The Impact of Immigration on Firm-Level Offshoring*

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Abstract

This paper studies the relationship between immigration and offshoring by examining whether an influx of foreign workers reduces the need for firms to relocate jobs abroad. We exploit a Danish natural experiment in which many immigrants were quasi-randomly allocated to municipalities based on a refugee dispersal policy. Using the Danish employer-employee matched data set covering the universe of workers and firms over the period 1995-2011, our findings show that an exogenous influx of immigrants into a municipality reduces firm-level offshoring at both the extensive and intensive margins. The fact that immigration and offshoring are substitutes has important policy implications, since restrictions on one may encourage the other. While the multilateral relationship is negative, a subsequent bilateral analysis shows that immigrants have connections in their country of origin that increase the likelihood that firms offshore to that particular foreign country.

Key words: Immigration, Offshoring, Globalization

JEL code: F22, F16, J61, F23, F66

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1 Introduction

Immigration and offshoring are two of the most contentious components of globalization.[1] A protectionist backlash against globalization is occurring in many countries, due in part to concerns about immigration and offshoring. While there are numerous studies examining the determinants and economic implications of each of these global forces, there is little research investigating the relationship between the two. This is unfortunate since restricting immigration could have important implications for offshoring and vice versa. Our paper fills this gap by exploring whether an exogenous influx of immigrants into a municipality affects the offshoring decisions of local firms.

Offshoring, or the relocation of domestic jobs abroad, is often motivated by the firm's desire to reduce labor costs, to move production closer to foreign consumers, or to utilize a foreign workforce with a different skill set.[2] The firm weighs these benefits against the inherent challenges associated with offshoring, which include the difficulty of monitoring production activities abroad, transporting intermediate goods between countries, and the need for foreign connections and familiarity with business environments abroad. Immigration into a municipality may influence the local firm's decision to offshore in a couple of ways.

First, an influx of foreign workers with a particular skill set may reduce the need for domestic firms to relocate these tasks abroad. Specifically, firms located in areas that have a supply of new immigrant workers may have less incentive to offshore. Rather than employing foreign workers abroad through offshore production, which is logistically difficult, the firm can instead hire immigrant workers with similar skills domestically. In a fundamental sense, the foreign workers have migrated to the domestic jobs rather than the jobs being relocated abroad. In addition, immigra-

[1] American workers list offshoring and immigration as the two factors of greatest concern to them ("Public Says American Work Life is Worsening, But Most Workers Remain Satisfied with Their Jobs," Pew Research Center, 2006).

[2] Offshoring can occur within or outside the boundaries of the firm (i.e. outsourcing). However, this distinction between offshoring to foreign affiliates or foreign arms-length suppliers is less important for our purposes than the simple fact that production is being relocated abroad. Our main offshoring measure will include both types of offshoring, but we also find similar results using an FDI-based measure of offshoring that only includes offshoring within the boundaries of the firm (see Table 9).

tion may also decrease domestic labor costs, which could reduce the firm's incentive to offshore in order to lower costs. According to these mechanisms, which we will refer to collectively as the labor supply effect, immigration and offshoring are substitutes.

There is anecdotal evidence supporting this hypothesis. For instance, there were concerns that the restrictions to H1B visas proposed in the 2013 U.S. Immigration Bill would have the unintended consequence of forcing U.S. firms to offshore jobs abroad.[3] Similarly, Brexit may limit the inflow of European Union (EU) migrant workers into the U.K. which could inadvertently encourage British firms to offshore activities abroad.[4] In Denmark the pork industry has offshored much of its production due in part to their reluctance, compared to their German competitors, to hire immigrant workers (Wagner and Refslund, 2016). While these sentiments are common, there is limited evidence verifying that immigration and offshoring are substitutes.

Second, immigration can influence offshoring decisions through the information and connections that immigrants often have with their country of origin. Local firms may utilize this expertise and these networks to offshore stages of production to the immigrant's source country. Thus, at the bilateral level immigration may actually encourage offshoring. According to this view, which we will refer to as the bilateral network effect, immigration and offshoring will be complements. A positive bilateral relationship and a negative multilateral relationship between immigration and offshoring are not incompatible since network effects are country specific while labor supply effects are strongest at the multilateral level.[5]

We study the relationship between these global forces in Denmark, which provides an appealing quasi-natural experiment. First, 'push factors' in a number of foreign countries led to a rapid and exogenous increase in the flow of immigrants into Denmark. For instance, unrest in

[3] "Why India is Irked by the U.S. Immigration Bill" Knowledge@Wharton, July 8, 2013.

[4] As The Economist says in their article "Brexit's Labour Pains" (January 14, 2017): "If Britain's firms cannot import enough workers, the country may simply export their jobs."

[5] Immigration may also lead to a "productivity effect" (Ottaviano et al., 2018) which refers to the cost-saving or productivity-enhancing effect of immigration, which in turn may influence offshoring decisions. The direction of this effect is ambiguous since more productive firms may be more successful at overcoming the fixed costs of offshoring or they may be less likely to offshore since their domestic production is now less costly. We control for firm productivity throughout our analysis, which allows us to carefully focus on the labor supply and network effects of interest, and we test for this productivity effect in Table 6.

foreign countries in the 1990s (i.e. Iraq, Afghanistan, Somalia, and the former Yugoslavia), and the European Union enlargement in the 2000s both increased Danish immigration. Second, once immigrants were in Denmark they were often allocated to municipalities according to the refugee Spatial Dispersal Policy, which had little regard for immigrant characteristics or local economic conditions (Damm, 2009; Damm and Dustmann, 2014; Foged and Peri, 2015).[6] Third, subsequent waves of immigrants often settled in the randomly assigned Danish municipalities that their countrymen were initially allocated to through the Spatial Dispersal Policy. These features of Danish immigration provide a unique opportunity to identify exogenous shocks to immigration within municipalities.

An added benefit of focusing on Denmark is that it has a detailed employer-employee matched data set covering the universe of firms and the entire population of workers within Denmark over the years 1995-2011. This data is well-suited for our analysis since it contains comprehensive information about the individual characteristics of workers, including their country of birth which allows us to measure immigration. Furthermore, it also has detailed information about employers, which for instance allows us to measure offshoring at the firm level. This represents a significant improvement over industry-level measures of offshoring that are common in the literature, since offshoring tends to be highly firm-specific (Hummels et al., 2014). In sum, the features of Danish immigration and this detailed data set offer an ideal opportunity to examine how exogenous immigration inflows affect firm-level offshoring decisions.[7]

The results show that an increase in the share of non-EU immigrants within a municipality reduces firm-level offshoring, after accounting for a variety of firm, industry, municipality, and workforce characteristics.[8] To address endogeneity concerns, we employ an instrumental variable approach that identifies an exogenous source of variation in immigration based on the tendency for immigrants to settle in municipalities where their countrymen previously located (Card, 2001).

[6] See section 2.1 for additional details about this program.

[7] Typically European labor markets are relatively rigid, however Denmark has one of the most flexible labor markets in the world, on par with the U.S. (Hummels et al., 2014; Foged and Peri, 2015).

[8] Given exogenous 'push factors' and the Spatial Dispersal Policy we focus on non-EU immigration, but broader or narrower immigrant measures generate similar results (see Table 8).

The specific features of Danish immigration during this period, including exogenous 'push factors' and the Spatial Dispersal Policy, make this common 'shift share' instrumental variable approach even more appealing. We find immigration reduces both the extensive margin of offshoring (i.e. the likelihood that the firm offshores at all) and the intensive margin of offshoring (i.e. how much the firm offshores). Specifically, a one percentage point increase in the share of immigrants reduces the extensive margin of offshoring by 6.4% and reduces the intensive margin of offshoring by 12.1%.[9] Overall, these findings suggest that the labor supply effect is empirically important by showing that an exogenous influx of immigrants into a municipality reduces the need for firms to offshore jobs abroad.

We explore the possible mechanisms driving this observed negative relationship between immigration and offshoring. First, firms may need foreign workers with a particular skill set and they either hire immigrants to perform these tasks or they offshore these tasks abroad. Consistent with this intuition, results show that offshoring firms disproportionately hire more immigrants and shift production to more routine tasks after an exogenous influx of immigrants into their municipality. This latter finding is consistent with offshoring often entailing the relocation of routine tasks abroad (Hummels et al., 2014; Ebenstein et al., 2014; Becker et al., 2013). Second, we explore whether the observed relationship between immigration and offshoring is due in part to an immigrant-induced decrease in domestic labor costs. We find no evidence that immigration reduces native wages in Denmark (consistent with Foged and Peri (2015)), suggesting that immigrants are not competing with native workers but rather substituting for offshoring. However, there is evidence that immigrants earn less than similarly qualified native workers, which may lower domestic labor costs and thus reduce incentives for firms to offshore.

While our multilateral results show that immigration and offshoring are substitutes, we also examine whether immigrants possess knowledge or connections that help local firms offshore to the immigrant's country of origin. Consistent with our network effect hypothesis, we find that

[9]These effects are calculated using the estimated coefficient and the mean of the dependent variable. Additional results show that this effect is larger in labor intensive industries, that immigration also affects domestic production location decisions in a similar way, and that our results are robust to measuring offshoring in a variety of ways.

an exogenous influx of immigrants increases the likelihood that a firm in that municipality will begin offshoring to the immigrant's country of origin (i.e. the extensive margin of offshoring). Not surprisingly, we find that network effects are stronger for more educated immigrants and for immigrants working in white-collar occupations. However, there is no impact of bilateral immigration on the intensive margin of offshoring, which is consistent with the idea that immigrants help the firm overcome the informational barriers associated with initially relocating production abroad but have little impact on offshoring volumes once the firm has already established foreign business connections of their own. While bilateral offshoring increases with immigration from the same foreign country, we confirm that it decreases with immigration from all other countries, which reconciles our bilateral and multilateral findings. Overall we find evidence that immigration substitutes for offshoring at the multilateral level, consistent with the labor supply effect, but complements offshoring at the bilateral level, consistent with the network effect.

Our paper makes a number of contributions. First, our findings support a growing body of evidence showing that immigration influences firm behavior. For instance, research has found that immigrant-induced labor supply shocks can cause firms to use more labor intensive technologies or to expand production activities in response (Acemoglu, 1998; Lewis, 2011; Olney, 2013; Dustmann and Glitz, 2015).[10] We contribute to this literature by showing that firm-level offshoring, at both the intensive and extensive margins, declines in response to immigration. This reduction in offshoring increases local labor demand, which together with the direct immigrant-induced increase in labor supply, could explain why immigration is often found to have little impact on wages (Foged and Peri, 2015; Card, 2005).

Second, the paper contributes to an existing literature that finds that immigrants help facilitate trade with their country of origin through knowledge, language, contacts, and networks (Gould, 1994; Head and Ries, 1998; Rauch and Trindade, 2002; Peri and Requena-Silvente, 2010). Our results are consistent with these findings, but explore a different dimension of globalization by showing that immigration increases bilateral offshoring to the country of origin. Furthermore, we

[10]Research also shows that offshoring can influence technological change (Bøler et al., 2015).

contribute to this literature by showing that in addition to the complementary effects at the bilateral level, immigration and offshoring are substitutes at the multilateral level.

Third, our examination of arguably the two most important and contentious components of globalization is similar to Ottaviano et al. (2013) and Olney (2012), who also look at immigration and offshoring in a unified framework but focus on the employment and wage ramifications for natives. Ottaviano et al. (2013) find that immigration reduces the employment share of offshoring in U.S. manufacturing industries, which suggests that the two are substitutes at the multilateral level. However in contrast to their earlier results, Ottaviano et al. (2018) find using a sample of U.K. service firms that immigration and offshoring are complements at the multilateral level but substitutes at the bilateral level. Our analysis attempts to clarify these conflicting findings in the literature by exploiting the unique features of Danish immigration and using our detailed employer-employee matched data set covering the universe of firms and workers in all industries. We find that immigration reduces offshoring, which is consistent Ottaviano et al. (2013) but in contrast to Ottaviano et al. (2018). We also find that bilateral immigration increases bilateral offshoring, which is not pursued by Ottaviano et al. (2013) and differs from Ottaviano et al. (2018).[11]

The paper is organized in the following manner. In section 2 we discuss the Spatial Dispersal Policy, the data, and the unique features of the Danish immigration experience which make this an appealing natural experiment to study. We also define and present descriptive statistics of our key measures of immigration and offshoring. Our empirical approach is explained in section 3, which also includes a discussion of our identification strategy. Section 4 presents evidence showing that immigration reduces offshoring at both the intensive and extensive margins, which is consistent with the labor supply effect. We complement this key finding with the caveat that at the bilateral-level immigration increases the likelihood that firms offshore to the immigrant's country of origin, which is consistent with the network effect (see section 5). Finally, section 6 shows that our results

[11]The discrepancy between our findings and Ottaviano et al. (2018) may be driven by their focus on the offshoring of service tasks at a sample of firms in U.K. service industries, where they argue there is a high degree of country specificity. In contrast, we focus on the offshoring of production tasks at the universe of firms across all industries (see section 5 for more details.)

are robust to alternate measures of immigration, alternate measures of offshoring, and to the use of different samples of firms and municipalities.

2 Background, Data, and Descriptive Statistics

Our empirical analysis exploits a Danish natural experiment and uses an employer-employee matched data from Statistics Denmark. In this section we provide background on the Danish Spatial Dispersal Policy and we offer an overview of the data sources. Variation in immigration and offshoring over time and geographically within Denmark is then documented.

2.1 Spatial Dispersal Policy

Beginning in 1986 the Danish Refugee Council, implemented a refugee dispersal policy. This government program, known as the Spatial Dispersal Policy (SDP) lasted for 13 years (1986-1998) and quasi-randomly allocated refugees to Danish municipalities.

The goals of the policy were two fold. First, the council attempted to more evenly disperse refugees across Denmark in a way that was sensitive to existing settlement patterns and available housing. Council officials do not recall a refugee ever rejecting the housing offer and Damm (2009) finds that over 90% of refugees were provided permanent housing through the program. Immigrants were encouraged to stay in their assigned municipality and had strong incentives to do so since they received social assistance and language courses for the first year and a half, however there were no formal restrictions on subsequent relocation (Damm and Dustmann, 2014). A second goal of the SDP program was to create ethnic enclaves within municipalities with the idea that this would ease the refugees' transition into Denmark. These national clusters of immigrants were due to the random timing of immigrant inflows from a particular country and the available housing in that particular year (Foged and Peri, 2015).[12]

[12]To account for the possibility that the availability of housing is tied to local economic conditions, we show that our results are robust to the inclusion of time-varying regional house price indexes (see Table A-4 in the appendix).

