The Evolution of Tradable and Non-Tradable Employment: Evidence from France

Philippe Frocrain* and Pierre-Noël Giraud*

Abstract – The objective of this paper is to investigate the evolution of employment in the tradable and non-tradable sectors in France over 1999-2015. We find that tradable employment makes up the minority of French employment and has decreased over this period, dropping from 27.5% to 23.6% of total employment. There has been significant restructuring within the sector: tradable services jobs now make up the majority of tradable jobs and have grown sharply, while employment has declined in the rest of the tradable sector (manufacturing, agricultural and mining industries). We also identify a large wage and labor productivity gap between tradable and non-tradable sectors. Finally, we examine the distribution of tradable jobs across French local labor markets, and how their development affects non-tradable employment locally. Using the empirical approach developed by Moretti (2010), we find that for every 100 tradable jobs created in a French employment area between 2008 and 2016, 80 additional non-tradable jobs were created within the same area.

JEL Classification: F16, F66, O52, R15, R23
Keywords: tradable, non-tradable, globalization, multiplier, local labor market, French employment structure

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The distinction between primary, secondary and tertiary sectors, initially made by Fisher (1935), forms the basis of classification of economic activities. Nevertheless, it has lost some of its relevance due to the blurring of the line between industrial activities and service activities. Manufactured goods involve a growing share of services that are required to produce them or are sold with them (Crozet & Milet, 2017). Symmetrically, some services are produced on an "industrial mode" (Fontagné *et al*., 2014) and require infrastructures and equipment, such as communication networks, to be delivered. On the other hand, the sharp growth in international trade in recent decades has made it increasingly necessary to distinguish between activities exposed to international competition and those not exposed to it, found in primary, secondary and tertiary sectors. This distinction between the tradable and non-tradable sectors has been widely used in international economics, with special relevance for, inter alia, the effects of devaluation, the purchasing-power-parity theory of exchange rates, the determination of inflation in open economies, and the specification and estimation of international trade flows (Goldstein & Officer, 1979). To date, the vast majority of empirical studies associate the tradable sector with the primary and secondary sectors, implicitly assuming that services are not tradable (Gervais & Jensen, 2015). Yet recent advances in information and communication technologies have increased the tradability of a great number of products and especially services, providing employment opportunities and risks. Surprisingly, only very few studies – Jensen and Kletzer (2005), Hlatshwayo and Spence (2014) for the United States, and Eliasson *et al*. (2012), Eliasson and Hansson (2016) for Sweden – have done a detailed analysis of tradable and non-tradable employment. We contribute to this recent literature and to the debate on the effects of increased globalization on the employment structure of our economies by analyzing employment, wages, skills, and labor productivity patterns across tradable and non-tradable industries in France from 1999 to 2015.

The distinction between tradable and non-tradable jobs stems from the division of a country's economy into two parts. The tradable sector produces goods and services that can be produced in one country and consumed in another – in the specific case of tourism, it is foreign consumers who travel. The non-tradable sector produces to satisfy exclusively domestic demand. Jobs in the tradable sector, usually referred to as *tradable jobs*, compete with jobs in other countries. This does not just involve jobs in the manufacturing and agricultural sectors, but also all the jobs engaged in producing remotely deliverable services. Thus, we can expect the tradable sector to include, e.g., automobile workers, call centre employees, milk producers, and software engineers. It also includes jobs in tourism, which are partly supported by the movement of foreign consumers. International tourists clearly consume in the territory where production takes place. But in choosing between several destinations, they put jobs located in different countries in competition with each other. Jobs in the non-tradable sector, referred to as *non-tradable jobs*, are only in direct competition with jobs in the same country, and often even in the same place. High tariffs can explain why some jobs are sheltered from international competition. Others are sheltered for regulatory or institutional reasons, e.g. soldiers and politicians. However, the most frequent barrier to international trade is transport costs, in particular for activities that require physical proximity between consumers and producers. A typical example is hairdressing, which is not yet automated or remotely controllable, and for which international differences in price and quality do not justify cross-border movement of consumers. This applies to a number of other non-tradable jobs (e.g. bakers, physiotherapists, etc.).

In practice, it is not easy to identify precisely tradable and non-tradable jobs. The distinction is not made in national accounts, and no consensual method has emerged in the academic literature. Moreover, the boundary between the two categories is not fixed once and for all, because of technical and regulatory changes. We identify three main, not mutually exclusive, methods to classify tradable and non-tradable jobs. A large body of literature (e.g., De Gregorio *et al*., 1994; Dwyer, 1992; Dixon *et al*., 2004; Amador & Soares, 2017) uses trade statistics to classify as tradable the industries that produce goods and services of which a sufficient portion are traded. For instance, based on Portuguese firm-level data, Amador and Soares (2017) include in the tradable sector the industries that report an export-to-sales ratio above 15%. Using this criterion, they find that almost one quarter of non-manufacturing employment is tradable. A second approach (Bardhan & Kroll, 2003; Blinder, 2009; Blinder & Krueger, 2013; Jensen & Kletzer,

2010) determines offshorability[1] based on the task content of occupations. The idea is that tasks involving little face-to-face customer contact or having high information content are likely to be offshorable. As an example, computer programming meets the criteria – unlike childcare, which requires close physical proximity. An important limitation, as shown by Lanz *et al*. (2011), is that workers performing tasks considered tradable also tend to perform non-tradable tasks. In addition, different offshorability measures coexist, even among authors using the same database (Püschel, 2013). In this paper, we choose a third approach, using geographic concentration indexes as an indicator of tradability.

In a stimulating contribution, Jensen and Kletzer (2005) compute geographic concentration indexes for industries and occupations to estimate the number of tradable jobs in the United States, paying particular attention to the tradability of services. Industries that produce tradable goods and services need to be geographically concentrated in order to take advantage of increasing returns to scale and agglomeration economies, or access to transportation nodes and natural resources. Conversely, non-tradable activities are more spatially dispersed, as they tend to follow the geographical distribution of population and income. Indeed, trade costs are so high for non-tradable industries that supply and demand necessarily converge domestically. For instance, bakeries tend to be highly dispersed, as they almost exclusively serve local customers, while car manufacturers are more concentrated, as the tradability of their output allows them to take advantage of concentration. Helpman and Krugman (1985) demonstrated this intuition in a formal model, while Krugman (1991) computed locational Gini coefficients for 106 three-digit US manufacturing industries.[2] From a methodological standpoint, the approach of Jensen and Kletzer (2005) differs in the sense that they do not study pure geographical concentration of supply as in Krugman (1991), but rather geographical concentration of supply relative to local demand. A few studies have since used this approach to classify industries and occupations. Eliasson *et al*. (2012) and Barlet *et al*. (2010) focus on the tradability of services in the case of Sweden and France respectively. Hlatshwayo and Spence (2014) study the evolution of the tradable and non-tradable sectors in the United States. Our work differs from Barlet *et al.* (2010) in the sense that they focus on the tradability of services, while we are interested in the evolution of all tradable and non-tradable jobs in the French economy and analyze not only employment, but also wages, skills, labor productivity, geography, and the local employment multiplier effect of tradable jobs on non-tradable jobs.

According to our classification of tradable and non-tradable industries, tradable employment is still the minority in France. And increasingly so: its share of total employment has significantly decreased, from to 27.5% in 1999 to 23.6% in 2015. In the space of sixteen years, non-tradable employment increased by 2.78 million, while tradable employment dropped by 400,000. Interestingly, tradable employment has become more tertiary, which is consistent with the growing importance of services in world trade and global value chains. Jobs in tradable service activities now represent almost half of tradable jobs, and have experienced a higher growth rate than jobs in non-tradable services. This has not however been sufficient to compensate for the decline in the manufacturing, agricultural and mining industries. The fall in tradable employment has also been accompanied by a widening productivity gap between the two groups: labor productivity gains are much more dynamic in tradable than non-tradable sectors. We also observe a large wage gap: in 2015, the annual gross wage in tradable jobs was on average 27% higher than in non-tradable jobs. The gap does not seem to reflect a difference in the skills structure, which is remarkably similar in the two sectors.

We also analyze how employment evolved at the local labor market level (French employment areas) between 2008 and 2016. Since tradable industries are concentrated in certain areas, there are disparities in regional exposure to foreign competition. We show that the increase in tradable services primarily benefited major metropolitan areas. In contrast, the erosion of manufacturing employment affected a great number of less-dense local economies. Strikingly, we observe that the employment areas in which tradable employment has shrunk the most have often also been affected by the destruction of

1. It should be noted that the concept of offshorability, i.e. the ability to perform work from abroad, differs slightly from our definition of tradability as it does not include jobs in tourism, which cannot strictly be offshored but depend partly on foreign demand.

2. More recently, Gervais and Jensen (2015) proposed a theoretical framework formalizing the idea that the disparity between local supply and local demand is an indicator of the extent of trade in an industry.

non-tradable jobs, and vice versa. To identify a causal relationship, we follow the econometric approach proposed by Moretti (2010) to estimate local multipliers, i.e. the impacts of employment changes in the tradable sector on employment in the non-tradable sector. Our results confirm the significant local multiplier effect of tradable employment. From 2008-2016, for every 100 additional jobs created in the tradable sector in an employment zone in mainland France, 80 jobs were also generated in the non-tradable sector within the same area.

