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Alessandro Turrini and
Tanguy van Ypersele

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Alessandro Turrini, European Commission and CEPR
Tanguy van Ypersele, Université de la Méditerranée, GREQAM, CORE and CEPR

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Centre for Economic Policy Research
90–98 Goswell Rd, London EC1V 7RR, UK
Tel: (44 20) 7878 2900, Fax: (44 20) 7878 2999
Email: cepr@cepr.org, Website: www.cepr.org

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ABSTRACT

Legal Costs as Barriers to Trade*

Recent evidence shows that the 'home bias puzzle' in international trade may be associated with the mere presence of national borders (McCallum (1995)). In this paper we provide a theoretical framework to explain why borders may matter so much for trade. Our argument is that even between perfectly integrated and similar countries the legal system differs, so that legal costs are higher when business is done abroad. Using a matching model of trade, we show that legal costs asymmetry produce home bias in an essentially different way than traditional trade costs. To estimate the relevance of legal costs in displacing trade we estimate gravity equations augmented with variables capturing the extent of legal asymmetries. Evidence from inter-national trade across OECD countries and intra-national trade across French support the view that legal asymmetries act as relevant obstacles to trade.

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Alessandro Antonio Turrini
Directorate General
Economic and Financial Affairs
European Commission
Office: Bu-1 0/113
B-1049 Bruxelles
BELGIUM
Tel: (32 2) 299 5072
Fax: (32 2) 299 60924
Email: alessandro.turrini@cec.eu.int

Tanguy van Ypersele
GREQAM
Château La Farge,
Route des Milles
13290 Les Milles
FRANCE
Tel: (33 4) 4293 5983
Fax: (33 4) 4293 0968
Email: tanguy.vy@univ-aix.fr

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1 Introduction

The “border effect” is one of the intriguing issues in international trade. The traditional view is that national borders matter for trade because their existence is associated with discriminatory policies, physical distance, or differences in consumer tastes. This view has been challenged in recent empirical work.¹ McCallum (1995), estimating the volume of trade through a gravity equation across US States and Canada provinces, found that the presence of the national border reduces trade by a factor of twenty. This result is quite surprising. The simple fact that the counterpart is located across the border reduces dramatically the volume of trade even between countries like the US and Canada, that have almost completely liberalized trade and that are quite homogenous culturally. These findings stimulated debate and further research. Subsequent work confirmed that the extent of the “border effect” is substantial, even though probably not striking as found by McCallum (1995).² Overall, consensus is shaping around the idea that the mere presence of national borders can choke-off a substantial amount of trade. But then, why do national borders matter so much?

One hypothesis is that regulatory asymmetries across countries and technical barriers to trade may explain the border effect. However, results for the EU indicate that these factors do not seem to be a major source of border effects (Head and Mayer (2000), Brenton and Vancauteren (2001)). Moreover, gravity equations implemented at the regional level have found evidence of border effects also across regions and within countries, which does not seem consistent with an explanation based on regulatory trade barriers (Wolf (2000), Combes, Lafourcade and Mayer (2005)). A series of papers emphasize informational barriers to trade and the role of commercial networks in reducing search costs in international trade (see Rauch (2001) for a survey and Combes, Lafourcade and Mayer (2005) for evidence on France). Other work focuses on the idea that contract incompleteness and imperfect

¹This paper focuses on the “border effect” puzzle. Another related puzzle is that of “missing trade”. Treffer (1995) tests empirically the Heckscher-Ohlin-Vanek model and finds that differences in factor endowment can predict only a fraction of actual trade even allowing for differences in production technologies and tastes biased in favor of domestic goods.

²Helliwell (1996) analyses trade between US States and Canada provinces using data relative to the post-Nafta period and finds that borders reduce trade by a factor of twelve. Other studies analyse the border effect comparing international trade with domestic transactions. Wei (1996) and Evans (2000) examine OECD trade, while Head and Mayer (2000), Nitsch (2000), and Chen (2004) look at trade flows in the EU. All these studies provide evidence that borders reduce trade substantially, but less compared with the results obtained by McCallum (1996) and Helliwell (1996). Anderson and van Wincoop (2003) analyze border effects between Canada and the US by implementing a theoretically founded gravity equation which also takes into account cross-country price differences. Their results show that the surprisingly high border effect found in McCallum (1995) can to some extent be explained by omitted variables and the small size of the Canadian economy.

enforcement is likely to be stronger when trade takes place across borders. Anderson and Marcouiller (1999) provide empirical support to this argument showing that, *ceteris paribus*, trade is significantly lower for countries with weak institutions and widespread corruption. This argument, however, appears to be more suited for explaining missing trade between developing countries rather than between countries with solid institutions like the US and Canada.

The argument developed in this papers is that national borders matter for international trade because they draw the frontier between different legal systems. We first develop a model that helps to understand how the heterogeneity of legal systems may lead to home bias in trade. We then provide empirical evidence which supports the view that asymmetries in legal costs may indeed matter for the extent of cross-border trade.

The idea that differences in legal systems may act as a barrier to trade is not new. Rodrik (2000, page 179), for instance, argues that “...national borders demarcate political legal jurisdictions. Such demarcations serve to segment markets in much the way that transport costs or border taxes do”. The main message from our theoretical analysis is that differences in jurisdictions associated with national borders may lead to home bias, though in a quite different way compared with tariffs or transport costs. Our point of departure is that, as observed in Rauch (1996, 1999), the international exchange of manufactures does not occur in organized markets like those of basic commodities. Manufactures differ too much in their quality and characteristics for quoted prices to reveal all the information required by traders to finalize their operations. Hence, the connection between sellers and buyers is often the result of a lengthy search process. In this context, the terms of exchange can only be fixed *ex-post*, after the realization of a match, and on the basis of the relative bargaining power of buyers and sellers, which is shaped by their outside options. Parties always have the option not to fulfill their obligations. However, by doing that, they will be confronted with legal sanctions. It is easy to understand why borders do matter in this context. When a transaction occurs across the border, it involves different jurisdictions, and the legal costs in case of trial are higher. This may result into a shift of bargaining power in favor of the party that can gain from opportunistic behavior in cross-border trade, into a lower incentive to search for business partners abroad, and then into a reduction of trade flows. This change in bargaining power would not occur instead with trade costs ensuing only from transport costs or border taxes.

A basic assumption of our model is that the amount of losses the injured party can recover by suing the non-compliant counterpart is lower when commercial disputes occur across the border. This assumption builds on two main arguments. *First*, overall trial costs are higher in case of cross-

border disputes.³ These higher costs are due to the fact that the lawsuit may need to occur in a court abroad, with additional transaction and procedural costs which are likely to be higher the bigger the difference in the legal system of the countries of the trading parties.⁴ Moreover, additional agency costs could be related to the absence of repeated interaction with foreign lawyers.⁵ *Second*, the injured party may not be able to fully recover the losses incurred in a dispute. In general, the estimate of legal costs made by courts is likely to be lower than those effectively paid.⁶ Available empirical evidence for the US seems consistent with our assumption. Clermont and Eisenberg (1996)) show that litigations initiated by foreigners have a higher probability of success than those started by domestic plaintiffs. An explanation for this evidence is that since the share of losses that can be recovered in international law-suits is lower than that recoverable in domestic law-suits, they will be pursued more seldom, only when the probability of success is high enough.

