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Similarity in Demand Structures and Foreign Direct Investment in the Food and Beverage Industry

Sandro Steinbach

Center of Economic Research
Swiss Federal Institute of Technology in Zurich (Switzerland)

`ssteinbach@ethz.ch`

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Abstract

I study the relationship between demand similarity and foreign direct investment in the food and beverage industry. My regression specification includes a measure of similarity in income per capita to proxy for similarity in demand. Using firm-level greenfield investment data, I find a significant effect of income similarity along the intensive and extensive margin of foreign direct investment. My findings show that investment activities are more intense between countries with similar income per capita. The similarity effect is larger for the intensive margin, implying that it is not only more likely that an investment is realized between countries with similar income per capita, but also that such a project involves a considerable larger investment and creates more jobs. Although I find evidence for heterogeneity in the similarity effect, all coefficient estimates have a negative sign. Moreover, distinguishing between types of foreign direct investment, I find that the similarity effect is mainly relevant for manufacturing projects. These results show that demand for quality is an important determinant of cross-border investment activities in the food and beverage industry.

Key words: Greenfield foreign direct investment, food and beverage industry, demand similarity

JEL Codes: F14, F23, L66

1 Introduction

The principal purpose of this paper is to provide empirical evidence for the Linder hypothesis within the scope of foreign direct investment in the food and beverage industry. [Linder \(1961\)](#) conjectured that countries develop a comparative advantage in the production of goods for which they face high domestic demand. Because countries differ in their valuation of quality, they spend a different proportion of their income on it. To satisfy the demand for quality, high-income countries focus on the production of high-quality goods and invest accordingly, whereas low-income countries serve their consumers best by expanding productive capacities for low-quality goods. The demand for quality can be satisfied by both domestic and foreign goods, and investment decisions are taken analogously. Therefore, countries trade more intensively with each other when they have similar demand structures, which was coined by [Krugman \(1980\)](#) as the ‘home-market effect’.

Linder’s conjecture for good trade finds strong empirical support in the literature (e.g., [Schott, 2004](#); [Hallak, 2010](#); [Fajgelbaum, Grossman, and Helpman, 2011](#)). In a recent paper, [Fajgelbaum, Grossman, and Helpman \(2015\)](#) extended the scope of analysis to foreign direct investment. They developed a theoretical model that features non-homothetic preferences for quality and monopolistic competition. The decision to specialize in the production of a good is solely driven by domestic and foreign demand for quality and depends on a proximity-concentration trade-off. They show that a foreign direct investment is more likely to take place between countries that have similar demand structures, which they measure by similarity in per capita income. Using establishment-level data on foreign subsidiaries, they provide empirical evidence for a systematic relationship between income levels and the intensive margin of foreign direct investment.

This paper follows the chain of thought outlined in [Fajgelbaum, Grossman, and Helpman \(2015\)](#) and tests whether foreign direct investment in the food and beverage industry are determined by similar demand structures. Only few studies have been concerned with foreign direct investment in the food and beverage industry. One of the first papers to look at the relationship is [Marion and Nash \(1983\)](#) who provide evidence that such investment activities mainly take place between countries with similar income structures. The role of local consumption patterns is stressed by [Traill \(1997\)](#). He shows that although consumer markets are developing cross-border segments, strong local consumption patterns remain, which is the driving force behind the strong growth in the number of multinational firms. Moreover, he argues that most of these activities are ‘multi-domestic’ with only limited cross-country interaction. This view is opposed by [Cheptea, Emlinger, and Latouche \(2015\)](#) who show that multinational retailers import much of their assortment from firms that are located in their home market.

A further strain of thought in support of the view that similar income levels are an important determinant of foreign direct investment streams from the theory of the firm. As shown by [McCorriston and Sheldon \(1998\)](#), the probability and the size of foreign direct investment are determined by a firm’s wealth level,

which is in most countries highly correlated with the income per capita. Hence, the income per capita level is accounting for the development stage of an economy, but also for the wealth level of firms operating in this market. [Gopinath, Pick, and Vasavada \(1999\)](#) have developed a monopolistic model to study a multinational firm's decision to export or produce in a foreign market. They provide strong empirical evidence that firms that operate in the food industry substitute exports with foreign sales. Moreover, the decision to invest in a foreign market is highly dependent on the per capita income level. The role of income per capita for foreign direct investment in the food industry is further stressed in [Gopinath and Echeverria \(2004\)](#). They used a 'naive' gravity type model to study the relationship between trade and foreign direct investment. Their results show that higher income per capita levels are associated with an increase in foreign direct investment. A potential limitation of their empirical approach is the degree of data aggregation as the higher ratio may mask scale economies. While [Gopinath and Echeverria \(2004\)](#) focus on the intensive margin of foreign direct investment, [Herger, Kotsogiannis, and McCorriston \(2008\)](#) look at the extensive margin, distinguishing between production, processing, wholesaling and retailing. They estimated a 'naive' gravity model using acquisition data from Thomson Reuters. Although their empirical specification does not include a direct measure for the income per capita, they proxy for it by a measure of differences in wage levels. [Herger, Kotsogiannis, and McCorriston \(2008\)](#) find that the probability of foreign direct investment is higher when two countries differ in their wage level. These results are in contrast to [Fajgelbaum, Grossman, and Helpman \(2015\)](#). A possible explanation for the discrepancy is the use of the 'naive' gravity specification, which is inconsistent with respect to the economic theory ([Anderson and van Wincoop, 2003](#)).