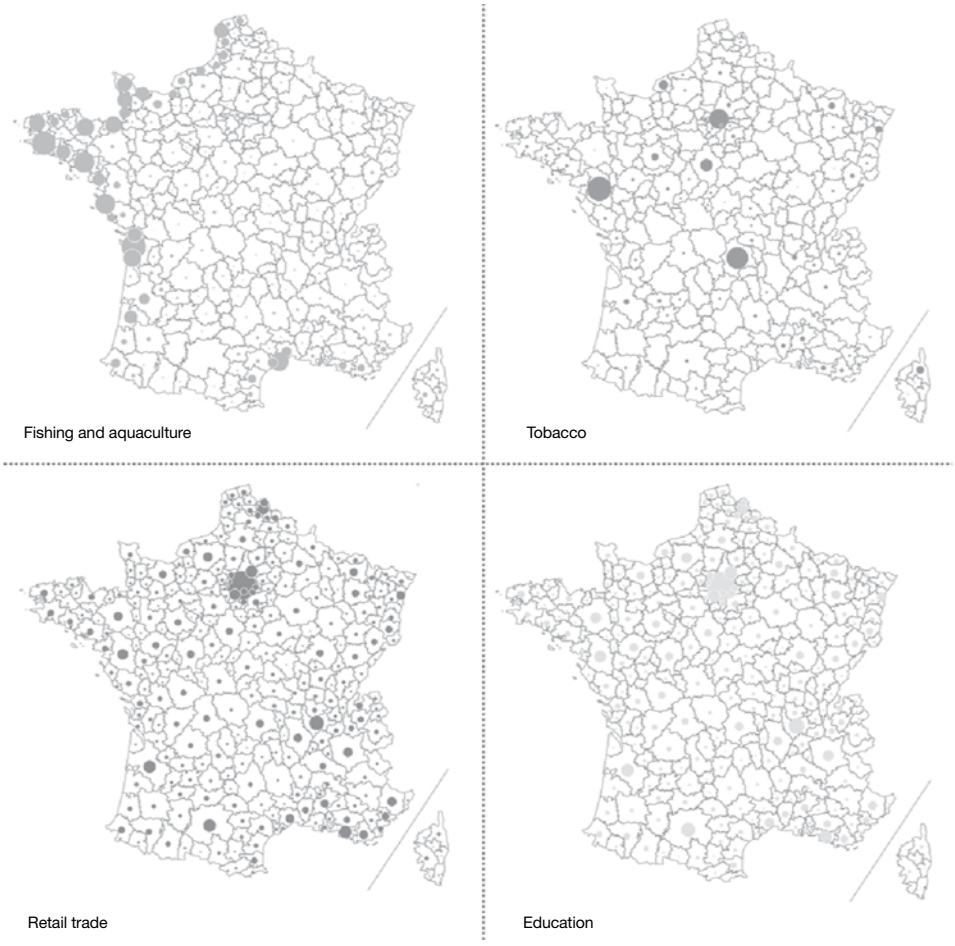
The remainder of this paper is organized as follows. The first section presents the classification used in this article and the methodology from which it is derived. In the second section we analyze employment trends and workers' characteristics in tradable and non-tradable sectors. The third section provides an estimate of local multipliers based on our classification of tradable and non-tradable jobs. The last section concludes.

Classification of Tradable and Non-Tradable Industries

Data and Methodology

Figure I depicts the distribution of employment across French employment areas for four industries. It illustrates the significant heterogeneity in the geographic concentration of production. Fishing and aquaculture jobs are concentrated in coastal areas, yet fish are consumed throughout France and even abroad. Although the presence of natural resources is determined by geography, these jobs are exposed to foreign competition if other countries propose similar or substitutable products. Similarly, 58% of jobs in "Tobacco products" are concentrated in three areas (Nantes, Clermont-Ferrand and Paris). In contrast, and as expected, jobs in "Retail trade" and "Education" are much more evenly distributed throughout France.

Figure I
Spatial Distribution of Employment, 2012



Produced using Philcarto: http://philcarto.free.fr.
Coverage: Naf rév. 2 A88, Metropolitan France.
Sources: Insee, Population Census 2012.

To measure geographic concentration, we compute Gini coefficients following the methodology of Barlet *et al*. (2010) based on the approach developed by Jensen and Kletzer (2005). Note that we use a different database. Our database includes more services (46 versus 36) than in Barlet *et al*. (2010), due to a change in the French classification of economic activities (NAF). Moreover, the number of employment areas have changed since their publication. In the rest of the paper, we indicate the NAF (rév.2) code in parentheses when referring to a particular industry.

We compute geographic concentration indexes to determine whether employment – a proxy for supply – in industry *i* is more concentrated than the demand it faces at the local level. If supply exceeds demand in a given area, then part of the production will necessarily be consumed outside the area, i.e. the output is tradable. Following Jensen and Kletzer (2005) and Barlet *et al*. (2010), we first compute the share of demand addressed to each industry in each employment area. Local demand for a given industry will vary depending on the amount of local household income and intermediate consumption from other industries.

All data come from Insee (the French National Statistical Institute). We use 2012 census data on local employment at the two-digit level (88 industries[3]) – the most disaggregated level for computing Gini coefficients and tracking the long-term evolution of employment – for 304 employment area,[4] and data on local population and median income for 2009.[5] We also use 2012 national Input-Output Supply and Use tables.[6] The demand share for industry *i* in employment area *ea* ($IDS_{i,ea}$) is calculated as follows:

$$IDS_{i,ea} = \sum_{j=1}^{J}\left(\frac{IC_{i,j}}{D_i} * \frac{EMP_{j,ea}}{EMP_j}\right) + \frac{HC_i}{D_i} * \frac{MINC_{ea}}{MINC_{tot}} * \frac{Pop_{ea}}{Pop_{tot}} \quad (1)$$

with:

– $IC_{i,j}$ the output of industry *i* used by sector *j* (intermediate consumption), $i \neq j$;

– D_i the demand for industry *i*'s products (final and intermediate consumptions, exports);

– $EMP_{j,ea}$ employment in industry *j* in area *ea*;

– EMP_j total employment in industry *j*;

– HC_i total household consumption of industry *i* products;[7]

– $MINC_{ea}$ the median income per consumption unit in employment area *ea*;

– $MINC_{tot}$ the median income in metropolitan France;

– Pop_{ea}: population in employment area *ea*;

– Pop_{tot}: population in metropolitan France.

The first term in (1) represents local demand for intermediate consumption. Importantly, with this term we take into account the fact that some non-tradable input suppliers might be concentrated because the downstream industry is itself concentrated. The second term is local household demand, assumed proportional to the employment area's population and median income. The higher the demand for industry *i*'s products in employment area *ea*, the higher the value of $IDS_{i,ea}$. Note that using this methodology we make three implicit assumptions, namely: (1) as input-output tables are only available at the national level, there are no local variations in the sectoral intermediate consumption structure, (2) output per worker is similar for local workers and national workers, and (3) income elasticity of final consumption is equal to 1.

We then compute a Gini coefficient (G_i) to determine whether an industry is more concentrated than the demand it faces. To compute the Gini coefficients we first need to sort employment areas by increasing order of local employment to local demand ratio, $\lambda_{i,ea} / IDS_{i,ea}$, with $\lambda_{i,ea} = EMP_{i,ea} / EMP_i$. Then we

3. Due to data availability we drop two industries from the initial 88 industries defined at this level of aggregation. The two industries not covered in national accounts are "Undifferentiated goods and services producing activities of private households for own use" (NAF code 98), and "Activities of extraterritorial organizations and bodies" (NAF code 99), which are very small in terms of employment so that their omission should not have a significant impact on results.

4. An employment area is a geographic area within which most of the labor force resides and works and in which employers can find most of the labor needed to fill available jobs. Due to data availability, we consider only metropolitan France, that is, 304 employment areas out of 322.

5. Data are taken from the Atlas des zones d'emploi 2010 *(Dares, Insee, Datar, 2012).*

6. We thank Insee for giving us access to this detailed data.

7. Total household consumption is the sum of household final consumption plus individual general government consumption expenditure in the supply and use table. We use public national account data on households' actual final consumption to complete the database when information is missing. Due to the lack of data on retail trade, except for motor vehicles and motorcycles, we assume that demand for this industry comes exclusively from households.

define the cumulative share of employment in industry *i* as:

$$\lambda_{i,ea(n)} = \sum_{ea=1}^{n} \lambda_{i,ea}$$

and the cumulative industry demand share as:

$$IDS_{i,ea(n)} = \sum_{ea=1}^{n} IDS_{i,ea}$$

The Gini coefficients can be written as:

$$G_i = 1 - \sum_{n=1}^{EA} \left[IDS_{i,ea(n)} - IDS_{i,ea(n-1)} \right] \left[\lambda_{i,ea(n)} + \lambda_{i,ea(n-1)} \right] \quad (2)$$

with $\lambda_{i,ea(0)} = IDS_{i,ea(0)} = 0$. Compared to a standard Gini coefficient, the baseline is the distribution of demand and not the uniform distribution of employment. In the case where employment in industry *i* strictly follows the spatial distribution of demand, the value of G_i is 0. On the contrary, a Gini coefficient equal to 1 corresponds to a situation where employment in industry *i* is concentrated in a single employment area while demand comes from other employment areas.

Admittedly, this methodology has some shortcomings. First, the calculated indexes may vary depending on the geographic unit used. This modifiable areal unit problem (MAUP), however, has only a limited impact in the case of France according to Barlet *et al.* (2010), who use three different geographic units. A second limitation when calculating Gini coefficients for only one period is that we assume static tradability over time. Third, production can be tradable and dispersed when not in an increasing return activity. Fourth, as pointed out by Collins (2010), domestic tradability does not necessarily imply international tradability, as transportation and transaction costs may differ. In particular, differences in language and legal frameworks are significant barriers to trade. Lastly, it is difficult to draw comparisons between countries, as detailed sectoral breakdown data are not available at the level of local labor markets for a panel of countries.

Choice of Tradability Threshold

The Gini coefficients inform us on an industry's degree of geographic concentration, but we still need to determine a threshold that separates the tradable and non-tradable sectors. This necessarily involves a degree of subjectivity. Jensen and Kletzer (2005) for instance consider that any activity with a Gini coefficient of over 0.1 is tradable. However, this threshold seems fairly irrelevant to our case since only 3 of the 86 sectors studied are situated below this figure. In other words, the concentration levels are on average higher in our estimations. This can result from the different sizes of the geographic units selected. The geographic division employed by Jensen and Kletzer (2005) for the United States (Metropolitan State Areas) corresponds to much larger areas. Yet the Gini coefficient tends to decrease as the size of the geographic unit increases (Barlet *et al.*, 2008). The tradability threshold of Barlet *et al.* (2010), which involves taking a threshold value corresponding to the Gini coefficient of the wholesale trade sector, is also unsuitable. It would lead us to include industries like "Public administration and defense" (84) and "Human health activities" (86) in the tradable sector. Since the tradability of the manufacturing sector is clearly identified in the empirical literature, the threshold value we select is the Gini coefficient of the least concentrated industry in that sector, i.e. "Repair and installation of machinery and equipment" (33). Therefore, industries with a Gini coefficient greater than or equal to 0.25 are considered as tradable. When the coefficient is below 0.25, jobs in the industry are non-tradable. This way of establishing the threshold value is similar to that used by Eliasson *et al.* (2012) for Sweden.

