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# Economic development, legality, and the transplant effect

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## Abstract

We analyze the determinants of effective legal institutions (legality) using data from 49 countries. We show that the way the law was initially transplanted and received is a more important determinant than the supply of law from a particular legal family. Countries that have developed legal orders internally, adapted the transplanted law, and/or had a population that was already familiar with basic principles of the transplanted law have more effective legality than countries that received foreign law without any similar predispositions. The transplanting process has a strong indirect effect on economic development via its impact on legality, while the impact of particular legal families is weaker and not robust to alternative legality measures. © 2001 Elsevier Science B.V. All rights reserved.

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## 1. Introduction

During the past 200 years, there have been three major transplantations of legal codes. First, during the period of imperialism (1890–1914) French law was transplanted throughout Europe and western law (especially French and English law) was exported throughout Latin America, Asia and Africa. Second, post-World War II, many newly independent states once again borrowed legal code from major western powers. United States law played an increasingly important role, but countries also borrowed from those

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western countries from which they had originally received their law. Third, following the collapse of socialist system in the late 1980s, countries in Central and Eastern Europe and the Former Soviet Union rebuilt their legal systems drawing heavily on the European and the United States models. While the massive importation of legal code allows countries to quickly overhaul their statutory law in comparison to the time it took for these laws to evolve in the exporting countries, available evidence from formerly socialist countries suggests that the enforcement of transplanted law is often problematic. Weak legal institutions have been singled out as a key impediment to future growth and development in these countries (Black et al., 2000; Johnson et al., 1997; Stiglitz, 1999). Many of the countries in the Former Soviet Union that have adopted sophisticated laws to protect creditors and shareholders lack effective legal institutions to enforce these laws and are plagued by corruption (Pistor et al., 2000). While Russia has imported the most sophisticated corporate law in the entire region, Russian shareholder rights are systematically violated and cross-country surveys suggest that the Russian judiciary is ineffective and its legal and administrative institutions are not trustworthy (Black et al., 2000).

La Porta, Lopez-de-Silanes, Shleifer and Vishny (La Porta et al., 1997, 1998) (hereinafter LLSV) argue that the correct legal code is critical for efficient financial markets, which are in turn critical for economic development. Using a sample of 49 non-socialist countries, LLSV show that countries belonging to different legal families (English common law, and French, German and Scandinavian civil law) exhibit different quality of shareholder and creditor protections in their statutory laws. Common law family countries have the most investor-friendly law; French and German civil law countries have the least investor-friendly law, and Scandinavian family countries fall somewhere in between. LLSV also examine the impact of legal families on enforcement. They find that German and Scandinavian civil law countries dominate English common law countries, which, in turn, perform better than French civil law countries. A reason for this result is that enforcement is highly correlated with GNP per capita, and the German and Scandinavian civil law countries are among the richest countries in their sample. However, after controlling for GNP per capita, LLSV conclude that countries with investor-friendlier laws also tend to have the most effective enforcement of law: French civil law countries have poorer enforcement than common law countries; German civil law countries tend to have poorer enforcement than common law countries, and enforcement in Scandinavian is similar to common law countries. A policy implication that has been drawn from the LLSV analysis is that transplanting the correct legal code (i.e., the common law) will enhance economic development (e.g., see Levine, 1999).

In light of the importance of enforcement and effective legal institutions (hereinafter, denoted legality) for economic development in general and for post-socialist economies in particular, this paper seeks to identify determinants of legality. It develops and tests the proposition that the way in which the modern formal legal order that evolved in some western countries was transplanted into other countries is a more important determinant than the supply of a particular legal code. Our argument is based on two key notions. First, for the law to be effective, it must be meaningful in the context in which it is applied so citizens have an incentive to use the law and to demand institutions that work to enforce and develop the law. Second, the judges, lawyers, and

other legal intermediaries that are responsible for developing the law must be able to increase the quality of law in a way that is responsive to demand for legality.

In order to test our theory, we develop proxies for the transplanting process and the supply of particular legal codes. Regarding supply, we use the legal families since LLSV demonstrate that there is a significant difference in quality of laws between the families at least with respect to the protection of investors. Furthermore, legal scholars show that these families differ significantly in style (Zweigert and Kötz, 1998). Regarding the transplanting process, we classify countries into those that developed their formal legal order internally (origins) and those that received their formal legal order externally (transplants) during the period when they first developed or received a comprehensive formal legal order. For most countries, the relevant period is the 19th century; for some it reaches into the first half of the 20th century. Our basic argument is that for legal institutions to be effective, a demand for law must exist so that the law on the books will actually be used in practice and legal intermediaries responsible for developing the law are responsive to this demand. If the transplant adapted the law to local conditions, or had a population that was already familiar with basic legal principles of the transplanted law, then we would expect that the law would be used. However, if the law was not adapted to local conditions, or if it was imposed via colonization *and* the population within the transplant was not familiar with the law, then we would expect that initial demand for using these laws to be weak. Countries that receive the law in this fashion are thus subject to the “transplant effect”: their legal order would function less effectively than origins or transplants that either adapted the law to local conditions and/or had a population that was familiar with the transplanted law.

Our econometric analysis shows that the “transplant effect” is a more important predictor of legality than the supply of a particular legal family. We also show that the transplant effect has a substantial negative impact on economic development via its impact on legality, but has no direct effect. By contrast, the impact of transplanting a particular legal family on economic development is not robust to different legality measures. Moreover, the overall impact of the transplanting process is stronger than the impact of a transplanting a particular legal family.

This paper contributes to an emerging literature that attempts to explain the variance of institutional development across countries. Most of this literature focuses on the political economy of institution building. There is a growing literature on just why strong institutions emerge or fail to emerge in formerly socialist economies that are making a transition to a market economy (Berkowitz and Li, 2000; Roland and Verdier, 1999; Zhuravskaya, 2000). There is also a growing interest in tracing the determinants of differences among legal families (Glaeser and Shleifer, 2000). Among the studies that explore determinants of high quality institutions, this paper is closest in spirit to Rodrik (2000), who provides empirical support for his argument that a well-designed strategy for institution building should take into account local knowledge, and should not over-emphasize best practice blueprints used in developed countries at the expense of local participation and experimentation. Our work also relates to Acemoglu et al. (2000), who use mortality rates of the first European settlers as an instrument for current institutions in the countries that they colonized. They argue that the settlers’

initial supply of institutions impacted the long run effectiveness of institutions. Contrary to their approach, we focus on the compatibility of imported institutions with initial local demand, and analyze its implication for long-term institutional development.

The rest of this paper is organized as follows. In the next section, we develop our argument that the way in which the law is transplanted is a critical determinant of legality, and code the same 49 countries that LLSV used in their study accordingly. In Section 3, we test for the impact of the transplantation process and legal families on legality and economic development. Section 4 checks for the robustness of these results to variations in the country coding; Section 5 checks for the validity of our aggregate legality measure; Section 6 concludes.

## **2. The transplant effect**

Virtually all countries today have a set of rules embodied in codes or court cases that were established by designated state organs, and state institutions in charge of enforcing these rules. We call this set of rules the formal legal order. Although quite important in many countries today, the formal legal order is but one element of the governance structure of society. Informal norms and institutions govern all societies, including the most developed ones. This informal legal order evolves over time mostly by internalizing existing norms of a social group (Coleman, 1990; Sunstein, 1996). It is enforced not by the state, but relies largely upon trust and reputation effects as well as monitoring devices. As we will discuss below, the transplantation of formal legal systems that have evolved in several European countries in the late 18th and early 19th centuries has shaped formal legal orders in most countries.

In this section we characterize the transplanting process. We propose that countries that have developed formal legal orders internally, adapted the transplanted law to local conditions, and/or had a population that was already familiar with basic legal principles of the transplanted law should be able to further develop the formal legal codes and build effective legal systems. By contrast, countries that received foreign legal systems without similar predispositions are much more constrained in their ability to develop the formal legal order and will have greater difficulties in developing effective legal systems (the transplant effect). In order to test these propositions empirically, we divide our 49 countries into 10 that developed their formal legal order internally (origins) and 39 that received their formal legal order externally (transplants); we then divide the transplants into those that are and those that are not subject to the transplant effect.

### *2.1. Origins vs. transplants*

Most countries derived their current formal legal order from Europe during the 19th century and the early 20th century. Earlier legal transplants are well known, including the reception of Roman law in Europe, the enactment of the Chinese codes in other parts of Asia, or the transfer of Spanish and Portuguese law to Latin America. Indeed, as Watson (1974) argues, legal transplants are as old as the law is. The transplanting process that occurred in the 19th and early 20th centuries superseded all earlier

transplants. Moreover, despite lively borrowing and transplantation since then, most countries have retained the core characteristics of the legal system they received during this period. The wholesale transplantation of legal systems was made possible by the consolidation and formalization of legal systems in Europe that coincided with the development of the nation state. The expansion of European influence through war and conquest was primarily responsible for the transplantation of these laws to countries in Asia, Africa, North America and Latin America, although some of these non-European countries received these laws voluntarily.

Three legal families, the English common law, the French civil law and the German civil law, dominated the process of consolidation and formalization of formal legal orders in Europe. The English common law has evolved over centuries and, in contrast to the French and German civil families, was never systematized and codified. Case law, or precedents established by courts, define legal principles that are applied to other cases. The roots of the common law date back to the Norman conquest of England in 1066, but only in the late 15th centuries was a firm body of legal principles established that replaced preexisting customary law. The publication of law since the 16th century (Ross, 1998) and the development of legal reports, which was completed in the second half of the 19th century contributed to the formation of a consistent body of law that was widely accessible. Statutory law gained in importance since the mid-19th century, but case law remains the hallmark of the English legal system to this day.

In continental Europe, statutory law has dominated case law. The Napoleonic codes enacted between 1804 and 1811 have had the greatest impact on the codification movement in Europe. These codes consolidated existing legislation and case law. The commercial code in particular codified existing business practice in language that was systematic and accessible to lay people (Zweigert and Kötz, 1998). Politically, the codification movement manifested the superiority of the parliament over the executive and the judiciary in making new law. The other major codification of the 19th century is the German civil code enacted in 1900, which was preceded by commercial, criminal, civil and criminal procedure codes, as well as a bankruptcy law. Codification in Germany was delayed until the end of the 19th century primarily for political reasons. The German codes differ from the earlier French codification. For the German civil code in particular, legal scholars compiled a consistent system of civil law based on Roman legal principles, and, as such, wrote codes that were highly technical and thus much less accessible to lay people.