The contribution of this paper is threefold. First, I introduce a novel measure of foreign direct investment. Instead of relying on cross-sectional variation in foreign subsidiary data (e.g., [Herger, Kotsogiannis, and McCorriston, 2008](#); [Fajgelbaum, Grossman, and Helpman, 2015](#)), I exploit variation in firm-level data on investment project. I consider both new projects and the expansion of old projects that had been realized since 2003. This dataset is the most comprehensive source of information on cross-border investment activities, tracking information on capital investment and job creation for more than 10,500 foreign direct investment projects in the food and beverage industry. This novel data allows for the investigation of both the intensive and extensive margin of foreign direct investment. Second, I estimate a gravity model that is well-grounded in the economy theory. The 'naive' gravity model is inadequate as the measure of similar demand structure is likely confounded by unobserved country characteristics. Third, I consider a full set of bilateral control variables that have been only sparsely used in the literature on foreign direct investment. I account for investment and tax treaties, and include standard gravity control variables such as the logarithm of geographical distance and a measure of economic integration. I carefully address econometric issues present in earlier studies, which are zero trade flows, heteroskedasticity and sampling issues.

I find robust empirical evidence for a systematic relationship between income similarity and foreign direct investment in the food and beverage industry. The parameter estimates are significant and negative for both the intensive and extensive margin of foreign direct investment. The similarity effect is larger for the intensive margin, implying that is not only more likely that an investment is realized between countries with similar income per capita, but also that such a project involves considerable larger investment volumes and creates more jobs. Although I find evidence for heterogeneity in the similarity effect, all coefficient estimates have a negative sign. Moreover, distinguishing between types of foreign direct investment in the food and beverage industry, I find that the similarity effect is mainly relevant for manufacturing projects, implying that demand for quality is an important determinant of cross-border investment activities in the food and beverage industry. Lastly, I find no evidence that an investment agreement increases the probability that an investment takes place. These results contribute to the ongoing debate on the benefits of investment agreements such as the Transatlantic Trade and Investment Partnership and the Trans-Pacific Partnership.

2 Empirical Strategy

My goal is to identify the relationship between income similarity and greenfield foreign direct investment in the food and beverage industry. To achieve this aim, I implement a double-difference strategy that exploits variation in investment activities between source and host countries over time. I rely on the theoretical model outlined in [Fajgelbaum, Grossman, and Helpman \(2015\)](#) to motivate my empirical investigation. Their model features non-homothetic preferences for quality and monopolistic competition. Because the decision to specialize in the production of a good is solely driven by domestic and foreign demand for quality while depending on a proximity-concentration trade-off, a foreign direct investment is more likely to take place between countries that have similar demand structures. I investigate the significance of this relationship for the food and beverage industry with the following baseline specification

$$e_{sht} = \exp(\alpha_{st} - \theta \log \tau_{sht} + \gamma_{ht}) + \epsilon_{sht} \quad (1)$$

where e_{sht} is denoting investment activities between source country s and host country h in year t . The theoretical model predicts the existence of a similarity effect for both the intensive and the extensive margin of foreign direct investment. I study the intensive margin with data for capital investment and job creation, and the extensive margin with data for project realization. I assume that the investment cost variable, which is denoted by τ_{sht} , is a linear combination of the similarity index and dyadic control variables. I measure income similarity as the absolute value of the difference in the logarithm of per capita income between the source and host country. According to [Fajgelbaum, Grossman, and Helpman \(2015\)](#), the coefficient of the similarity index is expected to have a negative sign. I include a number of covariates

that have been found to be predictive of the outcome. The regression specification includes a dummy variable for investment treaties that takes the value one if a bilateral or multilateral investment treaty was in force between source country s and host country h in year t . The literature on the relationship between investment treaties and foreign direct investment is inconsistent. Although [Neumayer and Spess \(2005\)](#) provide evidence for a significant relationship, more recent work has concluded that such a treaty is only relevant for sectors with high capital and low technology needs ([Colen, Persyn, and Guariso, 2016](#)). [Blonigen, Oldenski, and Sly \(2014\)](#) show that a significant relationship between tax treaties and foreign direct investment exists. Because such treaties are often signed between countries with similar per capita income, they reflect a potential source of endogeneity. To account for this issue, I include a dummy indicator for tax treaties between source and host countries. According to the theoretical model in [Fajgelbaum, Grossman, and Helpman \(2015\)](#), a firm in the source market can decide to serve the host market with exports and/or subsidiary sales. It is necessary to include covariates that account for the trade-off between investment and trade incentives. Therefore, my regression specification includes measures of both bilateral and multilateral economic integration. All else equal, an economic integration agreement may decrease the incentive for foreign direct investment because trade cost are lower between such country pairs. Lastly, the investment cost variable includes a number of standard gravity control variables such as the logarithm of the geographical distance, and dummies for contiguous countries, common language and common legacy. The source and construction of the covariates is discussed in the data section.