As expected, a high relative concentration of supply does not only concern the primary and secondary sectors. Some service industries also have very high Gini coefficients (Figure II), in particular "Air transport" (51), "Gambling and betting activities" (92), "Programming and broadcasting activities" (60), "Insurance" (65), and "Publishing activities" (58).[8] Other industries are located close to their clients or users (Table 2). Industries with a Gini coefficient lower than 0.25 include notably "Education" (85), "Human health activities" (86), "Retail trade" (47), "Public administration and defense" (84), "Other personal service activities" (dry cleaning-laundering, hairdressing, funeral services, etc.) (96), or "Services

8. We classify "Scientific research and development" (72) in the tradable sector without reporting a Gini coefficient. Since 2010, R&D is no longer considered as intermediate consumption expenditure, but as investment expenditure. Given that households do not consume this service, the demand measured at local level by the equation (1) is zero, so the Gini coefficient given by equation (2) is, by construction, equal to 1. Barlet et al. *(2010) have nevertheless shown that, with a Gini coefficient of 0.59 (well above our 0.25 threshold), this is one of the most concentrated sectors. The same problem arises for "Construction of buildings" (41). We consider this sector's employment, which is highly dispersed over the territory, as non-tradable.*

to buildings and landscape activities" (81). Obviously, a significant share of non-tradable employment corresponds to core services provided by the government throughout the country. Consequently, in what follows we sometimes break down non-tradable employment into a non-market component, grouping codes 84 to 88 of the NAF, and a market component, grouping all of the other divisions in the non-tradable sector. A complete list of the 86 industries and their classification can be found in the Appendix (see Table A1).

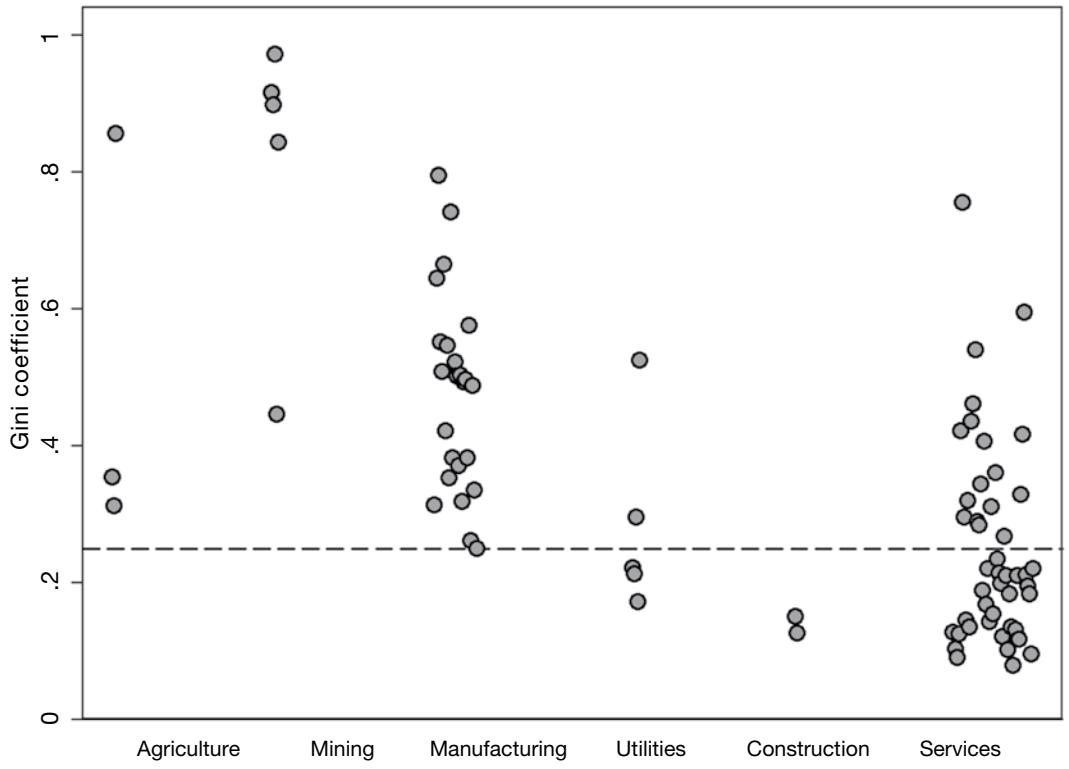
Tradable and Non-Tradable Employment in France

National Employment Trends

To study the evolution of tradable and non-tradable employment in France, we use national accounts data (Insee) on total employment by industry. We assume that the classification of industries established for 2012 does not vary throughout the period 1999-2015. Due to a change in the French classification system in 2008, it would be impossible for us to compare the Gini coefficients calculated for 1999 with those of 2012. Our results indicate that the share of tradable jobs significantly decreased between 1999 and 2015, dropping from 27.5% to 23.6% of total employment. This drop was very sharp from 2001 up to the financial crisis (2009-2010), and then less pronounced. In volume, the tradable sector lost around 400,000 jobs, while the non-tradable sector increased by 2.78 million (Figure III).

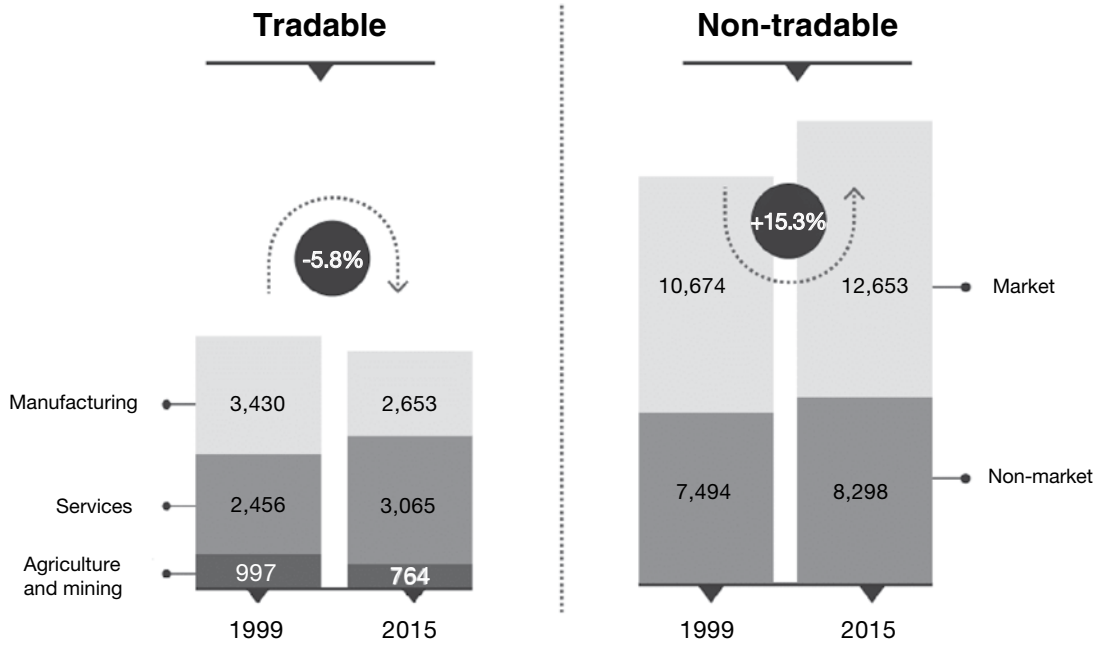
Perhaps more interesting is the increasingly tertiary nature of tradable jobs. Currently, almost one tradable job in two (47.3%) is in services, compared to 35.7% in 1999. While manufacturing, agriculture and the mining industry saw a considerable drop in their workforce, tradable services created a total of 610,000 jobs. Job creations in tradable services accelerated sharply from 2006 and slowed down very little during the crisis. Moreover, from 1999 to 2015, they increased much faster than non-tradable services and the non-tradable market sector (+24.8% compared to +14.5% and +18.5%). The most dynamic tradable services were "Activities of head offices,

Figure II
Gini Coefficients, 2012



Coverage: Naf rév.2 A88, Metropolitan France. The X-axis corresponds to the NAF code of each industry but we report only six broad sectors.
Sources: Insee, Population Census 2012, National Accounts and *Atlas des zones d'emploi*; authors' calculations.

Figure III
Employment Changes in Tradable and Non-Tradable Sectors (Thousands), 1999-2015



Sources: Insee, National Accounts; authors' calculations.

management consultancy activities" (70), +195,000; "Computer programming, consultancy and related activities" (62), +141,000; "Scientific research and development" (72), +81,000; as well as activities connected to tourism: "Creative, artistic and performance activities" (90), +69,000, and "Accommodation" (55), +47,000. While concerns have been raised about the recent increased tradability of services, our results suggest that this has not led to massive offshoring.

However, the growth in tradable service jobs has not counterbalanced the drop in other parts of the tradable sector. "Crop and animal production, hunting and related services" (1) dropped the most (-206,000), followed by traditional industries such as "Manufacture of wearing apparel" (14), -89,000, and "Manufacture of textiles" (13), -61,000, while industries like "Manufacture of motor vehicles, trailers and semi-trailers" (29) and "Manufacture of computer, electronic and optical products" (26) also contracted considerably (respectively -69,000 and -60,000). The fall in manufacturing employment results from a combination of factors: a strong productivity growth along with consumers' reduced sensitivity to price reductions on manufactured goods (low price elasticity of demand for manufactured goods); a change in the structure of household expenditure, including an increasingly large amount of services; outsourcing of some activities to specialized companies in the tertiary sector; and lastly, international competition, in particular from emerging countries. While in the 1990s there was a broad consensus that job losses were mostly attributable to technology, the surge in Chinese imports, a new focus in the literature on offshoring based on "trade in tasks" (Grossman & Rossi-Hansberg, 2008) have reopened the debate on the role of international trade in manufacturing employment decline. For instance, Chinese import competition could explain 13% of the recent decline in French manufacturing employment (Malgouyres, 2017), and around 25% in the case of the US (Autor *et al.*, 2013). According to Acemoglu *et al.* (2016), almost half of these job losses are concentrated in upstream industries, impacted through inter-industry linkages.[9]

In the non-tradable sector, the largest increases in employment were recorded in "Human health activities" (86), +364,000, the construction sector (41-43), +347,000, "Residential care activities" (87), +277,000, and "Food and beverage service activities" (56), 243,000. "Activities of membership organizations" (94) and "Public administration and defense"

9. The respective impacts of technological change and trade on the decline in manufacturing employment are still under debate. See Demmou (2010) for an evaluation of the significance of these structural determinants in the decline of industrial employment in France from 1980 to 2007.