Most legal families operating currently are derived either from the English common law, the French civil law or the German civil law. We denote England, France and Germany as origin countries, or simply origins, because their formal legal orders developed largely internally and display highly idiosyncratic features, some legal borrowing notwithstanding (Table 1). Comparative legal scholarship also distinguishes a fourth legal family, the Scandinavian one. The Scandinavian legal family is not built around a major codification, like the French or the German legal family, nor does it have a body of case law like the English common law. Early codification of existing business practices and the close political and economic relations among the four Scandinavian countries have given rise to a legal family based on statutory law, that is distinct from the legal systems described above. Although Finland was part of Sweden from the

Table 1  
Origins

| Country                    | Legal formation period | Formal law source  | Legal family |
|----------------------------|------------------------|--|--------------|
| Austria                    | 1811–1862              | Austria enacts a comprehensive civil code in 1811. It is an idiosyncratic codification based on the Roman/Germanic tradition. The 1862 general German commercial code reflects existing business practice as well as French influence.   | German       |
| Denmark                    | 1815–1905              | Early codification of customary law. Series of statutory enactments during the 19th century. Legal borrowing is limited primarily to other Scandinavian countries.   | Scandinavian |
| Finland <sup>a</sup>       | 1809–1917              | Strong influence of Swedish law before 1809 (Sweden cedes Finland to Russia). Finland remains attached to Scandinavian legal tradition throughout 19th century and strengthens this after independence in 1917.  | Scandinavian |
| France                     | 1804–1811              | Promulgation of the five Napoleonic Codes, including the Code civil, the Code of Civil Procedure, the Code of Commerce, the Code of Criminal Procedure, and the Penal Code. Codes consolidate legislation enacted prior to the revolution and codify business practice.                            | French       |
| Germany                    | 1862–1900              | Extensive codification after unification in 1871. Most influential is the 1896 civil code based on Roman legal principles with some references to Germanic law. Earlier enactment of commercial code (1862) codifies existing business practice.   | German       |
| Norway <sup>a</sup>        | 1814–1915              | Until 1814 part of Denmark with gradual infiltration of Danish law. Statutory enactments during the 19th century based draw on increasing legislative cooperation with Denmark and Sweden regarding.   | Scandinavian |
| Sweden                     | 1734–1905              | Codification of customary law in 1734 (some Roman and canon law influences). In the 19th century parts of the code are replaced with new statutes, many of which are based on collaborative efforts with Denmark and Sweden.   | Scandinavian |
| Switzerland                | 1881–1907              | Codification of commercial and civil law. In comparison to Germany less influence of Roman law. Codification of Swiss business practice, with some borrowing from French and Austrian laws that had earlier been enacted in parts of the country   | German       |
| United Kingdom             | 1485–1832              | The development of English common law begins with the Norman conquest in 1066. Local customary law completely replaced since mid 15th century. Increasing importance of statutory law since the 19th century, but case law continues to dominate.  | English      |
| United States <sup>a</sup> | 1774–1820              | In 1774, the first continental congress passes resolution that Americans are entitled to the common law and statutes that existed at the time of English colonization. Since late 18th century courts overrule English law and assess it against American constitutional and utilitarian standards | English      |

<sup>a</sup>We thank an anonymous referee for noting that it is controversial just whether the countries should be categorized as origins or receptive-transplants. We conduct robustness tests for this alternative categorization in Section 4.

12th century until Sweden ceded Finland to Russia in 1908, and Norway was part of Denmark until 1814, we treat all four countries as origins (Knapp, 1972). Denmark, Norway and Sweden closely collaborated since the mid 19th century in developing the formal modern law that has shaped their development since. While Finland was controlled by Russia from 1808 through 1917, it remained attached to the Scandinavian legal tradition throughout the nineteenth century and continued this tradition after it became independent. Nevertheless, as a robustness check, we consider a classification where only Sweden and Denmark are Scandinavian origins<sup>1</sup>.

Table 2a summarizes the finding by LLSV (1998) that the legal families capture differences in the quality of law on the books. Shareholder rights and creditor rights are cumulative indices developed by LLSV that measure the quality of the protection of shareholder and creditor rights by statutory law. English common law family countries have the best laws, French and German civil law countries have the least investor-friendly law, and Scandinavian family countries fall somewhere in between. In light of these results, we use legal families as an indicator of the quality of the law supplied by different legal families.

In our sample, the United States, Austria and Switzerland are also origins. While English common law influenced the legal system in the United States during the colonial period, legal development in the United States has sharply diverged from the English system after the colonial period (Horwitz, 1977). Because calling the United States an origin is controversial, we also classify it as a transplant as a robustness check. According to standard classification, Austria and Switzerland belong to the German legal family. The codification that forms the basis of the Austrian civil law, the AGBGB, was adopted in 1811, over 90 years before the adoption of the German civil code. It influenced the development of the German code, rather than the other way around. The major Swiss codification (the law on obligations of 1881 and the civil code of 1907) followed the German codification. However, it did not incorporate Roman law to the same extent as the German codifications, and differs considerably in style and organization from the German code (Zweigert and Kötz, 1998). Table 1 lists the 10 origins in our sample and notes the time when these systems were formed. All other countries (or territories that were later organized as independent states) received their formal legal orders, either voluntarily or involuntarily, from these 10 origin countries. We call these countries “transplants”.

In order to characterize the transplanting process, we note that a legal order existed in transplants at the time when the European law was transplanted and that many countries had formalized at least part of their legal systems. A legal order is a property of every society. Norms may be formalized, i.e. embodied in written rules, or they may be based on conventions, customs, and remain informal. Most societies today have both informal and formal legal systems. Many societies that received European law in the 19th century were familiar with a formal legal order. Legal texts had a long tradition in Hindu, Islamic and Chinese law. In content and style, these legal texts, however, differ substantially from the modern European codification. For example, Hooker (1978) shows that issues of morality are much closer interwoven with legal

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<sup>1</sup> We thank an anonymous referee for raising this point.

Table 2  
Shareholder and creditor rights

| Category   | Observations <sup>a</sup> | Shareholder rights | Creditor rights    |
|--|---------------------------|--------------------|--------------------|
| <i>(a) Categorical means for legal families<sup>a</sup></i>          |                           |                    |                    |
| English  | 18/19                     | 4.00<br>(0.970)    | 3.11<br>(1.231)    |
| French   | 21/19                     | 2.33<br>(1.197)    | 1.58<br>(1.346)    |
| German   | 6/6                       | 2.33<br>(1.033)    | 2.33<br>(0.816)    |
| Scandinavian   | 4/4                       | 3.00<br>(0.816)    | 2.00<br>(0.816)    |
| Sample Average   | 49/47                     | 3.00<br>(1.307)    | 2.30<br>(1.366)    |
| <i>Differences in means<sup>b</sup></i>                              |                           |                    |                    |
| English–French   |                           | 1.67<br>(0.000)*   | 1.53<br>(0.001)*   |
| English–German   |                           | 1.67<br>(0.008)*   | 0.78<br>(0.101)*** |
| English–Scandinavian   |                           | 1.00<br>(0.085)*** | 1.11<br>(0.065)*** |
| French–German  |                           | 0.00<br>(1.000)    | –0.75<br>(0.119)   |
| French–Scandinavian  |                           | –0.67<br>(0.220)   | –0.42<br>(0.438)   |
| German–Scandinavian  |                           | –0.67<br>(0.291)   | 0.33<br>(0.548)    |
| <i>(b) Categorical means for origins and transplants<sup>a</sup></i> |                           |                    |                    |
| Origin   | 10/10                     | 3.00<br>(1.333)    | 2.00<br>(1.247)    |
| Transplant   | 39/37                     | 3.00<br>(1.318)    | 2.38<br>(1.401)    |
| Receptive Transplant   | 11/11                     | 3.27<br>(1.618)    | 1.91<br>(0.944)    |
| Unreceptive Transplant   | 28/26                     | 2.89<br>(1.197)    | 2.58<br>(1.528)    |
| Sample Average   | 49/47/                    | 3.00<br>(1.307)    | 2.30<br>(1.366)    |
| <i>Differences in means<sup>b</sup></i>                              |                           |                    |                    |
| Origin–Transplant  |                           | 0.00<br>(1.000)    | –0.38<br>(0.420)   |
| Origin–Receptive Transplant  |                           | –0.27<br>(0.677)   | –0.09<br>(0.854)   |
| Origin–Unreceptive Transplant  |                           | 0.11<br>(0.826)    | –0.58<br>(0.258)   |
| Receptive–Unreceptive Transplant                                     |                           | 0.38<br>(0.491)    | –0.67<br>(0.117)   |

<sup>a</sup>Standard deviations are in parentheses.

<sup>b</sup>A two-sided two-sample *t* test with unequal variances is performed. *P*-values are reported in parentheses.

\*Significant at the 1-percent level; \*\*significant at the 5-percent level; \*\*\*significant at the 10 percent level.



rules and ambiguity rather than specificity characterizes their wording. Other societies did not have a formal legal order that was embodied in codes or case law and enforced primarily by the state. They were governed by an informal legal order that was enforced by social sanctions, including reputation effects and mutual monitoring. The social norms and enforcement mechanisms used differed considerably from society to society. The preexisting legal order persisted after the transplanting process was complete. In part, this was the intended outcome. In some instances the transplanted European law applied only to the European population, while local people continued to be governed by local custom. This was true in particular for Dutch colonies (Hooker, 1975). In other cases, criminal and administrative law was applied to local people, but in family, inheritance, but also commercial matters, local law prevailed. This was the practice in many English colonies, although the jurisdiction of common law courts was often extended over time (Katz, 1986; Knapp, 1972). Even when transplanted law was not as clearly circumscribed, and therefore in principle applicable to all subjects in all areas of the law, the government organs did not always apply the transplanted formal legal order to the indigenous population.