In the paper we consider the case in which it is the buyer (the importer) that has an incentive not to comply with trade obligations. Several reasons induce to think that this is the most likely case. It happens that in international transactions the delivery of goods comes before their effective payment, so that it is the buyer the one that can gain from opportunistic behavior. Even when documentary credit or bankguarantees are used, the seller still risks that the buyer claims that the occurrence of some contingency has altered the agreed terms of exchange (e.g., deterioration of quality).⁷ This asymmetric position of sellers and buyers in international

³An alternative to international law suit is that of international arbitration. If the arbitration takes place in a third country (e.g., at the International Chamber of Commerce in Paris) there are not asymmetries. However, evidence shows that international arbitration is also quite costly, and used only in case of large transactions (see, e.g., Casella (1992, 1996)).

⁴This is generally the rule in EU countries. According to Article 2 of the Lugano EC EFTA Convention on Jurisdiction and the Enforcement of Judgements in Civil and Commercial Matters (Lugano, 1988), "...persons domiciled in a Contracting State shall, whatever their nationality be sued in the courts of that State."

⁵On agency problems in the relations between a lawyer and his client see Stephen and Love (2000).

⁶The rules for the reimbursement of legal expenses depend upon the specific judicial system of countries (see, e.g., Katz (2000)). While in some countries (e.g., Germany, Spain) the party proved to be guilty has to refund all the legal expenses of the other party, there are countries (like the US, France and Belgium) where the judicial system is such that each party normally supports its own costs. Other countries (e.g., the UK, the Netherlands, Italy) are somehow in between: the obligation to refund the legal expenses of the injured party is subject to limits associated with statutory caps or conservative assessments made by judges in accordance with principles of fairness. In general, under most judicial systems, the reimbursement of legal expenses is less than full: "... judicial and statutory caps can and often do hold fee awards below the going market rate for legal representation..." (Katz (2000), p 66).

⁷See, e.g., del Busto (1994) for a description of documentary credit.

trade is reflected in public policies aimed at facilitating international transactions. While it is quite common the public support to export credit and insurance, similar practices targeted to importers are very seldom used.

We build a model of international trade where matching between buyers and sellers occurs randomly. The mechanics of the model are similar to those commonly used to analyze equilibrium unemployment (e.g., Pissarides (2000)). A matching function summarizes the number of random matches realized per unit of time between searching buyers and sellers. Buyers may be matched with domestic or foreign sellers. Exporters have to pay higher legal costs compared with domestic sellers to sue a buyer that behaves opportunistically, refusing to pay the due price. We show that this asymmetry in legal costs translates into a loss of bargaining power for sellers doing business abroad, and into the emergence of a border effect. Asymmetries in legal costs have a direct negative effect on the entry of foreign sellers, but also a possible effect on the entry behavior of domestic sellers. Thus, the border effect unambiguously shows up with a lower probability for each buyer to be matched with a foreign seller. We show that asymmetries in legal cost plays in an essentially different way than transport costs, which would only affect the entry behaviour of foreign sellers, leaving however unaffected that of domestic sellers.

A crucial issue is to what extent asymmetries in legal costs could contribute to reduce cross-border trade. The answer to this question can only be empirical. To shed light in this direction we estimate otherwise standard gravity equations augmented to take into account the impact of heterogeneous legal systems.

First, we analyse international trade across OECD countries. We measure the extent to which legal systems are similar using two different variables. One variable is an index of legal similarity built on the basis of the Lex Mundi survey (Djankov et al. (2003)) assessing the exact procedure to get refund of an unpaid check in all OECD countries. The other variable is a dummy that indicates whether a pair of countries share the same origin of their legal system. We show that similarities among legal systems have a significant impact on trade. Controlling for country-specific factors, distance, the presence of a common border and of a common language, if a pair of countries are characterized by identical legal procedures to refund an unpaid check trade flow are higher by about 65 per cent compared with the polar case of fully different procedures. If two countries share common origins for their legal system, on average they exhibit trade flows 47 per cent larger.

Second, in order to overcome a possible issue of overestimation of the impact of legal asymmetries on trade due to omitted variables positively related with trade and with the measures of legal asymmetries employed

in our regressions (e.g., hystorical or cultural factors), we analyse trade among regions (départements) within a given country (France). Controlling for region-specific factors, distance and contiguity, we show that if disputes among residents of a given pair of regions are settled in the same court of appeal trade is higher by 24 per cent.

This evidence supports the view that asymmetries in legal costs have a considerable role in segmenting trade across borders. Moreover, in the case of the analysis referred to trade among OECD countries, the inclusion of the variable capturing the origin of the legal system reduces significantly the coefficient of the border effect. Overall, these results suggest that, to some extent, the border effect puzzle could be explained by asymmetries in the legal system of different countries.

The remainder of the paper is organized as follows. In the next section we outline the structure of the model, while in section 3 we characterize equilibrium and qualify the emergence of border effects. Section 4 provides empirical evidence on the relevance of legal costs in segmenting trade using international trade flows for OECD countries and French regional data. Section 5 concludes.

2 The Model

2.1 The Economy

We consider a world with two countries (regions), each populated by a unit mass of buyers and sellers. The two economies are identical in all respects, so that we can concentrate the analysis on one of them only. There are two goods. One is a homogenous numéraire good produced and exchanged on competitive markets. The other good (“manufactures”) is instead exchanged on a market where the matching between buyers and sellers is imperfect. This imperfect matching is interpreted as the result of heterogenous product characteristics and buyers’ preferences. The utility of both sellers and buyers is linear in the numéraire. As for manufactures, it is assumed that at each instant of time buyers consume either one unit of manufactures if matched with a seller, which provides a utility flow of ρ , or zero units if not matched. All agents are infinitely-lived and discount the future at rate r . We restrict the analysis to an economy in the steady state.

In the economy, there is only one production factor, labor. The numéraire is produced 1:1 out of labor, so that the wage rate is equal to 1 in both countries. The manufactured good is produced under constant returns to scale with marginal costs equal to c . Each agent is endowed with a labor endowment which is supplied inelastically to the market. It is assumed that this endowment is sufficiently large to allow for the purchase of manufactures

and exclude, at each time, negative consumption.⁸

In each country, sellers may either be domestic or foreign. The variables referred to, respectively, the home and the foreign country are labelled with superscripts H and F . We also denote by H and F the set of domestic and foreign sellers.

2.2 Matching

At each period in time, some sellers and buyers are randomly matched and some existing matches are randomly destroyed at a Poisson rate d .

Sellers decide at each instant about entry. As soon as sellers enter in one location, they have to search for a buyer. Their search costs are represented by a flow of γ units of the numéraire per unit of time. A seller, after being matched with a buyer, posts a price and, if the buyer agrees, a business relation starts.⁹ At this point, the buyer has further to decide about her business conduct. Buyers may either be compliant (“honest”) or non-compliant (“dishonest”). A honest buyer pays for the delivered good, while a dishonest buyer refuses to pay. Whenever a buyer refuses payment to the seller, the business relation is terminated at a higher Poisson rate (d' instead of d , $d < d'$). At each moment, all sellers and buyers are either matched or searching. The behavior of the buyer is verifiable by a court, which imposes the due payment to the sued seller in case of non compliance. In case of non compliance, two possibilities arise: either the parties reach a pre-trial agreement (the buyer directly compensates the seller), or the seller sues the buyer to the court.