(84) are the two non-tradable industries that destroyed the most jobs (respectively -184,000 and -114,000). The non-tradable market sector, with 1.98 million jobs created (+18.5%), was overall more dynamic than the non-market non-tradable sector, where employment increased by 804,000 (+10.7%).

The evolution of the employment structure in France is remarkably similar to that observed in the United States. During the same period, Hlatshwayo and Spence (2014) estimate that US tradable employment went from 30% to 26.3% of total employment, and decreased in volume (-3.4 million units). Like in France, the drop in manufacturing and agricultural employment was not counterbalanced by more jobs in the tradable service sector, while the number of non-tradable jobs increased dramatically. Eliasson and Hansson (2016) find a much larger share of tradable jobs in the case of Sweden (almost 40% of total employment in 2010). Between 1990 and 2005 they do not identify a significant change in employment, either in the tradable sector or in the non-tradable sector. However, the period also saw a shift towards tradable service activities within the Swedish tradable sector.

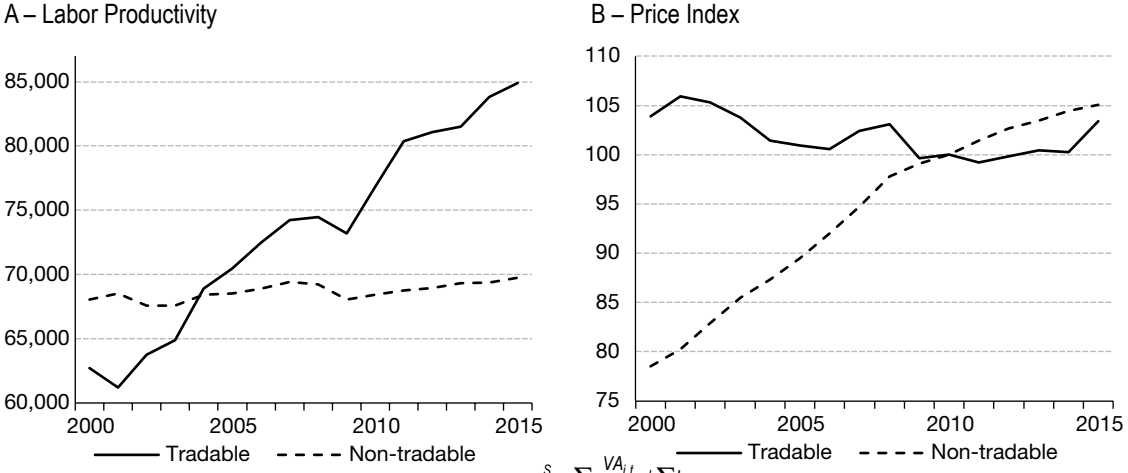
Labor Productivity, Wages and Skills

The distinction between tradable and non-tradable jobs reveals significant differences in labor productivity, defined here as real value added per worker in full-time equivalent. We observe much larger productivity growth in the tradable sector (Figure IV-A) between 2000 and 2015. The productivity differential may be explained by a rationalization effect of international trade: in Meltitz-type models (Melitz, 2003) with heterogeneous firms, trade leads to the intra-sectoral reallocation of resources. Put simply, foreign competition pushes the least productive domestic firms out of the market, and allows the most productive ones to extend their market shares. In addition, Timmer *et al.* (2014) showed that, within global value chains, advanced nations increasingly specialize in high value added activities. Another explanation may be that the shrinking tradable sector pushes the least able workers away (Young, 2014) and keeps the most productive ones. Perhaps as important in our opinion, this productivity gap may largely reflect the fact that numerous non-tradable service activities are still difficult to automate because they involve a high degree of social interaction (caregivers, psychiatrists, beauticians, etc.) or precision (hairdressers, cooks, decorators).

There is also a significant wage gap between tradable and non-tradable jobs. In 2015, workers gross annual wage (full-time equivalent) in the tradable sector was on average 27% higher, i.e. an annual difference of 9,156 euro.[10] Wages are also higher in tradable services, with an average annual gross wage of 48,279 euro

10. In the absence of detailed industry-level data for the self-employed (2.5 million people in France) at this level of sectoral disaggregation, we cannot generalize this result to all workers.

Figure IV
Price and Labor Productivity in Tradable and Non-Tradable Sectors, 2000-2013



Note: Labor productivity (in euros) at time t in sector $S=\{T,NT\}$ is $\varphi_t^S = \sum_{i\in S} \frac{VA_{i,t}}{PVA_{i,t}} / \sum_{i\in S} L_{i,t}$, where $VA_{i,t}$ is gross value added at current prices for each industry in sector S, $PVA_{i,t}$ is the price index of gross value added at time t for each industry in sector S (using 2010 as base year), and $L_{i,t}$ is full-time employment at time t in each industry in sector S. The price index at time t in sector S is $P_t^S = \sum_{i\in S} \omega_{i,t} PVA_{i,t}$, where $\omega_{i,t} = VA_{i,t} / VA_t^S$.
Sources: Insee, National Accounts; authors' calculations.

compared to 40,633 euro in manufacturing industries (see Table 1). This result is in line with Jensen and Kletzer (2005) and Eliasson *et al.* (2012) for the United States and Sweden, respectively.

Perhaps surprisingly, this wage gap does not reflect a difference in workers' educational attainment. Table 1 shows that tradable and non-tradable sectors have a very similar skills structure.[11] In the tradable sector, college graduates are principally employed in services. In the non-tradable sector, the share of college graduates is higher in non-market industries (46%), and particularly concentrated in health, education and administration, while workers in residential social-medical and social institutions and non-residential social action do not have a high school diploma. The skills structure of the market non-tradable sector is similar to the manufacturing sector, with less than one-third of college graduates. A higher wage in tradable industries is however consistent with the literature showing that exporters pay higher wages than non-exporters (Bernard & Jensen, 1995, 1997). Recent studies using matched employer-employee data find significant exporter wage premia, even after controlling for observable and unobservable individual characteristics (e.g., Schank *et al.*, 2007). The main usual explanation for the exporter wage premium is the higher productivity of exporting firms. Higher wages in the tradable sector are thus consistent with the productivity gap observed between the two sectors.

Interestingly, although significant productivity gains in the tradable sector may explain part of the wage differential, they have largely benefited non-tradable workers. The wage gap between tradable and non-tradable employees has in fact grown at a much slower pace than the productivity differential. From 2010 to 2015, the productivity ratio between tradable and non-tradable activities went up by 9.4 percentage points, while the wage ratio only increased by 1.6 percentage points.[12]

A classic "Balassa-Samuelson" effect (Balassa, 1964; Samuelson, 1964) can explain this phenomenon. According to this effect,

11. Note that the skill structure is similar even when broken down into 11 education levels.

12. Two mining industries, "Mining of coal and lignite" (05) and "Mining of metal ores" (07), for which value added was nil for several years are excluded from the calculation of tradable sector productivity and price index.

Table 1
Mean Wage and Education Attainment in the Tradable and Non-Tradable Sectors

Tradable	€ / %	Variation (%)	Non-tradable	€ / %	Variation (%)
All			*All*		
Mean yearly wage	43,258	8.8	Mean yearly wage	34,103	7.4
With no high school diploma	40.6	-14,2	With no high school diploma	41.9	-7,4
With high school diploma	18.8	-1,6	With high school diploma	20.4	4.8
With college diploma	40.5	9.3	With college diploma	37.7	10.3
Manufacturing			*Market*		
Mean yearly wage	40,633	8.1	Mean yearly wage	35,953	7.5
With no high school diploma	50.6	-16.6	With no high school diploma	46.5	-9.0
With high school diploma	18.3	-1.8	With high school diploma	21.8	3.6
With college diploma	31.1	5.6	With college diploma	31.7	13.8
Tradable services			*Non-market*		
Mean yearly wage	48,279	9.1	Mean yearly wage	31,497	7.4
With no high school diploma	24.5	-8.8	With no high school diploma	35.5	-4.5
With high school diploma	17.7	-3.0	With high school diploma	18.5	6.7
With college diploma	57.9	11.1	With college diploma	46.0	7.1

Notes: Yearly mean gross wage (including employee social security contribution but excluding employer social security) per worker in full-time equivalent in thousands of euro for the year 2015. Variation between 2010 and 2015. Skill structure in percentage for the year 2014. Variation rate in the number of workers for each category between 2010 and 2014. Census data provide information on the number of workers by education level for each industry. We aggregate the eleven educational levels into three categories: with no high school diploma, with high school diploma, with college diploma.
Sources: Insee, National Accounts, Population Census (2010-2014).

greater productivity growth in tradable industries translates into a rise in the relative price of non-tradable goods and services. Indeed, when productivity increases in the tradable sector, the wages of tradable workers go up because prices for tradable goods and services are set in international markets. Therefore, firms in the non-tradable sector also have to increase wages to prevent their employees from looking for work in the tradable sector where wages are higher. These wage increases for non-tradable workers can only be achieved through price increases, since productivity has remained the same in the non-tradable sector. As shown by Figure IV-B, prices in the non-tradable sector did in fact increase sharply while they went down slightly in the tradable sector. The impact of a productivity shock in the tradable sector on relative prices is closely dependent on labor mobility. When intersectoral mobility is high, non-tradable firms have to increase their prices significantly to align their wages with those of the tradable sector. Consumer preferences for non-tradable goods and services are also important. If consumers have strong preferences for non-tradable products, then the additional income generated by the increased productivity in the tradable sector will disproportionately benefit the non-tradable sector, pushing the price of these products even higher. The dynamics of relative prices may also be explained by the intensity of competition in the non-tradable sector. Due to greater protection of non-tradable markets, companies are freer to fix their prices and therefore tend to set them high. Bénassy-Quéré and Coulibaly (2014) show for instance that the divergence of relative prices within the European Union is explained in part by differences in the degree of regulation for product and labor markets. Lastly, a drop in real interest rates can trigger a faster increase in the prices of non-tradable goods and services. Piton (2016) identifies three mechanisms: 1) a higher demand for non-tradable products, following a drop in interest rates, cannot be satisfied by imports (Dornbusch, 1983); 2) the non-tradable sector is often more dependent on bank loans, especially in real estate (Reis, 2013); 3) the non-tradable sector may be more labor-intensive than the tradable sector and therefore benefit less from the drop in the cost of capital (Piton, 2017).