A further prediction of the theoretical model is that the overall market size determines a firm's decision to enter a quality segment and serve a foreign market via exports and/or a subsidiary. All other things being equal, the home-market effect and the proximity-concentration trade-off make foreign direct investment in a large country more attractive. I employ two different strategies to account for the effect of market size. First, I estimate [Equation 1](#) with time-invariant fixed effects for source and host countries as well as common time fixed effects. I denote the source country fixed effects with α_s , the host country fixed effects with γ_h , and the time fixed effects with ν_t . This specification allows me to include time-variant covariates that capture the effect of market size. These covariates are the logarithm of the gross domestic product (GDP) and the logarithm of the total population in the source and host country. I expect these variables to have a significant effect on a firm's decision to serve a foreign market via a subsidiary. Second, I estimate [Equation 1](#) with time-variant fixed effects for source and host countries, which I denote by α_{st} and γ_{ht} . These fixed effects absorb all non-dyadic covariates in my regression specification. I believe that this specification is providing more robust results because the fixed effects account for unobserved country characteristics that are possibly correlated with the similarity index and predictive of the outcome.

3 Data

I assembled a dataset of firm-level greenfield foreign direct activities in the food and beverage industry from the fDi Markets database ([fDi Intelligence, 2016](#)). The dataset is the most comprehensive source of information on greenfield investment activities. A distinct advantage of the greenfield investment data over both subsidiary activity and merger & acquisition data is that greenfield investment activities involve the transfer of considerable technological knowledge between the source and host country. These transfers are an important prediction of the theoretical model in [Fajgelbaum, Grossman, and Helpman \(2015\)](#). I use data on capital investment and job creation to measure the intensive investment margin, and the count of project realization to measure the extensive investment margin. The capital investment data is expressed in millions of USD with a two-digit precision, and the job creation data as the absolute number of jobs created. The data source is highly reliable because each project is cross-referenced against multiple sources. I select all investment activities from the dataset that are classified as food or beverage projects, and aggregate the industry data at the country-pair level to obtain a bilateral investment activity measure.¹ The dataset provides information on 10,572 investment projects involving 162 countries for 2003-2014. Each investment project also includes information on the project type, which I use to investigate differences in the effect of income similarity.

I obtained the income per capita data from the World Development Indicators database ([The World Bank, 2016](#)). The income per capita variable is measured in current USD. I also extracted the GDP and population data from this database. The data on investment treaties are from the United Nations Conference on Trade and Development ([UNCTAD, 2016](#)). Their database is the most comprehensive source for such data. For each country-pair, I constructed a dyadic variable based on the entire history of bilateral and multilateral investment treaties. I matched this information with the investment data. In case that more than one investment treaty was in force between two countries, the investment trade variable takes the value one. The tax treaty variable is constructed from online tax treaty data provided by [Tax Analysts \(2016\)](#). Tax Analysts is a tax publisher that maintains a comprehensive dataset on bilateral and multilateral tax treaties. Although detailed information on the treaty type are available, I make no distinction between these types because countries often sign them in bundles. I construct a variable for multilateral economic integration with membership information from the World Trade Organization. The bilateral economic integration variable is from the Economic Integration Agreement Dataset ([Bergstrand, 2016](#)). The dataset indexes the amount of trade openness on a scale 0 to 6, where 0 stands for no economic integration and 6 for an economic union. I make no distinction between the levels of economic integration and replace the variable by one if any type of economic integration agreement is in place between two

¹ The beverage industry is defined according to the North American Industry Classification System (NAICS) codes 445, 31211, 31213, 31214, and 9999904, and the food industry according to NAICS codes 42, 111, 112, 114, 445, 722, 3111, 3112, 3113, 3114, 3115, 3116, 3117, 3118, 31191, 31192, 31194, and 31199.

countries. Because the dataset only provides information on economic integration agreements until 2012, I completed the dataset relying the approach outlined by [Bergstrand \(2016\)](#). The remaining gravity control variables are from the GeoDist Database by [Mayer and Zignago \(2011\)](#). I extracted information on geographical distance, common language and common legacy. A descriptive statistics of the outcome variables and covariates is provided in [Table 1](#) in the supplementary materials.

4 Results

My empirical strategy identifies the effect of income similarity for the food and beverage industry by exploiting variation in investment activities between source and host countries over time. Before turning to the regression results, it is worthwhile examining patterns in the raw data. [Figure 1](#) illustrates the relationship between income similarity and the intensive margin of foreign direct investment for the food and beverage industry. The left-hand panel depicts the relationship for capital investment and the right-hand panel the relationship for job creation. Each dot stands for an investment project. There are two important features of [Figure 1](#). First, the dots are more dense when the income similarity is close to zero. This indicates that investment projects in the food and beverage industry are more likely to take place between countries with similar income per capita. Second, the figure shows that the size of capital investment and job creation is larger for countries that are more similar.