We do not have data on the effectiveness of the initial legal order and can only speculate about the ability of countries to develop an effective legal order internally, had they not received the legal order from the West. Our data, however, allow us to determine whether the transplantation of foreign law has helped or hindered these countries to develop levels of legality that are comparable with those of origins. Legal scholars have long observed that there is a gap between formal law on the books and law in action. While this gap exists in origins, we would expect to observe a larger gap between law on the books and law in action in transplants. The logic of this prediction follows from the idea that the law is primarily a “cognitive institution” (Means, 1980). This is self-evident with respect to the informal legal order. Observance of this law requires knowledge of the customs and habits of a social group. The fact that formal legal orders have put the key elements of the legal order in writing tends to disguise the fact that the effectiveness of these rules also rests on knowledge and understanding of these rules and their underlying values by social actors. While most members of society will not, and in fact need not, be familiar with the specifics of individual rules and regulations, they are familiar with the basic concepts of the legal order. Moreover, they can rely on legal professionals as intermediaries, who have a better knowledge of the formal legal order. But even for professionals to apply a special rule, they must not only grasp the wording of that rule, but also the concept behind it, the value judgments on which it rests, and its position within the overall legal order. Even a seemingly clear law—do not steal!—raises a host of interpretative problems when applied to real world cases. What about taking from a common pool, or overgrazing? What about taking something with the intention of returning it later, or picking up an object that (apparently) has been abandoned by the owner? An identical rule like this one would be interpreted differently by those charged with applying it and their understanding of the underlying values on which this norm rests. This is true even within the same legal system. If this was not the case, countries such as the United States would not need state supreme courts and a federal supreme court with the task of ensuring the uniform interpretation and application of the law within their jurisdiction.

When a transplant country applies a rule that it has transplanted from an origin, it is effectively applying a rule to its own local circumstances that was developed in a foreign socioeconomic order. Thus, we would expect that the interpretation of a legal rule will differ more within a transplant than an origin. Applying a simple rule that prohibits stealing in the context of communal property is a case in point. Other examples include the transplantation of limited liability companies to China in the early 20th century. According to Kirby (1995), while many firms used the label ‘limited liability company’, they remained unincorporated family owned businesses. Even where the corporate form was used, outside finance was marginal, as kinship networks provided the most important financial resources (Hamilton and Feenstra, 1997). They also ensured that obligations would be honored.

The context specificity law has important implications for legality in transplant countries. Where the meaning of specific legal rules or legal institutions is not apparent, they will either not be applied or applied in a way that may be inconsistent with the intention of the rule in the context in which it originated. This in turn has implications for the perception and trustworthiness of the institutions applying them, and thus for the future demand for these institutions. However, if a transplant country adopts foreign law from origins in a way that is sensitive to its initial conditions, then the meaning of these rules becomes clearer, and it is also simpler to develop institutions such as the courts, procurators, anti-trust agencies, etc. that enforce these rules. We conjecture that there are two reasons for this. First, when the law is adapted to local needs, people will use it and will want to allocate resources for enforcing and developing the formal legal order. Second, legal intermediaries responsible for enforcing and developing the formal legal order can be more effective when they are working with a formal law which is broadly compatible with the preexisting order, or which has been adapted to match demand.

## 2.2. *Receptive and unreceptive transplants*

Legal transplantation has taken different forms in different countries. Some legal transplants were imposed during occupation; others were part of a voluntary reform process initiated by the law receiving country. Differences in the transplanting process may impact the receptivity of the transplants, where receptivity is defined as the country’s ability to give meaning to the imported law. Based on the theoretical considerations developed in the previous section we develop proxies for the receptivity of import countries to foreign law, namely whether they have adapted the foreign law to local conditions, or whether they exhibit familiarity with the imported legal order (Tables 3 and 4).

Our argument is that a transplant increases its own receptivity by making a significant *adaptation* of the foreign formal legal order to initial conditions, in particular to the preexisting formal and informal legal order. Changes in the transplanted rules or legal institutions indicate that the appropriateness of these rules has been considered and modifications were made to take into account domestic legal practice or other initial conditions. Means (1980), for example, reports that Colombia voluntarily, but almost blindly, transplanted the Spanish commercial code of 1829. The few changes that were

Table 3  
Receptive and unreceptive transplants

| Country      | Transplanting period | Transplantation process |             | Transplant type |
|--------------|----------------------|-------------------------|-------------|-----------------|
|              |                      | Adaptation              | Familiarity |                 |
| Australia    | 1808–1873            | 0                       | 1           | Receptive       |
| Belgium      | 1810–1887            | 0                       | 1           | Receptive       |
| Canada       | 1810–1830            | 0                       | 1           | Receptive       |
| Ireland      | 1769–1801            | 0                       | 1           | Receptive       |
| Israel       | 1858–1945            | 1                       | 0           | Receptive       |
| Italy        | 1805–1870            | 1                       | 1           | Receptive       |
| Japan        | 1868–1899            | 1                       | 0           | Receptive       |
| Netherlands  | 1810–1838            | 1                       | 1           | Receptive       |
| New Zealand  | 1840–1900            | 0                       | 1           | Receptive       |
| Argentina    | 1862–1880            | 1                       | 0           | Receptive       |
| Chile        | 1854–1880            | 1                       | 0           | Receptive       |
| Brazil       | 1808–1865            | 0                       | 0           | Unreceptive     |
| Colombia     | 1821–1853            | 0                       | 0           | Unreceptive     |
| Ecuador      | 1831–1881            | 0                       | 0           | Unreceptive     |
| Egypt        | 1798–1840            | 0                       | 0           | Unreceptive     |
| Greece       | 1821–1878            | 0                       | 0           | Unreceptive     |
| Hong Kong    | 1844–1898            | 0                       | 0           | Unreceptive     |
| India        | 1858–1888            | 0                       | 0           | Unreceptive     |
| Indonesia    | 1815–1870            | 0                       | 0           | Unreceptive     |
| Jordan       | 1850–1918            | 0                       | 0           | Unreceptive     |
| Kenya        | 1895–1918            | 0                       | 0           | Unreceptive     |
| Malaysia     | 1867–1937            | 0                       | 0           | Unreceptive     |
| Mexico       | 1821–1889            | 0                       | 0           | Unreceptive     |
| Nigeria      | 1863–1915            | 0                       | 0           | Unreceptive     |
| Pakistan     | 1858–1888            | 0                       | 0           | Unreceptive     |
| Peru         | 1811–1853            | 0                       | 0           | Unreceptive     |
| Philippines  | 1889–1898            | 0                       | 0           | Unreceptive     |
| Portugal     | 1808–1867            | 0                       | 0           | Unreceptive     |
| Singapore    | 1858–1895            | 0                       | 0           | Unreceptive     |
| South Africa | 1815–1865            | 0                       | 0           | Unreceptive     |
| South Korea  | 1912–1945            | 0                       | 0           | Unreceptive     |
| Spain        | 1808–1829            | 0                       | 0           | Unreceptive     |
| Sri Lanka    | 1796–1861            | 0                       | 0           | Unreceptive     |
| Taiwan       | 1895–1945            | 0                       | 0           | Unreceptive     |
| Thailand     | 1908–1935            | 0                       | 0           | Unreceptive     |
| Turkey       | 1850–1927            | 0                       | 0           | Unreceptive     |
| Uruguay      | 1878–1900            | 0                       | 0           | Unreceptive     |
| Venezuela    | 1811–1873            | 0                       | 0           | Unreceptive     |
| Zimbabwe     | 1888–1923            | 0                       | 0           | Unreceptive     |

introduced were made in ignorance of the possible implications of these rules for business practice. For example, a provision requiring state approval for the formation of a corporation, which at the time was still common throughout Europe (the UK eliminated the registration requirement only in 1844), was eliminated from the books. At the end of the century when the code was amended, this time using Chilean law as a

| Country   | Transplanting period | Country/countries that transplant the Law  | Legal family                |
|-----------|----------------------|--|-----------------------------|
| Argentina | 1862–1880            | <i>Receptive transplants</i><br>Spanish, Portuguese, Brazilian, Dutch (transplants) and French laws are important sources of law. Argentina asserts autonomy in 1810 and declares independence in 1816. 1862 extensive legal reforms, including the enactment of civil, commercial, civil procedure laws.            | French                      |
| Australia | 1808–1873            | English common law is the main source. Australia was considered a “settled colony”, where the settlers took the law of England with them. Major migration by free settlers from England in early 19th century.   | English                     |
| Belgium   | 1810–1887            | French law is the main source. French law is introduced in 1810 during Napoleonic wars. Independence of low countries in 1815, but codes remain in place. Independent Belgium (since 1830) enacts national codification based on French model.   | French                      |
| Canada    | 1810–1830            | English common law is the main source. Trading companies and settlers from England and the United States import English law.   | English                     |
| Chile     | 1854–1880            | Spanish (transplant), French law and legal practice are major sources. Independence from Spanish rule in 1811. Legal reforms in the second half of the 19th century, including the enactment of a commercial code in 1854.   | French                      |
| Ireland   | 1769–1801            | English common law is the main source, and was introduced in Ireland after the Norman conquest. By the mid 17th century it had replaced the native Irish law.  | English                     |
| Israel    | 1858–1945            | English common law is the main source. Modern codes based on French model introduced in the Ottoman empire in second half of 19th century. Since 1922 British mandate, migration from Europe. Ottoman law still binding, but basic principles of English common law (excluding statutory law) introduced.            | French/English <sup>a</sup> |
| Italy     | 1805–1870            | French law is the main source. French rule since 1796; in 1805 Napoleon becomes King of Italy and introduces French codes. National codification only after Italy is unified, but individual states enact codes based on French law.   | French                      |
| Japan     | 1868–1899            | German law is the main source. Under foreign pressure, the Meiji restoration launches the formalization of the Japanese legal system based on foreign models. Earlier drafts of the commercial code are based on French law. For the final versions of the civil and commercial law, German law is most influential. | German                      |

