| | Treatment | | Control | |
| VARIABLES | Mean | SD | Mean | SD |
| Working in Norway | 0.09 | 0.28 | 0.01 | 0.08 |
| Working in Sweden | 0.80 | 0.40 | 0.85 | 0.36 |
| Working Overall | 0.86 | 0.35 | 0.85 | 0.35 |
| Unemployment Benefits | 0.12 | 0.05 | 0.10 | 0.04 |
| Annual Earnings (1,000s SEK) | 198.3 | 153.6 | 204.1 | 169.0 |
| Individual Observations | 627,661 | | 10,951,136 | |
| | Panel B: Municipality Outcomes | | | |
| | Treatment | | Control | |
| VARIABLES | Mean | SD | Mean | SD |
| 90th Percentile (1,000s) | 364.9 | 57.2 | 361.5 | 48.1 |
| 50th Percentile (1,000s) | 211.3 | 30.3 | 217.1 | 28.8 |
| 10th Percentile (1,000s) | 0 | 0 | 201.1 | 1385.3 |
| Population | 4828 | 2360 | 13084 | 16977 |
| Workers | 4139 | 2006 | 11165 | 14385 |
| Firms (3+ workers) | 84 | 44 | 234 | 303 |
| Firms (5+ workers) | 49 | 24 | 134 | 174 |
| Firms (10+ workers) | 23 | 12 | 61 | 80 |
| Firms (20+ workers) | 10 | 6 | 29 | 38 |
| | Panel C: Firm Outcomes | | | |
| | Treatment | | Control | |
| VARIABLES | Mean | SD | Mean | SD |
| Number of Workers | 4 | 17 | 5 | 23 |
| Exit Probability | 0.12 | 0.33 | 0.12 | 0.32 |
| Average Worker Earnings (1,000s) | 214.7 | 176.5 | 212.6 | 166.0 |
| Average Entry Earnings (1,000s) | 207.8 | 166.8 | 207.2 | 163.1 |
| Average Incumbent Earnings | 265.4 | 176.5 | 256.8 | 161.9 |
| Firm Value-Added (1,000s) | 2102.8 | 10846.3 | 2886.6 | 16103.4 |
| Firm Value-Added per Worker (1,000s) | 694.2 | 1299.8 | 850.4 | 1956.1 |
| Markdowns (1,000s) | 473.7 | 1313.5 | 637.4 | 1961.9 |

Note: Authors' calculations of register data from Sweden as described in Section 3.1.

Table A2: Sample Summary Statistics - Norway

| | Panel A: Municipality Outcomes | | | |
|---|---|---|---|---|
| | Treatment | | Control | |
| VARIABLES | Mean | SD | Mean | SD |
| Employment Rate | 0.694 | 0.032 | 0.715 | 0.031 |
| Unemployment Benefits | 0.055 | 0.019 | 0.053 | 0.019 |
| Commuters/ FT Domestic Workers | 0.091 | 0.087 | 0.018 | 0.042 |
| Annual Earnings (1,000s NOK) | 332.70 | 58.54 | 342.43 | 62.33 |
| 90th Percentile | 480.11 | 87.67 | 504.78 | 101.48 |
| 50th Percentile | 321.11 | 55.23 | 327.98 | 57.19 |
| 10th Percentile | 174.69 | 32.61 | 174.50 | 31.15 |
| Population | 11431 | 13066 | 10518 | 12190 |
| Non-Commuter Workers | 3786 | 4933 | 3802 | 5453 |
| Number of Firms (3+ workers) | 192.89 | 218.26 | 195.64 | 250.75 |
| Number of Firms (5+ workers) | 142.30 | 160.17 | 146.46 | 189.62 |
| Number of Firms (10+ workers) | 95.46 | 108.95 | 98.52 | 128.71 |
| Number of Firms (20+ workers) | 70.18 | 80.43 | 71.05 | 93.59 |

| | Panel B: Firm Outcomes | | | |
|---|---|---|---|---|
| | Treatment | | Control | |
| VARIABLES | Mean | SD | Mean | SD |
| Non-Commuter Workers | 8.23 | 22.49 | 8.53 | 26.54 |
| Exit Probability | 0.10 | 0.31 | 0.11 | 0.31 |
| Average Worker Earnings (1,000s) | 337.99 | 165.12 | 357.95 | 183.23 |
| Average Entry Earnings (1,000s) | 273.07 | 169.89 | 287.18 | 175.90 |
| Average Incumbent Earnings (1,000s) | 361.29 | 160.71 | 383.94 | 180.67 |
| Firm Value-Added (1,000s) | 5612.8 | 63978.6 | 5940.0 | 71395.4 |
| Firm Value-Added per Non-Commuter Worker (1,000s) | 494.26 | 1170.32 | 517.45 | 2288.22 |
| Markdowns (1,000s) | 156.28 | 1162.80 | 159.51 | 2273.55 |

Note: Authors' calculations of register data from Norway as described in Section 3.1.

Table A3: Municipality Response with Wild Cluster Bootstrap SE: Sweden

**Panel A: Core Labor Market**

| | Employment Norway | Employment Sweden | Employment Total | Unemployment Benefits | Average Earnings |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Phase In | 0.010*** | -0.008** | 0.001 | -0.015** | 4300.8** |
| | (0.002) | (0.004) | (0.004) | (0.006) | (2004.1) |
| Full Exposure | 0.033*** | -0.018** | 0.008 | -0.021** | 11499.5*** |
| | (0.004) | (0.007) | (0.005) | (0.009) | (3477.2) |
| *Mean* | 0.008 | 0.85 | 0.85 | 0.14 | 181729 |

**Panel B: Equality**

| | P10 | P50 | P90 |
|---|---|---|---|
| | (1) | (2) | (3) |
| Phase In | 236.0* | 2132.4 | 10919.0*** |
| | (132.2) | (1973.9) | (3307.8) |
| Full Exposure | 364.6 | 6804.1** | 22939.2*** |
| | (250.1) | (3343.4) | (5634.8) |
| *Mean* | 35.5 | 191998.2 | 338015.1 |

**Panel C: Municipality Population and Business Activity**

| | Population | Number Workers | Firms 3+ | Firms 5+ | Firms 10+ | Firms 20+ |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Phase In | -111.0 | -17.9 | -11.2** | -7.3*** | -1.1 | -0.80 |
| | (80.3) | (66.8) | (4.8) | (2.7) | (1.4) | (1.0) |
| Full Exposure | -552.0** | -323.4* | -24.6*** | -18.7*** | -5.1** | -4.6*** |
| | (224.1) | (183.3) | (8.9) | (5.6) | (2.4) | (1.3) |
| *Mean* | 14628 | 12308 | 246.1 | 139.8 | 64.3 | 30.2 |

Source: Authors' calculations of Swedish registry data from 2001 to 2014. Observations: 967 for every outcome.
Notes: Estimates come from Equation 2 and include fixed effects for municipality and year with wild cluster bootstrap standard errors below each coefficient.

Table A4: Municipality Response with Wild Cluster Bootstrap SE: Norway

| | Employment Rate, Domestic + Commuters | Domestic Pr(Employed) | Commuters/ FT Domestic Workers | Domestic Pr(UI Benefits) | Domestic Avg Wage | Norwegian Pr(Employed) |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Phase In | -0.005 | -0.010*** | 0.011** | 0.001 | -3024.0** | -0.011*** |
| Wild Bootstrap SE | (0.004) | (0.003) | (0.005) | (0.002) | (1197) | (0.003) |
| Full Exposure | -0.007 | -0.021*** | 0.048*** | 0.000 | -3338.0 | -0.023*** |
| Wild Bootstrap SE | (0.007) | (0.004) | (0.013) | (0.003) | (3062) | (0.003) |
| *Mean* | 0.73 | 0.71 | 0.03 | 0.05 | 340878 | 0.72 |
| **Panel B: Equality** | | | | | | |
| | P10 | P50 | P90 | | | |
| | (1) | (2) | (3) | | | |
| Phase In | -1690.6 | -2833.0** | -6896.7** | | | |
| Wild Bootstrap SE | (1422) | (1091) | (2665) | | | |
| Full Exposure | 351.4 | -2932.4 | -13301.1** | | | |
| Wild Bootstrap SE | (1422) | (1091) | (2665) | | | |
| *Mean* | 174533 | 326882 | 500843 | | | |
| **Panel C: Municipality population and business activity** | | | | | | |
| | Population | No. Domestic FT Workers | Firms 3+ | Firms 5+ | Firms 10+ | Firms 20+ |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Phase In | 30.31 | -67.4 | -1.96 | -0.79 | -0.12 | -1.01 |
| Wild Bootstrap SE | (154.8) | (64.4) | (4.44) | (3.99) | (3.23) | (2.76) |
| Full Exposure | 54.2 | -141.3 | -6.17 | -2.50 | -1.86 | -3.33 |
| Wild Bootstrap SE | (373) | (118.9) | (6.49) | (5.93) | (5.14) | (4.43) |
| *Mean* | 10664 | 3800 | 195 | 146 | 98 | 71 |

Source: Authors' calculations of Norwegian registry data from 2001 to 2014. Observations: 1,316 except Panel A columns 1-2, which have 1,144 observations.
Notes: Estimates come from Equation 2 and include fixed effects for municipality and year with wild cluster bootstrap standard errors below each coefficient.

Table A5: Effects on Probability of Working in Norway, by Industry

| | Agriculture, hunting and forestry | Fishing | Mining and quarrying except energy producing materials | Manufacturing |
|---|---|---|---|---|
| Full Exposure | 0.020** | -0.027 | 0.002 | 0.054*** |
| | (0.008) | (0.022) | (0.030) | (0.008) |
| Observations | 206,931 | 2,655 | 11,776 | 1,938,026 |
| | Electricity, gas and water supply | Construction | Wholesale and retail trade | Hotels and restaurants |
| Full Exposure | 0.024** | 0.038** | 0.028** | 0.036*** |
| | (0.009) | (0.017) | (0.013) | (0.007) |
| Observations | 66,837 | 139,531 | 585,022 | 1,253,137 |
| | Transport, storage and communication | Financial intermediation | Real Estate, renting and business activities | Public administration and defense |
| Full Exposure | 0.027*** | 0.061*** | 0.015 | 0.049*** |
| | (0.006) | (0.013) | (0.016) | (0.009) |
| Observations | 327,688 | 523,555 | 101,017 | 1,040,643 |
| | Education | Health and social work | Other community, social and personal service activities | Activities of households |
| Full Exposure | 0.028*** | 0.016*** | 0.041*** | 0.035*** |
| | (0.005) | (0.005) | (0.010) | (0.008) |
| Observations | 437,651 | 975,950 | 1,656,491 | 452,663 |

Source: Authors' calculations of register data from Sweden as described in Section 3.1.
Notes: Standard errors clustered at the municipality level.

Table A6: Summary Statistics - Swedish Commuters vs Non-Commuters in Sample

| | Commuters | | Non-Commuters | |
|---|---|---|---|---|
| | Mean | SD | Mean | SD |
| Children Under 18 | 0.38 | 0.48 | 0.46 | 0.50 |
| Age | 36.7 | 10.4 | 39.0 | 10.4 |
| Less than High School | 0.12 | 0.33 | 0.16 | 0.37 |
| College Degree or More | 0.22 | 0.42 | 0.18 | 0.39 |
| Earnings in Sweden (1,000s) | 49.8 | 105.4 | 184.2 | 139.9 |
| Female | 0.28 | 0.45 | 0.50 | 0.50 |
| Married | 0.25 | 0.44 | 0.32 | 0.47 |
| Employed in Sweden | 0.38 | 0.49 | 0.84 | 0.36 |
| Total Earnings (1,000s) | 346.1 | 205.1 | 184.2 | 139.9 |

Authors' calculations of register data from Sweden as described in Section 3.1.

Table A7: Municipality Response Additional Outcomes: Sweden

**Panel A: Equality**

| | P5010 | P9050 | P9010 |
|---|---|---|---|
| | (1) | (2) | (3) |
| Phase In | 1896.4 | 8786.6*** | 10682.9*** |
| | (1894.9) | (2701.5) | (3173.7) |
| Full Exposure | 6439.5** | 16135.1*** | 22574.5*** |
| | (3209.3) | (4250.5) | (5399.1) |
| *Mean* | 191962.6 | 146052.4 | 338015.1 |

**Panel B: Aggregate**

| | Aggregate Earnings (MSEK) | Income Taxes (MSEK) | Social Support (MSEK) | Income Taxes (pc) (1000SEK) | Social Support (pc) (1000SEK) | Combined Transfers (pc) (1000SEK) |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Phase In | -227*** | -103*** | - 40*** | 0.021 | -0.241 | -0.220 |
| | (74.1) | (28) | (11) | (0.874) | (1.036) | (0.748) |
| Full Exposure | -535*** | -205*** | -81*** | -1.833 | 1.119 | -0.715 |
| | (172) | (54) | (23) | (1.210) | (1.615) | (1.371) |
| *Mean* | 2123 | 771 | 152 | 67 | 18 | 85 |

Source: Authors' calculations of Swedish registry data from 2001 to 2014. Observations: 967 for every outcome.
Notes: Estimates come from Equation 2 and include fixed effects for municipality and year. Standard errors clustered at the municipality level.

