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IZA DP No. 11387

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ABSTRACT

Time Is on My Side: Relational Contracts and Aggregate Welfare*

This paper develops a simple general equilibrium model which establishes a link between the patience of economic agents and the well-being of nations. We show that firms in long-term oriented countries can mitigate hold-up inefficiencies by engaging with their suppliers in relational contracting – informal agreements sustained by the value of future relationships. Our model predicts that countries with a higher level of patience will exhibit greater economic well-being and higher total factor productivity. We provide empirical evidence in line with the predictions of our theory.

JEL Classification: D23, L14, L22, L23, O10

Keywords: time preferences, relational contracting, aggregate welfare, TFP

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* We thank the editor, Raoul Minetti, and two referees for their very valuable comments and suggestions. We also thank Gani Aldashev, Werner Antweiler, Christian Bauer, Rainald Borck, Brian Copeland, Mathias Hungerbuhler, Ola Kvaloy, Johann Graf Lambsdorff, Oliver Landmann, Stephan Lengsfeld, Jean-Philippe Platteau, Ludwig Ressner, Manuel Schubert, Monika Schnitzer, Günther Schulze, Christian Schwarz, Jens Südekum, Eric Toulemonde, and seminar participants in Duisburg, Frankfurt/Main, Freiburg, Houston (SSE), Lausanne (ETSG), Munich, Namur, Oslo (EEA), Paris, St. Louis (MEA) and Vancouver for helpful comments. Parts of this paper were written during our research visits at Harvard and at the University of British Columbia. We are grateful to these institutions for their hospitality.

1 Introduction

Why do the standards of living differ so widely across nations? This is one of the most pertinent puzzles in economics and one of the most important research questions today. There is no consensus on the answer, yet. However, there is very broad and strong agreement on how to approach this issue (Fuchs-Schündeln and Hassan 2016; Acemoglu 2008; Hall and Jones 1999). This view builds on an organizing framework which distinguishes proximate causes of differences in economic performance from more fundamental ('deeper') determinants. Proximate causes are those stressed in the theories of economic growth: total factor productivity and the stocks of physical and human capital. Abundant evidence documents that these factors differ greatly (in quantity and quality) across nations. At a deeper level, the question is why such differences arise in the first place. An emerging consensus comprises four groups of fundamental macro-level explanations: luck (history), geography (climate), institutions, and culture. Yet, there is considerable controversy about the importance of these fundamental determinants, their interrelation and micro-level origins.[1]

The aim of this paper is to advance a novel micro-level explanation for the disparity of living standards across nations which puts the patience of economic decision makers at its center. Our explanation builds on the notion that firms in countries where long-term orientation prevails are more likely to engage with their suppliers in relational contracting – informal agreements sustained by the value of future relationship – and, in so doing, avoid inefficiencies associated with hold-up problems.

To illustrate the key mechanism at work, consider a relationship between a headquarter company (henceforth synonymously: a final good producer or a firm, for short) and a subcontractor (synonymously: an intermediate supplier or a supplier, for short), who repeatedly transact for the provision of relationship-specific (customized) inputs in an environment of contractual incompleteness. If parties cannot write enforceable contracts contingent on the quality of intermediate goods, they can organize their cooperation in one of the following two ways. First, they may negotiate about the division of surplus 'on the spot', i.e., after these inputs have been produced and their quality is revealed. Since at this point parties are

[1] Acemoglu (2008), for instance, advances strong arguments in favor of the view that institutions (rules, regulations, laws and policies that affect economic incentives) are the key fundamental driver, but at the same time he notes that institutions might be endogenous to cultural factors, so that the prevailing evidence should be interpreted with care.

'locked' into the relationship, this type of cooperation is associated with ex-post hold-up and ex-ante underinvestment into relationship-specific inputs. Second, parties can enter at the outset an implicit (relational) agreement in which they promise to provide the first-best level of non-contractible activities and sustain it by the value of future relationship. However, as it is well-known from the Folk theorem (Fudenberg and Tirole, 1991), firms' abilities to enter such an agreement crucially depend on the time preference rates of the decision makers. We develop an analytically tractable general equilibrium model which shows that countries with a higher level of long-term orientation (patience) exhibit a higher aggregate welfare.

The contribution of our paper goes well beyond a general equilibrium representation of the Folk theorem. As stressed by Acemoglu (2008: 21), an explanation of differences in living standards can only count as a fundamental cause if it affects any of the above-mentioned proximate determinants of economic well-being. Our second key finding thus shows that countries with a higher prevalence of long-term oriented firms (managers) exhibit a higher total factor productivity. This result is driven by an endogenous entry process similar to Melitz (2003). More specifically, firms in our model are assumed to be heterogeneous with respect to their productivities, which they draw from a commonly known distribution upon paying a fixed cost of entry. Forward-looking entrepreneurs enter the market as long as their expected profits are larger than the fixed entry cost. Due to a higher probability of being matched with a patient supplier (with whom one can engage in relational contracting), potential entrepreneurs in long-term oriented countries expect higher profits. Our general equilibrium model predicts that the associated increase in entrepreneurial activity gets reflected in a higher total factor productivity.[2]

We complement our theoretical analysis with a deliberately brief empirical analysis of our two key predictions. To be clear, this simple exercise does not allow for a causal inference of the effects of patience but rather provides tentative conditional correlations in the hope of inspiring future empirical research on this topic. To the best of our knowledge, the only publicly available measure of a country's (average) patience stems from a survey by Hens et al. (2016). In this study, almost 7000 university students in 53 countries were asked about their preference for an immediate smaller vs. a delayed larger payoff. We use the percentage of respondents who opted for a future payoff as a proxy for a country's average

[2] Pflüger and Südekum (2013) show that entry subsidies also lead to the entry of more productive firms.

long-term orientation.[3] In a univariate regression, patience explains roughly 50% of the variation in income per capita across countries – our measure of economic well-being. To ensure that this simple relationship is not confounded by other deep-rooted determinants, we control for alternative explanatory factors of economic development, such as geography, institutions, culture, and religion. Throughout specifications, we find a robust positive correlation between a country's patience and its income per capita.

In line with our second key prediction, we also find a positive relationship between a country's level of patience and alternative proxies for total factor productivity, drawn from Hall and Jones (1999), Jones and Romer (2010), and the Penn World Tables.