|                                |           |   |                            |
|--------------------------------|-----------|---|----------------------------|
| Netherlands                    | 1810–1838 | French law is the main source; its codes are introduced in 1810 during when France annexes the Netherlands. After 1815 the laws remain in force on a preliminary basis and are replaced in 1838 by Dutch codification based on French law.  | French                     |
| New Zealand                    | 1840–1900 | English common law is the main source. In 1840 Britain officially takes possession of the country. Legal transplant through migration.  | English                    |
| <i>Unreceptive Transplants</i> |           |   |                            |
| Brazil                         | 1808–1865 | Spanish and French laws are the main sources. 1822 Brazil achieves independence from Portugal. Imperial Portuguese law remains in force. Legal modernization occurs in mid 19th century.  | French                     |
| Colombia                       | 1821–1853 | Spanish law is the main source. Major codification enacted in mid 19th century based on Spanish models of 1829. Subsequent revisions based on Chilean law.  | French                     |
| Ecuador                        | 1831–1881 | Spanish and Venezuelan laws are the main sources. Since 1830 independent state. In 1831, the Spanish code is made directly applicable in Ecuador. The 1882 commercial code is based on the Venezuelan codification. Procedural law governed by Spanish law.   | French                     |
| Egypt                          | 1798–1840 | French law is the main source. Under French occupation from 1796–1807 courts are established, but legal reform remains incomplete. During the 19th century French law is applied to cases involving foreign parties. Textbooks and translations of French law into Arabic serve as primarily sources of this law. | French                     |
| Greece                         | 1821–1878 | French law is the main source. Translations of French codes in the 19th century influences commercial law. Other statutory enactments during 19th century, in particular the civil code, draw not only on French, but also heavily on German and Austrian law.  | French/German <sup>b</sup> |
| Hong Kong                      | 1844–1898 | English common law is the main source. Ordinance of 1844 declares law of England applicable to colony except where local circumstances render this inappropriate.   | French                     |
| India                          | 1858–1888 | English common law is the main source. Establishment of British Raj in 1858. Jurisdiction of English law over local population gradually expanded. In 1862 all existing courts in India are replaced with English courts.   | English                    |
| Indonesia                      | 1815–1870 | Dutch law is the main source. Local (adat) law applies to indigenous population. Dutch law governs colonial population.   | French                     |
| Jordan                         | 1850–1918 | French law is the main source. As part of the Ottoman empire, Jordan received French law in mid 19th century.   | French                     |

| Country                   | Transplanting period | Country/countries that transplant the Law   | Legal family         |
|---------------------------|----------------------|---|----------------------|
| Kenya                     | 1895–1918            | English common law is the main source. Since 1895 British protectorate. The laws in force in England are made applicable in the colony, and codifications of common law that were earlier used in India are introduced.   | English              |
| Malaysia                  | 1867–1937            | English common law is the main source. In 1867, London's colonial office assumes direct control over "Straits Settlements". English law applied primarily to criminal and commercial (not family, inheritance) matters.   | English              |
| Mexico <sup>c</sup>       | 1821–1889            | Spanish and French laws are the main sources. Spanish imperial laws remain in force until replaced by new codifications. 1854 commercial code based on Spanish and French models; 1889 revision also incorporates elements of Italian law. Civil procedure modeled on Spanish law. 1870 comprehensive civil code based on various models. | French               |
| Nigeria                   | 1863–1915            | English common law is main source. Cession of Lagos in 1863 and establishment of British rule. Courts with jurisdiction over British subjects established. Codified common law introduced, including 1912 companies ordinance.  | English              |
| Pakistan                  | 1858–1888            | English common law is the main source. Establishment of British Raj (including India, Pakistan, and Bangladesh). See comments for India.  | English              |
| Peru                      | 1811–1853            | Spanish law is the main source. Legal reforms in mid 19th century copy Spanish codes of 1829.   | French               |
| Philippines               | 1889–1898            | Spanish law is the main source. Spanish colony since 1565. Codifications in the late 1900s are based Spanish codes of 1829. Amendments and introduction of new procedural rules when sovereignty over the Philippines is transferred to the US in 1898, but character of legal system remains unchanged.                                  | French               |
| Portugal <sup>c</sup>     | 1808–1867            | French law is main source. First introduction of the French codes in 1808 during the Napoleonic invasion. New civil code promulgated in 1867, new Commercial Code in 1888.  | French               |
| Singapore                 | 1858–1895            | English common law is the main source. In 1819 Singapore is founded as part of the Strait Settlements. English law applies to settlers and local population in criminal and commercial matters.   | English              |
| South Africa <sup>d</sup> | 1815–1865            | England and Roman–Dutch common law are the main sources. British takeover of former Dutch colony in 1815. English law applied to court organization, judicial procedure, and administration.  | English <sup>d</sup> |

|                       |           |   |                                 |
|-----------------------|-----------|---|---------------------------------|
| South Korea           | 1912–1945 | Japanese law is the main source. Korea is colonized by Japan in 1912 and Japanese codes of the Meiji restoration are enacted.   | German                          |
| Spain <sup>c</sup>    | 1808–1829 | French law is the main source. Introduction of the French codes in 1808 during the Napoleonic invasion. New civil code based on French model introduced in 1829; law on joint stock companies in 1848, and a revised code of civil procedure in 1881. | French                          |
| Sri Lanka             | 1796–1861 | English common law is the main source. British take over former Dutch colony. Roman–Dutch law continues to apply, but the establishment of common law courts after 1801 fosters the development of English common law.                                | English                         |
| Taiwan                | 1895–1945 | Japanese law is the main source. The island of Taiwan becomes Japanese colony and Japanese codes of the Meiji restoration are introduced.   | German                          |
| Thailand <sup>e</sup> | 1908–1935 | French law is the main source. Only country in SE Asia that escaped colonization. Set of codes produced under King Chulalongkorn with the help of French and Belgian advisors.  | French (English ?) <sup>e</sup> |
| Turkey <sup>f</sup>   | 1850–1927 | French and subsequently Swiss law are the main sources. The Ottoman empire introduces legislation based on French law in mid 19th century. Under Kemal Atatürk Turkey copies Swiss codes.   | French/German <sup>f</sup>      |
| Uruguay               | 1878–1900 | The law of Argentina is the main source. Modernization of legal system since 1865; codes are based on Argentine and Bolivian law models.  | French                          |
| Venezuela             | 1811–1873 | Chilean law is the main source. Venezuela becomes independent in 1811. Spanish imperial laws remain in force. In 1862 civil and commercial codes enacted based on Chilean model.  | French                          |
| Zimbabwe              | 1888–1923 | English common law is the main source. In 1888 charter issued by English law made applicable by decree.   | English                         |

<sup>a</sup>La Porta et al. (1998) code Israel as belonging to the English common law family.

<sup>b</sup>La Porta et al. (1998) code Greece as part of the French legal family. With regard to the civil (not the commercial) code, it could also be placed in the German legal family.

<sup>c</sup>We note in the paper that these three countries can also be categorized as a combination receptive-unreceptive transplant. We conduct robustness tests for this alternative categorization.

<sup>d</sup>Because of the influence of Roman–Dutch law, South Africa is sometimes classified as a mixed jurisdiction. In mixed jurisdictions, common law was introduced after earlier transplants had established a civil law system. Other mixed jurisdictions include Israel, the Philippines, and Sri Lanka.

<sup>e</sup>Note that La Porta et al. (1998) code Thailand as belonging to the English legal family.

<sup>f</sup>LLSV 1998 code Turkey as French, because of the Ottoman heritage.

model, state approval became mandatory, despite the fact that this rule had meanwhile been liberalized in most other countries. Materials on the legislative process provide no evidence of the reasons for these changes. However, the legal profession was underdeveloped in Colombia, and this suggests that the laws were chosen and adopted without even considering their contents.

*Adaptation* does not necessarily require that the transplanted law is changed significantly. However, at the very least, an informed choice about alternative rules must have been made. One indicator of an informed choice is that a country conducts extensive comparative research before adopting a foreign legal system. A good example is Japan. The process of legal transplantation began with the reorganization of the court system in the 1870s. Elements of Western law were introduced through case law in a gradual and piecemeal fashion before the enactment of comprehensive codes. The earlier drafts of the civil and commercial codes were largely modeled on French law. The civil code that was finally adopted, however, used German law as the dominant model. This model was adapted to allow sufficient room for local custom. In the words of Wigmore, a Western observer of the legal reforms during the Meiji restoration, "... the leading ideas of Code and custom (where comparison is possible) have the same content; that where latitude could be given, the new Code has allowed to local varieties of usage the freest play; and that where novelties or inflexible rules have been determined on, the conditions were such as to admit legislative discretion". Wigmore concludes that "the Codes are not in conflict with existing custom" (quoted in Haley, 1991, p. 71).

Another indicator that a transplant is *receptive* to formal legal order is that it has *familiarity* with the legal system that it uses as a model for legal borrowing. Countries that share a common legal history will be familiar with the transplanted legal concepts and will therefore have little reason to make major adaptations or to choose a system that is less familiar to them. Common roots in the distant past are, however, not sufficient. Most of the European countries can trace their legal history back to the Roman Empire. Yet, quite distinct legal systems developed on the basis of the Roman law, which incorporated centuries of legal practice that combined elements of Roman law with customary rules. Not all countries in Europe shared this experience in the same way. Spain, for example, had codified Roman law already in the 13th century and supplemented these rules periodically with imperial ordinances. However, Spain did not develop the legal principles that gave rise to the modern business corporation or an elaborate system of property rights based on the (political) recognition of the right to ownership. This also implies that Latin America, which received Spanish law in the 16th century, was exposed to Roman legal heritage, not, however, to the development of the private law, which formed the core of the formal legal orders that emerged in Europe in the 19th century. There is no definite time limit to distinguish a distant legal heritage from a more recently shared common legal history. From our discussion of law as a cognitive institution, it follows that the common history must still be recognizable in legal practice at the time when the foreign law is transplanted.

Imperialism and colonization resulted in a massive transplantation of Western law to other parts of the world. The majority of the people at the law-receiving end had no choice to adapt the law, sometimes not even to familiarize themselves with the law



once it had been enacted. In some colonies, however, the transplantation of foreign law took quite a different form. The English empire distinguished between “settled” and “conquered” territories. Settled territories were considered to be barren land, the existence of indigenous people like the Indians in North America, the Aborigines in Australia, or the Maoris in New Zealand notwithstanding. But these territories were designated for migration from Europe and, in fact, experienced a massive influx of European people. The migrants used violence and their control of economic resources to seize power from the indigenous population. English law was transplanted to these territories through migration. The first settlers brought the law with them. In some cases, the applicability of English law remained in doubt or was disputed, and was only confirmed by the English crown. For our purposes, however, the important point is that in the case of the so-called settled territories, European law was not imposed on people accustomed to an entirely different legal order, but was applied to people who were familiar with its basic principles. Therefore, even a colonized country may be a *receptive* transplant if, because of the migration process, it exhibits *familiarity* with the formal legal order.

