Essays on Migration and Trade

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A dissertation submitted in partial fulfillment of
the requirements for the degree of

Doctor of Philosophy

CERGE-EI

2009

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGMENTS

I would like to thank CERGE-EI and the Czech Academy of Sciences for generous financial support during my Ph.D. studies and research stay at the University of California, San Diego. Special acknowledgment goes to James Rauch, UCSD, who helped substantially to formulate the ideas of the first chapter. I would also like to thank Libor Dušek and Štěpán Jurajda for their invaluable comments. During the course of my work on this paper, I benefited from the feedback provided by Julian Betts, Levent Celik, Peter Katuščák, Róbert Menkyňa, Dilip Mookherjee, Jan Mysliveček, Andreas Ortmann, Avner Shaked, Fusako Tsuchimoto, Eric Verhoogen and Krešimir Žigić. The usual disclaimer applies.

DEDICATION

To my family, for its continuous support in course of my life.

Chapter 1

IMMIGRANT NETWORKS, TRADE CREATION, AND TRADE DIVERSION

I derive a simple gravity model with producer matching and use data on foreign-born population located in 19 OECD-member countries to estimate the impact of immigrant links on trade. The immigrant links are assumed to influence trade through three mechanisms. 1) Immigrants located in a given host country facilitate trade by forming joint ventures with agents in their country of origin. 2) Immigrants' joint ventures reduce the probability of forming a joint venture between host-country's natives and agents in the immigrants' country of origin . 3) The remaining immigrant communities in a given host country divert a fraction of joint ventures that would have otherwise been created between host's natives and agents from the concerned country of origin.

The empirical estimates suggest a statistically significant impact of immigrant links on trade. The trade-facilitating channel declines with the GDP of source country and is generally smaller than estimates from preceding studies. There is furthermore some empirical evidence that immigrant links change trade flows between countries. The net effect on total trade of a 10-percent increase in the overall immigrant stock varies between -0.12-1.18 percent for host countries and -6.99-2.58 percent for source countries in the sample.

Keywords: international trade, immigration, informal trade barriers

JEL classification: F22, O24

1.1 Introduction

Informal trade barriers have become one of the central points in the debate launched by McCallum's "mystery of the missing trade " (McCallum, 1995), i.e., the finding that nations

tend to trade too much intranationally and too little internationally. Particular attention has been directed towards insufficient information on available trading opportunities and imperfect contract enforcement. Insufficient information about foreign partners seems to be pronounced especially in more differentiated industries where product characteristics vary along multiple dimensions and price happens to be only one of several decision criteria. The resulting higher search costs can then make otherwise efficient cross-border matches unprofitable (Rauch and Trindade, 2003; Casella and Rauch, 2003). Similarly, in the absence of efficient contract enforcement when trade parties originate from different jurisdictions, potential contract renegation and losses accrued by the afflicted party decrease the incentives to engage in trade and, again, might prevent otherwise successful international matches (Greif, 1994).

Some social networks seem to be well equipped to deal with both kinds of informal trade barriers. These networks, often defined by common ethnicity or religion, can provide useful information and trade contacts to their members and/or employ some sort of collective punishment mechanism that could substitute for inadequate enforcement institutions. In particular, numerous studies on informal barriers examine the impact on trade of immigrant networks (e.g., Head and Ries, 1998; Gould, 1993; Girma and Yu, 2002). The results of these studies consistently support the notion that immigrant links indeed facilitate bilateral trade between host and source countries.

The present paper offers two extentions to the existing literature. First, it evaluates the potential role of immigrants in trade diversion, i.e., shifts in trade flows due to immigrant links to country of origin. Second, it derives a simple matching framework relating trade, immigrant links and the output of their country of origin, and calculates the GDP-adjusted estimates of immigrants' overall impact on trade by host and source country.

The paper argues that in a situation when exporters decide between several competing destination markets, the combination of pervasive informal trade barriers and country-specific knowledge possessed by immigrants might actually lead to the diversion of trade. Consider a German machinery producer who wishes to export to either Vietnam or Thailand. Other things equal, if the informal trade barriers are uniform across both countries and trade is still profitable, the producer will be indifferent as to where to export. If, on the other hand,

the producer is of Vietnamese ancestry, or perhaps employs Vietnamese officers in its trade department, the contacts and knowledge of local conditions might bias the export choice in favor of Vietnam.[1] Now assume such a decision has been made by a larger number of firms. While from the perspective of Germany the total exports do not change (or they increase somewhat if immigrants are more efficient in finding suitable matches), its bilateral trade with Thailand becomes lower than it would have been in the absence of immigrant networks. In this case, trade diversion from Thailand occurs due to a lost fraction of transactions that would have been realized by otherwise indifferent exporters.

A study on offshoring in the apparel industry (Gereffi, 1999) provides a related empirical observation; it describes the case of Taiwanese firms channeling large portions of their offshore investment into Malaysia and Thailand, despite markedly lower wages in other parts of the region. A large part of both economies is, however, controlled by ethnic Chinese who maintain extensive social networks. The author argues that these networks shape many investment decisions.[2] Within the present context, the trade diversion would take the form of unrealized offshoring projects in countries such as Bangladesh or Sri Lanka, i.e., in destinations with very low wages but insufficient links to Chinese networks.

The following section reviews the existing empirical research on the role of immigrant links in international trade. Section 1.3 presents the empirical model and Section 1.4 discusses the data employed. The following sections cover econometric issues, results and sensitivity analysis. Section 1.7 concludes.

1.2 Evidence on trade and immigrant links

There exists a number of country-specific studies that estimate the relationship between trade and immigrant links. For example, Gould (1993) analyzes migration inflows in the

[1] Heerander and Saavedra (2006) cite Peng's (1998) survey on the characteristics of trade intermediaries located in the U.S. According to this survey, 40 percent of U.S. intermediaries' officers or managers are foreign-born.

[2] Rauch and Trindade (2002) find that for trade between Southeast Asian countries with high population shares of ethnic Chinese, the smallest average portion of trade in differentiated products attributable to ethnic Chinese networks reaches nearly 60%.

U.S. using panel data from 1970 to 1986 and predicts a 10-percent increase in immigrant stock to increase U.S. exports by 4.7 percent and U.S. imports by 8.3 percent. An exercise using Canadian data has been produced by Head and Ries (1998). The authors employ two different measures of immigrant links, namely the cumulative sum of immigrant inflows after 1970 and the imputed immigrant populations using census data, and report a 10-percent increase in the immigrant stock to raise Canadian bilateral exports by 1.0-1.3 percent and imports by 3.1-3.9 percent.[3] Other more recent country studies include e.g., Girma and Yu (2002) for the U.K, White (2007a) for Denmark, or Blanes (2005) for Spain. These works will form a useful benchmark for the trade creation estimates discussed in Section 1.5.

A number of studies focus on characteristics of immigrants' country of origin influencing immigrant-driven trade. The Canadian study by Head and Ries (1998) finds that trade contribution of more recent immigrant cohorts from East Asian and Latin American countries tends to exceed that of traditional migrant communities from within the European continent.[4] The U.S. study by White (2007b) divides source countries into four income groups and estimates the immigrant-link effect for each distinct group. His results indicate that immigrant networks from low income economies exert stronger influence on trade than their higher income counterparts. On the contrary, White (2007a) finds the opposite result for the Danish data. Of course, these contrasting results might be driven by a number of distinct channels that would ultimately correlate with the income level of a source country. Besides different immigration histories emphasized by Head and Ries (1998), trade activities of immigrant networks could select into a relatively small number of sectors within the source economy, so that their differential contribution to trade would partially reflect the source countries' sectoral dynamics. In that case, the less developed economies with larger share of traditional sectors (such as production of cultural goods, see Tadesse and White, 2008) might observe correspondingly larger shares of immigrant-driven trade. Even without the selective focus on a subset of industries, however, some networks might have limited

[3]The link between immigration and Canadian trade has also been studied by Helliwell (1997) and Wagner et al. (2003).

[4]Recent shifts in the structure of immigrants' countries' of origin for OECD member states have been documented in OECD (2004).

capacity to exploit all available trade opportunities given the time, skill or logistic constraints, which would again translate into their lower relative contribution to trade. Despite the current inability to disentangle the individual mechanisms at work, White's estimates provide at least some idea on the actual magnitude of these effects.

Moving towards potential trade-diverting role of immigrant networks, the research by Herander and Saavedra (2005) is the only one to consider immigrant-driven trade spillovers. Herander and Saavedra (2005), however, explore the spatial dimension of immigrant networks. Focusing on trade-creation effects of immigrant networks operating within and between the U.S. states,[5] the results show a consistently stronger impact on U.S. state export volumes to a source country for local as compared to out-of-state populations. In particular, their results qualitatively conform to previous estimates in that a 10-percent increase in the local state immigration should on average increase the state's exports by 1.6 percent. The estimated impact of the out-of-state population, i.e. of the immigrant network geographic spillovers, then raises the states' export volumes by 0.7 percent only.

The present study aims to estimate a rather different dimension of network spillovers. While Herander and Saavedra (2005) deal with trade facilitating spillovers generated by immigrant networks of the *same* nationality located in different U.S. states, I instead focus on the relevance of potential trade-diverting spillovers by immigrant networks from *different* countries of origin within a given host economy. The following section presents the estimation framework.

1.3 Empirical model

For the empirical evaluation of the trade creation and diversion hypotheses I use a simple gravity framework that explicitly allows for matching in trade. The gravity relationship proportionally linking trade flows to the output of trading economies can be derived from a wide range of international trade models.[6] The present section, however, shows that

[5] Another study focusing on trade-immigration link at the U.S. state level is Dunlevy (2006).

[6] Examples include Anderson (1979), Bergstrand (1990), Deardorf (1998) and Helpman and Krugman (1985).

the gravity relationship might be consistent even with a very simple world economy with matching and no differences in productivity, endowments or preferences across countries.

Assume the world population N is distributed across $J + I$ countries, where J are labelled host and I source economies that differ in size and structure of their population. Each agent regardless of location and status has linear preferences and is endowed with x units of indivisible input normalized to zero, which can be used either for local production, or as an input into joint venture with a foreign partner. While local production technology transforms the normalized input into 1 unit of output, each of the participating parties within joint venture has to invest their whole endowment to produce $2a$, where $a > 1$ is a measure of match quality.[7]

The total N_j population in each host economy j consists of $\sum_i m_{ij}$ immigrants from source countries i and $N_j - \sum_i m_{ij}$ native agents, where m_{ij} equals a given immigrant population from i residing in j. Source economies i consist of native agents only. Native agents in i and j have to search in case they opt for foreign investment. During their random search for joint venture, native agents in j might meet foreign agents with a probability p_j. Immigrants in j coming from source countries i are identical to native agents, but they know identity of agents from source country i without having to search. Note that given the absence of search costs and the uniform match quality a, immigrants never choose to produce locally or to form a joint venture with agents from other than their source country i. Instead, they contact native agents in source economy i and set up joint venture. Native agents in i always accept, because $a > 1$ and the agents do not have to incur search costs.

The remaining populations in each country anticipate the choices of immigrants and of contacted native agents in source economies and select local production if and only if net expected profits exceed gains from a joint venture and/or uncontacted native agents in source i would not accept the potential offer. The participation constraints of native agents

[7] The present model assumes that $a > 1$ is a result of the combination of host country and source country's specific knowledge. Agents within one country or agents from two different host countries cannot form a joint venture.

in host country j are:[8]

$$\text{produce locally iff} \quad 1 > (1 - p_j) + p_j a$$

$$\text{search for joint venture iff } 1 \leq (1 - p_j) + p_j a \text{ and } 1 \leq (1 - p_i) + p_i a,$$

where p_j corresponds to

$$p_j = \frac{\sum^i \left[N_i - \sum^j m_{ij} \right]}{N_I} \min \left[1, \frac{N_I}{N_J} \right],$$

and p_i equals

$$p_i = \frac{\sum^j \left[N_j - \sum^i m_{ij} \right]}{N_J} \min \left[1, \frac{N_J}{N_I} \right].$$

The participation constraints of uncontacted native agents in i are the same except that p_i replaces p_j. Figure 1.1 outlines an example with world economy consisting of host country 1 and source country 2. The picture shows that immigrants m_{21} coming from source country 2 and residing in host country 1 match with native agents in 2 and set up joint ventures. The remaining native population $N_1 - m_{21}$ in country 1 and $N_2 - m_{21}$ in country 2 decide to either produce locally or to search for a foreign partner. Figure 1.1 represents a situation in which all agents try to form joint venture. Nonetheless, only a fraction in each of the two economies succeeds in finding a foreign partner, the rest producing locally.

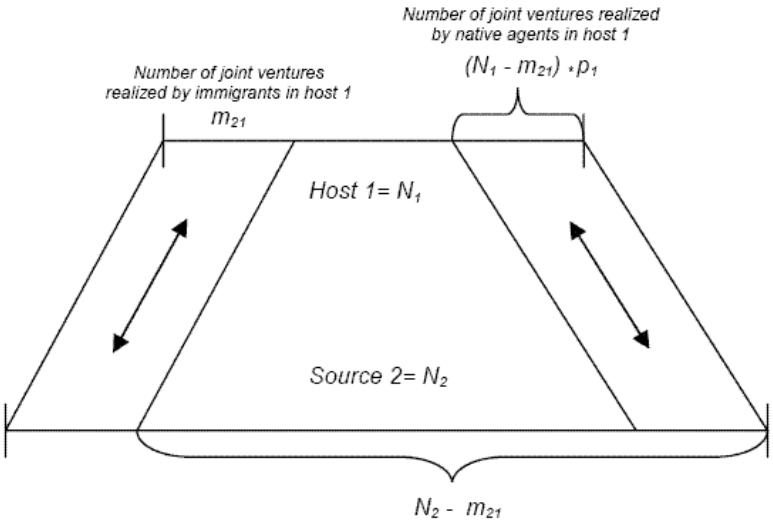
I take an approximation and assume the shares of overall immigrant populations in host countries and the size of immigrant communities with respect to their source country populations are sufficiently small, i.e., $h_j = \frac{\sum^i m_{ij}}{N_j} \to 0$, $\forall j$ and $d_i = \frac{\sum^j m_{ij}}{N_i} \to 0$, $\forall i, j$.[9] Then $p_j \to 1$, $p_i \to 1$ and country j's share in the aggregate output of all host countries equals

$$\frac{GDP_j}{GDP_J} = \frac{N_j \left[(1 - h_j) + a h_j + a \left(1 - h_j \right) p_j \right]}{\sum^j N_j \left[(1 - h_j) + a h_j + a \left(1 - h_j \right) p_j \right]} = \frac{N_j}{\sum^j N_j}, \tag{1.1}$$

[8] I assume both investors in joint venture play Nash bargaining solution and split the resulting joint surplus $2a$ equally.

[9] The average immigrant share in host countries $\frac{\sum^i m_{ij}}{N_j}$ in the sample is 0.026 and the average size of immigrants relative to source country populations $\frac{\sum^j m_{ij}}{N_i}$ equals 0.033.

Figure 1.1: Matching in world economy with one host and one source country.



where the terms in the brackets correspond to the contributions of local production, immigrant joint ventures, and joint ventures of native agents.

Similarly, a source country i's share in output of all source countries corresponds to

$$\frac{GDP_i}{GDP_I} = \frac{N_i \left[(1-d_i) + ad_i + a\left(1-d_i\right)p_i\right]}{\sum^i N_i \left[(1-d_i) + ad_i + a\left(1-d_i\right)p_i\right]} = \frac{N_i}{\sum^i N_i}, \tag{1.2}$$

For $N_J \leq N_I$ and using (1.1), trade volume T_{ij}^N generated by host j natives' joint ventures equals[10][11]

$$T_{ij}^N = aN_J \frac{GDP_i GDP_j}{GDP_I GDP_J} \left(1 - \frac{\sum_{j=1}^J m_{ij}}{N_i}\right)\left(1 - \frac{\sum_{i=1}^I m_{ij}}{N_j}\right) \tag{1.3}$$

and trade volume T_{ij}^I generated by the immigrants from i residing in j is

$$T_{ij}^I = aN_J \frac{m_{ij}}{N_j} \frac{GDP_j}{GDP_J}, \tag{1.4}$$

[10] The case $N_J > N_I$ does not change the line of argument.

[11] It might happen that the middle term in brackets and hence predicted trade can turn negative. The situation corresponds to a hypothetical country with its overseas diaspora larger than the country's domestic population. As all observations in the present sample are positive, I assume such a situation does not occur.

where use was made of (1.1). Summing the last two expressions, one obtains the relationship for bilateral trade:

$$T_{ij} = T_{ij}^N + T_{ij}^I = \tag{1.5}$$

$$= aN_J \frac{GDP_i GDP_j}{GDP_I GDP_J} \left[\left(1 - \frac{\sum_{j=1}^{J} m_{ij}}{N_i} \right) \left(1 - \frac{\sum_{i=1}^{I} m_{ij}}{N_j} \right) + \frac{\frac{m_{ij}}{N_j}}{\frac{GDP_i}{GDP_I}} \right]. \tag{1.6}$$

Premultiplying by $\left(1 - \sum_{j=1}^{J} m_{ij}/N_i\right) \left(1 - \sum_{i=1}^{I} m_{ij}/N_j\right)$, taking logarithms and approximating $\ln(1+x) \sim x$ for x small, one obtains

$$\ln T_{ij} = \ln \left(aN_J \frac{GDP_i GDP_j}{GDP_I GDP_J} \right) - \frac{\sum_{j=1}^{J} m_{ij}}{N_i} - \frac{\sum_{i=1}^{I} m_{ij}}{N_j} + \phi_{ij} \frac{\frac{m_{ij}}{N_j}}{\frac{GDP_i}{GDP_I}}, \tag{1.7}$$

where

$$\phi_{ij} = \left(1 - \frac{\sum_{j=1}^{J} m_{ij}}{N_i} \right)^{-1} \left(1 - \frac{\sum_{i=1}^{I} m_{ij}}{N_j} \right)^{-1}$$

Finally, for the estimation purposes, I use the general version of (1.7):

$$\ln T_{ij} = b_0 + b_1 \ln GDP_i GDP_j + b_2 \frac{\sum_{j=1}^{J} m_{ij}}{N_i} + b_3 \frac{\sum_{i=1}^{I} m_{ij}}{N_j} + b_4 \frac{\frac{m_{ij}}{N_j}}{\frac{GDP_i}{GDP_I}} + b_5 \left(\frac{\frac{m_{ij}}{N_j}}{\frac{GDP_i}{GDP_I}} \right)^2$$

$$+ a'z + \alpha_j + \varepsilon_{ij}, \tag{1.8}$$

where $\ln T_{ij}$ corresponds to the natural logartihm of either exports or imports flowing between countries i and j.

The coefficients b_2 and b_3 indicate the indirect impact on *native*-driven bilateral trade between i and j that has been caused by immigrants' choice to trade with their source countries (see Equation 1.3), and are expected to be equal to minus one. The coefficient b_2 captures the effect on bilateral trade of source country diasporas located in other countries. The larger is the overall diaspora relative to the population of country of origin, the lower are the chances of host's *native* agents to find a match in concerned source country. Since b_2 relates to the population of a source country N_i and approximates the potentially negative impact on *native*-driven bilateral trade, in the following I call the relative size of diaspora $\frac{\sum_{j=1}^{J} m_{ij}}{N_i}$ the source country trade diversion term.

The coefficient b_3 captures the role of the overall share of immigrants in host j's population. Using the logic of the present empirical model, the more immigrants in a given host country match with agents in their countries of origin, the lower will be the probability of host's *native* agents to trade with a given trade partner. b_3 connects to the population of a host country N_j and similarly to the coefficient b_2 estimates the negative impact on *native*-driven bilateral trade. For these reasons I label the overall immigrant share in host j's population $\frac{\sum_{i=1}^{I} m_{ij}}{N_j}$ the host country trade diversion term.

Being an empirical counterpart of ϕ_{ij} in Equation 1.7, the coefficient b_4 reflects the direct trade contribution by immigrants from i located in j (see also Equation 1.4), and is expected to be positive.[12] Note that the corresponding term differs from the commonly used natural logarithm of immigrant stock[13] as well as other commonly employed measures of immigrant links and has the source country GDP_i in its denominator. While the natural logarithm formulation remains intuitively appealing and easy to interpret, it suffers from the lack of theoretical justification and zero predicted trade in the absence of immigrant networks. The immigrant terms derived within the present framework rely on an explicit model and emphasize relative rather than absolute measures of immigrant networks. As the coefficient b_4 reflects direct positive immigrant effects on trade, the corresponding term will be referred to as the trade creation term.

The emphasis on the relative number of immigrants derives from the model's assumptions of different populations across host and source countries, and the possibility to form joint venture with one agent only. Other things equal, the higher the fraction of host j's population represented by immigrants from i, the more joint ventures will be formed with agents in immigrants' source country i. Similarly, the larger is the economy of immigrants' country of origin, the higher will be agent j's probability of forming a joint venture with an agent from i, and the smaller will be immigrants' relative contribution to bilateral trade

[12] I assume the parameter ϕ_{ij} in Equation 1.7 to be constant across all pairs ij, i.e., $\phi_{ij} = \phi$. This certainly leads to a measurement error in the right-hand-side variable and a subsequent coefficient bias towards zero. On the other hand, the estimates explicitly accounting for $\left(1 - \sum_{j=1}^{J} m_{ij}/N_i\right)\left(1 - \sum_{i=1}^{I} m_{ij}/N_j\right)$ practically do not differ from the simplifed output with ϕ replacing ϕ_{ij}. The estimation results are available upon request.

[13] The natural logarithms have been used by e.g., Head and Ries (1998), Girma and Yu (2002) and Heerander and Saavedra (2006).

between i and j. The relationship between the absolute measures of immigrant links (such as the natural logarithm of immigrant stock), and the relative measure derived within the present framework will be discussed in Section 1.5.

Larger immigrant communities might tend to trade with each other instead of trading with their country of origin. To accomodate possible trade substitution, I add a quadratic approximation of the trade creation term with a negative expected sign of the coefficient b_5.[14] It should be remembered that in order to obtain the net effect of immigrants on bilateral trade between i and j, one should take into account both the trade-creation and trade-divertion effects of immigrant links.

z is $k \times 1$ vector of additional explanatory variables that vary either at the level of host j, source i, or at the level of country pairs ij. The former two groups include export shares in the GDP as a proxy for openess and institutional quality measures. The country-pair ij variables consist of the natural logarithm of distance, the product of GDP's per capita (expressed in natural logarithms) and dummies for shared colonial past and common language.

Colonial past and common language are often used as proxies for informal trade barriers. As for the colonial dummy, entrepreneurs from former colonial power, e.g., traders or specialized information agencies, might have extended business links from colonial times and thus possess valuable information and contacts. Furthermore, a former colonial power often played a key role in the design of local institutions in source country. The resulting institutional proximity would then translate into relatively lower demands on the understanding of the local market environment. A common language dummy should capture lower search costs for all agents using the same mother language and again facilitate matching process.

I divide the colony and language dummy variables by the GDP of a source country i, so that the resulting variables are non-increasing in the source economy's size. The expected signs of coefficient estimates for both variables are positive, resulting in larger predicted trade impact of common language and/or colonial past for smaller source economies. In-

[14] While the immigrant ties introduced by the present matching model shift the geographical pattern of trade, they should not influence the total volume of trade between a given host country and its trading partners. If one is willing to accept the assumption of a more efficient matching technology by immigrant joint ventures, the total trade effect would be positive.

tuitively, had all the trading partners shared colonial past (or language), the relative trade enhancing role of both would be zero. As the trading partner gets smaller in size, however, their relevance should tend to increase as a smaller open economy tends to be relatively more sensitive to trade barriers.

The error term has two components. ε_{ij} is a random term specific to individual country pairs ij and independent of other errors. α_j correponds to an error term that is correlated within host country j. If common group errors α_j have not been controlled for, the resulting standard error estimates might suffer from a notable downward bias (Moulton, 1986). I allow for a more general covariance structure and heteroscedasticity of α_j as proposed by Liang and Zeger (1986). As an alternative form of adjustment for common-group errors, I employ the 2-step estimation approach by Donald and Lang (2007) that generates more reliable estimates in case the number of groups is small.

The advantage of the latter procedure is its robustness in case the number of groups is small, so that researchers do not have to rely on the asymptotics along the number of groups necessary for the `cluster` command.

The two-step procedure starts with the OLS regression of the natural logarithm of bilateral exports/imports on variables differing across country pairs ij, country j- and i-fixed effects:

$$\text{1st stage: } \ln T_{ij} = b_0 \ln GDP_i GDP_j + \mathbf{x}'_{ij} b + a_0 \frac{\frac{m_{ij}}{N_j}}{\frac{GDP_i}{GDP_I}} + d'_{ij} + \varepsilon_{ij},$$

where the term following coefficient a_0 is the newly added share in host population of a given immigrant stock relative to the country of origin GDP_i.

In the second stage, I run feasible GLS with the relevant fixed effect coefficient estimates from the first stage as dependent variables and country i- (or j-) level variables on the right-hand side of the regression:

$$\text{2nd stage:} \quad \hat{d}_j = c(J) + \mathbf{x}'_j z + a_1 \frac{\sum_{i=1}^{I} m_{ij}}{N_j} + u_j, \; \hat{var}(u_j) = \hat{\sigma}^2 I(J) + \Sigma_{\hat{d}_j} \tag{1.9}$$

$$\text{and} \quad \hat{d}_i = c(I) + \mathbf{x}'_i w + a_2 \frac{\sum_{j=1}^{J} m_{ij}}{N_i} + u_i, \; \hat{var}(u_i) = \hat{\sigma}^2 I(I) + \Sigma_{\hat{d}_i}, \tag{1.10}$$

where Equation 1.9 estimates the coefficient on the host trade diversion term, Equation 1.10 estimates the coefficient on the source trade diversion term, and $\hat{var}(u_{\{j,i\}})$ stands for the variance of the respective 2nd-stage error term $u_{\{j,i\}}$. The vectors of country-specific terms $\mathbf{x}_i$ and $\mathbf{x}_j$ include the natural logartihms of real GDP and GDP per capita, the corresponding relative measure, share of exports in GDP, and the Heritage Foundation measure of institutional quality. $\frac{\sum_{i=1}^{I} m_{ij}}{N_j}$ stands for the population share of the overall immigrant stock (regardless of origin) within a given host country, $\frac{\sum_{j=1}^{J} m_{ij}}{N_i}$ represents the size of the overseas diaspora relative to the population in diaspora's country of origin. The GLS procedure uses fixed effect covariance estimates $\Sigma_{\{\hat{d}_j,\hat{d}_i\}}$ from the 1st stage for the construction of weights.[15]

1.4 Data

1.4.1 Immigrants

The cross-country information on the numbers of foreign-born persons over 15 years of age for 19 OECD member countries was retrieved from the OECD Statistics Portal on Demography and Population.[16] The main advantage of the present dataset rests in the variation at both the source *and* host country levels, which permits the estimation of trade-diversion effects. This was not possible in empirical studies focusing exclusively on a single host country.

The OECD data represents the first attempt to create a coherent dataset covering several host countries. The data have been drawn from population registers, residence or work permits, surveys and censuses taking place usually every 5 or 10 years. Due to different timing of censuses, the reference year varies between 1999 and 2002, depending on the specific country. Some OECD countries had to be dropped due to large proportions of

[15] For more details see Donald and Lang (2007), p. 224-225.

[16] Other studies on trade and migration using the OECD migration data include working papers by Dolman(2007), and Felbemayr and Toubal (2008).

foreign-born population with the unknown country of origin.[17] For host countries that were left in the sample the values of unknown foreign-born did not exceed 2%. These unknown populations have been distributed using country-of-origin shares in the total number of foreign born in a concerned host country. The new entities on territories of former Soviet Union and Yugoslavia have not been included due to differences in aggregation across host countries.[18]

The figures for Germany were listed only by broad source regions instead of countries. For the Netherlands, the data included only the number of all foreign born instead of those over 15 years of age. I replaced the data for Germany with figures from the Federal Statistical Office of Germany and, since the available data for both Germany and the Netherlands covered total foreign-born population only, I adjusted them by the shares of immigrants over 15 years of age in the total foreign-born population by source country as recorded for comparatively open Belgium. As part of the sensitivity analysis in Section 1.6, I drop the two host countries and run all regressions to check for the robustness of results.

1.4.2 Trade and remaining data

The data on bilateral exports and imports have been obtained from the Direction of Trade Statistics compiled by the International Monetary Fund. Trade volumes of especially smaller developing countries can vary substantially from year to year. For that reason five-year averages of real trade volumes over 1999-2003 have been chosen instead of using the data for a single year only. The five-year averages reduce an additional problem with zero observed exports and imports.[19] Finally, since the focus of the present study is immigrant networks

[17] These include Australia (16.2% unknown), Czech Republic (28.2%), Mexico (41.9%), New Zealand (16.1%), Poland (41.1%), Slovak Republic (9.3%), and Switzerland (14.7%). The borderline cases, Finland (3.8%) and Denmark (6.7%) were left in the sample.