Strikingly, net destructions of jobs between 2010 and 2014 only concerned low-skilled workers, while the number of high-skilled workers increased in both tradable and non-tradable activities. This evolution is in line with that reported by Jensen and Kletzer (2005) who indicate – but for 1998-2002 – a general drop in low-skilled employment in the US and a steep rise in skilled employment in tradable services and the non-tradable sector. Interestingly, the erosion of low-skilled employment appears to be less pronounced in the non-tradable sector. While the number of workers without a high school diploma is rapidly declining in a large number of tradable sectors due to automation and competition from countries with low labor costs, some non-tradable industries have been relatively spared. For instance, services to buildings and landscape activities (81), along with residential care activities and social work activities without accommodation (87-88), are a kind of refuge for low-skilled workers.

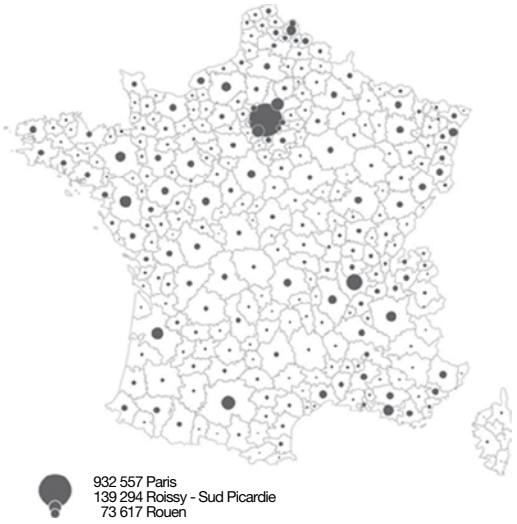
Geography

As a reminder, non-tradable jobs more or less follow the geographic distribution of their clients, unlike tradable jobs, which can produce far from the final consumer and therefore tend to be concentrated. The employment areas that feature the greatest number of tradable jobs are urban zones corresponding to the main French metropolitan areas, i.e. Paris, Lyon, Toulouse, Bordeaux, Nantes, Marseille, etc. (Figure V-A). The leading ten zones thus concentrate one third of French tradable employment. On the other hand, in relative terms, most tradable jobs are found in employment areas with few inhabitants. These are located in western France (Figure V-B), on a long strip of land going from Cognac (Charente), which specializes in producing brandy, to Vire (Calvados) in the northeast, which specializes in dairy processing, and in Auvergne and the Midi-Pyrénées. These zones are usually characterized by a high share of manufacturing jobs.

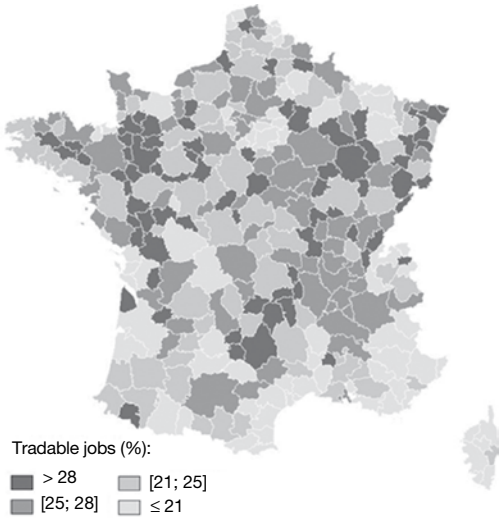
The Mediterranean coast is, on the contrary, the area in which tradable jobs represent the lowest shares of total employment. In this area, tradable sector employment is mainly composed of jobs in tradable services (Figure VI). Along with services linked to tourism, numerous workers are engaged in activities with higher added value (digital, R&D, corporate headquarters, etc.) in employment areas like Aix-en-Provence, Cannes-Antibes, and Marseille-Aubagne. However, this is insufficient to counterbalance the proportion of non-tradable jobs in the region.

Figure V
Number and Share of Tradable Jobs, Employment Areas (2012)

A – Number



B – Share

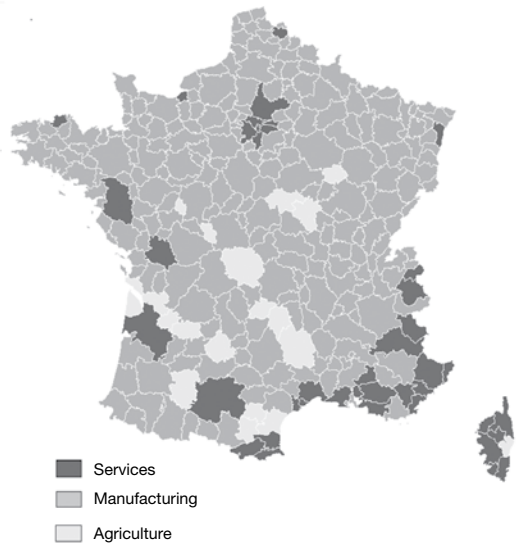


Produced using Philcarto: http:\\philcarto.free.fr.
Coverage: 304 employment areas of Metropolitan France.
Sources: Insee, Population Census 2012; authors'calculations.

Tradable services represent almost one tradable job in two nationally, but they are the majority component of tradable employment in only 41 of the 304 employment areas (Figure VI). They are concentrated around some of the major French cities and tourist areas. These 41 employment areas (37% of tradable employment) together account for 60% of national employment in tradable services. Agricultural employment only dominates tradable employment in a handful of rural employment areas, mostly located in the south of France. In the rest of the country, i.e. in 80% of employment areas, the manufacturing industry (41% of tradable employment) dominates the tradable sector.

This suggests that the continued drop in manufacturing employment, and to a lesser extent agricultural employment, is likely to destabilize a large number of local economies. Conversely, the growth of tradable services is likely to mostly benefit a reduced number of dense employment areas. Indeed, this is what we observe from 2008 to 2016 (Online complements C3 and C4).[13] Only 30 out of 304 employment areas saw an increase in manufacturing employment during that time. These zones of industrial resistance include for example Toulouse (aerospace), Figeac (aerospace), and Saint-Nazaire (shipbuilding). Deindustrialization is thus affecting most employment areas. Unsurprisingly, the traditional French industrial regions

Figure VI
Major Industry Within Tradable Employment, 2012



Produced using Philcarto: http:\\philcarto.free.fr.
Coverage: 304 employment areas of Metropolitan France.
Sources: Insee, Population Census 2012; authors'calculations.

(Hauts-de-France, Grand-Est, and Île-de-France) are undergoing the most deep-seated reorganization, while industrial employment is resisting better in the west. A non-negligible

13. We use the Acoss (Agence centrale des organismes de sécurité sociale) database to study the spatial distribution of jobs from 2008 to 2016. Note that it only concerns payroll employment, and excludes agricultural employees, households employing domestic personnel, and employees of public bodies.

number of these areas are also experiencing a drop in employment in tradable services. In other areas, employment in tradable services is sufficiently dynamic to compensate for deindustrialization. This mainly includes several major metropolitan areas (Nantes, Paris, Bordeaux, Montpellier, Lille, and Lyon). Finally, a small number of areas have seen an increase in both manufacturing and tradable services employment (Toulouse, Saint-Nazaire, Saint-Malo, Vitré, Chinon, Mont-Blanc, Salon-de-Provence, Les Sables d'Olonne, Ambert, and Corsica). Overall, though, only 14% of employment areas experienced an increase in tradable jobs from 2008 to 2016 (Online complement C1-I).

The growth of non-tradable employment is more widespread, concerning around half of employment areas (Online complement C1-II). However, the gains are highly concentrated: almost 60% of the non-tradable employment growth is concentrated in ten large metropolitan areas (representing 35% of non-tradable employment at the beginning of the period). Strikingly, the employment areas where non-tradable employment has dropped sharply (Centre, Bourgogne, Champagne-Ardennes, Lorraine) are often also areas that have been subject to a significant destruction of tradable jobs, and vice versa. This relation may be causal. Indeed, non-tradable jobs are highly dependent on the evolution of aggregated local income because their clients are mostly local, unlike tradable jobs, which satisfy scattered demand. We look at this issue in the next section.

The Local Multiplier Effect of Tradable Employment in France

Moretti (2010, 2011) has developed an econometric approach for estimating local employment multi- pliers, i.e. the number of non-tradable jobs created in a given area following an exogenous increase in the number of tradable jobs within the area. He finds a multiplier of 1.6 for US cities between 1980 and 2000, including only manufacturing industries in the tradable sector. We contribute to this recent literature by estimating the local employment multiplier effect for French employment areas between 2008 and 2016. The theoretical basis of Moretti's empirical approach builds upon the Rosen-Roback spatial general equilibrium model (Rosen, 1979; Roback, 1982) and is briefly outlined below.