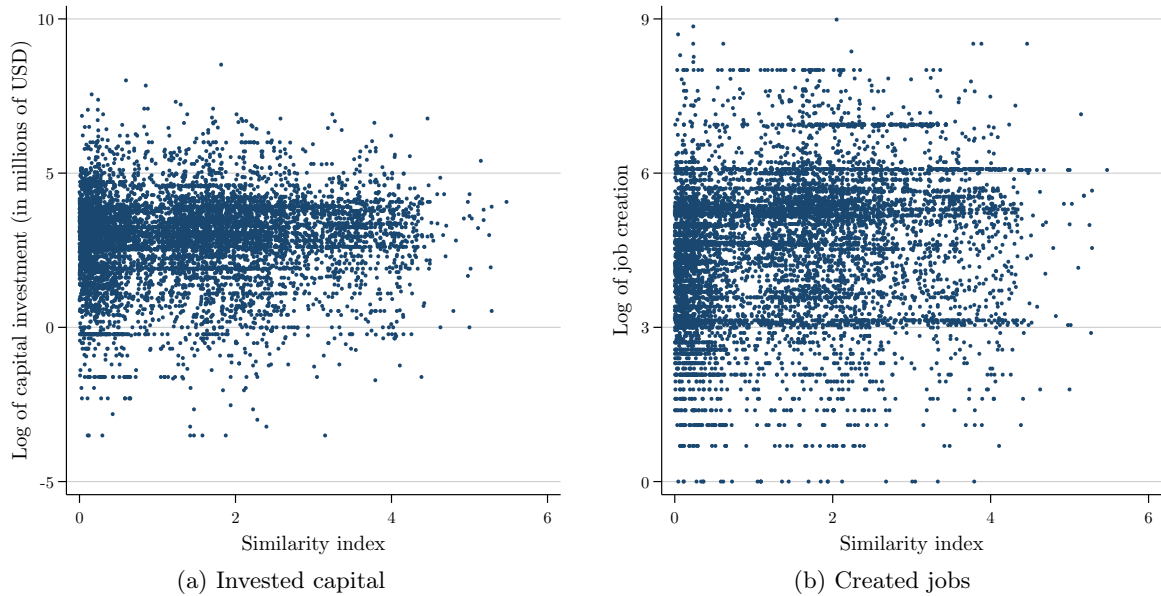


Figure 1: Income similarity and foreign direct investment in the food and beverage industry

Notes: This figure presents the relationship between income similarity and foreign direct investment in the food and beverage industry. The left panel shows the relationship for invested capital and the right panel the relationship for created jobs. Both measures of foreign direct investment are log-normalized. The figures depict 10,527 investment projects for 2003-2014.

In the following sections, I turn to the regression results from the model specified in [Equation 1](#). I first consider the baseline specification to demonstrate that a positive association between income similarity and foreign direct investment in the food and beverage industry exists for both the intensive and extensive

investment margin. I then provide results when allowing for heterogeneity in the effect of income similarity. My regression results show evidence for heterogeneity in the similarity effect. Lastly, I distinguish between types of foreign direct investment and show that the similarity effect is relevant for manufacturing projects but less relevant for other project types such as sales and logistics.

4.1 Baseline Analysis

I report the estimates of the baseline specification in [Table 1](#). The extent of greenfield investment activity between source country s and host country h in the food and beverage industry is analyzed for both the intensive and extensive investment margin. The investment data include a large portion of zero investment events. To address this issue, I identify the parameters in [Equation 1](#) with the Poisson Pseudo-Maximum Likelihood (Poisson PML) estimator. This one-stage estimator is consistent and efficient when zeros are present in the data ([Santos Silva and Tenreiro, 2006](#)). The estimator allows incorporating zeros by estimating the models in levels instead of logs. The estimator also solves the adding up problem, which is an issue with most other estimators of gravity-type regression models ([Arvis and Shepherd, 2013](#)). The error term is allowed to be heteroskedastic and correlated within clusters. I cluster the standard errors at the country-pair level and report them in parenthesis. The estimates of the intensive margin are presented in columns 1-4, and the estimates of the extensive margin are shown in columns 5-6. In addition to the reported covariates, source-country, host-country, and year fixed effects are included in the specification in columns 1, 3 and 5. The country-specific fixed effects account for the potential of countries to be the source and/or the host of a greenfield investment project in the food and beverage industry. Although I believe that these effects capture much of this potential, I also estimate the baseline specification with source-country-year and host-country-year fixed effects. By including time-varying country fixed effects, all country-specific covariates such as the population in the source and in the host country are dropped. Although these covariates may be important determinants of greenfield investment activities, they are likely correlated with other unobserved country characteristics. I allow these country characteristics to be absorbed by the time-varying fixed effects. The corresponding parameter estimates are reported in columns 2, 4 and 6.