Related literature. Our paper relates to several strands of research. First, it complements the existing theories which highlight the role of time preference rate in decision makers' saving behaviors and accumulation processes, see, for instance, the Ramsey-Cass-Koopmans model (Acemoglu 2008), the Lucas (1988) human capital model, and the theory of endogenous growth (e.g., Romer 1990). Clearly, patience can also affect a country's well-being in many other ways (e.g., long-term oriented government officials may establish rule-based institutions). While we acknowledge these alternative explanations and control for them in our empirical analysis, we believe that relational contracting is an important understudied channel through which patience gets transmitted into higher economic welfare, in particular, since the anecdotal evidence on the prevalence of relational contracts in commercial transactions is ubiquitous, cf. Gibbons and Henderson (2012, 2013), Macchiavello and Morjaria (2016).[4]

Second, we build on the extensive literature on relational contracting which shows that patient decision makers may avoid various types of inefficiencies via implicit long-term agreements, see, e.g., Baker et al. (2002), Halonen (2002), and Levin (2003). However, whereas these works address single firms in partial equilibrium, we focus on aggregate consequences of relational contracting. To the best of our knowledge, none of our key predictions – the effect of patience on aggregate welfare and total factor productivity – has been worked out

[3] See section 4.1 for a thorough discussion of our baseline proxy for patience. In the robustness check, we approximate the country's time preference rate with an alternative measure of long-term orientation drawn from Hofstede et al. (2010). We introduce the latter measure in section 2.

[4] A prominent example of a company that strongly relies on relational contracting is the Japanese automobile manufacturer Toyota. As reported in a survey by Helper and Henderson (2014: 59), "as long as [Toyota's suppliers] make a good-faith effort to perform as they should, the assembler will ensure that they receive a reasonable return on their investment [...], and as long as the supplier continued to meet the automaker's expectations, the supplier could count on the relationship continuing indefinitely".

in general equilibrium.[5]

The production side of our model is inspired by Antràs and Helpman (2004), who introduce the property rights theory of a firm by Grossman and Hart (1986) and Hart and Moore (1990) into a framework of monopolistic competition with firm heterogeneity along the lines of Melitz (2003) to study the make-or-buy decision of multinational firms. Since cooperation between headquarters and intermediate suppliers in Antràs and Helpman (2004) is captured as a one-shot game, managerial patience and relational contracting play no role in their model.[6] Further, our focus is not on firms' integration decisions. Rather, we use their basic set-up featuring incomplete contracts and hold-up inefficiencies to derive the effect of patience on aggregate welfare.

From the empirical perspective, our paper is related to the recent work by Dohmen et al. (2015), who find support for theoretical predictions of the current paper – the effect of patience on per capita income and total factor productivity. Their proxy for patience stems from the own-conducted survey and, similarly to the survey-based measure used in the current paper, captures the respondents' preferences for a smaller immediate vs. a larger future reward in a given country. Both contributions complement each other and enhance our understanding of the effects of patience on economic outcomes.

The paper's structure is as follows. In section 2, we briefly discuss existing evidence on the heterogeneity in time preference rates across countries. In section 3, we present our benchmark model and derive our testable predictions. Section 4 brings these predictions to the data. Section 5 concludes.

2 Heterogeneity in Time Preferences Across Countries

Since our theoretical model presupposes country-level heterogeneity with respect to time preference rates, it is worthwhile to ascertain that time preferences systematically differ across countries in reality. The most comprehensive evidence on this topic stems from the recent study by Falk et al. (2017). The authors have conducted a representative survey of 80,000 respondents in 76 countries to measure, among other things, cross-country differ-

[5] Board and Meyer-Ter-Vehn (2015) construct an industry equilibrium where relational contracting takes place between employers and employees.

[6] In a recent contribution, Kukharskyy (2016) finds that managerial long-term orientation facilitates relational contracting in global sourcing and may serve as a source of a country's comparative advantage.

ences in patience. Following the conventional approach in capturing time preferences (see Frederick et al. 2002), survey participants were asked to decide between receiving a payment today or larger payment in 12 months.[7] These responses were used to construct a country's average patience score. As illustrated in Figure 1, the variation in patience across countries is substantial, whereby dark blue (red) color depicts countries with patience level which is 0.55 standard deviations higher (respectively, lower) than world average. Furthermore, the authors calculate t-tests for all possible (2,850) pairwise comparisons of patience levels between countries and find that 83% of these comparisons are significant at 1 percent level.[8]

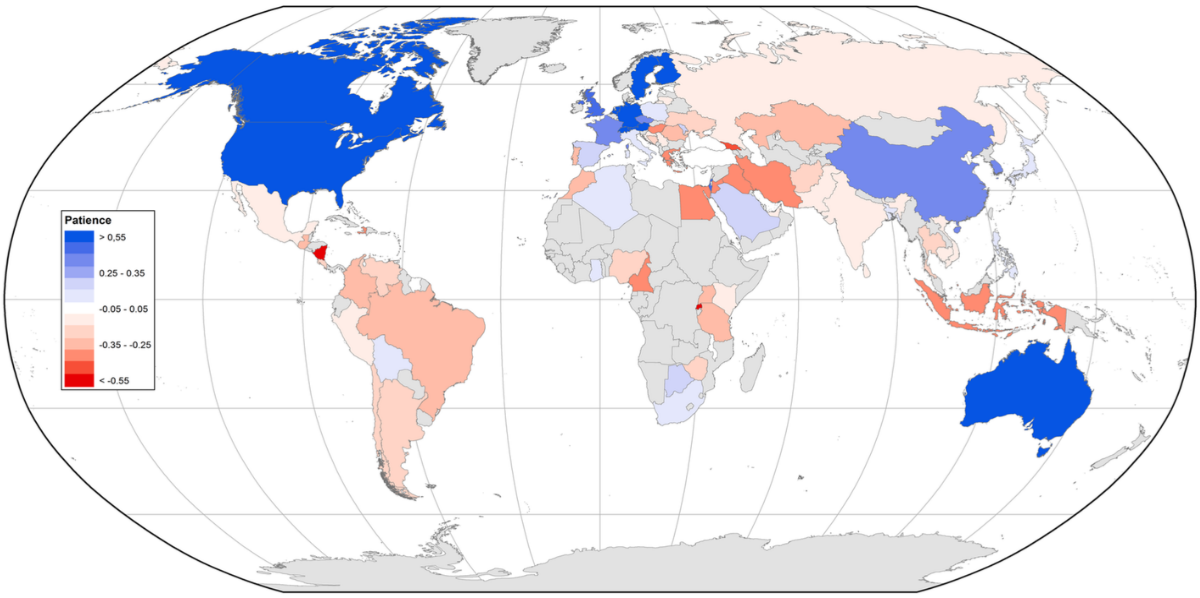

Figure 1: *World map of patience. Source: Falk et al. (2017).*

The second well-established measure of time preference rates is the index of a country's long-term orientation by Hofstede et al. (2010). The authors define long-term orientation as the cultural value that "stands for the fostering of virtues oriented towards future rewards, in particular, perseverance and thrift" (p. 239) and show that this measure is positively correlated with the importance ascribed to receiving profits in the future rather than obtaining short-term benefits.[9] This score is available for 91 countries and is widely recognized in the economic discipline as a valid proxy for a country's time-preference rate (see, e.g., Galor

7 To ensure comparability across countries, monetary amounts were expressed in local currency and scaled relative to median household income, see Falk et al. (2017) for details.