Conceptual Framework

We assume that each employment area is a competitive economy that uses labor to produce tradable and non-tradable goods and services. Prices for tradable goods and services are set in international markets, whereas prices for non-tradables are determined locally. Workers are perfectly mobile across industries within an employment area, so that marginal product and wages are equalized locally in the long run. Workers' indirect utility depends on the local wage net of living costs and on idiosyncratic preferences for location. Idiosyncratic preferences for location hamper labor mobility across areas, implying a finite elasticity of local labor supply (upward-sloping local labor supply curve). The elasticity of local labor supply is also affected by local unemployment rates. Therefore, if local unemployment and geographical mobility of labor are low, then an increase in local labor demand mostly results in higher local wages and not in higher employment. Finally, the local housing supply is not fixed and depends on geography and land use regulations. Assuming upward-sloping local labor and housing supply curves, Moretti (2010, 2011) departs from the Rosen-Roback framework in which any shocks to local labor markets are fully capitalized in the price of land.

Let us consider the case of a permanent increase in tradable industry *j* labor demand in employment area *ea*. This could occur e.g. if the local economy manages to attract a new firm or if the labor productivity of a pre-existing firm increases. With these new tradable workers, the number of local jobs increases (direct effect). Therefore, the local aggregate income has to increase, triggering additional demand for tradable and non-tradable goods and services (indirect effect). It also pushes up local prices, as local labor and housing supply curves are upward sloping (general equilibrium effects). The multiplier effect on non-tradable employment is unambiguously positive and translates into a lower local unemployment rate and/or labor migration from other employment areas. The magnitude of the multiplier depends on several factors. First, if households have strong preferences for non-tradable goods and services, they will spend a large fraction of additional income on those products. Second, it depends on technology in the non-tradable sector. Labor-intensive technology implies that additional demand is met principally by hiring new workers. Third,

the magnitude of the local employment multiplier is also affected by the type of new jobs created in the tradable sector. For a given number of tradable job creations, local aggregate income increases more when high-paying jobs are created. Fourth, it depends on the offsetting general equilibrium effects induced by changes in local prices. Higher wages and housing costs will increase production costs, reducing the supply of non-tradable products. Low elasticities of local housing and labor supplies imply large offsetting general equilibrium effects and hence a low multiplier. But since labor and housing supply are not perfectly inelastic, negative general equilibrium effects only partially undo the first positive income effect. The increase in labor costs also negatively impacts tradable employment in firms that are not directly affected by the increase in demand. Indeed, they cannot increase their prices to compensate for higher labor costs as tradable prices are set in international markets. This lowers their competitiveness, unless agglomeration economies are sufficiently large to compensate for the increase in factor prices. Of course, tradable intermediate input suppliers may benefit from an increase in tradable industry *j*'s production. However, these suppliers are not necessarily located in the same employment area. Therefore, the local multiplier effect on tradable employment should be quantitatively smaller than the local multiplier effect on non-tradable employment.

Econometric Approach

Following Moretti (2010), we estimate the elasticity of non-tradable local employment with respect to tradable local employment using the following model (Model 1):

$$\Delta NT_{ea,t} = \alpha_1 + \beta_1 \Delta T_{ea,t} + \gamma_1 d_t + \varepsilon_{ea} \quad (3)$$

where $\Delta NT_{ea,t}$ and $\Delta T_{ea,t}$ are, respectively, the change over time in the log number of jobs in the non-tradable and tradable sectors in employment area *ea*. The period covered in this paper runs from 2008 to 2016. For each employment area we include two observations, corresponding to two time intervals 2008-2012 and 2012-2016. We introduce an indicator d_t for the second period, and an error term $\varepsilon_{ea,t}$. The β_1 coefficient is the elasticity of non-tradable to tradable employment.

A one-percent increase in the number of tradable jobs is associated with a β percent increase in non-tradable employment. To obtain the value of the local multiplier, we simply multiply the estimated β_1 by the relative size of the non-tradable sector over our two periods, i.e. the number of non-tradable jobs for each tradable job:

$$Multiplier = \frac{NT_{2008} + NT_{2012}}{T_{2008} + T_{2012}} \quad (4)$$

The local multiplier gives the number of jobs created in the non-tradable sector for one additional job in the tradable sector. Alternative specifications are estimated. The effect of tradable jobs on other tradable jobs (Model 2) is estimated by randomly splitting tradable industries into two parts:

$$\Delta T^1_{ea,t} = \alpha_2 + \beta_2 \Delta T^2_{ea,t} + \gamma_2 d_t + \varepsilon_{ea,t} \quad (5)$$

Unlike other studies, we estimate separate elasticities for the market and non-market non-tradable sectors (Model 3). Indeed we anticipate that the multiplier effect of tradable jobs is lower on non-market non-tradable jobs than on market non-tradable jobs because part of the non-market non-tradable sector is funded from national taxation and therefore less sensitive to local income variations.

OLS estimation will likely lead to inconsistent estimates if there are unobserved time-varying local shocks affecting employment growth in both sectors. As pointed out by Moretti and Thulin (2013), shocks to the labor supply of an employment area due, for instance, to changes in crime rates, schools, air quality, public services, or taxes, may induce bias. The sign of the bias can be either positive or negative, depending on whether the shock is correlated positively or negatively with changes in tradable employment. For instance, improvements in the quality of infrastructures in an employment area will attract new tradable activities while at the same time facilitating workers' migration to the area, thus increasing demand for non-tradable products and employment in the non-tradable sector. This would result in an upward bias in the OLS estimator of the elasticity of non-tradable to tradable employment. Conversely, the estimate would be biased downward if a local government reacted to the decline in non-tradable jobs in the area by encouraging employment creation in the tradable sector through subsidies. Another potential concern is that of reverse causality. For instance, the creation of a new university campus in a given employment area may induce some tradable firms to move to this area to

benefit from a pool of skilled workers and local knowledge spillovers. To estimate the causal effect of tradable employment growth on non-tradable employment growth, we need to isolate exogenous shifts in demand for tradable employment. Following Moretti and Thulin (2013) we use a classic "Bartik-instrument" (Bartik *et al.*, 1991). The idea is to isolate local variations in tradable employment caused by national shocks from the variations resulting from local specificities. The instrumental variable for Model 1 is constructed as:

$$\sum_{j \in J} \left\{ \frac{T^{j}_{ea,t}}{T^{J}_{ea,t}} \left[\ln\left(\sum_{ea' \in EA} T^{j}_{ea',t+4} \right) - \ln\left(\sum_{ea' \in EA} T^{j}_{ea',t} \right) \right] \right\} \quad (6)$$

where $\frac{T^{j}_{ea,t}}{T^{J}_{ea,t}}$ denotes the share of tradable industry j in total tradable employment of employment area ea at period t. The term in brackets is the nationwide change in employment between t and $t + 4$ in tradable industry j (excluding employment area ea itself). Thus an employment area is affected by national trends in proportion to its initial industry mix. Arguably, as long as national changes are not driven by specific economic conditions in a given employment area, the instrument captures exogenous changes in local labor demand.

Data and Results

We use Acoss (*Agence centrale des organismes de sécurité sociale*) data on payroll employment for the period 2008-2016. Data are available at the two-digit industry and employment area level. However, these data do not cover agricultural employees, households that employ domestic personnel, and employees of public bodies. Each of the 304 employment areas of mainland France is observed over two four-year time intervals, so that our database contains 608 observations.

Table 2 displays the results for the local multiplier in France between 2008 and 2016. Columns (1) and (2) present OLS estimates. In column (2), we control for other covariates – local unemployment rates, total local labor force, and the share of local non-tradable employment at the beginning of each period – and introduce regional fixed effects. In both columns the elasticity is positive and significant. However, as explained earlier, OLS estimates are likely to suffer from reverse causality or omitted variable bias, so that instrumental variable estimates are preferred. Our estimate obtained with the Bartik-instrument in column (5) indicates that, over the period, for every 100 tradable jobs created in an employment area in mainland France, 80 additional non-tradable jobs were created within the same area (i.e. a local multiplier of 0.8). This result is robust to the inclusion of additional controls and regional fixed effects, with a point estimate of 0.88 (column (6)). A comparison of OLS and IV results reveal that IV estimates provide significantly higher coefficients, suggesting that OLS estimates are biased downward.

We find a significant but lower multiplier effect of tradable jobs on other tradable jobs (0.39). This result is consistent with Moretti's theoretical framework. Firstly, demand (intermediate consumption and final household demand) for tradable goods and services mainly comes from firms and households located in other areas in France or abroad. Secondly, employment growth in part of the tradable sector pushes up local prices and may cause firms in the rest of the tradable sector to relocate or even disappear. As expected, the local multiplier is lower on non-market non-tradable jobs (0.1) than on market non-tradable jobs (0.74) and even lower than multiplier on tradable jobs. This arguably reflects the fact that non-market non-tradable jobs partly depend on state subsidies or social security contributions and are therefore less affected by local aggregate income variations.

Our local multiplier of tradable on non-tradable jobs is half the size of that estimated by Moretti (2010) in the case of the United States. However, as shown by Van Dijk (2018), Moretti's multiplier is likely to be overestimated. When Van Dijk (2018) includes additional controls, location fixed effects, and not only manufacturing but also tradable services, the size of the multiplier is reduced. He finds a multiplier of 1.0, which is in line with the multiplier we find in the case of France. Gerolimetto and Magrini (2015), who include the period 2000-2010, tradable services, and spatial interdependencies, find a lower local multiplier of 0.53 for the US. By including only manufacturing jobs in the tradable sector, Malgouyres (2017) finds a local multiplier of 1.46 in the case of France for the period 1995-2007. Altogether, our two studies identify a fairly large local multiplier for France, i.e. larger than in other studies including e.g. Moretti and Thulin (2013) in the case of Sweden, Wang and Chanda (2017) using Chinese data, and de Blasio and Menon (2011) for the case of Italy. These results suggest that trade shocks have large negative effects on French local employment, not only for jobs

Table 2
Summary of Estimated Local Multipliers for French Employment Areas Between 2008 and 2016

	OLS		IV		Multiplier	
	(1)	(2)	(3)	(4)	(5)	(6)
Model 1						
Tradable on non-tradable	0.140*** (0.029)	0.085*** (0.029)	0.327*** (0.062) [69.21]	0.361*** (0.126) [24.57]	0.80	0.88
Model 2						
Tradable on other tradable	0.212*** (0.049)	0.110** (0.054)	0.430*** (0.148) [38.32]	0.441* (0.244) [14.10]	0.39	0.40
Model 3						
Tradable on market non-tradable	0.161*** (0.032)	0.090*** (0.031)	0.367*** (0.068) [69.21]	0.344** (0.148) [17.93]	0.74	0.70
Tradable on non-market non-tradable	0.055 (0.046)	0.027 (0.047)	0.231** (0.103) [69.21]	0.320* (0.167) [27.71]	0.1	0.13
Year FE	Y	Y	Y	Y	Y	Y
Region FE	N	Y	N	Y	N	Y
Controls	N	Y	N	Y	N	Y

* Significance at the 10% level; ** significance at the 5% level and *** significance at the 1% level.
Notes: Robust standard errors clustered by employment area reported in parentheses. Kleibergen-Paap Wald rk F statistic in brackets. The multiplier in columns (5) (6) is calculated using the IV estimator in columns (3) (4). Control variables include local unemployment rates, local total labor force, and the share of local non-tradable employment at the beginning of each period. Location fixed effects correspond to dummy variables for 22 regions of Metropolitan France.
Coverage : Naf rév.2 A88, France métropolitaine.
Sources: Acoss and Insee; authors' computation.

directly exposed to foreign competition but also for non-tradable jobs.