Tables 2a and b provide a comparison of the origin and transplant categories with the legal families. As already noted, the legal families are excellent predictors of differences in creditor rights and shareholder rights. By contrast, Table 2b shows that the origin and transplant categories have almost no ability to explain these formal laws: in nineteen of the 22 possible binary comparisons, there is no statistically significant difference. In the next sections, we will show that legal families by themselves cannot explain cross-country variance in legality, while the transplantation process is a more important determinant of legality, and its impact on economic development.

### 3. Legality and the transplant effect

In this section, we present tests of our hypothesis that the way in which the law is transplanted is a more important determinant of legality than the supply of a particular family. We also test for the impact of the process of transplantation and the supply of particular legal families on economic development (GNP per capita). If, after controlling for legality, there is a direct relationship between the transplanting process and economic development, then there is reason to believe that a well-designed legal reform would have an *immediate* positive impact on GNP per capita. If, however, the process of transplantation has a primarily indirect effect via its impact on legality, then an effective reform can improve legality, which, *over time*, will raise economic development. Similarly, it is critical to decompose the impact of supplying a particular legal family into its immediate direct effect and its indirect effect via its impact on legality. If legal families have a direct impact on GNP per capita, then policy makers could perhaps expect to obtain an immediate gain in GNP per capital by picking the best family.

In order to measure legality, we first use the same survey data measuring the effectiveness of the judiciary, rule of law, the absence of corruption, low risk of contract repudiation and low risk of government expropriation observed during 1980–95

employed by LLSV (1997, 1998).<sup>2</sup> Log GNP per capita in 1994 measures economic development. Tables 9 and 10 in Appendix A provide summary statistics for our data. The legality proxies are ranked on a scale from zero to 10, where a higher number means that legal institutions are more effective. The average correlation between a pair of the legality proxies is 0.801. This high correlation creates multicollinearity problems when log GNP per capita is regressed on the legality proxies. Therefore, following standard practice, we aggregate the individual legality proxies into a single legality index using principal components analysis.<sup>3</sup> The first component accounts for 84.6 percent of the total variance, and is given by  $\text{Legality} = 0.381 * (\text{Efficiency of Judiciary}) + 0.578 * (\text{Rule of Law}) + 0.503 * (\text{Absence of Corruption}) + 0.347 * (\text{Risk of Expropriation}) + 0.384 * (\text{Risk of Contract Repudiation})$ . The analysis in this section is restricted to this single-variable legality measure. The validity of this simplification is formally investigated in the next section.

Since we do not have a structural model of the interactions between legality, economic development, and our exogenous variables (the transplantation process and the supply of particular legal families), our baseline model consists of two fully unrestricted reduced form equations for legality and economic development conditional on our exogenous variables. Let  $\xi$  denote legality, and  $g$  the log of GNP per capita in 1994, and let  $i$  denote a country:  $i = 1, \dots, 49$ . Let  $x$  denote a vector of regressors consisting of a constant term and the six exogenous other variables: receptive-transplant, unreceptive-transplant, French, German, and Scandinavian families and OECD membership. We estimate the following unrestricted reduced form equations using ordinary least squares (OLS):

$$\xi = \gamma'x + u, \tag{1}$$

$$g = p'x + v. \tag{2}$$

There are 22 OECD members in our sample. Legality in 20 of these OECD countries exceeds median legality in our sample; GNP per capita in 20 of the OECD countries also exceeds median GNP per capita. In order to account for the potential impact of OECD membership on  $\xi$  and  $g$ , we control for it in our reduced form equations.<sup>4</sup> It follows from the definition of  $x$  that the intercepts represent averages for the English-origin countries. Therefore, the coefficient for a transplant variable captures the difference between an origin and a transplant; the coefficient for a family variable measures the difference between the English family and another family. It is useful to represent this system in the form of one unrestricted reduced form equation for  $\xi$  given the exogenous variables ( $x$ ) and one unrestricted regression equation for  $g$ ,

<sup>2</sup> In the next section we also use a similar data for 1997–98 constructed by Kaufmann et al. (1999).

<sup>3</sup> Knack and Keefer (1994) construct an index of security of contractual and property rights with our legality proxies and other related variables. Because their data is highly correlated, they simply add it up to form their index. They note that their results are robust to other aggregation schemes, including principle components (factor analysis).

<sup>4</sup> We are grateful to an anonymous referee for encouraging us to do this.

given  $\xi$  and  $x$ :

$$\xi = \gamma'x + u, \quad (3)$$

$$g = b\xi + c'x + \varepsilon. \quad (4)$$

Systems (1)–(2) and (3)–(4) are equivalent to each other with

$$b = \sigma_{uw}/\sigma_{uu}, \quad p = c + b\gamma, \quad (5)$$

where  $\sigma_{uu}$  and  $\sigma_{uw}$  denote the variance of  $u$  and the covariance between  $u$  and  $v$ , respectively, and the covariances between  $\varepsilon$  and  $(\xi, x)$  are all zero by construction. Eq. (5) decomposes the overall impact of our exogenous variables into a direct and indirect effect. For example,  $p_j$  denotes total impact of regressor  $j$  on  $g$ ;  $c_j$  denotes its direct effect and  $b\gamma_j$  denotes its indirect effect via its impact on legality.

The number of estimated regressors in the unrestricted system (Eqs. (3)–(4)) is large in comparison to the sample size of 49 countries. Unsurprisingly, therefore, unrestricted OLS estimates are not accurate, and have many statistically insignificant coefficients. We follow a standard reduction technique whereby insignificant coefficients (with a  $t$ -value less than 2) are sequentially eliminated one at a time (this corresponds to the ‘general to simple’ methodology advocated, e.g., by Hendry (2000)). Regression columns 1 and 2 in Table 5 report the restricted reduced form equation for legality, and the restricted regression equation for  $\ln$  gnp per capita. Regression coefficients and standard errors in parentheses are reported in each cell.

Regarding legality, the fit is quite impressive: we obtain an  $R^2$  of 0.742. Three variables are excluded: the receptive-transplant, the German and the Scandinavian families. Unreceptive-transplant, French family and OECD dummies are all significant at the 1-percent level. In order to test globally these exclusion restrictions, we also compute an overall  $F$  test-statistic for the excluded variables and obtain a  $p$ -value of 0.734, which fully validates our restricted equation. These exclusions have two implications: firstly, a receptive-transplant policy is effective, since its impact on legality is indistinguishable from the impact of being an origin; second, there is no substantial difference between the English, German and Scandinavian families.

The legality estimates contain several important implications about transplantation and legal families. The process of unreceptive-transplantation and the transplantation of French law both have a negative impact on legality, and the absolute impact of the unreceptive-transplant effect is marginally worse. Specifically, an unreceptive transplantation is associated with a 70-percent standard-deviation decline in legality; while transplanting the French family is associated with a 48-percent standard-deviation decline. Second, since the receptive-transplant, English, German and Scandinavian families variables are all set to zero, the unreceptive transplant variable measures the difference between a receptive and unreceptive transplant that has received either the English or German legal code.<sup>5</sup> The unreceptive-transplant plus the French family

<sup>5</sup> There are no Scandinavian transplants. However, in our robustness Table 7 we consider an alternative coding where Finland and Norway are coded as receptive transplants.

Table 5  
Determinants of legality (1980–95) and economic development (1994)<sup>a</sup>

|                                       | OLS specification                        |                            |                   | System test                   |                                    |                                 |
|---------------------------------------|--|----------------------------|-------------------|-------------------------------|------------------------------------|---------------------------------|
|                                       | Legality                                 | Ln GNP<br>per capita       |                   | Legality                      | Ln GNP<br>per capita               | GNP:<br>derived<br>reduced form |
| Unreceptive-transplant                | −3.017*<br>(0.958)                       |                            |                   | −3.020*<br>(0.941)            |                                    | −0.995*<br>(0.315)              |
| French                                | −2.060*<br>(0.679)                       |                            |                   | −2.063*<br>(0.665)            |                                    | −0.680*<br>(0.222)              |
| French & German                       |  | 0.651*<br>(0.160)          |                   |                               | 0.653*<br>(0.155)                  | 0.653*<br>(0.155)               |
| OECD member                           | 4.271*<br>(0.929)                        |                            |                   | 4.267*<br>(0.882)             |                                    | 1.406*<br>(0.304)               |
| Legality                              |  | 0.329*<br>(0.019)          |                   |                               | 0.330*<br>(0.019)                  |                                 |
| Intercept                             | 16.731*<br>(0.943)                       | 2.926*<br>(0.336)          |                   | 16.74*<br>(0.923)             | 2.924*<br>(0.347)                  | 8.440*<br>(0.321)               |
| R <sup>2</sup>                        | 0.742                                    | 0.872                      |                   | 0.742                         | 0.873                              | 0.638                           |
| <i>Test statistics</i>                | Given pc                                 |                            |                   | Given pc                      |                                    |                                 |
| Families only<br>P-value              | $F(2, 45) = 51.75$<br>0.000              |                            | Not relevant      | $\chi^2(6) = 52.39$<br>0.000  |                                    | Not<br>relevant                 |
| Exclusion restrictions:<br>P-value    | $F(3, 42) = 0.43$<br>0.734               | $F(5, 41) = 0.24$<br>0.942 |                   | $\chi^2(8) = 2.88$<br>0.965   |                                    |                                 |
| Principal components test:<br>P-value | Not relevant                             |                            |                   | $\chi^2(28) = 43.11$<br>0.139 |                                    | Not<br>relevant                 |
| Weighting<br>method                   | Weights on legality (1980–95) components |                            |                   |                               |                                    | Share of<br>variance            |
|                                       | Efficiency of<br>judiciary               | Rule of<br>law             | Corruption        | Risk of<br>expropriation      | Risk of<br>contract<br>repudiation |                                 |
| Principal<br>component                | 0.381                                    | 0.578                      | 0.503             | 0.347                         | 0.384                              | 84.6%                           |
| Maximum<br>likelihood                 | 0.370*<br>(0.044)                        | 0.578*<br>(0.029)          | 0.505*<br>(0.025) | 0.350*<br>(0.019)             | 0.389*<br>(0.019)                  |                                 |