Table A8: Municipality Response: Sweden Poisson Specification for Count Variables

| **Municipality Population and Business Activity** | | | | | | |
|---|---|---|---|---|---|---|
| | Population | Number Workers | Firms 3+ | Firms 5+ | Firms 10+ | Firms 20+ |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Phase In | -0.032*** | -0.032** | -0.026 | -0.047 | 0.037 | -0.045 |
| | (0.011) | (0.013) | (0.029) | (0.031) | (0.05) | (0.082) |
| Full Exposure | -0.073*** | -0.067*** | -0.035 | -0.097*** | -0.003 | -0.243*** |
| | (0.021) | (0.025) | (0.038) | (0.037) | (0.048) | (0.076) |

Source: Authors' calculations of Swedish registry data from 2001 to 2014. Observations: 967 for every outcome.
Notes: Estimates come from Equation 2 using a Poisson specification and include fixed effects for municipality and year. Standard errors clustered at the municipality level.

Table A9: Municipality Response Additional Outcomes: Norway

| | P5010 | P9050 | P9010 | Agg. Earnings (MNOK) |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Phase In | -1142.4 | -4063.7 | -5206.1* | -16.0 |
| | (1568.5) | (2596.1) | (2977.5) | (126.9) |
| Full Exposure | -3283.8 | -10368.7** | -13652.5** | -38.3 |
| | (2745.5) | (3988.3) | (5638.3) | (280.2) |
| *Mean* | 152349.7 | 173961.0 | 326310.7 | 1853.4 |

Source: Authors' calculations of Norwegian registry data from 2001 to 2014. Observations: 1,316 for every outcome.
Notes: Estimates come from Equation 2 and include fixed effects for municipality and year. Standard errors clustered at the municipality level. Aggregate income is measured earned income from work by residents of the municipality age 20-64.

Table A10: Municipality Response: Norway Poisson Specification for Count Variables

| **Municipality Population and Business Activity** | | | | | | |
|---|---|---|---|---|---|---|
| | Population | No. Domestic FT Workers | Firms 3+ | Firms 5+ | Firms 10+ | Firms 20+ |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Phase In | 0.001 | -0.018** | -0.010 | -0.004 | 0.001 | -0.015 |
| | (0.009) | (0.008) | (0.009) | (0.011) | (0.013) | (0.017) |
| Full Exposure | -0.000 | -0.037** | -0.031* | -0.014 | -0.015 | -0.046* |
| | (0.017) | (0.017) | (0.016) | (0.014) | (0.019) | (0.028) |
| *Mean* | 10664 | 3800 | 195 | 146 | 98 | 71 |
| *Observations* | 1316 | 1316 | 1316 | 1316 | 1316 | 1316 |

Source: Authors' calculations of Norwegian registry data from 2001 to 2014. Observations: 1,316 for every outcome.
Notes: Estimates come from Equation 2 using a Poisson specification and include fixed effects for municipality and year. Standard errors clustered at the municipality level.

Table A11: Municipality Response: Sweden with alternative controls

**Panel A: All municipalities except three metropolitan cities**

| | Employment Norway (1) | Employment Total (2) | Average Earnings (3) | P90 (4) | Population (5) | Firms (6) |
|---|---|---|---|---|---|---|
| Phase In | 0.011*** | 0.002 | 3757.7* | 6882.0** | -229.2*** | -10.09*** |
| | (0.002) | (0.003) | (1924.7) | (3260.0) | (59.0) | (2.00) |
| Full Exposure | 0.033*** | 0.009* | 10011.7*** | 15744.0*** | -894.1*** | -23.70*** |
| | (0.004) | (0.005) | (3351.2) | (5549.1) | (156.0) | (3.48) |
| Mean | 0.007 | 0.850 | 184927.3 | 345129.1 | 13668.4 | 131.08 |

**Panel B: All municipalities**

| | Employment Norway (1) | Employment Total (2) | Average Earnings (3) | P90 (4) | Population (5) | Firms (6) |
|---|---|---|---|---|---|---|
| Phase In | 0.011*** | 0.002 | 3801.6** | 6896.9** | -402.4*** | -13.99*** |
| | (0.002) | (0.003) | (1923.4) | (3256.0) | (138.1) | (3.54) |
| Full Exposure | 0.033*** | 0.009* | 10047.5*** | 15732.9*** | -1399*** | -33.30*** |
| | (0.004) | (0.005) | (3349.1) | (5542.9) | (414.2) | (8.22) |
| Mean | 0.007 | 0849 | 184857.4 | 345538.6 | 16554.9 | 158.10 |

Source: Authors' calculations of Swedish registry data from 2001 to 2014.
Notes: Estimates come from Equation 2 with alternative control municipalities and include fixed effects for municipality and year. Standard errors clustered at the municipality level.

Table A12: Municipality Response: Norway with alternative controls

**Panel A: All Municipalities Except Three Largest Cities**

| | Domestic Pr(Employed) | Commuters/ FT Domestic Workers | Domestic Avg Earnings | P90 | Population | Firms 3+ |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Phase In | -0.016*** | 0.013*** | -6623.7*** | -14575.4*** | -14.7 | -2.258 |
| | (0.002) | (0.004) | (955.1) | (2417.1) | (146.6) | (3.960) |
| Full Exposure | -0.031*** | 0.051*** | -12100.0*** | -29361.1*** | -36.1 | -7.635 |
| | (0.004) | (0.013) | (2726.6) | (5229.7) | (348.2) | (5.849) |
| *Mean* | 0.72 | 0.02 | 348805.3 | 516444.4 | 8986 | 170.68 |

**Panel B: All Municipalities**

| | Domestic Pr(Employed) | Commuters/ FT Domestic Workers | Domestic Avg Earnings | P90 | Population | Firms 3+ |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Phase In | -0.016*** | 0.013*** | -6702.7*** | -14776.5*** | -156.5 | -5.482 |
| | (0.002) | (0.004) | (954.5) | (2416.6) | (175.8) | (4.417) |
| Full Exposure | -0.031*** | 0.051*** | -12255.2*** | -29794.5*** | -415.9 | -12.767* |
| | (0.004) | (0.013) | (2725.6) | (5229.6) | (436.1) | (6.677) |
| *Mean* | 0.72 | 0.02 | 349293.7 | 517489.6 | 11298 | 215.03 |

Source: Authors' calculations of Norwegian registry data from 2001 to 2014.
Notes: Estimates come from Equation 2 with alternative control municipalities and include fixed effects for municipality and year. Standard errors clustered at the municipality level.

Table A13: Municipality Response: Sweden through Synthetic Difference-in-Differences Design

**Panel A: Core Labor Market**

| | Employment Norway (1) | Employment Sweden (2) | Employment Total (3) | Unemployment Benefits (4) | Average Earnings (5) |
|---|---|---|---|---|---|
| Treated | 0.033 | -0.023 | 0.003 | -0.012 | 10064.3 |
| Bootstrap SE | (0.004)*** | (0.006)*** | (0.003) | (0.011) | (3974.8)** |

**Panel B: Equality**

| | P10 (1) | P50 (2) | P90 (3) |
|---|---|---|---|
| Treated | -62.0 | 4749.9 | 26254.5 |
| Bootstrap SE | (51.5) | (2684.5)* | (8409.7)*** |

**Panel C: Municipality Population and Business Activity**

| | Population (1) | Number Workers (2) | Firms 3+ (3) | Firms 5+ (4) | Firms 10+ (5) | Firms 20+ (6) |
|---|---|---|---|---|---|---|
| Treated | -708.2 | -347.0 | -24.1 | -20.7 | -6.0 | -4.6 |
| Bootstrap SE | (279.3)** | (178.5)* | (9.4)** | (5.2)*** | (2.2)*** | (1.1)*** |

Source: Authors' calculations of Swedish registry data from 2001 to 2014.
Notes: Estimates correspond to the "Full Exposure" values for 2010-2014 in the synthetic difference-in-differences design in Section 6.2. Bootstrap standard errors based on 100 iterations are provided in parentheses Arkhangelsky et al. (2021).

Table A14: Municipality Response: Norway through Synthetic Difference-in-Differences Design

| | Employment Rate, Domestic + Commuters | Domestic Pr(Employed) | Commuters/ FT Domestic Workers | Domestic Pr(UI Benefits) | Domestic Avg Earnings | Norwegian Pr(Employed) |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| **Panel A: Core Labor Market** | | | | | | |
| Treated | -0.001 | -0.024 | 0.047 | 0.011 | -8690.45 | -0.026 |
| Bootstrap SE | (0.008) | (0.003)*** | (0.014)*** | (0.004)** | (3430.05)** | (0.004)*** |
| **Panel B: Equality** | | | | | | |
| | P10 | P50 | P90 | | | |
| | (1) | (2) | (3) | | | |
| Treated | -2695.49 | -8134.94*** | -27172.2*** | | | |
| Bootstrap SE | (2259.51) | (2840.37) | (6914.95) | | | |
| **Panel C: Municipality population and business activity** | | | | | | |
| | Population | No. Domestic FT Workers | Firms 3+ | Firms 5+ | Firms 10+ | Firms 20+ |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Treated | 3.97 | -105.92 | -0.586 | 3.309 | -0.166 | -0.245 |
| Bootstrap SE | (124.24) | (98.14) | (5.82) | (5.98) | (3.52) | (2.14) |

Source: Authors' calculations of Norwegian registry data from 2001 to 2014.
Estimates correspond to the "Full Exposure" values for 2010-2014 in the synthetic difference-in-differences design in Section 6.2. Bootstrap standard errors based on 100 iterations are provided in parentheses Arkhangelsky et al. (2021).

Table A15: Municipality Response: Sweden Within-Region Exposure

**Panel A: Core Labor Market**

| | Employment Norway (1) | Employment Sweden (2) | Employment Total (3) | Unemployment Benefits (4) | Average Earnings (5) |
|---|---|---|---|---|---|
| Phase In | 0.165*** | -0.116*** | 0.003 | -0.152** | 55955.8*** |
| | (0.021) | (0.038) | (0.033) | (0.062) | (20479.2) |
| Full Exposure | 0.366*** | -0.206** | 0.077 | -0.193*** | 123524.3*** |
| | (0.042) | (0.069) | (0.047) | (0.094) | (30942.4) |

**Panel B: Equality**

| | P10 (1) | P50 (2) | P90 (3) |
|---|---|---|---|
| Phase In | 1525.2* | 23384.7 | 139741.4*** |
| | (802.7) | (20449.3) | (34829.3) |
| Full Exposure | 3104.1 | 72938.4*** | 245591.4*** |
| | (2115.8) | (30600.9) | (51195.0) |

**Panel C: Municipality Population and Business Activity**

| | Population (1) | Number Workers (2) | Firms 3+ (3) | Firms 5+ (4) | Firms 10+ (5) | Firms 20+ (6) |
|---|---|---|---|---|---|---|
| Phase In | -1494.9* | -788.2 | -124.1** | -93.6*** | -32.0* | -8.1 |
| | (874.6) | (727.9) | (50.1) | (33.0) | (16.6) | (10.7) |
| Full Exposure | -5735.8** | -3583.2* | -245.9*** | -193.5*** | -58.9** | -47.8*** |
| | (2208.2) | (1821.5) | (84.8) | (55.0) | (24.0) | (11.6) |

Source: Authors' calculations of Swedish registry data from 2001 to 2014. Observations: 967 for every outcome.
Notes: The table presents our estimates from a modified version of Equation2, where instead of binary treatment, we use the average predicted commuting probability in the municipality as a measure of treatment intensity. Using the individual data for those in the sample in 2004, we estimate linear probability models for commuting to Norway in the post-shock period based on demographics in each of our treated municipalities using the following pre-shock variables as predictors: age (bins), gender, marital status, presence of children under the age of 18, industry of work, education, total wage, and pre-shock cross-border commuting status.

Table A16: Industry Composition in Sweden, Treatment and Control

| | Treatment | Control |
|---|---|---|
| Agriculture | 0.025 | 0.024 |
| Fishing | 0.000 | 0.000 |
| Mining and Quarrying | 0.002 | 0.002 |
| Manufacturing | 0.162 | 0.164 |
| Electric and Gas | 0.006 | 0.006 |
| Water | 0.011 | 0.011 |
| Construction | 0.053 | 0.054 |
| Wholesale and retail trade | 0.121 | 0.120 |
| Hotels and Restaurants | 0.032 | 0.032 |
| Transport, storage, communication | 0.061 | 0.061 |
| Financial intermediation | 0.018 | 0.019 |
| Real estate, renting and business activity | 0.126 | 0.126 |
| Public administration and defense | 0.052 | 0.052 |
| Education | 0.103 | 0.101 |
| Health and social work | 0.156 | 0.158 |
| Other Services | 0.059 | 0.057 |
| Panel B: Demographic Composition | | |
| | Treated | Control |
| Average Age | 38.99 | 38.96 |
| Female | 0.475 | 0.483 |
| Less than High School | 0.156 | 0.144 |
| High School | 0.640 | 0.612 |
| Bachelors or More | 0.204 | 0.244 |
| Married | 0.353 | 0.417 |
| Has Child at Home | 0.468 | 0.492 |

Source: Authors' calculations of Swedish registry data in 2004 before the commuting shock.