Importantly the dispersal policy did not depend on the immigrant's skills and preferences, or on the economic conditions in the municipality. The council had refugees fill out a questionnaire identifying only their birth date, family size, and nationality. The placement officers did not meet with the refugees and thus the questionnaire responses were the only information available to the council (Damm and Dustmann, 2014). Thus, the location decision was not influenced by the immigrant's preferences or their characteristics, such as their educational attainment, skills, language ability, or profession. Furthermore, municipalities had little input into how many refugees they would accept, since the Refugee Council communicated this information to them after the decision and housing arrangements had been made (Foged and Peri, 2015). As a result, economic conditions and the Danish municipality's preferences had little influence on the location of refugees.

The dispersal policy was a success. In the pre-program period (1980-1984) refugees were concentrated in the metropolitan areas of Copenhagen, Aarhus, Aalborg, and Odense (see Figure A1a in Damm and Dustmann (2014)), which could have been potentially problematic for us if offshoring was also more common in these urban areas. However, in the post-policy period (1986-1998) refugees were more evenly distributed across Danish municipalities (see Figure A1b in Damm and Dustmann (2014)), which is consistent with the stated goals of the program. For instance, just two years after the SDP program began, refugees were living in 243 out of 275 municipalities (Damm, 2009).[13]

The spatial dispersal program generated national clusters of refugees within municipalities, which were unrelated to pre-existing labor market conditions (this is verified in Table 3). Subsequent waves of immigrants from these same countries moved to Denmark for exogenous reasons (i.e. unrest in their country of origin), and often settled in the municipalities that their countrymen were initially randomly allocated to. These features of Danish immigration represent a unique natural experiment, which allow us to examine the impact of exogenous immigration inflows on subsequent offshoring decisions.

[13] Spatial distribution policies have been studied in other countries as well, such as Germany (Glitz, 2012)

2.2 Data Sources

Our data set is constructed by merging information from three different Statistics Denmark sources. First, firm-level data comes from the Firm Statistics Register (FirmStat henceforth), which covers the universe of private-sector firms over the years 1995-2011. FirmStat has detailed information on the industry and location of the firm within Denmark, which is important for our analysis.[14] In addition, FirmStat has detailed information on a variety of useful firm characteristics, such as productivity, capital intensity, and foreign ownership.[15] Accounting for these time varying firm-specific characteristics allows us to more carefully isolate the impact of immigration on offshoring.

Second, worker-level data is provided by the Integrated Database for Labor Market Research (IDA henceforth) which covers the entire Danish working population over the period 1980-2011. Importantly, IDA provides information on each individual's country of birth, which allows us to measure the immigrant share of the workforce within a municipality. In addition, IDA provides a number of useful workforce characteristics such as education, age, tenure, gender, and work experience of employees. Using the Firm-Integrated Database for Labor Market Research (FIDA) every worker in IDA is linked to every firm in FirmStat data using a unique identifier. This generates an employer-employee matched data set covering the universe of private-sector firms and the population of Danish workers.

Third, trade data comes from the Foreign Trade Statistics Register and consists of two parts, the Intrastat (within EU trade) and the Extrastat (trade with non-EU countries). Import data measured at the firm level for the years 1995-2011, is used to construct our offshoring measure and offers

[14] Statistics Denmark identifies a time-varying 2-digit industry code based on the main (core) activity of the firm. The location of multi-establishment firms is determined by Statistics Denmark using the municipality of the headquarter establishment. Multi-establishment firms constitute only 10% of our sample, but obviously a larger share of employment, sales, and imports (around 40%). We control for multi-establishment firms throughout, and we confirm in Table 10 that our results are similar if these firms are dropped from the sample.

[15] Labor productivity is calculated as sales per employee in logarithmic scale. The capital stock comprises the sum of land, buildings, machines, equipment and inventory (in Danish kroner). Foreign ownership is a binary variable based on the company's ownership form provided by the Central Business Register. We deflate all monetary values using the World Bank's GDP deflator with 2005 as the base year. FirmStat imputes some balance sheet variables for a limited number of small firms with fewer than 50 employees. Our results are robust to either excluding just these observations or excluding all firms with fewer than 50 employees.

immediate advantages over industry-level trade data often used in the literature. Furthermore, firm-level trade data is available by foreign country and detailed product level (8-digit Combined Nomenclature), which is useful for our bilateral and industry-level analyses. The Foreign Trade Statistics data is linked to the FirmStat and FIDA data using the same unique firm identifier.

Combining these different data sources generates an unbalanced panel of approximately 35,000 firms and 1 million workers, spanning 70 different industries and 97 Danish municipalities over the period 1995-2011.[16] The ability to link firm-level trade data with an employer-employee matched data set is appealing.

2.3 Immigration

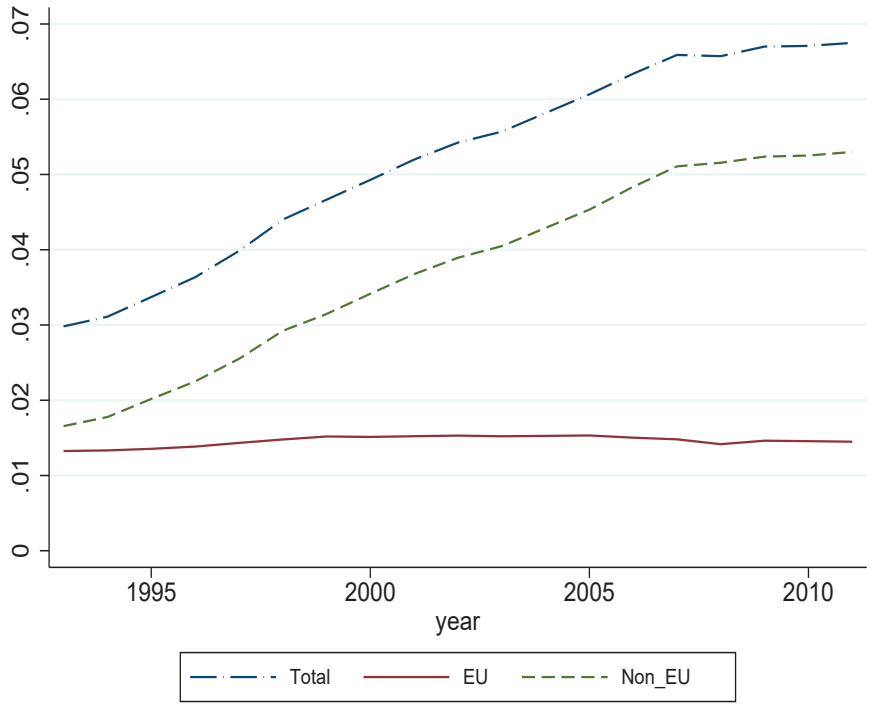
We begin by calculating the share of foreign-born workers in Denmark and document how this has evolved over time. Figure 1 shows that in 1993 the immigrant share of the workforce in Denmark was about 3% but by 2011 it had increased to almost 7%. The fact that the share of foreign workers more than doubled in Denmark in a relatively short period represents a unique opportunity to examine the economic implications of immigration.

Our empirical analysis focuses on non-EU(15) immigrants, who for a number of reasons are an appealing segment of the immigrant population to study.[17] First, Figure 1 shows that all of the increase in immigration over this period is driven by an influx of foreign workers from non-EU countries, while EU immigration has remained relatively flat. For instance, in 1993 EU and non-EU immigrants comprised roughly the same share of the workforce (1.5%) but by the end of our sample the non-EU immigrant share was almost four times larger than the EU share (about 5.5% compared to 1.5%).

[16] We exclude firms with only 1 employee, to avoid self-employment. We also exclude firms that relocate within Denmark. However, the inclusion of these mobile firms in our analysis does not affect our findings, as shown in Table 10. Our analysis focuses on 97 Danish municipalities, which combines Frederiksberg and Copenhagen (see Foged and Peri (2015)).

[17] Non-EU immigration includes foreign workers from all countries outside the EU15 (not counting Denmark itself the EU15 countries are Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and the U.K.).

Figure 1: Foreign Born Share in Denmark by Area of Origin



Notes: Share of migrant workers by area of origin calculated using data from Danish Integrated Database for Labor Market Research.

Second, the growth in non-EU immigration during this period was largely driven by exogenous factors, such as foreign unrest in the 1990s and by European Union enlargement in the 2000s. Refugees and new-EU immigrants account for the majority of the growth in immigration seen in Figure 1.[18] Specifically, almost half (44%) of the growth in non-EU immigration over the sample period comes from the eight refugee countries, while new-EU member countries constitute 9% of this growth.[19]

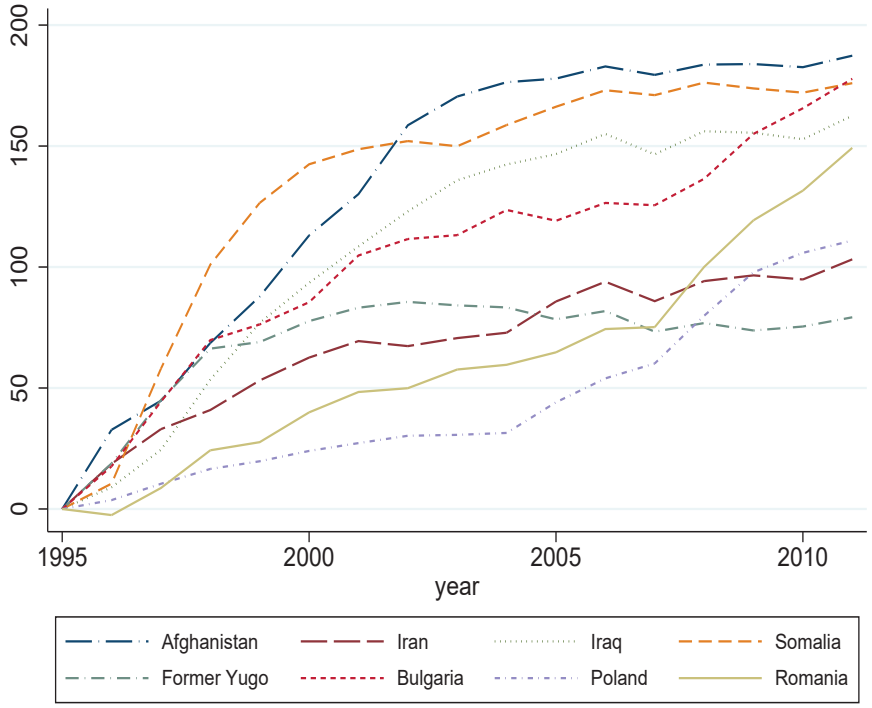
Figure 2 shows the growth in the share of immigrants from particular non-EU countries. There was a rapid increase in immigrants from countries experiencing instability in the 1990s, such as Afghanistan, Somalia, Iraq, and the former Yugoslavia. Immigrant inflows increased in the 2000s

[18]Refugee countries include Afghanistan, Somalia, Iraq, Iran, Vietnam, Sri Lanka, Lebanon, and the former Yugoslavia (following Foged and Peri (2015)) and the new-EU countries include Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Slovak Republic, Slovenia, Cyprus, and Malta who joined the EU in 2004 and Bulgaria, and Romania who joined in 2007.

[19]Our subsequent findings are similar if we focus on non-EU immigrants, refugee and new-EU immigrants, or only refugee immigrants (see Table 8).

from countries that recently joined the European Union. For instance, immigration from Poland increased after they joined the EU in 2004 and immigration from Romania and Bulgaria increased after 2007 when both joined the EU. The country-specific variation illustrated in Figure 2 indicates that the growth in non-EU immigration does not appear to be driven by domestic economic conditions in Denmark, which could be correlated with offshoring decisions. Instead, this variation suggests that the growth in Danish immigration during this period was driven by idiosyncratic external 'push-factors' in foreign countries.[20]

Figure 2: Growth Rate in the Immigrant Share by Country since 1995



Notes: Growth rate from 1995 in the share of migrant workers from particular foreign countrries. Immigrant shares are calculated as the stock of foreign workers relative to Danish employment using data from the Danish Integrated Database for Labor Market Research.

Third, since offshoring often, although not always, entails the relocation of routine, lower-skilled tasks abroad (Hummels et al., 2014; Ebenstein et al., 2014; Becker et al., 2013), firm-level offshoring decisions may be more responsive to non-EU immigration. Demographic characteris-

[20]Figure 10 provides additional details on the origin countries of Danish immigrants, as well as the destination countries of Danish offshoring.

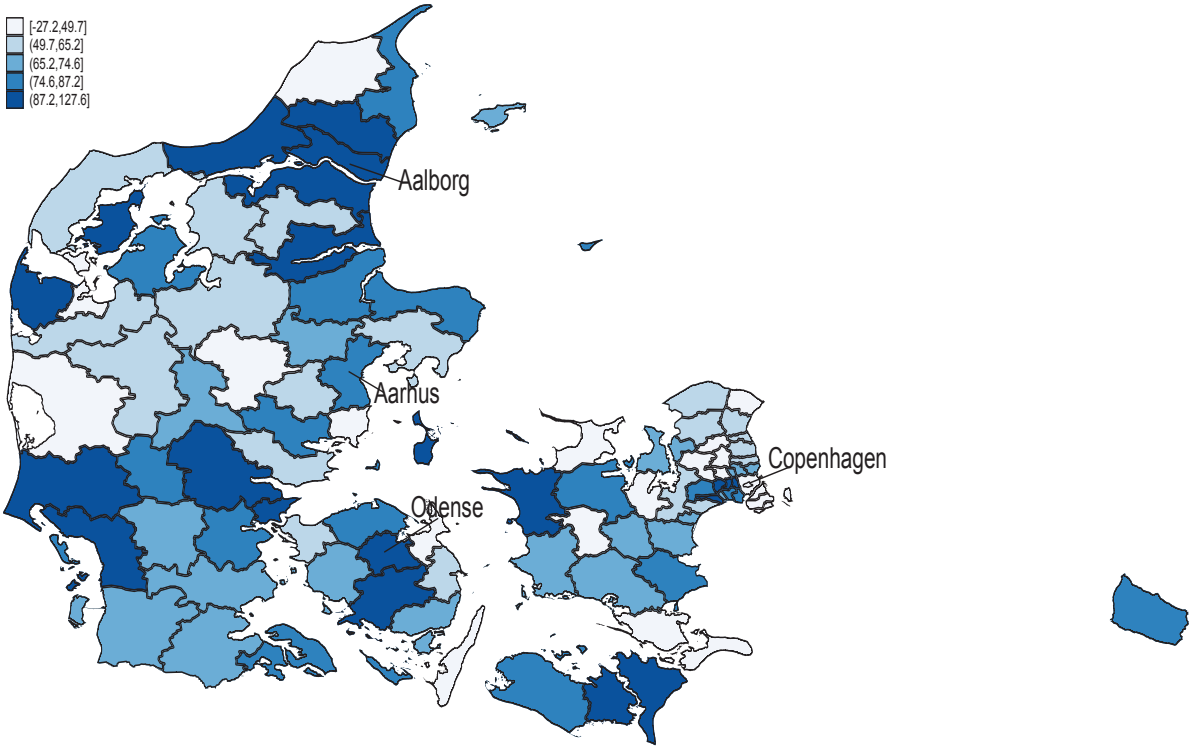
tics reported in Table 1 show that non-EU immigrant workers are on average younger, have less education, and are more likely to work blue-collar jobs compared to natives and EU immigrants. For instance, non-EU immigrants are on average 34.6 years old while natives and EU immigrants are 39.6 and 43.6 respectively. Similarly, non-EU immigrants have an average of 10 years of education, while natives have 12 years and EU immigrants have 12.5 years of education. Finally, non-EU immigrants work in blue-collar jobs 78% of the time while natives and EU immigrants work in blue-collar jobs 64% and 57% of the time.