2.2.1 The matching technology

The mass of instantaneous matches between buyers and local (resp. foreign) sellers is an increasing function of the mass of searching buyers and local (resp. foreign) sellers. More formally, let b and s^i be, respectively, the mass of searching buyers and sellers belonging to country i , $i = H, F$; the matching function $m[s^i, b]$, $m : R^+ \times [0, 1] \rightarrow R^+$, specifies the mass of instant matches between buyers and sellers belonging to country i . We assume $m[s^i, b]$ to be increasing in both its arguments, to exhibit constant return to scale, and to respect Inada conditions.¹⁰ Let define $\theta^i \equiv s^i/b$

⁸As will be clear in the following, negative consumption could arise since sellers searching to be matched with buyers pay a search cost γ at each instant of time. The numéraire endowment is such that it is greater than $\max[\rho, \gamma]$.

⁹The assumption that sellers make take-it-or-leave-it offers to buyers simplifies the analysis but is not crucial. The main qualitative conclusions are obtained allowing parties to share the surplus from the match according to some given rule.

¹⁰Although in principle matching probabilities could depend on the total number of sellers (local and foreign) in the analysis we keep home and foreign sellers separated.

and $q(\theta^i) \equiv \frac{m(s^i, b)}{s^i}$. $q(\theta^i)$ represents average flow of matches with a buyer (Poisson rate) for a searching seller belonging to country i , while $\theta^i q(\theta^i)$ are the average instant matches for a buyer with a seller belonging to country i .¹¹

2.2.2 Sellers

The steady-state value function for a searching seller belonging to country i , $i = H, F$, (denoted by i) is the sum of the instant losses ($-\gamma$) and the option value of searching, i.e., the expected gain once matched with a buyer:

$$rV^i = -\gamma + q(\theta^i) \{ \max [J^i, V^i] - V^i \}. \quad (1)$$

Note that since there is free entry and $q(\theta^i)$ is decreasing with s^i , entry by sellers belonging to country i will occur until $V^i = 0$.

The value function of sellers depends both on whether the match occurs domestically or across the border, and on whether the matched buyer pays after delivery or refuses to pay. We will limit the analysis to empirically consistent cases in which buyers are compliant (Appendix A.1 identifies sufficient conditions for this to be the case). The value function of a seller belonging to country i matched with a buyer will thus be given by

$$rJ^i = p^i - c - d[J^i - V^i], \quad i = H, F, \quad (2)$$

where p^i is the price charged by seller belonging to country i , and d is the separation rate. The price p^i is set unilaterally by the seller, who is in the position to make a take-it-or-leave-it offer to the buyer. Each seller has therefore to solve the problem of the buyer to set optimally p^i .

2.2.3 Buyers

After the price is posted, the matched buyer has to decide, in sequence, whether to start business with a matched seller and, if yes, whether to behave honestly or dishonestly. As soon as the business relation starts, the good is delivered. A honest buyer pays the price posted by the seller p^i . A dishonest buyer refuses to pay. Since the behavior of the buyer is verifiable, the seller can obtain the due payment by suing the buyer. However, since the trial is costly and both parties are rational, they will always reach a pretrial agreement.

All the qualitative results would hold unchanged by admitting matching probabilities depending on the total mass of sellers (a proof is available by the authors upon request). Keeping foreign and local sellers separated eases exposition.

¹¹Note that, from the Inada conditions assumed to be respected by $m(.,.)$, it must be that $\lim_{\theta^i \rightarrow 0} q[\theta^i] = +\infty$ and $\lim_{\theta^i \rightarrow +\infty} q[\theta^i] = 0$.

Denote by h^i , $i = H, F$, the transfer from the buyer to the seller that is agreed in the pre-trial settlement. This transfer must be such that both parties will be as well off as without the agreement, i.e., in the case of having the lawsuit settled by the court. For simplicity, and without loss of generality, it is assumed that the parties share equally the surplus from the pre-trial agreement. The transfers for the pre-trial settlement are therefore equal to $h^H = p^H - \Delta^H$ and $h^F = p^F - \Delta^F$, where $\Delta^i \equiv 1/2(\Delta_s^i - \Delta_b^i)$ for $i = H, F$, and where Δ_b^i is the trial cost for the buyer, while Δ_s^i is that for the seller.

As long as $\Delta^i > 0$, it will be the buyer to have a possible incentive to behave opportunistically. This is the case we consider.¹² To ease exposition, we assume $\Delta_b^i = 0$, $i = H, F$. Moreover, we assume that trial costs are larger for lawsuits taking place across the border, so that $\Delta^F > \Delta^H$. This assumption implies that in the pre-trial settlement foreign sellers receive less than domestic ones. Again, to ease notation, trial costs for domestic lawsuits are set to zero, while the trial cost for foreign sellers Δ_s^F are set equal to 2Δ . From this simplifications it is obtained that $h^H = p^H$ and $h^F = p^F - \Delta$. By reaching a pre-trial settlement, the seller will spend Δ instead of 2Δ to obtain the due compensation, while the buyer will save Δ in terms of a lower expense to obtain the good.

Denoting by C_h^i the value function of a honest buyer that is matched with a seller belonging to country i , we get

$$rC_h^i = \rho - p^i - d(C_h^i - W), \quad i = H, F \quad (3)$$

where W is the value function of a buyer if searching. The welfare of a buyer that behaves opportunistically depends crucially on whether she is matched with a domestic or with a foreign seller. Denoting by C_d^i the welfare of a dishonest buyer of type j , we have, respectively, in the case of a domestic and a cross-border match

$$rC_d^H = \rho - p^H - d'(C_d^H - W), \quad (4)$$

$$rC_d^F = \rho - p^F + \Delta - d'(C_d^F - W). \quad (5)$$

When a buyer matched with a home seller decides not to pay, the settlement is the price p^H , but the business relation is destroyed at the rate 1. As $d < d'$, a home buyer matched with a home seller will always be compliant. Things are different when the match occurs across the border, since the required compensation is lower and the instantaneous surplus for a dishonest buyer is higher. We see that a buyer matched with a foreign seller will be

¹²Note that there would be scope for opportunistic behaviour also in the opposite case, where $\Delta^i < 0$. In that case, the seller would have an incentive to deliver goods of inferior quality, thus saving on costs. A richer version of the model could also consider that case.

honest provided $C_d^F \leq C_h^F$. One checks using equations (3) and (5) that this condition is met if and only if

$$C_d^F - W \geq \frac{\Delta}{d' - d}. \quad (6)$$

Note that honest behavior requires that the rate of match destruction is higher with a dishonest buyer.

2.3 Pricing

Sellers will set the highest price such that buyers accept the proposed deal. Restricting the analysis to cases with compliant behaviour, in case of, respectively, a domestic and a cross-border match we have the following equations implicitly defining the price posted by sellers

$$\begin{aligned} C_h^H - W &= 0, \\ C_h^F - W &= \frac{\Delta}{d' - d}. \end{aligned} \quad (7)$$

Buyers matched with foreign sellers are in the position to extract a positive surplus from the match, in spite of the fact that sellers make take-it-or-leave-it offers. This is related to the stronger incentive not to comply in case of matches occurring across the border. The rent appropriated by the buyer increases with Δ because the higher is Δ the lower is the compensation in favor of the seller agreed in a pre-trial settlement in case of dishonest behavior. The rent to the buyer also increases the lower is the term $d' - d$, which measures by how much the destruction rate rises in case of dishonest behavior.