<sup>a</sup>The origin and English dummy variables are normalized at zero. OECD membership until the beginning of 1994 is used for legality (1980–95), and through 1998 for legality (1997–98) reported in Table 8. Standard errors are reported in the parentheses. \*Significant at the 1-percent level; \*\*Significant at the 5-percent level. A standard deviation in legality (1980–95) is 4.32; a standard deviation in legality (1997–98) is 1.696. These conventions apply to Tables 6 and 8.

coefficients measures the difference between a receptive transplant that has received English or German law and an unreceptive transplant that has received the French code. Clearly, it is much worse to be an unreceptive transplant that has received the French law, than it is to be an unreceptive transplant that has received the German or English law. Third, the OECD dummy, in absolute terms, dominates either the impact

of the French or unreceptive-transplant coefficient. An implication is that it is much worse to be an unreceptive-transplant that is not a member of the OECD, and the worst possible outcome is to be an unreceptive-transplant that has received the French code and is not a member of the OECD. Countries in this category include the Philippines, Indonesia, Peru, Sri Lanka and Colombia, and each is contained in the at-the-bottom quintile of our legality measures.<sup>6</sup> Finally, the families, *by themselves*, cannot adequately explain the cross-country variance in legality. In the test statistics section of Table 5, we report the  $F$  test-statistic for the null hypothesis that only families enter the legal equation. This null is overwhelmingly rejected (the  $p$ -value is 0.000).

Regarding the regression for economic development, the fit is also impressive: we obtain an  $R^2$  of 0.872, and, the test for the exclusion restriction passes with an impressive  $p$ -value of 0.985. This regression contains several important lessons about the impact of transplantation and legal families on economic development. First, since the unreceptive transplant coefficient is excluded from this regression, there is no direct unreceptive transplant effect and the negative impact of unreceptive transplantation on log GNP per capita is completely indirect. Multiplying the legality coefficient in this economic development regression (0.329) times the unreceptive-transplant coefficient in the restricted reduced form for legality ( $-3.017$ ), the approximate indirect effect of transplant effect on log GNP per capita is  $-1.00$  (roughly two-thirds of a standard deviation away from the mean log GNP per capita). Second, the impact of OECD membership on development is completely indirect, and is approximately equal to 1.41 (the legality coefficient in this economic development regression, 0.329, times the OECD coefficient in the legality regression, 4.271). Third, the *overall* impact of the French family is negligible. The indirect effect of the French family on log GNP per capita is 0.329 times  $-2.060$ , which is roughly  $-0.678$ . This completely offsets the direct French and German effect of 0.651. Finally, supplying the German family can have a substantial direct effect on GNP per capita that is not offset by any indirect effect. However, the absolute impact of the unreceptive transplantation (1) dominates the overall impact of the German family (0.658). Column five in Table 5 contains the

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<sup>6</sup> Only four of the 28 unreceptive-transplants in our sample are members of the OECD by the beginning of 1994, and only three of the 21 origins and receptive transplants are non-members. Our econometric specification assumes that the impact of OECD membership on legality is the same for unreceptive transplants and the group of receptive transplants and origins. If we relax this assumption, then our results are still robust, but OECD membership has a somewhat weaker impact on legality in the unreceptive transplants. One interpretation of this finding is that unreceptive transplantation had a strong negative impact on legality and economic development which made it difficult for countries to enter the OECD, and which subsequently limited development of good institutions in those unreceptive transplants that managed to enter. All in all, the most relevant comparison for evaluating the impact of transplantation is between a non-OECD unreceptive transplant and OECD members that are either receptive transplants or origins with, as shown in Table 5, an average difference of legality of 7.288 ( $3.017 + 4.271$ ). As previously noted, GNP per capita in 20 of the 22 OECD members is higher than the sample median. Thus, a caveat with the OECD variable is that it may act as a high-income dummy variable. However, if this were the case, then the OECD variable should have a significant and positive impact on GNP per capita regression after controlling for legality. We show in the next paragraph that this is not the case. If we replace the OECD variable with a high-income-dummy variable in a GNP per capita regression controlling for legality, then the high-income dummy has a positive and significant impact. Clearly, the OECD variable plays a very different role than a high-income dummy in our model.

system validated derived reduced form estimates and standard errors for the total impact of the transplantation and families on  $\ln$  GNP per capita.<sup>7</sup> To see how this works, consider Colombia: it is an unreceptive transplant of French legal code, and GNP per capita in 1994 was \$1,400 per capita. A receptive transplant strategy would have raised 1994 GNP per capita to roughly \$3,785, which is comparable to Mexico and Uruguay. Transplanting the English or Scandinavian code in an unreceptive manner would have had no impact. Transplanting the German code in an unreceptive manner would have raised 1994 GNP per capita to only \$2,690, which is comparable to Venezuela.

These findings have important policy implications. An effective legal reform strategy should include measures that would avoid the transplant effect. Because the impact of the transplant effect on economic development is purely indirect, there is no reason to believe that a legal reform would have a direct and immediate impact on GNP per capita. Furthermore, because the transplant effect dominates the impact of legal families, the results do not support the idea that picking the correct family would lead to a direct and immediate gain in economic development. Finally, in the next section we will show that the relatively weak German effect is not robust to alternative legality measures.

#### **4. Robustness**

To check for robustness of these results, we change Mexico from an unreceptive transplant to a half unreceptive and half receptive transplant; we also change Portugal and Spain from unreceptive to half unreceptive and half receptive. While Mexico copied the Spanish commercial code in an unreceptive fashion in 1854, 20 years later Mexico promulgated a civil code using various sources and including lessons from legal practice, and subsequently also revised the commercial code. While we usually use the date of the first reception, these two dates are very close. Moreover, it is questionable whether the earlier code had a long-term impact, because it was quickly superseded. Spain and Portugal are included in robustness test, because their proximity to France and Germany could suggest that they were fairly familiar with the modern formal legal order that developed in these countries, even though they themselves did not directly participate in this development. Table 6 shows that our original results (Table 5) are robust to these modifications with only minor changes in the restricted legality reduced form equation (well within one standard deviation), and virtually no change in  $\ln$  GNP per capita regression.

As another robustness check, we change several countries from origin to receptive-transplant. As previously noted, it can also be argued that Sweden transplanted the Scandinavian code to Finland, and that Denmark transplanted this code to Norway. Because there was familiarity between Sweden and Finland, and Denmark and Norway, we re-code Finland and Norway as receptive-transplants. The classification of the United States as origin is also controversial, because it can be argued that its process of developing the English common law was not significantly different than what was

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<sup>7</sup> Section 6 and a technical appendix describe the system test.

Table 6  
Robustness check for receptive–unreceptive transplant coding

|   | OLS specification           |                            | System test                   |                   |                                 |
|---|-----------------------------|----------------------------|-------------------------------|-------------------|---------------------------------|
|   | Legality                    | Ln GNP per capita          | Legality                      | Ln GNP per capita | <i>g</i> : derived reduced form |
| Unreceptive-transplant                        | −3.465*<br>(1.022)          |                            | −3.465*<br>(0.998)            |                   | −1.142*<br>(0.335)              |
| French  | −2.247*<br>(0.657)          |                            | −2.249*<br>(0.641)            |                   | −0.741*<br>(0.214)              |
| French & German                               |                             | 0.651*<br>(0.160)          |                               | 0.652*<br>(0.155) | 0.652*<br>(0.155)               |
| OECD member                                   | 3.839*<br>(0.982)           |                            | 3.838*<br>(0.925)             |                   | 1.265*<br>(0.314)               |
| Legality                                      |                             | 0.329*<br>(0.019)          |                               | 0.330*<br>(0.019) |                                 |
| Intercept                                     | 17.155*<br>(0.998)          | 2.926*<br>(0.336)          | 17.16*<br>(0.973)             | 2.925*<br>(0.347) | 8.579*<br>(0.336)               |
| <i>R</i> <sup>2</sup>                         | 0.749                       | 0.872                      | 0.749                         | 0.873             | 0.645                           |
| <i>Test statistics</i>                        | Given pc                    |                            | Given pc                      |                   | Including pc                    |
| Families only<br><i>P</i> -value              | $F(2, 45) = 53.88$<br>0.000 | Not relevant               | $\chi^2(6) = 54.68$<br>0.000  |                   | Not relevant                    |
| Exclusion restrictions:<br><i>P</i> -value    | $F(3, 42) = 0.45$<br>0.716  | $F(5, 41) = 0.38$<br>0.859 | $\chi^2(8) = 3.79$<br>0.918   |                   |                                 |
| Principal components test:<br><i>P</i> -value | Not relevant                |                            | $\chi^2(28) = 42.13$<br>0.160 |                   | Not relevant                    |

observed in other receptive-transplants of English law including Australia and Canada. Therefore, we change the United States from origin to receptive-transplant. While this change in code changes the unrestricted reduced form for legality and the regression for Ln GNP per capita, it has no impact on the restricted results reported in Table 5. Though this may seem tautological in view of the fact that the restricted results in Table 5 excluded the receptive-transplant dummy, it is important to emphasize that we reran the full simplification search as part of the robustness check. This re-codification marginally changes the various test statistics, which are reported in Table 7. Once again, a regression with families only has no explanatory power for legality, and the exclusion restrictions hold.