Fourth, the Spatial Dispersal Policy, as discussed, allocated refugees to municipalities within Denmark in order to more evenly disperse immigrants across the country and to create, when possible, enclaves of immigrants of the same nationality. Importantly, the dispersal policy was not influenced by the skill-level of the immigrant, their geographic preferences, or the economic conditions of the Danish municipality. Thus, the Spatial Dispersal Policy generates variation in immigration across municipalities that is independent of local economic conditions, which could be endogenous. Furthermore, even after the Spatial Dispersal Policy officially ended, new immigrants from these refugee countries had connections that often led them to locate in the randomly assigned municipalities to which their countrymen were initially allocated.

Figure 3 shows the percent change in municipalities' non-EU immigrant share over our sample period. First note that there is substantial geographic variation in immigration which is important for our empirical analysis. For instance, it is not the case that immigration increased more rapidly in urban areas, like Copenhagen, which would be concerning if offshoring is also more common in these municipalities for unrelated reasons. Instead we see that immigrants were randomly dispersed across Denmark, especially compared to the much more highly concentrated distribution of refugees prior to the SDP program (see Figure A1a in Damm and Dustmann (2014). Figure 3 shows for example that the municipality of Lemvig on the west coast of Denmark saw its non-EU immigrant share increase by 126%, while the similar neighboring municipality of Hostelbro saw its share increase by half as much (61%). The historical features of Danish immigration, including both the exogenous 'push factors' and this quasi-random geographic variation, represent a unique

opportunity to examine the causal impact of immigration on firm-level offshoring decisions. Our subsequent instrumental variable approach more carefully isolates these useful sources of variation in the data.

Figure 3: Percent Change (1995 to 2011) in the Share of Non-EU Immigrants by Municipality



Notes: Share of non-EU migrant workers calculated using data from the Danish Integrated Database for Labor Market Research.

Our empirical analysis focuses on variation in the supply of immigrants across local labor markets (see Figure 3), rather than on immigrant employment shares within the firm. This approach exploits the exogeneity of the dispersal policy, which allocated immigrants across municipalities, and it avoids the potentially endogenous hiring decisions of firms.[21] Thus, we measure the non-EU immigrant share of employment as $Img_{mt}^{non-EU} = F_{mt}^{nonEU}/P_{mt}$, where F_{mt}^{non-EU} is the stock of immigrant workers of non-EU origin and P_{mt} is total employment in municipality m and year t. Our empirical specification will examine how changes in the share of immigrants within a municipality

[21] Furthermore, offshoring decisions may respond to the pool of available workers within a local labor market and not just the workers that the firm ultimately chooses to hire. While measuring immigration within local labor markets is preferable even when firm-level data on immigration is available (Foged and Peri, 2015; Dustmann and Glitz, 2015), we confirm in Table 8 that the results are similar if we use the share of non-EU immigrant workers at the firm instead.

affects the offshoring decisions of local firms. Additional results show that our findings are robust to a variety of other ways of constructing this immigration variable, including as the total immigrant share, the refugee and new-EU immigrant share, the refugee share, the non-EU low-skilled immigrant share, or the firm-level non-EU immigrant share (see Table 8).

2.4 Offshoring

Using data from the Foreign Trade Statistics Register, we construct a firm-level measure of offshoring. We follow the well-established method of measuring offshoring using detailed import data first proposed by Feenstra and Hanson (1999) at the industry level and then constructed at the firm level by Hummels et al. (2014). This approach is supported by survey data which indicates that 95% of Danish firms that offshore to a particular region also import from that region (Bernard et al., 2017).[22] Another appealing aspect of this measure is that it captures offshoring within and outside the boundaries of the firm, by including imports from both arms-length suppliers and from foreign affiliates.

Measuring offshoring at the firm level is appealing. First, there is significant heterogeneity in offshoring across otherwise similar firms within the same industry (Hummels et al., 2014). This suggests that an industry-level measure of offshoring constructed using input-output tables is missing important variation in the data. Furthermore, firm-level offshoring allows us to control for observed and unobserved firm characteristics that could be related to both offshoring and immigration. Our offshoring measure can also be constructed for each foreign destination country, which will be used in our bilateral analysis. For all of these reasons, firm-level measures are considered the "gold standard" of offshoring variables (Hummels et al., 2016).

We construct a "narrow offshoring" measure that is defined as the summation of imports in

[22] While these imports are often final goods rather than intermediate inputs (Bernard et al., 2017), for our purposes the type of imports matter less than the simple fact that the firm has offshored production activities abroad. To the extent that Danish firms offshore production and then sell the output in foreign markets, our import-based measure of offshoring will be an underestimate.

the same HS4 category as firm production.[23] Focusing on imports within the same detailed product code, increases the probability that the firm previously produced these products domestically, consistent with the concept of offshoring. For instance, this narrow measure of offshoring does not include imported raw materials that may be used in domestic production but are less compatible with standard definitions of offshoring.

Our analysis will focus on two dimensions of offshoring. First, we are interested in the firm's initial decision to offshore production activities abroad (i.e. the extensive margin of offshoring). This requires the firm to weigh the benefits of lower foreign labor costs, for instance, against the drawbacks associated with coordinating and monitoring production abroad. Our extensive margin measure is a binary variable equaling one if the firm offshores to any foreign country. Second, we are interested in whether the volume of offshoring at the firm changes (i.e. the intensive margin of offshoring). Our intensive margin measure is the natural log of the volume of offshoring, conditional on the firm offshoring.

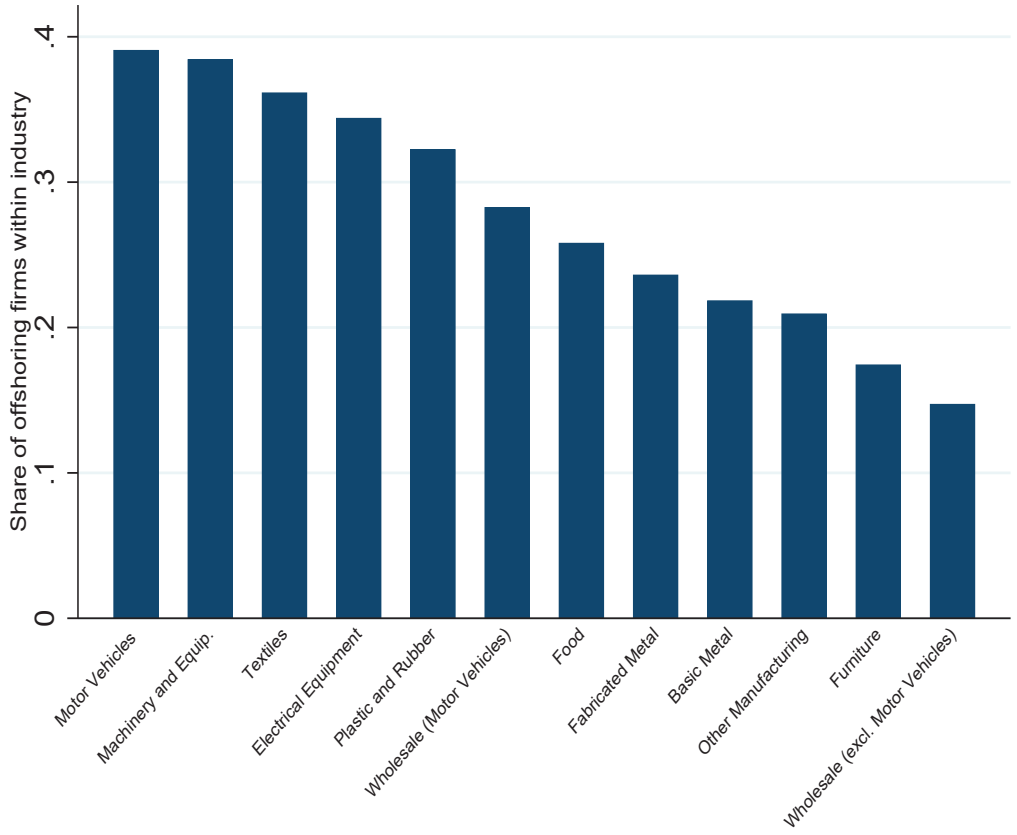
We expect that an immigrant-induced labor supply effect will reduce both the extensive and intensive margins of offshoring. Immigration will increase the supply of foreign workers with a particular skill set and it may reduce domestic labor costs, both of which will discourage offshoring. Alternatively, if the main motivation for offshoring is to locate production closer to foreign consumers, then firms' offshoring decisions will be less responsive to immigration, which will work against our findings. The bilateral network effect likely has different impacts on the extensive and intensive margins of offshoring. Firms will find the immigrant's connections with their country of origin useful when they initially begin to offshore. However, if the firm has already offshored and thus has business connections of their own, then the intensive margin of offshoring should be less sensitive to immigration.

Figure 4 presents evidence on the prevalence of offshoring across Danish industries. We find that offshoring is common in industries such as Motor Vehicles, Machinery and Equipment, and Textiles where almost forty percent of firms offshore. This is consistent with evidence showing that

[23] Given the rich data, we are able to sum imports across all of the HS4 products that multi-product firms produce.

offshoring of routine, blue-collar jobs is relatively common (Hummels et al., 2014; Ebenstein et al., 2014; Becker et al., 2013). Using a totally different measure of offshoring based on survey data, Bernard et al. (2017) find that offshoring is common in these three industries too which provides external validity for our offshoring measure. The industry variation in Figure 4 is sensible, it is consistent with existing evidence, and it indicates that our measure is successfully capturing useful variation in offshoring.

Figure 4: Offshoring by Industry



Notes: Share of offshoring firms (narrow definition) within each 2-digit Danish industry code (1995-2011) calculated using data from the Danish Foreign Trade Statistics Register.

Figure 5 shows basic time-series variation in the share of non-EU immigration (top panel) and the share of offshoring firms (bottom panel) over the last twenty five years in Denmark. While the variation in non-EU immigration is familiar from Figure 1, the bottom panel shows a long-run upward trend in Danish offshoring, which increases from about 11% in 1998 to about 15% in

2011. However, around this trend there are interesting fluctuations. For instance, in two periods (1996-1998 and 2003-2005) there is an increase in the share of non-EU immigrants while at the same time offshoring declines. Strong inferences are challenging in basic time-series figures, but this suggests that immigration and offshoring may be related even at the national level.

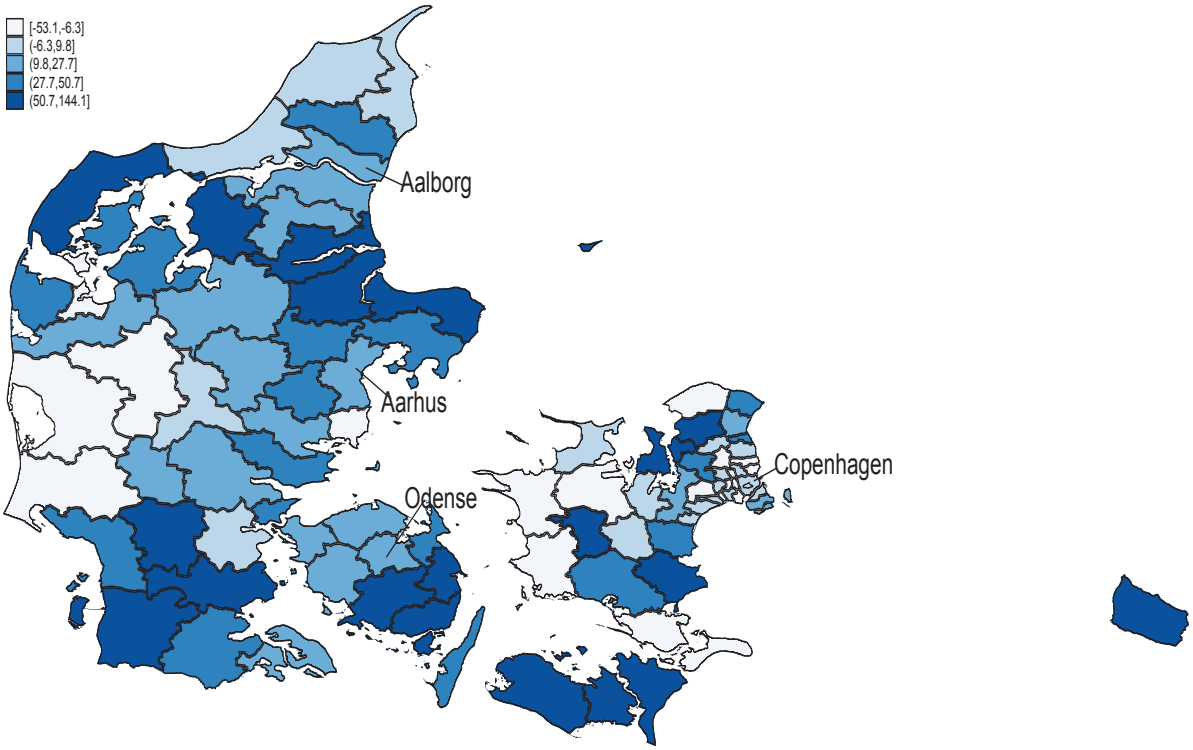
Figure 5: Immigration and Offshoring Time-Series Variation

Notes: Share of non-EU migrant workers calculated using the Danish Integrated Database for Labor Market Research and share of firms that offshore (narrow definition) calculated using data from the Danish Foreign Trade Statistics Register.