Table A17: Industry and Demographic Composition in Norway, Treatment and Control

| Panel A: Industry Composition | | |
|---|---|---|
| | Treatment | Control |
| Agriculture | 0.013 | 0.010 |
| Fishing | 0.000 | 0.000 |
| Mining and Quarrying | 0.002 | 0.003 |
| Manufacturing | 0.183 | 0.164 |
| Electricity, Gas, Water | 0.009 | 0.010 |
| Construction | 0.083 | 0.075 |
| Wholesale and Retail Trade | 0.134 | 0.147 |
| Hotels and Restaurants | 0.017 | 0.027 |
| Transportation, Storage, and Communication | 0.052 | 0.056 |
| Financial Intermediation | 0.015 | 0.015 |
| Real Estate, Renting, and Business Activity | 0.069 | 0.076 |
| Public Administration and Defense | 0.080 | 0.067 |
| Education | 0.098 | 0.094 |
| Health and Social Work | 0.218 | 0.226 |
| Other Services | 0.027 | 0.030 |
| Panel B: Demographic Composition | | |
| | Treated | Control |
| Average Age | 41.98 | 42.33 |
| Female | 0.493 | 0.501 |
| Less than High School | 0.225 | 0.196 |
| High School | 0.513 | 0.511 |
| Bachelors or More | 0.256 | 0.286 |
| Married | 0.588 | 0.581 |
| Has Child at Home | 0.631 | 0.634 |
| Sweden-Born | 0.017 | 0.008 |
| Non-Western Immigrants | 0.027 | 0.035 |

Source: Authors' calculations of Norwegian registry data in 2004 before the commuting shock.

Table A18: Municipality Response: Sweden with Shift-share Control Industry

**Panel A: Core Labor Market**

| | Employment Norway (1) | Employment Sweden (2) | Employment Total (3) | Unemployment Benefits (4) | Average Earnings (5) |
|---|---|---|---|---|---|
| Phase In | 0.015*** | -0.009** | 0.000 | -0.011* | 4132.6** |
| | (0.002) | (0.004) | (0.003) | (0.006) | (1873.0) |
| Full Exposure | 0.033*** | -0.016** | 0.007 | -0.015* | 10448.6*** |
| | (0.004) | (0.006) | (0.005) | (0.009) | (2866.9) |

**Panel B: Equality**

| | P10 (1) | P50 (2) | P90 (3) |
|---|---|---|---|
| Phase In | 134.9 | 953.6 | 11650.0*** |
| | (147.5) | (2038.2) | (3102.4) |
| Full Exposure | 309.0 | 5456.4* | 21416.5*** |
| | (303.7) | (3044.6) | (4672.1) |

**Panel C: Municipality Population and Business Activity**

| | Population (1) | Number Workers (2) | Firms 3+ (3) | Firms 5+ (4) | Firms 10+ (5) | Firms 20+ (6) |
|---|---|---|---|---|---|---|
| Phase In | -119.6 | -82.8 | -10.1** | -8.8*** | -2.5 | -1.0 |
| | (86.8) | (77.1) | (4.7) | (3.2) | (1.7) | (1.0) |
| Full Exposure | -515.0** | -344.0* | -21.6*** | -18.1*** | -5.0** | -4.5*** |
| | (202.3) | (175.6) | (7.7) | (4.8) | (2.4) | (1.1) |

Source: Authors' calculations of Swedish registry data from 2001 to 2014. Observations: 967 for every outcome.
Notes:
Notes: The industry Bartik control is constructed by interacting the total change in national employment between 2004 to 2014 in each 2-digit industry (the shift) with 2004 baseline shares of municipality employment in each 2-digit industry (the share). This predicts expected exposure to any industry-specific shocks between 2004 and 2014 for each municipality.

Table A19: Municipality Response: Norway with Shift-share Control Industry

**Panel A: Core Labor Market**

| | Employment Rate, Domestic + Commuters | Domestic Pr(Employed) | Commuters/ FT Domestic Workers | Domestic Pr(UI Benefits) | Domestic Avg Earnings |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Phase In | -0.005 | -0.010*** | 0.011** | 0.001 | -2777** |
| | (0.004) | (0.003) | (0.005) | (0.002) | (1152) |
| Full Exposure | -0.007 | -0.021*** | 0.048*** | 0.0005 | -2761 |
| | (0.007) | (0.004) | (0.013) | (0.003) | (2697) |
| *Mean* | 0.73 | 0.71 | 0.03 | 0.05 | 340878 |

**Panel B: Equality**

| | P10 | P50 | P90 |
|---|---|---|---|
| | (1) | (2) | (3) |
| Phase In | -1663 | -2740*** | -6173** |
| | (1376) | (1031) | (2512) |
| Full Exposure | 414.9 | -2715 | -11614** |
| | (2086) | (2525) | (5049) |
| *Mean* | 174533 | 326882 | 500843 |

**Panel C: Municipality population and business activity**

| | Population | No. Domestic FT Workers | Firms 3+ | Firms 5+ | Firms 10+ | Firms 20+ |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Phase In | 55.06 | -54.77 | -1.297 | -0.200 | 0.403 | -0.519 |
| | (147.4) | (58.71) | (4.030) | (3.666) | (2.963) | (2.512) |
| Full Exposure | 111.9 | -111.9 | -4.642 | -1.132 | -0.643 | -2.179 |
| | (355.2) | (111.7) | (6.070) | (5.412) | (4.705) | (4.092) |
| *Mean* | 10664 | 3800 | 195 | 146 | 98 | 71 |

Source: Authors' calculations of Norwegian registry data from 2001 to 2014. Observations: 1,316 except Panel A columns 1-2, which have 1,144 observations.
Notes: The industry Bartik control is constructed by interacting the total change in national employment between 2004 to 2014 in each 2-digit industry (the shift) with 2004 baseline shares of municipality employment in each 2-digit industry (the share). This predicts expected exposure to any industry-specific shocks between 2004 and 2014 for each municipality.

Table A20: Municipality Response: Sweden with Shift-share EU Expansion Control

**Panel A: Core Labor Market**

| | Employment Norway | Employment Sweden | Employment Total | Unemployment Benefits | Average Earnings |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Phase In | 0.016*** | -0.011*** | 0.001 | -0.017** | 4716.2** |
| | (0.002) | (0.004) | (0.003) | (0.006) | (2057.3) |
| Full Exposure | 0.034*** | -0.018** | 0.008 | -0.028*** | 10436.4*** |
| | (0.004) | (0.007) | (0.005) | (0.009) | (3165.5) |

**Panel B: Equality**

| | P10 | P50 | P90 |
|---|---|---|---|
| | (1) | (2) | (3) |
| Phase In | 194.0* | 1728.5 | 12189.4*** |
| | (109.9) | (2021.1) | (3444.9) |
| Full Exposure | 449.6 | 5783.8* | 21058.0*** |
| | (315.6) | (3125.5) | (5048.6) |

**Panel C: Municipality Population and Business Activity**

| | Population | Number Workers | Firms 3+ | Firms 5+ | Firms 10+ | Firms 20+ |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Phase In | -214.488** | -132.0 | -13.9** | -10.5*** | -3.6* | -1.1 |
| | (103.2) | (82.8) | (5.6) | (3.6) | (1.8) | (1.0) |
| Full Exposure | -764.4*** | -514.6** | -30.2*** | -23.2*** | -7.7** | -5.4*** |
| | (290.2) | (231.5) | (11.0) | (7.5) | (3.0) | (1.6) |

Source: Authors' calculations of Swedish registry data from 2001 to 2014. Observations: 967 for every outcome.
Notes: The EU expansion Bartik control is constructed by interacting the total change in the number of workers between 2004 and 2014 that were born in the 25 expanded EU states excluding the Nordic countries (the shift) with 2004 baseline shares of municipality employment from each of the 25 expanded EU states (the share). This predicts expected exposure to EU migration from expansion between 2004 and 2014 for each municipality.

Table A21: Municipality Response: Norway with Shift-share EU Expansion Control

**Panel A: Core Labor Market**

| | Employment Rate, Domestic + Commuters | Domestic Pr(Employed) | Commuters/ FT Domestic Workers | Domestic Pr(UI Benefits) | Domestic Avg Earnings |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Phase In | -0.00 | -0.011*** | 0.010** | 0.001 | -3010** |
| | (0.004) | (0.003) | (0.004) | (0.002) | (1151) |
| Full Exposure | -0.009 | -0.023*** | 0.046*** | 0.001 | -3287 |
| | (0.007) | (0.005) | (0.013) | (0.003) | (2962) |
| *Mean* | 0.73 | 0.71 | 0.03 | 0.05 | 340878 |

**Panel B: Equality**

| | P10 | P50 | P90 |
|---|---|---|---|
| | (1) | (2) | (3) |
| Phase In | -1720 | -2780** | -6641** |
| | (1412) | (1081) | (2593) |
| Full Exposure | 244.6 | -2741 | -12374** |
| | (2179) | (2601) | (5544) |
| *Mean* | 174533 | 326882 | 500843 |

**Panel C: Municipality population and business activity**

| | Population | No. Domestic FT Workers | Firms 3+ | Firms 5+ | Firms 10+ | Firms 20+ |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Phase In | 62.06 | -55.47 | -1.459 | -0.408 | 0.272 | -0.701 |
| | (147.3) | (60.75) | (4.328) | (3.905) | (3.133) | (2.664) |
| Full Exposure | 169.1 | -98.19 | -4.379 | -1.127 | -0.441 | -2.202 |
| | (343.0) | (106.8) | (6.122) | (5.679) | (4.821) | (4.135) |
| *Mean* | 10664 | 3800 | 195 | 146 | 98 | 71 |

Source: Authors' calculations of Norwegian registry data from 2001 to 2014. Observations: 1,316 except Panel A columns 1-2, which have 1,144 observations.
Notes: The EU expansion Bartik control is constructed by interacting the total change in the number of workers between 2004 and 2014 that were born in the 10 EU expansion states of Eastern and Southern Europe (the shift) with 2004 baseline shares of municipality employment from each of the 10 expansion states (the share). This predicts expected exposure to EU migration from expansion between 2004 and 2014 for each municipality.

Table A22: Municipality Response: Sweden and Norway with Demographic and Skill Controls

| **Panel A: Sweden** | | | | | |
|---|---|---|---|---|---|
| | Employment Norway | Employment Sweden | Employment Total | Unemployment Benefits | Average Earnings |
| | (1) | (2) | (3) | (4) | (5) |
| Phase In | 0.010*** | -0.008** | 0.000 | -0.011** | 4630** |
| | (0.002) | (0.004) | (0.003) | (0.005) | (2053) |
| Full Exposure | 0.033*** | -0.018** | 0.007 | -0.018** | 12088*** |
| | (0.004) | (0.007) | (0.005) | (0.009) | (3191) |
| *Mean* | 0.008 | 0.85 | 0.85 | 0.14 | 181729 |
| **Panel B: Norway** | | | | | |
| | Employment Rate, Domestic + Commuters | Domestic Pr(Employed) | Commuters/ FT Domestic Workers | Unemployment Benefits) | Domestic Avg Earnings |
| | (1) | (2) | (3) | (4) | (5) |
| Phase In | -0.006 | -0.010*** | 0.009** | -0.0001 | -1445 |
| | (0.005) | (0.003) | (0.004) | (0.002) | (1098) |
| Full Exposure | -0.012* | -0.022*** | 0.044*** | 0.0003 | -1998 |
| | (0.007) | (0.005) | (0.011) | (0.003) | (2548) |
| *Mean* | 0.73 | 0.71 | 0.03 | 0.05 | 340878 |

Source: Authors' calculations of Swedish and Norwegian registry data from 2001 to 2014. Observations: 967 for Sweden and 1,316 for Norway. Notes: Estimates come from Equation 2 with the inclusion of controls for education bins, female share of workers, age bins, the share married, share single, and the share of adults with children at home.

Table A23: Firm Endline Outcomes: Sweden

| | Net Revenues (1000SEK) (1) | Capital (1000SEK) (2) | Inventory (1000SEK) (3) |
|---|---|---|---|
| Phase In | -16.45*** | 242.20 | -1785.86*** |
| | (2.63) | (497.57) | (357.28) |
| Full Exposure | -29.94*** | -574.31 | -2871.07*** |
| | (5.01) | (440.35) | (601.83) |
| *Observations* | 488838 | 488838 | 488838 |
| *Mean* | 251 | 5672 | 15300 |

Source: Authors' calculations of Swedish registry data from 2001 to 2014.
Notes: Estimates come from Equation 2 and include fixed effects for firm, municipality, and year. Standard errors clustered at the firm-by-municipality level.