The asset equation for a searching buyer, W , is given by the option value of being matched with a domestic or a foreign seller:

$$rW = \theta^H q(\theta^H)(C_h^H - W) + \theta^F q(\theta^F)(C_h^F - W). \quad (8)$$

>From equations (3) and (8) we obtain

$$(r + d)(C_h^i - W) = \rho - p^i - \theta^H q(\theta^H)(C_h^H - W) - \theta^F q(\theta^F)(C_h^F - W). \quad (9)$$

where $i = H, F$. Using (7) and (9) it is obtained that the price charged by, respectively, a domestic seller and a foreign seller to a buyer are given by

$$p^H = \rho - \theta^F q(\theta^F) \frac{\Delta}{d' - d}, \quad (10)$$

$$p^F = \rho - [r + d + \theta^F q(\theta^F)] \frac{\Delta}{d' - d}. \quad (11)$$

The prices set by both domestic and foreign sellers are lower than the instant utility for the buyer ρ . Note that the price set by exporters is lower compared with that fixed by domestic sellers. We thus obtain a “dumping” result, that is explained by the fact that foreign sellers have to leave some rent to the buyer to induce honest behavior. It is also to note that both in the case of matches within and across the borders an “outside option” term appears in the expression of prices. The seller will set a price that is lower the higher is the term $\Delta/(d' - d)$ –reflecting the amount of the surplus appropriated by buyers matched with exporters– and the higher the rate at which a buyer enters a business relation with a foreign partner (given by the Poisson rate $\theta^F q(\theta^F)$ at which matches arrive). This is easily explained. Even if setting a take-it-or-leave-it price, the seller cannot fully appropriate the instant surplus from the buyer, since for the latter there is the option value from waiting for a match with a foreign partner. It is to remark that in case markets are segmented only because of transport costs or border taxes, this outside option term would not materialize in the expression of prices. So, while changes in legal costs Δ will in general affect the behavior of both domestic and foreign sellers, in the presence of transport costs or tariffs, only the behavior of exporters would be affected.

The candidate equilibrium in which buyers behave honestly that has been characterized so far can be an actual equilibrium only if no seller has an incentive to deviate from their price behavior. The only deviation can occur in case of cross-border matches. When the match occurs within national borders, in fact, the seller is in the position to fully extract the surplus from the matched buyer. A lower price would leave some surplus. A higher price would induce buyers to reject the deal. In case of cross-border matches, instead, sellers have the alternative option of setting a price higher than (11) that induces dishonest behavior on the part of the matched buyer. In that case, sellers would set the highest price that still make the deal acceptable for the matched buyer. Appendix A.1 shows that such deviations cannot be profitable at equilibrium when production (c) and legal (Δ) costs are sufficiently small (condition (22), that is assumed to hold in the whole analysis).¹³

3 Equilibrium

Henceforth, we restrict attention to cases in which cross-border trade takes place. An equilibrium with cross-border trade boils down to a strictly posi-

¹³The intuition is that buyers’ rents in case of honest behavior are associated with legal costs Δ (check (6)). When such costs are sufficiently low, sellers would not gain from deviating to prices higher than (11), because this would result in a small increase in the rent from the match, too small to compensate for the increase in the destruction rate of the match.

tive solution (θ^F, θ^H) of the following system

$$V^H = 0, \quad (12)$$

$$V^F = 0, \quad (13)$$

where V^i is that of a searching seller, $i = H, F$. The mass of searching buyers, b , and that of searching sellers, s^i , $i = H, F$, are obtained recursively from the steady-state conditions $\dot{b} = 0$, $\dot{s}^i = 0$, where the dots denote time changes.

Proposition 1 *An equilibrium with honest behavior and cross-border trade exists and is unique.*

Proof: See Appendix A.1.

The equilibrium can be characterized graphically. Figure 1 depicts the equilibrium of the model in the (θ^F, θ^H) space. The values for these variable are implicitly defined by equations (12) and (13). While from (13) follows that there is a unique value of θ^F that solves the free-entry condition for foreign sellers, equation (12) is satisfied for values of θ^H that depend negatively on θ^F (see Appendix A.1). In fact, while the entry condition for foreign sellers is not affected by variables relating to domestic sellers, the decisions of domestic sellers are affected by θ^F via the outside option available to buyers. The pricing equations (10) and (11) show that the rent appropriated by buyers increase with the Poisson rate of being matched with foreign sellers $\theta^F q(\theta^F)$. The equilibrium is obtained at point A at the intersection of the flat $V^F = 0$ locus with the downward sloping $V^H = 0$ schedule.

Insert Figure 1 about here

Would equilibrium exhibit a border effect? Answering to such a question requires measuring the ratio between foreign and domestic trade in the model. Define by z^H and z^F respectively, the mass of matched home and foreign sellers. At the steady state, z^H and z^F must be constant (inflows in z^H must be equal to the outflows from it; the same with respect to z^F), so that:

$$dz^i = \theta^i q(\theta^i) b, \quad i = H, F \quad (14)$$

where dz^i and $\theta^i q(\theta^i) b$ are, respectively, the number of destroyed and that of created matches per unit of time. Hence, the steady state share of cross-border trade over domestic trade is defined as

$$\frac{z^F}{z^H} = \frac{\theta^F q(\theta^F)}{\theta^H q(\theta^H)}. \quad (15)$$

Note that the presence of a border effect (such that trade across the border is smaller than domestic trade) depends upon differences between θ^F and θ^H since these terms summarise the “relative tightness of markets”. The higher is the ratio $\theta^F q(\theta^F)/\theta^H q(\theta^H)$ the easier it is for a buyer to be matched with a foreign seller rather than with a domestic one. It can be shown that the asymmetric pricing behavior that has been previously characterized inevitably leads to home bias because of lower market tightness for foreign sellers, i.e., $\theta^H > \theta^F$.

Proposition 2 *Legal costs asymmetries (Δ) create a “border effect” because buyers are less likely to be matched with foreign sellers than with local sellers ($\theta^H > \theta^F$).*

Proof: See Appendix A.2.

Asymmetries in legal costs alter the relative entry conditions of foreign and domestic sellers, with the result of a relatively lower probability of buyers to be matched with foreign sellers.¹⁴ What about the impact on the absolute mass of foreign and domestic sellers? Graphic analysis only helps partially to address this issue. As indicated in figure 1, starting from equilibrium A , an increase in the extent of legal cost asymmetries (higher Δ) moves both the $V^F = 0$ and the $V^H = 0$ loci downward, with an unambiguous negative impact on θ^F but with ambiguous effects on θ^H (which may either fall or rise, depending on whether the new equilibrium looks like point B or point B'). It is shown in Appendix A.3. that both cases in which the entry of domestic sellers rises (θ^H rises) or falls (θ^H falls) are possible.

Proposition 3 *The border effect induced by legal cost asymmetries is always associated with reduced entry by foreign sellers and, when the level of legal cost asymmetries is sufficiently high, may also be associated with increased entry of domestic sellers.*

Proof: See Appendix A.3.

It is to note that the impact of legal asymmetries on trade requires imperfect matching. It is also to note that such an impact on the behaviour of

¹⁴In a previous version of the model sellers and buyers were assumed to differ ex-ante in terms of the quality characteristics of the goods supplied and most valued, respectively. The model had features analogous to those of Marimon and Zilibotti (1999) labour market model: buyers may reject a matches with sellers supplying goods of a quality type too distant from their preferred ones. In that model version, the home bias is associated not only with lower probabilities for buyers to be matched with foreign sellers but also with a lower probabilities of buyers accepting a given match with foreign sellers.

domestic sellers would not be present should the border effect be associated with “traditional” transport costs rather than with asymmetries in legal costs.