We now turn to the variation in offshoring across Danish municipalities. Figure 6 shows that there is substantial geographic variation in offshoring changes from 1995 to 2011, which is useful for our empirical analysis. Importantly, the municipalities that experienced the largest increase in offshoring do not seem to be clustered around Copenhagen nor do they appear to be positively correlated with immigration (Figures 3). Furthermore, neither immigration nor offshoring seem to

be correlated with changes in GDP shown in an analogous Figure A-1 in the appendix.

Figure 6: Percent Change (1995 to 2011) in the Share of Firms that Offshore by Municipality



Notes: Share of firms that offshore (narrow definition) calculated using data from the Danish Foreign Trade Statistics Register.

It is worth noting that our results are similar using other offshoring definitions, such as a "broad offshoring" measure or a conceptually distinct FDI-based measure of offshoring (Table 9). Furthermore, the estimated impact of immigration on offshoring differ in sensible ways across industries (see Table A-2). These additional results provide confirmation that our measure is accurately reflecting firm-specific offshoring decisions and that our results are robust to other offshoring definitions.

2.5 Descriptive Statistics

Descriptive statistics of our offshoring, immigration, workforce, and firm variables over the period 1995-2011 are presented in Table 2. Thirteen percent of firms engage in offshoring according to our narrow measure, while twenty six percent do so according to our broad measure. Focusing on

the intensive margin of offshoring, we see that the average volume of offshoring is about 90,000 Danish Krone.

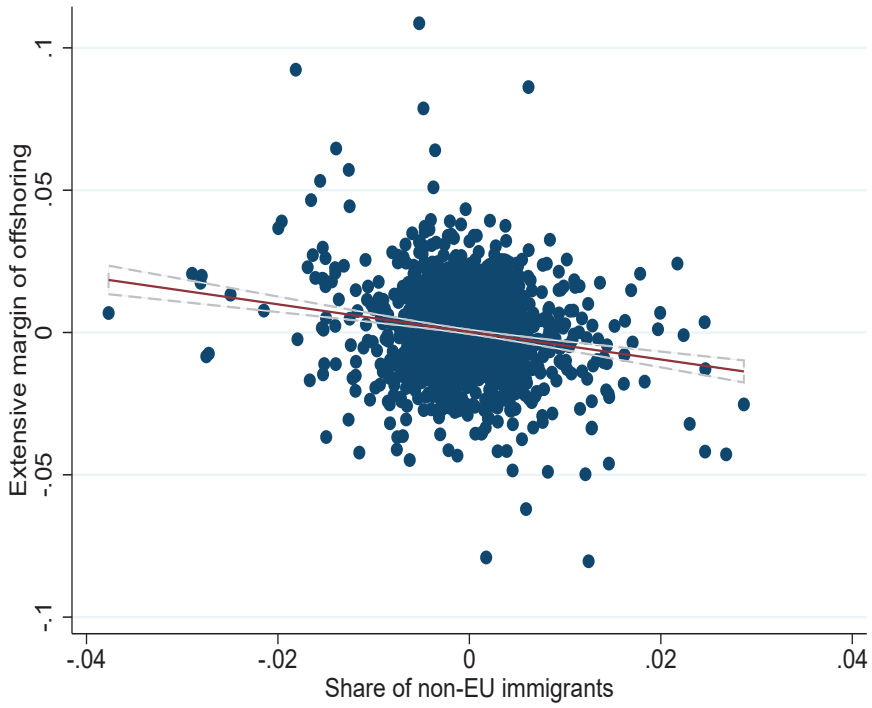
The share of non-EU immigrant workers in the municipality is on average 3.1%. However, this masks substantial variation over time and across municipalities. For instance, the non-EU immigrant share ranges from 1.65% in 1993 to 5.3% in 2011 and from 0.005% in the municipality of Morsø to 12.35% in the municipality of Ishøj. Both the time-series variation (seen in Figure 1) and the geographic variation (seen in Figure 3) in immigration will be useful for our empirical analysis.

Given the detailed employer-employee data set we are also able to account for many relevant workforce and firm characteristics. Specifically, we control for the average gender, age, education, tenure, and work experience of employees at the firm. As reported in Table 2, workers are on average 39.5 years old, have 11.8 years of education, have 13.5 years of experience which includes 5.6 years at their current firm, and are 72% male.[24] We also account for a variety of firm characteristics, such as productivity, size, capital intensity, multi-establishment status, and foreign ownership status. We see in Table 2 that 10.5% of the sample has more than fifty employees, 10.1% are multi-establishment firms, and 0.3% are foreign owned.

To provide preliminary insight into the relationship of interest, we plot the share of non-EU immigrants against municipality offshoring at the extensive margin (Figure 7) and at the intensive margin (Figure 8) after accounting for municipality and year fixed effects. In both scatter plots, a significant negative relationship is evident. Consistent with the predictions from the labor supply effect, an increase in the share of non-EU immigrants is associated with a decline in both the likelihood that a firm offshores and the volume of firm offshoring. It is interesting that these negative relationships emerge in such raw cuts of the data. We now examine whether this relationship holds in a more rigorous empirical specification.

[24]Men are more heavily concentrated in the private sector.

Figure 7: Extensive Margin of Offshoring and Share of Non-EU Immigrants



Notes: The residuals from regressing the share of firms that offshore (narrow definition) on municipality and year dummies is reported on the vertical axis. The residuals from regressing the share of non-EU migrant workers on municipality and year dummies is reported on the horizontal axis.

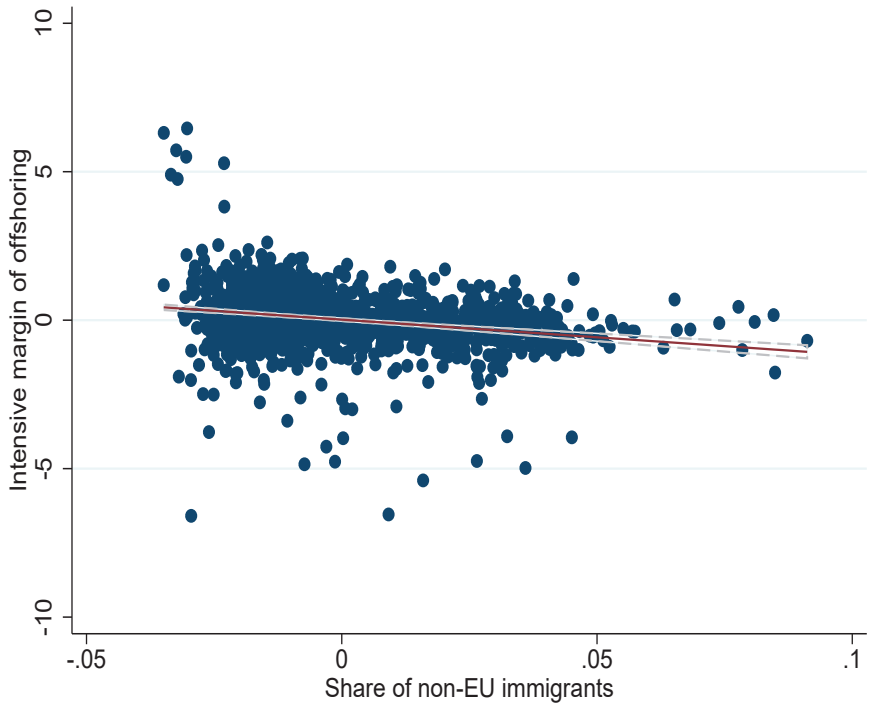
3 Empirical Strategy

This sections outlines our estimation approach and identification strategy. Here we focus on the labor supply effect and later in section 5 we will discuss how this specification is altered in order to test for the bilateral network effect.

3.1 Specification

Our goal is to examine how a firm's offshoring decisions respond to the share of immigrants within the municipality. We estimate the following equation:

Figure 8: Intensive Margin of Offshoring and Share of Non-EU Immigrants



Notes: The residuals from regressing the log of offshoring volumes (narrow definition) on municipality and year dummies is reported on the vertical axis. The residuals from regressing the share of non-EU migrant workers on municipality and year dummies is reported on the horizontal axis.

$$Off_{ijmt} = \beta_0 + \beta_1 Img_{mt-1}^{non-EU} + X'_{ijmt-1}\delta_1 + W'_{ijmt-1}\delta_2 + \gamma_i + \gamma_j + \gamma_m + \gamma_t + \epsilon_{ijmt} \quad (1)$$

where the dependent variable, Off_{ijmt}, is offshoring at firm i, in industry j, located in municipality m, and in year t. Our analysis initially focuses on narrow offshoring at both the extensive and intensive margin.

Our key independent variable, Img_{mt-1}^{non-EU}, is the non-EU immigrant share of the workforce in municipality m and year $t-1$. Immigration and the other independent variables are lagged to account for the fact that it takes time for companies to adjust offshoring in response to changing

economic conditions.[25] According to the labor supply effect, an influx of foreign workers will reduce the need for firms to relocate jobs abroad ($\beta_1 < 0$). While it is possible that natives may leave in response to immigration, this should result in little net change in labor supply and attenuate our results. Furthermore, similar results are obtained using the level of immigration rather than the share (Appendix Table A-3).

The vector X_{ijmt-1} includes a set of firm characteristics that could influence offshoring decisions. Specifically, we include firm-level productivity, capital intensity, and foreign ownership, as well as firm size dummies and a multi-establishment dummy. We anticipate that offshoring will increase with all of these factors. The vector W_{ijmt-1} includes detailed workforce characteristics, such as average education, age, tenure, work experience, and gender. Since some of these firm and demographic characteristics could be endogenous, we report findings with and without these controls. We incorporate a comprehensive set of fixed effects including firm fixed effects (γ_i), industry fixed effects (γ_j), municipality fixed effects (γ_m), and year fixed effects (γ_t). Finally, the standard errors are clustered at the municipality level.

3.2 Identification

Unobserved municipality-specific shocks could be correlated with both immigration and offshoring. For instance, municipalities that are becoming more cosmopolitan and global may experience an influx of immigrants and be more likely to offshore production activities abroad. This most obvious source of endogeneity will, if anything, introduce a spurious positive bias in our immigration coefficient which will attenuate the anticipated negative immigration coefficient. Nonetheless, in order to address endogeneity concerns we pursue an instrumental variable approach, which identifies the causal effect of immigration on firm-level offshoring by isolating plausibly exogenous variation in immigration.

As discussed, three historical features of Danish immigration during this period inform our

[25] Our results are qualitatively similar if we use longer lag structures, assume a non-linear impact of immigration on offshoring, or estimate equation (1) in first differences (see Appendix Tables A-3 and A-4).

identification strategy. First, the majority of Danish immigrants came from non-EU countries where conflict, instability, or policy changes (i.e. EU membership) led them to migrate. Importantly, it was not features of the Danish economy that caused these new immigrant inflows. Second, once in Denmark, the Spatial Dispersal Policy (Damm, 2009; Damm and Dustmann, 2014) quasi-randomly assigned non-EU refugees to Danish municipalities. Thus, these immigrants were not choosing a municipality based on local economic conditions. Third, through both official family reunification policies and informal networks, subsequent waves of immigrants often settled in municipalities where family and friends from the same source country were initially randomly located (Foged and Peri (2015)).

Our instrumental variable approach exploits these features of this natural experiment. The instrument takes advantage of the fact that foreign shocks led to an exogenous increase in the number of non-EU immigrants arriving in Denmark in each year. The instrument then allocates these immigrants to municipalities where previous immigrants from the same country lived in 1990, when immigrant location decisions were often determined by the Spatial Dispersal Policy.[26] More specifically, the predicted non-EU immigrant share is calculated as follows:

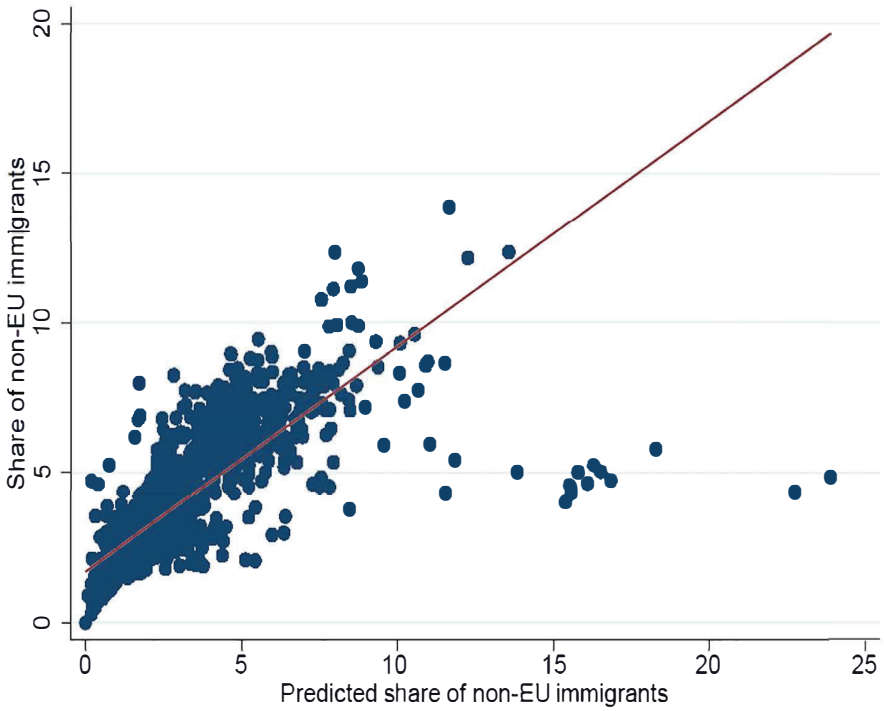
$$ImgIV_{mt}^{non-EU} = \sum\nolimits_{d} \frac{F_{dt} * (F_{md90}/F_{d90})}{P_{m90}} \tag{2}$$

where F_{dt} is the national stock of immigrants from a non-EU country d in year t. These immigrants are allocated to municipalities based on the share of migrants from country d in year 1990 (i.e., F_{md90}/F_{d90}). This product is then normalized by total employment in the municipality in 1990 (P_{m90}) and summed across all foreign countries d to generate predicted immigration at the municipality-year level.