[18] Turkey, the last OECD member in the sample, is in many respects closer to a typical developing country and its membership in the OECD owes more to strategic considerations rather than the level of economic development. Nonetheless, despite being left out from the main regressions, the results with Turkey as a host country remain both quantitatively and statistically similar to the main regression results listed in Table 1.2. Results including Turkey can be provided upon request.

[19] While 23 out of the total 1,684 sample observations on exports from host countries (i.e. roughly 1.4 percent) reported zero trade in at least one year over the 1999-2003 period, none of them did so for the whole five year period. For imports to host countries the figures equalled 57 (i.e., 3.4 percent) and 18 respectively. The tentative random-effect tobit estimates using the `xttobit` command in Stata produced

and the home links of overseas Chinese communities quite likely cover both China and Hong Kong, the two entities are treated as a single country.

Table 1.1: Summary statistics, n=1,684.

Variable	Mean	Standard deviation	Minimum	Maximum
Exports_{ij}	353.49	2,156.04	0.001	62,824.19
Imports_{ij}	324.23	1,780.94	0	48,734.65
Host GDP^*_j	1,164,183	2,101,759	77,757.52	9,012,508
Source GDP^*_i	46,081.42	128,490.4	575.76	1,027,513
Host GDP/capita_j	21,786.83	7,720.79	9,306.51	36,720.11
Source GDP/capita_i	3,034.50	4,972.48	100,78	29,185.42
$\text{Immigrant stock}_{ij}$	12,365.68	65,698.51	0	8,359,180
$\text{Trade creation}_{ij}$	0.44	1.55	0	12.59
Host diversion_j	0.02	0.02	0.002	0.07
$\text{Source diversion}_i$	0.03	0.06	0.01	0.33
Distance_{ij}	7,300.51	3,487.39	375	19,594
$\text{Export share host}_j$	0.42	0.22	0.11	0.98
$\text{Export share source}_i$	0.19	0.14	0.03	0.76
$\text{Institutional quality host}_j$	73.19	6.39	58.53	81.01
$\text{Institutional quality source}_i$	44.58	13.98	15.09	78.5
$\text{Shared colonial past}_{ij}/\text{GDP}_i$	0.01	0.02	0	0.15
$\text{Common language}_{ij}/\text{GDP}_i$	0.01	0.03	0	0.16

*in millions of 1998 U.S. dollars

The remaining variables, common language and a measure of circle distance between capital cities were retrieved from Jon Haveman's web page[20] and added manually if values were missing. A dummy for common colonial past was constructed from histories of each colonial power detailed in *Wikipedia.* The dummy equals one if the country in question was either a colony or protectorate after 1945. As a measure of institutional quality I use the five-year averages for countries i and j of the restricted Index of Economic Freedom produced by the Heritage Foundation. The Index of Economic Freedom over 1999-2003

coefficient estimates that were qualitatively and quantitatively very similar to results in Table 1.2. These can be provided upon request. The export figures are reported f.o.b., the import volumes are c.i.f.

[20] Jon Haveman's web page can be found at http://www.macalester.edu/research/economics/PAGE/HAVEMAN/Trade.Resources/TradeData.html#Gravity.

compiles evaluations of nine areas essential for functioning market environment. The restricted version includes only those areas that most closely relate to institutional quality in trade context – corruption, non-tariff trade barriers, rule of law and regulatory burden – and drops inflation, fiscal burden, restrictions on banks, labor regulation and government intervention. Finally, figures on population, GDP, GDP per capita and export shares in hosts' GDP were collected from the World Development Indicators published by the World Bank. To avoid the potential endogeneity problem of the GDP variables, I use GDP and GDP per capita figures from 1998 as proxies. The main sample consists of 19 host countries and 90 source countries, generating an unbalanced panel of 1,684 observations. Table 1.1 presents the summary statistics for key variables.

1.5 Empirical results

The estimated coefficients for the trade creation and diversion terms are reported in Table 1.2.[21] The first columns for both exports and imports display the estimates from the benchmark OLS regression with regional dummies for host and source countries and clustering by host country. In the following columns I present the results of the Donald and Lang (2007)'s 2-step procedure, where the trade creation estimates have been obtained in the 1st stage. Columns (2) and (5) contain the 2nd stage estimates of the source trade diversion for exports and imports. Columns (3) and (6) report the estimated coefficients of the host country trade diversion term.

1.5.1 Trade creation

Regardless of specification and direction of trade, the estimated coefficients on trade creation are consistently positive, relatively stable, and significantly different from zero at least

[21] For a complete list of all explanatory variables and estimation results see Table A1.2 in Appendix A1. For Liang and Zeger (1986)'s OLS estimation with clustering, Equation 1.8 has been supplied with regional dummies to control for possible correlation of explanatory variables with unobserved region characteristics. The five regional dummies for host countries correspond to North America, East Asia, Northern Europe, Central Europe, and Southern Europe, the UK and Ireland representing the benchmark economies. For source countries the regions are Northern Africa and Arab states, Subsaharan Africa, South Asia and South-East Asia, with Latin American countries being the baseline economies.

Table 1.2: Main regression results, dependent variables real exports and imports 1999-2003.

	Real exports 1999-2003		
	(1) OLS regional dummies i and j	(2) 2-step estimates for source i	(3) 2-step estimates for host j
Trade creation$_{ij}$	0.085***	0.056***	0.056***
	(0.021)	(0.017)	(0.017)
Trade creation$_{ij}^2$	-0.184***	-0.001	-0.001
	(0.056)	(0.001)	(0.001)
Source diversion$_i$	-0.117	-2.486***	-
	(0.476)	(0.939)	
Host diversion$_j$	-9.099	-	-6.911
	(6.036)		(4.105)
R^2	0.852	0.670	0.595
N	1,577	1,684	1,684
	Real imports 1999-2003		
	(4) OLS regional dummies i and j	(5) 2-step estimates for source i	(6) 2-step estimates for host j
Trade creation$_{ij}$	0.073***	0.044**	0.044**
	(0.017)	(0.018)	(0.018)
Trade creation$_{ij}^2$	-0.223***	-0.001	-0.001
	(0.06)	(0.001)	(0.001)
Source diversion$_i$	-1.475***	-1.654*	-
	(0.5)	(0.965)	
Host diversion$_j$	-10.408**	-	-4.929
	(3.999)		(11.235)
R^2	0.856	0.496	0.600
N	1,577	1,684	1,684

Notes: The OLS with regional dummies account for clustering by host countries.
***,**,* - Significant at 1%, 5%, and 10% respectively. Standard errors in parentheses.

at the 5 percent significance level. The marginal trade creation impact of a 10-percent increase in immigrant stock m_{ij} depends on the level of m_{ij}, population of host j, and the output GDP_i of source country i (see Equation 1.8). This dependance differs from the studies using natural logarithm of immigrant stock, where the marginal impact is fully described by the estimated regression coefficient. Table 1.3 provides examples of the implied export and import creation resulting from a 10 percent boost of immigrant stock for country pairs ij that have different levels of GDP_i, but are otherwise comparable in terms of both m_{ij} and N_j. The estimates suggest that for source countries with smaller GDP_i levels, a given number of immigrants connects to a relatively larger part of source economy. Due to the gravity relationship linking output with trade, these connections then translate into relatively higher shares in trade between host j and source i.

The implied marginal trade creation effects lie within the interval $\langle 0, 1\rangle$ in more than

91,5 percent of country pairs in the sample and generally fall short of marginal effects reported by studies using the natural logarithm of immigrant stock.[22] Apart from the measurement error of the trade creation term discussed in Section 1.3, lower marginal effects can be partly explained by the cross-sectional nature of the sample and low immigrant levels m_{ij} in a number of host countries. Focusing on the trade effect of a 10-percent increase in immigrant stock m_{ij} and holding other things constant, country pairs ij with smaller immigrant populations generate lower marginal trade effects as compared to observations with more numerous immigrant stocks. The smaller marginal impacts (as compared to earlier empirical studies) nonetheless apply to all host economies and pairs ij, regardless of immigrants' population size m_{ij}.

Table 1.3: Examples of trade creation in response to a 10 percent boost in immigrant stock for different host and source countries.

Host j	Source i	GDP_i's % share in world GDP	Immigrant population m_{ij}	Exports creation in %	Imports creation in %
Canada	Bangladesh	0.14	19,515	0.24	0.19
	Tanzania	0.03	19,525	1.19	0.93
France	China	3.68	32,913	0.01	0.01
	Cameroon	0.03	33,125	0.95	0.75
Netherlands	Pakistan	0.24	10,052	0.15	0.11
	Ghana	0.16	10,311	2.2	1.73
UK	South Africa	0.44	124,658	0.27	0.21
	Kenya	0.044	125,491	2.70	2.12
USA	Panama	0.039	132,975	0.68	0.53
	Cambodia	0.11	133,240	2.46	1.93

[22] For example, a static version of the model by Girma and Yu (2002) produces a 1.6 percent increase in UK exports and a 1 percent rise in UK imports from non-Commonwealth countries. Head and Ries (1998) find a 1-1.3 percent boost for Canadian bilateral exports and 3.1-3.9 percent for imports. The study on U.S. exports by Herander and Saavedra (2005) reports 1.6 percent.

Another and potentially more important explanation relates to the role of source country GDP_i. Immigrants from source countries with lower levels of GDP_i trade relatively more than their counterparts from larger source economies. This is intuitive if trade is proportional to GDP's of trading parties (as in model from Section 1.3) and immigrants' trading technology has constant returns to scale, since then a given number of better-informed immigrants will generate a lower fraction of the overall trade volume.

The lower magnitude of the trade-creation effects can be also explained by the discrepancy between the estimated and theoretical coefficient values. The model from Section 1.3 predicts the trade creation coefficient b_4 to exceed one for immigrant shares sufficiently small. This could change once some of the assumptions get relaxed. While immigrants are more likely to understand the source i's environment and business practices as compared to native agents from host j, they could lack the knowledge necessary for exports of more sophisticated and value added products. For example, Turkish traders in Germany might specialize in trading of used cars or ethnic goods instead of power engines. Relatively less productive matching (as compared to matches initiated by host j's natives) might be rational especially if immigrants' outside options in host j are not sufficiently profitable. The outside options of immigrants might be thought of as a function of profficiency in host-country language, legal status, and/or experience with host's labor market. Given this assumption, they are likely to be lower than the opportunities of native agents.[23] Sectors that have some bearing to immigrants' source country thus could provide one of few opportunities to employ immigrants' human capital gainfully, even though the ultimate contribution to trade might be relatively lower than that of native agents.

Finally, immigrant networks could operate across a larger number of countries. In such a case, the matching mechanism in model from Section 1.3 might be too restrictive and low trade creation estimates would be capturing only a fraction of the total effect.

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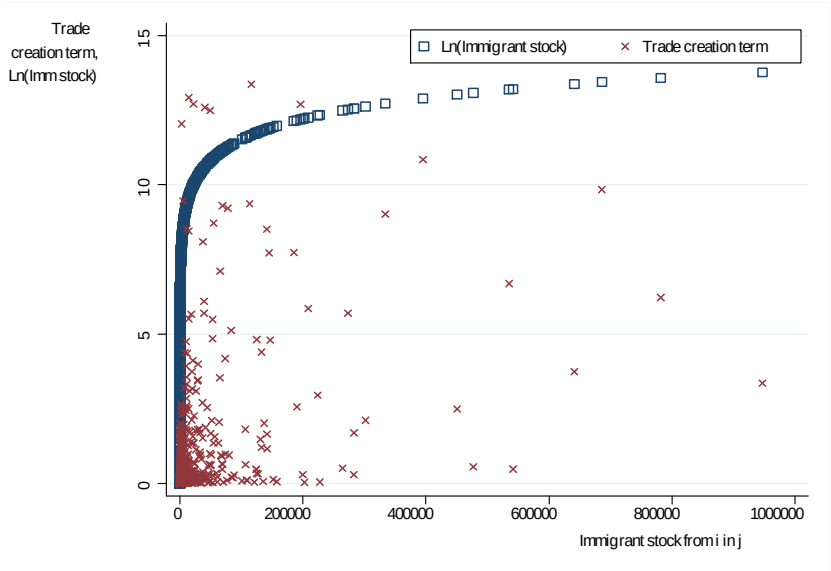
[23] The empirical study on Izraeli labor market by Friedberg (2000) found that immigrants' education obtained abroad is significantly less rewarded than education received locally. Similarly, Chiswick and Miller (1995) focus on the impact of language profficiency on immigrants' earnings in Australia and three other countries (the USA, Canada, and Israel), and show that higher fluency in host's language significantly increases immigrants' earnings.

Trade creation term vs. natural logarithm of immigrant stock

In this section I focus on the relative performance of the trade creation term and the commonly employed level measures such as the natural logarithm of immigrant stock. Figure

Figure 1.2: Immigrant stock, its natural logarithm, and trade creation term.



1.2 illustrates the sample relationship between the absolute immigrant stock m_{ij}, its natural logarithm $\ln(m_{ij})$, and the trade creation variable derived in Section 1.3.

The figure indicates that the trade creation term is only weakly related to the natural logarithm of immigrant stock.[24] Table 1.4 reports the estimates from regressions with host j and source i fixed effects and clustering by host country. The regressions employ both specifications of the immigrant variable, first separately and then simultaneously.

The coefficient estimates from the specification with natural logarithm in columns (2) and (5) resemble results from the previous studies. For the present dataset, a 10 percent increase in the immigrant stock leads on average to a 1.06 percent boost of exports from, and a 1.13 percent increase in imports to the host country. The natural logarithm specification

[24] The correlation coefficient between the trade creation term and the natural logarithm of immigrant stock equals 0.126

of the immigrant variable, however, suffers from the ignorance of trade partner's economic size and immigrants' share in host j's population.

Figure 1.3 summarizes the differences between the two specifications in predicted bilateral export increases following the 10-percent rise of immigrant population m_{ij} in host j. The horizontal line indicates the marginal effect obtained from the natural logarithm specification in Column 2 - i.e., the value of the coefficient on $Ln(Imm\ stock)_{ij}$, multiplied by 10. The implied effect from the natural logarithm specification thus remains the same

Table 1.4: Trade creation term vs natural logarithm of immigrant stock, fixed effect estimates.

	Real exports 1999-2003			Real imports 1999-2003		
	(1)	(2)	(3)	(4)	(5)	(6)
Trade creation$_{ij}$	0.056***	-	0.02*	0.044**	-	0.025*
	(0.017)		(0.01)	(0.018)		(0.013)
Trade creation$^2_{ij}$	-0.001	-	-0.035	-0.001	-	-0.049
	(0.001)		(0.038)	(0.001)		(0.047)
Ln(Imm stock)$_{ij}$	-	0.106***	0.092***	-	0.113***	0.095***
		(0.02)	(0.021)		(0.024)	(0.025)
R^2	0.910	0.911	0.912	0.906	0.906	0.908
N	1,684	1,684	1,684	1,684	1,684	1,684

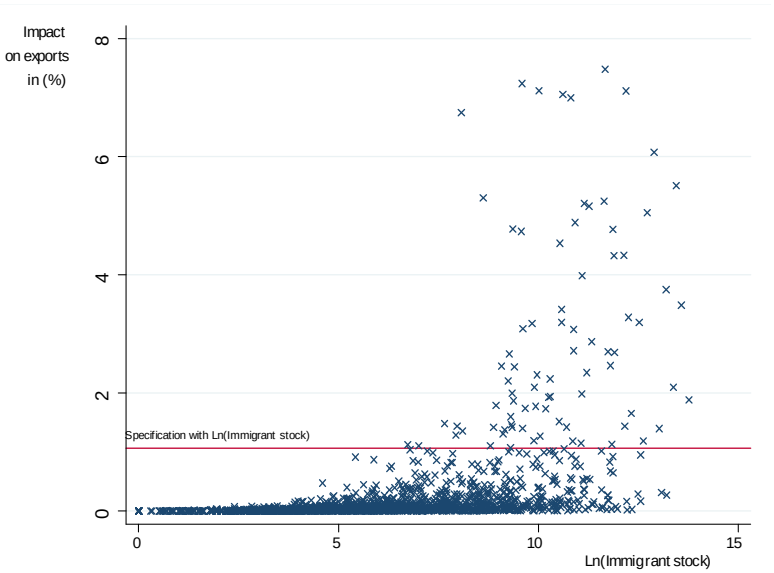
Note: All estimates account for clustering by host countries. Standard errors in parentheses. ***,**,* - Significant at 1%, 5%, and 10% respectively.

regardless of the actual size of the immigrant community m_{ij}. In case of the calculated marginal impacts obtained from the specification derived in Section 1.3 using results listed in Column (1) in Table 1.4, the trade increases center mostly on larger immigrant populations, leaving smaller communities m_{ij} without any notable effect on trade.

Finally, Columns (3) and (6) in Table 1.4 report the results from the estimation including simultaneously trade creation term and the natural logarithm of immigrant stock.[25] One can observe that despite a drop in the levels of the trade creation term, the combination of relative and absolute measures preserves the statistical significance of both. The levels

[25] The 2nd stage estimates of host and source trade diversion coefficients did not change substantially and can be provided to interested reader.

Figure 1.3: Marginal trade creation effects of a 10-percent increase in m_{ij}, matching model predictions, real exports 1999-2003.



and joint significance of the relative and absolute terms suggest that despite the significance of the trade creation term, and its account for trade partner's output GDP_i and relative size of immigrant population $\frac{m_{ij}}{N_j}$, the model from Section 1.3 captures only part of the trade-immigration story. The next subsection focuses on the trade diversion estimates.

1.5.2 Trade diversion

Regardless of specification and direction of trade, the host and source trade diversion terms in 1.2 have expected signs. Focusing on the estimates obtained through Donald and Lang (2007)'s 2-step procedure, the source trade diversion terms differ from zero at least at 10-percent probability level, and all trade diversion coefficients are negative and not statistically different from minus one as predicted by the model from Section 1.3. A one-percentage-point increase in the size of the total immigrant community $\sum_{j=1}^{J} m_{ij}$ relative to the source country i's population would result in a decrease in its *total* exports by roughly 2.5 percent and its *total* imports by 1.7 percent on average. The host diversion estimate is statistically

not different from zero.

Figures 1.4 and 1.5 present the net overall effect on trade of host and source countries, using the coefficient estimates from the 2-step procedure by Donald and Lang (2007) that included the natural logarithm of immigrant stock and trade creation and diversion measures derived in Section 1.3.[26] Each figure provides an answer to one of two simple questions. 1) Do immigrant communities located in a given host j facilitate aggregate trade between host j and immigrants' countries of origin? 2) Do source countries with larger shares of population located in advanced OECD economies on aggregate benefit from immigrant-driven trade links?

To answer the first question, I consider the implied marginal impact on the sum of exports and imports of a balanced 10-percent increase across total immigrant population $\sum_{i=1}^{I} m_{ij}$ for a given host j, holding total population constant. For the second question, I employ the same proportional increase of a given source i's natives located in OECD countries $\sum_{j=1}^{J} m_{ij}$, again fixing source i's population N_i. Figure 1.4 presents the predicted impact on the sum of exports and imports for 19 OECD host countries in the sample. Present results are consistent with the positive role of immigrant links found by previous studies, with Austria being the only OECD country with negative predicted impact of immigrants on trade. The positive role of immigrant links related to information provision, informal contract enforcement and preferences for source-country products thus seems to dominate the potential losses due to associated shifts in trade of host countries.

A similar conclusion holds for source countries and their populations located in OECD host countries. 71 out of 90 source economies show positive marginal impact of immigrant links on the economies' total trade with OECD hosts. The marginal impact on trade on average declines with rising shares of source i's population located in OECD host countries. Since the trade creation term does not change substantially with rising shares of source i's total overseas population, the trade diversion channel gradually gains in importance. The net effect of immigrants on trade might even turn negative in case the productivity of

[26] I did not include host trade diversion term in the computations of net trade effects, given that it was not statistically different from zero. Net trade effects on exports and imports for individual host and source countries can be found in Table A1.1 in Appendix A1.

Figure 1.4: Host j's aggregate trade with source countries and 10% increase in total immigrant stock.

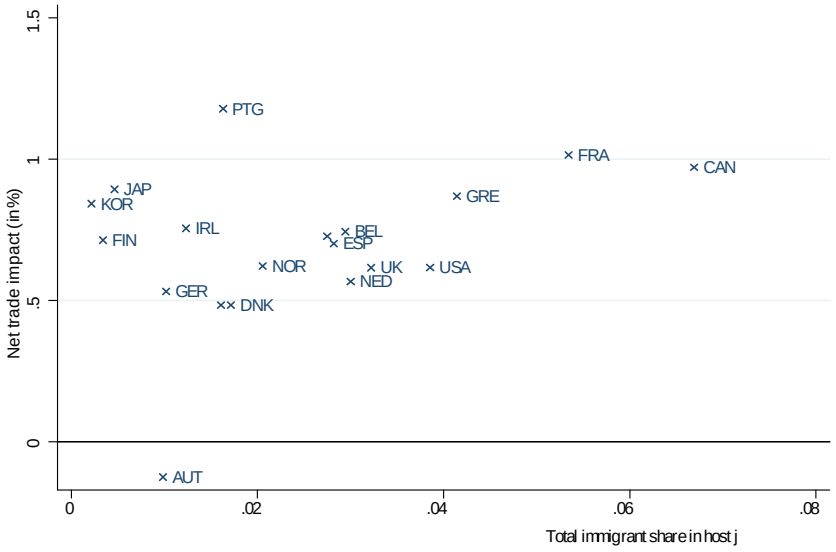
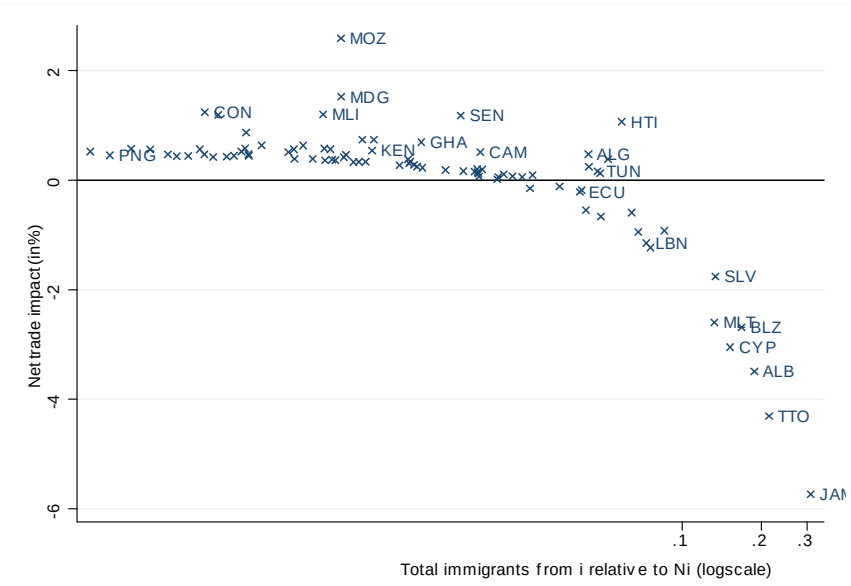


Figure 1.5: Source i's aggregate trade with OECD countries and 10% increase in total immigrant stock.



matches between immigrants and natives from source i falls short of productive matches forgone by host j's native agents. The next section focuses on the robustness of the estimated results.

1.6 Sensitivity analysis

1.6.1 Relative size of source markets, large immigrant stocks and adjustments in migration data

The model and econometric specification in Section 1.3 assume the trade creation coefficient to be identical across all observations, and the only country-pair ij variation in estimated trade creation effects to be driven by differences across immigrant stocks m_{ij}, host populations N_j, and/or source countries' GDP_i. With larger immigrant share $\frac{m_{ij}}{N_j}$ relatively to source-country GDP_i, immigrant networks might face decreasing number of profitable trading opportunities or tougher competition between individual network participants, which translate into lower profit margins. The trade creation coefficient would then likely vary across different country groups.

To evaluate this hypothesis, I construct two additional variables *Trade creation large*$_{ij}$ and *Ln(Imm stock large*$_{ij}$*)*, which are equal to the values of *Trade creation*$_{ij}$ and *Ln(Imm stock*$_{ij}$*)* in case *Trade creation*$_{ij} > 1$, and zero otherwise. These variables should capture trade impact of immigration for country pairs with large immigrant communities m_{ij} (in terms of host j's population) relatively to market size in country of origin i.[27] I then run the fixed effects regression allowing for clustering by host country and compare the obtained estimates with previous results. Table 1.5 presents the regression output.

The estimates show that given the use of the natural logarithm of immigrant stock, immigrants' contribution to trade between countries with relatively large immigrant communities in host j combined with small source-country i markets is no different from others. The situation becomes radically different once trade creation measure from Section 1.3 is

[27] The 142 out of 1,684 observations having trade-creation values above one consist mostly of trade partners with former colonial relationship (38 out of 53 colonial pairs in the sample), or poorer/small economies with disproportionately large overseas diasporas.

Table 1.5: Estimates distinguishing source countries with relatively large immigrant communities, i.e. *Trade creation*$_{ij} > 1$.

	Real exports 1999-2003			Real imports 1999-2003		
	(1)	(2)	(3)	(4)	(5)	(6)
Trade creation$_{ij}$	0.607***	-	0.409***	0.522***	-	0.391**
	(0.085)		(0.133)	(0.101)		(0.141)
Trade creation large$_{ij}$	-0.545***	-	-0.427***	-0.473***	-	-0.435***
	(0.08)		(0.129)	(0.09)		(0.136)
Ln(Imm stock)$_{ij}$	-	0.128***	0.096***	-	0.117***	0.089***
		(0.022)	(0.026)		(0.026)	(0.03)
Ln(Imm stock large)$_{ij}$	-	0.002	0.028**	-	0.008	0.04***
		(0.007)	(0.012)		(0.008)	(0.012)
R^2	0.911	0.913	0.914	0.900	0.903	0.904
N	1,684	1,684	1,684	1,684	1,684	1,684

Note: All estimates account for clustering by host countries. Standard errors in parentheses. ***,**,* - Significant at 1%, 5%, and 10% respectively.

employed. The coefficient estimates suggest that previous results from Table 1.2 in fact averaged the effects across country pairs with rather heterogeneous immigrant-trade links. The estimates maintain relatively high levels even after the simultaneous inclusion of both proxies for immigrant networks. A relatively small market size in country of origin i thus might prevent the full realization of benefits from immigrant-driven trade due to, e.g., more intensive competition among traders and resulting lower markups. This is not to say that concerned country pairs do not benefit from immigrants at all. The signs and statistical significance of the natural logarithm of immigrant stock in fact indicate that the absolute size of immigrant community matters even more for source countries with relatively small markets.[28] This result is consistent with the study by White (2007b), given that these source countries have relatively lower GDP per capita levels with respect to the rest of the sample.

Apart from the heterogeneity across the trade creation dimension, the estimated out-

[28] Figure A1.1 and Figure A1.2 in Appendix A1 show the net trade effects for a balanced 10-percent rise of immigrant stock, using the coefficient estimates from Columns (3) and (6) in Table 1.5 and the corresponding 2-stage estimates. Figure A1.3 presents trade creation predictions for a 10-percent increase in m_{ij} generated by the matching model from Section 1.3.

comes might be possibly driven by a handful of source countries with large immigrant populations. To account for this possibility, for each host j I drop five source countries (out of 90 non-OECD states) with the highest share in the overall immigrant stock. The levels and the statistical significance of the output, however, remain the same and can be provided upon request.

The discussion of the data on foreign-born persons in Section 1.4.1 mentioned the adjustments made to allow the inclusion of two key host countries, Germany and the Netherlands, into the sample. I run the whole estimation again and drop both host countries. Again, the results do not change substantially and the coefficients of interest remain highly significant.

1.6.2 Endogeneity of immigrant variables

The potential endogeneity of trade creation and diversion terms presents a might cast some doubt on the presented results. Over time, trade partners could learn about the living conditions in the other country and might pass the information further to potential migrants. Growing bilateral trade might likewise provide employment opportunities within the immigrant communities engaged in trading and thus reduce the *ex ante* uncertainty of agents considering migration.

While similar reasoning seems to be in line with the findings of the literature on international migration,[29] previous studies on immigrant networks have avoided the endogeneity issue. Indeed, finding a suitable instrument for the trade creation variable proves to be a daunting task. An exception is Javorcik et al. (2006)'s study of migrant networks' links and foreign direct investment. The authors use the natural logarithm of population density and the share of passport costs in real GDP per capita in the source country from McKenzie (2005), both identified as significant push factors for migration. For the present purposes, however, the correlations between the stock of immigrants, population density in the source country and passport costs seem to be negligible and in the former case even with the opposite sign.

[29] Focusing on the key pull and push factors shaping international migration decisions, Mayda (2005) finds a statistically significant positive effect of bilateral trade.

The correlations of the two IVs and immigrant levels when all expressed in natural logarithms are higher (0.14 and -0.21, respectively). Nonetheless, in the 2SLS regressions on exports and imports with the logartihms of both IVs and the natural logartihm of immigrant stock as the instrumented variable, the Shea partial R-squared failed to pass 0.01 for any combination of the instruments and joint F-tests in the first stage did not prove to be significant. The weakness of the available instruments thus precludes the quantification of the degree of endogeneity, at least in terms of the trade creation term.