Table A24: Sweden: Local Services Revenue and House Prices

| | Total Revenue in Local Goods (1,000 SEK) (1) | Average House Price (1,000 SEK) (2) |
|---|---|---|
| Phase In | -185.45 | -0.65 |
| | (334.17) | (67.71) |
| Full Exposure | 56.31 | 57.96 |
| | (679.01) | (126.88) |
| Observations | 967 | 962 |
| Robust standard errors in parentheses | | |
| *** p<0.01, ** p<0.05, * p<0.1 | | |

Source: Authors' calculations of Swedish register data at the municipality level.
Notes: Estimates come from Equation 2 and include fixed effects for municipality and year. Standard errors clustered at the municipality level.

Table A25: Firm Response: Sweden in Tradable Sector

**Panel A: Workers and Earnings**

| | Number of Workers (1) | Firm Exit (2) | Average Earnings (3) |
|---|---|---|---|
| Phase In | -0.161 | 0.003 | 4186.262 |
| | (0.214) | (0.002) | (2645.241) |
| Full Exposure | -0.339 | 0.010** | 10687.05** |
| | (0.330) | (0.004) | (4400.295) |
| *Observations* | 171723 | 178310 | 200702 |
| *Mean* | 6.59 | 0.028 | 186459.1 |

**Panel B: Entrants and incumbents**

| | Number of Entrants (1) | Number of Incumbents (2) | Average Entry Earnings (3) | Average Incumbent Earnings (4) |
|---|---|---|---|---|
| Phase In | -0.146** | -0.141 | 412.84 | 394.12 |
| | (0.058) | (0.088) | (4392.26) | (3661.45) |
| Full Exposure | -0.145* | 0.141 | 5427.6 | 11450.8** |
| | (0.077) | (0.133) | (6672.811) | (5669.561) |
| *Observations* | 187161 | 187161 | 76062 | 141256 |
| *Mean* | 1.650 | 2.746 | 188808.8 | 221621.4 |

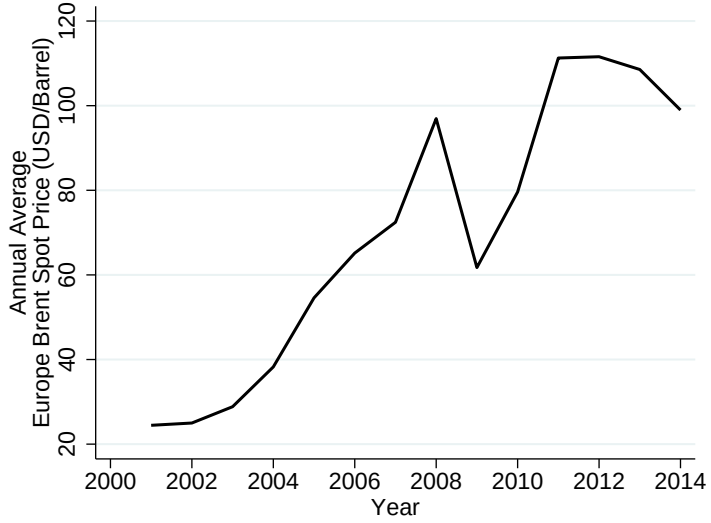
**Panel C: Value Added and Distribution of Income**

| | Value Added (1) | Value Added Per Worker (2) | Average Markdown (3) |
|---|---|---|---|
| Phase In | -167.52 | -29.68* | -32.78** |
| | (156.71) | (15.78) | (15.94) |
| Full Exposure | -404.53** | -65.84** | -76.133*** |
| | (202.63) | (28.86) | (29.28) |
| *Observations* | 171723 | 171723 | 171723 |
| *Mean* | 3295.5 | 570.62 | 384.25 |

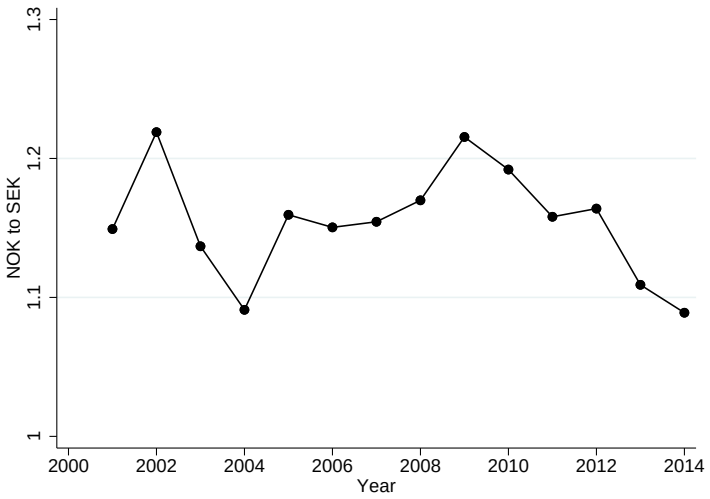
Source: Authors' calculations of Swedish registry data from 2001 to 2014.
Notes: Estimates come from Equation 2 and include fixed effects for firm, municipality, and year. Standard errors clustered at the firm-by-municipality level. Value added and markdowns are measured in 1,000s SEK.

Figure A1: Annual Oil Prices in Europe and NOK to SEK Exchange Rate

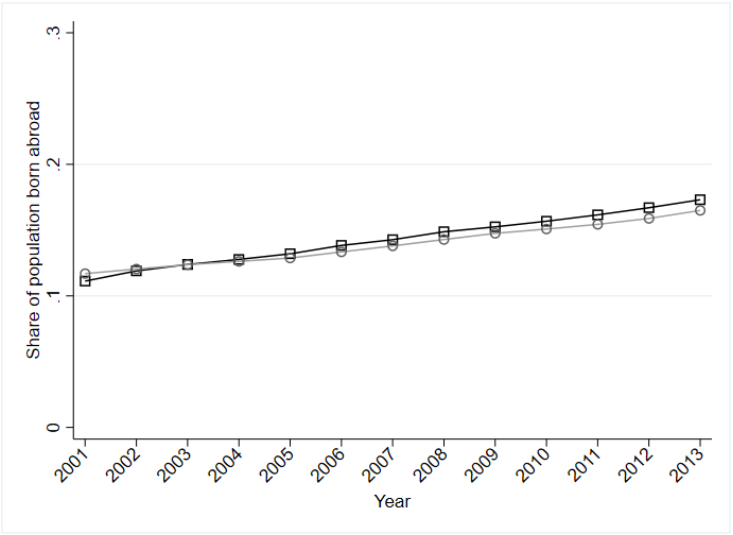
Panel A: Oil Prices in Europe



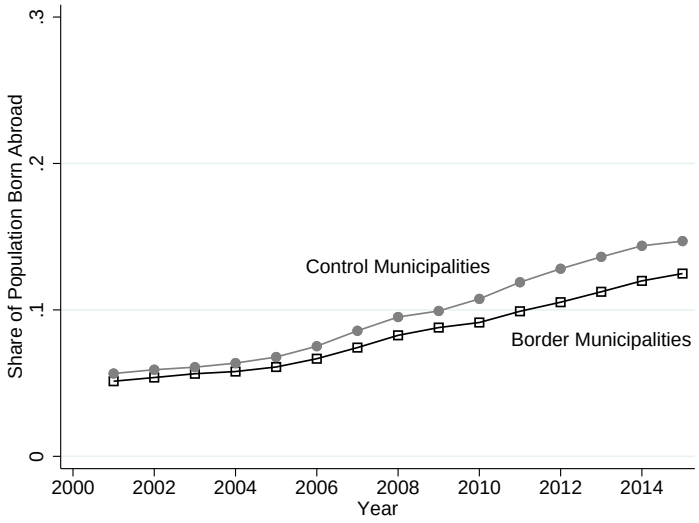

Panel B: NOK to SEK Exchange Rate




Panel C: Sweden Foreign-Born Share

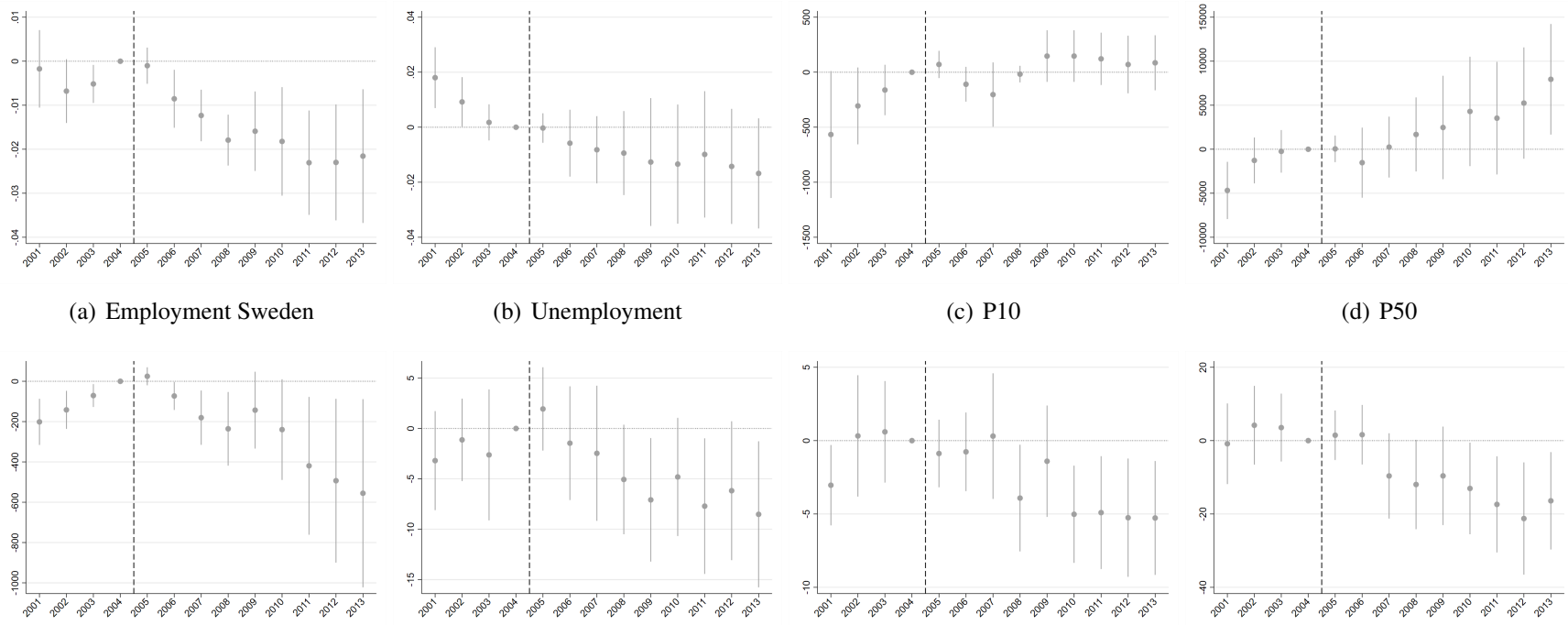



Panel D: Norway Foreign-Born Share




Source: Authors' calculations of register data from Sweden and Norway, US Energy Information Administration (oil prices) and Norges Bank (exchange rates).
Notes: Line depicts the annual average of Europe Brent spot prices in Panel A. Panel B line reflects the annual average exchange rate.

Figure A2: Sweden - Municipalities, Event Studies - Additional Outcomes

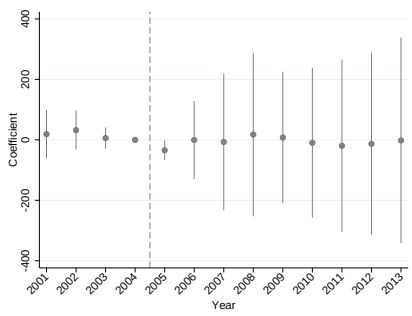


(a) Employment Sweden (b) Unemployment (c) P10 (d) P50

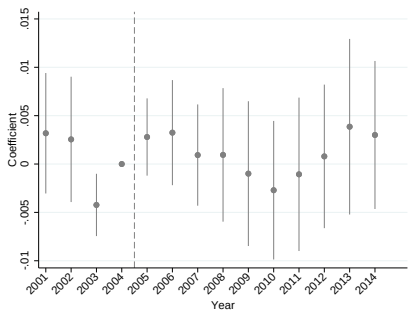
(e) Number of workers (f) Firms 3+ (g) Firms 10+ (h) Firms 20+

Source: Authors' calculations of Swedish register data.
Notes: Coefficients from Equation 1. Estimates include fixed effects for municipality and year. Bars represent 95% confidence intervals. Standard errors clustered at the municipality level.