Take the case in which there are no asymmetries in legal systems ($\Delta = 0$) and consider how the introduction of a trade cost τ that raises the production cost of manufactures affects equilibrium values. Since $\Delta = 0$ and the seller makes a take-it-or-leave-it offer to the buyer, it is clear from (9) that home and foreign prices are the same

$$p^H = p^F = \rho. \quad (16)$$

The presence of “traditional” trade barriers have the only effect of raising costs and reducing the profits of foreign sellers, what are affected are only the decisions of foreign sellers, via a modified value function which becomes as follows

$$J^F = \frac{p^F - c - \tau}{r + d},$$

and a consequently changed free-entry condition $V^H = 0$. Absent asymmetric legal costs, and in presence of trade costs, only θ^F falls compared with a fully frictionless situation, while θ^H is the same as under full free trade.

Proposition 4 *The border effect resulting from trade costs purely affecting cost conditions would only reduce the entry of foreign sellers without affecting that of domestic sellers.*

The reason why the behaviour of domestic sellers is not affected by trade costs is the absence of the outside option effect that materializes instead with legal cost asymmetries. Crossing the border has direct implications for foreign sellers because of the costs associated with asymmetries in the legal system. There are however also indirect effects via the changed outside option of buyers, and this has an impact both on the decision of foreign and domestic sellers. There maybe cases in which this indirect effect arising via the buyers’ outside option magnifies the direct impact of legal asymmetries, so that the border effect is associated not only with lower entry of foreign sellers but also with increased entry by domestic sellers.

How big could the border effect induced by legal costs asymmetries? Such a question is a crucial one to assess the relevance of the theoretical results produced so far. The answer however is an empirical one, and it is dealt with in the next section of the paper.

4 Do legal systems contribute to the border effect? Empirical evidence

The purpose of this section is to provide an estimate of the relevance that heterogenous legal systems may have in contributing to the border effect. The estimation of gravity equations permit to analyse the determinants of trade flows, including the possible impact of heterogenous legal systems. The good performance of gravity equations in explaining trade flows is well-known since Timbergen (1962). Moreover, the assumptions underlying gravity equations are quite general and can accommodate alternative trade models. All models predicting complete specialization of production across countries would indeed be compatible with gravity equations (Evenett and Keller (2002)). The model developed in this paper, for the sake of parsimony, has been kept as simple as possible and as such does not permit to derive a typical gravity equation. The ratio of cross-border trade over national trade (15) depends on measures of legal costs (Proposition 1) and other type of trade costs (Proposition 4). Admitting countries with different labour endowments and assuming additional variety-specific fixed production costs paid in terms of labour, the endogenous number of varieties produced in each country would be proportional to labour and income and would affect trade shares, as in standard model providing theoretical foundations for gravity equations.

Our objective in this section is to make a step forward in the estimation of gravity equations by including measures of the degree of heterogeneity of legal systems. There is no obvious way to implement such an empirical test. We follow two different approaches in carrying out our empirical analysis.

First, we analyse aggregate trade flows among OECD countries. We augment a basic gravity equation with two alternative measures of the similarity of the legal system. The first one is an index built on pairwise comparisons between legal procedures to get refund of an unpaid check as described in the “Lex Mundi project” database compiled by Djankov et al. (2003). This among the most direct measures of similarity of legal arrangements in case of trade disputes obtainable from readily-available cross-country information. Nevertheless, one can argue that to some extent the features of the legal arrangements and procedures to solve trade disputes between a pair of countries depend on trade linkages themselves. Those countries that trade more (due, e.g., to proximity and absence of explicit trade restrictions) are also those that are more likely to undergo a process of “deeper” trade integration whereby business procedures, including those related to disputes, are simplified via the determination of common principles and standards. We therefore use an alternative proxy for legal similarity consisting of a dummy indicating whether a pair of countries share a common origin of their legal system.

Second, we look at trade occurring within national borders among small geographical units, small enough that traders belonging to different geographical units may or may not be subject to the same court of appeal in case of trade disputes. We estimate a gravity equation using trade data for French regions (départements) and add a variable capturing whether, for a given pair of regions, the court of appeal competent to deal with trade disputes is the same for both or differ. Using international trade data the estimates of the impact of heterogenous legal systems is likely to be on the high side, given that the origin of the legal system may capture not only additional legal costs involved in disputes occurring across the border but also other factors (cultural, historical,...) that are not explicitly controlled for in the regressions but that may nevertheless explain a more intense trade activity. Conversely, the estimates obtained using sub-national data is likely to be on the low side. The additional costs associated with the need to deal a dispute in a court of appeal different than usual is likely to be relatively small when the court is still located within national borders, while comparatively higher costs may occur in case of disputes taking place across national borders. The “true” effect may be in between that estimates using the two alternative approaches we follow.

4.1 Evidence from international trade among OECD countries

It is customary to explain bilateral trade flows on the basis of gravity equations where all country-specific variables (income, price level, trade barriers,...) are captured by origin and destination-country fixed effects.¹⁵ Among the explanatory factors capturing factors specific to the particular pair of countries considered, gravity equations generally include measures of distance, and dummies indicating whether the countries share a common border or other common features that may matter for the magnitude of trade flows (e.g., a common language). Bilateral imports are generally used as dependent variable. When the analyzed trade flows include measures of countries’ imports from themselves, it becomes possible to assess whether, and by how much, the mere fact that trade takes place across the border matters for the magnitude of trade flows, i.e., it permits to estimate the border effect.

We estimate a gravity equation in which the dependent variable is bilateral imports, both from other partner countries and from self and where

¹⁵Papers that adopt the approach of capturing country-specific variables via fixed effects include Harrigan (1996), Rose and van Wincoop (2001), Redding and Venables (2004), Combes, Lafourcade and Mayer (2005). The use of fixed effects permit to estimate consistently the average border effect in regressions including data on imports from both partner countries/regions and self and has the advantage of simplicity (Feenstra (2002)).

the regressors are country-of-origin and country-of-destination fixed effects, distance, and two dummies. One takes value 1 when a pair of different countries share a common border (“contiguity” variable). The other has value 1 when a pair of countries share a common language (“common language” variable).¹⁶ An additional dummy takes value 1 if trade occurs with self (“no border” variable). The coefficient of this dummy captures the border effect. Using measures of trade flows and distance in logarithm, the coefficient for the “no border” dummy is interpreted as the logarithm of the factor by which, other things being equal, trade flows are higher if taking place without crossing a national border.¹⁷

Gravity equations are estimated on a data set including all OECD countries over the period 1990-2001. The source of the data is CEPII for what concerns trade, production and measures of distance.¹⁸ Imports from self of a given country are measured as the difference between aggregate production and aggregate exports. In addition to origin and destination country fixed effects, year fixed effects are included among the set of the explanatory factors to exploit the panel structure of the dataset and permit to control for shifts in the constant term occurring over time.

Our aim is to augment this otherwise standard gravity equation with a variable capturing the extent to which the legal systems between different countries is different, thereby implying extra costs to traders that may be involved in disputes across the border compared with the case of trade taking place within borders. We use two alternative variables. The first variable uses the information contained in the “Lex Mundi Project” dataset constructed by Djankov et al. (2003). This dataset includes, inter-alia, descriptions of the procedures used by litigants and courts to collect a bounced

¹⁶In estimating gravity equations it is customary to use a specifications of dummy variables for contiguity and common language such that these variables can take value 1 only when trade flows occur between different countries (see, e.g., Nitsch (2000), Helliwell (2002), Chen (2004)).