I find a negative relationship between income similarity and investment activities. The estimates of the similarity effect are all significant at the 1 percent level. These findings suggest that income similarity between the source and the host country is an important determinant of investment activities in the food and beverage industry. The similarity effect has a similar size for the specification with source-country, host-country, and year fixed effects (1), and the specification with source-country-year and host-country-year fixed effects (2). These findings indicate that the incentives and potentials for greenfield investment activities in the food and beverage industry remain largely unchanged. Turning to the coefficient estimates of the intensive margin, I find that the similarity effect is larger for capital investment than for job

Table 1: Baseline specification

	Capital investment		Job creation		Project realization	
	(1)	(2)	(1)	(2)	(1)	(2)
Similarity index	-0.272*** (0.068)	-0.267*** (0.060)	-0.210*** (0.059)	-0.194*** (0.054)	-0.134*** (0.042)	-0.144*** (0.039)
Investment treaty	-0.077 (0.123)	-0.133 (0.117)	-0.139 (0.116)	-0.192* (0.114)	-0.005 (0.104)	-0.091 (0.104)
Tax treaty	0.748*** (0.187)	0.672*** (0.163)	0.523*** (0.162)	0.492*** (0.147)	0.589*** (0.110)	0.524*** (0.104)
WTO membership	0.062 (0.157)	0.285 (0.384)	-0.023 (0.133)	1.022** (0.426)	-0.087 (0.113)	-0.285 (0.322)
Economic integration treaty	-0.039 (0.147)	-0.143 (0.138)	0.092 (0.145)	-0.009 (0.140)	0.013 (0.114)	-0.371*** (0.111)
Geographical distance	-0.832*** (0.072)	-1.010*** (0.047)	-0.888*** (0.084)	-1.019*** (0.061)	-0.861*** (0.058)	-1.255*** (0.030)
Contiguous countries	0.001 (0.175)	-0.217 (0.160)	0.050 (0.196)	-0.069 (0.185)	0.005 (0.132)	-0.388*** (0.116)
Common language	0.757*** (0.158)	0.774*** (0.161)	0.995*** (0.182)	1.015*** (0.180)	0.907*** (0.113)	0.850*** (0.123)
Common legacy	0.472 (0.404)	0.454 (0.357)	0.483 (0.400)	0.357 (0.347)	0.429* (0.245)	0.148 (0.236)
GDP in source country	1.488*** (0.279)		1.371*** (0.243)		0.412*** (0.153)	
GDP in host country	-0.418** (0.202)		-0.294* (0.169)		-0.388*** (0.116)	
Population in source country	0.393 (0.698)		0.977* (0.581)		1.827*** (0.519)	
Population in host country	3.043*** (0.817)		2.529*** (0.671)		2.174*** (0.518)	
Observations	312,984	312,984	312,984	312,984	312,984	312,984
Pseudo R^2	0.366	0.603	0.517	0.646	0.549	0.629

Note: This table presents the estimates of the baseline specification. Columns 1-2 show the estimates for capital investment, columns 3-4 the estimates for job creation, and columns 5-6 the estimates for project realization. In addition to the reported covariates, α_s , γ_h and ν_t are included in the specification presented in columns 1, 3 and 5, and α_{st} and γ_{ht} in the specification reported in columns 2, 4 and 6. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent, respectively.

creation. The larger coefficient estimate for capital investment indicates that a greenfield investment project implemented between a country with high income per capita and a country with low income per capita will employ more labor relative to capital than a project between two countries with high income per capita. Although [Fajgelbaum, Grossman, and Helpman \(2015\)](#) find no compelling evidence for a significant relationship between income similarity and the extensive margin of foreign direct investment, my estimates for the food and beverage industry provide empirical evidence for such a relationship. It is more likely that a greenfield investment project is realized between countries with similar income per capita than between countries that differ with respect to their income level.

Turning to the parameter estimates of the control variables, I find that an investment treaty has no effect on both margins of foreign direct investment in the food and beverage industry. Although empirical evidence for a significant effect at the aggregated level was presented by [Neumayer and Spess \(2005\)](#), these

findings are compromised by the small sample size (Yackee, 2009). Moreover, Colen, Persyn, and Guariso (2016) show that the effect of investment treaties can vary considerably between sectors. They find that an investment treaty has larger effects for sectors with high capital and low technology requirements. They find no evidence of such an effect for the agricultural sector but a significant effect for both the service and utility sector. I find compelling evidence that a tax treaty has a significant effect on greenfield investment activities in the food and beverage industry. The estimates of the tax treaty variable are all significant at the 1 percent level. The effect of a tax treaty is larger for the intensive margin than for the extensive margin. A tax treaty increases capital investment by 95.8 percent, job creation by 63.6 percent, and the number project realization by 68.9 percent. My findings are in line with earlier studies on the relationship between tax treaties and foreign direct investment (e.g., Di Giovanni, 2005; Stein and Daude, 2007; Blonigen, Oldenski, and Sly, 2014). Both bilateral and multilateral investment treaties have no influence on investment activities in the food and beverage industry. There are only few studies in the literature that are concerned with this relationship. For instance, Di Giovanni (2005) also found no evidence for a significant effect of economic integration treaties on foreign direct investment. On the one hand, geographical distance has a significant effect on the decision to invest in a certain country. Countries that are more close together receive higher investment than countries that are more far apart. The effect is larger for the extensive margin than for the intensive margin. Similar results are presented by Fajgelbaum, Grossman, and Helpman (2015). On the other hand, there is no compelling evidence that contiguous countries direct more investment towards each other. I find that countries that share a common language have higher investment activities. All effect estimates are statistically significant at the 1 percent level. The effect is stronger for job creation than for capital investment. My findings are in line with Di Giovanni (2005). They suggest that a common language facilitates job creation more than capital investment. Lastly, I find no evidence that a common legacy has an effect on investment activities.