Admittedly, we need to remain cautious about the exact value of the multiplier. Our database covers only payroll employment and not total employment or total hours worked. As the majority of French self-employed workers are in the non-tradable sector (personal services, health and social action, construction),[14] we may be underestimating the value of the local multiplier. On the other hand, we may be overlooking some long-term effects since we are studying four-year intervals. This could potentially reduce the size of the multiplier if crowding out effects take time to occur.

* *
*

In this paper, we first examine the evolution and characteristics of tradable and non-tradable jobs in France over the period 1999-2015. We establish a classification of 86 industries, based on their degree of geographic concentration. We show that tradable jobs are in the minority and decreasing. They make significant productivity gains and on average receive higher wages than non-tradable jobs. Non-tradable jobs, however, constitute the vast majority of jobs and are growing. These jobs have to date experienced lower productivity gains though they are not less skilled than tradable jobs. We also show that there has been significant restructuring within the sector: tradable services jobs now make up the majority of tradable jobs in France while manufacturing is declining.

Since employment areas tend to specialize in different tradable activities, they have evolved in different ways. Major metropolitan areas seem to benefit from the growth of employment in tradable services, while the drop in employment in the rest of the tradable sector is disrupting a great number of less-dense areas. We note in particular that the areas where non-tradable employment has decreased have, for the most part, also destroyed a high number of tradable jobs, and vice versa.

Using an econometric approach developed by Moretti (2010), we show that tradable jobs do

14. *See Omalek and Rioux (2015).*

appear to have a significant local multiplier effect on non-tradable jobs. According to our estimates, from 2008-2016, for every 100 additional jobs created in the tradable sector in an employment zone in mainland France, 80 jobs were also generated in the non-tradable sector within the same area. This result may explain why local governments grant numerous subsidies to attract or simply maintain tradable activities in their territory. It also suggests that trade shocks spill over beyond jobs directly exposed to foreign competition. □

BIBLIOGRAPHY

Acemoglu, D., Autor, D., Dorn, D., Hanson, G. H. & Price, B. (2016). Import Competition and the Great U.S. Employment Sag of the 2000s. *Journal of Labor Economics*, 34(S1), S141–S198. https://doi.org/10.1086/682384

Amador, J. & Soares, A. C. (2017). Markups and bargaining power in tradable and non-tradable sectors. *Empirical Economics*, 53(2), 669–694. https://doi.org/10.1007/s00181-016-1143-z

Autor, D., Dorn, D. & Hanson, G. H. (2013). The China Syndrome: Local Labor Market Effects of Import Competition in the United States. *American Economic Review*, 103(6), 2121–2168. https://www.jstor.org/stable/42920646

Balassa, B. (1964). The Purchasing-Power Parity Doctrine: A Reappraisal. *The Journal of Political Economy*, 72(6), 584–596.

Bardhan, A. D. & Kroll, C. (2003). The New Wave of Outsourcing. *Fisher Center for Real Estate & Urban Economics Research Report Series*. https://econpapers.repec.org/RePEc:cdl:fisher:qt02f8z392

Barlet, M., Briant, A. & Crusson, L. (2008). Concentration géographique dans l'industrie manufacturière et dans les services en France : une approche par un indicateur en continu. Insee, *Documents de Travail de la DESE* N° G2008/09. https://www.insee.fr/fr/statistiques/1380877

Barlet, M., Crusson, L., Dupuch, S. & Puech, F. (2010). Des services échangés aux services échangeables : une application sur données françaises. *Économie et Statistique*, 435-436, 105–124. https://www.insee.fr/fr/statistiques/1377478?sommaire=1377486

Bartik, T. J. (1991). *Who benefits from state and local economic development policies?* Kalamazoo, Mich.: W.E. Upjohn Institute for Employment Research.

Bénassy-Quéré, A. & Coulibaly, D. (2014). The impact of market regulations on intra-European real exchange rates. *Review of World Economics*, 150(3), 529–556. https://doi.org/10.1007/s10290-014-0185-6

Bernard, A. B. & Jensen, J. B. (1995). Exporters, Jobs, and Wages in U.S. Manufacturing: 1976-1987. *Brookings papers on economic activity. Microeconomics*, 1995, 67–119. https://www.brookings.edu/bpea-articles/exporters-jobs-and-wages-in-u-s-manufacturing-1976-1987/

Bernard, A. B. & Jensen, J. B. (1997). Exporters, skill upgrading, and the wage gap. *Journal of international Economics*, 42(1-2), 3–31. https://doi.org/10.1016/S0022-1996(96)01431-6

Blinder, A. S. (2009). How Many US Jobs Might be Offshorable? *World Economics*, 10(2), 41. https://econpapers.repec.org/RePEc:wej:wldecn:376

Blinder, A. S. & Krueger, A. B. (2013). Alternative Measures of Offshorability: A Survey Approach. *Journal of Labor Economics*, 31(S1), 97–128.

Collins, S. M. (2010). Comment on "measuring tradable services and the task content of offshorable services jobs". In: Abraham, K., Spletzer, J. R. & Harper, M. J., (Eds.), *Labor in the New Economy*, pp. 335–339. Chicago: University of Chicago Press.

Crozet, M. & Milet, E. (2017). The servitization of French manufacturing firms. In: Fontagné, L. & Harrison, A. (Eds.), *The factory-free economy: Outsourcing, Servitization, and the Future of Industry*, pp. 111–135. Oxford: Oxford University Press.

de Blasio, G. & Menon, C. (2011). Local Effects of Manufacturing Employment Growth in Italy. *Giornale degli Economisti e Annali di Economia*, 70(3), 101–112. https://www.jstor.org/stable/41756381

De Gregorio, J., Giovannini, A. & Wolf, H. C. (1994). International evidence on tradables and nontradables inflation. *European Economic Review*, 38(6), 1225–1244.
https://doi.org/10.1016/0014-2921(94)90070-1

Demmou, L. (2010). Le recul de l'emploi industriel en France entre 1980 et 2007. Ampleur et principaux déterminants: un état des lieux. *Économie et Statistique*, 438-439-440, 273–296.
https://www.insee.fr/fr/statistiques/1377172?sommaire=1377175

Dixon, H., Griffiths, D. & Lawson, L. (2004). Exploring tradable and non-tradable inflation in consumer prices, *New Zealand Association of Economists conference*.

Dornbusch, R. (1983). Real Interest Rates, Home Goods, and Optimal External Borrowing. *Journal of Political Economy*, 91(1), 141–153.
https://www.jstor.org/stable/1840434

Dwyer, J. (1992). The Tradeable Non-Tradeable Dichotomy: A Practical Approach. *Australian Economic Papers*, 31(59), 443–459.
https://ideas.repec.org/a/bla/ausecp/v31y1992i59p443-59.html

Eliasson, K. & Hansson, P. (2016). Are workers more vulnerable in tradable industries? *Review of World Economics*, 152(2), 283–320.
https://link.springer.com/article/10.1007/s10290-016-0249-x

Eliasson, K., Hansson, P. & Lindvert, M. (2012). Jobs and Exposure to International Trade within the Service Sector in Sweden. *The World Economy*, 35(5), 578–608.
https://ideas.repec.org/a/bla/worlde/v35y2012i5p578-608.html

Fisher, A. G. B. (1935). *The clash of progress and security*. London: Macmillan.

Fontagné, L., Mohnen, P. & Wolff, G. (2014). Pas d'industrie, pas d'avenir ? *Notes du conseil d'analyse économique* N° 2014/3, 1–12.
https://www.cairn.info/revue-notes-du-conseil-d-analyse-economique-2014-3-page-1.htm

Gerolimetto, M. & Magrini, S. (2015). A spatial analysis of employment multipliers in the US. *Letters in Spatial and Resource Sciences*, 9(3), 277–285.
https://link.springer.com/article/10.1007/s12076-015-0157-z

Gervais, A. & Jensen, J. B. (2015). The Tradability of Services: Geographic Concentration and Trade Costs. NBER *Working Paper* N° 19759.
https://www.nber.org/papers/w19759

Goldstein, M. & Officer, L. H. (1979). New Measures of Prices and Productivity for Tradable and Nontradable Goods. *Review of Income and Wealth*, 25(4), 413–427.
https://doi.org/10.1111/j.1475-4991.1979.tb00116.x

Grossman, G. M. & Rossi-Hansberg, E. (2008). Trading tasks: A simple theory of offshoring. *American Economic Review*, 98(5), 1978–1997.
https://doi.org/10.1257/aer.98.5.1978

Helpman, E. & Krugman, P. R. (1985). *Market structure and foreign trade: Increasing returns, imperfect competition, and the international economy*. Cambridge, Mass.: MIT press.