8 Apart from cross-country differences in patience, the authors also document substantial variation in time preference rates within countries. The latter finding is also well aligned with our theoretical model.

9 This measure is constructed based on several questions from the well-known World Values Survey. For instance, a country is considered to be more long-term oriented if a higher fraction of respondents choose "thrift, saving money and things" as an answer to the following question: "Here is a list of qualities that children can be encouraged to learn at home. Which, if any, do you consider to be especially important?"

and Özak, 2016). Figure 2 plots Hofstede's measure of long-term orientation, which varies between 0 (short-term orientation) and 100 (long-term orientation), whereby darker color represents higher long-term orientation. Once again, we observe a substantial variation in time preference rate between countries.[10]

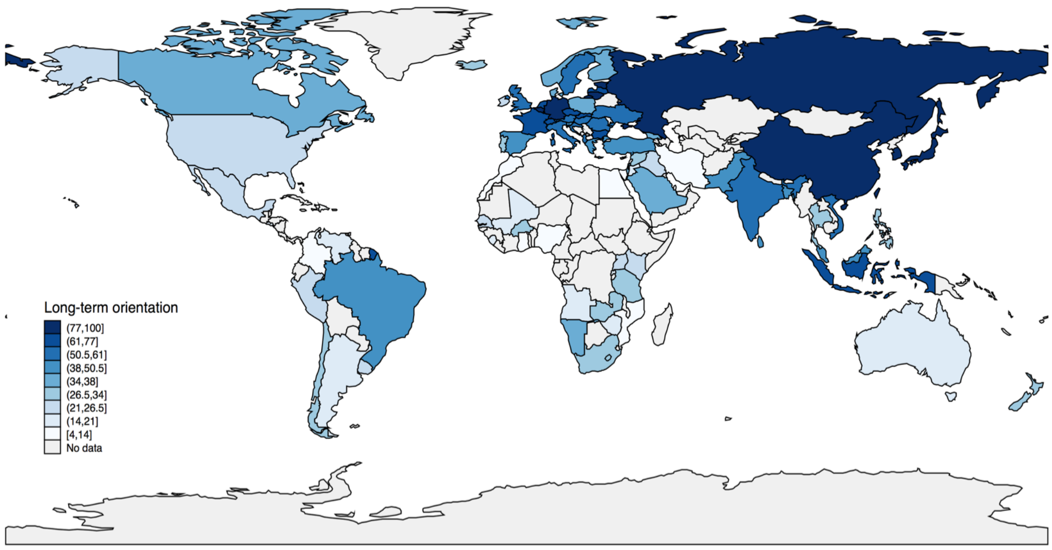

Figure 2: *World map of long-term orientation. Source: Own illustration based on Hofstede et al. (2010).*

After reviewing the evidence on the heterogeneity across countries with respect to patience, we now address how time preference rates fit into the paradigm of proximate and fundamental determinants of economic performance and into our own analysis. The key idea of this paper is to analytically establish that low rates of time preference are a fundamental driver for the maintenance of relational contracts between firms and suppliers, which positively feeds into total factor productivity – a proximate cause of the economic well-being – and the welfare itself. The importance of this channel derives from the fact that the slicing-up of the chain of value added is ubiquitous today (see Antràs 2015).

It is important to stress that we are not claiming that relational contracts are exclusively established by low time preference rates, nor are we insisting that there are no other correlates of low time preference rates that may positively feed into the proximate causes of economic welfare. For example, relational contracts may also be the result of 'trust', as highlighted in a large literature following Arrow (1972)[11] and, for another example, time preference rates also

10 Casual inspection of Figures 1 and 2 reveals that the correlation between the measure of patience by Falk et al. (2017) and the measure of long-term orientation by Hofstede et al. (2010) is not perfect. Nevertheless, Falk et al. (2017) report significant correlation between the two measures, with the Spearman's rho coefficient of 0.43.

11 It should be pointed out that 'trust', as a concept, has remained somewhat opaque and that there is no unanimity on its definition. In fact, definitions range from general notions (such as 'mutual confidence')

feed into factor accumulation as stressed in traditional growth theory. However, we believe that the mechanism that we highlight in the current paper is important in practice and has not been stressed in the literature on the fundamental causes of economic well-being.[12]

It should be further noted that, akin to factor endowments in Heckscher-Ohlin theory, a country's rate of time preference in our model is treated as a primitive, exogenous factor. We fully acknowledge that, just as a country's factor endowment is shaped by migration and capital accumulation, so are time preference rates possibly shaped by various cultural, psychologic, sociologic, geographic, and economic factors. We are, to the best of our knowledge, aware of two alternative narratives which attempt to explain differences in time preference rates across countries. The first one traces time preferences back to geographic factors: Galor and Özak (2016) argue that variation in the natural return to agricultural investments triggered learning processes among populations, which have had a persistent effect on the distribution of time preferences across countries. Chen (2013) advances an alternative explanation, which relates the long-term orientation of countries to the structure of their languages. More specifically, countries with a higher share of individuals that speak a language with weak future time reference appear to be more long-term oriented.[13]

Both of these narratives raise a number of issues just as the more general recent research on the various fundamental causes of economic well-being, despite intriguing natural experiments and identification strategies, leaves open various endogeneity concerns.[14] What is crucial for our analysis, however, is that both above-mentioned narratives relate the distribution of time preference rates across countries to factors that are exogenous to a country's current economic development. Moreover, we are not aware of any empirical study that would establish a causal effect of the economic development of a country on its time preference rates. This gives us reason to take a country's time preference rate as exogenous to its economic welfare in our theoretical model. Against the background of the afore-mentioned

to specific interpretations which use it almost synonymously to the rate of time preference (see McLeod 2007). In our empirical analysis, we control for a country's level of trust using the conventional proxy from the World Values Survey.

12 Our analysis may thus be seen as an implementation of the suggestion for future research expressed by Fuchs-Schündeln and Hassan (2016), to write models that formalize determinants of economic outcomes that are outside of our standard models.

13 Languages with weak time reference are those where the habit of speech does not strongly separate the future from the present grammatically (see Chen 2013).

14 See Fuchs-Schündeln and Hassan (2016) for a recent critical review of the state of the art of the research on the fundamental determinants of the standard of living across countries.

intricacies, however, we take a modest approach in our empirical analysis in section 4 and do not make any causal claims about the relationship between time-preference rates and welfare.