4.2 Heterogeneity in the Similarity Effect

To account for the possibility of heterogeneity in the similarity effect, I interact the similarity index with quartile dummies and estimate Equation 1 again. These dummies are created by classifying the similarity index according to quartiles of the similarity distribution. The estimates for each quartile are summarized in Table 2. I find a negative relationship between income similarity and investment activities. Apart of the first quartile, the estimates of the similarity effect are all significant at the 5 percent level. These findings suggest that although income similarity is an important determinant of investment activities in the food and beverage industry, the similarity effect is likely heterogenous. For both investment margins, the similarity effect is largest for the second quartile and smallest for the fourth quartile. The estimates for capital investment are larger than the estimates for job creation, which is also the case in the baseline specification. Moreover, my results suggest that heterogeneity is also relevant for the extensive margin.

Table 2: Estimates of the similarity effect by quartile

	Capital investment	Job creation	Project realization
First quartile	−0.423 (0.309)	−0.270 (0.331)	−0.415* (0.214)
Second quartile	−0.556*** (0.127)	−0.367*** (0.121)	−0.293*** (0.087)
Third quartile	−0.318*** (0.080)	−0.187*** (0.072)	−0.201*** (0.054)
Fourth quartile	−0.267*** (0.064)	−0.213*** (0.057)	−0.154*** (0.040)

Note: This table presents the parameter estimates of the similarity index by quartile. Columns 1, 2, and 3 report the estimates for capital investment, job creation, and project realization, respectively. The table is sorted by quartile. All regression include α_{st} and γ_{ht} . The complete list of parameter estimates is provided in [Table 2](#) in the supplementary materials. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent, respectively.

4.3 Variation in the Similarity Effect by Project Type

[Table 3](#) presents the estimates of the similarity effect by project type. I used information on the project type provided by [fDi Intelligence \(2016\)](#) to classify the investment activities in the food and beverage industry according to five categories. The estimation results show that the similarity effect is significant at the 5 percent level for both investment margins when the project type is manufacturing. I find no evidence for a significant relationship between income similarity and investment activities for sale and logistic projects. These findings provide empirical evidence for the validity of the theoretical model by [Fajgelbaum, Grossman, and Helpman \(2015\)](#), which predicts that income similarity is an important determinant of investment activities that involve manufacturing of differentiated products. The similarity effect is larger for the intensive margin than the extensive margin.

Table 3: Estimates of the similarity effect by project type

	Capital investment	Job creation	Project realization
Retail	−0.186* (0.102)	−0.094 (0.075)	−0.164*** (0.063)
Manufacturing	−0.215*** (0.067)	−0.117** (0.055)	−0.095** (0.041)
Sales, marketing and support	−0.004 (0.055)	0.059 (0.067)	−0.020 (0.047)
Logistics, distribution and transportation	−0.168 (0.190)	−0.187 (0.176)	−0.065 (0.123)
Others	−0.440** (0.193)	−0.298** (0.131)	−0.121* (0.062)

Note: This table presents the parameter estimates of the similarity index by project type. Columns 1, 2, and 3 report the estimates for capital investment, job creation, and project realization, respectively. The table is sorted by project type. All regression include α_{st} and γ_{ht} . The complete list of parameter estimates for capital investment, job creation, and project realization is provided in [Table 3](#), [Table 4](#), and [Table 5](#) in the supplementary materials. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent, respectively.

5 Conclusion

This paper investigated the relationship between demand similarity and foreign direct investment in the food and beverage industry. My empirical investigation is motivated by [Fajgelbaum, Grossman, and Helpman \(2015\)](#), who developed a theoretical model that features non-homothetic preferences for quality and monopolistic competition. A major feature of this model is that the decision to specialize in the production of a good is solely driven by domestic and foreign demand for quality and depends on a proximity-concentration trade-off. Their main prediction is that a foreign direct investment is more likely between countries that have similar demand structures, which is measured by similarity in income per capita. Although they find evidence for a significant effect along the intensive margin of foreign direct investment, they fail to do so for the extensive margin. My paper follows the chain of thought outlined in [Fajgelbaum, Grossman, and Helpman \(2015\)](#) and tests whether foreign direct investment in the food and beverage industry are determined by similar demand structures.