Moving to the trade diversion terms, any significant endogeneity problem seems to be of minor relevance. The trade diversion variables relate the *total* immigrant shares in host and source population to *bilateral* trade. If bilateral trade between countries i and j promotes international migration between the two yet not between the host or source country and other economies, its contribution to the total immigration shares would be most likely negligible.[30] Moreover, the mutual relationship between the immigration shares and bilateral trade should be positive, whereas the trade diversion terms establish a *negative* link. Hence, if anything, the endogeneity would underestimate the impact of trade diversion by immigrant networks.

1.7 Concluding remarks

The study complements research on the links between immigrant networks and international trade. The trade creation measure derived within the matching framework points to the importance of the relative size of a given source country economy and immigrant network. I estimate the differential impact of immigrant links based on the GDP of their respective country of origin and find that the immigrant communities from relatively larger economies facilitate trade less than implied by existing studies.

While previous work focused largely on trade creation by immigrant networks, I also derive trade diversion measures capturing negative spillovers to host and source countries' total exports. While immigrant networks can mitigate some informal barriers to trade (e.g., the lack of information on foreign markets or ineffective contract enforcement institutions),

[30] The shares in the host population for the largest source country i do not exceed 2.1 percent.

the same networks' advantages coupled with the pervasive presence of informal trade barriers might lead to shifts in trade patterns previously known e.g., in the context of customs unions. By channeling trade to the immigrants' country of origin, potentially more profitable matches in other countries become lost. Using a dataset of 19 OECD countries, I find some empirical support for this hypothesis.

Apart from being statistically significant, the results are robust to the inclusion of commonly used level measures of immigrant stock. Nonetheless, more work needs to be done in the search for valid instruments that could better capture potential endogeneity concerns relating to the immigrant network variables. Future extensions that allow for heterogeneity in matching as well as country productivity could furthermore permit more precise estimates of both trade creation and diversion terms.

1.8 Appendix A1

Table A.1: Net trade effect of a 10-percent increase of total immigrant stock.

OECD host countries	Net trade effect (in %)	Source countries	Net trade effect (in %)
Austria	-0,12	Guinea	0,51
Belgium	0,74	Haiti	1,06
Canada	0,97	Honduras	-0,55
Denmark	0,48	Indonesia	0,44
Finland	0,71	Iran	0,28
France	1,01	Israel	-0,16
Germany	0,53	Jamaica	-5,73
Greece	0,87	Jordan	0,16
Ireland	0,76	Kenya	0,53
Italy	0,48	Kuwait	0,07
Japan	0,89	Lao P.Dem.R	0,13
Korea	0,84	Lebanon	-1,15
Netherlands	0,57	Madagascar	1,52
Norway	0,62	Malawi	0,56
Portugal	1,18	Malaysia	0,33
Spain	0,7	Mali	1,19
Sweden	0,73	Malta	-2,6
UK	0,62	Mauritania	0,74
USA	0,62	Mauritius	-0,6
Source countries	Net trade effect (in %)	Morocco	0,38
		Mozambique	2,58
Albania	-3,49	Nepal	0,47
Algeria	0,47	Nicaragua	0,24
Angola	0,12	Niger	0,52
Argentina	0,27	Nigeria	0,47
Bahrain	0,22	Oman	0,43
Bangladesh	0,45	Pakistan	0,42
Barbados	-6,99	Panama	-0,67
Belize	-2,69	Papua N.Guinea	0,45
Benin	0,63	Paraguay	0,39
Bolivia	0,34	Peru	0,15
Brazil	0,39	Philippines	0,06
Bulgaria	0,11	Qatar	0,33
Burkina Faso	0,56	Romania	0,07
Burundi	1,19	Rwanda	0,87
Cambodia	0,51	Saudi Arabia	0,42
Cameroon	0,56	Senegal	1,17
Chad	0,57	Seychelles	-1,24
Chile	0,18	South Africa	0,33
China	0,43	Sri Lanka	0,2
Colombia	0,15	Sudan	0,47
Congo	1,24	Syria	0,31
Costa Rica	0,06	Tanzania	0,52
CoteD′Ivoire	0,57	Thailand	0,36
Cyprus	-3,05	Togo	0,73
Dem.Rep.Congo	-0,12	Trinidad and Tbg	-4,31
Dominican Rep.	-0,93	Tunisia	0,16
Ecuador	-0,22	Uganda	0,63
Egypt	0,37	UAE	0,36
El Salvador	-1,76	Uruguay	0,02
Eq.Guinea	0,09	Venezuela	0,24
Ethiopia	0,57	Vietnam	0,19
Fiji	-0,95	Yemen	0,44
Gabon	0,38	Zambia	0,56
Ghana	0,69	Zimbabwe	0,46
Guatemala	-0,19		

Table A1.2: Regression results, dependent variable real exports and imports 1999-2003.

	Real exports 1999-2003			Real imports 1999-2003		
	(1) OLS regional dummies i and j	(2) 2-step estimates for source i	(3) 2-step estimates for host j	(4) OLS regional dummies i and j	(5) 2-step estimates for source i	(6) 2-step estimates for host j
$\ln(GDP_i GDP_j)$	1.105***	0.783***	0.783***	0.996***	0.754***	0.754***
	(0.03)	(0.020)	(0.020)	(0.031)	(0.021)	(0.021)
$\ln(GDPcap_i GDPcap_j)$	-0.047	-0.203***	-0.203***	-0.013	-0.183***	-0.183***
	(0.044)	(0.035)	(0.035)	(0.044)	(0.036)	(0.036)
Source diversion$_i$	-0.117	-2.486***	-	0.073	-2.318**	-
	(0.476)	(0.939)		(0.432)	(0.973)	
Host diversion$_j$	-9.099	-	-6.911	-7.254	-	-4.929
	(6.036)		(4.105)	(5.690)		(11.235)
Trade creation$_{ij}$	0.085***	0.056***	0.056***	0.090***	0.044**	0.044**
	(0.021)	(0.017)	(0.017)	(0.024)	(0.018)	(0.018)
Trade creation$_{ij}^2$	-0.184***	-0.001	-0.001	-0.001*	-0.001	-0.001
	(0.056)	(0.001)	(0.001)	(0.0004)	(0.001)	(0.001)
Distance$_{ij}$	-0.669***	-1.080***	-1.080***	-0.779***	-1.153***	-1.153***
	(0.068)	(0.047)	(0.047)	(0.079)	(0.049)	(0.049)
Colony$_{ij}$	7.234**	5.133***	5.133***	7.211**	5.882***	5.882***
	(3.202)	(1.051)	(1.051)	(1.580)	(1.110)	(1.110)
Language$_{ij}$	4.565***	5.591***	5.591***	5.019***	5.081***	5.081***
	(1.455)	(0.725)	(0.725)	(1.742)	(0.766)	(0.766)
HF Index host$_j$	-0.024*	-	-0.015	-0.030	-	0.001
	(0.014)		(0.019)	(0.027)		(0.052)
HF Index source$_i$	0.012***	0.030***	-	0.013***	0.030***	-
	(0.002)	(0.004)		(0.002)	(0.004)	
Export share host$_j$	1.647***	-	2.773***	1.651***	-	0.601
	(0.351)		(0.233)	(0.295)		(0.688)
Export share$_i$	2.586***	1.786***	-	1.730***	1.246***	-
	(0.215)	(0.323)		(0.130)	(0.335)	
Constant	-10.016***	2.046	1.82	-11.505***	-2.320***	0.463
	(0.625)	(2.53)	(2.521)	(2.341)	(0.152)	(4.221)
R^2	0.852	0.670	0.595	0.856	0.496	0.600
N	1,577	1,684	1,684	1,577	1,684	1,684

Notes: The OLS with regional dummies account for clustering by host countries.
***,**,* - Significant at 1%, 5%, and 10% respectively. Standard errors in parentheses.

Figure A1.1: A 10% increase in total immigrant stock and Host j's trade with source countries. Estimates accounting for relatively large immigrant communities (*Trade creation*$_{ij} > 1$, see Table 5).

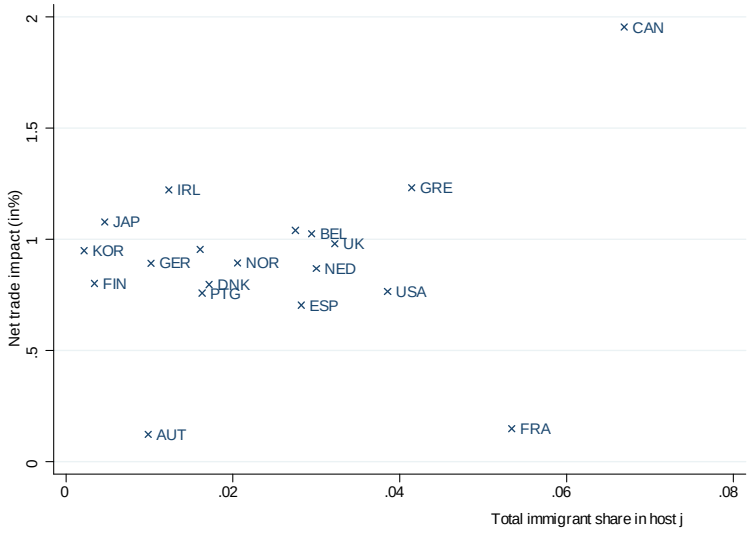


Figure A1.2: A 10% increase in total immigrant stock and Source i's trade with OECD countries. Estimates accounting for relatively large immigrant communities (*Trade creation*$_{ij} > 1$, see Table 5).

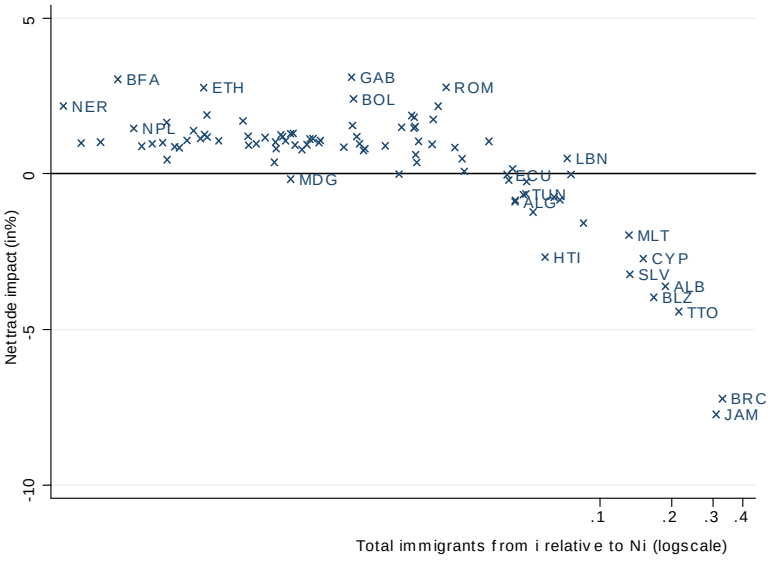


Figure A1.3: Marginal trade creation effects of a 10-percent increase in m_{ij}, model predictions accounting for relatively large immigrant communities ($Trade\ creation_{ij} > 1$, see Table 5).

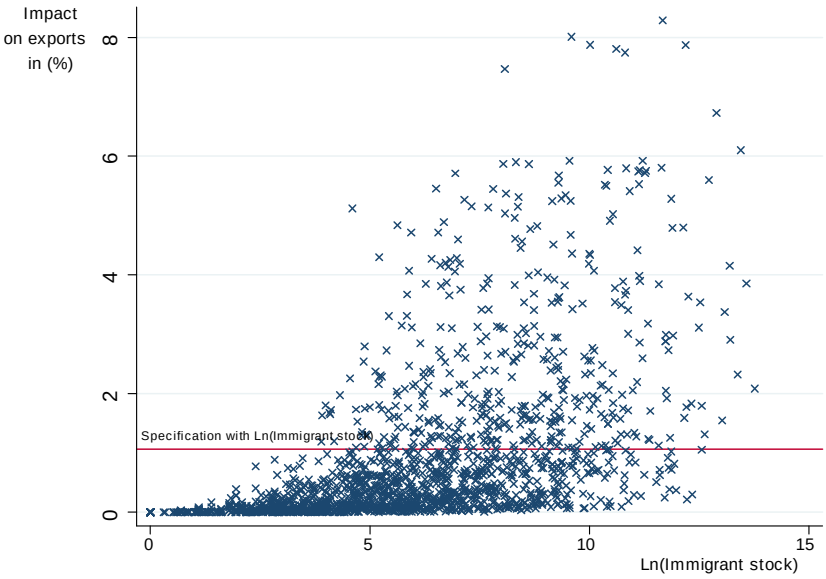


Table A1.3: Regression results, dependent variable real exports and imports 1999-2003.

	real exports$_{ij}$	real imports$_{ij}$	Host GDP$_j$	Source GDP$_i$	Host GDPcap$_j$	Source GDPcap$_i$	Imm. stock$_{ij}$	Trade creation$_{ij}$	Host diversion$_j$	Source diversion$_i$
exports$_{ij}$	1									
imports$_{ij}$	0,79	1								
Host GDP$_j$	0,54	0,51	1							
Source GDP$_i$	0,37	0,39	0,001	1						
Host GDPcap$_j$	0,19	0,06	0,37	0	1					
Source GDPcap$_i$	0,24	0,08	0	0,04	0	1				
Immigrant stock$_{ij}$	0,27	0,26	0,26	0,15	0,11	-0,05	1			
Trade creation$_{ij}$	0,10	0,11	0,14	-0,08	0,08	-0,1	0,39	1		
Host diversion$_j$	0,07	0,10	0,19	0,001	0,02	0,001	0,16	0,27	1	
Source diversion$_i$	-0,09	-0,14	0,01	-0,14	0,001	0,14	0,03	0,1	-0,01	1

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Chapter 2

EXPATRIATES AND TRADE

The study evaluates the contribution to bilateral trade of expatriates from the OECD countries living in less developed economies. The expatriates promote trade between the OECD countries and their country of residence. A 10 percent increase in the size of expatriate community leads to a 0.6 percent average increase in its OECD trade partner's imports against a 2.5 percent impact of immigrants in OECD countries. The imports-facilitating role of expatriates' networks is centered in host countries with low institutional quality. In economies lying within the lowest third of the institutional quality distribution, a 10 percent increase in expatriate stock would lead to a 1.7 increase in imports into their country of origin. The estimates on expatriates role in exports are not statistically different from zero. The study further addresses the impact on trade of immigrant networks from former colonies. There is some evidence that trade contribution of immigrants from past colonies residing in former imperial powers is relatively lower.

Keywords: international trade, immigration, informal trade barriers
JEL classification: F22, O24

2.1 Introduction

There exists an extensive evidence that immigrant networks facilitate bilateral trade between their country of origin and host economies (e.g., Gould, 1993; Head and Ries, 1998; Combes et al., 2005). The main operating mechanisms include transmission of information, knowledge of local institutions in trade partner's market, informal contract enforcement among the network's members, and transplanted demand for home-country products. Immigrants' knowledge of cultural patterns, social values and organization of society in their country of origin helps identify profitable trade opportunities and works towards their successful realization. Similarly, the inefficient bureaucracy, weak legal culture and enforcement

institutions of many countries increase trade costs that immigrants could avoid through own enforcement rules.[1]

It remains ex ante unclear as to how strong these mechanisms are for expatriates from rich economies located in generally poorer, less developed countries.[2] For example, immigrants tend to concentrate at either the top or bottom of the host country's occuptional ladder (see Stalker, 2000). While significant fraction of immigrant populations in OECD countries occupies lower-status jobs and entrepreneurship in trade sector might be one of few profitable alternatives, the expatriates are likely to face a relatively wider range of opportunities. In addition, as advanced market economies dispose of dense trading infrastructure and information flows, the host's demand for expatriate networks' services might be lower. Expatriates might be also less able to understand the actual functioning of host's society as compared to immigrants with links to source country. Finally, expatriates' populations tend to be distinctly smaller in comparison to their counterparts OECD countries.[3]

The present study analyzes the trade impact of expatriates from advanced market economies such as the U.S. or Canada that are located in less developed countries, and compares it to the trade effect of immigrants in OECD economies. By using migrant stocks of *both* trading partners, the approach differs from the existing empirical works that typically take the perspective of a host country and relate the immigrant stocks (or flows) to the country's bilateral trade figures. The study also investigates the trade impact of immigrants from former colonies. Trade partners with former colonial relationship might have more similar social and political institutions, so that value added of immigrants' knowledge might relatively decrease. I test this hypothesis for a number of past colonial powers and complement the existing empirical evidence for the UK data by Girma and Yu (2002).

The following section reviews the empirical evidence on the role of immigrant links in

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[1] Greif (1994) describes the evolution of informal enforcement mechanisms among the 14th century Maghribi traders in the environment where formal contracting rules were absent.

[2] Since migrants from advanced market economies are likely to differ from typical migrants from developing countries in their income levels, access to credit or motivation to migrate, I label the former 'expatriates' rather than 'immigrants'.

[3] On the other hand, Gould (1993) finds that the impact of immigrant networks decreases with size, thus favoring a relatively larger role for networks from developed host economies.

international trade. Sections 2.3 and 2.4 provide details on data sources and methodology, Section 2.5 presents empirical results, Section 2.6 checks for the robustness of results and the final section concludes.

2.2 Trade and immigrant networks

Given existing data constraints, there does not exist a study evaluating the impact on trade of immigrant communities from *both* trading partners. A number of authors instead focused on a given host economy, used available figures on local immigrant populations, and implicitly assumed that host's overseas populations were either equal to zero or irrelevant for bilateral trade flows. The pioneering study by Gould (1993) analyzed trade patterns of the U.S. economy between 1970 and 1986 and estimated a 10-percent increase in immigrant stock to boost U.S. exports by 4.7 percent and U.S. imports by 8.3 percent. Another work by Head and Ries (1998) employed Canadian data and estimated the link between immigration and trade to be relatively weaker (a 1.0-1.3 percent increase for exports from and 3.1-3.9 percent for imports into Canada).[4] Their successors focused on either other OECD economies,[5] and/or evaluated more detailed mechanics of the migration-trade link.[6] Konečný (2009) is one of few studies that analyzes the migration and trade relationship within the context of several host countries.[7] Using the data on foreign-born population located in 19 OECD-member economies, the study shows that the relative impact on trade of immigrant networks declines with the GDP of source country, is generally smaller than estimates from preceding studies, and the immigrant networks might actually shift trade flows between countries.

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[4] The stronger effect for import is usually attributed to the combination of transplanted preferences channel and network effects. The transplanted preferences mechanism is driven by the immigrants' demand for source-country products. For exports the preference-driven link is not operative.

[5] Studies dealing with immigration and trade include e.g., Girma and Yu (2002) exploiting the U.K. data, Blanes (2005) (Spain), Combes et al. (2005) (France), Law and Bryant (2005) (New Zealand), or Piperakis (2003) (Greece). Rauch and Trindade (2002) used data on Chinese minorities in South-East Asia.

[6] For example, White (2007)b's study on U.S. data classifies immigrants' countries of origin according to their income, Head and Ries (1998) discuss the possible role of length of stay, Dunlevy (2006) focuses on corruption and the role of common language.

[7] Other studies on trade and migration using the OECD migration data include working papers by Dolman (2007), and Felbemayr and Toubal (2008).

Girma and Yu (2002) extend studies focusing on the individual mechanisms at work. The authors evaluate immigrants' ability to overcome informal trade barriers related to their source country's social institutions. Using the UK data on the stock of immigrant population by country of origin over 1981 and 1991, the authors argue that immigrants from the institutionally more similar Commonwealth countries are on average less engaged in trade with respect to immigrants generally know their source countries' markets and social institutions, the benefits of this knowledge become lower once the concerned country is institutionally close to their current location, which in turn reduces immigrants' incentive to trade. The complementary evidence on the role of institutional quality and institutional similarity in immigrants' contribution to trade (emphasized by Girma and Yu, 2002) will be examined in more detail in the following sections.

2.3 Estimation strategy and specification

I use the gravity relationship derived by Helpman (1984) and employed by the study on trade and immigration by Head and Ries (1998). Imports from country j into country i in an integrated world economy with nonnegative trade costs producing symmetric differentiated products can be expressed as

$$T_{ij} = s_{ij} GDP_j,$$

where s_{ij} corresponds to the share of products from country j that are consumed by agents in country i, and GDP_j stands for the output of country j. Trade costs distort the pattern of trade and imply

$$s_{ij} = \frac{GDP_i}{\sum_{i=1}^{N} GDP_i} \frac{1}{\tau_{ij}},$$

where $\sum_{i=1}^{N} GDP_i$ corresponds to world GDP and τ_{ij} is a trade cost parameter for countries i and j. Putting the two terms together, taking natural logarithms, and assuming that $\tau_{ij} = \exp(-\mathbf{x}'_{ij} b)$ with $\mathbf{x}_{ij}$ representing a $k \times 1$ matrix of variables affecting the trade costs and b corresponding to a $k \times 1$ vector of regression coefficients results into the following empirical specification:

$$\ln T_{ij} = b_0 \ln GDP_i GDP_j + \mathbf{x}'_{ij} b + d'_{ij} + \alpha_j + \varepsilon_{ij}. \tag{2.1}$$

The gravity relationship thus proportionally links trade flows to the incomes of trading economies.

The vector $\mathbf{x}_{ij}$ in Equation 2.1 contains a number of factors affecting costs of trade between countries i and j. Immigrant and expatriate networks assumed to reduce trade costs are measured by the natural logarithms of migrant stocks located in both trading partners. This specification has been used in a number of existing studies on immigrant networks and international trade (e.g., Girma and Yu, 2002; Head and Ries, 1998; or Herander and Saavedra, 2005). The natural logarithm of distance between trading partners represents a proxy for transportation costs. Dummies for colonial past and language allow for differential propensity to trade given that trade partners share common colonial past or speak common language.

For the evaluation of Girma and Yu (2002)'s hypothesis of minor impact of immigrant networks from former colonies, vector $\mathbf{x}_{ij}$ contains a binary indicator equal to one for observations containing a former imperial power and her past colony. This measure covers developing countries that are either member countries of the Commonwealth, or have been French, Spanish, Dutch, Portugese, Belgian, Italian or German colonies. Alternative proxies used in the estimation are the interaction terms of the natural logarithm of migrant stocks with dummy variables describing separately each of former imperial powers (the U.K., France, Spain and others) and their colonies. Additional interaction terms of immigrant networks with index of institutional quality and dummy for common language have been created to control for the possibility of a relatively larger role of immigrants from institutionally weaker countries and countries speaking different languages (see Dunlevy, 2006).

Equation 2.1 is augmented by d'_{ij}, a $1 \times (i + j)$ vector of country j and i fixed effects. α_j correponds to an error term correlated within the OECD economy j. The error term ε_{ij} is specific to each country pair ij and independent of other errors. To account for within-group correlation and heteroscedasticity within the OECD economies, I adopt fixed effects and clustered-errors approach by Liang and Zeger (1986). The robust covariance estimator by Liang and Zeger (1986) should thus account for any remaining within-group correlation in excess of j's fixed effects.

2.4 Data

The estimation of expatriate networks' effects has been until now impossible due to the absence of information on foreign-born populations in developing economies that typically form the source of migration. The present study uses a recently published database on international bilateral migration stocks compiled by the University of Sussex and the World Bank compiled by Parson et al. (2007). The database provides unique data on stocks of foreign-born population in advanced market economies and developing countries. The database consists of a 226 x 226 matrix containing migrants by country of birth (i.e., the foreign-born population). The information was collected from the year 2000 round of censuses whenever possible, and older data were included where such information was unavailable. Using a variety of techniques, Parson et al. (2007) estimated the missing data and reconciled all the available information to create a complete matrix of international bilateral migrant stocks.

The data on bilateral exports and imports have been obtained from the Direction of Trade Statistics compiled by the International Monetary Fund. I employ five-year averages of real trade volumes over 1999-2003, instead of using the data for a single year in order to reduce the additional problem with zero observed exports and imports for some countries and years.[8] A measure of circle distance between capital cities has been retrieved from Jon Haveman's web page or added manually if values were missing.[9]

I use five-year averages (1999-2003) of the restricted Index of Economic Freedom as a measure of institutional quality. The Index of Economic Freedom produced by the Heritage Foundation compiles evaluations of nine areas essential for the functioning market environment. The restricted version includes only those areas that most closely relate to the institutional quality in trade context - corruption, non-tariff trade barriers, rule of law and regulatory burden - and drops inflation, fiscal burden, restrictions on banks, labor regulation and government intervention. Finally, figures on GDP and GDP per capita have been

[8] Dunlevy (2006) uses a similar approach by averaging bilateral export data at the U.S. state level over 1990-1992. The current sample contains 157 pairs with imports and 69 pairs with exports below 100 thd U.S. dollars over the five-year period. Nonetheless, the random-effect tobit estimates with host-country dummies lead to very similar results (both qualitatively and quantitatively).

[9] Jon Haveman's web page is available at http://www.macalester.edu/research/economics/PAGE/ HAVEMAN/Trade.Resources/TradeData.html#Gravity.

Table 2.1: Summary statistics

Variable	Obs.	Mean	Std.Dev.	Min	Max
Imports_{ij}^{x}	2,409	409.08	3,438.94	0	120,767.4
Exports_{ij}^{x}	2,641	283.41	2,064.99	0	94,023.73
OECD economies					
GDP_{i}^{xx}	2,641	947,000	1,870,000	19,400	9,012,508
$\text{GDP per capita}_{i}$	2,641	25,391.18	8,063.58	11,958.24	49,045.66
$\text{Immigrant stock}_{ij}$	2,641	19,420	197,533.6	1	9,336,719
Inst.quality_{i}	2,641	74.55	5.93	60,7	81
Developing economies					
GDP_{j}^{xx}	2,586	51,400	1,350,000	206	1,027,513
$\text{GDP per capita}_{j}$	2,641	3,020.99	4,592.12	0	24,715.53
$\text{Expatriate stock}_{j}$	2,641	1,902.96	12,608.22	0	342,137
Inst.quality_{j}	2,604	46.21	15.86	13,8	92,5
Other variables					
Distance_{ij}	2,641	6,938.22	3,849.23	200	19,158.67
$\text{Common language}_{ij}$	2,641	0.06	0.23	0	1
$\text{Colonial relationship}_{ij}$	2,641	0.03	0.17	0	1

^{x} Trade figures from the perspective of OECD countries

^{xx} in millions of 1998 U.S.dollars

collected from the World Development Indicators published by the World Bank. To avoid the potential endogeneity problem of the GDP variable, GDP and GDP per capita figures from 1998 have been used as proxies. Table 2.1 contains summary statistics for all variables of interest.[10] The following subsections discuss the estimation results for both exports and imports.

2.5 Empirical results

Table 2.2 reports the estimated coefficients from regressions with the natural logarithm of exports from and imports to the OECD countries as dependent variables, fixed effects for

[10] Table A2.1 in Appendix A2 presents the full list of 21 advanced market economies and 135 less developed economies that passed the data availibility constraints. The use of the terms exports and imports in the text always refers to the direction of trade from the perspective of the advanced market economy. The terms developing and less developed economies in the text will be used interchangeably.

both trade partners, and clustering by OECD economies.[11] Columns (1) and (4) deliver estimates from benchmark regressions absent interaction terms and the expatriates' networks variable. The coefficients have expected signs and reasonable values. The estimate on immigrant networks located in the OECD economies is smaller than the corresponding coefficient in the imports equation, which is in accord with the numerous empirical evidence (e.g., Gould, 1993; Head and Ries, 1998) and the hypothesis that while immigrants in advanced market economies in general promote both exports and imports through the reduction of trade costs and demand for source-country products, in case of exports from host country the latter channel should be absent. The estimates suggest that a 10-percent increase in the size of immigrant stock in a given OECD country would promote the country's exports by 2 percent and imports by 2.9 percent on average, which is slightly above the middle of the range provided by the existing literature.[12][13]

The adjacent columns include the proxy for expatriates' networks. According to the estimates from regressions with the added expatriates variable, a 10-percent increase in the trade partner's immigrant population in the OECD economies would boost the country's exports by 1.8 and imports by 2.6 percent. The results with the added expatriate variable in Columns (2) and (5) thus maintain the previous conclusions with respect to the immigrant network term. The newly introduced expatriates facilitate imports by the average 0.3-0.5 percent after a 10 percent increase, the actual level depending on the direction of bilateral trade flow. The estimated trade impact of expatriate networks is nonetheless statistically not different from zero.

Columns (3) and (6) provide some additional insights into the benchmark model. For exports, the added interactions of migrant variables with proxies for institutional quality

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[11] The coefficient estimates on the interactions of migrant terms with dummies for common language are presented in the Appendix A2 (together with the remaining output). None of the coefficients passed 10-percent significance level and in some cases had the opposite sign.