3 Theoretical Framework

3.1 Benchmark Model

3.1.1 Set-up

The model economy has two industries, a traditional and a modern one. The traditional industry produces a homogenous good under constant returns to scale and perfect competition. The modern industry produces a continuum of differentiated varieties under monopolistic competition as in Dixit and Stiglitz (1977). In the modern industry, there are two types of firms, headquarter companies and manufacturing suppliers, defined at length further below. The economy is populated by $L = l + \ell$ individuals (consumer-workers). l individuals possess entrepreneurial abilities, which allow them to establish new headquarter firms and become entrepreneurs. ℓ individuals have managerial abilities, which allow them to become managers of supplier firms. We assume that the pool of potential entrepreneurs is strictly lower than the mass of potential managers, i.e. $l < \ell$. Individuals that do not select to become entrepreneurs or managers are employed as workers either in the traditional or in the modern industry. Each individual is endowed with a unit of inelastically supplied labor.[15]

Demand. The utility function is identical across individuals and takes the following form:

$$U = x_T + \zeta \ln X \quad , \quad X = \left[\int_0^N x(i)^\alpha \mathrm{d}i \right]^{1/\alpha} , \tag{1}$$

where x_T denotes consumption of the homogeneous traditional good (chosen as numéraire), X is the (constant-elasticity-of-substitution) basket of differentiated varieties of the modern good, and N is the endogenous mass of available varieties. Parameter $\zeta > 0$ is a measure of the intensity of preferences for differentiated goods and $\alpha \in (0, 1)$ is a parameter related to the elasticity of substitution between any two varieties, $\sigma = 1/(1 - \alpha)$.

[15] Since the effect of patience on the accumulation of capital is well-known from the theories of intertemporal optimization and endogenous economic growth mentioned in the introduction, we do not introduce capital as a further (primary) production factor into the current model. However, as will become clear below, our model features an endogenous accumulation of intermediate factors of production.

Individuals maximize their utility given the budget constraint, $PX + x_T = Y$, whereby Y denotes a consumer's income and P represents the aggregate price index, defined by:

$$P = \left[\int_0^N p(i)^{\frac{\alpha}{\alpha-1}} \mathrm{d}i \right]^{\frac{\alpha-1}{\alpha}}, \tag{2}$$

with $p(i)$ denoting the price of variety i. Utility maximization yields demand functions for the differentiated goods bundle, $X = \zeta P^{-1}$ and the homogenous good, $x_T = Y - \zeta$. We assume $\zeta < Y$ to ensure positive consumption of the numéraire good. Total (inverse) demand for a differentiated variety i is obtained by aggregating individual demands over the L consumers:

$$p(i) = \zeta x(i)^{\alpha-1} X^{-\alpha} L^{1-\alpha}. \tag{3}$$

A consumer's indirect utility (welfare) is given by:

$$V = Y + \zeta \ln X - \zeta. \tag{4}$$

Notice that welfare increases in the aggregate consumption index, X.

Production. The numéraire is produced under perfect competition with a unit labor input requirement. This pins down the economy-wide wage at unity, i.e. $w = 1$.

In the modern industry, each firm produces a single variety i of a differentiated good under increasing returns to scale. As in Melitz (2003), firms are heterogeneous with respect to their productivities. Prior to entry, potential entrepreneurs have to bear a fixed cost of entry, f_E. This cost is measured in units of labor and is identical across firms. Upon paying f_E, entrepreneurs draw their productivities θ from a commonly known distribution function $\gamma(\theta)$, which has a positive support over $(\underline{\theta}, \infty)$ and has a continuous cumulative distribution $\Gamma(\theta)$. If the productivity draw is sufficiently low, an entrepreneur may decide to immediately exit and seize her outside option, $w = 1$. If an entrepreneur decides to enter the market, she starts a new company, referred to hereafter as a headquarter or final good producer, H. The entrepreneur becomes the owner-manager of the firm and reaps this firm's operating profit.

We assume that production of final goods requires a cooperation with a manufacturing supplier, M. The latter is run by a single (owner-)manager, who reaps the firm's pure profit. Each M has to bear advertising expenses, ε, needed to secure a deal with a given headquarter firm. Since the pool of potential managers is assumed to be strictly larger than the mass of entrepreneurs (headquarter firms), supply managers will increase the advertising expenses to the point where their pure profits are equal to the outside option, $w = 1$.

As in Antràs and Helpman (2004), production of any variety i necessitates two intermediate inputs: headquarter services $h(i)$, supplied by H, and manufacturing components $m(i)$, supplied by M. Intermediates $h(i)$ and $m(i)$ are produced with one unit of labor per unit of output and are combined to final goods according to the following Cobb-Douglas production function:

$$x(i) = \theta \left(\frac{h(i)}{\eta}\right)^{\eta} \left(\frac{m(i)}{1-\eta}\right)^{1-\eta}, \tag{5}$$

whereby $\eta \in (0,1)$ parameterizes the relative importance of headquarter inputs in the production process (henceforth, headquarter intensity). Both inputs are assumed to be relationship-specific, i.e., have a higher value inside a relationship (for which they were customized) than outside of it. Utilizing (5) in (3), the joint revenue from cooperation of H and M is given by:

$$R(i) = \zeta \theta^{\alpha} \left(\frac{h(i)}{\eta}\right)^{\alpha\eta} \left(\frac{m(i)}{1-\eta}\right)^{\alpha(1-\eta)} X^{-\alpha} L^{1-\alpha}. \tag{6}$$

Note that a firm's revenue negatively depends on the aggregate production index, X. Intuitively, higher aggregate output leads to a lower demand for goods of a single firm, see (3). The index X is exogenous to a firm but is endogenously determined in the industry equilibrium. To simplify the notation, we drop the variety index i from now on.

In our model, firms play an infinitely repeated game, described in detail further below. Firm leaders discount future profits, whereby $1/(1+\delta_H)$ and $1/(1+\delta_M)$ denote the discount factors of a headquarter and a supplier manager, respectively. Managers with a high time preference rate, δ strongly discount future profits and, hence, are more short-term oriented than managers with a low δ. We assume that entrepreneurs are ex-ante uncertain about the time preference rate of the supplier manager and learn the latter only after the relationship with a given M has been established. We assume that δ_M is drawn from a commonly known distribution function $\phi(\delta_M)$, which has support over $(\underline{\delta}_M, \bar{\delta}_M)$.[16] For simplicity, we do not introduce heterogeneity with respect to the time preference rate of headquarter managers,

[16] The heterogeneity of individual time preference rates has been established in many different contexts, see Lawrance (1991), Samwick (1998), Warner and Pleeter (2001) and Frederick et al. (2002). Furthermore, Bloom and Van Reenen (2012), Bloom et al. (2012), Graham et al. (2013) and Poterba and Summers (1995) provide evidence for differences in *managerial* time horizons across firms within countries.

δ_H into the model.