Hlatshwayo, S. & Spence, M. (2014). Demand and defective growth patterns: The role of the tradable and non-tradable sectors in an open economy. *The American Economic Review*, 104(5), 272–277.
https://www.jstor.org/stable/42920949

Jensen, J. B. & Kletzer, L. G. (2005). Tradable Services: Understanding the Scope and Impact of Services Offshoring. In: Jensen, J. B., Kletzer, L. G., Bernstein, J. & Feenstra, R. C. (Eds.) *Brookings trade forum*, pp. 75–133. Washington, DC : Brooking Instituion Press.
https://www.jstor.org/stable/25058763

Jensen, J. B. & Kletzer, L. G. (2010). Measuring tradable services and the task content of offshorable services jobs. In: Abraham, K., Spletzer, J. R. & Harper, M. J., (Eds.), *Labor in the New Economy,* pp. 309–335. Chicago: University of Chicago Press.

Krugman, P. R. (1991). *Geography and Trade*. Cambridge, Mass.: MIT press.

Lanz, R., Miroudot, S. & Nordås, H. (2011). Trade in Tasks. OECD *Trade Policy Working Papers* N° 117.
http://dx.doi.org/10.1787/5kg6v2hkvmmw-en

Malgouyres, C. (2017). The Impact of Chinese Import Competition on the Local Structure of Employment and Wages: Evidence from France. *Journal of Regional Science*, 57(3), 411–441.
https://doi.org/10.1111/jors.12303

Melitz, M. J. (2003). The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity. *Econometrica*, 71(6), 1695–1725.
https://doi.org/10.1111/1468-0262.00467

Moretti, E. (2010). Local Multipliers. *American Economic Review*, 100(2), 373–377.
https://doi.org/10.1257/aer.100.2.373

Moretti, E. (2011). Local Labor Markets. In: *Handbook of Labor Economics*, vol. 4B, pp. 1237–1313.
https://econpapers.repec.org/RePEc:eee:labchp:5-14

Moretti, E. & Thulin, P. (2013). Local multipliers and human capital in the United States and Sweden. *Industrial and Corporate Change*, 22(1), 339–362. https://doi.org/10.1093/icc/dts051

Omalek, L. & Rioux, L. (2015). Panorama de l'emploi et des revenus des non-salariés. *Insee Référence – Emploi et revenus des indépendants,* 11–28. https://www.insee.fr/fr/statistiques/1374690?sommaire=1374698

Piton, S. (2016). Divergence des prix relatifs : une maladie européenne? *La Lettre du CEPII* N° 369. http://www.cepii.fr/CEPII/fr/publications/lettre/abstract.asp?NoDoc=9450

Piton, S. (2017). A European Disease? Non-tradable inflation and real interest rate divergence. *CESifo Economic Studies*, 63(2), 210–234. https://doi.org/10.1093/cesifo/ifw018

Püschel, J. (2013). *A Task-Based Approach to US Service Offshoring*. PhD thesis, Freie Universität Berlin.

Reis, R. (2013). The Portuguese slump and crash and the euro crisis. *Brookings Papers on Economic activity*, Spring 2013, 143–210. https://www.brookings.edu/bpea-articles/the-portuguese-slump-and-crash-and-the-euro-crisis/

Roback, J. (1982). Wages, Rents, and the Quality of Life. *The Journal of Political Economy*, 90(6), 1257–1278. https://www.jstor.org/stable/1830947

Rosen, S. (1979). Wage-based indexes of urban quality of life. In: Mieszkowski, P. & Straszheim, M. (Eds.), *Current Issues in Urban Economics*, pp. 74–104.

Samuelson, P. A. (1964). Theoretical Notes on Trade Problems. *The Review of Economics and Statistics*, 46(2), 145–154. https://www.jstor.org/stable/1928178

Schank, T., Schnabel, C. & Wagner, J. (2007). Do exporters really pay higher wages? First evidence from German linked employer–employee data. *Journal of international Economics*, 72(1), 52–74. https://doi.org/10.1016/j.jinteco.2006.08.004

Timmer, M. P., Erumban, A. A., Los, B., Stehrer, R. & de Vries, G. J. (2014). Slicing Up Global Value Chains. *Journal of Economic Perspectives*, 28(2), 99–118. https://doi.org/10.1257/jep.28.2.99

Van Dijk, J. J. (2018). Robustness of econometrically estimated local multipliers across different methods and data. *Journal of Regional Science*, 58(2), 281–294. http://dx.doi.org/10.1111/jors.12378

Wang, T. & Chanda, A. (2018). Manufacturing Growth and Local Multipliers in China. *Journal of Comparative Economics*, 46(2), 515–543. https://doi.org/10.1016/j.jce.2017.10.002

Young, A. (2014). Structural Transformation, the Mismeasurement of Productivity Growth, and the Cost Disease of Services. *American Economic Review*, 104(11), 3635–3667. https://doi.org/10.1257/aer.104.11.3635

APPENDIX

Table A-1
Gini Coefficient, Tradable/Non-Tradable Classification, and Employment by Industry

Naf code	Industry	Gini	Tradable / Non-tradable	Employment 2015
01	Crop and animal production, hunting and related service activities	0.35	T	708.56
02	Forestry and logging	0.31	T	29.80
03	Fishing and aquaculture	0.86	T	18.22
05	Mining of coal and lignite	0.92	T	0.02
06	Extraction of crude petroleum and natural gas	0.90	T	0.25
07	Mining of metal ores	0.97	T	0.55
08	Other mining and quarrying	0.45	T	18.11
09	Mining support service activities	0.84	T	0.17
10	Manufacture of food products	0.31	T	593.37
11	Manufacture of beverages	0.64	T	30.63
12	Manufacture of tobacco products	0.80	T	1.32
13	Manufacture of textiles	0.55	T	43.15
14	Manufacture of wearing apparel	0.51	T	44.13
15	Manufacture of leather and related products	0.67	T	23.63
16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	0.42	T	66.15
17	Manufacture of paper and paper products	0.55	T	61.59
18	Printing and reproduction of recorded media	0.35	T	75.45
19	Manufacture of coke and refined petroleum products	0.74	T	8.80
20	Manufacture of chemicals and chemical products	0.38	T	119.68
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	0.52	T	46.43
22	Manufacture of rubber and plastic products	0.50	T	162.66
23	Manufacture of other non-metallic mineral products	0.37	T	106.08
24	Manufacture of basic metals	0.50	T	85.69
25	Manufacture of fabricated metal products. except machinery and equipment	0.32	T	314.24
26	Manufacture of computer. electronic and optical products	0.49	T	82.50
27	Manufacture of electrical equipment	0.50	T	83.49
28	Manufacture of machinery and equipment n.e.c.	0.38	T	164.04
29	Manufacture of motor vehicles. trailers and semi-trailers	0.58	T	123.17
30	Manufacture of other transport equipment	0.26	T	80.57
31	Manufacture of furniture	0.49	T	53.12
32	Other manufacturing	0.33	T	75.44
33	Repair and installation of machinery and equipment	0.25	T	280.63
35	Electricity, gas, steam and air conditioning supply	0.22	N	137.12
36	Water collection, treatment and supply	0.21	N	19.37
37	Sewerage	0.30	T	25.83
38	Waste collection, treatment and disposal activities; materials recovery	0.17	N	107.94
39	Remediation activities and other waste management services	0.53	T	4.62
41	Construction of buildings	n.r.	N	168.20
42	Civil engineering	0.15	N	181.85
43	Specialised construction activities	0.13	N	1488.23
45	Wholesale and retail trade and repair of motor vehicles and motorcycles	0.13	N	483.17
46	Wholesale trade, except of motor vehicles and motorcycles	0.10	N	1109.67

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Table A-1 (contd.)

Naf code	Industry	Gini	Tradable / Non-tradable	Employment 2015
47	Retail trade, except of motor vehicles and motorcycles	0.09	N	2093.05
49	Land transport and transport via pipelines	0.13	N	791.46
50	Water transport	0.42	T	15.20
51	Air transport	0.76	T	66.81
52	Warehousing and support activities for transportation	0.30	T	260.94
53	Postal and courier activities	0.15	N	237.50
55	Accommodation	0.32	T	237.69
56	Food and beverage service activities	0.14	N	905.76
58	Publishing activities	0.44	T	119.19
59	Motion picture, video and television programme production, sound recording and music publishing activities	0.46	T	58.10
60	Programming and broadcasting activities	0.54	T	35.06
61	Telecommunications	0.29	T	137.08
62	Computer programming, consultancy and related activities	0.28	T	403.44
63	Information service activities	0.34	T	70.16
64	Financial service activities, except insurance and pension funding	0.19	N	422.06
65	Insurance, reinsurance and pension funding. except compulsory social security	0.41	T	180.89
66	Activities auxiliary to financial services and insurance activities	0.17	N	177.93
68	Real estate activities	0.22	N	351.18
69	Legal and accounting activities	0.14	N	331.38
70	Activities of head offices; management consultancy activities	0.31	T	447.26
71	Architectural and engineering activities; technical testing and analysis	0.15	N	387.87
72	Scientific research and development	-	T	446.90
73	Advertising and market research	0.36	T	168.55
74	Other professional, scientific and technical activities	0.23	N	92.94
75	Veterinary activities	0.21	N	25.95
77	Rental and leasing activities	0.20	N	139.23
78	Employment activities	0.12	N	801.38
79	Travel agency, tour operator and other reservation service and related activities	0.27	T	55.08
80	Security and investigation activities	0.21	N	166.70
81	Services to buildings and landscape activities	0.10	N	462.31
82	Office administrative, office support and other business support activities	0.18	N	382.08
84	Public administration and defense; compulsory social security	0.14	N	2392.57
85	Education	0.08	N	1825.31
86	Human health activities	0.13	N	1824.16
87	Residential care activities	0.21	N	782.69
88	Social work activities without accommodation	0.12	N	1168.88
90	Creative. arts and entertainment activities	0.33	T	224.19
91	Libraries, archives, museums and other cultural activities	0.42	T	55.90
92	Gambling and betting activities	0.60	T	24.18
93	Sports activities and amusement and recreation activities	0.21	N	272.37
94	Activities of membership organisations	0.20	N	314.93
95	Repair of computers and personal and household goods	0.18	N	83.85
96	Other personal service activities	0.10	N	374.15
97	Activities of households as employers of domestic personnel	0.22	N	155.16