To assess the strength of our instrument, Figure 9 plots the actual share of non-EU immigrants

[26]The dispersal policy did not apply to all immigrants; refugees comprised 21% of non-EU immigrants in 1990. However, for our identification strategy the more important point is that this initial distribution was random and the subsequent growth in refugees was sizable (the refugee share doubled to 40% by 2011). Immigrant location decisions that were determined by this program are more exogenous than is typically assumed by the common 'shift share' instrument.

Figure 9: Immigration and the Immigration Instrument



Notes: The share of non-EU migrant workers in a given municipality and year is reported on the vertical axis. The predicted share (IV) of non-EU migrant workers in a given municipality and year is reported on the horizontal axis.

within a municipality against predicted immigration. A significant positive relationship is evident which verifies that our instrument is correlated with immigration within a municipality. This provides preliminary visual confirmation of the standard first-stage IV results reported later.

The threats to this common 'shift share' instrumental variable approach are less relevant in the Danish context. First, typically there are concerns that the national stock of immigrants from country d, F_{dt}, could be driven by domestic conditions that are endogenous. However, in Denmark the large inflow of non-EU immigrants during this period was largely driven by instability and policy changes in foreign countries (see Figure 2).

Second, there are often concerns that the initial distribution of immigrants across municipalities in the pre-sample year could have been driven by endogenous economic conditions that have persisted over time. While this is less likely in the Danish context due to the Spatial Dispersal

Policy, we nevertheless test for this potential violation of our exclusion restriction in Table 3. We find that long-run changes in our immigration instrument are uncorrelated with pre-sample trends in offshoring within a municipality. In particular, the change in the instrument from 1995 to 2011 is unrelated to the pre-1995 trend in the extensive (column 1) or intensive (column 2) margins of offshoring. We find that long-run changes in our immigration instrument are also uncorrelated with pre-sample trends in other economic conditions within the municipality such as employment (column 3) and wages (column 4). Consistent with the stated goals of the Spatial Dispersal Policy, we find no evidence that predicted immigration was driven by pre-sample economic trends within the municipality.[27]

We do find, however, that our instrumental variable is correlated with the share of non-EU immigration in column 5. Specifically, long-run changes in the instrument have a statistically significant positive impact on long-run changes in the share of non-EU immigration within the municipality. This provides additional evidence that the instrument is successful at predicting actual immigration inflows. As a placebo test of the enclave hypothesis, column 6 confirms that long-run changes in our non-EU immigrant instrument do not predict long-run changes in the share of EU immigration. Not surprisingly, initial immigrants from non-EU countries do not have family connections that influence subsequent EU immigrant location decisions.

The final two columns of Table 3 pursue a long-run reduced form specification, which examines the relationship between the immigration instrument and the extensive and intensive margins of offshoring. These findings show that exogenous changes in predicted immigration have a significant negative impact on changes in the extensive (column 7) and intensive (column 8) margins of offshoring. This provides preliminary evidence of the labor supply effect.

Overall, the results in Table 3 support our exclusion restriction, verify that the instrument is a good predictor of non-EU immigration but not of EU immigration, and provide evidence that immigration does influence offshoring decisions. The unique features of the Danish immigration experience provides an appealing natural experiment which makes this relatively common instru-

[27] Additional pre-sample trend results are reported in Table A-1 in the online appendix.

mental variable approach even more compelling.

4 Labor Supply Effect Results

This section presents our findings on the labor supply effect. First, we examine whether an influx of immigrants decreases the likelihood that firms begin to offshore jobs abroad (i.e. the extensive margin). Then we focus on whether immigration decreases offshoring volumes, conditional on the firm offshoring at all (i.e. the intensive margin). The final subsections then focuses on the possible mechanisms driving these relationships.

4.1 Extensive Margin

We estimate the impact of non-EU immigration on the extensive margin of offshoring, after controlling for only industry, municipality, and year fixed effects. Even in this relatively straightforward specification we find that the share of non-EU immigration is negatively related to the probability that a firm within that municipality will offshore (see column 1 of Table 4). The immigration coefficient of -0.303 implies that a one percentage point increase in the immigrant share is associated with a 0.0030 decrease in the probability that a firm will offshore, which represents a 2.3% decline.[28]

Before proceeding with more sophisticated linear probability models, we first quickly verify that similar results are obtained using an alternate probit specification.[29] Column 2 reports the estimated marginal effect from this probit specification. Reassuringly, we see that the immigration coefficients in the linear probability model (column 1) and the probit model (column 2) are both

[28]Since the immigration variable is in decimal form the coefficient is interpreted as a 0.003 decrease which represents a 2.3% decline relative to the mean of the dependent variables (0.13) reported at the bottom of Table 4.

[29]Following the existing literature (Damm and Dustmann, 2014; Miguel et al., 2004) we prefer the flexibility of the linear probability model, especially since our analysis includes a large number of fixed effects (i.e. over 30,000 firm fixed effects) and instruments for immigration, both of which are more challenging in a probit specification. The linear probability model is unbiased and consistent as long as few of the predicted probabilities lie outside the unit interval (Horrace and Oaxaca, 2006). Moreover, Angrist and Pischke (2010) deem the linear probability model a preferable approach, especially when the nature of the non-linear model is unknown.

negative, significant, and similar in magnitude (-0.3 versus -0.2). With our results confirmed using this alternate probit specification, we return to our preferred linear probability specification.

Column 3 of Table 4 adds firm fixed effects and then column 4 includes firm-level characteristics (including productivity, capital intensity, foreign ownership, size, and multi-establishment), and workforce characteristics (including gender, education, age, tenure, and experience) to the estimation equation. The immigration coefficient remains similar in magnitude after controlling for firm fixed effects and then firm and workforce characteristics (i.e. -0.30 in column 1, -0.32 in column 2, and -0.35 in column 3) .

The estimated impact of the other firm-level characteristics are sensible. For instance, in column 4 we see that more productive firms are more likely to offshore. This is consistent with abundant evidence that shows that only the most productive firms can overcome the fixed costs associated with globalization (Melitz, 2003; Helpman et al., 2004). We also find, not surprisingly, that offshoring is increasing with capital intensity and foreign ownership, and with size and multi-establishment status (unreported). While these estimates do not necessarily represent causal relationships, importantly the estimated impact of immigration on offshoring remains similar after these firm characteristics are included.

We then turn to our instrumental variable approach to address endogeneity concerns in the remaining columns of Table 4. The first-stage results show that the instrument has a significant positive impact on immigration (see bottom panel of columns 4-7). The first stage F-stats are all above 10, indicating a relatively strong first stage which is consistent with our earlier results (Figure 9 and Table 3). The second-stage results show that immigration significantly reduces the likelihood of offshoring, and they now carry a causal interpretation. Specifically, in column 7, a one percentage point increase in immigration leads to a 0.0083 or 6.4% decline in the probability that a firm within that municipality will offshore. This is a sizable effect, which for instance is larger in magnitude than the relationship between productivity and offshoring.[30]

[30] A one standard deviation increase in immigration (0.02) leads to a 12.7% decline in offshoring (=0.02*0.826/0.13) while a one standard deviation increase in productivity (0.852) is associated with a 9.8% increase in offshoring (=0.852*0.015/0.13).

The immigration coefficient in the IV specification (column 7) is larger in magnitude than the analogous OLS coefficient (column 4). This is consistent with the most obvious endogeneity concern, which predicts that as some municipalities become more global they will attract more migrant workers and local firms will be more likely to offshore. As a result there is a spurious positive bias in the OLS coefficient reported in column 4. Our instrumental variable approach addresses this issue and thus in column 7 the causal impact of immigration on offshoring is more negative. Overall, Table 4 confirms that the labor supply effect is important by showing that immigration has a significant negative impact on the extensive margin of offshoring.[31]

An additional industry level analysis (reported in appendix Table A-2) shows that our results are similar if we exclude wholesale and retail industries or if we only include manufacturing industries.[32] Furthermore, the impact of immigration on offshoring is stronger in labor intensive industries and in industries where offshoring is more feasible.[33] The fact that our results are strongest in the anticipated places is reassuring.

4.2 Intensive Margin

We also examine the impact of immigration on the intensive margin of offshoring. Table 5 uses as the dependent variable the logarithm of offshoring volumes, conditional on the firm offshoring at all. In column 1 we find that an increase in the share of non-EU immigrants in a municipality is significantly negatively related to the volume of offshoring, after accounting for industry, municipality, and year fixed effects. Columns 2 then includes firm fixed effects, while column 3 adds firm and workforce characteristics. In both columns we still find a negative relationship between

[31] Results are similar if other measures of immigration are used instead, such as total immigration, refugee and new-EU immigration, refugee immigration, non-EU low-skilled immigration, or non-EU firm-level immigration (Table 8).

[32] A one percentage point increase in immigration decreases offshoring in non-wholesale and retail industries by 9.6% and reduces offshoring in manufacturing industries by 6.8% (see Table A-2). While we prefer to include the universe of firms, which generates the most conservative estimates, it is reassuring that our results are similar when focusing on these industries where our offshoring measure may be most applicable (Hummels et al., 2014)

[33] Results in Table A-2 show that a one percentage point increase in immigration reduces offshoring by 19.0% in labor intensive industries, by 4.2% in capital intensive industries, by 6.7% in industries where offshoring is more feasible, and by 2.8% in non-offshoring industries.

immigration and the intensive margin of offshoring. The point estimate in column 3 indicates that a one percentage point increase in the immigrant share is associated with a 6.2% decline in the volume of firm-level offshoring within that municipality. Productivity is positively related to the intensive margin of offshoring while capital intensity and foreign ownership are insignificant.

While the numerous controls and fixed effects reduce endogeneity concerns, they do not eliminate them entirely and thus we turn to our instrumental variable approach in column 4. The first-stage coefficient on the instrument is significant and positive as expected (see the bottom panel of column 4), but the first-stage F-stat on the instrument is slightly weaker at 9.2. The second-stage IV results reported above show that immigration has a significant negative impact on offshoring volumes. The immigration coefficient remains negative and significant after firm fixed effects, and then firm and workforce characteristics are added. A one percentage point increase in immigration decreases the intensive margin of offshoring by 12.1% (see column 6). This is a sizable effect, which for instance is slightly larger than the productivity relationship.[34]

The immigration coefficient in the IV specification (column 6) is more negative than the analogous OLS coefficient (column 3), due to the spurious positive bias in the OLS coefficient discussed previously. Once this source of endogeneity is accounted for with our instrumental variable approach, we find a more negative impact of immigration on the intensive margin offshoring.

Overall the results reported in Table 4 and 5 provide compelling evidence that immigration and offshoring are indeed substitutes. An exogenous influx of immigrants reduces both the likelihood that firms will begin to offshore production activities abroad and the volume of offshoring, conditional on the firm already offshoring. Specifically, a one percentage point increase in immigration decreases the extensive margin of offshoring by 6.4% (see column 7 of Table 4) and decreases the intensive margin of offshoring by 12.1% (see column 6 of Table 5). These findings support the labor supply effect, by showing that firms located in municipalities that experience an exogenous influx of foreign workers have less need to relocate domestic production activities abroad. In a fun-

[34] A one standard deviation increase in immigration (0.02) leads to a 24.1% decline in offshoring (=0.02*12.064) while a one standard deviation increase in productivity (0.852) is associated with a 21.6% increase in offshoring (=0.852*0.253).

damental sense, the foreign workers are migrating to the firms rather than the jobs being relocated abroad.

4.3 Mechanisms

This section explores possible explanations for this observed negative relationship between immigration and offshoring. We discuss a variety of potential mechanisms and present empirical evidence in Table 6 on the importance of each of these explanations.

First, foreign workers may have a set of skills that are in limited supply domestically. According to this view, an influx of immigrants will not necessarily compete with native workers for jobs because they perform different types of tasks (Ottaviano and Peri, 2012; Peri and Sparber, 2009). However, an influx of immigrants will reduce the incentive for firms to offshore these jobs. Domestic firms no longer need to relocate particular tasks abroad to be performed by foreign workers and instead they can hire foreign workers that have migrated to them. This mechanism emphasizes the need for firms to employ foreign workers either through offshoring or by hiring immigrant workers.

To test this mechanism, we begin by examining which firms hire immigrant workers. If immigration is substituting for offshoring, then we anticipate that offshoring firms will employ a larger share of immigrant workers.[35] The results show that the share of non-EU workers increases by more at offshoring firms (coefficient of 0.317 in column 1) than at non-offshoring firms (0.105 in column 2) in response to an exogenous influx of immigrants. The immigrant share increases at both types firms, but the difference in magnitude is consistent with offshoring firms hiring immigrant workers instead of relocating tasks abroad. We then complement these findings, with an analysis of the types of tasks being performed at these firms. If immigration and offshoring are indeed substitutes and given that offshoring often entails the relocation of routine tasks abroad, then immigration should increase the share of routine tasks at offshoring firms.[36] The results show that an

[35] An offshoring firm is defined as a firm that has offshored at least once over the sample period.

[36] Following Hummels et al. (2014) we measure how routine an occupation is by calculating the principle compo-

exogenous influx of foreign workers into a municipality increases the share of routine occupations at offshoring firms (column 3) but has no significant impact on the share at non-offshoring firms (column 4). Overall, these findings provide additional evidence that immigration and offshoring are substitutes by showing that offshoring firms are the ones that hire more immigrants and shift production to more routine tasks after an exogenous influx of immigrants.

A second potential mechanism is that immigration could influence domestic labor costs through its impact on equilibrium wages. An influx of immigrants increases the labor supply within the municipality, which may put downward pressure on native wages (Borjas, 2003). Firms within the municipality would then have less incentive to offshore in order to reduce costs, because domestic labor is now less expensive. Column 5 examines this possibility by estimating the impact of non-EU immigration on the average wage of native workers. The results show that immigration does not significantly affect native wages. This is consistent with Foged and Peri (2015), who find across a wide array of specifications that immigration has not decreased native wages. We conclude that this mechanism, while theoretically appealing, is not the driving force behind our findings. Immigrant workers do not appear to be directly competing with native workers but rather substituting for offshoring.