Contracts. Parties transact in an environment of contractual incompleteness, i.e., courts cannot verify the quality of inputs.[17] Hence, firms cannot sign legally enforceable contracts that stipulate a price for manufacturing components in exchange for a given m. Since no formal contracts can be signed ex-ante, parties organize their cooperation in one of the following two ways: First, firms can bargain about the division of surplus ex-post, i.e., after investment in manufacturing inputs had been sunk. In this case, a final good producer obtains an exogenous fraction $\beta \in (0, 1)$ of the ex-post gains from the relationships, while the supplier gets a fraction $(1 - \beta)$.[18] Second, final good producers and their suppliers may enter the following implicit agreement: A supplier promises to provide the first-best level of manufacturing components, m and H promises to compensate M with an ex-post bonus, B if the supplier honors this agreement. We borrow from Baker et al. (2002) the names '$s$pot contracting' (s) for the former and '$r$elational contracting' (r) for the latter $g$overnance mode (g).

Since the quality of inputs is not verifiable, a relational agreement cannot be enforced by the courts, however. Hence, a supplier may renege on the relational contract by ex-ante underinvesting in manufacturing components. Similarly, a final good producer may underinvest in headquarter inputs and refuse to transfer the promised bonus to the supplier. In case any party reneges on the implicit agreement, the relational contract is broken and the surplus in this period is shared via ex-post bargaining (with H obtaining a fraction β of the revenue). Following Baker et al. (2002), we assume that parties live forever under spot contracting after one of the parties deviates from the implicit agreement.

Timing. The game begins with potential entrepreneurs bearing the fixed cost of entry f_E and drawing their productivities θ, which become common knowledge for all market participants. Subsequently, entrepreneurs decide whether to start production or seize their outside option, $w = 1$. Those entrepreneurs who enter the market call for proposals from potential suppliers, who conduct advertisement expenses ε to receive an order from a given H.[19] After H and M match, entrepreneurs discover the time preference rate of the respective

[17] As shown in the extension, our results continue to hold in a framework with partial contractibility.

[18] The parameter β captures the bargaining power of the final good producer in the Nash bargain. We follow Antràs and Helpman (2004) and assume β to be exogenous, for simplicity, rather than modeling it as an endogenous variable as in the well-known analysis by Rubinstein (1982), which would considerably complicate our analysis.

[19] Note that we abstract from the possibility that suppliers strategically exploit low discount factors.

suppliers. Consequently, final good producers choose the governance mode, $g \in \{s, r\}$.

If H selects spot contracting (s), the timing of a single period of the game reads:

s_1: H and M simultaneously and independently invest in h and m, respectively.

s_2: H and M negotiate about the division of surplus, whereby H obtains the fraction β of the revenue.

s_3: Final goods are produced and sold. The revenue is distributed between parties according to the sharing rule stipulated in s_2.

If H selects relational contracting (r), the timing of a single period of the game reads:

r_1: Parties promise to provide the first-best level of inputs h and m. H promises to pay a bonus B to M if the latter adheres to this agreement.

r_2: H and M simultaneously invest in h and m, as agreed in r_1.

r_3: Final goods are produced and sold. The revenue is distributed between parties according to the compensation rule agreed upon in r_1.

The cycle g_1-g_3, $g \in \{s, r\}$ is repeated in all future periods of the game, $t = 1, ..., \infty$.

Before describing the equilibrium of the game, it is worth pausing to briefly discuss the (implicit) assumptions of the framework delineated above. First, we assume that spot and relational contracting are the only two available governance modes. While this dichotomy is certainly simplistic and does not do justice to the plethora of alternative mechanisms suggested in contract theory (see, for instance, Bolton and Dewatripont 2005), we believe that, on a high abstraction level, it provides a fair first approximation of real-world commercial transactions (see Baker et al. 2002, Halonen 2002). Second, to keep our general equilibrium model analytically tractable, we assume away many aspects that have been emphasized in the recent literature on relational contracting, for instance, asymmetric information, supplier re-matching, constraints on bonus payments, etc. (see Gil and Zanarone 2015 for an overview of this literature). Third, our model does not contain ex-ante transfers from M to H, occasionally assumed in the literature to ensure that final good producers reap the *entire* net surplus from cooperation, see, e.g., Antràs and Helpman (2004). Since such transfers are hard to reconcile with real-world commercial transactions (in particular, in a repeated-game context), we rule them out in the current model.[20] Lastly, note that our baseline model assumes fully incomplete contracts, in the sense that courts cannot verify and enforce any investments under spot contracting. In Appendix A.4, we provide an extension of the benchmark framework which allows for partial contractibility and shows that our results continue to hold in the more general setting.

3.1.2 Equilibrium investments and profits

Spot contracting. Since the level of h and m is not enforceable, each firm chooses its profit-maximizing inputs, taking the investment of the production partner as given. Formally, H chooses h to maximize $\beta R(h,m) - h$, whereas M picks m to maximize $(1-\beta)R(h,m) - m$. Using (6), these maximization problems yield equilibrium investment levels:

$$h^s = \beta\eta\alpha R^s \quad , \quad m^s = (1-\beta)(1-\eta)\alpha R^s, \tag{7}$$

and the associated revenue under spot contracting:

$$R^s = \left(\beta^\eta (1-\beta)^{(1-\eta)}\right)^{\frac{\alpha}{1-\alpha}} \Theta A X^{-\frac{\alpha}{1-\alpha}}, \tag{8}$$

where $\Theta \equiv \theta^{\frac{\alpha}{1-\alpha}}$ is an alternative measure of firm productivity and $A \equiv \zeta^{\frac{1}{1-\alpha}} \alpha^{\frac{\alpha}{1-\alpha}} L$ is a parameter defined for notational simplicity. Using (7) in (3), we obtain the price charged by a single final good producer:

$$p^s = \frac{1}{\alpha\theta} \frac{1}{\beta^\eta (1-\beta)^{1-\eta}}, \tag{9}$$

where $1/\alpha$ is the monopoly mark-up over marginal costs $1/\theta$, and $1/\beta^\eta(1-\beta)^{1-\eta} > 1$ is the cost factor associated with incomplete contracts. Using (7) and (8) in maximization problems above, we obtain H's and M's profits under spot contracting:

$$\begin{aligned} \pi_H^s &= \beta^{\frac{1-\alpha(1-\eta)}{1-\alpha}} (1-\beta)^{\frac{\alpha(1-\eta)}{1-\alpha}} (1-\alpha\eta) \Theta A X^{-\frac{\alpha}{1-\alpha}}, \\ \pi_M^s &= \beta^{\frac{\alpha\eta}{1-\alpha}} (1-\beta)^{\frac{1-\alpha\eta}{1-\alpha}} (1-\alpha(1-\eta)) \Theta A X^{-\frac{\alpha}{1-\alpha}} - \varepsilon. \end{aligned} \tag{10}$$

Relational contracting. When H and M enter a relational contract, they implicitly agree

[20] Yet, our key results continues to hold when we allow for lump-sum transfers, see Kukharskyy and Pflüger (2010).