I examined the relationship using firm-level greenfield foreign direct investment data from the fDi Markets database. I implemented a double-difference strategy by exploiting variation in investment activities between source and host countries over time. My empirical findings show robust evidence for a systematic relationship between income similarity and foreign direct investment in the food and beverage industry. The parameter estimates are significant for both the intensive and extensive margin of foreign direct investment. I find that investment activities are more intense between countries with similar income per capita. The similarity effect is more significant for the intensive margin, which entails not only that an investment is more likely to be realized between countries with similar income per capita, but also that such a project involves considerable larger investment volumes and creates more jobs. Although I find evidence for heterogeneity in the similarity effect, all coefficient estimates have a negative sign. Moreover, distinguishing between types of foreign direct investment in the food and beverage industry, I find that the similarity effect is mainly relevant for manufacturing projects. This implies that demand for quality is an important determinant of cross-border investment activities in the food and beverage industry. Lastly, I find no evidence that an investment agreement increases the probability that an investment takes place. More work needs to be done in the future to fully understand the relationship between demand similarity and foreign direct investment in the food and beverage industry. It is likely that the similarity effect is heterogeneous across multinational firms.

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6 Supplementary materials

Supplement Table 1: Descriptive statistics

Variables	Mean	Standard deviation			Trend
		Overall	Between	Within	
<u>Outcomes</u>					
Capital investment	1.13	25.35	16.22	19.48	0.00
Job creation	6.29	135.11	103.54	86.80	−0.00
Project realization	0.03	0.38	0.31	0.22	0.00
<u>Covariates</u>					
Similarity index	1.78	1.26	1.24	0.23	−0.05
Investment treaty	0.44	0.50	0.48	0.12	0.04
Tax treaty	0.13	0.34	0.33	0.09	0.04
WTO membership	0.67	0.47	0.45	0.14	0.07
Economic integration treaty	0.26	0.44	0.41	0.14	0.08
Geographical distance	8.76	0.78	0.78	0.00	0.00
Contiguous countries	0.02	0.13	0.13	0.00	−0.00
Common language	0.15	0.35	0.35	0.00	−0.00
Common legacy	0.01	0.10	0.10	0.00	0.00
GDP	23.98	2.52	2.49	0.36	0.12
Population	15.61	2.14	2.13	0.08	0.02

Note: This table is divided into two parts and reports the descriptive statistics. The upper part presents the statistics for the different outcomes and the lower part the statistics for the covariates. Capital investment is expressed in in millions of USD, and job creation and project realization are expressed in absolute terms. Geographical distance, GDP and population are expressed in logs. For each variable, I present the mean, and the standard deviation in terms overall, between and within variation, and the trend. The trend is defined as the correlation between each variable and the year variable.

Supplement Table 2: Covariate estimates for the similarity effect by quartile

	Capital investment	Job creation	Project realization
Similarity index			
<i>First quartile</i>	−0.423 (0.309)	−0.270 (0.331)	−0.415* (0.214)
<i>Second quartile</i>	−0.556*** (0.127)	−0.367*** (0.121)	−0.293*** (0.087)
<i>Third quartile</i>	−0.318*** (0.080)	−0.187*** (0.072)	−0.201*** (0.054)
<i>Fourth quartile</i>	−0.267*** (0.064)	−0.213*** (0.057)	−0.154*** (0.040)
Investment treaty	−0.127 (0.116)	−0.188* (0.112)	−0.085 (0.105)
Tax treaty	0.690*** (0.166)	0.501*** (0.148)	0.534*** (0.104)
WTO membership	0.239 (0.408)	0.951** (0.464)	−0.313 (0.328)
Economic integration treaty	−0.137 (0.136)	0.005 (0.138)	−0.358*** (0.110)
Geographical distance	−1.001*** (0.049)	−1.004*** (0.062)	−1.242*** (0.031)
Contiguous countries	−0.199 (0.157)	−0.053 (0.182)	−0.379*** (0.115)
Common language	0.757*** (0.167)	1.019*** (0.183)	0.854*** (0.124)
Common legacy	0.459 (0.367)	0.353 (0.361)	0.153 (0.240)
Observations	312,984	312,984	312,984
Pseudo R^2	0.610	0.648	0.631

Note: This table presents the parameter estimates of the similarity index by quartile. Columns 1, 2, and 3 report the estimates for capital investment, job creation, and project realization, respectively. All regression include α_{st} and γ_{ht} . ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent, respectively.