¹⁷An alternative is to use as dependent variable the ratio of bilateral imports with partner countries over trade with self. In this case, the border effect is captured by the coefficient of the intercept in the regression. See, e.g., Feenstra (2002).

¹⁸The data set on trade and production is available on the web page of the CEPII <http://www.cepii.fr/anglaisgraph/bdd/TradeProd.htm>. In this data set, trade and production data originate, respectively, from UN COMTRADE and UNIDO, and have been previously compiled and made available for the 1976-1999 period by Alessandro Nicita and Marcelo Olarreaga at the World Bank. CEPII extended the data set by Nicita and Olarreaga and filled missing values using the CEPII database of international trade (BACI), more recent versions of the UNIDO CD-ROM and the OECD STAN database for OECD countries. Concerning distance measures, these are available at <http://www.cepii.fr/anglaisgraph/bdd/distances.htm> and consists of estimates of the average distance between pair of countries and internal within country distance based on bilateral distances between cities weighted by the share of the city in the overall country’s population. This database also contains variables indicating whether countries share a common border and a common language (which is assumed to be the case if at least 9 per cent of the population of a pair of countries speaks the same language).

check in 109 countries. The Lex Mundi survey reports yes/no answers to questions relating to a series of features of the judicial system of countries. We consider the information pertaining to the answers concerning the procedures to get reimbursement of an unpaid check via the judicial system. For each pair of OECD countries, we construct an index of similarity which is equal to 1 minus the sum the square differences in answers divided by the total number of questions.¹⁹ In formal terms, for each pair of countries i,j we compute an index $ls_{i,j} = 1 - \sum_k (a_i^k - a_j^k)^2 / K$, where k is an index denoting the type of question and $a_i^k, a_j^k \in \{0, 1\}$, is the answer provided to question k by country i . The index ranges between 0 and 1. The higher the index, the more similar is the legal system between a given pair of countries as far as the procedures to obtain reimbursement of an unpaid check are concerned. Across OECD countries, this index has a mean of 0.66, meaning that, on average, a given pair of OECD countries have 66 per cent of the characteristics of the procedures to have a check paid via the judicial system in common.

Table 1 reports regression results. The estimation method is OLS with coefficient standard errors robust with respect to possible error correlation for the same importing region. The first column of Table 1 refers to a basic specification excluding the variable capturing the presence of the same origin of the legal system. All variables turn out to be significant at the 1% level and with the expected sign. The magnitude of the coefficients of the various explanatory variables is in line with that found in similar analyses. The size of the border effect is very close to that estimated in Nitsch (2000), who also analyses trade among OECD countries. The the coefficient of “no border” variable is 2.32, meaning that the absence of borders raises trade by a factor of $\exp(2.32)=10.2$.

The second column of Table 1 reports the results of regressions including the “legal similarity” variable. The coefficient of this variable is statistically significant. The interpretation is that if a pair of countries have identical procedures, other things being equal, will trade about 65 per cent cent more compared with a pair of countriesd having fully different procedures ($\exp(0.5)-1=0.65$). After the inclusion of the “legal similarity” variable the absence of borders turns out to reduce trade by $\exp(2.14)=8.5$ times, significantly less compared with the case in which no account is given of differences in legal systems.

¹⁹We consider 25 questions on 6 different subjects: i) professionalism (is the judge acting professionally?); ii) written elements (which steps of the procedure are in written format?); iii) engagement formalities (is there a mandatory pre- trial conciliation procedure? are the complaint or the judgement to be served through the intervention of judicial officers?); iv) legal justification (what is the level of legal justification for the complaint and for the judgement?); v) on the statutory regulation of evidence (who has the right to introduce evidence and how?); vi) terms of appeal (how does the appeal take place?).

In order to avoid endogeneity issues related with the possibility that the intensity of trade among countries may have an impact on cross-border dispute settlement procedures, we consider in our regressions an alternative variable capturing whether a pair of countries share a common origin for their legal system. The information used to construct our variable is provided in La Porta et al. (1999). Legal systems of OECD countries are distinguished according to whether their origin is English common law, French commercial code, German commercial code, Scandinavian civil law or Socialist civil law. Our variable is a dummy taking value 1 in all cases in which a pair of different countries share the same origin of their legal system.

Insert Table 1 about here

The third column of Table 1 reports the results of regressions including the “same legal origin” variable. The coefficient of this variable is statistically significant and relatively high (0.39). The interpretation is that if a pair of countries share a same origin for their legal system, other things being equal, they trade among themselves almost 50 per cent more ($\exp(0.39)-1=0.48$). It is to notice that the inclusion of the “same legal origin” variable causes a drop in all the other explanatory variables. However, while the drop is negligible for the distance variable and relatively small for the contiguity variable, it is quite substantial for the “common language” variable and especially for the “no border” variable. After the inclusion of the “same legal origin” variable, the absence of borders turns out to reduce trade by $\exp(2.04)=7.7$ times, significantly less compared with the case in which no account is given of differences in legal systems.

Overall, the results from our analysis on trade flows among OECD countries indicate that legal asymmetries seem to matter in explaining trade flows and that may contribute to explain to some extent the border effect puzzle. The issue arises whether the “same legal origin” or the “legal similarity” variables capture, together with a measure of differences in the legal system, also other factors (cultural, historical,...) that may facilitate trade. If this is the case, due to an omitted variables problem the impact of the legal system as reported in Table 1 could be overestimated. Rather than searching for measures for these possible omitted variables, we opt for measuring the impact of the legal system on trade also from a different corner that rules out from the start the risk of overestimation.

4.2 Evidence from French regional trade

As an alternative to the empirical strategy exposed in the previous section, instead of relying on international trade data and on an instrument to measure the legal heterogeneity, we analyse within-country trade and check whether trade flows occurring between parties subject to different courts of appeal is lower, controlling for other factors. In a sense, following this route, we take quite literally the model presented in this paper, where legal systems are the only major source of heterogeneity among geographical locations and the only impediments to trade. We analyse French data on trade flows across the 94 different regions (*départements*) in which the French territory is divided. In France there are 30 courts of appeal for commercial disputes. Each of these courts has a geographical jurisdiction that contains between 1 and 6 départements (none of the département belongs to two different jurisdictions). We check whether départements belonging to the jurisdiction of the same court of appeal trade more among each other, other things being equal.

This approach has some advantages. First, no choices are needed for identifying heterogenous legal systems or measuring differences in legal systems. Second, since trade occurs within national borders, there is no strong issue that such borders could be correlated with other cultural or historical factors that significantly impact trade. Clearly, this approach is a prudent one, and the estimated effect of the impact of asymmetries in legal systems can be taken as a lower bound for that taking place across countries, when trade is international.

The data used in the analysis are taken from Combes, Lafourcade and Mayer (2005). It comprises trade within and between French regions for year 1993 and estimates of transport costs.²⁰ We run the regression as for the OECD countries except that in this case the “common language” variable is not present. The idea in this context is that of enriching a basic gravity equation specification with a “cojurisdiction” variable that takes value 1 when two trading regions belong to the jurisdiction of the same court of appeal and zero otherwise.