We also check if our results are robust to an alternative legality measure including three proxies of legality developed by Kaufmann et al. (1999). Because these data are for 1997–98, we use Ln GNP per capita in 1998 for the economic development regression and we extend OECD membership until 1998. Here again we use a principal components analysis. The first component, which accounts for 95.9 percent of the total

Table 7  
Robustness check for origin-transplant coding

| <i>Test statistics</i>     | Given pc           |                   | Given pc             |              |
|----------------------------|--------------------|-------------------|----------------------|--------------|
|                            |                    |                   |                      |              |
| Families only              | $F(2, 45) = 51.75$ | Not relevant      | $\chi^2(6) = 52.53$  | Not relevant |
| <i>P</i> -value            | 0.000              |                   | 0.000                | relevant     |
| Exclusion restrictions:    | $F(3, 42) = 0.44$  | $F(5, 41) = 0.26$ | $\chi^2(8) = 3.03$   |              |
| <i>P</i> -value            | 0.729              | 0.932             | 0.965                |              |
| Principal components test: | Not relevant       |                   | $\chi^2(28) = 44.87$ | Not relevant |
| <i>P</i> -value            |                    |                   | 0.113                |              |

variance, is denoted legality (1997–98) and is given by  $0.577*(\text{Government Effectiveness}) + 0.576*(\text{Rule of Law}) + 0.579*(\text{Control of Corruption})$ . Table 8 reports the estimates and test statistics. The fit is still impressive ( $R^2=0.612$  for legality,  $R^2=0.783$  for ln GNP per capita), but is lower than the original estimates.

Regarding legality, the test statistics verify that the receptive-transplant and the German and Scandinavian families can be excluded, and the families, by themselves, still have poor explanatory power. The unreceptive-transplant and OECD dummy variables are both significant at the 1-percent level, while the significance of the French family deteriorates to the 7-percent level. In order to compare the impact of transplantation and families on original legality measure and legality (1997–98), it is useful to compare their impact on a standard deviation in legality. The unreceptive transplant is associated with a 70-percent and 87-percent standard deviation decline in legality (1980–95) and legality (1997–98); the French family is associated with a 48-percent and 35-percent standard deviation decline in legality (1980–95) and legality (1997–98). Therefore, the absolute impact of an unreceptive transplant compared to a transplantation of the French family is stronger under the alternative legality measure.

Regarding economic development, the exclusion restriction test verifies that both transplant variables and all legal families can be excluded. Therefore, the result that the impact of the unreceptive-transplant is completely indirect via its impact on legality is robust. OECD membership, however, has a direct effect of 0.793, which almost one-half a standard deviation. However, there is a comparable indirect impact of OECD membership equal roughly to 0.746 (the legality coefficient in this economic development regression, 0.607, times the OECD coefficient in the legality regression, 1.229). The results for legal families are not robust. In the original estimates, the French family had an insignificant impact on ln GNP per capita: its negative indirect impact through legality was offset by its positive direct effect. In the alternative specification there is no direct effect of the French family that offsets the negative indirect effect. In the original estimates, the direct and overall impact of the German family on economic development were both positive. Column 5 in Table 8 reports the overall impact and standard errors for the exogenous variables on economic development derived from the system test. The German effect vanishes in this alternative data set, while the French family has a negative overall impact.



Table 8  
Robustness check for alternative legality measure

|                            | OLS specification                        |                   | System test           |                   |                                 |
|----------------------------|--|-------------------|-----------------------|-------------------|---------------------------------|
|                            | Legality                                 | Ln GNP per capita | Legality              | Ln GNP per capita | <i>g</i> : derived reduced form |
| Unreceptive-transplant     | −1.482*<br>(0.420)                       |                   | −1.421*<br>(0.387)    |                   | −0.900*<br>(0.274)              |
| French                     | −0.601**<br>(0.326)                      |                   | −0.581**<br>(0.302)   |                   | −0.368**<br>(0.199)             |
| OECD member                | 1.229*<br>(0.405)                        | 0.793*<br>(0.273) | 1.178*<br>(0.376)     | 0.793*<br>(0.269) | 1.539*<br>(0.323)               |
| Legality                   |  | 0.607*<br>(0.081) |                       | 0.633*<br>(0.086) |                                 |
| Intercept                  | 0.503<br>(0.426)                         | 8.341*<br>(0.168) | 1.611*<br>(0.400)     | 7.628*<br>(0.141) | 8.648*<br>(0.317)               |
| $R^2$                      | 0.612                                    | 0.783             | 0.638                 | 0.789             | 0.601                           |
| <i>Test statistics</i>     | Given pc                                 |                   | Given pc              |                   |                                 |
| Families only              | $F(2, 45) = 29.36$                       | Not relevant      | $\chi^2(6) = 40.05$   |                   | Not relevant                    |
| <i>P</i> -value            | 0.000                                    |                   | 0.000                 |                   |                                 |
| Exclusion restrictions:    | $F(3, 42) = 0.19$                        | $F(5, 41) = 0.67$ | $\chi^2(8) = 4.69$    |                   |                                 |
| <i>P</i> -value            | 0.900                                    | 0.645             | 0.858                 |                   |                                 |
| Principal components test: | Not relevant                             |                   | $\chi^2(14) = 36.64$  |                   | Not relevant                    |
| <i>P</i> -value            |  |                   | 0.005                 |                   |                                 |
| <i>Weighting method</i>    | Weights on legality (1980–98) components |                   |                       | Share of variance |                                 |
|                            | Government effectiveness                 | Rule of law       | Control of corruption |                   |                                 |
| Principal component        | 0.577                                    | 0.576             | 0.579                 | 95.9%             |                                 |
| Maximum likelihood         | 0.565*<br>(0.018)                        | 0.567*<br>(0.019) | 0.599*<br>(0.017)     |                   |                                 |

The substantial negative impact of an unreceptive transplant strategy, which in turn has a substantial indirect and overall impact on economic development, is robust to several modifications in code and to an alternative legality measure. The substantial (albeit weaker) impact of transplanting the French code on legality is also robust. However, just whether or not there is a negative or negligible impact of the French family on development, as well as a positive or negligible impact of the German family on development depends on how and when we measure legality. These robustness tests cast doubt on the idea that picking the correct legal family can provide an immediate and direct increase in output.

## 5. Validity of principal component aggregation

Since we actually have observations on  $k$  legality proxies (five for 1980–95 and three for 1997–98), we must make sure that in employing a single aggregate measure of legality we have not lost relevant information. In the absence of aggregation, our more general baseline model consists of  $k+1$  fully unrestricted reduced form equations for  $y$  and  $g$ , conditionally on  $x$ :

$$\begin{pmatrix} y \\ g \end{pmatrix} = P'x + \begin{pmatrix} u \\ v \end{pmatrix}, \quad \text{where } \begin{pmatrix} u \\ v \end{pmatrix} \sim N_{k+1}(O, V), \quad (6)$$

where  $y$  denotes the vector of  $k$  legality proxies and  $g$  denotes ln GNP per capita. Here again, it is convenient to represent this system in the form of  $k$  reduced form equations for  $y$  given  $x$  and an unrestricted regression equation for  $g$ , given  $y$  and  $x$

$$y = \Pi'x + u, \quad u \sim N_k(O, \Omega) \quad (7a)$$

$$g = b'y + c'x + \varepsilon \quad \varepsilon \sim N(O, v^2) \quad (7b)$$

where  $\varepsilon$  is independent of  $(y, x)$  by construction. Systems (6) and (7) are equivalent to one another. Their parameters are in one-to-one correspondence with

$$P = (\Pi \quad c + \Pi b), \quad V = \begin{pmatrix} \Omega & \Omega b \\ b'\Omega & v^2 + b'\Omega b \end{pmatrix}. \quad (8)$$

By Eq. (7a) the *unconditional* covariance matrix of  $y$  is given by

$$V = \Omega + \Pi'\Phi\Pi, \quad (9)$$

where  $\Phi$  denotes the covariance matrix of  $x$ . In the decomposition of  $V$ ,  $\Pi'\Phi\Pi$  represents the explained variance of  $y$ , and  $\Omega$  represents the unexplained variance.

The validation of our earlier aggregate analysis requires the following three key assumptions:

1. The replacement of  $y$  by an aggregate measure  $\xi = \beta'y$  should not result in a loss of information with respect to the interactions between  $y$  and  $x$ . The relevant hypothesis is that the  $k$  rows of  $\Pi'$  be proportional to another, i.e. that  $\Pi$  be of rank one:

$$\Pi = \gamma\beta', \quad (10)$$

where  $\gamma$  and  $\beta$  are vectors and  $\beta$  is normalized to unity ( $\beta'\beta = 1$ ) for identification. In the discussion that follows,  $\beta$  is estimated *directly* by constrained Maximum Likelihood Estimation (hereafter MLE) of the reduced form (7a). Note that the intercepts are not constrained to account for the fact that the  $k$  legal components are centered differently.

2. It follows from Eq. (10) that  $\beta$  also represents the principal component of the *explained* covariance matrix  $\Pi'\Phi\Pi$  with eigenroot  $\gamma'\Phi\gamma$ . For it to coincide with the

principal component of the *unconditional* covariance matrix  $V$ , we have to assume that  $\beta$  is also an eigenvector of the residual covariance matrix  $\Omega$ . Let  $\delta$  denote the corresponding eigenroot, in which case  $\delta + \gamma' \Phi \gamma$  is an eigenroot of  $V$  and, in fact, the leading eigenroot in view of the overall excellent fit of the reduced form.

3. Finally, we have to assume that only  $\xi$ , and not all  $k$  components of  $y$ , enter the ln GNP regression (7b). This implies that  $b$  is proportional to  $\beta$ .

These three assumptions imply a total of  $[6k - (k + 5)] + 2(k - 1)$  predominately non-linear restrictions on  $\Pi$ ,  $V$  and  $b$ . This implies 28 restrictions in the case of legality (1980–95) where  $k=5$ , and 14 restrictions in the case of legality (1997–98) where  $k=3$ . The number of restrictions represents the degrees of freedom of the principal component likelihood ratio test statistics reported in the systems tests in Tables 5 and 8, together with the restricted MLE's of  $\beta$ ,  $\gamma$  and  $c$ . In view of the small sample size of 49 countries, all  $p$ -values and standard deviations are produced by Monte Carlo simulation (1,000 replications). The derivation of the MLE's and likelihood ratio statistics is discussed in technical appendix that is available upon request.