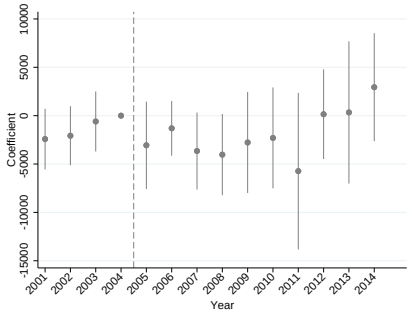
Figure A3: Norway - Municipalities, Event Studies - Additional Outcomes



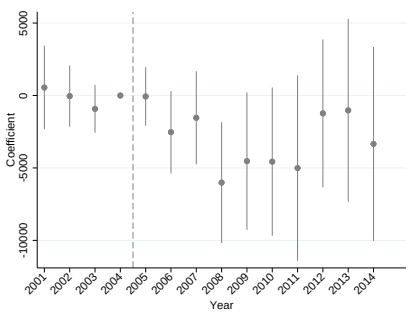

(a) Employment Domestic+Commuters



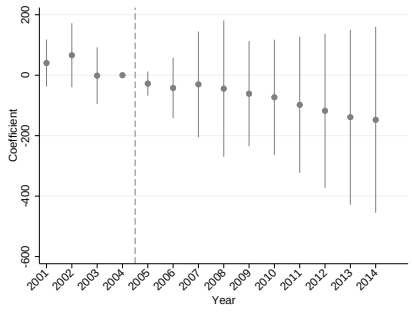

(b) Unemployment



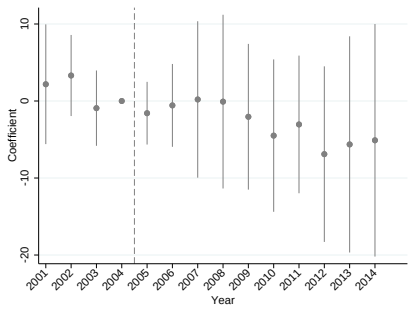

(c) P10



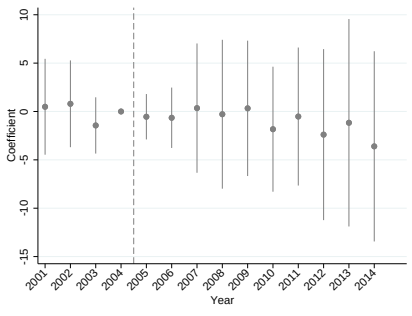

(d) P50



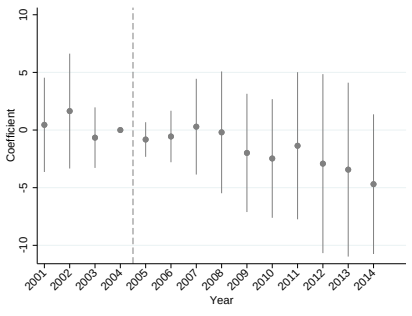

(e) Domestic Workers




(f) Firms 3+



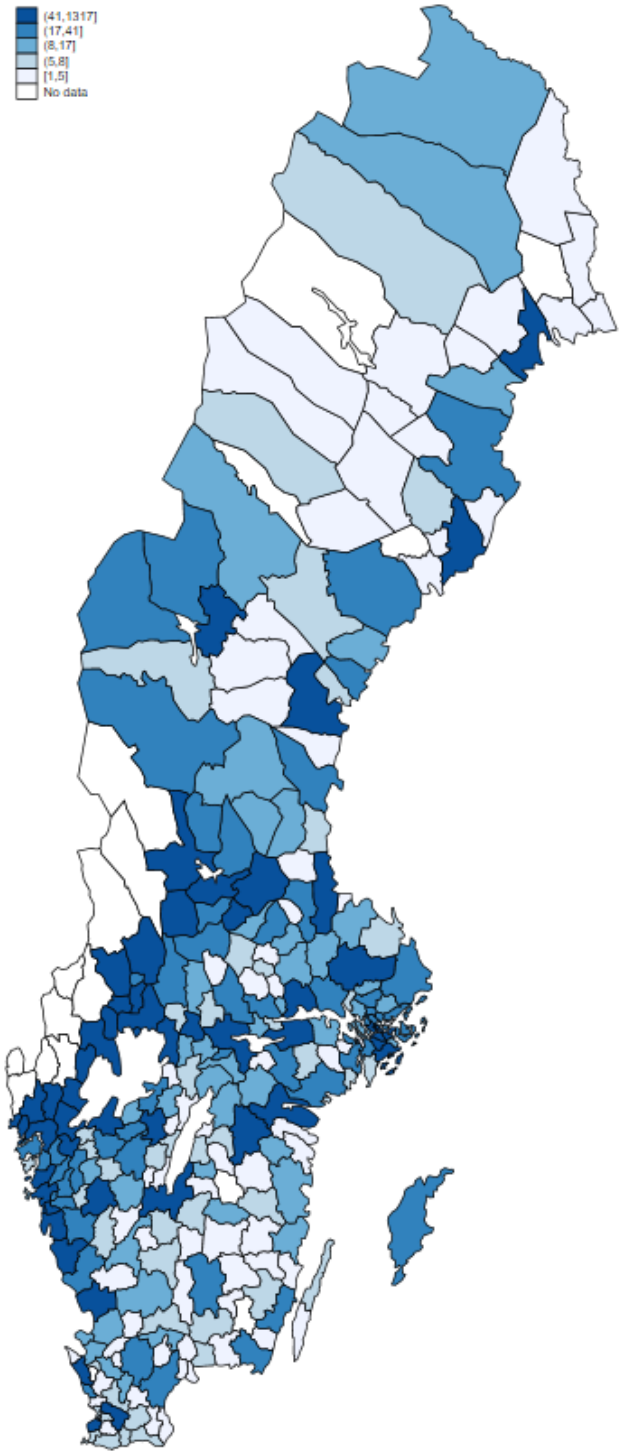

(g) Firms 10+




(h) Firms 20+

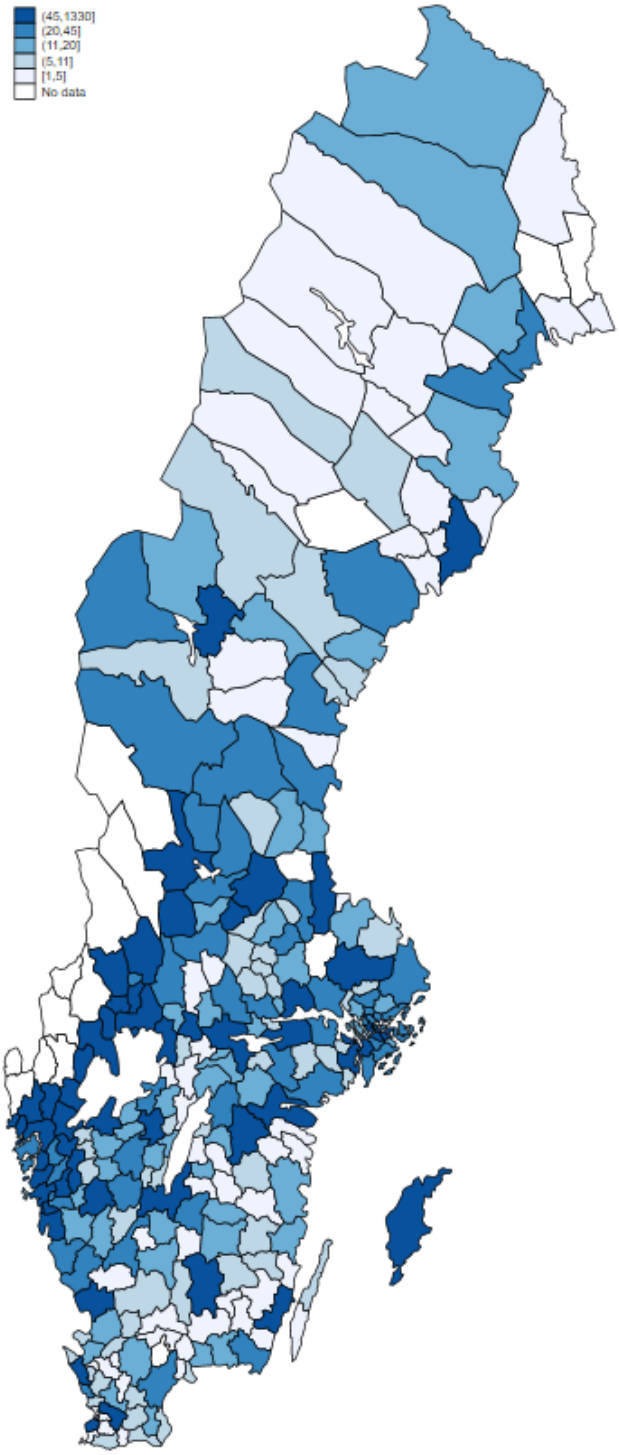
Source: Authors' calculations of Norwegian register data.
Notes: Coefficients from Equation 1. Estimates include fixed effects for municipality and year. Bars represent 95% confidence intervals. Standard errors clustered at the municipality level.

Figure A4: Where Did Swedes From Treatment Group Move After the Shock?



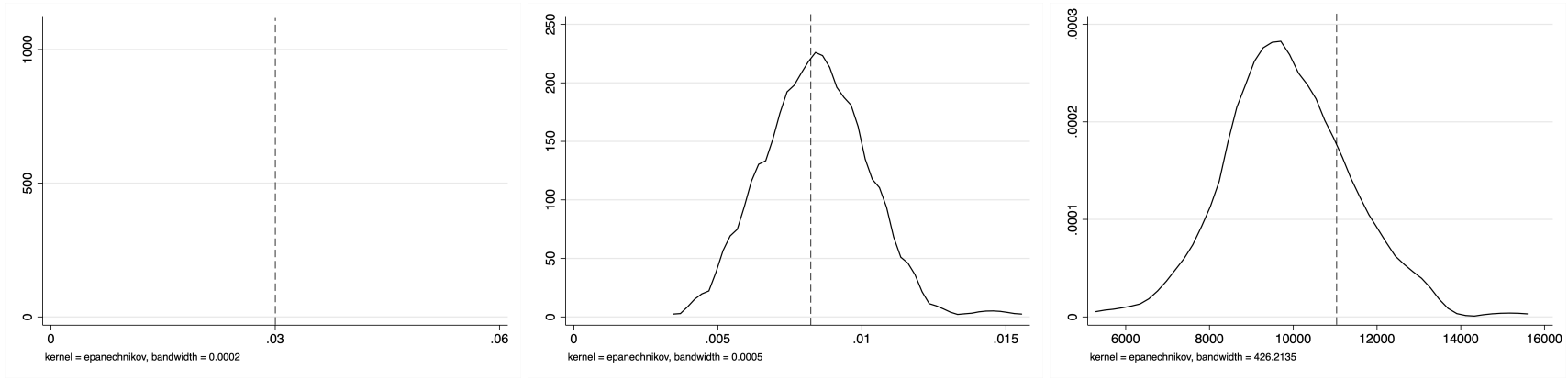

Source: Authors' calculations of Swedish register data.
Notes: Figure captures the number of workers moving from the treated municipalities on the border with Norway to each mapped municipality from 2005 to 2009.

Figure A5: Where Did Swedes From Treatment Group Move Before the Shock?




Source: Authors' calculations of Swedish register data.
Notes: Figure captures the number of workers moving from the treated municipalities on the border with Norway to each mapped municipality from 2001 to 2004.

Figure A6: Sweden - Municipalities, Random Control Permutations

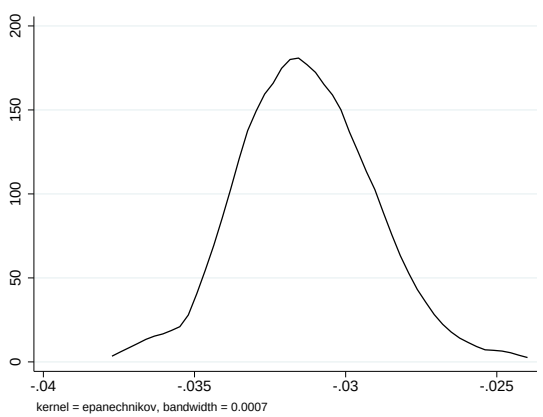



(a) Employment Norway (b) Employment Total (c) Average Earnings

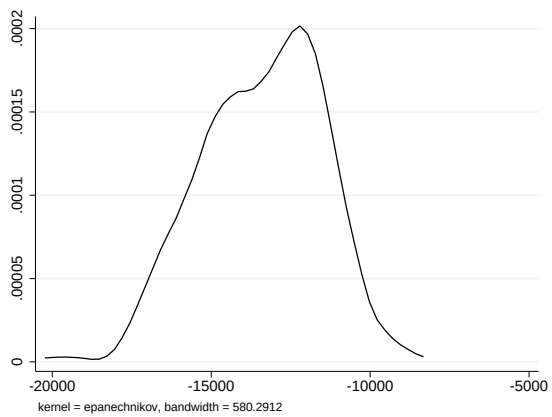
(d) P90 (e) Population (f) Firms 5+

Source: Authors' calculations of Swedish register data.
Notes: Coefficients are for the "Full Exposure" values from Equation 2 when randomly generating control assignment for each of the non-border municipalities in our baseline specification. Vertical lines represent our baseline estimates. In Panel (a), all permutations return results between 0.0301 and 0.0303; identical to the base specification of 0.03. We therefor plot this as a point distribution.