²⁰Trade data are obtained from the French Ministry of Transports and concern commodity flows transported by road and railway. These data are constructed on the basis of an annual survey of a stratified random sample of road transport vehicles and of reported trade flows shipped by railway. Data on transport costs between regions are based on Combes and Lafourcade (2005) and include direct and opportunity costs associated with the connection by truck of each pair of French regions. Within-regions transport costs are obtained by regressing road transport on distance and multiplying the estimated coefficients by measures of average internal distances. Distances are measured on the basis of the standard assumption that consumers are uniformly distributed and all production takes place in the centre of regions whose shape is taken as circular. Regions’ total production is obtained via the summation of all trade flows (internal and external to the region itself). Regional wages are taken from annual firm surveys conducted by French National Institute of Statistics and Economic Studies (INSEE).

Table 2 displays the results. All variables are significant at the 1 per cent level and the sign of the coefficients is consistent with expectations. It is to notice that, in spite of the fact that these regressions consider trade across regions and that the same variables have been measured differently compared with the estimates referring to OECD countries (e.g., trade data have been measured following different criteria, distance variables have been constructed differently), the values of the coefficients in Table 2 turn out to be broadly in line with those appearing in Table 1. In particular, the value of the coefficient of the “no border” variable is quite close in the two cases. Once the cojurisdiction variable is added (second column of Table 2), its value is positive and significant. If two regions belong to the jurisdiction of the same court of appeal, other things being equal, they trade 24 per cent more ($\exp(.22)-1= 0.24$). Opposite of what found using OECD data, the inclusion of the “cojurisdiction” variable does not have a major impact on the coefficient of none of the other explanatory variables.

Insert Table 2 about here

In summary, evidence on both international and intra-national trade supports the view that asymmetries in legal costs can displace a considerable amount of trade. The impact is roughly of the same order of that of other variables that generally appear in gravity equations like the contiguity and the common language variables. When using OECD data, the inclusion of the variable capturing the origin of the legal system causes a considerable drop in the border effect. However, this estimate of the impact of the legal system is likely to be on the high side. When data on French regional trade are used, the estimate of the impact of legal costs is lower but still considerable. The “true impact” may lie between these two boundary estimates.

5 Conclusions

National borders matter for trade. In this paper we offer an explanation of the border effect based on the existence of asymmetries in legal systems across countries. The starting point of the analysis is that international trade in many manufacturing sectors does not occur in organized markets like those of basic commodities. In these sectors, the connection between sellers and buyers is the result of a costly search process. Moreover, the price at which trade occurs reflects the relative bargaining power of buyers and sellers, which is shaped by their outside options. In this context, the change in the legal system associated with crossing the border translates into a shift of bargaining power towards the party that has the opportunity

to behave opportunistically (buyers, in our model), by refusing to fulfill the agreed obligations. This reduces cross-border trade because sellers prefer to invest resources to search for domestic partners, rather than for foreign ones. Our analysis also shows that as legal costs rise, trade may fall not only because the mass of foreign sellers searching in the home market falls, but also because more domestic sellers start searching for partners, thus increasing domestic trade with respect to foreign trade at equilibrium. The reason is that a lower probability of being matched with foreign sellers reduces the outside option of buyers vis-a-vis domestic sellers, and this stimulates entry of the latter. Border effects generated via this indirect channel are peculiar to legal costs and would be absent in case of “traditional” trade barriers such as tariffs.

In order to assess to what extent asymmetries in legal costs could contribute to reduce cross-border trade we estimate gravity equations augmented to take into account the impact of heterogeneous legal systems. We follow two alternative approaches. First, on the basis of trade flows between OECD countries, we show that similarities among legal systems have a significant impact on trade. Second, we analyse trade among French regions (départements) and find that if disputes among residents of a given pair of regions are settled in the same court of appeal trade is significantly higher. Overall, this evidence supports the view that asymmetries in legal costs have a considerable role in segmenting trade across borders. Moreover, in the case of the analysis referred to trade among OECD countries, asymmetries in the legal system appear to shrink considerably the border effect.

The main implication of the analysis is that without further developments in contractual arrangements such as international arbitration or documentary credit or some degree of effort of sovereign countries to further integrate their economies also from the viewpoint of the settlement of international disputes, the volume of cross-border trade is doomed to remain lower compared with that taking place within national boundaries.

A Appendix

A.1 Proof of Proposition 1

In a first step, we take as given the existence of a candidate equilibrium with honest equilibrium and show that for small values of legal costs Δ and production costs c this candidate equilibrium can be an actual equilibrium because sellers would not have an incentive to deviate from their price decisions. In a second step we show that for small values of Δ an interior equilibrium with honest behavior and cross-border trade exists and is unique. There, we show that: i) for any θ^F a single value for θ^H solves equation (12); ii) that only one value for θ^F solves (13).

Step 1

An equilibrium with compliance by all buyers must be such that no seller has an incentive to deviate from (11) and that all buyers are willing to pay for the requested price. The price \tilde{p} set by a seller matched with a foreign buyer as a result of a deviation (assuming all other sellers are setting (11)) solves $C_F^d = W$, where the superscript d and the subscript F refer, respectively to the conjectured behavior on the part of the matched buyer (dishonest) and to the fact that the match occurs across the border. Since, by refusing to pay, the buyer will have to compensate the seller with $\tilde{p} - \Delta$ in a pre-trial settlement, the asset equation for a non-compliant buyer must be as follows

$$rC_F^d = \rho - \tilde{p} + \Delta - d'[C_F^d - W]. \quad (17)$$

>From (8), and since the buyers' surplus is nil in domestic matches, it must be that $rW = \theta^F q(\theta^F) \frac{\Delta}{d' - d}$, so that $C_F^d(x) = W$ yields the following price set in a deviation

$$\tilde{p} = \rho + \Delta \left[1 - \frac{\theta^F q(\theta^F)}{d' - d} \right]. \quad (18)$$

Denote now by J_F^d and J_F^h the asset value of the seller when setting, respectively, the optimal price inducing dishonest and honest behavior in the buyer, i.e., (18) and (11). A deviation from an equilibrium with honest behavior is profitable for a seller as long as $J_F^d > J_F^h$. From (12) and (13) it must be that

$$J_i^h = \frac{p^i - c}{r + d}, \quad (19)$$

where $i = F, H$. Moreover, recalling that with dishonest behavior the match is destroyed at rate d' and that the compensation to the seller will be $\tilde{p} - \Delta$, we must have

$$J_F^d = \frac{\tilde{p} - \Delta - c}{r + d'}, \quad (20)$$

Substituting, respectively, (11) in (19) and (18) in (20) after some algebra it is obtained that $J_F^d > J_F^h$ if and only if

$$\rho < c + \frac{\Delta}{(d' - d)^2} [(r + d)(r + d') + (d' - d)\theta^F q(\theta^F)]. \quad (21)$$

It follows that if the condition

$$\rho \geq c + \frac{\Delta}{(d' - d)^2} [(r + d)(r + d') + (d' - d)\theta^F q(\theta^F)] \quad (22)$$

holds no deviation can occur from an equilibrium with honest behavior. When the value of Δ is sufficiently small, sufficiently low values for c always exist such that condition (22) is satisfied.

Step 2.a.

>From (1), (10) and (19), (12) transforms to

$$\gamma = \frac{q(\theta^H)}{r + d} \left[\rho - \theta^F q(\theta^F) \frac{\Delta}{d' - d} - c \right]. \quad (23)$$

By the properties of $q(\theta)$ the right hand side of (23) is monotonically decreasing in θ^H . Furthermore, the right hand side of (23) goes to infinity when $\theta^H \rightarrow 0$ and to zero when $\theta^H \rightarrow +\infty$. It follows that, for any θ^F there is always a single value of θ^H that solves (23). It is also checked that θ^H is negatively related to θ^F , and Δ .