Third, it is possible that immigration alters domestic labor costs through a different channel. Immigrants typically earn more than they did in their country of origin, but they may earn less than similarly qualified workers in their host country. If so, an influx of immigrants can lower domestic labor costs and therefore reduce incentives for local firms to offshore tasks. Consistent with this idea, column 6 shows that an exogenous influx of non-EU immigrants decreases the average non-EU wage in the municipality. To test this hypothesis more carefully, column 7 regresses an individual's log hourly wage on a binary variable indicating whether the worker is a non-EU immigrant. The results show that conditional on a variety of factors (including municipality, industry,

nent of the following O*NET job descriptors: manual dexterity, finger dexterity, multi-limb coordination, processing information, and evaluating information. Occupations above the 75th percentile according to this measure are defined as routine. Results are not sensitive to this cutoff, and in fact more restrictive definitions of routine occupations lead to larger results. According to this definition, about a third of workers in the pre-sample period are employed in routine occupations.

occupation, firm, gender, age, and education) immigrants are paid 7.2% less than similar native workers. This finding provides empirical support for the idea that immigrant-induced changes in domestic labor costs also influence offshoring decisions.

A fourth mechanism focuses on the possibility that immigration influences firm productivity. Immigration may increase firm productivity, which in turn allows firms to more easily overcome the fixed costs of offshoring (Ottaviano et al., 2018). However, contrary to our findings, this explanation predicts that immigration and offshoring will be complements. An alternate mechanism, which is more consistent with our results, is that immigration may increase the productivity of domestic activities which in turn reduces firms' incentives to offshore tasks abroad.[37] While we control for firm productivity throughout our analysis, to test this mechanism more carefully we instead use firm productivity as our dependent variable. The results indicate that immigration has no significant impact on firm productivity (column 8 of Table 6).

Immigration may not only reduce offshoring, but also encourage firms to relocate domestic production to a municipality (Olney (2013); Dustmann and Glitz (2015)). An analogous 'domestic offshoring' measure is not feasible due to the lack of trade data between municipalities within Denmark. Instead, as an additional check of our findings, we explore how immigration affects the stock and inflow of firms into a municipality. Results in column 9 show that non-EU immigration increases the stock of firms within a municipality. Similarly, column 10 finds that immigration has a significant positive impact on the number of firms moving into a particular municipality. Both of these findings confirm that immigration not only reduces the offshoring of tasks abroad but it also encourages domestic production to locate in the municipality. We find it sensible that the same forces that are influencing foreign production location decisions are also influencing domestic production location decisions.

Overall, the results in Table 6 provide insight into the negative relationship between immigration and offshoring. We find that an exogenous influx of immigrants into a municipality dispropor-

[37] Given the theoretically analogous cost-savings and productivity-enhancing effects of immigration, this mechanism is similar to the previous explanation that emphasized reductions in domestic labor costs.

tionately increases both the share of immigrant workers and the share of routine tasks at offshoring firms. Firms apparently need foreign workers for particular tasks and they either hire immigrants or they offshore these jobs abroad. While immigration does not significantly reduce equilibrium native wages, there is evidence that immigrants themselves tend to be paid less than other similar workers, which reduces domestic labor costs and incentives to offshore.

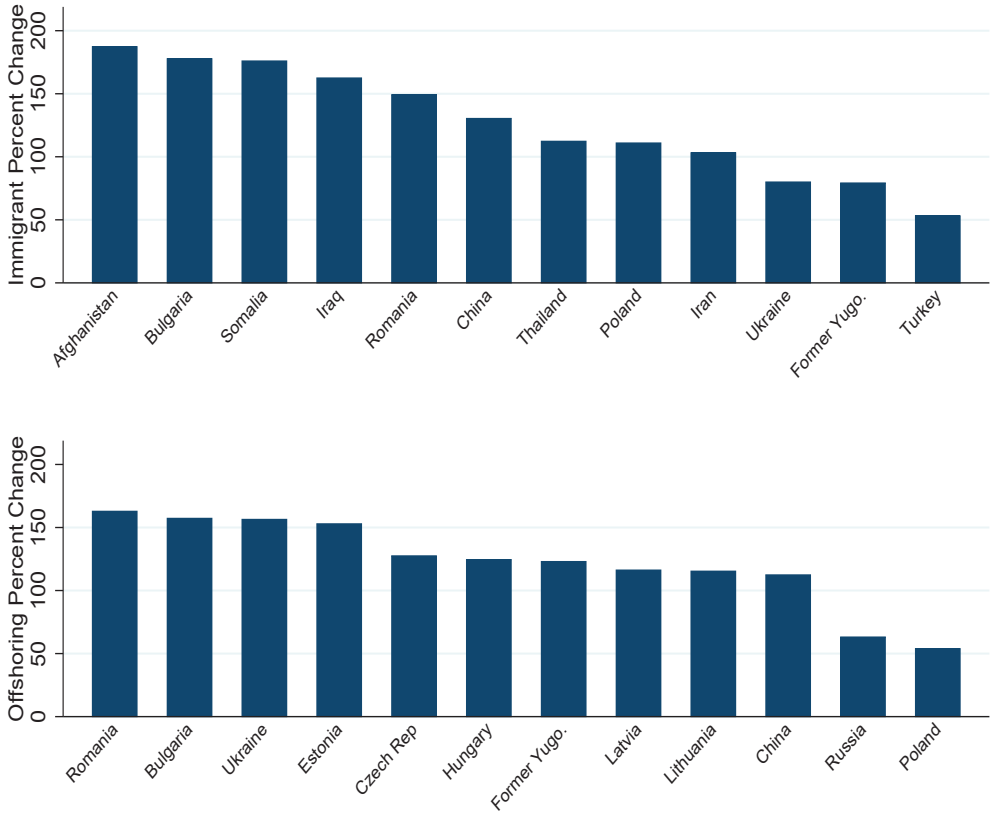
5 Network Effect Results

Although we find that immigration and offshoring are substitutes at the multilateral level, they may be complements at the bilateral level. This section examines whether immigration generates a network effect which increases offshoring to the immigrant's country of origin. Immigrants often have connections and knowledge of the business environment in their source country that could prove useful for Danish companies. The firm may draw on this expertise and these networks in order to help facilitate offshoring to the immigrant's country of origin.

To investigate this hypothesis we first present descriptive evidence showing the origin countries of Danish immigrants and the destination countries of Danish offshoring. Specifically, the top panel of Figure 10 shows the non-EU countries with the largest percent increase in the immigrant share from 1995 to 2011. There are big influxes of immigrants from countries experiencing conflict and instability (such as Afghanistan, Somalia, and Iraq) and from new-EU countries (like Bulgaria, Romania, and Poland), as we saw in Figure 2.

We then compare these high-immigrant countries to those countries with the largest percent increase in offshoring from 1995 to 2011. The bottom panel of Figure 10 shows the important destinations of Danish offshoring over this period, which includes countries like Romania and Bulgaria. Many top immigrant source countries are also important destination countries of offshoring, which suggests that there may be a bilateral relationship between these two global forces. For instance, six countries are both top immigration and top offshoring countries (i.e. Romania,

Figure 10: Immigration and Offshoring at the Bilateral Level



Notes: The percent change between 1995 and 2011 in the share of migrant workers is reported in the top panel by non-EU country. The percent change between 1995 and 2011 in the share of offshoring firms is reported in the bottom panel by non-EU country.

Bulgaria, Ukraine, the former Yugoslavia, China, and Poland).[38]

To test for this bilateral network effect we adopt a similar empirical specification to the one outlined in Equation (1). However, instead of examining the impact of multilateral immigration on multilateral offshoring, we now focus on the impact of bilateral immigration on bilateral offshoring. Thus, we estimate the following equation, where offshoring and immigration now vary at the foreign country level:

[38]There is a significant positive relationship between bilateral offshoring to and bilateral immigration from non-EU countries after accounting for country and year fixed effects.

$$Off_{ijmdt}^{non-EU} = \beta_0 + \beta_1 Img_{mdt-1}^{non-EU} + X'_{ijmt-1}\delta_1 + W'_{ijmt-1}\delta_2 + \gamma_i + \gamma_j + \gamma_m + \gamma_t + \gamma_d + \epsilon_{ijmdt} \quad (3)$$

The dependent variable, Off_{ijmtd}, is now offshoring to a particular destination country d by firm i, in industry j, located in municipality m, and in year t. Img_{mdt-1}^{non-EU} represents the immigrant share of workers from country d in municipality m and in year t. Given our focus on exogenous non-EU immigration, offshoring is also restricted to non-EU countries in this bilateral specification. Destination country fixed effects (γ_d) are now included in addition to the full set of firm characteristics (X_{ijmt-1}), workforce characteristics (W_{ijmt-1}), and fixed effects (γ_i, γ_j, γ_m, and γ_t) from before. The immigration instrument is constructed in the manner outlined in equation (2), except that it is now calculated at the bilateral level, and we continue to cluster our standard errors at the municipality level.

Equation (3) is well-suited to test for the bilateral network effect. For instance, this specification examines whether Polish immigrants within a municipality lead to a subsequent increase in the likelihood that local Danish firms offshore to Poland. However, in this bilateral specification the labor supply effect identified previously will be weaker since immigration from any one foreign country is unlikely to increase the local labor supply enough to influence offshoring decisions. In contrast, in equation (1) the labor supply effect is strong since multilateral immigration can be large enough to influence the local labor supply. However, network effects are diluted because immigrants from any one country (i.e. Poland) are unlikely to have connections that prove useful in offshoring to another foreign country (i.e. China). Pursuing both multilateral and bilateral empirical strategies allows us to disentangle the labor supply and network effects, which provides a more complete picture of how immigration influences offshoring.

Results from estimating equation (3) are reported in Table 7.[39] The bottom panel of column 1 shows that our instrument remains a strong predictor of actual immigration at the bilateral level

[39]This is a more data intensive specification with the sample size rising to over 20 million observations since the unit of analysis now varies by destination country.

(the first-stage F-stat is above 20). The second-stage results, reported above, indicate that immigration from a particular foreign country significantly increases the likelihood that firms within that municipality will offshore to that country. A 0.1 percentage point increase in bilateral immigration increases the probability that a firm offshores to the immigrant's country of origin by 0.00236 or 8.1%.[40] This provides evidence that immigration and offshoring are indeed complements at the bilateral level, as predicted by the network effect.

The relative strength of the network effect likely differs according to the characteristics of the immigrant and the nature of the job they perform. We suspect that high-skilled immigrants may have a larger network of business connections which is useful in facilitating offshoring to their country of origin. Consistent with this intuition, column 2 shows that skilled immigration increases offshoring by much more than less-skilled immigration.[41] Relatedly, the nature of the immigrant's job may also influence how important their business networks are in promoting offshoring. Column 3 shows that immigrants working in white-collar jobs increase offshoring by more than immigrants in blue-collar jobs. A final piece of evidence focuses on the non-EU immigrant share within the firm. Results in column 4 show that firm offshoring decisions are more sensitive to immigrant networks of the firm's own employees compared to the networks of immigrant workers in the municipality more generally. Bilateral offshoring increases by 32.4% due to a standard deviation increase in immigration within the firm (column 4) and by 24.4% due to a standard deviation increases in immigration within the municipality (column 1).

Is it possible to reconcile the negative relationship between immigration and offshoring found at the multilateral level (column 7 of Table 4) with the positive relationship found at the bilateral level (column 1 of Table 7)? We examine this issue by including in column 5 both the bilateral immigrant share from country X and the immigrant share from all other foreign countries (not including country X). We find that offshoring to country X is increasing with immigration from

[40] A one percentage point increase in bilateral immigration is implausibly large, thus we focus on a 0.1 percentage point increase which is more similar to the standard deviation in bilateral immigration of 0.003.

[41] High-skilled immigrants are those with at least a tertiary education, while less-skilled immigrants are those with less than a tertiary education.

country X consistent with the network effect but it is decreasing with immigration from all other foreign countries consistent with the labor supply effect. The results in column 5 verify that at the bilateral level immigration generates a network effect which complements offshoring, while at the multilateral level immigration generates a labor supply effect that substitutes for immigration.

These findings contribute to the existing literature by clarifying and reconciling some conflicting findings. Our results are consistent with the substitutability of multilateral immigration and offshoring found in Ottaviano et al. (2013). However, our results differ from Ottaviano et al. (2018) who find that immigration and offshoring are complements at the multilateral level but substitutes at the bilateral level. Their findings indicate, for instance, that Pakistani immigrants reduce offshoring only to Pakistan but actually increase offshoring to India and other foreign countries via a productivity effect. They explain this result by assuming that service tasks can only be carried out by either Pakistani immigrants domestically or by offshoring to Pakistan, which generates a substitution effect at the bilateral level. In contrast, we implicitly assume a more flexible production process that does not require tasks to be country-specific. Our findings support this assertion by showing, for instance, that Pakistani immigrants reduce the need for firms to offshore to other countries (due to the new supply of immigrant workers within the municipality) but increase offshoring to Pakistan (due to immigrant networks).[42]

The extensive margin results (columns 1-5 of Table 7) indicate that bilateral immigration helps domestic firms overcome the fixed costs associated with initially offshoring to the immigrant's country of origin. Immigrants' knowledge and connections are apparently useful for the firm in setting up stages of production abroad. However, once the Danish firm is already producing in the foreign country, we anticipate that immigration will have little impact on the intensive margin of offshoring because the firm has already made business connections of its own abroad. Thus, as a quasi-placebo test, we replicate our bilateral specifications but use as the dependent variable the logarithm of the volume of offshoring. The results from this exercise are reported in columns

[42]The discrepancy between our findings and Ottaviano et al. (2018) may be driven by their focus on the offshoring of service tasks at a sample of firms in U.K. service industries, where they argue there is a high degree of country specificity. In contrast, we focus on the offshoring of production tasks at the universe of firms across all industries.

6-10 of Table 7 and show that the intensive margin of offshoring to country X is not sensitive to immigration from country X in any of our specifications. This verifies that once the firm has already set up production activities in a particular foreign country, additional immigration from that country has no significant impact on offshoring. However, in column 10 immigration from all other countries does reduce the intensive margin of bilateral offshoring and the magnitude of this effect is similar to earlier findings (see column 6 of Table 5). We find it reassuring that our results are significant in the anticipated places but insignificant along other sensible dimensions. Overall the results in Table 7 verify that immigration generates a bilateral network effect that increases the extensive margin of offshoring but has no impact on the intensive margin of offshoring.

6 Extensions

6.1 Immigration Measures

Given exogenous 'push factors' in many non-EU countries and the Spatial Dispersal Policy which affected non-EU refugees, our analysis focuses on the non-EU immigrant population. This section examines whether our results are robust to focusing on broader or narrower groups of Danish immigrants. Specifically, column 1 of Table 8 uses the share of all foreign workers in the municipality, including both EU and non-EU immigrants. We construct an analogous instrument using predicted immigration from all foreign countries. This captures a more comprehensive picture of immigration within a Danish municipality but sacrifices some of the exogenous features of non-EU immigration. Nonetheless, the first and second-stage IV results in column 1, are similar to the non-EU results re-reported in column 2 for comparison purposes. Specifically, the immigration coefficient is -0.87 in column 1 and -0.83 in column 2. The similarity of these results is consistent with the fact that non-EU immigration is the driving force behind changes in total immigration over this period (Figure 1).