[12] E.g., a static version of the model by Girma and Yu (2002) produces a 1.6 percent increase in UK exports and a 1 percent rise in UK imports from non-Commonwealth economies. Head and Ries (1998) estimate a 1-1.3 percent boost for Canadian bilateral exports and 3.1-3.9 percent for imports. The study on U.S. exports by Herander and Saavedra (2005) states 1.6 percent.

[13] For a complete list of all explanatory variables and estimation results for exports see Columns (1)-(3) in Table A2.2 in Appendix A2. For the corresponding import estimates see Columns (1)-(3) in Table A2.3 in Appendix A2.

Table 2.2: Fixed effects results with ln exports and ln imports as dependent variable.

	Ln(Exports)$_{ij}$			Ln(Imports)$_{ij}$		
Dependent variables$^{£}$	(1)	(2)	(3)	(4)	(5)	(6)
Ln immigrant stock$_{ij}$	0.202***	0.182***	0.239***	0.292***	0.262***	0.146***
	(0.028)†	(0.030)	(0.063)	(0.032)	(0.03)	(0.049)
Ln expatriate stock$_{ij}$	-	0.030	0.049	-	0.053	0.342***
		(0.028)	(0.057)		(0.036)	(0.106)
Inst. quality$_{ij}$ x Ln imms$_{ij}$	-	-	-0.001	-	-	0.003**
			(0.001)			(0.001)
Inst. quality$_{ij}$ x Ln expats$_{ij}$	-	-	0.000	-	-	-0.006***
			(0.001)			(0.002)
Colonial relationship$_{ij}$	-	-	0.002	-	-	-0.053
x Ln imms$_{ij}$			(0.092)			(0.081)
Colonial relationship$_{ij}$	-	-	-0.063	-	-	-0.026
x Ln expats$_{ij}$			(0.049)			(0.062)
R^2	0.483	0.482	0.448	0.404	0.412	0.375
Obs.	2,641	2,516	2,498	2,427	2,340	2,321

$^{£}$For complete estimates see Tables A2.2 and A2.3 in Appendix 2A.
^{x}Standard errors in parentheses. *, **, *** - significant at 10%, 5%, and 1% respectively.
†Standard errors account for clustering by host country.

and shared colonial past change neither the qualitative nor quantitative conclusions with respect to immigrant and expatriate effects. On the other hand, both networks have statistically significant effect on imports into the OECD countries. The institutional quality interactions in import equations are significant, suggesting considerable heterogeneity of the immigrant and expatriate effects across less developed economies. Taking the average value of the institutional quality term across developing countries (46.2), a 10-percent rise in the immigrant networks' size implies 2.7-percent increase in imports, in case of expatriates the effect amounts to 0.6 percent. The quantitative conclusions thus remain the same as those based on the coefficient estimates from columns (3) and (4), yet have now become statistically significant also for expatriates from OECD countries.

The positive and significant sign on the immigrants' interaction with institutional quality in Column (6) is not in line with studies suggesting weaker immigration-trade link for less corrupt countries (see Dunlevy, 2006). The present results have been, however, obtained from different dataset. The set of less developed economies in the present study excludes the advanced economies as providers of immigrants and exploits additional heterogeneity among less developed economies in the sample.

Table 2.3: Fixed effect estimates differentiating migrants' impact on trade by tertiles of institutional quality distribution.

	Ln(Exports)$_{ij}$		Ln(Imports)$_{ij}$	
Dependent variables$^{£}$	(1)	(2)	(3)	(4)
Ln immigrant stock$_{ij}$	0.239***	0.212***	0.146***	0.222***
	(0.063)	(0.042)	(0.049)	(0.034)
Ln expatriate stock$_{ij}$	0.049	0.044	0.342***	0.17**
	(0.057)	(0.041)	(0.106)	(0.061)
Inst. quality$_{ij}$ x Ln imms$_{ij}$	-0.001	-	0.003**	-
	(0.001)		(0.001)	
Inst. quality dummies	-	-	-	-
- 2nd tertile x Ln imms$_{ij}$	-	-0.032	-	0.054
		(0.024)		(0.044)
- 3rd tertile x Ln imms$_{ij}$	-	-0.065	-	0.068
		(0.043)		(0.049)
Inst. quality$_{ij}$ x Ln expats$_{ij}$	0.000	-	-0.006***	-
	(0.001)		(0.002)	
Inst. quality dummies				
- 2nd tertile x Ln expats$_{ij}$	-	0.003	-	-0.109**
		(0.039)		(0.052)
- 3rd tertile x Ln expats$_{ij}$	-	-0.010	-	-0.18**
		(0.038)		(0.069)
R^2	0.448	0.442	0.375	0.385
Obs.	2,498	2,498	2,321	2,321

$^{£}$For complete estimates see Tables A2.2 and A2.3 in Appendix 2A.
^{x}Standard errors in parentheses. *, **, *** - significant at 10%, 5%, and 1% respectively.
†Standard errors account for clustering by host country.

The results presented in Table 2.2 provide a rather mixed picture. While the estimates on the effect of immigrant networks generally conform to the existing literature, the expatriates contribution seems to be relatively smaller, limited only on imports into OECD countries, and relevant mainly for agents located in less institutionally developed countries. The following two tables provide a more detailed perspective on immigrant and expatriates' role in trade between their host and source countries.

Columns (1) and (3) in Table 2.3 report the estimates from the benchmark fixed-effect specification with the interactions of the migrant terms and the continuous institutional quality index values. For Columns (2) and (4), I recoded the institutional quality measure into three binary variables, each indicating the location within the quality index distribution, and created the interactions of migrant terms with the dummies for the middle or top of

Table 2.4: The estimated interactions of migrant network terms and colonial past.

	Ln(Exports)$_{ij}$		Ln(Imports)$_{ij}$	
Dependent variables$^{£}$	(1)	(2)	(3)	(4)
Ln immigrant stock$_{ij}$	0.239***	0.228***	0.146***	0.145***
	(0.063)	(0.058)	(0.049)	(0.051)
Ln expatriate stock$_{ij}$	0.049	0.029	0.342***	0.33***
	(0.057)	(0.06)	(0.106)	(0.11)
Colonial relationship$_{ij}$	0.002	-	-0.053	-
x Ln imms$_{ij}$	(0.092)		(0.081)	
Colonial power dummies				
- Spain x Ln imms$_{ij}$	-	-0.010	-	-0.174*
		(0.094)		(0.086)
- France x Ln imms$_{ij}$	-	-0.004	-	-0.12**
		(0.064)		(0.053)
- UK x Ln imms$_{ij}$	-	-0.008	-	-0.041
		(0.073)		(0.077)
- Others x Ln imms$_{ij}$	-	0.117	-	-0.023
		(0.155)		(0.124)
Colonial relationship$_{ij}$	-0.063	-	-0.026	-
x Ln expats$_{ij}$	(0.049)		(0.062)	
Colonial power dummies				
- Spain x Ln expats$_{ij}$	-	-0.027	-	0.013
		(0.083)		(0.09)
- France x Ln expats$_{ij}$	-	0.03	-	0.075
		(0.047)		(0.055)
- UK x Ln expats$_{ij}$	-	-0.05	-	-0.048
		(0.047)		(0.053)
- Others x Ln expats$_{ij}$	-	-0.039	-	-0.022
		(0.099)		(0.087)
R^2	0.448	0.442	0.375	0.376
Obs.	2,498	2,498	2,321	2,321

$^{£}$Fixed-effects specification. For complete estimates see Tables A2.2 and A2.3 in Appendix 2A.
^{x}Standard errors in parentheses. *, **, *** - significant at 10%, 5%, and 1%.
†Standard errors account for clustering by host country.

the distribution part.[14]

The estimated interactions provide information on the parts of the institutional quality distribution that drive the results. For the immigrant networks the role of institutional quality is relatively minor, as the dummy interaction terms for either trade flow are not statistically different from the baseline immigrant network coefficient. The differences between selected institutional quality groups thus seem to be spread quite uniformly over the

[14]For a complete list of all explanatory variables and estimation results for exports see Columns (4) and (5) in Table A2.2 in Appendix A2. For the corresponding import estimates see Columns (4) and (5) in Table A2.3, Appendix A2.

individual parts of the quality index distribution.

The overall picture changes for expatriates' networks. Expatriates located in economies with lower institutional quality are the only ones that on average support bilateral exports from the OECD countries. The marginal impact on trade of expatriates from the top two thirds of the institutional quality distribution is not statistically different from zero.

The signs of the interactions with colonial past dummies in most cases conform to the expectations. They are, however, not statistically significant and thus provide a rather limited statistical support for the links between the institutional similarity (as proxied by shared colonial past) and trade effects of migrant networks presented, e.g., in Girma and Yu (2002). The situation changes for imports, once the colonial interaction terms become replaced by the interactions of migrant terms and four separate dummies for former colonies of the U.K., France, Spain, and the remaining imperial powers. As can be seen from the coefficient estimates in Column (4), while the results for the UK fails to pass the usual significance levels, the corresponding interactions for Spain and France do.

The role of expatriates from former colonial powers (as opposed to immigrants) seems to be no different from the role of other migrants located in countries without shared colonial past.[15] The next subsection discusses the results for exports from advanced market economies.

2.5.1 The immigrant vs. expatriate effects

The estimates on immigrant and expatriate effects on trade point to the importance of the characteristics and the relative position of both host and source countries. Should the relationship between immigrant/expatriate networks and bilateral trade flows be identical irrespective of the characteristics of country of origin and host country, one should observe expatriate networks promote the OECD economy's exports in the same way as immigrants promote its imports. The expatriates' impact on exports should furthermore exceed their effect on imports, where the transplanted-preferences channel discussed in previous sections is absent and the sole trade-facilitating force should operate through the reduction of trade

[15] Complete results on both imports and exports can be found in Tables A2.1 and A2.2 in Appendix A2.

costs. Yet none of the two cases holds true, as expatriates' contribution to trade falls short of that of immigrant networks and expatriates promote only imports into OECD from institutionally weaker countries.

The present results thus suggest that the incentives and functioning of immigrant networks in the OECD economes seem to be qualitatively different from expatriate networks residing in less developed countries.

Part of this difference, namely lower coefficients on expatriate networks with respect to their immigrant counterparts located in developed economies, are consistent with the study by White (2007a). The author finds that immigrants coming from lower-income countries contribute more to bilateral trade. His argument based on the evaluation of the U.S. data claims that to the extent that lower-income economies have generally weaker contracting and enforcement mechanisms, immigrants from such countries might better exploit their source country' knowledge and engage in profitable trade opportunities.

Expatriates' knowledge, on the other hand, would likely be in relatively lower demand given the dense trading infrastructure and information flows in their country of origin. Furthermore, under the assumption that expatriates might be less able to understand the cultural patterns, social values and organization of host's society as compared to the OECD immigrants born in less developed countries, one could also expect their trade contribution to be relatively lower.[16] Given that the institutional quality index is positively correlated with per capita income, the estimates from Table 2.3 seem to partially capture this effect. The abovementioned finding, however, does not explain as to why the estimated expatriates' contribution to the exports of the OECD economies is lower (indeed not different from zero) than their impact on imports,[17] and why the expatriates facilitate only imports from countries with weak institutions.

There are several potential explanations for these two effects. Assume the expatriates

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[16] The current dataset is unlikely to include managers from the OECD countries that have been sent abroad by their employers, given that their length of stay and legal status would be different from a typical immigrant. The trade contribution of such individuals might be notably higher if their mission is related to foreign investments or trade contracts by their mother companies.

[17] The insignificance of the interaction terms in Table 2.3 suggests, that expatriates contribute to trade in no different way than other agents of the host country.

maximize their earnings and decide based on the relative profitability of trade with respect to other activities. Also assume that the costs of trade are negatively related to the hosting, less developed country's institutional quality and that the expatriates' knowledge of institutions helps reduce these costs. Other things equal, the expatriates will be more likely to trade in countries with relatively weaker institutions, given that net profits from trade will be higher. Nonetheless, the potential traders also have to decide as to what direction of trade they choose. The generally small size of expatriate communities and the prevailing low purchasing power in less developed economies could make supplying of the host's market unprofitable. Instead, the expatriates' attention might be directed towards supplying of the overseas OECD markets, so that one could ultimately observe the empirical pattern found in Table 2.3.

An alternative explanation for the expatriates' facilitation of the OECD imports as opposed to exports might relate to the cross-sectional nature of the present sample. The expatriates are likely to face a relatively wide range of business and/or employment opportunities (Stalker, 2000). While some of these opportunities (such as, e.g., the agricultural production or the extraction of mineral resources) might over time materialize as imports into the country of origin, the initial source-country exports they might have likewise stimulated would be missing in the estimations, assuming that these investments have been made before the observed period.[18]

2.6 Robustness checks

2.6.1 The role of the immigrant-network measures and migrants from other countries

Konečný (2009) argues for the inclusion of relative measures of immigrant networks in addition to the commonly employed natural logarithm of immigrant stock or other level variables. A simple gravity model in which agents produce either locally or form a joint venture with foreign partner illustrates that the impact on trade might vary with the size of immigrant community relative to the market size of country of origin, as well as with the

[18] A more detailed analysis of the particular mechanism at work would require a shift from the aggregate data towards the information collected at the micro-level.

overall shares of immigrant communities with respect to the populations of trade partners. The three proposed relative measures that might influence trade between host j and source country i include 1) the share in host population of a given immigrant stock relative to the country of origin GDP$_i$, 2) the population share of the overall immigrant stock (regardless of origin) within a given host country, and 3) the size of the overseas diaspora relative to the population in diaspora's country of origin.

The first measure controls for the size of trade partners. Assuming that immigrants match exclusively with agents from their country-of-origin and the rest of host's population searches randomly, the positive effect on trade of a marginal increase in immigrant stock would on average rise with the stock's share in host country and its relative size with respect to the source country market. The second measure controls for the possibly negative effects on bilateral trade of immigrant links of immigrant communities from other source countries. The more immigrants in a given host country match with their countries of origin, the lower will be the probability of host's native agents to trade with given trade partner. Finally, the third measure accounts for the potentially negative bilateral trade effects of source country diasporas located in other countries. The larger is the overall diaspora relative to the population of country of origin, the lower are the chances of host's native agents to find a match in concerned source country.[19]

Since the fixed-effect specification employed in previous sections precludes the estimation of country-level relative measures potentially affecting trade, I adopt a two-stage version of Equation 2.1 using the methodology developed by Donald nad Lang (2007). The two-step procedure starts with the OLS regression of the natural logarithm of bilateral exports/imports on variables differing across country pairs ij, country j- and i-fixed effects:

$$\text{1st stage: } \ln T_{ij} = b_0 \ln GDP_i GDP_j + \mathbf{x}'_{ij} b + a_0 \frac{\frac{m_{ij}}{N_j}}{\frac{GDP_i}{GDP_I}} + d'_{ij} + \varepsilon_{ij},$$

where the term following coefficient a_0 is the newly added share in host population of a given immigrant stock relative to the country of origin GDP$_i$.

In the second stage, I run feasible GLS with the relevant fixed effect coefficient estimates

[19] For a detailed exposition to the assumptions and mechanisms driving the results, see Konečný (2009).

from the first stage as dependent variables and country i- (or j-) level variables on the right-hand side of the regression:

$$\text{2nd stage:} \quad \hat{d}_j = c(J) + \mathbf{x}_j' z + a_1 \frac{\sum_{i=1}^{I} m_{ij}}{N_j} + u_j, \; \hat{var}(u_j) = \hat{\sigma}^2 I(J) + \Sigma_{\hat{d}_j} \tag{2.2}$$

$$\text{and} \quad \hat{d}_i = c(I) + \mathbf{x}_i' w + a_2 \frac{\sum_{j=1}^{J} m_{ij}}{N_i} + u_i, \; \hat{var}(u_i) = \hat{\sigma}^2 I(I) + \Sigma_{\hat{d}_i}, \tag{2.3}$$

where Equation 2.2 estimates the coefficient on the host trade diversion term, Equation 2.3 estimates the coefficient on the source trade diversion term, and $\hat{var}(u_{\{j,i\}})$ stands for the variance of the respective 2nd-stage error term $u_{\{j,i\}}$. The vectors of country-specific terms $\mathbf{x}_i$ and $\mathbf{x}_j$ include the natural logartihms of real GDP and GDP per capita, the corresponding relative measure, share of exports in GDP, and the Heritage Foundation measure of institutional quality. $\frac{\sum_{i=1}^{I} m_{ij}}{N_j}$ stands for the population share of the overall immigrant stock (regardless of origin) within a given host country, $\frac{\sum_{j=1}^{J} m_{ij}}{N_i}$ represents the size of the overseas diaspora relative to the population in diaspora's country of origin. The GLS procedure uses fixed effect covariance estimates $\Sigma_{\{\hat{d}_j, \hat{d}_i\}}$ from the 1st stage for the construction of weights.[20] Table 2.5 presents the results using Donald and Lang (2007)'s 2-step estimation procedure.

The estimates' signs conform to the ex ante expectations. The trade impact of immigrant and expatriate stocks has remained statistically significant despite a slight decrease in levels, and the expatriate network term in the exports equation in Column (2) remains significant at 10% level. Despite the consistency with immigrant-driven shifts in trade flows modelled in Konečný (2009), the overall net effect of immigrant networks on aggregate trade is still nonnegative.

2.6.2 Endogeneity and large migrant populations

The study's results from previous sections might be subject to the potential endogeneity of migrant network terms. Over time, trade partners could learn about the living conditions in

[20] For more details see Donald and Lang (2006), p. 224-225.

Table 2.5: Regression results including relative measures of immigrant networks.

	Ln(Exports)$_{ij}$		Ln(Imports)$_{ij}$	
Dependent variables$^{£}$	(1)	(2)	(3)	(4)
Ln immigrant stock$_{ij}$	0.183***	0.159***	0.281***	.251***
	(0.015)	(0.016)	(0.023)	(0.025)
Ln expatriate stock$_{ij}$	-	0.035*	-	0.060**
		(0.020)		(0.030)
Immigrant stock$_{ij}$ relative	0.239***	0.245***	0.201**	0.181**
to country of origin GDP$_i$	(0.078)	(0.072)	(0.074)	(0.089)
Share of overall imm. stock	-9.637*	-9.042	-6.411	-5.465
in OECD country	(5.193)	(5.330)	(4.600)	(4.609)
Overseas diaspora	-0.617	-0.684	-2.041*	-1.342
relative to country of origin	(0.765)	(0.779)	(1.076)	(1.084)
R^2	0.483	0.482	0.404	0.412
Obs.	2,585	2,460	2,378	2,291

$^{£}$2-step estimates Donald and Lang (2007).
^{x}Standard errors in parentheses. *, **, *** - significant at 10%, 5%, and 1%.

the other country and might pass the information further to potential migrants. Trade might provide employment opportunities within the immigrant/expatriate communities engaged in trading[21] and thus reduce the ex ante uncertainty of agents considering migration.

Javorcik et al. (2006) used the natural logarithm of population density and the share of passport costs in real GDP per capita as instruments for migrant networks in their study on the link between migration and FDI. The correlations between these variables[22] and the stock of immigrants in the current data are, however, negligible (-0.01 and -0.03, respectively), and in the case of population density even with the opposite sign.[23]

The correlations of the two instrumental variables (IVs) and migrant levels when all expressed in natural logarithms are higher (0.13 and -0.06, respectively). In the 2SLS regressions on exports and imports with the logartihms of both IVs and the natural logartihm

[21] Peng's (1998) survey on the characteristics of trade intermediaries located in the U.S. reported 40 percent of U.S. intermediaries' officers or managers to be foreign-born.

[22] The instruments have been taken from McKenzie (2005).

[23] A similar result has been found in Konečný (2009).

of immigrant stock as the instrumented variable, the Shea partial R-squared failed to pass 0.01 for any combination of the instruments, the coefficients on instrumental variables had theoretically implausible signs, and joint F-tests in the first stage did not prove to be significant. The weakness of the available instruments thus precludes the quantification of the degree of endogeneity.

The data might also contain influential observations driving the estimation results. To check for this possibility, I estimate the benchmark regressions without country pairs that exceeded critical values of the `dfbeta` test on influential obervations in Stata. The same exercise has been repeated for expatriate stocks. The results remain nonetheless qualitatively the same.

2.7 Conclusion

The study evaluates the contribution of expatriate networks to bilateral trade between host and source countries, a topic that has not been studied by previous studies due to pending data constraints. The study shows that similarly to immigrants in OECD countries, the expatriates from advanced market economies seem to facilitate bilateral trade with their country of origin. The expatriates' contribution to trade (as compared to immigrants located in OECD) is rather limited and seems to operate through different mechanisms. Following a 10 percent increase in the size of expatriate community, the predicted average increase in imports into OECD economies revolves around 0.6 percent. The same increase in immigrant stock, on the other hand, would correspond to more than 2.5 percent change. The trade facilitating role of expatriates' networks becomes most evident in host countries with low institutional quality. In economies lying within the lowest third of the institutional quality distribution, a 10 percent increase in expatriate stock would result to a predicted 1.7 increase in imports into their country of origin. For the remaining parts of the distributions as well as for exports, the study did not find any empirical evidence on expatriates' involvement. A more detailed analysis of individual mechanisms at work would call for the use of more detailed, micro-level information instead of the commonly used data on aggregate migrant stocks.

The study has besides addressed the cross-sample validity of the findings by Girma and Yu (2002) on the interactions between the migrant network variables and institutional similarity proxied by shared colonial past. The estimations reveal that there is some, though not particularly strong, evidence that the trade contribution of immigrant networks from past colonies operating in former imperial powers is relatively lower.

2.8 Appendix A2

Table A2.1: Countries in the sample.

OECD economies	Less developed economies		
Australia	Albania	Georgia	Pakistan
Austria	Algeria	Ghana	Panama
Belgium	Angola	Guatemala	Pakistan
Canada	Argentina	Guinea	Panama
Denmark	Armenia	Guinea-Bissau	Papua N.Guinea
Finland	Azerbaijan	Guyana	Paraguay
France	Bahamas	Haiti	Peru
Germany	Bahrain	Honduras	Philippines
Greece	Bangladesh	Hong Kong	Poland
Ireland	Barbados	Hungary	Qatar
Italy	Belarus	India	Romania
Luxembourg	Belize	Indonesia	Russian Fed.
Netherlands	Benin	Iran	Rwanda
New Zealand	Bolivia	Iraq	Samoa
Norway	Bosnia and Hrzg	Israel	Saudi Arabia
Portugal	Botswana	Jamaica	Senegal
Spain	Brazil	Jordan	Sierra Leone
Sweden	Bulgaria	Kazakhstan	Singapore
Switzerland	BurkinaFaso	Kenya	Slovakia
UK	Burundi	Kuwait	Slovenia
USA	Cambodia	Kyrgyzstan	Somalia
	Cameroon	Latvia	SouthAfrica
	CapeVerde	Lebanon	SriLanka
	Centr.Afr.Rep.	Lesotho	Sudan
	Chad	Libya	Suriname
	Chile	Lithuania	Swaziland
	China	former Yugoslavia	Syria
	Colombia	Madagascar	Tajikistan
	Congo	Malawi	Tanzania
	Costa Rica	Malaysia	Thailand
	Cote d′Ivoire	Mali	Togo
	Croatia	Malta	Trinidad and Tbg
	Cuba	Mauritania	Tunisia
	Cyprus	Mauritius	Turkey
	Czech Republic	Mexico	Turkmenistan
	Djibouti	Moldova	Uganda
	Dominican Rep.	Mongolia	Ukraine
	Ecuador	Morocco	UAE
	Egypt	Mozambique	Uruguay
	El Salvador	Myanmar	Uzbekistan
	Eq. Guinea	Namibia	Venezuela
	Estonia	Nepal	Vietnam
	Ethiopia	Nicaragua	Yemen
	Fiji	Niger	Zambia
	Gabon	Nigeria	Zimbabwe
	Gambia	Oman	

Table A2.2: Regression results with ln exports as dependent variable.

Dependent variables	(1)	(2)	(3)	(4)	(5)
Ln immigrant stock$_{ij}$	0.202***	0.182***	0.239***	0.212***	0.228***
	(0.028)	(0.030)	(0.063)	(0.042)	(0.058)
Ln expatriate stock$_{ij}$	-	0.030	0.049	0.044	0.029
		(0.028)	(0.057)	(0.041)	(0.06)
Inst. quality$_{ij}$ x Ln imms$_{ij}$	-	-	-0.001	-	-0.001
			(0.001)		(0.001)
Inst. quality dummies					
- 2nd tertile x Ln imms$_{ij}$	-	-	-	-0.032	-
				(0.024)	
- 3rd tertile x Ln imms$_{ij}$	-	-	-	-0.065	-
				(0.043)	
Inst. quality$_{ij}$ x Ln expats$_{ij}$	-	-	0.000	-	0.000
			(0.001)		(0.001)
Inst. quality dummies					
- 2nd tertile x Ln expats$_{ij}$	-	-	-	0.003	-
				(0.039)	
- 3rd tertile x Ln expats$_{ij}$	-	-	-	-0.010	-
				(0.038)	
Colonial relationship$_{ij}$	-	-	0.002	0.012	-
x Ln imms$_{ij}$			(0.092)	(0.093)	
Colonial power dummies					
- Spain x Ln imms$_{ij}$	-	-	-	-	-0.010
					(0.094)
- France x Ln imms$_{ij}$	-	-	-	-	-0.004
					(0.064)
- UK x Ln imms$_{ij}$	-	-	-	-	-0.008
					(0.073)
- Others x Ln imms$_{ij}$	-	-	-	-	0.117
					(0.155)
Colonial relationship$_{ij}$ x	-	-	-0.063	-0.064	-
Ln expats$_{ij}$			(0.049)	(0.05)	
Colonial power dummies					
- Spain x Ln expats$_{ij}$	-	-	-	-	-0.027
					(0.083)
- France x Ln expats$_{ij}$	-	-	-	-	0.03
					(0.047)
- UK x Ln expats$_{ij}$	-	-	-	-	-0.05
					(0.047)
- Others x Ln expats$_{ij}$	-	-	-	-	-0.039
					(0.099)
Common language$_{ij}$	-	-	-0.052	-0.058	-0.037
x Ln imms$_{ij}$			(0.082)	(0.082)	(0.084)
Common language$_{ij}$	-	-	0.04	0.041	0.028
x Ln expats$_{ij}$			(0.048)	(0.05)	(0.054)
R^2	0.483	0.482	0.448	0.442	0.452
Obs.	2,641	2,516	2,498	2,498	2,498

[x]Standard errors in parentheses. *, **, *** - significant at 10%, 5%, and 1% respectively.

Table A2.3: Regression results with ln imports as dependent variable.

Dependent variables	(1)	(2)	(3)	(4)	(5)
Ln immigrant stock$_{ij}$	0.292***	0.262***	0.146***	0.222***	0.145***
	(0.032)	(0.03)	(0.049)	(0.034)	(0.051)
Ln expatriate stock$_{ij}$	-	0.053	0.342***	0.17**	0.33***
		(0.036)	(0.106)	(0.061)	(0.11)
Inst. quality$_{ij}$ x Ln imms$_{ij}$	-	-	0.003**	-	0.003**
			(0.001)		(0.001)
Inst. quality dummies					
- 2nd tertile x Ln imms$_{ij}$	-	-	-	0.054	-
				(0.044)	
- 3rd tertile x Ln imms$_{ij}$	-	-	-	0.068	-
				(0.049)	
Inst. quality$_{ij}$ x Ln expats$_{ij}$	-	-	-0.006***	-	-0.006***
			(0.002)		(0.002)
Inst. quality dummies					
- 2nd tertile x Ln expats$_{ij}$	-	-	-	-0.109**	-
				(0.052)	
- 3rd tertile x Ln expats$_{ij}$	-	-	-	-0.18**	-
				(0.069)	
Colonial relationship$_{ij}$	-	-	-0.053	-0.052	-
x Ln imms$_{ij}$			(0.081)	(0.083)	
Colonial power dummies					
- Spain x Ln imms$_{ij}$	-	-	-	-	-0.174*
					(0.086)
- France x Ln imms$_{ij}$	-	-	-	-	-0.12**
					(0.053)
- UK x Ln imms$_{ij}$	-	-	-	-	-0.041
					(0.077)
- Others x Ln imms$_{ij}$	-	-	-	-	-0.023
					(0.124)
Colonial relationship$_{ij}$ x	-	-	-0.026	-0.024	-
Ln expats$_{ij}$			(0.062)	(0.062)	
Colonial power dummies					
- Spain x Ln expats$_{ij}$	-	-	-	-	0.013
					(0.09)
- France x Ln expats$_{ij}$	-	-	-	-	0.075
					(0.055)
- UK x Ln expats$_{ij}$	-	-	-	-	-0.048
					(0.053)
- Others x Ln expats$_{ij}$	-	-	-	-	-0.022
					(0.087)
Common language$_{ij}$	-	-	-0.032	-0.032	-0.041
x Ln imms$_{ij}$			(0.058)	(0.064)	(0.058)
Common language$_{ij}$	-	-	-0.059	-0.062	-0.058
x Ln expats$_{ij}$			(0.041)	(0.044)	(0.043)
R^2	0.404	0.412	0.375	0.385	0.376
Obs.	2,427	2,340	2,321	2,321	2,321

[x]Standard errors in parentheses. *, **, *** - significant at 10%, 5%, and 1% respectively.