Step 2.b. First note that equations (13) does not depend θ^H .

Substituting (19) in (13), the following equation is obtained

$$\gamma = \frac{q(\theta^F)}{r + d} \left[\rho - (r + d + \theta^F q(\theta^F)) \frac{\Delta}{d' - d} - c \right]. \quad (24)$$

Using the properties of the function $q(\theta)$ one checks that the right hand side of (24) is strictly decreasing in θ^F . Moreover, the right hand side of (24) goes to infinity when $\theta^F \rightarrow 0$ and to zero, a negative finite value or $-\infty$ when $\theta^F \rightarrow +\infty$. Therefore, (24) must have a unique solution θ^F .

Q.E.D.

A.2 Proof of Proposition 2

When $\theta^H = \theta^F$, the right hand side of (24) is smaller than the right hand side of (23). Recalling that $q' < 0$ it follows that $\theta^H > \theta^F$. Q.E.D.

A.3 Proof of Proposition 3

Comparative statics on the equilibrium solution are performed more easily if the equilibrium conditions (12) and (13) are modified as follows, substituting (13) into (12)

$$F^1 \equiv \frac{1}{q(\theta^H)} - \frac{1}{q(\theta^F)} - \frac{\Delta}{(d' - d)\gamma}, \quad (25)$$

$$F^2 \equiv q(\theta^F) \frac{1}{r+d} \left\{ \rho - c - \frac{\Delta}{d' - d} q(\theta^F) \theta^F - \frac{\Delta}{d' - d} (r+d) \right\} - \gamma. \quad (26)$$

Setting $\delta \equiv \Delta/(d' - d)$, the differentiation of system (25)-(26) yields

$$\begin{bmatrix} F_{\theta^H}^1 & F_{\theta^F}^1 \\ F_{\theta^H}^2 & F_{\theta^F}^2 \end{bmatrix} \begin{bmatrix} \frac{\partial \theta^H}{\partial \delta} \\ \frac{\partial \theta^F}{\partial \delta} \end{bmatrix} = \begin{bmatrix} -F_{\delta}^1 \\ -F_{\delta}^2 \end{bmatrix},$$

with partial derivatives given by

$$\begin{aligned} F_{\theta^H}^1 &= -\frac{q'(\theta^H)}{q(\theta^H)^2} > 0, \\ F_{\theta^F}^1 &= -\frac{q'(\theta^F)}{q(\theta^F)^2} < 0, \\ F_{\delta}^1 &= -\frac{1}{\gamma} < 0, \\ F_{\theta^H}^2 &= 0, \\ F_{\theta^F}^2 &= \frac{q'(\theta^F)\gamma}{q(\theta^F)} - \frac{q(\theta^F)}{r+d} \delta (q'(\theta^F)\theta^F + q(\theta^F)) < 0, \\ F_{\delta}^2 &= -q^F \left(1 + \frac{q(\theta^F)\theta^F}{r+d} \right) < 0. \end{aligned}$$

It is easy to show that $\partial \theta^F / \partial \delta < 0$. In fact, $\partial \theta^F / \partial \delta = C/A$, with

$$\begin{aligned} A &\equiv \begin{vmatrix} F_{\theta^H}^1 & F_{\theta^F}^1 \\ F_{\theta^H}^2 & F_{\theta^F}^2 \end{vmatrix} = -\frac{q'(\theta^H)}{q(\theta^H)^2} \left(\frac{q'(\theta^F)\gamma}{q(\theta^F)} - \frac{q(\theta^F)}{r+d} \delta (q'(\theta^F)\theta^F + q(\theta^F)) \right) < 0; \\ C &\equiv \begin{vmatrix} F_{\theta^H}^1 & F_{\delta}^1 \\ F_{\theta^H}^2 & F_{\delta}^2 \end{vmatrix} = -\frac{q'(\theta^H)}{q(\theta^H)^2} q(\theta^F) \left(1 + \frac{q(\theta^F)\theta^F}{r+d} \right) > 0. \end{aligned}$$

The sign is generally ambiguous instead for what concerns $\partial \theta^H / \partial \delta$. This can be checked noting that $\partial \theta^H / \partial \delta = B/A$, with

$$B \equiv \begin{vmatrix} F_{\delta}^1 & F_{\theta^F}^1 \\ F_{\delta}^2 & F_{\theta^F}^2 \end{vmatrix} = -\frac{q(\theta^F)}{r+d} \left[\frac{q'(\theta^F)\theta^F}{q(\theta^F)} + \frac{\delta}{\gamma(r+d)} (q'(\theta^F)\theta^F + q(\theta^F)) \right].$$

The sign of B is clearly positive for δ sufficiently close to zero, so that $\partial \theta^H / \partial \delta < 0$. Conversely, for δ sufficiently large, B can become negative.

This can be seen by assuming a Cobb-Douglas matching function $m(s, b) = s^\alpha b^{1-\alpha}$, $\alpha \in (0, 1)$. In this case $q(\theta) = \theta^{\alpha-1}$, so that $\text{sign} B = \text{sign} \left[-(1-\alpha) + \frac{\alpha}{r+d} \frac{\delta}{\gamma} \theta^{F-2(1-\alpha)} \right]$.

As δ gets bigger, θ^F falls, hence $\frac{\alpha}{r+d} \frac{\delta}{\gamma} \theta^{F-2(1-\alpha)}$ rises. Sufficiently high values of δ guarantee that $\text{sign} B$ is negative and that $\partial \theta^H / \partial \delta > 0$.

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Table 1: The relevance of legal costs in segmenting trade: evidence from OECD countries, years 1990-2001.

Exp. variables	Dep. variable: bilateral trade flows		
	(1)	(2)	(3)
Distance	-1.05*** (0.01)	-1.05*** (0.01)	-1.03*** (0.01)
Contiguity	0.14*** (0.03)	0.125*** (0.038)	0.06 (0.03)
Common language	0.39*** (0.03)	0.37*** (0.031)	0.21*** (0.03)
No border	2.32*** (0.05)	2.14*** (0.06)	2.04*** (0.05)
Same legal origin			0.39*** (0.02)
Legal similarity		0.5*** (.094)	
N	7959	7959	7959
R sq.	0.91	0.92	0.92

Note: The regression includes fixed effects for importing and exporting countries and year effects.

The estimation method allows for error correlation for observations pertaining to the same importing country.

Robust standard errors are reported in perentthesis.

***, **, * denote, respectively, statistical significance at the 1%, 5%, and 10% level.

Table 2: The relevance of legal costs in segmenting trade: evidence from French regions (départements), year 1993

Exp. variables	Dep. variable: bilateral imports	
Distance	-1.81*** (0.07)	-1.80*** (0.07)
Contiguity	0.90*** (0.08)	0.84*** (0.08)
No border	1.98*** (0.13)	2.01*** (0.13)
Same court of appeal		0.22*** (0.08)
N	7585	7585
R sq.	0.64	0.64

Note: The regression includes fixed effects for importing and exporting regions. The estimation method allows for error correlation for observations relative to the same importing region.

Robust standard errors are reported in perenthesis.

***, **, * denote, respectively, statistical significance at the 1%, 5%, and 10% level.