The remaining specifications in columns 3-5 focus on narrower definitions of immigration.

In column 3, we use migrants from either refugee countries or new-EU member countries and in column 4 we include only refugee immigrants. This more carefully identifies foreign workers that migrated to Denmark due to exogenous foreign shocks and that were allocated to municipalities based on the Spatial Dispersal Policy. However, it narrows the set of immigrants within a municipality that can potentially influence a firm's offshoring decision. The results in columns 3 and 4 show that immigration defined in these ways still has a negative impact on offshoring and if anything it is slightly larger in magnitude.[43]

Column 5 examines how Danish firms respond to lower-skilled immigration in particular.[44] Since offshoring often entails the relocation of routine, blue-collar tasks abroad (Hummels et al., 2014; Ebenstein et al., 2014; Becker et al., 2013), the offshoring decisions of Danish firms may be more sensitive to an influx of lower-skilled foreign workers. The results in column 5 confirm that an exogenous influx of lower-skilled non-EU immigrants significantly reduces the likelihood that Danish firms within that municipality will offshore and the magnitude of this effect is larger (11.5%) than the baseline results in column 2 (6.4%).

Finally, column 6 focuses on the share of non-EU immigrants within the firm rather than within the municipality.[45] Using firm-level immigrant shares is more specific but the downside is that immigration may influence offshoring decisions without necessarily increasing the immigrant share at all firms. The weaker first-stage results, suggests that this concern may be empirically relevant. However, the second-stage results indicate that an increase in immigrant workers within the firm significantly reduces firm-level offshoring. Overall, the results in Table 8 demonstrate that our findings are robust to a variety of alternate definitions of immigration.

[43] Similar findings are also obtained if the non-EU immigrant share is instrumented with the refugee and new-EU immigrant IV. Note that the first-stage F-stats are weaker in columns 3-6 of Table 8.

[44] Lower-skilled workers are defined as those with less than a tertiary education.

[45] The instrument, however, still measures exogenous changes in non-EU immigration at the municipality level.

6.2 Offshoring Measures

While our offshoring measure is consistent with a totally different survey-based measure of offshoring (compare Figure 4 to Bernard et al. (2017)), as a further check this section examines the extent to which our results are robust to other definitions of offshoring. We begin by utilizing a "broad offshoring" definition which uses firm imports in all product categories rather than just those within the same HS4 code as firm production. This could be important if firms offshore all activities within a HS4 sector and thus no longer produce anything domestically. Using this alternate offshoring variable generates similar results, as shown in column 1 of Table 9. A one percentage point increase in immigration leads to a 0.0162 or 6.1% decrease in the probability that a firm within that municipality will offshore (versus 6.4% using the narrow offshoring measure).

As a placebo test, we examine how immigration affects the imports of goods not in the same HS4 code as firm production. These are products that the firm is unlikely to be able to produce itself, they therefore do not reflect offshoring, and thus there should be no substitution between immigration and these imports. As expected, immigration does not have a negative impact on these non-offshoring imports (see column 2). This finding indicates that our results are specific to offshoring and do not reflect the impact of immigration on imports more generally. In fact the weak positive coefficient in column 2 indicates that immigration may expand domestic production due to either an immigrant-induced increase in the population or a reduction in the offshoring of other tasks, which in turn increases imports of these non-offshoring products.

We construct a conceptually distinct measure of offshoring using a completely different data set administered by the National Bank of Denmark (Esperian). Using firm-level information on outward foreign direct investment (FDI) of Danish multinationals in both manufacturing and service industries, an extensive margin offshoring measure is defined as whether the Danish firm has any majority owned foreign affiliates abroad.[46] The benefit of this variable is that it captures offshoring whose output is sold back to Denmark as well as offshoring whose output is sold in foreign

[46]Foreign direct investment data is not available for all the firms in our sample.

markets (our main measure of offshoring does not include this latter component). However, the downside of this approach is that it misses offshoring to foreign arms-length suppliers that are outside the boundaries of the firm (which is a component of offshoring that our main measure does capture). Column 3 of Table 9 reports results using this alternate FDI-based offshoring measure. Consistent with our earlier results, we find that an exogenous influx of immigrants leads to a significant decrease in the likelihood that firms within that municipality offshore. The fact that we arrive at similar results using a conceptually distinct measure of offshoring provides external validity for our findings.

Columns 4 and 5 of Table 9 shift the focus to the intensive margin of offshoring. Specifically, in column 4 we use as the dependent variable the log of offshoring per employee, which scales offshoring to firm size. We see that the impact of immigration on offshoring in column 3 (an effect of 14.7%) remains similar to our main findings (an effect of 12.1% in column 4 of Table 5). This should not be surprising given our analysis already controls for firm size and productivity. Column 5 explores whether our intensive margin results, which condition on the firm offshoring, could be influenced by the extensive margin entry into or exit from offshoring. To address this concern we restrict the sample of firms to those that offshore in all years. Despite the decrease in sample size, the estimated impact of immigration on the intensive margin of offshoring remains significant and similar in magnitude to our main findings (16.3% versus 12.1%). Overall, the results in Table 9 show that the impact of immigration on the extensive and intensive margins of offshoring are robust to a variety of alternate definitions of offshoring.

6.3 Additional Sensitivity Results

This section examines the extent to which our results are influenced by outlier municipalities and firms. For instance, as the capital and largest city in Denmark, Copenhagen is likely different along a number of dimensions. While we already include municipality fixed effects, as an additional check of our findings, we exclude Copenhagen (and Frederiksberg) entirely from the analysis.

Reassuringly, the immigration coefficient in column 1 of Table 10 remains negative, significant, and similar in magnitude (i.e. still a 6.4% impact) after Copenhagen is excluded from the sample.

Statistic Denmark's approach of identifying the geographic location of multi-establishment firms using the headquarter municipality may introduce measurement error into our analysis. While we control for multi-establishments in all of our specifications, we check that our results are robust to the exclusion of these firms from the analysis. When we drop these multi-establishment firms from the sample entirely in column 2, the immigration point estimate remains significant and similar in sign and magnitude (now an impact of 7.2%).

Our main analysis excludes firms that moved from one municipality to another within Denmark. This ensures that changes in the share of non-EU immigrants captures variation over time within the same municipality and does not reflect the possibility that the firm has relocated. However, in column 3 we include firms that relocated and find similar results (an impact of 8.2%). Overall, we conclude that our results are robust to different samples of municipalities and firms.

7 Conclusion

This paper examines the impact of immigration on firm-level offshoring decisions. A number of features of Danish immigration during this period provide a unique opportunity to identify the causal impact of immigrant inflows on subsequent firm-level offshoring decisions. We utilize a detailed employer-employee matched data set covering the universe of Danish firms and workers over the period 1995-2011. Our results provide new insights into the relationship between arguably the two most controversial components of globalization.

First, we find that an exogenous increase in immigration leads to a significant decrease in firm-level offshoring at both the extensive and intensive margins. Consistent with the labor supply effect, this result indicates that an influx of foreign immigrant workers reduces the need for firms to relocate production activities to foreign countries. In other words, immigration and offshoring

are substitutes.

Second, a bilateral analysis confirms that immigration increases the likelihood that firms offshore to the immigrant's country of origin. Consistent with the network effect, this result indicates that immigrants have connections in their country of origin that help the firm initially offshore to that particular foreign country. However, once the firm has already set up production activities abroad and made its own business connections, additional immigration from that country does not increase the intensive margin of offshoring. Overall, we find that immigration and offshoring are complements at the bilateral level but substitutes at the multilateral level.

These findings carry important policy implications at a time when many countries are increasingly skeptical of both immigration and offshoring. Our key finding that immigration and offshoring are substitutes, suggests that policies aimed at reducing immigration could have the unintended consequence of encouraging firms to offshore jobs abroad. Policy makers should be cognizant of this important trade-off: either foreign workers immigrate to perform the jobs domestically or the jobs themselves are offshored to be performed by foreign workers abroad.

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Table 1: Descriptive Statistics of Natives and Immigrants

Variables	**Natives**		**Non-EU Immigrants**		**EU Immigrants**	
	Mean	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*
Age	39.648	13.147	34.613	11.729	43.652	11.733
Years of Education	11.987	3.295	10.021	3.564	12.508	3.424
White Collar	0.359	0.479	0.222	0.415	0.430	0.495
Blue Collar	0.641	0.479	0.778	0.415	0.570	0.495
N	42,085,725		1,644,604		491,082	

Notes: All descriptive statistics are calculated as averages over the period 1995-2011 for the whole workforce.

Table 2: Descriptive Statistics

Variables	**Definition**	**Mean**	**S.D.**
Offshoring variables			
Extensive margin of offshoring (narrow)	1, if the firm offshores (narrow definition)	0.130	0.316
Intensive margin of offshoring (narrow)	log of offshoring volumes, conditional on offshoring (narrow definition)	11.409	3.298
Extensive margin of offshoring (broad)	1, if the firm offshores (broad definition)	0.264	0.426
Workforce variables			
Non-EU Immigrant Share	share of employees from non-EU countries (municipality level)	0.031	0.020
Male	male employees as a proportion of all employees	0.715	0.294
Age	average employees' age	39.536	7.144
Years of Education	average employees' years of education	11.847	1.869
Tenure	average employees' tenure	5.565	3.924
Work Experience	average employees' work experience	13.523	4.842
Firm variables			
Labor Productivity	log of sales per employee	14.387	0.852
Size1	1, if the number of employees is smaller than 50	0.895	0.360
Size2	1, if the number of employees is between 50 and 100	0.063	0.254
Size3	1, if the number of employees is langer than 100	0.042	0.185
Capital Intensity	log of capital stock per employee	12.465	1.322
Multi-establishment	1, if the firm is a multi-establishment company	0.101	0.295
Foreign	1, if the firm is foreign owned	0.003	0.056
N			439,627
Number of firms			34,812

Notes: All descriptive statistics are calculated as averages over the period 1995-2011. Trade and accounting variables are in real Danish Kroner (using 2005 as the base year).

Table 3: Pre-Sample Trends and Long-Run Changes in Immigration and Offshoring

	Δ Ext. Margin Offshoring (1993-1995)	Δ Int. Margin Offshoring (1993-1995)	Δ Employment (1993-1995)	Δ Hourly Wages (1993-1995)
	(1)	(2)	(3)	(4)
Δ Non-EU Img Share IV (1995-2011)	0.035	2.374	-0.111	-0.518
	(0.020)	(1.927)	(0.382)	(0.359)
N	97	97	97	97
R-sq	0.722	0.243	0.213	0.213
	Δ Share of Non-EU Img (1995-2011)	Δ Share of EU Img (1995-2011)	Δ Ext. Margin Offshoring (1995-2011)	Δ Int. Margin Offshoring (1995-2011)
	(5)	(6)	(7)	(8)
Δ Non-EU Img Share IV (1995-2011)	0.220**	-0.015	-0.015**	-1.511*
	(0.104)	(0.016)	(0.006)	(0.801)
N	97	97	97	97
R-sq	0.731	0.270	0.801	0.293

Notes: In columns 1 and 2 the dependent variable is the pre-sample trend (i.e. the change from 1993 to 1995) in offshoring at the municipality level. In columns 3 and 4 the dependent variable is the pre-sample trend (i.e. the change from 1993 to 1995) in the log of employment and hourly wages at the municipality level. In column 5 the dependent variable is the long-run change (1995 to 2011) in the share of non-EU immigrants at the municipality level, while in column 6 it is the long-run change in the share of EU immigrants. In columns 7 and 8 the dependent variable is the long-run change in offshoring (1995 to 2011) at the municipality level. The explanatory variable in all regressions is the long-run change (1995 to 2011) in the immigration instrument. Regressions also include 1995 municipality averages of all of the other control variables (including labor productivity, capital stock, foreign-ownership, a multi-establishment dummy, size dummies, male, age, work experience, tenure, and years of education). Regressions are weighted by the local labor force in 1995. Robust standard errors in parentheses. Significance levels: ***1%, **5%, *10%.

Table 4: Immigration and the Extensive Margin of Firm Offshoring

	Offshoring (Extensive Margin)						
	OLS	**Probit**	**OLS**	**OLS**	**IV**	**IV**	**IV**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Non-EU Immigrant Share$_{t-1}$	–0.303**	–0.206**	-0.321**	-0.349**	-0.740**	-0.785**	-0.826**
	(0.150)	(0.085)	(0.161)	(0.171)	(0.267)	(0.302)	(0.335)
Labor Productivity$_{t-1}$				0.015***			0.015***
				(0.002)			(0.002)
Capital Intensity$_{t-1}$				0.065**			0.067**
				(0.028)			(0.028)
Foreign$_{t-1}$				0.002*			0.001
				(0.001)			(0.001)
Industry, Municipality and Year Fixed Effects	yes	yes	yes	yes	yes	yes	yes
Firm Fixed Effects	no	no	yes	yes	no	yes	yes
Firm Size Dummies and Multi-establishment Dummy	no	no	no	yes	no	no	yes
Workforce Characteristics	no	no	no	yes	no	no	yes
Mean Y	0.130	0.130	0.130	0.130	0.130	0.130	0.130
First Stage: KP F-stat on Instrument	.	.	.	.	13.999	12.989	12.643
First Stage: Non-EU Img IV Coeff.	.	.	.	.	0.248*** (0.068)	0.202*** (0.067)	0.179*** (0.064)
R-sq/Pseudo R-sq	0.254	0.375	0.763	0.763	0.254	0.763	0.764
N	439,627	439,627	439,627	439,627	439,627	439,627	439,627

Notes: The dependent variable is a binary variable indicating whether the firm offshores (narrow definition). The non-EU immigrant share$_{t-1}$ is the lagged share of non-EU foreign workers within the municipality. Workforce composition characteristics include the lagged share of male workers, and average years of education, age, tenure and work experience. In column 2 we report the marginal effect of the non-EU immigrant share$_{t-1}$ calculated at the mean of the independent variables. Robust standard errors clustered at the municipality level in parentheses. Significance levels: ***1%, **5%, *10%.