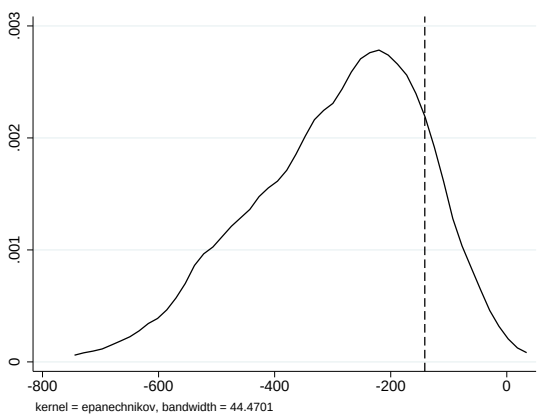
Figure A7: Norway - Municipalities, Random Control Permutations



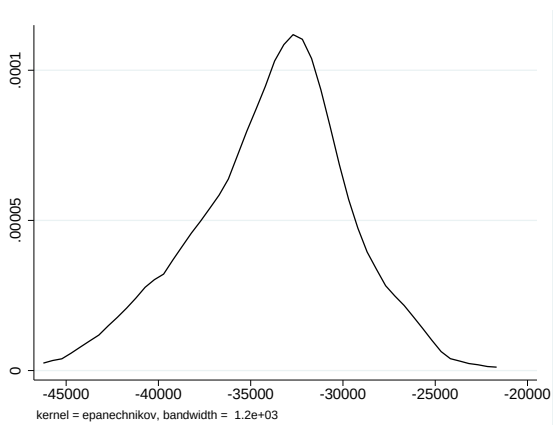

(a) Pr(Employed)



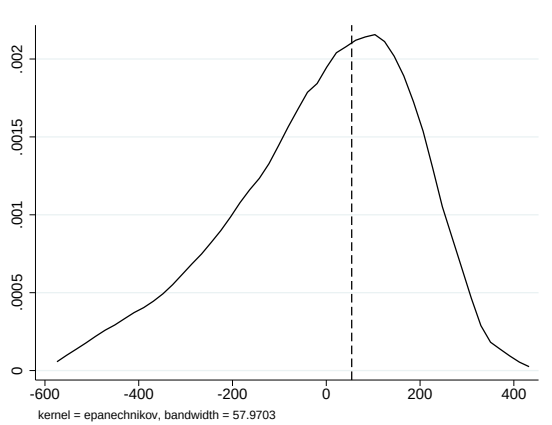

(b) Average Earnings



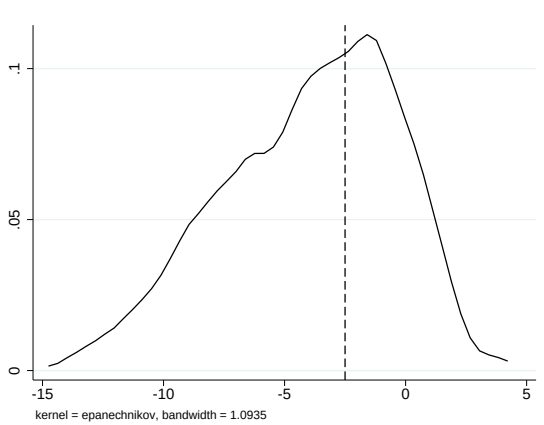

(c) Domestic Workers




(d) P90




(e) Population

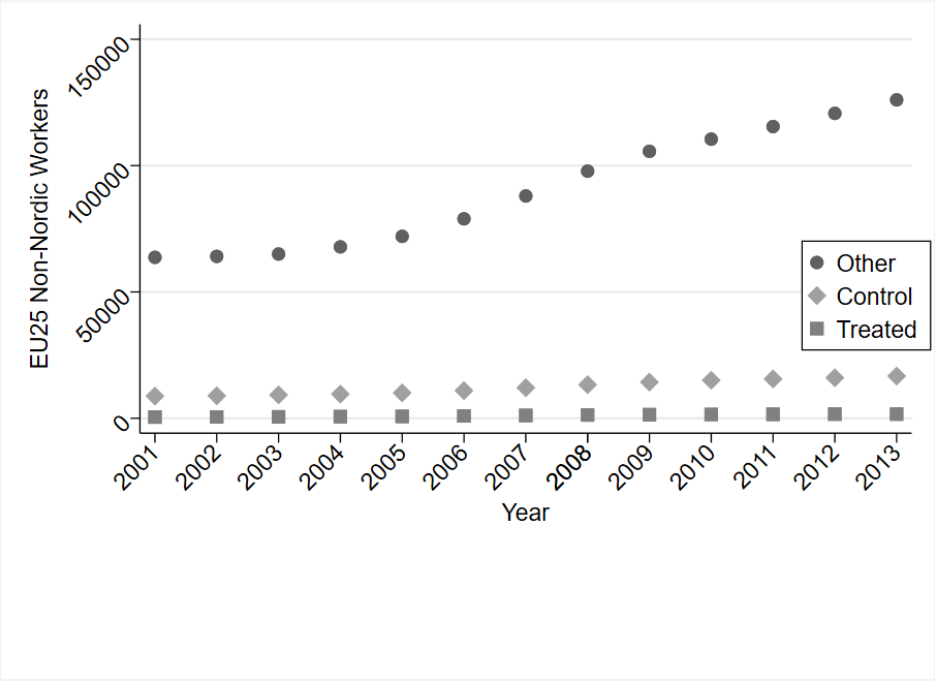



(f) Firms 5+

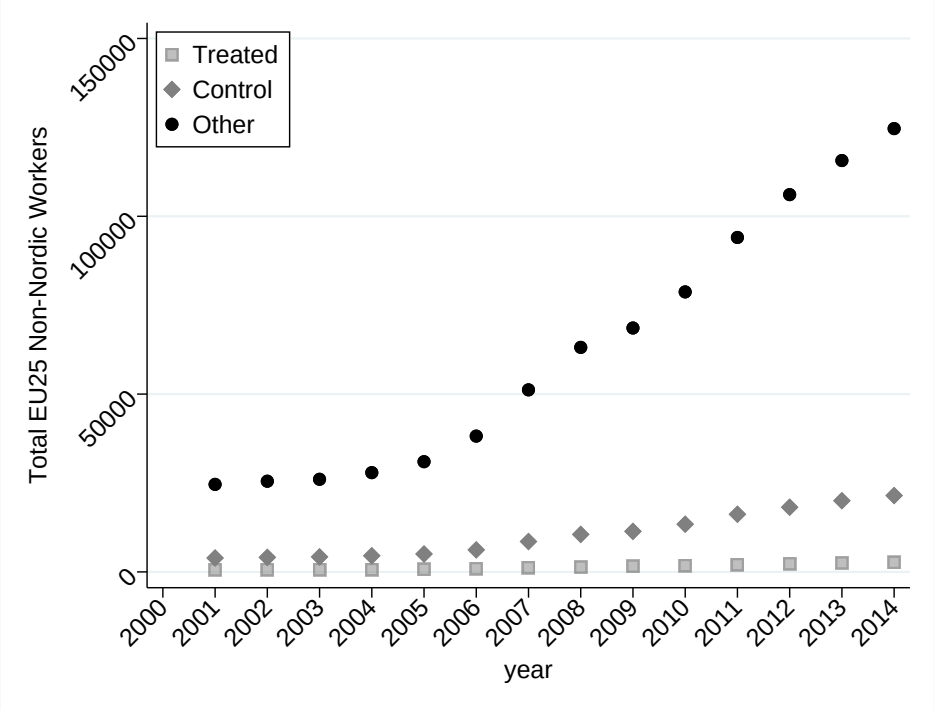
Source: Authors' calculations of Norwegian register data.
Notes: Coefficients are for the "Full Exposure" values from Equation 2 when randomly generating control assignment for each of the non-border municipalities in our baseline specification. Vertical lines represent our baseline estimates.

Figure A8: Trends Around EU Expansion

Panel A: Sweden



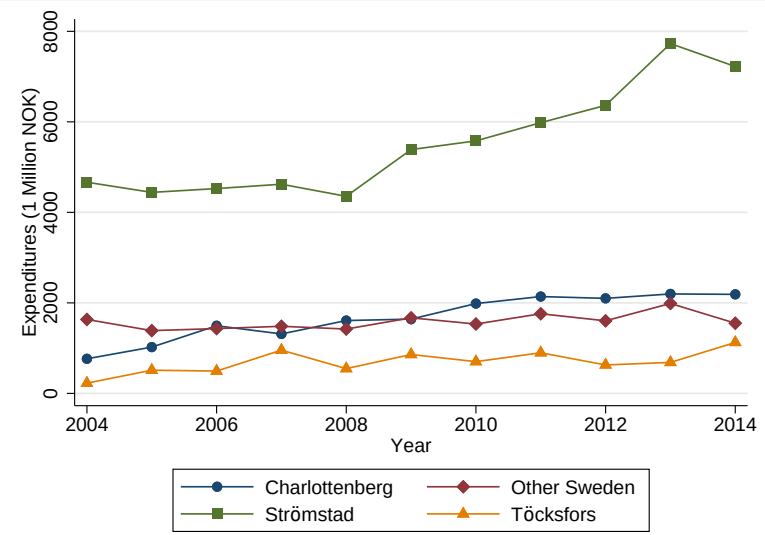

Panel B: Norway



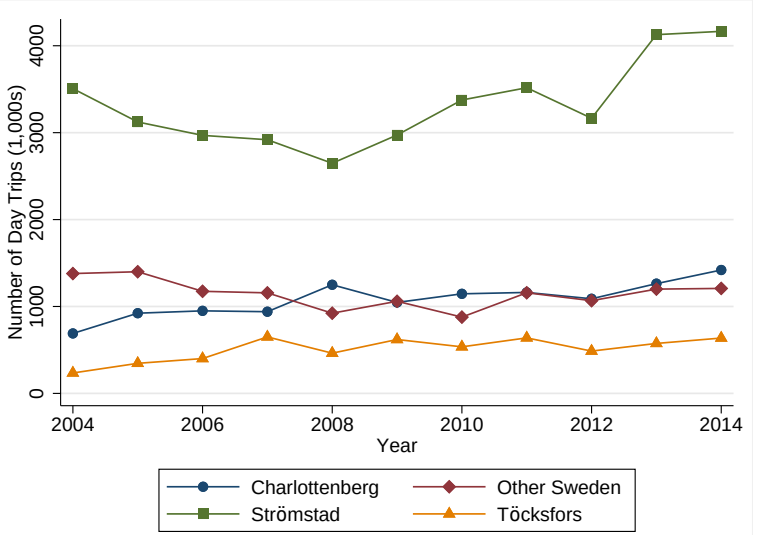

Source: Authors' calculations of Swedish and Norwegian register data.
Notes: Figure captures the number of workers born in the 25 expanded EU countries excluding the Nordics.

Figure A9: Cross-Border Trade

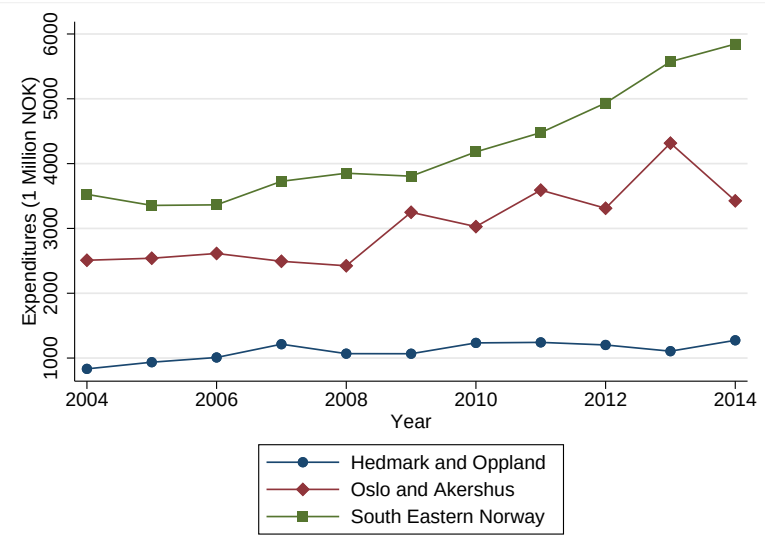
Panel A: Expenditures by Destination (Million NOK)