Table A2.4: Correlation table for trade flows and migrant stocks.

	Ln Imports$_{ij}$	Ln Exports$_{ij}$	Ln Imm stock$_{ij}$	Ln Expats$_{ij}$
Ln Imports$_{ij}$	1			
Ln Exports$_{ij}$	0,812	1		
Ln Immigrant stock$_{ij}$	0,633	0,659	1	
Ln Expatriates$_{ij}$	0,559	0,562	0,543	1

Table A2.5: Country pairs in the sample with common colonial past.

Mother country	Colony	Mother country	Colony
Belgium	Burundi	Spain	Costa Rica
	Rwanda		Cuba
France	Benin		Dominican Rep.
	Burkina Faso		Ecuador
	Cambodia		El Salvador
	Cameroon		Eq. Guinea
	Chad		Guatemala
	Congo		Honduras
	Cote d′Ivoire		Jamaica
	Djibouti		Mexico
	Gabon		Morocco
	Guinea		Nicaragua
	Haiti		Paraguay
	Lebanon		Peru
	Madagascar		Philippines
	Mali		Uruguay
	Mauritania	UK	Bangladesh
	Mauritius		Barbados
	Morocco		Cyprus
	Niger		Ghana
	Senegal		Guyana
	Togo		Hong Kong
	Tunisia		India
	Vietnam		Jamaica
Italy	Ethiopia		Kenya
	Libya		Malaysia
	Somalia		Malta
Netherlands	Guyana		Mauritius
	Indonesia		Nigeria
	Suriname		Pakistan
Portugal	Angola		Sierra Leone
	Brazil		South Africa
	Cape Verde		SriLanka
	Guinea-Bissau		Tanzania
	Mozambique		Trinidad and Tbg
Spain	Argentina		Uganda
	Bolivia		Zambia
	Chile		Zimbabwe
	Colombia		

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Chapter 3

FAIR TRADE - IS IT REALLY FAIR?

(written jointly with Jan Mysliveček)

One of the arguments against the Fair Trade scheme is that the guaranteed minimum price tends to depress world prices and thus the incomes of non-participating farmers (e. g. The Economist, 2006). We develop a model that distinguishes between the impact of the introduction of a Fair Trade market *per se* and the effect of minimum pri ce policies given that a Fair Trade market actually exists. The model suggests that the claims against Fair Trade might not be correct. The introduction of a Fair Trade ma rket reduces information asymmetries between the trading parties and dampens the market power of middlemen. Improved matching and lower margins of the middlemen have the c apacity to increase the incomes of both participating and non-participating farmers. The minimum contracting price as part of Fair Trade standards, however, precludes the full realization of the program's potential benefits by reducing farmers' payoffs relative to the free-contracting alternative. The minimum price also paradoxically increa ses the profits of the middlemen whose local monopsony power the Fair Trade scheme originally aimed to retrench.

Keywords: Certification, regulation, price setting, coffee, Fair Trade, monopsony
JEL classification: D18, D21, D43, D45, D71, J51, Q17, Q56

3.1 Introduction

As Fair Trade-certified products gradually move from specialized shops to supermarket shelves, the actual impact and potential of Fair Trade has become an increasingly discussed topic. Academics, journalists and policymakers as well as NGOs and other stakeholders involved in the Fair Trade scheme present their worries and expectations regarding the movement's actual capacity to improve the livelihoods of poor people. Besides the common

assertion that Fair Trade certification helps marginalized producers through guaranteed minimum prices and other provisions like access to pre-finance or market information FLO (2007), the most vocal concerns of Fair Trade opponents relate to the excess Fair Trade supply, the impact on non-participating producers, and the uncertain nature of Fair Trade demand (The Economist, 2006; Washington Post, 2005; Weber, 2007, etc.).[1] These opinions certainly deserve a more detailed analysis as the potential reach of Fair Trade extends to millions of households living in poverty.

This paper aims to address some of the most frequently expressed concerns relating to the Fair Trade certification scheme, namely the excess of Fair Trade supply due to the guaranteed minimum price, the impact on non-participating producers, and the limited scope of Fair Trade demand. In particular, it aims to answer the following questions: What is the impact of the introduction of Fair Trade markets on farmers' incomes? Does the guaranteed Fair Trade price disadvantage those producers who do not engage in Fair Trade compared with those who do? How do the costs and benefits of the scheme depend on the structure of global markets?

We develop a simple framework incorporating the empirical regularities of the largest and most successful Fair Trade market—coffee. Within this framework we distinguish between the impact of the introduction of a market with Fair Trade-certified products[2] and the effect of minimum price policies given that a Fair Trade market actually exists. Furthermore, we study the link between the two above-mentioned measures and the behavior of middlemen operating in regional coffee markets.

The following section provides a brief expose of the structural changes on the global coffee market in the 90s and the success of Fair Trade-labelled coffee. Section 3.3 reviews the organization of the Fair Trade labelling scheme and the major arguments favoring the Fair

[1] There are, of course, additional arguments against Fair Trade such as the inefficiencies in processing and distribution due to Fair Trade's bypassing of specialized intermediaries exploiting economies of scale. Fair Trade has also been criticised as yet another instrument for price discrimination across customers. For the sake of clarity, our paper does not address these issues and instead focuses exclusively on the excess supply argument and the corresponding impact on farmers.

[2] The assumption that there indeed exists a demand for such products can be justified by Andreoni (1990)'s "warm glow" effect. In the present context, the "warm glow" effect reflects the additional utility due to the consumption of coffee grown under "fair" standards.

Trade idea. Section 3.4 develops a model that addresses some of the benefits and concerns relating to Fair Trade in a simple framework first without monopsonistic middlemen and then with the middlemen that control access to world markets. For ease of exposition, Section 3.4 also contains the numerical results obtained from explicit supply and demand structures. The final section concludes.

3.2 Fair Trade and the global coffee market

The Fair Trade idea is usually associated with coffee, the most successful Fair Trade commodity with the largest share in total sales and the longest history among traded Fair Trade commodities.[3] The growth of Fair Trade can be neatly illustrated by the story of this commodity. The yearly average increase in total sales volume of Fair Trade coffee over the period 2001-2006 amounted to 27%, with growth rates increasing on a yearly basis and reaching as much as 53% in 2006 FLO (2007). The extraordinary growth can be attributed mostly to the expanding markets in the United States, where only in 2006 the sales volumes more than doubled. Nonetheless, in Europe with its 79,000 sales points, the market shares of Fair Trade coffee have been likewise increasing substantially. In the United Kingdom, the market share of ground Fair Trade coffee increased from 1.5% in 1999 to 20% in 2004 (FINE, 2005).[4] While in other European countries the growth rates and market shares have been more modest, they still exceed the annual growth of world coffee demand (0.4%) by an order of magnitude. Hence, despite a still negligible share in the overall world coffee consumption (0.8% out of a total 6.7 million tons in 2006, FLO, 2007 and ICO, 2007),[5]the continuing

[3]In North America, coffee accounted for 34% of all Fair Trade sales in 2003 (EFTA, 1998). According to the European Commission (1999), the estimated share of Fair Trade food products totaled 60% of the overall Fair Trade retail turnover within the EU. Coffee made up approximately 50% of the above-mentioned share.

[4]Note that the figures refer to ground coffee, for instant coffee the shares are much lower FLO (2007).

[5]According to the FLO (2007), the worldwide certified sales of all Fair Trade products amounted to roughly 2.3bln USD. The overall sum will be slightly higher given that the figure does not include non-certified Fair Trade articles. Given this minor share, one could argue that the cross-price effects impacting the non-participating farmers are likely to be rather tame, if any. In Section 4 we argue that this might not be the case.

expansion of specialty markets and rising consumer awareness of the Fair Trade concept[6] call for a closer evaluation of the respective pros and cons. We begin with developments on the world coffee markets over the last few decades.

3.2.1 Coffee crisis in the 90s

Until 1989, the global coffee market was regulated through the International Coffee Agreement (ICA), a set of agreements which stipulated production quotas and governed quality standards for the majority of produced coffee. The disintegration of the ICA and the following sharp rise in coffee supply coincided with stagnating demand and market concentration of major roasting and trading companies. On the supply side, the quota abolition led to the output expansion of existing producers (e.g., Brazil), as well as the entry of new significant players (Vietnam) specializing in the production of lower quality Robusta coffee. The demand side, on the other hand, witnessed improved processing technologies that removed the bitter taste of cheaper coffee beans such as Robusta and "natural" Arabica. These advances shifted roasters' demand away from traditional coffee exporters from Central America specializing in a more expensive mild Arabica (see Lindsey, 2003).[7] The coffee glut has been further exacerbated by the long adjustment lags typical for coffee production.[8]

Except for short periods of recovery in the mid-90s, coffee prices reached historical lows and led to substantial hardship in the affected rural economies.[9] In October 2001, the price of higher quality Arabica coffee[10] quoted at the New York Board of Trade reached its lowest level in 30 years at 45 cents/lb. For the sake of comparison, Bacon (2005) puts the estimated average monetary production costs of small farm producers to vary between 49

[6] Moore (2004) cites survey evidence on expanding shares of consumers describing themselves as "ethical", or "strongly ethical".

[7] According to Wasserman (2002), cited in Lindsey (2003), the estimated percentage of mild Arabica in the roasters' leading coffee blends dropped from 50% in 1989 to 35% in 2001.

[8] It takes several years before beans can be first harvested.

[9] Bacon (2005) mentions substantial rural-urban migration in Matagalpa, Nicaragua and eroded farmlands following the substitution from coffee to cattle pasture in Coto Brus, Costa Rica. Similar observations from other regions can be found in e.g., Raynolds (2002a) or Ronchi (2002).

[10] Arabica and Robusta are the two main coffee species produced. While Arabica is grown mostly in Latin America and Eastern Africa, major producers of Robusta coffee are located in Brazil, Uganda, India and South-East Asian countries (ICO, 2007).

and 79 cents/lb. Nonetheless, since 2001 the price of Arabica coffee has gradually risen so that in October 2007 it has surpassed the Fair Trade minimum price 121 cents/lb.

3.2.2 Growth of specialty markets

While demand for normal "bulk" coffee has been stagnating and its prices have been falling, the specialty coffee sector has been growing fast. For example, the U.S. gourmet coffee market in 2001 represented 40% of the total market value and 17% by volume with annual growth rates well above 5% (Giovanucci, 2001). The continuing success of specialty brands has reflected increasing consumer demand for high quality, taste and an attractive "story" behind each cup of coffee. The Fair Trade and organic labels were able to keep up with these market differentiation trends and although they represent still a relatively minor share in the specialty coffee sector (3-5% in the U.S. specialty coffee retail market Giovanucci (2001)), their position becomes stronger year-by-year. Apart from increasing market shares in the gourmet sector, the growing importance of Fair Trade in the coffee market becomes apparent from both its increasing recognition by customers and widening presence in common distribution channels. The former can be illustrated by survey evidence according to which 74% of the French population understood the notion of Fair Trade and 50% of the adult population in the UK recognized the Fair Trade label (FINE, 2005). Fair Trade products have also become increasingly available in "mainstream" retail outlets. In Europe only, the number of supermarkets with a Fair Trade selection increased from 43,100 in 1999 to 56,700 in 2004 (FINE, 2005), i.e., by 32%. The origins, organization and working of Fair Trade networks facilitating the above-mentioned market progress is described in more detail in the following section.

3.3 The origins, organization and benefits of Fair Trade

The Fair Trade movement can be traced back more than 40 years when Alternative Trade Organizations (ATO) established trade networks connecting marginalized producers in developing countries with socially aware customers in developed markets. In 1997 several independent labelling initiatives formed Fairtrade Labelling Organization International (FLO).

Five years later the FLO launched the FairTrade label in order to harmonize different labels used at the time.

The organization currently works with 569 Fair Trade-certified producer organisations representing over 1.4 million farmers and workers in 57 countries in Africa, Asia and Latin America FLO (2007). Similar to other Fair Trade initiatives, the FLO supports Fair Trade through the linking of producers with traders in order to match supply and demand, liaison with producer organizations to strengthen their production and export capacities, and lobbying at international forums on trade and development. Nonetheless, the main task of the FLO is the standard setting, certification and monitoring of the Fair Trade Certification Trademark recipients.

3.3.1 Fair Trade and labelling

Of course, coffee is not the only Fair Trade article and not all Fair Trade products are certified. According to FLO data, the retail value of all Fair Trade products sold in 14 European countries in 2005 totaled €657m at minimum, out of which €597m (i.e., approximately 90%) came from the sales of certified products.The labelling scheme covers almost exclusively food products. Besides coffee as a leading and most successful commodity, the Fair Trade certification portfolio covers a number of other major crops including bananas, cocoa and rice. The certification standards vary by commodity and production process (small-scale farming vs. production by hired labor) and distinguish between producers and traders.

In the case of coffee, traders have to trade directly with Fair Trade producers and:

1. pay at least a guaranteed minimum price (121 cents/lb for Arabica coffee) or above to cover the costs of sustainable production. In case the coffee price quoted at the New York Board of Trade exceeds the Fair Trade Minimum Price, the Fair Trade price equals the New York price,

2. pay the Fair Trade premium 10 cents that should be used by producers for community development or investment by individual producers,

3. offer pre-financing/liquidity up to 60% of the contract value,

4. sign contracts that promote long-term sustainable planning.

Fair Trade coffee producers, on the other hand, have to

1. be small-scale farmers associated in a democratic organization,

2. have the necessary export capacity,

3. pursue environmentally friendly production techniques FLO (2007).

The most visible Fair Trade benefit to the participating farmers seems to be the Fair Trade Minimum Price. Shocks and long adjustment lags of inelastic supply and demand in the global coffee market directly translate into price fluctuations, which can inflict significant hardship on micro- and small-scale producers accounting for a significant part of the overall coffee production structure (see e.g., Raynolds, 2002a; Moore, 2004).[11] These producers face limited opportunities to cope with adverse market developments especially in periods of prolonged low prices.

However, the availability of the minimum Fair Trade price during times of coffee gluts and low market prices might result in excess supply that forces FT farmers to sell part of their production via traditional channels. Depending on the relative prices and costs of their production on FT and regular markets, it is possible that the excess supply regime brings losses to some of the farmers. In Section 3.4, we develop a model that allows us to study these effects.

3.3.2 Other benefits of Fair Trade

The minimum Fair Trade price is not the only benefit to the participating farmers. The interviewed farmers often mention the advantages of stability rather than the actual level of the price.

[11] In Central America, approximately 85% or 250,000 farms are micro- and small-scale (CEPAL, 2002 cited in Bacon, 2005).

An even more important dimension of Fair Trade, however, seems to be the access to developed markets as well as the expert assistance from Fair Trade organizations aimed to improve farmers' position on the market. Fair Trade cooperatives often perceive the scheme as an opportunity to learn about current demand trends and quality expectations by customers. Relationships between the cooperatives and ATOs usually exceed the notion of a common market transaction and can include joint investments or the development of marketing strategies for the developed market. Raynolds (2002b, pp. 419) claims that

> "in many cases the technical expertise and market information provided through Fair Trade may be more important for producer associations than the financial and commodity arrangements. ... This information is critical for those selling their coffee via conventional channels or seeking organic specification."

In addition, many producers (Raynolds, 2002a; FLO, 2007; FTF, 2006) stated the elimination of middlemen and farmers' direct Fair Trade experience markedly improved their bargaining position with respect to other market agents and official authorities.

3.4 Model

While the farmers' narratives consistently report higher or at least stable incomes and improved living conditions due to the guaranteed Fair Trade price, the question still remains how the very existence of Fair Trade, the minimum price and other dimensions of the scheme impact upon non-participating producers. Fair Trade has been sometimes called a mechanism creating an excess supply of coffee, which ultimately hurts the non-participating farmers through a lower equilibrium price on the global market (The Economist, 2006). In this section we argue that regardless of the degree of competition on local coffee markets, the introduction of a Fair Trade market *per se* leads to an improvement or at worst a preservation of all farmers' incomes unless the total realized demand for both types of coffee decreases in a new equilibrium.[12] In this respect, what many critics seem to address is

[12] The question how the demand for coffee changes when a FT market is introduced is primarily a question about the consumers' preferences. Since we could argue both for an increase as well as a decrease of the demand, we leave this question open.

not the actual existence of a market with Fair Trade-certified products but the effect of a guaranteed rather than market-determined Fair Trade price. This, together with Fair Trade's impact on middlemen's behavior and profits, is also a major focus of our study.

In this section we develop a model that allows for several transmission channels that might impinge on both participating and non-participating farmers. The model addresses the following questions: What is the impact of the introduction of Fair Trade markets on farmers' incomes? Does the guaranteed Fair Trade price disadvantage those producers who do not engage in Fair Trade compared with those who do? How do the costs and benefits of the scheme depend on the structure of the markets?

For the sake of simplicity, we divide the exposition into two subsections. The opening subsection assumes the absence of middlemen with monopsonistic positions vis-\'{a}-vis the farmers. The basic setup presents a world describing two coexisting, perfectly competitive markets (one for conventional coffee, the other for Fair Trade coffee) supplied by farmers from regions. We first compare the two-market outcomes to the case with a single market for normal coffee and then examine the impact of the Fair Trade price set above its market-clearing level.

In the second part, we extend this framework by assuming market failure in the distribution chain. In this setup, the middlemen control access to consumers, purchase normal coffee from regional farmers and then deliver their product to the global market. Note that while the world without middlemen described in the opening subsection is a useful benchmark, it is not the existing structure of the coffee market. Our analysis thus allows us to compare the impact of the Fair Trade mechanism in markets that do have powerful middlemen with those that don't. It also allows us to predict what would happen if the role of middlemen were somehow eliminated. Would FT continue to operate if middlemen were absent?

3.4.1 Fair Trade in a world without middlemen

We assume there is a measure one of regions producing coffee and three types of economic agents: farmers producing coffee, consumers and the Fair Trade Organization (FTO). The

FTO sets up a new market and decides on the contracting price p^F at which the exchange will occur. The FTO does not engage in actual Fair Trade transactions and instead focuses purely on the institutional support of Fair Trade exchange. Assume each farmer decides between investment into the production of 1 unit of coffee or an outside option normalized to zero.[13] Given that the farmer opted for coffee production, she can sell the harvested coffee on the world market with normal coffee and get p, or to the Fair Trade market at price p^F. In each region there is a measure one of farmers with heterogeneous production costs c and compliance costs f.[14] The production costs c follow a general distribution function with c.d.f. $G(c)$ defined over support $\langle 0, 1\rangle$. All farmers can also enter the Fair Trade market, yet the cost of doing so for each farmer is f. We assume the following timing:[15]

1. The FTO sets up the FT market and sets the price p^F.

2. Farmers choose between no production (outside option), production of regular coffee, and production of certified FT coffee.

3. Production and trading take place.

The case for heterogeneity in production cost c is rather straightforward. Farmers' education, experience, family size, equipment and soil fertility generally differ, which translates into corresponding differences in farm cost levels.

The relationship between production costs c and compliance costs f is less clear and derives directly from the nature of certification standards determined by the FLO. We argue that these costs are negatively correlated with farmers' productivity. To start with, the

[13] The normalization has been adopted for the sake of simplicity. While farmers might well face positive and possibly heterogeneous outside options, these can be absorbed by the production cost parameter c. The parameter would then have to be rescaled and reinterpreted as net investment costs into coffee production.

[14] Given the absence of an intensive production margin, both types of farmers' costs are in principle fixed. We discuss their nature as well as the mutual relationship between c and f later in this section.

[15] We focus on subgame perfect equilibria, in which all players correctly expect those variables that are determined later in the game. For example, farmers correctly expect the price of coffee on the world market, p.

farmers willing to produce and sell under the FLO label have to be organized into cooperatives, keep records of all income and expenses and follow a number of other FLO monitoring guidelines. It seems quite reasonable to assume that the compliance with this kind of costs will be easier for more productive farmers whose lead in productivity presumably links to their superior management skills and expertise. The FLO's standards also include progress requirements in terms of growth or volume, again favoring those with higher productivity. Our emphasis on intangible skills such as know-how and management capacity rather than production technologies in a traditional "narrow" sense likewise conforms to the anecdotal evidence. For example, Raynolds (2002)b mentions the case of a Mexican cooperative that succeeded in Fair Trade largely through its years of experience in conventional markets. Similarly, Weber (2007) reports the difficulties of younger, less experienced producer organizations with entering the Fair Trade markets while Raynolds (2002)a emphasizes the necessary strong leadership and capacity to innovate.

A fraction of compliance costs f can be attributed to the certification fees derived from the FLO's certification scheme. These take the form of a flat yearly fee paid to the FLO to cover the costs of certification and expenses related to on-site inspections. Note that the certification fee applies to the whole cooperative and thus introduces an incentive to expand in order to reduce the per-capita certification cost. Since the incentives at the cooperative level lie outside the primary focus of our paper, we abstract from this issue and assume the per capita certification fee to be fixed so that the positive correlation between production costs c and overall compliance costs f will be preserved.

In addition to the positive correlation between the two types of costs, we assume that the compliance costs are indivisible. That is, farmers cannot choose to incur only a part of the compliance costs f, depending on the proportion of their harvest targeted to the Fair Trade market. Given that the above-mentioned compliance costs relate largely to farm attributes that are indivisible in nature, we believe our assumption to be a reasonable one.

As far as the other assumptions concerns, the introduction of multiple regions reflects the fact that coffee growing areas are typically spatially divided among private middlemen taking a monopsonist or oligopsonist position with respect to local farmers. Arbitrage among regions is in practice limited given the lack of information, poor infrastructure and

natural barriers in mountainous areas where many small-scale coffee producers live (see e.g. Ronchi, 2002).[16] We also do not allow for production adjustment at the intensive margin and instead assume a fixed output per farmer. As Weber (2007) observes, FLO generally does not induce a higher Fair Trade supply of presently participating farmers and instead re-channels the existing production from conventional markets either through the certification of additional applicants. Even if this was not the case, however, the situation of farmers often does not permit a significant expansion of output due to either the absence of key productive assets such as land or capital, or the replacement of the former coffee growing areas by urban development (Ronchi, 2002; Winters et al., 2004). This fact has also been acknowledged by the European Fair Trade Association, which stated that "given the parcels of land [the farmers] possess and the lack of working capital and resources, [the expansion of output] is almost out of the question" (EFTA, 1998 cited in Ronchi, 2002). Despite the suggestive evidence on its relatively low relevance for farmers' adjustment, the model can nonetheless allow for the intensive margin. The impact of price changes on the numbers of active farmers would then be partly muted via the accommodation of farm output, yet the middlemen's incentives would remain the same, since the middleman is primarily interested in the available quantity of coffee instead of the number of farmers.

The farmers' constraints

In our model, a farmer has three options. Given her expectations regarding the price of regular coffee p, she can take an outside option of zero value (no production), or invest into producing 1 unit of coffee. Given her decision to invest, she can sell to the market with normal coffee or pay for the FT standards at an additional cost f and sell on the FT market.

[16] The normalization of the number of regions to 1 has been used for ease of exposition. Note that this does not impact the results. The interested reader may simply multiply demand functions by $\frac{1}{n}$ (where n stands for the number of regions) and proceed with the analysis. Similarly, one might argue that the distribution of the Fair Trade production across regions is not symmetric. Allowing for a fraction of regions to be without Fair Trade production (yet with the same assumed cost structure) would impact on the relative strength of individual channels at work. The qualitative picture, however, would not change. Finally, one might argue that the cost structure is not identical across regions. In such a case, the model might be given an alternative interpretation, where the overall cost distribution across internally homogeneous regions follows c.d.f. $G(c)$ and a single middleman with sole access to world markets decides on the overall amount of purchases. The assumption of the middleman being a price taker on world markets, however, would be rather difficult to justify.

The participation constraints are

$$\begin{aligned} \text{no production:} \qquad & p < c \;\&\; \pi p^F + (1-\pi)\, p - c < f \\ \text{sell regular coffee:} \qquad & p \geq c \;\&\; \pi \left(p^F - p\right) < f \\ \text{sell FT:} \qquad & \pi p^F + (1-\pi)\, p - c \geq f \;\&\; \pi \left(p^F - p\right) > f, \end{aligned}$$

where $\pi \in [0, 1]$ denotes the share of FT production that a farmer is able to sell his products on the FT market, or equivalently, a probability of being able to sell all of the production for a risk-neutral farmer. The case of $\pi = 1$ corresponds to the situation with both markets clearing.

Rationing

If $\pi < 1$, the Fair Trade price p^F is set above its market-clearing level. As a result, some rationing of the sales of FT coffee has to take place.

The excess supply with $\pi < 1$ is a fairly justified assumption, both theoretically and empirically. First, it is usual to see excess supply on a market in which the price is artificially increased above its equilibrium value. Empirical studies confirm this expectation. According to Bacon (2005), close to 70% of Fair Trade cooperatives' production goes to conventional coffee markets and this figure is attributed to low demand and high quality requirements. The Costa Rican cooperatives examined by Ronchi (2002) sold a mere 49% of their coffee production as Fair Trade. In 2002, the FLO had to temporarily reject pending applicants due to the discrepancy between supply and demand. In the same year the FLO estimated that the supply of Fair Trade coffee was seven times the total Fair Trade volume actually exported Weber (2007). While there are other possible explanations why FT farmers might sell their coffee through conventional markets (e.g, liquidity problems during the harvest season, see Bacon, 2005), in light of the above-mentioned evidence it seems that excess supply plays an important role. In our model, the assumption of FT sales flowing partially through conventional channels relies fully on the excess supply argument.

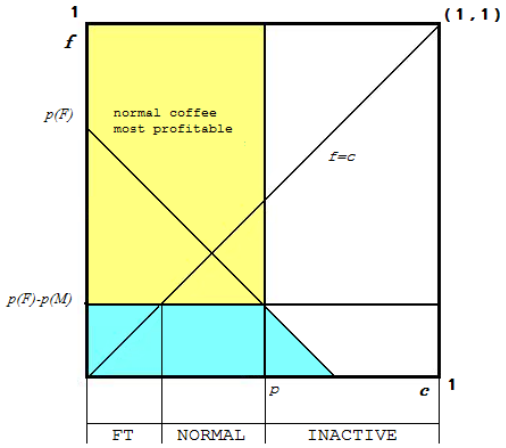
We assume proportional rationing rule, ie. excess supply on the FT market makes the participating farmers sell only part of their production through the Fair Trade channel, the rest being directed back to markets with normal coffee. In the rational expectations

equilibrium, the expectations will have to coincide with the realized proportion of the total FT output sold to FT customers.

While proportional rationing seems a natural choice, it is not the only possibility and different rules may affect results significantly. For example, if the rationing is done according to the costs of FT production, only farmers with low costs will find it optimal to apply for FT certificate. This follows from rational expectations assumption: farmers with higher costs that would be able to sell part of their production under the proportional rationing rule but nothing under the rule based on the costs of production would prefer not to enter in the first place to save on the fee and additional production costs f. This would imply that there would not be any rationing taking place, since only farmers that expect to be able to sell on the FT market will enter it. The impact of an increase in FT price would thus depend on the effect it has on the quantity of coffee traded. We assume that this effect is negative, which would mean that if the FTO raises the FT price, it restricts the entry of farmers. This does not need to happen under the rationing rule, because higher price on FT market may attract more farmers despite a decrease in the probability of an successful trade, as we show later in the numerical example. Since we do observe significant excess supply on the FT market, we prefer the proportional rationing rule.

We make another assumption that might influence our results. We assume that consumers do not care about the excess supply on the FT market. We are not aware of any evidence that would suggest that consumers are aware of the existence of the excess supply or that they change their behavior according to it. One might imagine that the consumers increase their consumption of FT coffee in case of higher excess supply (due to potentially more significant "warm glow" effect). It is also possible that they would decrease their consumption, because they feel that the organization of FT market is wasteful and not beneficial to the farmers. Since we use rather general demand functions, an explicit assumption about the consumers' reaction to excess supply would seem arbitrary. However, it might be a potentially interesting venue for future research.

Figure 3.1: Farmers' decisions for various cost combinations (f, c).



Production costs

The above-mentioned constraints define the potential combinations of c and f (as well as the corresponding cut-off points) that are consistent with the particular participation choices of the farmers. For simplicity, we will assume $f = kc$, where $k \leq 1$ is a parameter.[17] Figure 3.1 illustrates the participation constraints and the respective supplies for normal and FT coffee generated by the line $f = kc$ with $k = 1$ and c distributed uniformly over $\langle 0, 1 \rangle$.

[17] Our specific assumption of the linear relationship between production costs c and compliance costs f satisfies the assumption of a positive correlation between c and f and greatly simplifies the subsequent analysis. We might further allow for a part of compliance costs to reflect the fixed per-capita certification fee discussed in this section, so that $f = a + kc$, $a > 0$. Nonetheless, the positive constant a does not add much to our story (see the curve $f = kc$ in Figure 3.1, which is in fact a special case of $f = a + kc$ with $a = 0$). Also note that independent of the production costs c and given the coffee prices p and p^F, if $k = 0$ and $f = a$, all active farmers would be willing to participate either exclusively in the Fair Trade or the normal market. The price mechanism would then have to adjust so that ultimately the farmers are indifferent between the two choices. Hence some heterogeneity in f is needed for the model to become interesting. For the purpose of the testing of our theory, one would need to estimate the value of the parameter k from the costs that FT farmers have in addition to their similar non-FT counterparts. Such estimation, however, goes beyond the scope of this paper.