to provide investments that maximize joint firm profits, $\pi(h,m) = R(h,m) - h - m$. Using (6), this maximization problem yields equilibrium investment levels:

$$h^r = \eta\alpha R^r \quad , \quad m^r = (1-\eta)\alpha R^r, \tag{11}$$

and the associated revenue under relational contracting:

$$R^r = \Theta A X^{-\frac{\alpha}{1-\alpha}}. \tag{12}$$

A simple comparison of (7) and (11) implies that, for any given R, both parties' investments under spot governance are lower than under relational contracting. Intuitively, with incomplete contracts, parties engaged in spot contracting capture in the ex-post bargaining only a fraction of the marginal return to their investments and, therefore, underinvest ex-ante. As a result, the revenue under spot contracting is lower than under relational governance, $R^s < R^r$. Given that h^r and m^r maximize joint firm profits, they will be referred to as first-best investment levels from the viewpoint of producers.[21] Higher efficiency of relational contracting is also reflected in the equilibrium price:

$$p^r = \frac{1}{\alpha\theta}, \tag{13}$$

which is lower than p^s from (9) for all $\beta, \eta \in (0,1)$. If a supplier provides the first-best level of manufacturing components, m^r, the headquarter compensates him with a bonus B and both parties' profits are given by $\pi_H^r = R^r - h^r - B$ and $\pi_M^r = B - m^r - \varepsilon$. Using (11) and (12) therein, profits on the equilibrium path under relational contracting read:

$$\pi_H^r = \Theta A X^{-\frac{\alpha}{1-\alpha}}(1-\alpha\eta) - B \quad , \quad \pi_M^r = B - \alpha(1-\eta)\Theta A X^{-\frac{\alpha}{1-\alpha}} - \varepsilon. \tag{14}$$

If the relational contract is self-enforcing, there must exist a bonus B which ensures both parties' non-negative profits in equilibrium. To derive this bonus, we now turn to the off-the-equilibrium (deviation) path.

[21] Since firms have monopoly power in this model, this is not the first-best solution from the viewpoint of the economy.

Since a relational contract is implicit and not enforceable by the courts, each party may renege on it. Consider first a supplier's deviation (D) incentives. M defects on the relational agreement by providing a sub-optimal level of manufacturing inputs, $m < m^r$, while H behaves cooperatively (i.e., invests h^r). In this case, the relational contract is broken and the distribution of this period's revenue between H and M occurs according to ex-post bargaining with exogenous shares β and $(1-\beta)$, respectively. M's maximization problem on the deviation path is $\max_m (1-\beta)R(h^r, m) - m$, whereby h^r is H's first-best level of headquarter services from (11). This maximization problem implies the following investment level and revenue:

$$m^D = (1-\beta)(1-\eta)\alpha R^D \quad , \quad R^D = (1-\beta)^{\frac{\alpha(1-\eta)}{1-\alpha(1-\eta)}} \Theta A X^{-\frac{\alpha}{1-\alpha}}. \tag{15}$$

A simple comparison of (15) and (11) implies a lower investment into manufacturing components on the deviation path as compared to the first-best level, i.e. $m^D < m^r$. Utilizing (15) in M's maximization problem, a supplier's equilibrium profit on the deviation path reads:

$$\pi_M^D = (1-\beta)^{\frac{1}{1-\alpha(1-\eta)}} (1-\alpha(1-\eta)) \Theta A X^{-\frac{\alpha}{1-\alpha}} - \varepsilon. \tag{16}$$

Given the trigger strategy specified above, M can reap these deviation profits only once and is 'punished' by non-cooperation in all future periods of the game.[22] A supplier honors the relational contract whenever the present value of his profits under relational contracting, $\pi_M^r + \sum_{t=1}^{\infty} \left(\frac{1}{1+\delta_M}\right)^t \pi_M^r = \pi_M^r + \frac{\pi_M^r}{\delta_M}$, is larger than his one-shot deviation profit, π_M^D plus the present value of profits in all post-deviation periods of the game, $\sum_{t=1}^{\infty} \left(\frac{1}{1+\delta_M}\right)^t \pi_M^s = \frac{\pi_M^s}{\delta_M}$. M's incentive compatibility constraint, ICC_M thus reads:

$$\pi_M^r + \frac{\pi_M^r}{\delta_M} \geq \pi_M^D + \frac{\pi_M^s}{\delta_M}, \tag{17}$$

[22] We assume that neither of the existing partners can enter into a new relational agreement with a third party. This can be motivated by assuming that all existing cooperations are registered in a commercial registry, which is common knowledge for all market participants. However, neither the terms of the relational contract nor the identity of the reneging party can be detected by a third person. By assuming that a party who was cheated upon in the relational contract cannot credibly signalize her cooperative behavior to third parties, no third party will have an incentive to enter into a new relational agreement with a party who just contracted out.

whereby π_M^s, π_M^r and π_M^D are given by (10), (14) and (16), respectively. The headquarter has an incentive to stipulate the smallest possible bonus B, which still fulfills the ICC_M. Manipulating (17), this bonus can be expressed as

$$B = \left[\alpha(1-\eta) + \frac{1-\alpha(1-\eta)}{1+\delta_M}\left(\delta_M(1-\beta)^{\frac{1}{1-\alpha(1-\eta)}} + \beta^{\frac{\alpha\eta}{1-\alpha}}(1-\beta)^{\frac{1-\alpha\eta}{1-\alpha}}\right)\right]\Theta A X^{-\frac{\alpha}{1-\alpha}}. \tag{18}$$

Utilizing (18) in (14), we obtain per-period profits of H and M on the equilibrium path under relational contracting:

$$\begin{aligned}\pi_H^r &= \left[(1-\alpha) - \frac{1-\alpha(1-\eta)}{1+\delta_M}\left(\delta_M(1-\beta)^{\frac{1}{1-\alpha(1-\eta)}} + \beta^{\frac{\alpha\eta}{1-\alpha}}(1-\beta)^{\frac{1-\alpha\eta}{1-\alpha}}\right)\right]\Theta A X^{-\frac{\alpha}{1-\alpha}},\\ \pi_M^r &= \frac{1-\alpha(1-\eta)}{1+\delta_M}\left(\delta_M(1-\beta)^{\frac{1}{1-\alpha(1-\eta)}} + \beta^{\frac{\alpha\eta}{1-\alpha}}(1-\beta)^{\frac{1-\alpha\eta}{1-\alpha}}\right)\Theta A X^{-\frac{\alpha}{1-\alpha}} - \varepsilon.\end{aligned} \tag{19}$$

A supplier's profit is non-negative for all parameter values, hence M's participation constraint is fulfilled. The sign of π_H^r depends on the sign of the term in squared brackets, which may be positive or negative. In Appendix A.1, we show that $\pi_H^{r\prime}(\delta_M) < 0$, i.e., a headquarter's profit is more likely to be positive the more long-term oriented the supplier. Intuitively, when the supplier places a higher value on future profits, the ICC_M can be satisfied with a smaller bonus, see (18), and H's profits from relational contracting increase.