Supplement Table 3: Covariate estimates for capital investment by project type

	(1)	(2)	(3)	(4)	(5)
Similarity index	−0.186* (0.102)	−0.215*** (0.067)	−0.004 (0.055)	−0.168 (0.190)	−0.440** (0.193)
Investment treaty	−0.181 (0.191)	−0.086 (0.132)	−0.051 (0.140)	0.037 (0.275)	0.534*** (0.196)
Tax treaty	0.682*** (0.249)	0.564*** (0.186)	0.547** (0.221)	1.663*** (0.291)	1.415*** (0.321)
WTO membership	0.342 (0.918)	−0.378 (0.250)	0.378 (0.437)	1.020* (0.588)	0.149 (0.373)
Economic integration treaty	−0.312 (0.306)	0.006 (0.129)	−0.443*** (0.146)	−1.040*** (0.332)	−0.598 (0.448)
Geographical distance	−1.289*** (0.105)	−0.967*** (0.037)	−1.135*** (0.043)	−1.071*** (0.096)	−1.207*** (0.098)
Contiguous countries	−0.530* (0.285)	−0.187 (0.170)	−0.270 (0.266)	0.007 (0.303)	−1.128 (0.744)
Common language	1.157*** (0.384)	0.635*** (0.140)	0.690*** (0.163)	0.411 (0.330)	0.963 (0.879)
Common legacy	1.570*** (0.420)	−0.287 (0.457)	−0.705 (0.683)	0.021 (0.738)	0.201 (1.163)
Observations	312,984	312,984	312,984	312,984	312,984
Pseudo R^2	0.565	0.596	0.514	0.428	0.224

Note: This table presents the estimates of the analysis for capital investment by project type. Columns 1, 2, 3, 4, and 5 report the estimates for retail (1), manufacturing (2), sales, marketing and support (3), logistics, distribution and transportation (4), and others (5), respectively. Fixed effects for α_{st} and γ_{ht} are included in each regression. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent, respectively.

Supplement Table 4: Covariate estimates for job creation by project type

	(1)	(2)	(3)	(4)	(5)
Similarity index	−0.094 (0.075)	−0.117** (0.055)	0.059 (0.067)	−0.187 (0.176)	−0.298** (0.131)
Investment treaty	−0.269 (0.172)	−0.082 (0.133)	−0.143 (0.144)	0.111 (0.265)	0.269 (0.274)
Tax treaty	0.670*** (0.228)	0.246 (0.157)	0.605** (0.279)	1.555*** (0.305)	0.941** (0.443)
WTO membership	0.744 (0.894)	0.269 (0.294)	0.633 (0.388)	1.106* (0.641)	−0.679 (0.658)
Economic integration treaty	−0.033 (0.213)	0.086 (0.131)	−0.365** (0.156)	−0.587* (0.310)	−0.044 (0.396)
Geographical distance	−1.185*** (0.102)	−0.927*** (0.047)	−1.081*** (0.043)	−0.934*** (0.091)	−0.895*** (0.087)
Contiguous countries	−0.264 (0.274)	0.097 (0.192)	−0.213 (0.270)	−0.099 (0.336)	−0.163 (0.874)
Common language	1.483*** (0.317)	0.732*** (0.137)	0.765*** (0.191)	0.470 (0.353)	0.624 (0.726)
Common legacy	1.167** (0.479)	0.113 (0.431)	−0.873 (0.615)	0.499 (0.850)	−0.163 (1.012)
Observations	312,984	312,984	312,984	312,984	312,984
Pseudo R^2	0.662	0.415	0.729	0.382	0.215

Note: This table presents the estimates of the analysis for job creation by project type. Columns 1, 2, 3, 4, and 5 report the estimates for retail (1), manufacturing (2), sales, marketing and support (3), logistics, distribution and transportation (4), and others (5), respectively. Fixed effects for α_{st} and γ_{ht} are included in each regression. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent, respectively.

Supplement Table 5: Covariate estimates for project realization by project type

	(1)	(2)	(3)	(4)	(5)
Similarity index	−0.164*** (0.063)	−0.095** (0.041)	−0.020 (0.047)	−0.065 (0.123)	−0.121* (0.062)
Investment treaty	−0.220 (0.167)	−0.044 (0.122)	−0.045 (0.121)	−0.136 (0.235)	0.006 (0.146)
Tax treaty	0.570*** (0.204)	0.312*** (0.114)	0.786*** (0.196)	1.152*** (0.244)	0.827*** (0.218)
WTO membership	−0.328 (0.436)	−0.575** (0.227)	−0.082 (0.309)	−0.081 (0.333)	−0.446* (0.258)
Economic integration treaty	−0.382* (0.210)	−0.400*** (0.123)	−0.847*** (0.154)	−0.719*** (0.259)	−1.011*** (0.185)
Geographical distance	−1.507*** (0.057)	−1.276*** (0.025)	−1.299*** (0.029)	−1.376*** (0.057)	−1.335*** (0.038)
Contiguous countries	−0.475** (0.189)	−0.450*** (0.137)	−0.627*** (0.210)	−0.243 (0.278)	−0.606** (0.242)
Common language	1.210*** (0.265)	0.692*** (0.123)	0.697*** (0.142)	0.575** (0.273)	0.031 (0.165)
Common legacy	0.455 (0.355)	0.218 (0.351)	−1.055* (0.613)	0.288 (0.678)	0.612 (0.659)
Observations	312,984	312,984	312,984	312,984	312,984
Pseudo R^2	0.557	0.464	0.353	0.365	0.432

Note: This table presents the estimates of the analysis for project realization by project type. Columns 1, 2, 3, 4, and 5 report the estimates for retail (1), manufacturing (2), sales, marketing and support (3), logistics, distribution and transportation (4), and others (5), respectively. Fixed effects for α_{st} and γ_{ht} are included in each regression. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent, respectively.