Tables 5–8 show that the OLS estimates for the restricted reduced form legality equation and the restricted regression of economic development are fully validated by the system test. The estimated weights for the various legality components along with standard errors, which are reported on the bottom of Tables 5 and 8 (the weights for Tables 6 and 7 are very close to those reported in Table 5, and are available upon request), are very close to the weights assigned by principal components analysis. The point estimates for the OLS specification and system test are also very close. However, the system test's standard errors are more efficient. The test-statistics show that all of the previous results obtained by OLS are completely robust. Given the pc (principal component) weighting, the likelihood ratio test shows that the families only regressions have poor explanatory power (the  $p$ -value is always 0.000) and the exclusion restrictions always hold (the lowest  $p$ -value is 0.858).

Regarding aggregation, the principal components test statistic fully validates the principal components aggregation of the five legality proxies from LLSV et al. (1998) data set into a legality (1980–95) index: the  $p$ -values for this  $\chi^2(28)$  test of 0.139, 0.160, 0.113 all exceed the critical 0.10-level. However, aggregation from the Kaufmann et al. (1999) data into legality (1997–98) is rejected: the  $p$ -value for this  $\chi^2(14)$  test statistic is 0.005. Two comments follow from this result. First, given this principal components weighting, the exclusion restrictions imposed on the restricted system still hold, and therefore, aggregation still is a useful simplification. Second, it is the impact of families on the legality proxies that drive this rejection. If we examine the general system (7), then all of the results regarding the impact of transplantation and OECD membership are robust: the impact of the receptive transplant on the legality proxies and ln GNP per capita, given the legality proxies, is negligible; the unreceptive-transplant always has a negative impact on the legality proxies that, in absolute terms, dominates the impact of any particular family; the impact of the unreceptive transplant on ln GNP per capita is purely indirect via its impact on the legality proxies; and, OECD membership has a significant and positive effect on the reduced form regressions for the legality proxies and on ln GNP per capita after controlling for legality. The impact of

the families is muddled: they have no significant impact on Government Effectiveness, and the French family has a negative impact on Control of Corruption and Rule of Law (these results are available upon request). Thus, the system test provides further evidence that impact of transplantation is robust, while the impact of the families on legality and economic development is relatively less robust.

## **6. Conclusions**

We have shown that the way in which the law was initially transplanted is a more important determinant of legality than the supply of a particular legal family. Furthermore, the legal transplantation process has a large, albeit indirect, effect on economic development via its impact on legality. The policy implication of these results are fundamental: a legal reform strategy should aim at improving legality by carefully choosing legal rules whose meaning can be understood and whose purpose is appreciated by domestic law makers, law enforcers, and economic agents, who are the final consumers of these rules. In short, legal reform must ensure that there is a domestic demand for the new law, and that supply can match demand. The close fit between the supply and demand for formal legal rules appears to be a crucial condition for improving the overall effectiveness of legal institutions, which over time will foster economic development. While further research is warranted before making practical policy recommendations, a cautious suggestion would be that legal borrowing should take place either from a country with a similar legal heritage, or substantial investments should be made in legal information and training prior to adoption of a law, so that domestic agents can enhance their familiarity with the imported law and make an informed decision about how to adapt the law to local conditions. This would at least increase the possibility that the new law will be used in practice. It is, however, vain to expect that an effective transplant strategy will have a direct or immediate impact on economic development.

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## **Appendix A.**

Tables 9 and 10 provide summary statistics for our data.

Table 9  
Legality (1980–95) and economic development (1994)

| Summary statistics              | Efficiency of judiciary system 1980–83 | Rule of law 1982–95 | Absence of corruption 1982–95 | Risk of expropriation 1982–95 | Risk of contract repudiation 1982–95 | Legality 1980–95 | GNP per capita (U.S.\$) 1994 |
|---------------------------------|--|---------------------|-------------------------------|-------------------------------|--------------------------------------|------------------|------------------------------|
| Average                         | 7.67                                   | 6.74                | 6.90                          | 8.05                          | 7.58                                 | 16.05            | 11156                        |
| Median                          | 7.25                                   | 6.78                | 7.27                          | 8.25                          | 7.57                                 | 16.54            | 7660                         |
| Standard deviation              | 2.05                                   | 2.80                | 2.29                          | 1.59                          | 1.79                                 | 4.32             | 10190                        |
| Minimum                         | 2.50                                   | 0.00                | 2.15                          | 5.22                          | 4.36                                 | 8.51             | 270                          |
| Maximum                         | 10.00                                  | 10.00               | 10.00                         | 9.98                          | 9.98                                 | 21.91            | 35760                        |
| <i>Correlation coefficients</i> |  |                     |                               |                               |                                      |                  |                              |
| Efficiency of judiciary         | 1.000                                  |                     |                               |                               |                                      |                  |                              |
| Rule of law                     | 0.643                                  | 1.000               |                               |                               |                                      |                  |                              |
| Corruption                      | 0.793                                  | 0.848               | 1.000                         |                               |                                      |                  |                              |
| Risk of expropriation           | 0.656                                  | 0.910               | 0.845                         | 1.000                         |                                      |                  |                              |
| Contract repudiation            | 0.635                                  | 0.880               | 0.841                         | 0.961                         | 1.000                                |                  |                              |
| Legality                        | 0.803                                  | 0.950               | 0.949                         | 0.944                         | 0.930                                | 1.000            |                              |
| GNP per capita                  | 0.738                                  | 0.853               | 0.839                         | 0.871                         | 0.871                                | 0.906            | 1.000                        |

Table 10  
Legality (1997–98) and economic development (1998)

| Summary statistics              | Government effectiveness 1997–98 | Rule of law 1997–98 | Control of corruption 1997–98 | Legality 1997–98 | GNP Per Capita (U.S.\$) 1998 |
|---------------------------------|----------------------------------|---------------------|-------------------------------|------------------|------------------------------|
| Average                         | 0.645                            | 0.644               | 0.663                         | 0.000            | 13107                        |
| Median                          | 0.714                            | 0.861               | 0.672                         | 0.245            | 10670                        |
| Standard deviation              | 0.940                            | 0.944               | 0.989                         | 1.696            | 11837                        |
| Minimum                         | -1.321                           | -1.220              | -0.954                        | -3.216           | 300                          |
| Maximum                         | 2.082                            | 1.996               | 2.129                         | 2.473            | 39980                        |
| <i>Correlation coefficients</i> |                                  |                     |                               |                  |                              |
| Government Effectiveness        | 1.000                            |                     |                               |                  |                              |
| Rule of law                     | 0.923                            | 1.000               |                               |                  |                              |
| Control of corruption           | 0.944                            | 0.934               | 1.000                         |                  |                              |
| Legality                        | 0.979                            | 0.977               | 0.982                         | 1.000            |                              |
| GNP per capita                  | 0.817                            | 0.838               | 0.842                         | 0.850            | 1.000                        |

## Appendix B. Constrained estimation of the reduced form model

ML estimation of system (7) under the hypotheses introduced in Section 6 proceeds stepwise. Firstly, conditionally on any given value of  $\beta$ , we transform the system into

one which can be estimated by Ordinary Least Squares (hereafter OLS). The corresponding (analytical) concentrated log likelihood function is then numerically maximized w.r.t.  $\beta$ . In this appendix, we outline the first stage derivations, which are conditional on any given value of  $\beta$  as selected by the second stage numerical optimizer. The critical step consists of a linear transformation of the legal reduced form (7a) into

$$\phi = Ay = P'x + v, \quad v \sim N_k(0, V), \tag{B.1}$$

where  $P = \Pi A'$  and  $V = A\Omega A'$ .  $A$  is a square non-singular matrix such that  $A\beta = e_k$ , where  $e_k$  denotes the last column of the identity matrix  $I_k$ . Let partition  $\beta'$  into  $\beta' = (\beta'_1 \beta'_2)$ , where  $\beta_2 \neq 0$  is a scalar. A convenient choice for  $A$  is given by

$$A = \begin{pmatrix} I_{k-1} & 0 \\ 0 & 0 \end{pmatrix} + \begin{pmatrix} -\beta_1 \\ 1 \end{pmatrix} \cdot \beta'. \tag{B.2}$$

All vectors and matrices in (B.1) are then partitioned conformably with  $\beta$  into

$$\phi = \begin{pmatrix} \phi_1 \\ \phi_2 \end{pmatrix}, \quad v = \begin{pmatrix} v_1 \\ v_2 \end{pmatrix}, \quad P = (P_1 \quad p_2) \quad \text{and} \quad V = \begin{pmatrix} V_{11} & v_{12} \\ v_{21} & v_{22} \end{pmatrix}.$$

It is then trivial to verify that assumptions  $H_1: \Pi = \gamma\beta'$  and  $H_2: \Omega\beta = \lambda\beta$  are transformed into assumptions  $H_1^*: P_1 = 0$  and  $H_2^*: v_{12} = 0$ , respectively. A further simplification obtains if we factorize the density of  $\phi | x$ , as given in (B.1) into those of  $\phi_1 | x$  and  $\phi_2 | \phi_1, x$ . Under  $H_1^*$  we have

$$\phi_1 | x \sim N_{k-1}(0, V_{11}), \tag{B.3}$$

$$\phi_2 | \phi_1, x \sim N_1(\gamma'x + \delta'\phi_1, v^2) \tag{B.4}$$

where  $\delta = V_{11}^{-1}v_{12}$  and  $v^2 = v_{22} - v_{21}V_{11}^{-1}v_{12}$ . The coefficients  $(\gamma, \delta, v^2, V_{11})$  are then estimated by OLS (ML) and the corresponding constrained ML estimates of  $(\Pi, \Omega)$  are obtained by inversion of the transformation introduced above. The same analysis applied under  $H_1^* \cup H_2^*$ , with the additional simplification that  $\delta = 0$ . The GNP regression in (7b) is also estimated by OLS (ML). Its restricted version (when  $b$  is proportional to  $\beta$ ) takes the form of a regression of  $g$  on  $x$  and  $\beta'y$ .

Finally, the concentrated log likelihood function takes the form

$$\ln L_*(\beta) \propto -\frac{n}{2} \ln[\hat{\sigma}^2(\beta) \cdot |\tilde{\Omega}(\beta)|], \tag{B.5}$$

where  $\hat{\sigma}^2(\beta)$  and  $\tilde{\Omega}(\beta)$  denote the first stage ML (OLS) estimators of  $\sigma^2$  and  $\Omega$ , respectively (with no degrees of freedom correction).

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