A low time preference rate δ_M which ensures a positive π_H^r, is not yet a sufficient condition for the incentive compatibility of a relational agreement. A headquarter may renege on this implicit contract by underinvesting in h and, subsequently, refusing to provide the ex-post bonus B. H's maximization problem on the deviation path reads $\max \beta R(h, m^r) - h$, whereby m^r is the first-best level of manufacturing inputs from (11). This maximization problem implies the following investment and revenue on H's deviation path:

$$h^D = \beta\eta\alpha R^D \quad , \quad R^D = \beta^{\frac{\alpha\eta}{1-\alpha\eta}}\Theta A X^{-\frac{\alpha}{1-\alpha}}. \tag{20}$$

A simple comparison of (20) and (11) implies that H's investment on the deviation path is lower as compared to the first-best level, i.e., $h^D < h^r$. Utilizing (20) in H's maximization problem, a headquarter's profit on the deviation path reads:

$$\pi_H^D = \beta^{\frac{1}{1-\alpha\eta}}(1-\alpha\eta)\Theta A X^{-\frac{\alpha}{1-\alpha}}. \tag{21}$$

A headquarter complies with the relational integration contract only if the following incentive compatibility constraint, ICC_H is fulfilled:

$$\pi_H^r + \frac{\pi_H^r}{\delta_H} \geq \pi_H^D + \frac{\pi_H^s}{\delta_H}. \tag{22}$$

Using (10), (19) and (21) therein, we can derive the cutoff time preference rate that satisfies this ICC_H with equality:

$$\hat{\delta}_M \equiv \frac{(1-\alpha)(1+\delta_H) - \beta^{\frac{\alpha\eta}{1-\alpha}}(1-\beta)^{\frac{\alpha(1-\eta)}{1-\alpha}}\left[(1-\beta)(1-\alpha(1-\eta))(1+\delta_H) + \beta(1-\alpha\eta)\right] - \delta_H(1-\alpha\eta)\beta^{\frac{1}{1-\alpha\eta}}}{\left[(1-\alpha(1-\eta))(1-\beta)^{\frac{1}{1-\alpha(1-\eta)}} - (1-\alpha)\right](1+\delta_H) + (1-\alpha\eta)\left[\delta_H\beta^{\frac{1}{1-\alpha\eta}} + \beta^{\frac{1-\alpha(1-\eta)}{1-\alpha}}(1-\beta)^{\frac{\alpha(1-\eta)}{1-\alpha}}\right]}. \tag{23}$$

If a supplier is sufficiently long-term oriented, i.e., $\delta_M \leq \hat{\delta}_M$, the relational agreement is self-enforcing. In contrast, if $\delta_M > \hat{\delta}_M$, the relational contract is not incentive-compatible. In Appendix A.1, we show that, for any $\delta_M \leq \hat{\delta}_M$, we have $\pi_H^r > \pi_H^s$. This yields

Lemma 1. Profits of final good producers engaged in relational contracting, π_H^r are larger than profits obtained under spot contracting, π_H^s.

Proof. See Appendix A.1.

Intuitively, firms engaged in relational contracting avoid ex-post hold-up and, thereby, prevent inefficiencies due to ex-ante underinvestment, which plague commercial relationships under spot contracting.

Two important results are worth mentioning in view of equation (23). First, the feasibility of relational contracting does not depend on the firm-specific productivity, θ. This result builds on the fact that firm productivity linearly affects firm profits both on the equilibrium and the deviation path. Therefore, in a given industry, there may exist firms which differ in their profitability despite the identical productivity, θ. Second, since the governance regime (be it spot or relational) stipulated in period $t = 0$ is a subgame-perfect equilibrium in each stage of the repeated game, the parties live forever under the regime agreed upon in the very first period. Consequently, differences in profitability between firms persist over time. We summarize these findings in

Corollary 1. In a given industry, seemingly similar enterprises may exhibit persistent differences in terms of their profitability.

Before turning to the general equilibrium representation of our model, it is worth pausing to briefly discuss the evidence for this corollary and our micro-level foundation. Recent empirical literature documents substantial performance difference (in particular with respect to profitability) across firms with similar production technologies, even within narrowly defined industries (see Gibbons and Henderson 2013 and Syverson 2011 for extensive surveys). An emerging explanation for this phenomenon lies in superior organizational practices (Bloom and Van Reenen 2007, 2010, and Bertrand and Schoar 2003) and, in particular, the ability of firms to enter relational contracts with their suppliers (Gibbons and Henderson 2012, and Helper and Henderson 2014). Moreover, the key mechanism stressed in our analysis – the mitigation of an underinvestment problem via trust-based contracting – has recently received strong support in an empirical analysis of the German automotive industry, which uses unique data on individual supplier-buyer relationships (Calzolari et al. 2015). Overall, this micro-level evidence reinforces our view of relational contracting as an integral part of commercial transactions and paves the way for the general equilibrium analysis.

3.1.3 General equilibrium

Similar to Melitz (2003), equilibrium in the modern sector is characterized by zero-cutoff profit and free entry conditions. A zero-cutoff profit condition (ZCP) dictates that, upon drawing a productivity θ and discovering the supplier's time preference rate δ_M, the cutoff entrepreneur is indifferent between starting production or seizing her outside option, $w = 1$. Given that our model exhibits two kinds of firms – those engaged in spot and relational contracting – we have two zero-cutoff profit conditions. The first ZCP defines the cutoff θ^s, which solves $\pi_H^s(\theta^s) = 1$. Using (10) therein, we obtain the threshold productivity level, from which on firms are active in spot contracting:

$$\theta^s = \left(\beta^{\frac{1-\alpha(1-\eta)}{1-\alpha}}(1-\beta)^{\frac{\alpha(1-\eta)}{1-\alpha}}(1-\alpha\eta)A\right)^{\frac{\alpha-1}{\alpha}} X. \tag{24}$$

The second ZCP defines the cutoff θ^r, which solves $\pi_H^r(\theta^r) = 1$. Using (19), we obtain the threshold productivity level, from which on firms engage in relational contracting:

$$\theta^r = \left(\left[(1-\alpha) - \frac{1-\alpha(1-\eta)}{1+\delta_M}\left(\delta_M(1-\beta)^{\frac{1}{1-\alpha(1-\eta)}} + \beta^{\frac{\alpha\eta}{1-\alpha}}(1-\beta)^{\frac{1-\alpha\eta}{1-\alpha}}\right)\right] A\right)^{\frac{\alpha-1}{\alpha}} X. \tag{25}$$