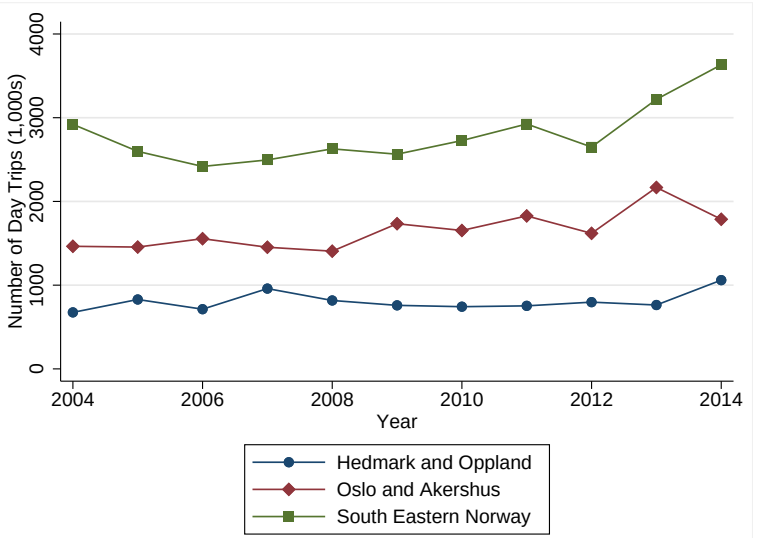

Panel B: Day Trips by Destination (1000s)




Panel C: Expenditures by Source Region (Million NOK)

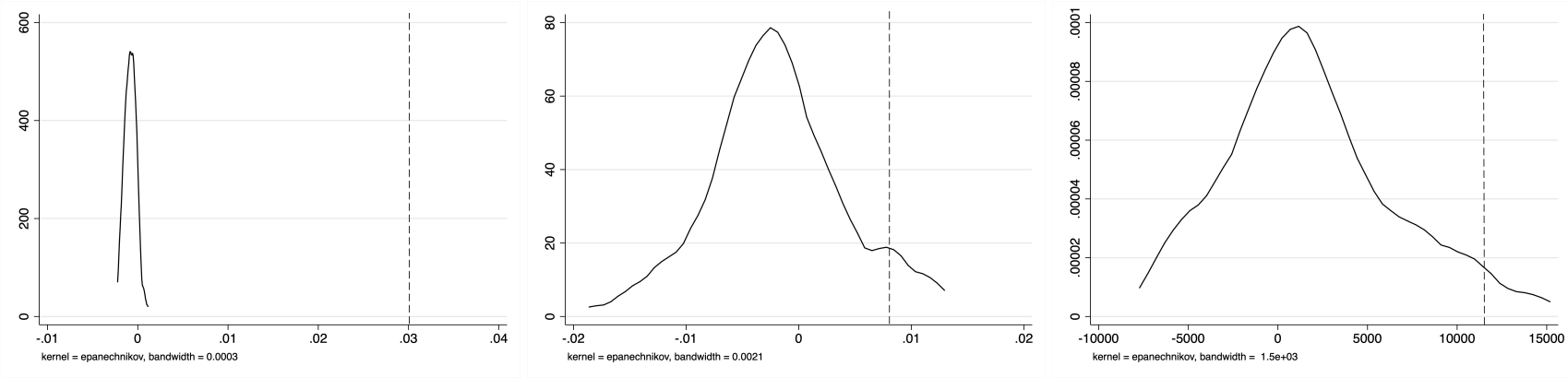



Panel D: Day Trips by Source region (1000s)




Source: Statistics Norway's quarterly cross-border trade survey for trips taken without accommodations including business and leisure purposes.
Notes: Panels A and B are for specific destination municipalities on the Swedish side of the border. Panels C and D are for regions in Norway from which cross-border shoppers originate their day trips.

Figure A10: Sweden - Municipalities, Placebo Estimates

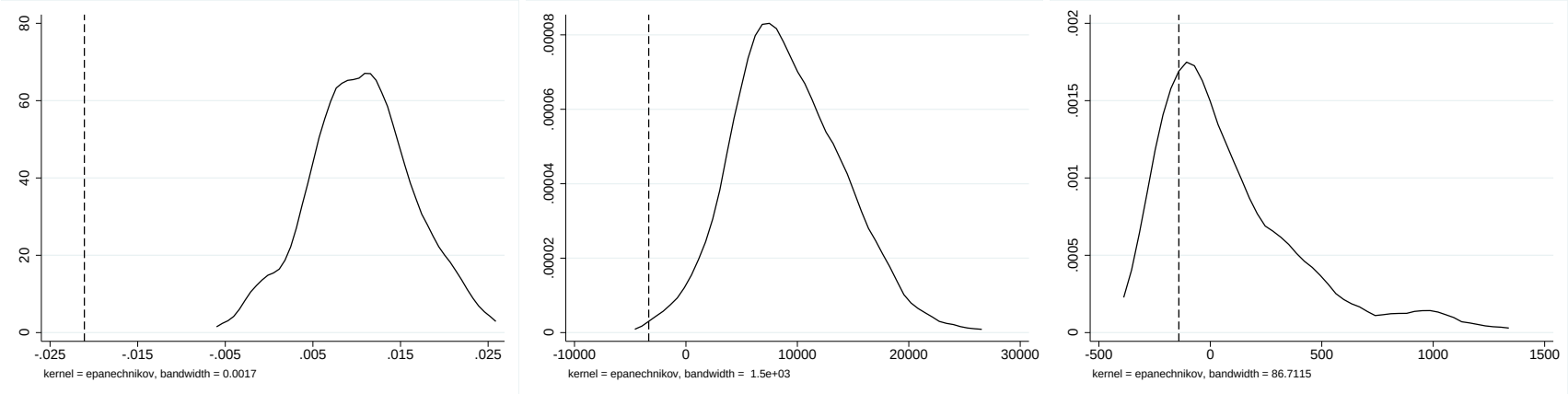



(a) Employment Norway (b) Employment Total (c) Average Earnings

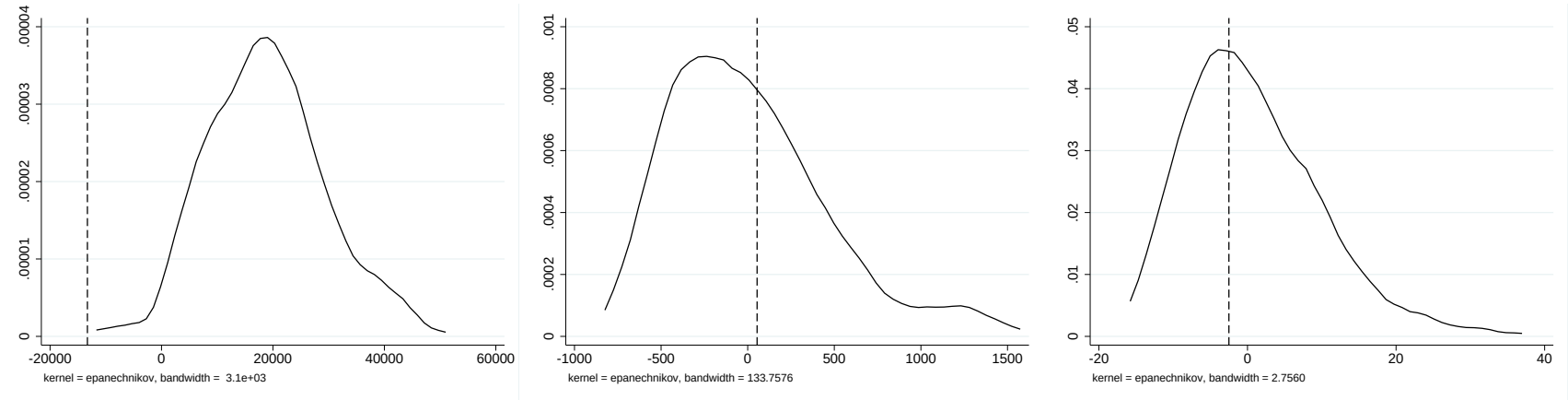
(d) P90 (e) Population (f) Firms 5+

Source: Authors' calculations of Swedish register data.
Notes: Coefficients are for the "Full Exposure" values from Equation 2 when randomly generating treatment assignment for each of the municipalities not originally designated as treated in our baseline specification. Vertical lines represent our baseline estimates.

Figure A11: Norway - Municipalities, Placebo Estimates



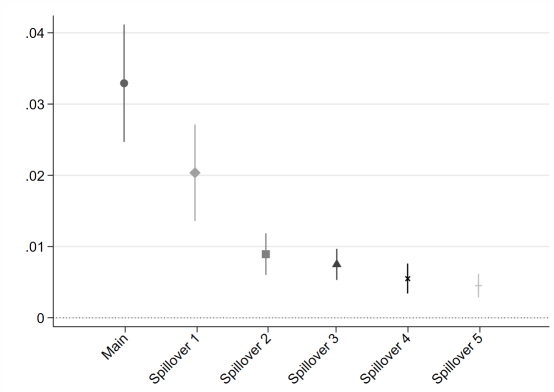

(a) Pr(Employed) (b) Average Earnings (c) Domestic Workers



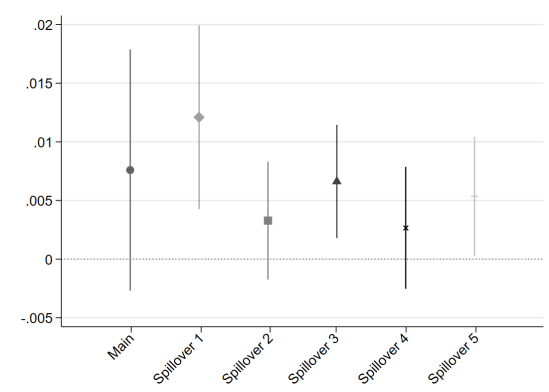

(d) P90 (e) Population (f) Firms 5+

Source: Authors' calculations of Norwegian register data.
Notes: Coefficients are for the "Full Exposure" values from Equation 2 when randomly generating treatment assignment for each of the municipalities not originally designated as treated in our baseline specification. Vertical lines represent our baseline estimates.

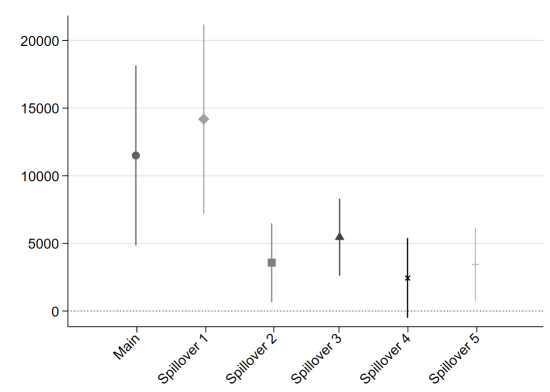
Figure A12: Sweden - Municipalities, Alternative Treatment Groups