Table 5: Immigration and the Intensive Margin of Firm Offshoring

	Offshoring (Intensive Margin)					
	OLS	**OLS**	**OLS**	**IV**	**IV**	**IV**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Non-EU Immigrant Share$_{t-1}$	-7.085**	-6.777**	-6.249**	-14.212**	-13.177**	-12.064**
	(3.437)	(3.143)	(3.032)	(7.176)	(6.650)	(5.339)
Labor Productivity$_{t-1}$			0.015***			0.015***
			(0.002)			(0.002)
Capital Intensity$_{t-1}$			0.065**			0.067**
			(0.028)			(0.028)
Foreign$_{t-1}$			0.002*			0.001
			(0.001)			(0.001)
Industry, Municipality and Year Fixed Effects	yes	yes	yes	yes	yes	yes
Firm Fixed Effects	no	yes	yes	no	yes	yes
Firm Size Dummies and Multi-establishment Dummy	no	no	yes	no	no	yes
Workforce Characteristics	no	no	yes	no	no	yes
Mean Y	11.409	11.409	11.409	11.409	11.409	11.409
First Stage: KP F-stat on Instrument	.	.	.	9.227	8.765	7.829
First Stage: Non-EU Img IV Coeff.	.	.	.	0.191***(0.057)	0.189** (0.086)	0.186** (0.083)
R-sq	0.047	0.569	0.570	0.046	0.568	0.569
N	59,399	59,399	59,399	59,399	59,399	59,399

Notes: The dependent variable is the natural log of firm-level offshoring volumes (narrow definition) conditional on offshoring. The non-EU immigrant share$_{t-1}$ is the lagged share of non-EU foreign workers within the municipality. Workforce composition characteristics include the lagged share of male workers, and average years of education, age, tenure and work experience. Robust standard errors clustered at the municipality level in parentheses. Significance levels: ***1%, **5%, *10%.

Table 6: Immigration and Firm Offshoring, Mechanisms

	Share of Non-EU at Offshoring Firms (Firm-Level)	Share of Non-EU at Non-Offshoring Firms (Firm-Level)	Share of Routine Occ. at Offshoring Firms (Firm-Level)	Share of Routine Occ. at Non-Offshoring Firms (Firm-Level)	Avg. Native Wage (Mun.-Level)	Avg. Non EU Wage (Mun.-Level)	Wages (Worker-Level)	Productivity (Mun.-Level)	Stock of Firms (Mun.-Level)	Inflow of Firms (Mun.-Level)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Non-EU Immigrant Share$_{t-1}$	0.317**	0.105**	2.690**	0.250	-6.077	-2.859***		0.552	3.938*	8.409*
	(0.142)	(0.048)	(1.325)	(0.553)	(3.922)	(0.485)		(0.459)	(2.184)	(4.465)
Non-EU Immigrant$_t$							-0.072***			
							(0.001)			
Municipality and Year Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Municipality Averages of All the Other Control Variables	no	no	no	no	yes	yes	no	yes	yes	yes
Industry, Firm, Occupation, and Gender Fixed Effects	no	no	no	no	no	no	yes	no	no	no
Age and Education Variables	no	no	no	no	no	no	yes	no	no	no
Firm and Industry Fixed Effects	yes	yes	yes	yes	no	no	no	no	no	no
Firm Size Dummies and Multi-establishment Dummy	yes	yes	yes	yes	no	no	no	no	no	no
Workforce Characteristics	yes	yes	yes	yes	no	no	no	no	no	no
Mean Y	0.039	0.017	0.309	0.356	5.315	5.133	5.080	14.359	5.697	4.154
First Stage: KP F-stat on Instrument	14.292	11.273	14.292	11.273	31.273	31.273	.	31.273	31.273	31.273
First Stage: Non-EU Img IV Coeff.	0.238*** (0.069)	0.156*** (0.051)	0.238*** (0.069)	0.156*** (0.051)	0.122*** (0.022)	0.122*** (0.022)	.	0.122*** (0.022)	0.122*** (0.022)	0.122*** (0.022)
R-sq	0.774	0.845	0.763	0.805	0.802	0.856	0.456	0.854	0.884	0.848
N	99,063	339,895	99,063	339,895	1,552	1,552	16,283,602	1,552	1,552	1,552

Notes: In columns 1 and 2 the dependent variable is the firm-level share of non-EU workers at time t. In columns 3 and 4 the dependent variable is the share of workers who are employed in routine occupations at the firm level at time t. An occupation is classified as routine intensive if the principle component index of manual dexterity (O*NET task id 1.A.2.a.2), finger dexterity (1.A.2.a.3), multilimb coordination (1.A.2.b.2), processing information (4.A.2.a.2), and evaluating information to determine compliance with standards (4.A.2.a.3), is above the 75th percentile of the index distribution. In columns 1 and 3 the sample includes only those firms that offshore for at least one year over the sample period. In columns 2 and 4 the sample includes all the other firms. In column 5 (6) the dependent variable is the natural log of the average hourly wages of native (non-EU) workers at the municipality level at time t. In column 7 the dependent variable is the log of hourly wages at the worker level and the independent variable is a binary variable indicating whether the worker is a non-EU immigrant. In column 8 the dependent variable is the average firm productivity at the municipality level at time t. In column 9 the dependent variable is the natural log of the stock of firms in a given municipality at time t. In column 10 the dependent variable is the natural log of existing firms moving into a given municipality at time t. The municipality averages of all the other control variables are included (i.e. labor productivity, capital stock, foreign-ownership, a multi-establishment dummy, size dummies, male, age, work experience, tenure, and years of education). Municipality regressions are weighted by the local labor force at time t. Robust standard errors in parentheses in all columns and clustered at the firm (worker) level in columns 1,2,3 and 4 (7). Significance levels: ***1%, **5%, *10%.

Table 7: Immigration and Firm Offshoring at the Bilateral Level

	Extensive margin					Intensive margin				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**
Bilateral Non-EU Immigrant Share$_{t-1}$	2.357***				2.103***	18.365				16.428
	(0.890)				(0.179)	(10.716)				(9.395)
Bilateral Non-EU Immigrant Share$_{t-1}$ (High-Skill)		19.649***					23.689			
		(3.121)					(87.707)			
Bilateral Non-EU Immigrant Share$_{t-1}$ (Low-Skill)		0.783**					10.127			
		(0.333)					(13.526)			
Bilateral Non-EU Immigrant Share$_{t-1}$ (White-Collar)			14.234***					2.145		
			(1.876)					(7.707)		
Bilateral Non-EU Immigrant Share$_{t-1}$ (Blue-Collar)			0.303**					0.543		
			(0.146)					(2.443)		
Bilateral Firm Non-EU Immigrant Share$_{t-1}$				0.303***					7.277	
				(0.039)					(10.711)	
Other non-EU Immigrant Share$_{t-1}$					-0.100**					-12.006*
					(0.046)					(6.634)
Industry, Municipality and Year Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Firm Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Firm Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Workforce Characteristics	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Destination Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Mean Y	0.029	0.029	0.029	0.029	0.029	10.487	10.487	10.487	10.487	10.487
First Stage: KP F-stat on Instruments	20.378	21.179; 15.310	21.633; 13.776	16.192	20.654; 8.512	32.838	24.441; 13.971	23.675; 12.876	13.120	35.623; 11.471
First Stage: Bil Non-EU Img IV Coeff.	0.257** (0.108)			1.200***(0.086)	0.782*** (0.069)	0.504*** (0.077)			1.130*** (0.147)	0.497*** (0.076)
First Stage: Bil Non-EU Img IV Coeff (High-Skill)		1.107*** (0.043)					1.256*** (0.056)			
First Stage: Bil Non-EU Img IV Coeff (Low-Skill)		0.806*** (0.096)					1.271*** (0.076)			
First Stage: Bil Non-EU Img IV Coeff (White Collar)			1.985*** (0.057)					1.991*** (0.088)		
First Stage: Bil Non-EU Img IV Coeff (Blue Collar)			0.556*** (0.099)					0.877*** (0.152)		
First Stage: Non-EU Img IV Coeff.					0.187*** (0.054)					0.179** (0.072)
R-sq	0.124	0.125	0.125	0.124	0.131	0.264	0.264	0.264	0.264	0.264
N	20,306,958	20,306,958	20,306,958	20,306,958	20,306,958	103,025	103,025	103,025	103,025	103,025

Notes: The dependent variable is bilateral offshoring to foreign country (X) measured at the extensive margin in columns 1-5 and at the intensive margin in columns 6-10. The Bilateral Non-EU Immigrant Share variable is foreign country (X) specific. The bilateral Non-EU Immigrant Share (High-Skill) includes foreign workers with at least a tertiary education. The bilateral Non-EU Immigrant Share (Low-Skill) includes foreign workers with less than a tertiary education. The Firm Non-EU Immigrant Share is the share of non-EU immigrants from country X within the firm. Finally, the Other Non-EU Immigrant Share variable includes immigrants from all other countries, not including country X. Robust standard errors clustered at the municipality level in parentheses. Significance levels: ***1%, **5%, *10%.

Table 8: Immigration and Firm Offshoring, Using Alternate Immigration Variables

	(1)	(2)	(3)	(4)	(5)	(6)
Total Immigrant Share	-0.874**					
	(0.364)					
Non-EU Immigrant Share		-0.826**				
		(0.335)				
Refugee and New-EU Immigrant Share			-1.007**			
			(0.493)			
Refugee Immigrant Share				-1.198*		
				(0.628)		
Non-EU Low-Skill Immigrant Share					-1.498**	
					(0.702)	
Non-EU Immigrant Firm Share						-1.308**
						(0.650)
Industry, Municipality and Year Fixed Effects	yes	yes	yes	yes	yes	yes
Firm Fixed Effects	yes	yes	yes	yes	yes	yes
Firm Controls	yes	yes	yes	yes	yes	yes
Workforce Characteristics	yes	yes	yes	yes	yes	yes
Mean Y	0.130	0.130	0.130	0.130	0.130	0.130
First Stage: KP F-stat on Instrument	13.011	12.643	7.825	8.133	7.527	5.534
First Stage: Total Img IV Coeff.	0.166** (0.075)					
First Stage: Non-EU Img IV Coeff.		0.179*** (0.081)				0.113*** (0.036)
First Stage: Refugee & New-EU Img IV Coeff.			0.192** (0.097)			
First Stage: Refugee Img IV Coeff.				0.241*** (0.045)		
First Stage: Non-EU Low-Skill Img IV Coeff.					0.136** (0.065)	
R-sq	0.741	0.741	0.741	0.741	0.741	0.741
N	439,627	439,627	439,627	439,627	439,627	439,627

Notes: The dependent variable is a binary variable indicating whether the firm offshores (narrow definition). In column 1, the endogenous variable is the share of total (EU and non-EU) immigrants in the municipality, while the instrument is the predicted share of all immigrants. In column 2 the endogenous variable is the share of non-EU immigrants in the municipality, while the instrument is the predicted share of non-EU immigrants. In column 3 the endogenous variable is the share of refugee or new-EU immigrants in the municipality, while the instrument is the predicted share of refugee and new-EU immigrants. In column 4 the endogenous variable is the share of refugee immigrants in the municipality, while the instrument is the predicted share of refugee immigrants. In column 5 the endogenous variable is the share of non-EU low-skilled immigrants in the municipality, while the instrument is the predicted share of non-EU low-skilled immigrants (where low-skilled immigrants are defined as those with less than a tertiary education). In column 6 the endogenous variable is the share of non-EU immigrants at the firm, while the instrument is the predicted share of non-EU immigrants in the municipality. Robust standard errors clustered at the municipality level in parentheses. Significance levels: ***1%, **5%, *10%.

Table 9: Immigration and Firm Offshoring, Using Alternate Offshoring Variables

	Broad Offshoring	**Non-offshoring Imports**	**FDI-Based Offshoring**	**Offshoring per Employee (Intensive Margin)**	**Firms Offshoring in All Years (Intensive Margin)**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Non-EU Immigrant Share$_{t-1}$	-1.618**	1.572*	-0.302**	-14.676**	-16.328*
	(0.711)	(0.8933)	(0.143)	(7.163)	(9.628)
Industry, Municipality and Year Fixed Effects	yes	yes	yes	yes	yes
Firm Fixed Effects	yes	yes	yes	yes	yes
Firm Controls	yes	yes	yes	yes	yes
Workforce Characteristics	yes	yes	yes	yes	yes
Mean Y	0.264	0.269	0.154	8.683	12.623
First Stage: KP F-stat on Instrument	12.643	12.489	12.883	7.829	6.987
First Stage: Non-EU Img IV Coeff	0.179*** (0.076)	0.223*** (0.052)	0.195*** (0.048)	0.186** (0.083)	0.125**(0.061)
R-sq	0.779	0.737	0.883	0.565	0.570
N	439,627	439,627	67,517	56,399	20,925

Notes: In column 1 the dependent variable is a binary variable indicating whether the firm offshores (broad definition). In column 2 the dependent variable is a binary variable indicating whether the firm imports products in a different HS4 category as firm production. In column 3 the dependent variable is a binary FDI-based measure of offshoring indicating whether the firm has a foreign affiliate. In column 4 the dependent variable is the log of offshoring volumes per employee (narrow definition). In column 5 the dependent variable is the log of offshoring volumes (narrow definition) and the sample is restricted to firms that offshore in all years. Robust standard errors clustered at the municipality level in parentheses. Significance levels: ***1%, **5%, *10%.

Table 10: Immigration and Firm Offshoring, Additional Sensitivity Results

	Excl. Copenhagen	**Excl. Multi-Establishment Firms**	**Incl. Firms that Relocate**
	(1)	**(2)**	**(3)**
Non-EU Immigrant Share$_{t-1}$	-0.746**	-0.678**	-1.142***
	(0.351)	(0.337)	(0.184)
Industry, Municipality and Year Fixed Effects	yes	yes	yes
Firm Fixed Effects	yes	yes	yes
Firm Controls	yes	yes	yes
Workforce Characteristics	yes	yes	yes
Mean Y	0.117	0.094	0.139
First Stage: KP F-stat on Instrument	10.351	9.68	14.643
First Stage: Non-EU Img IV Coeff	0.213*** (0.090)	0.173*** (0.048)	0.269*** (0.001)
R-sq	0.739	0.726	0.736
N	403,137	394,354	488,164

Notes: The dependent variable is a binary variable indicating whether the firm offshores (narrow definition). In column 1 we exclude from the sample the municipality of Copenhagen (and Frederiksberg). In column 2 we exclude multi-establishment firms. In column 3 we include firms that relocate from one Danish municipality to another. Robust standard errors clustered at the municipality level in parentheses. Significance levels: ***1%, **5%, *10%.