Objective function of the Fair Trade Organization

The Fair Trade Organization is a non-profit institution that claims to aim to improve the living conditions of farmers. It is not clear how this broadly defined motivation translates into a decision about the Fair Trade price and other requirements. Thus, instead of making an explicit assumption about the objective function of the FTO, we study how different choices of the Fair Trade price impacts farmers (both participating and non-participating). This allows us to discuss which objective of the FTO is consistent with its current behavior and which is not.

Regardless of the objective function of the FTO, its role as a certification body is to guarantee to the consumer that certain conditions (like price, pre-financing, etc.) for the farmers are met. In this respect, the FT certification works like any other certification system. The certifier, FTO, assures consumers about the properties of the good they purchase that they cannot directly or easily observe. Thus, it solves the asymmetry of information problem and facilitates the matching between farmers' supply and consumer preferences. The FTO, however, does not enter into direct transactions with either farmers or traders.

It is easy to find examples of for-profit certification systems but it seems that the for-profit behavior of the FTO would go directly against what it tries to sell. Thus, we focus on possible non-profit objectives instead. It is also important to note that the quality that the certifier FTO provides is not the taste of the coffee and thus Fair Trade complements rather then substitutes vertical differentiation in this respect. Fair Trade certification, even though it requires the sustainability of production processes, does not require that the products are organic. In fact, one can often find both organic and Fair Trade certification of the same coffee.

The equilibrium and comparative statics

We will assume that world demand for FT coffee $D^F\left(p, p^F\right)$ depends on the prices of both types of coffee and satisfies the following restrictions:[18]

$$D_p^F\left(p, p^F\right) > 0, D_{p^F}^F\left(p, p^F\right) < 0 \text{ and } \left|D_p^F\left(p, p^F\right)\right| < \left|D_{p^F}^F\left(p, p^F\right)\right|$$

A symmetric pattern is required to hold for normal coffee demand $D^N\left(p, p^F\right)$. These assumptions impose reasonable restrictions—the direct price effect is negative and the indirect price effect is positive but smaller in absolute value than the direct effect.

Note that given the minor share of Fair Trade in world coffee consumption (see Section 2), the cross-price effects impacting upon the non-participating farmers could arguably be rather tame (if there are any). In practice, however, even world demand differentiates across regions of origin. As a result, Fair Trade production in e.g. Nicaragua, where the share of Fair Trade production is relatively high, might indeed affect the prices of Nicaraguan coffee. We assume that Fair Trade is strong enough to shift world prices.[19]

We are interested in an equilibrium with both markets being active.

If the price p^F becomes market-determined, participation and realized supplies coincide as farmers supply either to the normal or FT coffee market and $\pi = 1$. In the excess supply setup with $\pi < 1$, however, we need to distinguish between the local participation choices and the realized supplies to global markets.

---

[18] Several studies such as e.g., Broda and Weinstein (2006), Petrin (2002), or Feenstra (1994) addressed the welfare impact of the introduction of new goods/markets within the Dixit and Stiglitz (1977)'s framework that relies largely on CES utility functions and love-of-variety. In the present context of market creation through environmental or socially conscious labelling, Podhorsky (2006) provides an extension of Melitz (2003)'s industry model with heterogeneous firms where each firm produces a different variety and decides on the adoption of environmental label. For Fair Trade labelling, however, the goods in question are typically *ex ante* homogeneous (such as locally fragmented coffee production before the introduction of FT) and hence cannot be modelled as a differentiated variety demanded by CES customers. By so doing, it imposes product differentiation among firms/farmers *before* the actual introduction of Fair Trade.

[19] In the Appendix 3A we also provide a model extension in which we assume that the price of FT coffee does not impact the demand for regular coffee.

$$
\begin{aligned}
\text{[Participation in FT]}: \quad & S^F = G\left(\frac{\pi\left(p^F - p\right)}{k}\right) \\
\text{[Participation in N]}: \quad & S^N = G(p) - G\left(\frac{\pi\left(p^F - p\right)}{k}\right) \\
\text{[Realized FT]}: \quad & S^{WF} = \pi S^F \\
\text{[Realized N]}: \quad & S^{WN} = S^N + (1-\pi)\, S^F,
\end{aligned}
$$

where N stands for "normal/regular coffee market" and FT for "Fair Trade market". While $G\left(\frac{\pi\left(p^F-p\right)}{k}\right)$ of the total population of farmers choose to participate in the FT scheme, they are not able to sell exclusively to FT markets. Not being able to find enough buyers, their remaining harvest $(1-\pi)\, S^F$ has to be sold through conventional channels.

In the rational expectations equilibrium, the realized supplies and demands have to be equal.

$$
\begin{aligned}
\pi S^F\left(\pi, p, p^F\right) &= D^F\left(p, p^F\right) \\
S^N\left(\pi, p, p^F\right) + (1-\pi) S^F\left(\pi, p, p^F\right) &= D^N\left(p, p^F\right). \\
\pi = \pi\left(p^F\right), p &= p\left(p^F\right)
\end{aligned}
\tag{3.1}
$$

It is possible to show that there exists an equilibrium under standard conditions, using the Implicit Function Theorem (IFT). The assumptions of the IFT require the existence of a solution in one point, and non-singularity of the Jacobian of the equilibrium conditions. This in fact imposes mild conditions on the supply and demand functions. The existence of an equilibrium is not the prime focus of our paper and we thus do not provide a detailed proof. A numerical example later shows that some equilibria indeed exist. Furthermore, in the Appendix A3 we discuss informally the existence of equilibria in a model with middlemen.

Lemma 1 *Under standard conditions on supply and demand functions, there exists an equilibrium for a range of FT prices* p^F*.*

The following lemma shows that the presence of Fair Trade in our model benefits all farmers under quite general conditions.

Lemma 2 *Given that markets clear (i.e., $\pi = 1$), the incomes of all farmers (weakly) increase if and only if the total realized demand does not fall after the introduction of the Fair Trade market.*

Proof. If the overall realized demand in a new Fair Trade equilibrium remains constant, it can exist only if the participating farmers are relatively better off than selling through the conventional channels. The normal farmers' payoffs are furthermore unchanged due to a constant price p.

If the overall realized demand in a new Fair Trade equilibrium increases, the non-participating farmers have to be better off since the actual increase only becomes possible if the previously inactive farmers enter the production and this can only happen once the purchase price of normal coffee p rises. Furthermore, the Fair Trade farmers are unambiguously better off, otherwise they would not have been participating in the first place.

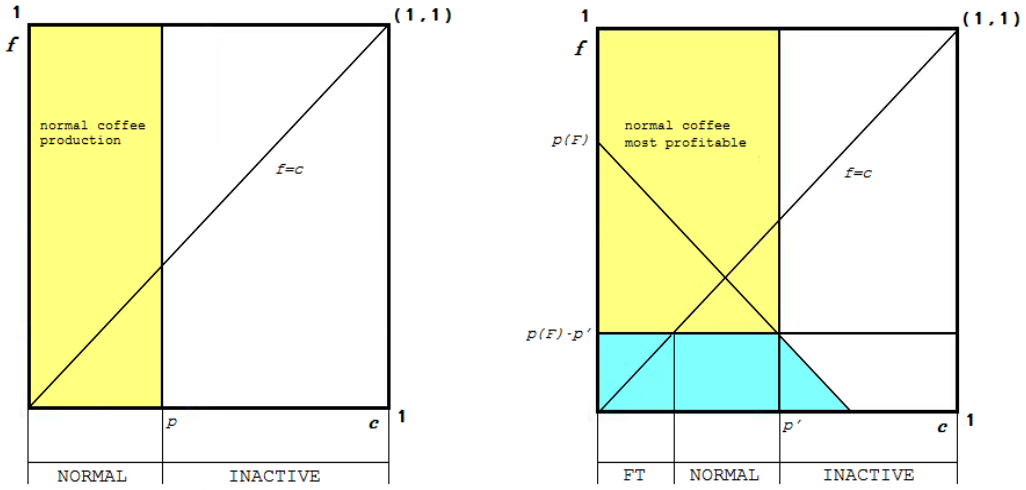
If the total realized demand declines following the introduction of Fair Trade, the fall in the consumption of conventional coffee has been less than compensated by the purchases of Fair Trade coffee. As a result, normal farmers become worse off. Some FT farmers may be better off. ■

In other words, unless total realized demand does not fall after the introduction of the Fair Trade market, the very introduction of the scheme by the Fair Trade Organization absent any price-setting constraints helps the participating farmers and at least does not hurt the incomes and participation of normal coffee producers. Figure 3.2 illustrates the case where the total realized demand has increased after the introduction of Fair Trade despite a shift away from normal coffee. This happened due to a more-than-compensating rise of Fair Trade consumption.

The present results are somewhat similar to the third degree price discrimination, where the effect of the discrimination depends on whether it decreases the output.[20] As in the literature on third degree price discrimination, we are also concerned here with the impact of opening a new market. In addition to that, we study how fixing the price on the newly

[20] We are grateful to Roland Strausz for suggesting this similarity.

Figure 3.2: Shift away from normal coffee when Fair Trade is introduced (total demand increases).



open market affects the previous market. The first question is thus similar to the question in the literature on price discrimination, even though the decision to open the new market is not done by the seller(s) on the old market and each consumer makes purchases on both markets.

Our paper, due to the general structure of the demand side, does not allow us to study in detail welfare effects of opening a new market with FT coffee and setting above-equilibrium price on it. For example, if opening the new market reduces the quantity traded on the normal market, the effect on farmers and consumers is heterogeneous. Some farmers (those remaining on regular market) are worse off because of the fall in price; those moving to the FT market may be better off. Similarly for consumers. Increasing the price of FT coffee may have positive effects for some FT farmers and farmers on the regular market (due to substitution effects), but may hurt consumers. Unfortunately, deeper analysis of these effects is impossible without explicitly modelling demand side.

Assuming that the equilibrium exists, we are now interested in how it compares with the market-clearing equilibrium at which there is no excess supply on the FT market ($\pi = 1$).

Lemma 3 *If there are no middlemen, an increase in price p^F above its market-clearing*

level increases the excess supply $(1-\pi)$ *and reduces the price of regular coffee* p*.*

$$\frac{d\pi}{dp^F} < 0, \frac{dp}{dp^F} < 0.$$

All proofs are provided in the Appendix A3, unless noted otherwise.

Lemma 4 *By increasing the price* p^F *above its market-clearing level, the farmers' participation in the Fair Trade scheme increases if and only if*

$$\left|\varepsilon^{D^N}_{p^F} \frac{S^{WN}}{S^{WF}}\right| < \left|\varepsilon^{\pi}_{p^F}\right| \text{ and } \left|\varepsilon^{D^F}_{p^F}\right| < \left|\varepsilon^{\pi}_{p^F}\right|.$$

The payoffs of farmers participating in Fair Trade decrease unambiguously relative to the market-clearing case.

The intuition behind both lemmas is quite straightforward. Holding other things constant, if the Fair Trade Organization sets the contracting price p^F above its market-clearing level so as to maximize farmers' participation in Fair Trade, the demand for Fair Trade has to fall. Despite the concomitant rise of the demand for conventional coffee (we assume that the indirect price effect is weaker than the direct one), the excess supply of coffee remains preserved and translates into corresponding pressure to reduce the price p. Furthermore, if the demand elasticities are low vis-à-vis excess-supply elasticity $\varepsilon^{\pi}_{p^F}$,[21] the decrease in price p becomes so pronounced that it makes the Fair Trade scheme more attractive and thus increases participation. In such a situation the effects of the minimum price p^F resemble the impact of the minimum wage in labor markets with heterogeneous oligopsonists (Manning, 2003). While the actual mechanism at work varies in each case, both results point to the importance of agent heterogeneity in the modelling of market interventions. This result has a simple corollary.

Corollary 5 *In the excess-supply equilibrium with* $\pi < 1$*, the participation in the Fair Trade scheme can increase relative to the market-clearing case with* $\pi = 1$*. This might happen despite the fall of the participating farmers' payoffs.*

[21] The excess-supply elasticity $\varepsilon^{\pi}_{p^F}$ is defined as $\frac{p^F}{\pi}\frac{d\pi}{dp^F}$.

Increasing the price p^F above its market-clearing level hurts all farmers regardless of their status, since both the price of the regular coffee p and the probability of being able to sell Fair Trade π more than offsets the initial benefit of a higher FT price p^F. The previous result holds even if participation in the Fair Trade scheme actually rises. The FT market becomes relatively more attractive than the regular market, yet the FT payoffs of the switching farmers fall short of the normal-coffee payoffs earned in the market-clearing equilibrium. Had this not been the case, the switching farmers would have acted irrationally in the first place by having chosen normal coffee production in the market-clearing equilibrium.

Nonetheless, given the positive impact of the introduction of the Fair Trade market and monotonically decreasing farmers' payoffs, the FT farmers are still better off as compared to the setup with the non-existent Fair Trade market. To see this, note that if the Fair Trade price p^F were gradually raised up to the level prohibiting the existence of the Fair Trade market, all farmers would supply to the normal market, thus imitating the equilibrium with a single existing market for normal coffee.

In the following, we move away from the analysis of farmers' individual payoffs and instead explore the impact of the excess-supply price p^F both on the aggregated profits of all farmers and on Fair Trade participants only. The aggregated profits serve as a proxy for resources available for community investment.[22]

Lemma 6 *In the excess-supply equilibrium with $\pi < 1$, the aggregated profits of all farmers are decreasing.*

The fact that the total profit of all farmers is decreasing in p^F does not tell us whether it is because the profits of both Fair Trade and regular farmers decrease, or because one group benefits in the aggregate while the other does not. The following lemma partially answers this question. It formalizes the intuition that Fair Trade farmers cannot benefit in

[22] The literature on Fair Trade lists a number of benefits of Fair Trade that the present framework addresses only indirectly or not at all (for a brief outline and references see the Appendix A3). One of the frequently mentioned improvements concerns the pooling of resources for the production of positive externalities. Ronchi (2002) reports the efforts of the Costa Rican cooperative COOPELDOS aimed at the maintenance of local roads, other cooperatives provide a number of services such as extended credit or reforestation support also to non-members. Strong rural linkages operating through large expenditure shares of local non-tradeables (e.g., perishable and/or locally processed foods and services) have been emphasized in a study by Winters et al. (2004).

aggregate if their participation decreases as a result of an increase in price p^F. Note that the lemma actually strengthens this result by showing that even an increase in participation may not be sufficient to guarantee an increase in their profits.

Lemma 7 *If the participation of Fair Trade farmers decreases as a result of an increase in p^F, then the overall Fair Trade farmers' profit decreases.*

The observation is straightforward, since we already know that an increase in p^F above its market-clearing level lowers the profits of Fair Trade farmers.[23] The only theoretical possibility thus remains the case when the participation in Fair Trade increases. However, such a condition is not sufficient given the simultaneous fall of Fair Trade farmers' individual profits (see the Appendix A3). We will return to the possibility of increased overall Fair Trade profits (driven by participation) in the following section with middlemen.

Summary of the results in the world without middlemen

In this section we focused on the effect of the introduction of a Fair Trade market and a binding minimum price p^F in a setup without the presence of monopsonistic middlemen. Our interim results assign a generally positive role to Fair Trade in that setting up a new market might improve the matching of consumers' preferences with farmers' supply. On the other hand, the results conform to the critiques expressed e.g. in The Economist (2006) or the Washington Post (2005), claiming that the excess supply caused by the binding minimum price policy of the FLO tends to depress the incomes of the non-participating farmers. This happens through the decline in the normal coffee price p, which in addition forces some of the most disadvantaged to leave coffee production and seek outside options. In this respect the Fair Trade scheme does not help farmers as much as it potentially could, which also translates into profits at the aggregate level. Nonetheless, we assert that once the new Fair Trade market *per se* boosts the farmers' incomes, the excess-supply regime still outperforms the initial situation with a single market for normal coffee.

[23] In the absence of quantity adjustment at the farmer's individual level, payoffs and profits can be used interchangeably.

In the following section we allow for a specific kind of market failure on the normal coffee market and incorporate monopsonistic middlemen restricting the access to world markets. We will focus on the relationship between Fair Trade, farmers' and middlemen's incomes and the behavior of the normal coffee price p.

3.4.2 Fair Trade in a world with middlemen

Previous sections have dealt with two interconnected markets absent any intermediaries. The middlemen, however, play a significant role in the overall distribution chain and their allegedly exploitative position in fact stood at the very roots of the whole Fair Trade movement (see previous sections). For these reasons we extend the model to allow for the presence of intermediaries. These middlemen purchase coffee from local farmers and they have sole access to world markets.

1. FTO sets price p^F.

2. Middlemen set price p^M.

3. Farmers choose between no production, regular coffee production and FT coffee production.

4. Production and trade take place.

We assume that such a middleman is small with respect to global markets, yet she holds some monopsony power vis-Our timing also requires that the middlemen can commit to a given price and to buy any amount of coffee from farmers at that price. The second restriction is not binding because in rational expectations equilibrium, middlemen correctly expect the amount of coffee supplied by the farmers. Farmers' choices are identical to those from the previous market-clearing case, yet now instead of the global market price p they receive a price p^M offered by the middleman. We assume farmers have expectations about the probability π of being able to sell their production on the FT market. The case $\pi = 1$ corresponds to no excess supply, while if $\pi < 1$ there is excess supply.

The middleman's problem

Each middleman maximizes her profit so that

$$\begin{aligned} &\max_{p^M} \ (p - p^M)\left[S^N + (1-\pi)\, S^F\right] \\ \text{s.t. } &S^N = G(p^M) - G\left(\frac{\pi\left(p^F - p^M\right)}{k}\right) \\ &S^F = G\left(\frac{\pi\left(p^F - p^M\right)}{k}\right), \end{aligned}$$

which for a given π leads[24] implicit solution for p^M.

$$[p^M] : -[S^N + (1-\pi)\, S^F] + (p - p^M)\left(g(p^M) + \frac{\pi^2}{k} g\left(\frac{\pi\left(p^F - p^M\right)}{k}\right)\right) = 0 \tag{3.2}$$

or alternatively,

$$(p - p^M)\left(g(p^M) + \frac{\pi^2}{k} g\left(\frac{\pi\left(p^F - p^M\right)}{k}\right)\right) = G(p^M) - \pi G\left(\frac{\pi\left(p^F - p^M\right)}{k}\right). \tag{3.3}$$

One can immediately observe that the middleman's optimal price p^M is a function of the success rate of Fair Trade farmers π, the price of the Fair Trade coffee p^F, and the price p the middleman receives on the world market with conventional coffee. The following lemma summarizes the relationship between the purchase price p^M and the above-mentioned variables.

Lemma 8 *The middleman's optimal price p^M is an increasing function of all its arguments, i.e., $\frac{\partial p^M}{\partial \pi} > 0$, $\frac{\partial p^M}{\partial p^F} > 0$, and $\frac{\partial p^M}{\partial p} > 0$.*

Proof. We provide an intuition for this statement; the formal proof is standard. An increase in the success rate π or the Fair Trade price p^F might make the middleman lose part of the available farmers' supply. In response to this, the middleman partly compensates farmers

[24] Even though we normalize number of regions ($n = 1$) and thus also number of middlemen for technical simplicity, the model is based on the assumption of large number of regions. For example, each middleman does not take into account his impact on π, because the excess supply on the FT market depends on the behavior of other middlemen. If there would be only one middleman, he would be able to take π as dependent on his price p^M, significantly complicating the model.

by raising her purchase price p^M. Similarly, a higher selling price p boosts the middleman's revenues and allows further adjustment on the cost side.

More formally, the middleman sets the optimal price p^M so as to equate the two expressions. If π, p^F, or p increases, the marginal revenue loss for a given p^M increases, while the marginal cost savings fall or remain unchanged. Since the marginal gains in revenues from additional normal coffee purchases exceed the corresponding marginal costs if p^M is relaxed, it is optimal[25] for the middleman to raise the purchase price to $p^{M\prime}$ in order to compensate for the improved outside options of the farmers (upward shifts in π and/or p^F) or to exploit favorable conditions on world markets (higher p). ■

One can also note that the middleman's optimal price setting means that any market developments reflected in price p translate only indirectly and typically in a less pronounced way into farmers' revenues.[26]

The equilibrium and comparative statics

We start with an analysis of the equilibrium where the FTO decides on a price regime p^F when the middleman is present. If the participating farmers sell only part of their production through the Fair Trade channel, the rest is sold to the middleman.

The farmer's choices change to:

$$\begin{aligned} \text{no production:} \quad & p^M < c \;\&\; \left[\pi p^F + (1-\pi)p^M\right] - c < f, \\ \text{sell to middleman:} \quad & p^M \geq c \;\&\; \pi\left(p^F - p^M\right) < f, \\ \text{sell FT:} \quad & \left[\pi p^F + (1-\pi)p^M\right] - c \geq f \;\&\; \pi\left(p^F - p^M\right) \geq f, \end{aligned}$$

where p^M is the middleman's optimal price, taking into account part of the Fair Trade production that could not match Fair Trade markets. As before, we restrict our attention

[25] The second order condition implies that the slope of the marginal cost-savings function is steeper than the slope of the marginal revenue loss function. As a result, the equality can be restored only at a higher price p^M.

[26] One can conjecture that in most cases $\frac{\partial p^M}{\partial p} < 1$, but the proof depends on the behavior of the derivative of density function g'. Thus, there might exist an equilibrium in which even $\frac{\partial p^M}{\partial p} > 1$. For uniform distribution, one can easily show that $\frac{\partial p^M}{\partial p} = \frac{1}{2}$.

to the case $c = kf$. Similar to the previous case when the middleman is not present, one has to distinguish between farmers' local participation choices and the realized supplies.

We have

$$\begin{aligned}
\text{[Participation in FT]}: \quad & S^F = G\left(\frac{\pi\left(p^F - p^M\right)}{k}\right), \\
\text{[Participation in N]}: \quad & S^N = G(p^M) - G\left(\frac{\pi\left(p^F - p^M\right)}{k}\right), \\
\text{[Realized FT]}: \quad & S^{WF} = \pi S^F, \\
\text{[Realized N]}: \quad & S^{WN} = S^N + (1-\pi)\, S^F.
\end{aligned} \tag{3.4}$$

In a rational expectations equilibrium the realized supplies and the realized demands are equal.

$$\begin{gathered}
S^{WF} = \pi S^F\left(\pi, p^M, p^F\right) = D^F\left(p, p^F\right) \\
S^{WN} = S^N\left(\pi, p^M, p^F\right) + (1-\pi) S^F\left(\pi, p^M, p^F\right) = D^N\left(p, p^F\right). \\
\pi = \pi\left(p^F\right), p = p\left(p^F\right), p^M = p^M\left(\pi, p, p^F\right)
\end{gathered}$$

Lemma 9 *Given that markets clear (i.e., $\pi = 1$), all farmers are better-off if and only if the price p^M offered by the middlemen increases once the FT market opens. This happens either if the downward adjustment of the world normal coffee price p stays relatively modest, or if the price p actually increases in response to the new FT market.*

The statement of the preceding lemma conforms to our results from Lemma 2 that dealt with the world without middlemen. In fact, the present results are slightly stronger than those from Lemma 2. The reason is that contrary to the case without middlemen, the non-participating farmers now fare strictly better even if the price of normal coffee remains unchanged. This happens as a consequence of the strategic behavior of the middleman, who finds it profitable to adjust her price p^M slightly so as to mute the outflow of farmers towards Fair Trade. A direct consequence of the middleman's behavior is also that the non-participating farmers can be better off even if the normal coffee price p falls, given that

the effect of a decline in price p does not outweigh the positive effect of Fair Trade farmers' improved access to world markets.

Moving to the comparative statics, we are now interested in how the price of normal coffee p changes once the FTO sets price p^F above its market-clearing level (i.e., $\pi < 1$).

Lemma 10 *Assume that* $\frac{\partial p^M}{\partial \pi} > 0$ *is small enough. In the presence of middlemen, an increase in price* p^F *above its market-clearing level increases the excess supply* $(1-\pi)$ *and might reduce or increase the price of regular coffee* p*.*

Increasing p^F above the market-clearing level might lead to four possible responses of p and π,

$$\frac{dp}{dp^F} < 0, \text{ and } \frac{d\pi}{dp^F} < 0; \frac{dp}{dp^F} > 0, \text{ and } \frac{d\pi}{dp^F} > 0,$$
$$\frac{dp}{dp^F} > 0, \text{ and } \frac{d\pi}{dp^F} < 0; \frac{dp}{dp^F} < 0, \text{ and } \frac{d\pi}{dp^F} > 0.$$

The combination

$$\frac{dp}{dp^F} < 0, \text{ and } \frac{d\pi}{dp^F} > 0$$

is not possible. Technically possible, yet very unlikely, is the case

$$\frac{dp}{dp^F} > 0, \text{ and } \frac{d\pi}{dp^F} > 0.$$

First of all, an increase in π following the departure from market clearing is not a viable option given that $\pi = 1$ and $\pi \in \langle 0, 1\rangle$. Secondly, while further away from the market-clearing price p^F such a constellation might still be permissible, this can happen only if one is willing to accept $\frac{dD^F(p,p^F)}{dp^F} > 0$.[27] We do not find such an adjustment setting plausible and instead focus on the remaining options. Thus, there are only two interesting cases where an increase in p^F raises the excess supply

$$\frac{dp}{dp^F} < 0, \text{ and } \frac{d\pi}{dp^F} < 0,$$
$$\frac{dp}{dp^F} > 0, \text{ and } \frac{d\pi}{dp^F} < 0.$$

[27] The following lemma states that $\frac{dp^M}{dp^F} < 0$, which together with the present possibility that $\frac{d\pi}{dp^F} > 0$ implies $\frac{dS^F}{dp^F} > 0$. But then the realized Fair Trade demand D^F would have to be very sensitive to the price p^F and increase even more than Fair Trade supply S^Fin the new equilibrium in order to be consistent with $\frac{d\pi}{dp^F} > 0$.

Note that the results from the previous lemma differ markedly from the setup with no middlemen and contradict the statements by The Economist (2006) regarding the declining normal coffee prices in the excess-supply regime. Given that an excess supply of Fair Trade coffee is indeed able to influence the prices of regular coffee, these can in principle move in *both* directions. In particular, the arguments relying on the price mechanism operating through world markets do not take into account the presence of market failure in the distribution chain. The introduction of the Fair Trade channel mitigates the negative impact of the middlemen restricting coffee supplies. The Fair Trade excess-supply regime, on the other hand, returns part of the market power back to the middlemen, reintroduces previous inefficiency and in some cases might even lead to an actual increase in the prices of regular coffee. Within the discussion of the excess-supply's impact on the incomes of farmers, nonetheless, our results conform to The Economist (2006)'s critique.

Lemma 11 *In the excess-supply equilibrium with $\pi < 1$, the non-participating farmers are unambiguously worse off relative to the situation with the market-clearing Fair Trade scheme ($\pi = 1$). In other words, $\frac{dp^M}{dp^F} < 0$.*

If $\frac{dp}{dp^F} > 0$, the overall demand falls unambiguously given our demand assumptions and hence $\frac{dp^M}{dp^F} < 0$ in order to have a viable equilibrium. If $\frac{dp}{dp^F} < 0$, we show that it still holds that $\frac{dp^M}{dp^F} < 0$, otherwise the monopsonist does not behave optimally.

Consider the situation of an increased price p^F. Given that price p^F rises and holding price p constant, the demand for Fair Trade falls, so the part of production previously sold as Fair Trade needs to be sold via middlemen to normal markets. Given p^M and p and regardless of farmers' participation choices, the middlemen now face a higher supply from farmers and can adjust optimally. Increasing p^M given p would decrease their profits even if one ignores the unexpected windfall coming from FT. The reason is that in such a case the middlemen would not have been optimizing *ex ante* in the first place. Taking into account the windfall would make their decision even more unprofitable at the margin. So the middlemen will adjust by decreasing the purchase price p^M.

Similarly to the setup without middlemen, we explore the impact of the excess-supply price p^F both on the aggregated profits of all farmers and on Fair Trade participants only.