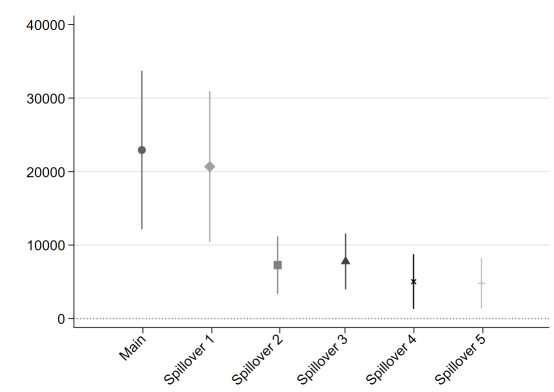

(a) Employment Norway



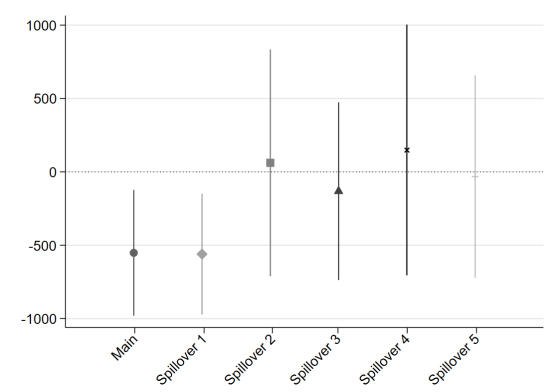

(b) Employment Total



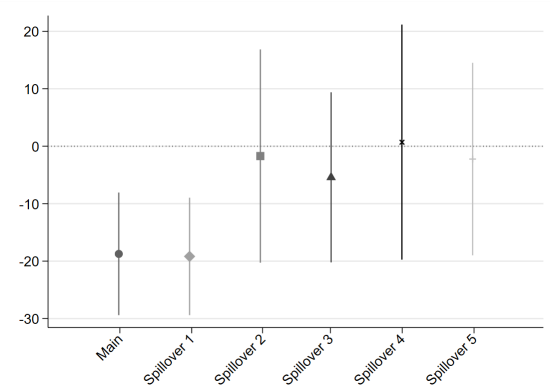

(c) Average Earnings




(d) P90



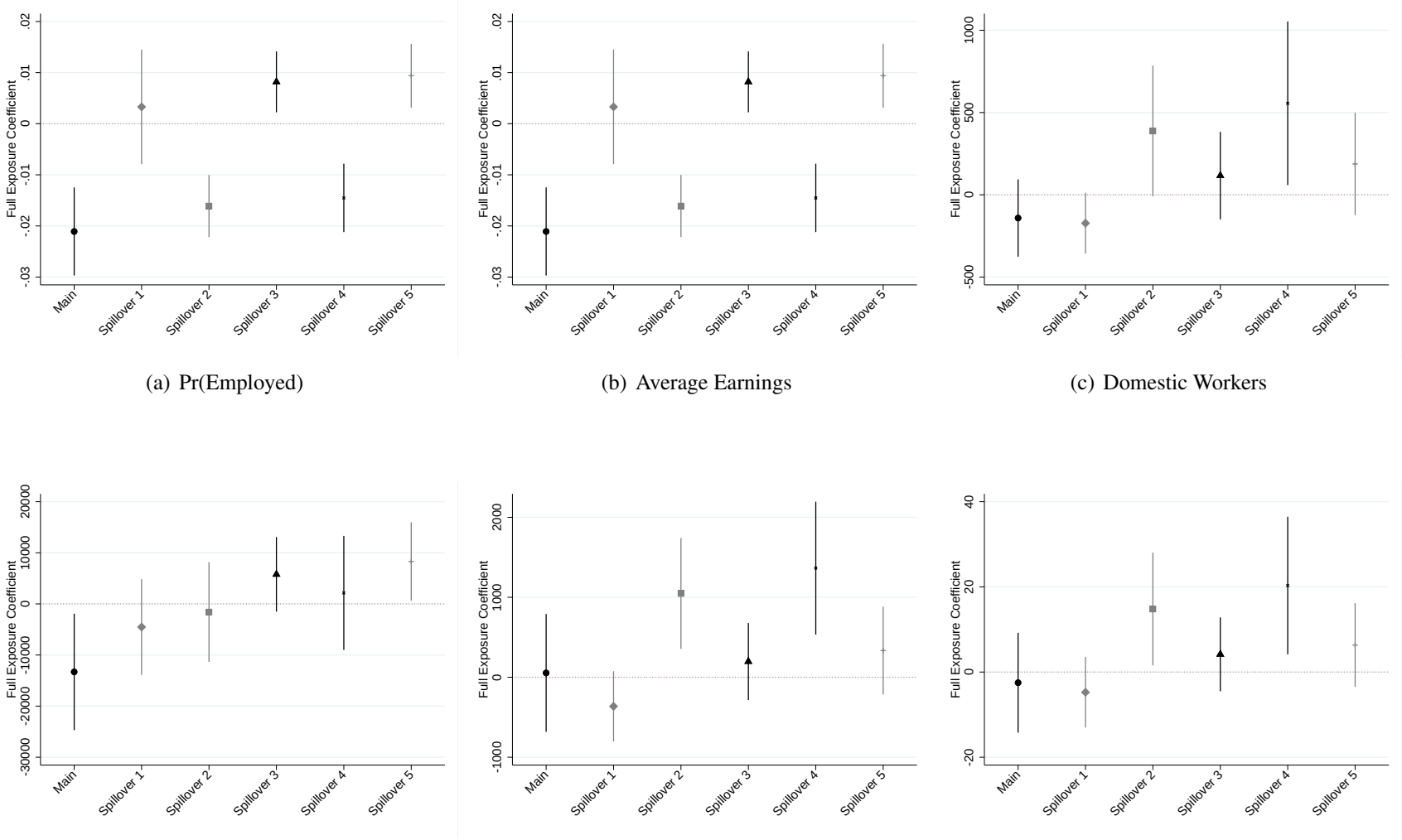

(e) Population




(f) Firms 5+

Source: Authors' calculations of Swedish register data.
Notes: Coefficients from Equation 1. Estimates include fixed effects for municipality and year. Bars represent 95% confidence intervals. Standard errors clustered at the municipality level. We first show the main estimate, the expanded treatment group to include all border municipalities (including those in the sparse northern area) in spillover 1, then all municipalities in the counties that our main treatment municipalities are located in (including those municipalities in the counties that are not on the border) in spillover 2, all municipalities in all border counties (including those in the north) in spillover 3, all municipalities in the counties that our main treatment municipalities are located in except our main treatment municipalities in spillover 4, and all municipalities in all border counties except those that are at the border in spillover 5.

Figure A13: Norway - Municipalities, Alternative Treatment Groups

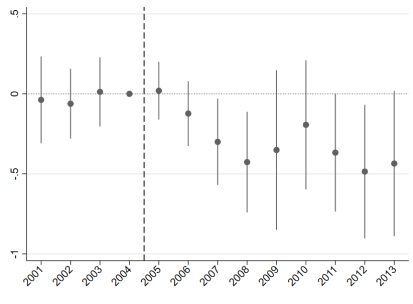



(a) Pr(Employed) (b) Average Earnings (c) Domestic Workers

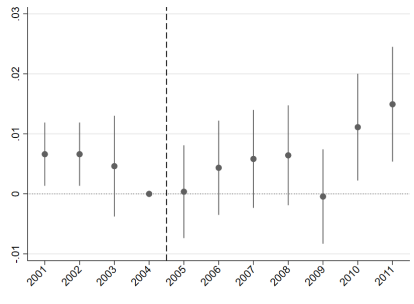
(d) P90 (e) Population (f) Firms 5+

Source: Authors' calculations of Norwegian register data.
Notes: Coefficients from Equation 1. Estimates include fixed effects for municipality and year. Bars represent 95% confidence intervals. Standard errors clustered at the municipality level. We first show the main estimate, the expanded treatment group to include all border municipalities (including those in the sparse northern area) in spillover 1, then all municipalities in the counties that our main treatment municipalities are located in (including those municipalities in the counties that are not on the border) in spillover 2, all municipalities in all border counties (including those in the north) in spillover 3, all municipalities in the counties that our main treatment municipalities are located in except our main treatment municipalities in spillover 4, and all municipalities in all border counties except those that are at the border in spillover 5.

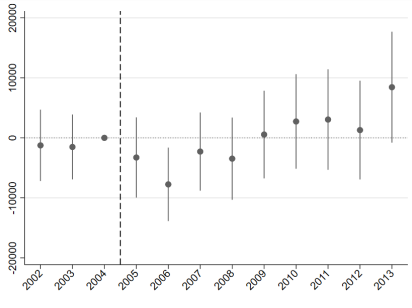
Figure A14: Sweden - Firms, Event Studies - Main Outcomes



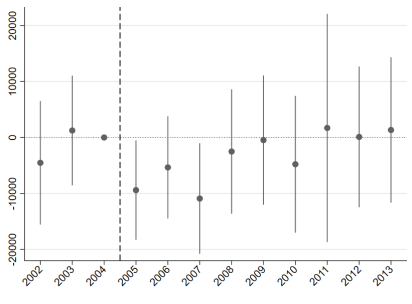
(a) Workers



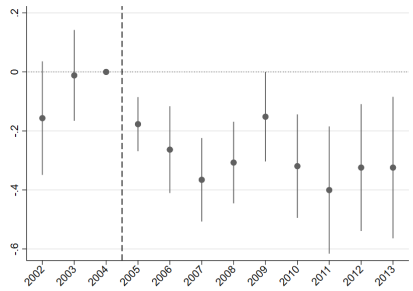
(b) Pr(Exit)



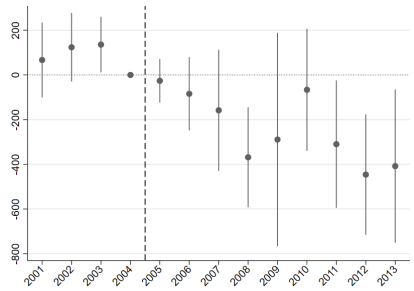
(c) Average Annual Earnings, Incumbents



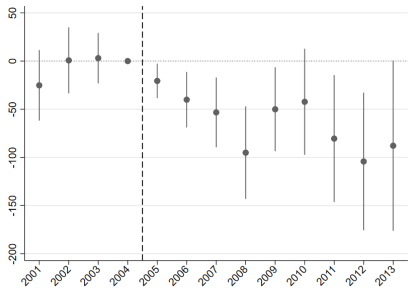
(d) Average Annual Earnings, Entrants



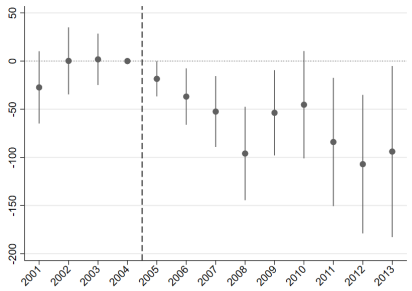
(e) Entrants



(f) Firm Value Added



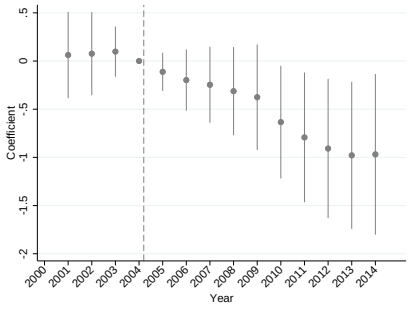
(g) Value Added Per Worker



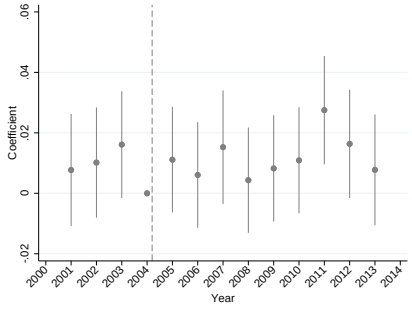
(h) "Markdown" (VA/Worker - Avg. Earnings

Source: Authors' calculations of Swedish register data.
Notes: Coefficients from Equation 1 with data at the firm-municipality level. Estimates include fixed effects for firm, municipality, and year, and estimates are weighted by the share of firm employment in each municipality. Bars represent 95% confidence intervals. Standard errors clustered at the firm-by-municipality level.

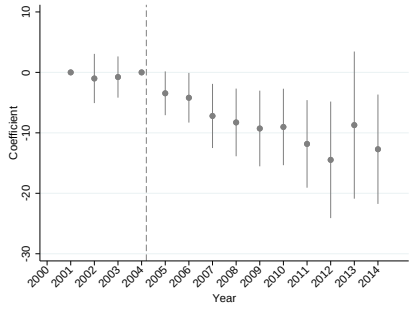
Figure A15: Norway - Firms, Event Studies - Main Outcomes



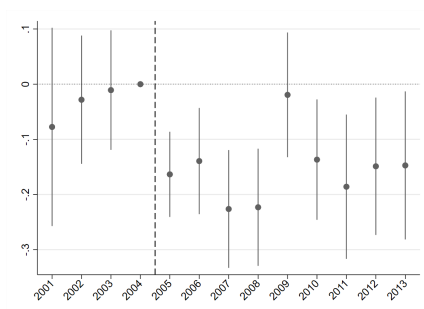

(a) Workers



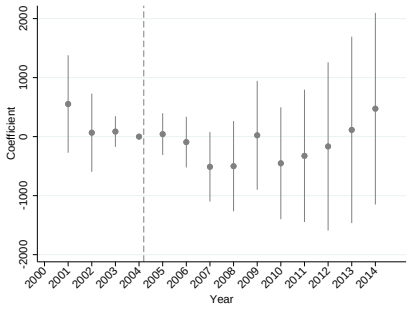

(b) Pr(Exit)



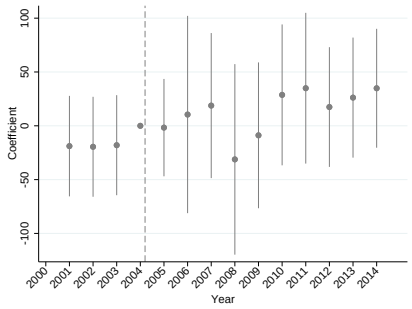

(c) Average Annual Earnings, Incumbents



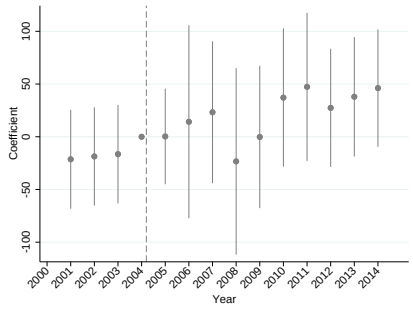

(d) Entrants



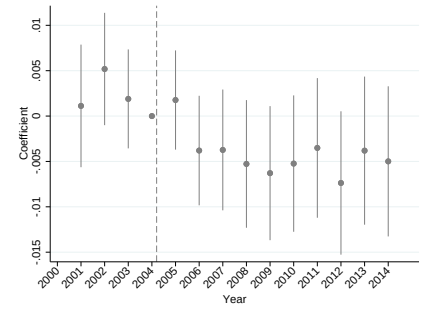

(e) Firm Value Added




(f) Value Added Per Worker




(g) "Markdown" (VA/Worker - Avg. Earnings




(h) Labor Share of Revenue

Source: Authors' calculations of Norwegian register data.
Notes: Coefficients from Equation 1 with data at the firm-municipality level. Estimates include fixed effects for firm, municipality, and year, and estimates are weighted by the share of firm employment in each municipality. Bars represent 95% confidence intervals. Standard errors clustered at the firm-by-municipality level.