Lemma 12 *If $\pi < 1$, $\frac{d\pi}{dp^F} < 0$, and $\frac{dp^M}{dp^F} < 0$ in an equilibrium, then the revenue of all farmers is decreasing in p^F above its equilibrium value.*

Proof. The proof is identical to the proof of Lemma 5, if one substitutes p^M in place of p. The difference between these cases comes from the difference between prices p and p^M. In the case of a market with middlemen, price p is not directly relevant for the decision making of a farmer, because he cannot trade at this price. Even though it might seem unlikely to observe $\frac{dp^M}{dp^F} < 0$ in the case with middlemen or $\frac{dp}{dp^F} < 0$ without middlemen, our numerical example (see Figures 3.3–3.5) shows that both cases are possible in general and the first is in fact prevalent. Intuitively, such an outcome happens because the probability of successful trade π decreases enough to offset any favorable increase in price. ■

Lemma 13 *If the participation of FT farmers decreases as p^F increases, then the aggregate FT farmers' profits decrease.*

Proof. Again, use p^M instead of p to obtain the proof. ■

The preceding lemmas show that it is very unlikely that the aggregate profits of any group of farmers would increase as a consequence of the excess supply Fair Trade regime. Again, the only theoretical possibility remains an increase in the aggregate Fair Trade profits. However, our numerical results produce falling aggregate profits regardless of the participation patterns.[28]

The present setup with monopsonistic middlemen helped us understand the effects of the introduction of a new Fair Trade market and the negative impact of a minimum binding price on both the normal farmers' incomes and the aggregate profits. Nonetheless, we would also like to analyze the relationship between the excess supply, the participation patterns of both types of farmers, the income of Fair Trade farmers and profits of the middlemen. Since the comparative statics with general demands and supply distributions proves to be excessively complex, in the next subsection we illustrate a number of model outcomes on an example with explicit functional forms.

[28] The same holds for the simulation results in the setup without middlemen.

Example with explicit demands

In this subsection, we analyze the links between participation, incomes, middlemen's profits and the excess supply on a specific example with quasilinear demand preferences and uniform productivity distribution. We specify demand functions using a model of consumers that considers normal and Fair Trade coffee to be imperfect substitutes. Let's assume a quasilinear utility function

$$\tilde{U} = U(x^N, x^{FT}) + Q$$
$$U(x^N, x^F) = \alpha\left(x^N + x^F\right) - \frac{1}{2}\left(\left(x^N\right)^2 + 2\gamma x^N x^F + \left(x^F\right)^2\right)$$
$$\gamma \in \langle 0, 1\rangle,\ \alpha,\ \delta > 0,$$

where x^N and x^F are consumptions of normal and FT, Q is the numeraire good. Note that while Richardson and Stähler (2007) treat FT and normal products as perfect substitutes, we take an alternative approach and model the Fair Trade good as an imperfect substitute for normal coffee. In our framework, the degree of substitutability γ is assumed to depend negatively on the "warm glow" effect discussed by Andreoni (1990), which in the present context reflects the additional utility due to the consumption of coffee grown under "fair" standards. Note that higher γ implies a "lower warm glow effect", i.e., regular and FT coffee are easier to substitute.

Consumers maximize their utility given the budget constraint

$$px^N + p^F x^F + Q \leq M.$$

The maximization problem leads to the demand function for normal and FT coffee, respectively:

$$\begin{aligned} x^N &= \frac{\alpha}{1+\gamma} + \frac{\gamma}{1-\gamma^2}p^F - \frac{1}{1-\gamma^2}p, \\ x^F &= \frac{\alpha}{1+\gamma} + \frac{\gamma}{1-\gamma^2}p - \frac{1}{1-\gamma^2}p^F. \end{aligned}$$

Numerical results

In the following we plot three groups of graphs with our numerical results, each group capturing a specific model dimension. For all graphs, the x-axis represents the excess of the

Fair Trade price p^F above its market equilibrium value. The results have been derived for three different values of the substitution parameter γ, namely 0 (dot), 0.5 (circle) and 0.99 (x).

The first group depicts the behavior of equilibrium prices p and p^M and the proportion of production going to Fair Trade π. The graphs show that the proportion of production sold on Fair Trade markets π decreases with the excess p^F, but this effect is smaller if γ is lower, i.e., when the two types of coffee are harder to substitute. In particular, lower γ leads to a relatively milder drop in the Fair Trade demand, hence the equilibrating adjustment of π does not have to be as pronounced.

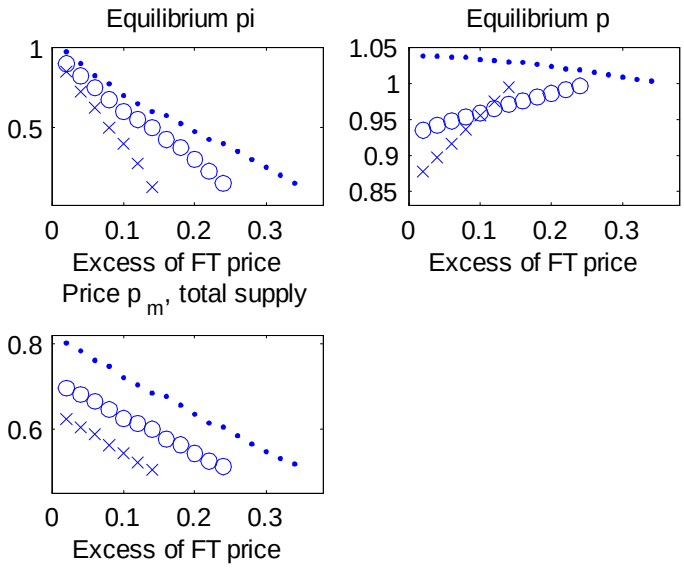
Consistent with Lemma 10, the graphs also show that the equilibrium price p on the market for normal coffee can be both increasing and decreasing with p^F, depending again on the degree of substitutability. If both types of coffee are easier to substitute (higher γ), then the increase in price p^F leads to a likewise increase in the price of normal coffee p.

The reason for the co-movement of prices p^F and p is the congruent working of the demand for normal coffee and the middleman's incentives to cut costs.[29] Holding farmers' expectations regarding π and p constant, the initial rise in the Fair Trade price p^F reduces the Fair Trade demand. The released Fair Trade output has to be rechanneled back to the middleman. With a higher degree of substitutability γ, this output volume becomes larger, the middleman has a stronger incentive to lower the purchase price p^M, and more of the least productive farmers are thus pushed out of the normal coffee market. At the same time, the cross-price reaction of the demand for normal coffee rises with γ and further dampens the extent of the potential coffee glut. As a result, for a sufficiently strong combination of the middleman's price cutting and demand cross-price effects the overall outcome might be a higher normal coffee price p. Our numerical results in Figure 3.3 conform to the theoretical possibility of a rising price p in the excess-supply regime.

We have already discussed the middlemen's motivation to reduce the purchase price p^M in the excess-supply equilibrium (see Lemma 11). The last graph illustrates how the excess supply of Fair Trade coffee strengthens the position of the middlemen relative to Fair Trade

[29] Remember that such a constellation would not be possible in the world without middlemen, since there is no mechanism that would work against the downward pressure on the prices of conventional coffee.

Figure 3.3: Equilibrium prices.



with market clearing.[30] As the middlemen's profit margin increases with γ, one might even observe a decline in the living standards of normal farmers and the least effective farmers leaving the market, despite a simultaneous increase in the world price of normal coffee p.

The second group of plots shows how profits depend on the excess of p^F above its market equilibrium value. Farmers' aggregate profits are decreasing in the degree of substitutability between normal and Fair Trade coffee. One can also see how the Fair Trade excess supply

[30] In our discussion of the model's adjustment mechanism, we assume that the middleman is not able to distinguish between normal and Fair Trade farmers so that she offers the same price p^M to both groups. In other words, the middleman is not able to discriminate between the two types of producers. The middleman's ability to ration depending on the producer type would lead to the optimal response p^M being set to zero for unsold Fair Trade production, which would in turn lower the Fair Trade farmers' expected payoffs as well as their participation in the scheme. The remaining participating farmers would then de facto play an infinite lottery with the probability π of winning $p^F - c - f$ and the probability $1-\pi$ of making a loss $-(c+f)$. While we did not find any empirical evidence on middlemen's discrimination based on farmers' status, the main reason for our non-rationing assumption is that the lottery setup represents a rather special sub-case of the present model with no significant changes in results.

Of course, by decreasing p^M, the middleman forgoes some farmers on the produce/stay inactive margin, yet this amount depends on γ only indirectly through the middleman's reaction to the released Fair Trade output.

Figure 3.4: Equilibrium profits.

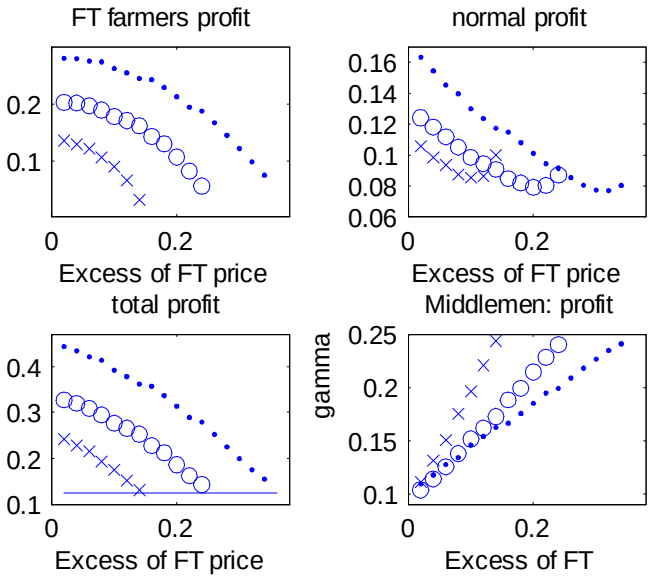
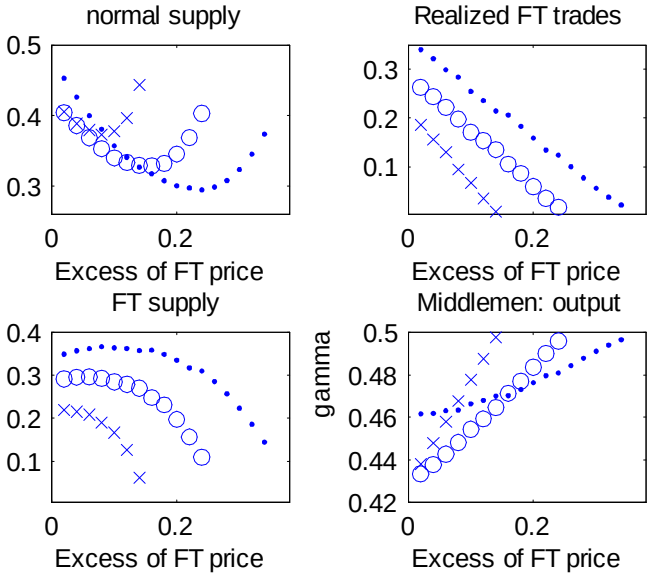


Figure 3.5: Equilibrium quantities.



regime benefits the middlemen and how the increasing level of γ boosts their profits. The closer substitutes both kinds of coffee are, the faster the middlemen's profits rise both at the intensive $(p - p^M)$ and the extensive (S^{WN}) margin.

Finally, we plot graphs that describe farmers' participation choices and realized supplies as functions of the excess-supply price p^F. The farmers' participation choices are described in plots labelled "normal supply" and "FT supply". The reader will notice that the participation in the Fair Trade scheme initially rises yet eventually decreases as the difference between FT price p^F and market-clearing price increases. At these levels, the Fair Trade participation declines sharply as many previously Fair Trade farmers now switch back to the normal coffee production. Given that the middlemen's purchase price p^M falls continuously, it is precisely this group of farmers that drive the postponed increase of the normal coffee supply.

The participation choices differ from the pattern of realized trades, since part of the Fair Trade harvest has to be sold through conventional markets. The plots labeled "Realized FT trades" and "Middlemen output" capture the actual volumes of trade transacted on each market. These plots again confirm that the greatest benefactor from the excess-supply regime are in fact not the farmers, but paradoxically the middlemen.

Summary of the results in the world with middlemen

In this section we focused on the effect of the introduction of the Fair Trade market and binding minimum price p^F in a setup with monopsonistic middlemen. Our results conform to the generally positive role for Fair Trade discussed in the previous section. Furthermore, they convey a number of additional conclusions that either complement or replace the non middlemen setup.

First of all, the common claims that the excess supply caused by the binding minimum price policy of the FLO tends to depress world prices and thus the incomes of the non-participating farmers are not quite precise. The normal coffee price p might in fact *increase* due to the market failure in the distribution chain - the middlemen. Nonetheless, the impact on the non-participating farmers' incomes remains negative. The reason is that in the

present setup there exist two channels through which Fair Trade affects the incomes of farmers. In comparison with the world without middlemen, the first channel has strengthened in that the Fair Trade market boosts incomes not only through the improved matching of farmers' output with differentiated demand, but also by dampening the market power of the middlemen. The second channel, i.e. the negative impact of the minimum price p^F, has however likewise became stronger. The minimum contracting price policy now returns part of the market power back to the middlemen, who in fact become the greatest benefactors of this regime relative to the Fair Trade market with flexible price.

3.5 Conclusion

The recent success story of Fair Trade has provoked a lively debate on the scope and intensity of the scheme's actual benefits and shortcomings. We develop a simple framework and find that the introduction of a new Fair Trade market has the capacity to improve the living conditions of all farmers. The scheme's potential is not fully met, however, as the FTO's supplementary policy of a minimum contracting price brings about costs in terms of the lower-than-possible payoffs of the majority of farmers, the higher-than-necessary exit of the non-participating farmers from the coffee production, and less resources for community investment. The above equilibrium Fair Trade price can be justified merely as a policy of increasing farmers' participation within the Fair Trade scheme.

The major beneficiary of the minimum price policy are paradoxically the middlemen whose allegedly exploitative position stood at the very roots of the whole Fair Trade movement. In our numerical example we show that the middlemen use their monopsony position to appropriate part of the farmers' payoffs that would have been realized under the market-clearing setup. The excess supply thus allows the middlemen to exploit the farmers more than they could in the case of market clearing on the Fair Trade market. The profitability of the excess-supply regime for the middlemen also raises with the substitutability (as measured by γ) between normal and Fair Trade coffee. For a high degree of substitutability, one might even observe an increase in the world price of normal coffee p and a simultaneous decline in the living standards of normal farmers.

Our paper does not focus on certain aspects of Fair Trade, including the impact on migration and the local environment, self-governance, credibility or the nation-wide reallocation of resources. By no means do we claim that these concerns are of lesser or no importance. Nonetheless, given the absence of an integrated modelling approach, we focus on a specific area of interest and analyze it within a well-defined framework. This area relates to the distributional impact of the Fair Trade scheme.

The model's results should serve as a comment on the potential risks and limitations of the otherwise relatively successful Fair Trade scheme. It seems quite reasonable that the very existence of Fair Trade alleviates the informational asymmetry between "socially-conscious" Western consumers, distributors and farmers located in developing countries. Given that consumers value "fair" production, the absence of credible information and non-negligible fixed costs related to setting up markets hinders the functioning of the Fair Trade market and some sort of market intervention thus might be justified. Nonetheless, the scheme's optimal design remains an open question and we hope to provide at least a partial answer.

From the policy perspective, we agree that the guaranteed minimal p^F can take a number of other important roles such as insurance against volatile coffee prices or an improved outside option for the farmers participating in sharecropping agreements. Our results should rather be understood as a selective contribution to the debate on the benefits of alternative policy instruments. For example, the stability of Fair Trade prices can be achieved through other instruments than a fixed minimum price. The related problem of the excess supply on Fair Trade markets can be addressed e.g., through the introduction of a predetermined schedule and gradual replacement of established Fair Trade producers by their less experienced counterparts.

3.6 Appendix A3

3.6.1 Model without middlemen

Comparative statics Proof of Lemma 3. To show that

$$\frac{d\pi}{dp^F} < 0, \frac{dp}{dp^F} < 0$$

take the total derivatives of the market equilibrium conditions and rearrange them to obtain

$$\left(S^F + \pi S_\pi^F\right) \frac{d\pi}{dp^F} + \left(\pi S_p^F - D_p^F\right) \frac{dp}{dp^F} = D_{p^F}^F - \pi S_{p^F}^F$$

$$S_\pi^{WN} \frac{d\pi}{dp^F} + \left(S_p^{WN} - D_p^N\right) \frac{dp}{dp^F} = D_{p^F}^N - S_{p^F}^{WN}$$

$$S^F = G\left(\pi\left(p^F - p\right)\right)$$

$$S^N = G(p) - G\left(\frac{\pi\left(p^F - p\right)}{k}\right)$$

$$S^{WF} = \pi S^F = \pi G\left(\frac{\pi\left(p^F - p\right)}{k}\right)$$

$$S^{WN} = G(p) - \pi G\left(\frac{\pi\left(p^F - p\right)}{k}\right),$$

where

$$t = \frac{\pi\left(p^F - p\right)}{k}$$

$$S_\pi^F = g(t)\frac{p^F - p}{k}, S_p^F = -g(t)\frac{\pi}{k}, S_{p^F}^F = g(t)\frac{\pi}{k}$$

$$S_\pi^{WN} = -\pi\left(g(t)\frac{p^F - p}{k}\right) - S^F$$

$$S_p^{WN} = g(p) + \pi(g(t))\frac{\pi}{k}$$

$$S_{p^F}^{WN} = -\pi g(t)\frac{\pi}{k}.$$

Substituting for supply relationships and expressed in a convenient matrix form we obtain:

$$\begin{bmatrix} S^F + \pi g(t)\frac{p^F - p}{k} & -\left(g(t)\frac{\pi^2}{k}) + D_p^F\right) \\ -\pi g(t)\frac{p^F - p}{k} - S^F & g(p) + \pi(g(t))\frac{\pi}{k} - D_p^N \end{bmatrix} \begin{bmatrix} \frac{d\pi}{dp^F} \\ \frac{dp}{dp^F} \end{bmatrix} = \begin{bmatrix} D_{p^F}^F - g(t)\frac{\pi^2}{k} \\ D_{p^F}^N + g(t)\frac{\pi^2}{k} \end{bmatrix}.$$

Note that the signs of the individual cells are unambiguous:

$$\begin{bmatrix} + & - \\ - & + \end{bmatrix} \begin{bmatrix} \frac{d\pi}{dp^F} \\ \frac{dp}{dp^F} \end{bmatrix} = \begin{bmatrix} - \\ + \end{bmatrix}.$$

Rearranging comparative statics one gets

$$\frac{d\pi}{dp^F} = \frac{D^F_{p^F} - g(t)\frac{\pi^2}{k}}{S^F + \pi g(t)\frac{p^F - p}{k}} + \frac{\left(g(t)\frac{\pi^2}{k}) + D^F_p\right)}{S^F + \pi g(t)\frac{p^F - p}{k}} \frac{dp}{dp^F} \tag{3.5}$$

$$\frac{d\pi}{dp^F} = -\frac{D^N_{p^F} + g(t)\frac{\pi^2}{k}}{S^F + \pi g(t)\frac{p^F - p}{k}} - \frac{g(p) + \pi(g(t))\frac{\pi}{k} - D^N_p}{S^F + \pi g(t)\frac{p^F - p}{k}} \frac{dp}{dp^F}. \tag{3.6}$$

Equations (3.5) and (3.6) give us comparative statics in the FT market with the equilibrium values of $\frac{d\pi}{dp^F}$ and $\frac{dp}{dp^F}$. Of course, in the overall equilibrium both equations have to be satisfied simultaneously, which allows us to compute both $\frac{d\pi}{dp^F}$ and $\frac{dp}{dp^F}$.

Given our demand assumptions, a closer look at the system tells us that

$$\begin{aligned} \frac{D^F_{p^F} - g(t)\frac{\pi^2}{k}}{S^F + \pi g(t)\frac{p^F - p}{k}} &< -\frac{D^N_{p^F} + g(t)\frac{\pi^2}{k}}{S^F + \pi g(t)\frac{p^F - p}{k}} \text{ and} \\ 0 < \frac{\left(g(t)\frac{\pi^2}{k}) + D^F_p\right)}{S^F + \pi g(t)\frac{p^F - p}{k}} &< -\frac{g(p) + \pi(g(t))\frac{\pi}{k} - D^N_p}{S^F + \pi g(t)\frac{p^F - p}{k}}, \end{aligned}$$

because we assume that the direct price effect is stronger than the indirect one: $|D^F_{p^F}| > D^N_{p^F}$, $|D^N_p| > D^F_p$. This implies that the solution has to satisfy $\frac{d\pi}{dp^F} < 0$, $\frac{dp}{dp^F} < 0$. This is easy to see - while both relationships are not linear, the intercept of (3.5) is unambiguously lower than the intercept of (3.6), while the slope of (3.5) is positive yet not as steep as that of (3.6). This implies that both curves (given that they exist and are continuous, which we assume) can cross only in the 3^{rd} quadrant,[31] or in other words

$$\frac{d\pi}{dp^F} < 0, \frac{dp}{dp^F} < 0.$$

■

[31] Alternatively, one can express $\frac{dp}{dp^F}$ from (3.5) and (3.6) to see that the sign has to be negative:

$$\frac{dp}{dp^F} = -\frac{\frac{D^F_{p^F} - \pi^2/k}{2S^F} + \frac{D^N_{p^F} + \pi^2/k}{2S^F}}{\frac{D^N_p - (1+\pi^2)/k}{2S^F} + \frac{\left(\pi^2/k + D^F_p\right)}{2S^F}} < 0.$$

Once this is established, one can infer that $\frac{d\pi}{dp^F} < 0$ from (3.5).

The impact of Fair Trade on farmers' payoffs and participation **Proof of Lemma 4.** 1) In the excess-supply equilibrium, the farmers' participation in the Fair Trade scheme increases if and only if

$$\left|\varepsilon_{p^F}^{D^F}\right| < \left|\varepsilon_{p^F}^{\pi}\right| \text{ and } \left|\varepsilon_{p^F}^{D^N}\frac{S^{WN}}{S^{WF}}\right| < \left|\varepsilon_{p^F}^{\pi}\right|.$$

The payoffs of farmers participating in Fair Trade decrease unambiguously relative to the market-clearing case.

- We are interested in the sign of $\frac{dS^F\left(\pi,p,p^F\right)}{dp^F}$, where $S^F\left(\pi,p,p^F\right)$ corresponds to participation in the Fair Trade certification scheme.

In the excess-supply equilibrium with $\pi < 1$ it has to hold that

$$\begin{gathered}\pi S^F\left(\pi,p,p^F\right) = D^F\left(p,p^F\right)\\ S^N\left(\pi,p,p^F\right) + (1-\pi)S^F\left(\pi,p,p^F\right) = D^N\left(p,p^F\right),\\ \pi = \pi\left(p^F\right), p = p\left(p^F\right).\end{gathered}$$

Consider an increase of p^F above its equilibrium value. In the new equilibrium, the realized FT supply πS^F has to match the FT demand D^F, hence it has to hold that

$$\begin{aligned}\frac{d\left[\pi S^F\left(\pi,p,p^F\right)\right]}{dp^F} &= \frac{dD^F}{dp^F}\\ S^F\left(\pi,p,p^F\right)\frac{d\pi}{dp^F} + \pi\frac{dS^F\left(\pi,p,p^F\right)}{dp^F} &= \frac{dD^F}{dp^F}\\ \frac{dS^F\left(\pi,p,p^F\right)}{dp^F} &= \frac{1}{\pi}\left(\frac{dD^F}{dp^F} - S^F\left(\pi,p,p^F\right)\frac{d\pi}{dp^F}\right)\\ sign\left(\frac{dS^F\left(\pi,p,p^F\right)}{dp^F}\right) &= sign\left(\frac{dD^F}{dp^F} - S^F\left(\pi,p,p^F\right)\frac{d\pi}{dp^F}\right)\\ sign\left(\frac{dS^F\left(\pi,p,p^F\right)}{dp^F}\right) &= sign\left(\frac{dD^F}{dp^F} - \frac{D^F}{\pi}\frac{d\pi}{dp^F}\right).\end{aligned}$$

Pre-multiplying the term in the brackets by $\frac{p^F}{D^F} > 0$, one gets

$$sign\left(\frac{dS^F\left(\pi,p,p^F\right)}{dp^F}\right) = sign\left(\frac{p^F}{D^F}\frac{dD^F}{dp^F} - \frac{p^F}{\pi}\frac{d\pi}{dp^F}\right) = sign\left(\varepsilon_{p^F}^{D^F} - \varepsilon_{p^F}^{\pi}\right).$$

Finally, since $\frac{d\pi}{dp^F}$ and $\frac{dD^F}{dp^F}$ are both negative, we have

$$\frac{dS^F\left(\pi,p,p^F\right)}{dp^F}>0 \iff \left|\varepsilon_{p^F}^{D^F}\right|<\left|\varepsilon_{p^F}^{\pi}\right|.$$

- For the second part of Lemma 4 we use the fact that

$$\begin{aligned} S^F &= G\left(\frac{\pi\left(p^F-p\right)}{k}\right) \\ S^{WN} &= S^N+(1-\pi)S^F = G(p)-\pi G\left(\frac{\pi\left(p^F-p\right)}{k}\right), \end{aligned}$$

hence

$$sign\left(\frac{dS^F\left(\pi,p,p^F\right)}{dp^F}\right)=sign\left[\left(p^F-p\right)\frac{d\pi}{dp^F}+\pi\left(1-\frac{dp}{dp^F}\right)\right].$$

Take the total derivative of the normal coffee market equilibrium condition 3.1,

$$\begin{aligned} \frac{d\left[S^{WN}\left(\pi,p,p^F\right)\right]}{dp^F} &= \frac{dD^N}{dp^F} \\ \frac{d\left[G\left(p\right)-\pi G\left(\frac{\pi\left(p^F-p\right)}{k}\right)\right]}{dp^F} &= \frac{dD^N}{dp^F} \\ \frac{1}{k}\left[\left(p^F-p\right)\frac{d\pi}{dp^F}+\pi\left(1-\frac{dp}{dp^F}\right)\right] &= -\frac{\left(D_p^N\frac{dp}{dp^F}+D_{p^F}^N\right)}{\pi g\left(\frac{\pi\left(p^F-p\right)}{k}\right)}+\frac{g(p)}{\pi g\left(\frac{\pi\left(p^F-p\right)}{k}\right)}\frac{dp}{dp^F}- \\ & \quad -\frac{G\left(\frac{\pi\left(p^F-p\right)}{k}\right)}{\pi g\left(\frac{\pi\left(p^F-p\right)}{k}\right)}\frac{d\pi}{dp^F}, \end{aligned}$$

which implies

$$sign\left(\frac{dS^F\left(\pi,p,p^F\right)}{dp^F}\right)=sign\left[\begin{array}{c} -\left(D_{p^F}^N+G\left(\frac{\pi\left(p^F-p\right)}{k}\right)\frac{d\pi}{dp^F}\right)+ \\ \left(g(p)-D_p^N\right)\frac{dp}{dp^F} \end{array}\right].$$

Knowing that $\frac{dp}{dp^F}<0$, multiply the term in the brackets by $\frac{p^F}{\pi}>0$ and

$$\frac{G\left(p\right)-\pi G\left(\frac{\pi\left(p^F-p\right)}{k}\right)}{G\left(p\right)-\pi G\left(\frac{\pi\left(p^F-p\right)}{k}\right)}=1$$

to obtain

$$sign\left(\frac{dS^F\left(\pi,p,p^F\right)}{dp^F}\right)=sign\left[\begin{array}{c}(-1)\left(\varepsilon_{p^F}^{D^N}\frac{S^{WN}}{S^{WF}}+\varepsilon_{p^F}^{\pi}\right)+\\ \underbrace{\left(g(p)-D_p^N\right)\frac{dp}{dp^F}\frac{p^F}{\pi}}_{<0}\end{array}\right].$$

That is,

$$\frac{dS^F\left(\pi,p,p^F\right)}{dp^F}>0\iff\left|\varepsilon_{p^F}^{D^N}\frac{S^{WN}}{S^{WF}}\right|<\left|\varepsilon_{p^F}^{\pi}\right|.$$

2) In the excess-supply equilibrium without middlemen, the Fair Trade farmers' payoffs decrease unambiguously.

To show that the participating farmers' payoffs decrease unambiguously, note that

$$\frac{d\pi}{dp^F}<\frac{D_{p^F}^F}{G\left(\frac{\pi(p^F-p)}{k}\right)}$$

implies $\frac{dp}{dp^F}<0$, so for more negative values of $\frac{d\pi}{dp^F}$ the change in farmer's revenues from FT becomes less and less favorable. In other words,

$$\frac{d\pi}{dp^F}=\frac{D_{p^F}^F}{G\left(\frac{\pi(p^F-p)}{k}\right)}$$

represents the marginal value of $\frac{d\pi}{dp^F}$ consistent with transition to a new equilibrium. Now

$$\frac{d\pi}{dp^F}=\frac{D_{p^F}^F}{G\left(\frac{\pi(p^F-p)}{k}\right)}\rightarrow\frac{dp}{dp^F}=0$$

and we have

$$\begin{aligned}\frac{d}{dp^F}\left(\frac{\pi p^F+(1-\pi)\,p}{k}\right)&=\frac{1}{k}\left[\pi+\underbrace{\left(p^F-p\right)\frac{d\pi}{dp^F}}_{<0}+\underbrace{(1-\pi)\frac{dp}{dp^F}}_{<0}\right]=\\&=\frac{1}{k}\left[\pi+\underbrace{\left(p^F-p\right)\frac{d\pi}{dp^F}}_{<0}\right].\end{aligned}\tag{3.7}$$

But we also know that for $\frac{d\pi}{dp^F}=\frac{D_{p^F}^F}{G\left(\frac{\pi(p^F-p)}{k}\right)}$

$$\left(p^F-p\right)\frac{d\pi}{dp^F}=-\frac{kD_{p^F}^F}{\pi g\left(\frac{\pi(p^F-p)}{k}\right)}+\frac{k}{\pi g\left(\frac{\pi(p^F-p)}{k}\right)}\frac{dD^F}{dp^F}-\pi,$$

so that

$$\frac{d}{dp^F}\left(\frac{\pi p^F+(1-\pi)\,p}{k}\right)=\frac{1}{k}\left[\pi+\underbrace{\left(p^F-p\right)\frac{d\pi}{dp^F}}_{<0}+\underbrace{(1-\pi)\,\frac{dp}{dp^F}}_{<0}\right]= \tag{3.8}$$

$$\frac{1}{\pi g\left(\frac{\pi(p^F-p)}{k}\right)}\left[-D^F_{p^F}+\frac{dD^F}{dp^F}\right]=\frac{1}{\pi g\left(\frac{\pi(p^F-p)}{k}\right)}\left[D^F_p\frac{dp}{dp^F}\right]=0, \tag{3.9}$$

which is the best possible impact on the Fair Trade farmers' payoffs that is consistent with the excess-supply equilibrium. ■

Proof of Corollary 1. Following the rise of the Fair Trade price, the participation in the Fair Trade scheme can increase despite the fall of the participating farmers' payoffs.

The total derivative of the Fair Trade participation equals

$$\begin{aligned}\frac{dG\left(\frac{\pi\left(p^F-p\right)}{k}\right)}{dp^F} &= \underbrace{g\left(\frac{\pi\left(p^F-p\right)}{k}\right)}_{>0}\left[\frac{d}{dp^F}\left(\frac{\pi\left(p^F-p\right)}{k}\right)\right]= \\ &= \frac{1}{k}g\left(\frac{\pi\left(p^F-p\right)}{k}\right)\left[\frac{d\left(\pi p^F+(1-\pi)\,p\right)}{dp^F}-\frac{dp}{dp^F}\right],\end{aligned}$$

where

$$g\left(x\right)=\frac{dG(x)}{d(x)}.$$

Hence the sign of the total derivative depends on the sign of the part in square brackets. Even if the Fair Trade payoffs decline after the move from $\pi=1$, i.e.,

$$\frac{d\left(\pi p^F+(1-\pi)\,p\right)}{dp^F}<0,$$

the bracketed term can be positive since $-\frac{dp}{dp^F}>0$. ■

3.6.2 Model with middlemen

Existence of equilibria with middlemen In order to proceed with the analysis, we will assume that there exists an equilibrium in which both markets are active, and which generates market-clearing prices p and p^F, i.e. an equilibrium in which $\pi=1$. This section informally discusses under which conditions the equilibrium will exist. We do not claim

that these conditions are necessary, as the existence of the equilibrium is not of our primary interest. In particular, we discuss the price ranges for which one may hope to find an equilibrium.

The market-clearing conditions are

$$\begin{aligned} \text{FT market} \quad &: \quad D^F\left(p, p^F\right) = G(\left(p^F - p^M\right)/k) = S^F\left(p^F, p^M\left(p, p^F\right)\right) \\ \text{Normal market} \quad &: \quad D^N\left(p, p^F\right) = S^N\left(p^F, p^M\left(p, p^F\right)\right) = G(p^M) - G(\left(p^F - p^M\right)/k). \end{aligned}$$

Obviously, we may have equilibrium only if

$$0 \leq S^F \leq 1, 0 \leq S^N \leq 1, S^F + S^N \leq 1.$$

We will be interested in those equilibria in which both markets are active. In case of a uniform distribution $G(x) = x, g(x) = 1$, we can discuss a range of prices for which there might be an equilibrium.

$$0 < S^F, 0 < S^N, S^F + S^N \leq 1.$$

The last constraint can be expressed in the form

$$\frac{p}{2} + \frac{p^F}{2\left(k+1\right)} \leq 1.$$

The other two constraints are

$$(2k+1)p^F - p(1+k) > 0, p + kp - p^F > 0.$$

The possible combination of prices p, p^F is the triangle on the following picture.

We can see that if k decreases, which means that it is relatively cheaper for all farmers to produce FT coffee, the set of prices that might correspond to an equilibrium shrinks. This is an intuitive result - for very low k, it is cheap to obtain an FT certificate and thus prices on the regular market (p) must be close to the FT prices (p^F) in the market equilibrium. Note that this result holds in the excess supply equilibrium with appropriate modifications to the picture (p^F has to be replaced with πp^F on the supply side). The expected value from participation in the FT and regular markets must be similar if the participation costs in the FT market are low.

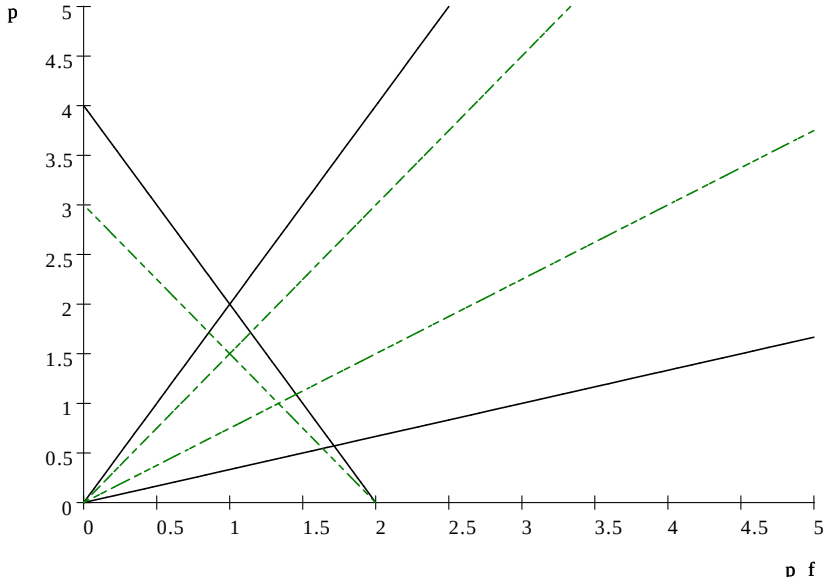


Figure A3.1: Participation constraints depending on p, p^F for $k = 1$ (full line) and $k = 0.5$ (dashed line) .

The impact of Fair Trade on farmers' payoffs and participation with the middlemen **Proof of Lemma 9.** All farmers are better off if and only if the price p^M offered by the middlemen increases once the FT market opens. This happens if the overall demand for coffee does not fall substantially, i.e., if the world price of normal coffee p is relatively insensitive to the price of FT coffee p^F, or if it actually increases as a result of the new FT market. It is easy to observe that compared to the situation without Fair Trade, all farmers benefit only if the price of coffee set by middleman p^M increases and such increases indeed attract new farmers. If the price p^M decreases, some FT farmers might be better off than before, but there is a group of farmers who stop selling coffee altogether. These farmers lose, since in the absence of FT they used to make small yet positive profits. In general, the middleman's price p^M might move both ways, because the movement of the price p is ambiguous and might dominate the other effects working through the Fair Trade price p^F or the success rate π. Nonetheless, it is easy to show that for fixed p, price $p^{M\prime}$ in the world with an active FT market is larger than p^M when an FT market does not exist. To see this,

compare the first order conditions of the middleman:

$$\begin{aligned}
[\text{no FT}]: \ & \left(p - p^M\right) g(p^M) - G(p^M) = 0 \\
[\text{FT}]: \ & \left(p' - p^{M\prime}\right) \left[g(p^{M\prime}) + \frac{1}{k} g\left(\frac{p^{F\prime} - p^{M\prime}}{k}\right)\right] - \\
& \left[G(p^{M\prime}) - G\left(\frac{p^{F\prime} - p^{M\prime}}{k}\right)\right] = 0.
\end{aligned}$$

It is obvious that once we plug in the values of p^M and p from the first line, the last element on the second line, $G(p^M) - G\left(\frac{p^F - p^M}{k}\right)$, is smaller than $G(p^M)$. Also, trivially $\frac{1}{k} g\left(\frac{p^F - p^M}{k}\right) > 0$. Thus, if we plug in p^M from the first FOC into the second one and evaluate the sign, we see that

$$\left(p - p^M\right) g(p^M) - G(p^M) + \left(p - p^M\right) \frac{1}{k} g\left(\frac{p^F - p^M}{k}\right) + G\left(\frac{p^F - p^M}{k}\right) > 0 \qquad (3.10)$$

or alternatively,

$$\left(p - p^M\right) \left[g(p^M) + \frac{1}{k} g\left(\frac{p^F - p^M}{k}\right)\right] > \left[G(p^M) - G\left(\frac{p^F - p^M}{k}\right)\right].$$

Since the marginal gains in revenues from additional normal coffee purchases exceed the corresponding marginal costs for p^M from the world without Fair Trade, it is optimal for the middleman to raise the purchase price to $p^{M\prime}$. Thus the inequality implies that $p^{M\prime} > p^M$.

This argument requires that the first order condition of the FT market middleman is monotonic (unique local maximum) and that p is fixed. If the world price p is not very sensitive to the introduction of FT coffee (e.g., the FT market is small), then the argument holds by continuity (expression (3.10) remains positive for small changes in p). It is obvious to see that if p actually increases, then the argument holds as well, so the only case when it might not hold is when p decreases significantly as a result of the FT market opening. However, this can only happen once the overall world demand declines sharply after the introduction of Fair Trade, which is consistent with our results from Lemma 2 that dealt with the world without the middlemen. In fact, the results for the market-clearing case with the middlemen are slightly stronger than those in Lemma 2. In the world with the middlemen, the non-participating farmers are better off even if the price of the normal coffee does not change. This happens as a consequence of the strategic behavior of the middleman,

who finds it profitable to adjust her price p^M slightly in order to mute the outflow of farmers towards Fair Trade. Hence the non-participating farmers can fare better despite the possible fall of the normal coffee price p, given that the decline is not too sharp. ■

Comparative statics in the world with middlemen **Proof of Lemma 10.** Again, similarly to the excess supply analysis without the middlemen we differentiate the whole system (3.4):

$$S^F \frac{d\pi}{dp^F} + \pi \left(S^F_\pi \frac{d\pi}{dp^F} + S^F_{p^M} \left(\frac{\partial p^M}{\partial p^F} + \frac{\partial p^M}{\partial \pi} \frac{d\pi}{dp^F} + \frac{\partial p^M}{\partial p} \frac{dp}{dp^F} \right) + S^F_{p^F} \right) =$$
$$D^F_p \frac{dp}{dp^F} + D^F_{p^F}$$
$$S^{WN}_\pi \frac{d\pi}{dp^F} + S^{WN}_{p^M} \left(\frac{\partial p^M}{\partial p^F} + \frac{\partial p^M}{\partial \pi} \frac{d\pi}{dp^F} + \frac{\partial p^M}{\partial p} \frac{dp}{dp^F} \right) + S^{WN}_{p^F} =$$
$$D^N_p \frac{dp}{dp^F} + D^N_{p^F},$$

where S^{WN}_π is a partial derivative of S^{WN} with respect to π, for example.

Rearranging, one gets

$$\left(S^F + \pi S^F_\pi + \pi \frac{\partial p^M}{\partial \pi} S^F_{p^M} \right) \frac{d\pi}{dp^F} + \left(\pi S^F_p + \pi \frac{\partial p^M}{\partial p} S^F_{p^M} - D^F_p \right) \frac{dp}{dp^F} =$$
$$= D^F_{p^F} - \pi S^F_{p^F} - \pi S^F_{p^M} \frac{\partial p^M}{\partial p^F} \tag{3.11}$$
$$\left(S^{WN}_\pi + S^{WN}_{p^M} \frac{\partial p^M}{\partial \pi} \right) \frac{d\pi}{dp^F} + \left(S^{WN}_p - D^N_p + S^{WN}_{p^M} \frac{\partial p^M}{\partial p} \right) \frac{dp}{dp^F}$$
$$= D^N_{p^F} - S^{WN}_{p^F} - \frac{\partial p^M}{\partial p^F} S^{WN}_{p^M}. \tag{3.12}$$

We can plug in for $S^F, S^N, S^F, S^{WF}, S^{WN}$ and their derivatives:

$$S^F = G\left(\frac{\pi \left(p^F - p^M \right)}{k} \right)$$
$$S^N = G(p) - G\left(\frac{\pi \left(p^F - p^M \right)}{k} \right)$$
$$S^{WF} = \pi S^F = \pi G\left(\frac{\pi \left(p^F - p^M \right)}{k} \right)$$
$$S^{WN} = G(p^M) - \pi G\left(\frac{\pi \left(p^F - p^M \right)}{k} \right)$$

$$
\begin{aligned}
\pi S^F_{\pi} + \pi \frac{\partial p^M}{\partial \pi} S^F_{p^M} &= g(t)\left(\frac{p^F - p^M}{k} - \frac{\pi}{k}\frac{\partial p^M}{\partial \pi}\right) \\
\pi S^F_{p} + \pi \frac{\partial p^M}{\partial p} S^F_{p^M} &= -g(t)\frac{\pi^2}{k}\frac{\partial p^M}{\partial p}, \\
\pi S^F_{p^F} + \pi S^F_{p^M}\frac{\partial p^M}{\partial p^F} &= \pi g(t)\frac{\pi}{k} - \frac{\pi^2}{k}g(t)\frac{\partial p^M}{\partial p^F}, \\
S^{WN}_{\pi} + S^{WN}_{p^M}\frac{\partial p^M}{\partial \pi} &= g(p^M)\frac{\partial p^M}{\partial \pi} - \pi g(t)\left(\frac{p^F - p^M}{k} - \frac{\pi}{k}\frac{\partial p^M}{\partial \pi}\right) - S^F \\
S^{WN}_{p} + S^{WN}_{p^M}\frac{\partial p^M}{\partial p} &= \left(g(p^M) + \pi g(t)\frac{\pi}{k}\right)\frac{\partial p^M}{\partial p} \\
S^{WN}_{p^F} + \frac{\partial p^M}{\partial p^F} S^{WN}_{p^M} &= \left(g(p^M) + \pi g(t)\frac{\pi}{k}\right)\frac{\partial p^M}{\partial p^F} - \pi g(t)\frac{\pi}{k} \\
t &= \frac{\pi\left(p^F - p^M\right)}{k}.
\end{aligned}
$$

We can rewrite the equations (3.11) into matrix form

$$
\begin{bmatrix}
S^F + \pi g(t)\left(\frac{p^F - p^M}{k} - \frac{\pi}{k}\frac{\partial p^M}{\partial \pi}\right) & -g(t)\frac{\pi^2}{k}\frac{\partial p^M}{\partial p} - D^F_p \\
g(p^M)\frac{\partial p^M}{\partial \pi} - \pi g(t)\left(\frac{p^F - p^M}{k} - \frac{\pi}{k}\frac{\partial p^M}{\partial \pi}\right) - S^F & \left(g(p^M) + \pi g(t)\frac{\pi}{k}\right)\frac{\partial p^M}{\partial p} - D^N_p
\end{bmatrix}
\begin{bmatrix} \frac{d\pi}{dp^F} \\ \frac{dp}{dp^F} \end{bmatrix} =
\begin{bmatrix}
D^F_{p^F} - g(t)\frac{\pi^2}{k} \\
D^N_{p^F} - \left(g(p^M) + \pi g(t)\frac{\pi}{k}\right)\frac{\partial p^M}{\partial p^F} + \pi g(t)\frac{\pi}{k}
\end{bmatrix}.
$$

Note that the signs of the individual cells depend on the size of $\frac{\partial p^M}{\partial \pi}$

$$
\begin{bmatrix} + & - \\ - & + \end{bmatrix}
\begin{bmatrix} \frac{d\pi}{dp^F} \\ \frac{dp}{dp^F} \end{bmatrix} =
\begin{bmatrix} - \\ + \end{bmatrix}
$$

$$
\begin{aligned}
S^F + \pi g(t)\left(\frac{p^F - p^M}{k} - \frac{\pi}{k}\frac{\partial p^M}{\partial \pi}\right) &> 0 \\
-g(t)\frac{\pi^2}{k}\frac{\partial p^M}{\partial p} - D^F_p &< 0 \\
g(p^M)\frac{\partial p^M}{\partial \pi} - \pi g(t)\left(\frac{p^F - p^M}{k} - \frac{\pi}{k}\frac{\partial p^M}{\partial \pi}\right) - S^F &< 0 \\
\left(g(p^M) + \pi g(t)\frac{\pi}{k}\right)\frac{\partial p^M}{\partial p} - D^N_p &> 0.
\end{aligned}
$$

From Lemma 9, we know that $\frac{\partial p^M}{\partial \pi} > 0$, so we need $\frac{\partial p^M}{\partial \pi}$ to be small for this result to hold.

For notational simplicity, we will write

$$\begin{bmatrix} A & B \\ C & D \end{bmatrix} \begin{bmatrix} \frac{d\pi}{dp^F} \\ \frac{dp}{dp^F} \end{bmatrix} = \begin{bmatrix} E \\ F \end{bmatrix}.$$

To show that

$$\frac{dp}{dp^F} < 0 \text{ and } \frac{d\pi}{dp^F} > 0$$

is not possible, we need to show that if $\frac{d\pi}{dp^F} > 0$, then $\frac{dp}{dp^F} > 0$. To do this, we write

$$\begin{aligned} A\frac{d\pi}{dp^F} + B\frac{dp}{dp^F} &= E \\ C\frac{d\pi}{dp^F} + D\frac{dp}{dp^F} &= F. \end{aligned}$$

We know that $A > 0 > C, D > 0 > B, F > 0 > E$. So if $\frac{d\pi}{dp^F} > 0, A > 0$, but $E < 0$, it must be that $B\frac{dp}{dp^F} < 0$ in equilibrium, which means, because $B < 0$, that $\frac{dp}{dp^F} > 0$. The same argument holds for the second equation: $F > 0$, the first element ($C\frac{d\pi}{dp^F} < 0$) is negative, so the second element on the second line must be positive. Since $D > 0$, it implies $\frac{dp}{dp^F} > 0$. So the previous results about the impossibility of $\frac{d\pi}{dp^F} > 0$ and $\frac{dp}{dp^F} > 0$ seem to be preserved.

Thus, we have the following combinations that are of theoretical interest:

$$\begin{aligned} \frac{dp}{dp^F} &< 0, \text{ and } \frac{d\pi}{dp^F} < 0 \\ \frac{dp}{dp^F} &> 0, \text{ and } \frac{d\pi}{dp^F} < 0. \end{aligned}$$

Other possibilities are either not interesting or impossible:

$$\begin{aligned} \frac{dp}{dp^F} &> 0 \text{ and } \frac{d\pi}{dp^F} > 0 \text{ (not interesting)} \\ \frac{dp}{dp^F} &< 0, \text{ and} \frac{d\pi}{dp^F} > 0 \text{ (not possible).} \end{aligned}$$

So one can see that an increase in FT price p^F leads to an increased excess supply, but the impact on the world price is ambiguous p.[32] ■

[32] Note that the effect on the world price, even if theoretically predicted, is likely to be extremely small given the relative sizes of both markets. Thus, the result is more of a theoretical interest than a testable prediction.

3.6.3 Aggregate farmers' profits

Proof of Lemma 5. Unless the world price of coffee p increases significantly when the price of FT coffee increases, the aggregated profit of all farmers is decreasing in p^F above the market equilibrium.

Revenues of the farmers in the excess-supply regime without middlemen is

$$R = S^{WN}p + S^{WF}p^F = (S^N + S^F)p + \pi S^F(p^F - p),$$
$$S^F = G\left(\frac{\pi\left(p^F - p\right)}{k}\right)$$
$$S^N = G(p) - G\left(\frac{\pi\left(p^F - p\right)}{k}\right)$$
$$R = G(p^M)p + \pi G\left(\frac{\pi\left(p^F - p\right)}{k}\right)(p^F - p).$$

The costs are slightly more complicated:

$$C = \int_0^t (k+1)cg(c)dc + \int_t^p cg(c)dc$$
$$C = \int_0^{p^M} cg(c)dc + k\int_0^t cg(c)dc,$$
$$t = \frac{\pi\left(p^F - p\right)}{k}.$$

These costs change with the change in p^F in the following way:

$$\begin{aligned}\frac{dC}{dp^F} &= pg(p)\frac{dp}{dp^F} + ktg(t)\frac{\pi}{k}(1 - \frac{dp}{dp^F}) + ktg(t)\frac{p^F - p}{k}\frac{d\pi}{dp^F},\\ &= pg(p)\frac{dp}{dp^F} + ktg(t)\left(\frac{d\pi}{dp^F}\frac{p^F - p}{k} + \frac{\pi}{k}\left(1 - \frac{dp}{dp^F}\right)\right).\end{aligned}$$

The change in revenues is

$$\frac{dR}{dp^F} = \frac{dp}{dp^F}\left(G(p) + pg(p)\right) + \frac{d\pi}{dp^F}G(t)(p^F - p) +$$
$$\pi(p^F - p)g(t)\frac{dt}{dp^F} + \pi G(t)\left(1 - \frac{dp}{dp^F}\right),$$
$$\frac{dt}{dp^F} = \frac{d\pi}{dp^F}\left(p^F - p\right)/k + \frac{\pi}{k}\left(1 - \frac{dp}{dp^F}\right).$$

Note that

$$\frac{dR}{dp^F} - \frac{dC}{dp^F} = \frac{dp}{dp^F}\left(G(p) - \pi G\left(\frac{\pi\left(p^F - p\right)}{k}\right)\right) + \frac{d\pi}{dp^F}\left(G(t)(p^F - p)\right).$$

Since $\pi \leq 1$ and $\frac{\pi\left(p^F - p\right)}{k} \leq p$ in an equilibrium, the outcome depends on the sign of $\frac{dp}{dp^F}$ and $\frac{d\pi}{dp^F}$. We have already shown that $\frac{d\pi}{dp^F} < 0$ in any relevant equilibrium. Thus, unless $\frac{dp}{dp^F} > 0$ and is large enough, the profit of all farmers is decreasing in p^F above the market equilibrium. ■

Proof of Lemma 6. If the participation of FT farmers decreases as a result of an increase in p^F, then the overall FT farmers' profit decreases.

The revenue and costs of FT farmers:

$$\begin{aligned} R &= G(t)(\pi p^F + (1-\pi)p) = G(t)(kt + p) \\ C &= \int_0^t (k+1)cg(c)dc. \end{aligned}$$

We can compute the derivatives:

$$\begin{aligned} \frac{dR}{dp^F} &= g(t)(kt+p)\frac{dt}{dp^F} + G(t)\left(k\frac{dt}{dp^F} + \frac{dp}{dp^F}\right) \\ \frac{dC}{dp^F} &= (k+1)tg(t)\frac{dt}{dp^F}, \\ \frac{dt}{dp^F} &= \frac{d\pi}{dp^F}\left(p^F - p\right)/k + \frac{\pi}{k}\left(1 - \frac{dp}{dp^F}\right). \end{aligned}$$

The difference is

$$\begin{aligned} \frac{dR}{dp^F} - \frac{dC}{dp^F} &= g(t)(kt+p)\frac{dt}{dp^F} + G(t)\left(k\frac{dt}{dp^F} + \frac{dp}{dp^F}\right) - (k+1)tg(t)\frac{dt}{dp^F} \\ &= \frac{dt}{dp^F}g(t)\left(p - \pi\frac{p^F - p}{k} + kG(t)\right) + G(t)\frac{dp}{dp^F}. \end{aligned} \tag{3.13}$$

Note that

$$g(t)\left(p - \pi\frac{p^F - p}{k} + kG(t)\right) > 0,$$

and thus

$$\frac{dt}{dp^F} < 0, \frac{dp}{dp^F} < 0 \implies \frac{dR}{dp^F} - \frac{dC}{dp^F} < 0.$$

■

3.6.4 Small FT market - fixed p

We extend our analysis to the situation when the FT market is too small to impact the world price p of coffee. For example, we may assume that there is a large number of regions, but in only very few of them are farmers participating in Fair Trade. Middlemen, if present, adjust to the FT market only if there are FT farmers in their region.

Lemma 14 *If there are no middlemen, the Fair Trade market where the price is set to clear the market always helps the farmers.*

Proof. Since price p does not change, the number of active farmers $G(p)$ does not change. Those farmers who decide to sell on the FT market ($G(\frac{p^F-p}{k})$ of them) are all better off, because they could have stayed in the non-FT market ■

In the world where the FT market clears, but there are middlemen, the situation is slightly more complicated. Middlemen react to the FT market and thus alter the revenue of non-FT farmers. However, we have shown before that all active farmers are strictly better off if the price p^M increases and that this happens when p is not very sensitive to p^F. We can thus apply the same argument as in Lemma 9 here, because price p is assumed to be fixed. For fixed p, the argument is very intuitive - middlemen increase price to attract more farmers to offset the loss from those who left for the FT market. This increase in price helps all non-FT farmers, but FT farmers are still better off than non-FT ones.

Lemma 15 *When the FT market clears, it helps all the farmers even if there are middlemen.*

Proof. See Lemma 9 and note that p is fixed. ■

In the case of the FT market with price p^F above market equilibrium (and thus $\pi < 1$), but no middlemen, we will analyze the impact of a small increase in p^F. Farmers benefit if the expected revenue, πp^F, increases. This happens when

$$\begin{aligned} \frac{\partial(\pi p^F)}{\partial p^F} &= \frac{\partial \pi}{\partial p^F} p^F + \pi > 0 \\ \frac{\partial \pi}{\partial p^F} &> -\frac{\pi}{p^F}. \end{aligned}$$

We can use market equilibrium conditions to prove the following result.

Lemma 16 *Farmers benefit from a marginal increase in p^F if and only if*

$$\frac{D^F_{p^F}(p,p^F) - \pi^2 g(t)/k}{G(t) + tg(t)} > -\frac{\pi}{p^F},$$

where $t = \pi\frac{p^F - p}{k}$.

Proof. We use comparative statics to show that

$$\begin{aligned} D^F(p,p^F) - \pi G(t) &= 0 \\ \frac{\partial \pi}{\partial p^F} &= \frac{D^F_{p^F}(p,p^F) - \frac{\pi^2}{k} g(t)}{G(t) + tg(t)} < 0, \end{aligned}$$

because $D^F_{p^F} < 0$. From the previous discussion, we know that farmers benefit from the FT market if $\frac{\partial \pi}{\partial p^F}$ is large enough:

$$\frac{\partial \pi}{\partial p^F} = \frac{D^F_{p^F}(p,p^F) - \frac{\pi^2}{k} g(t)}{G(t) + tg(t)} > -\frac{\pi}{p^F}.$$

■

The final case, excess supply on the FT market and middlemen on the normal coffee market, is slightly more complicated. Because of the middlemen, farmers don't get a fixed price p for their normal coffee but price p^M that in general depends on the price p^F. The equilibrium condition on the FT market is

$$\begin{aligned} D^F(p,p^F) &= \pi G\left(t'\right), \\ t' &= \pi\frac{p^F - p^M}{k}. \end{aligned}$$

Lemma 17 *If middlemen never increase their price p^M more than the price on the FT market increased, $\frac{\partial p^M}{\partial p^F} < 1$, and they do not increase their price too much when the probability of success on the FT market increases:*

$$\frac{\partial p^M}{\partial \pi} < k\frac{t'}{\pi^2}\left(\frac{G(t')}{t'g(t')} + 1\right),$$

then the probability of successful trade on the FT market decreases when the FT price increases.

Proof. We can again use the comparative statics argument to show

$$\frac{\partial \pi}{\partial p^F} = \frac{D^F_{p^F} - \frac{\pi^2}{k} g(t')(1 - \frac{\partial p^M}{\partial p^F})}{G(t') + \pi g(t') \left(\frac{t'}{\pi} - \frac{\pi}{k} \frac{\partial p^M}{\partial \pi} \right)}.$$

Assuming that

$$\frac{\partial p^M}{\partial p^F} < 1, \frac{\partial p^M}{\partial \pi} < k \frac{t'}{\pi^2} \left(\frac{G(t')}{t' g(t')} + 1 \right),$$

and by observing that

$$G(t') + \pi g(t') \left(\frac{t'}{\pi} - \frac{\pi}{k} \frac{\partial p^M}{\partial \pi} \right) > 0 \iff \frac{\partial p^M}{\partial \pi} < k \frac{t'}{\pi^2} \left(\frac{G(t')}{t' g(t')} + 1 \right),$$

we can conclude that $\frac{\partial \pi}{\partial p^F} < 0$. ■

Note that this lemma also allows for the possibility that the probability of success on the FT market (π) is locally increasing in p^F. This happens when $\frac{\partial p^M}{\partial p^F}$ is very large and such a condition is rather intuitive. If middlemen increase the price relative to an increase in p^F, it is possible that more FT farmers switch back to regular coffee production. However, this effect has to be stronger than a decrease in demand by FT coffee consumers. It is clear that such a case is very unlikely.

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