The free entry condition, FE ensures that, in equilibrium, the expected net present value of the entrepreneurial profit flow is equal to the fixed cost of entry:

$$\int_{\underline{\delta}_M}^{\hat{\delta}_M}\int_{\theta^r}^{\infty} \frac{(1+\delta_H)\,\pi_H^r}{\delta_H}\,\gamma(\theta)\phi(\delta_M)\,d\theta\,d\delta_M + \int_{\hat{\delta}_M}^{\bar{\delta}_M}\int_{\theta^s}^{\infty} \frac{(1+\delta_H)\,\pi_H^s}{\delta_H}\,\gamma(\theta)\phi(\delta_M)\,d\theta\,d\delta_M = f_E, \tag{26}$$

whereby θ^r and θ^s are given, respectively, by (24) and (25), $\hat{\delta}_M$ is given by (23), and π_H^s and π_H^r are given by (10) and (19), respectively. The general equilibrium of this model is fully characterized by equation (26).[23] For specific parameterizations of $\gamma(\theta)$ and $\phi(\delta_M)$, this condition provides a solution for the aggregate production index X, which uniquely pins down all other endogenous variables of interest (the number of firms, price index, etc.).[24]

Following a large part of literature on firm heterogeneity, we assume that firm productivities are distributed Pareto:[25]

$$\Gamma(\theta) = 1 - \left(\frac{\underline{\theta}}{\theta}\right)^{\kappa} \quad , \quad \gamma(\theta) = \kappa\underline{\theta}^{\kappa}\theta^{-\kappa-1} \quad , \quad \theta \geq \underline{\theta} > 0, \tag{27}$$

where $\underline{\theta}$ is the lower bound of the support and κ is a shape parameter of this function. In order to ensure that firm size is finite, we impose $\kappa > \alpha/(1-\alpha)$. To keep our analysis as simple as possible, we assume a binomial distribution of time preference rates: With probability ρ, a final good producer matches with a long-term oriented supplier, who has a *low* time preference rate, $\delta_M^{low} < \hat{\delta}_M$, while with the inverse probability $(1-\rho)$, the supplier's time preference rate is *high*, $\delta_M^{high} > \hat{\delta}_M$.

In Appendix A.2, we derive the closed-form solution for the production index X and show that the latter increases in ρ. Intuitively, since firms engaged in relational contracting can avoid ex-post hold-up and ex-ante underinvestment, countries with a higher fraction of long-term oriented firms achieve a higher production level. According to equation (4), a larger X immediately gets reflected in a higher consumer welfare. We thus have

23 In this two-sector model, the general equilibrium follows immediately once the industry equilibrium in the modern sector is derived. More specifically, equilibrium in the modern sector determines that sector's labor use. The remaining labor is used to produce the outside good. By Walras law the expenses on the two goods just match the wage income generated in the economy.

24 For any given X, the competitive fringe of suppliers ensures that M's equilibrium pure profit is equal to a supply manager's outside option, $\pi_M^g(X,\theta,\varepsilon) = 1$, $g \in \{s,r\}$.

25 Apart from providing a good fit to the observed firm size distribution (see, e.g., Axtell 2001 and Helpman et al. 2004), the Pareto distribution proves to be analytically tractable (see, e.g., Antràs and Helpman 2004, and Melitz and Redding 2014).

Proposition 1. Countries with a higher prevalence of long-term oriented managers exhibit higher aggregate welfare.

Proof. See Appendix A.2.

We further show in Appendix A.3 that the total factor productivity, defined as an average productivity across all active producers, is increasing in ρ. Intuitively, in countries with a higher prevalence of long-term oriented managers, potential entrepreneurs expect larger profits (see Lemma 1) and, therefore, are more likely to enter the 'productivity lottery'. This, in turn, increases the number of most productive firms in the market. We thus have

Proposition 2. Total factor productivity is larger in countries with a higher prevalence of long-term oriented managers.

Proof. See Appendix A.3.

So far, we assumed that both parties' ex-ante investments are fully unverifiable by the courts. This assumption is certainly contestable given that some components of real-world commercial contracts can be verified and enforced by the courts. In Appendix A.4, we provide an extension of our baseline model, in which courts can partly verify both parties' inputs. We show that our theoretical results extend to the case of partial contractibility. To sum up, our general equilibrium model predicts that countries with a higher prevalence of long-term oriented managers exhibit higher welfare and total factor productivity. In the next section we turn to a brief empirical analysis of these theoretical predictions.

4 Empirical Implementation

4.1 Econometric Specification and Data

To examine the impact of long-term orientation on the economic well-being of nations (Proposition 1) and total factor productivity (Proposition 2), we test the following econometric model:

$$Y_i = \alpha Patience_i + \beta \boldsymbol{X}_i + \varepsilon_i, \tag{28}$$

where Y_i measures the respective economic outcome in country i, $\boldsymbol{X}_i$ is a vector of controls and ε_i is the error term. Our key explanatory variable is the average level of $Patience_i$ of economic agents in country i.

Following Gorodnichenko and Roland (2011, 2016), we take (the logarithm of) GDP per capita in 2000 (at purchasing power parity) from the Penn World Tables as our measure of economic well-being, henceforth *GDP per capita*.[26] To assess the impact of patience on total factor productivity (TFP), we consider three alternative measures conventionally used in the empirical literature: the log of TFP from the Penn World Tables, henceforth TFP_{PWT}, the log of TFP from Hall and Jones (1999), henceforth TFP_{HJ}, and the log of TFP from Jones and Romer (1999), henceforth TFP_{JR}.

We consider two alternative proxies for a country's average long-term orientation. Our baseline proxy for *Patience* stems from an international survey by Hens et al. (2016), conducted among 6912 university students in 53 countries. Following the methodology in Frederick (2005), the authors measure the preference for a lower immediate vs. a higher future payoff via the following hypothetical question:[27]

Which offer would you prefer?

A. a payment of $3400 this month

B. a payment of $3800 next month

We use the share of participants who decided to wait for a higher payoff in the future, as a proxy for *Patience*. This measure substantially varies across countries, with Germany being the most long-term oriented country in the dataset (89% of respondents chose option B), Nigeria the most short-term oriented (8% chose option B), and a standard deviation of 0.18.

Before introducing further measures, it is worth pausing to reflect a number of issues concerning the data and our baseline proxy for patience. First, since subjects of the survey by Hens et al. (2016) were university students, one might be worried that the sample is not representative of the respective country's population.[28] Yet, this general concern is less relevant in the current context, since the key explanatory variable of our theoretical model is the time preference rate of *managers* (rather than of a society as a whole). Moreover, the

[26] Our results are robust to consideration of any year in the range 2000-2010, as well as taking averages.

[27] The monetary payoffs were adjusted to each country's purchasing power parity and to monthly incomes and expenses of students. The question is hypothetical since no real payments were made.

[28] As mentioned in section 2, Falk et al. (2017) construct a qualitatively similar survey-based measure of patience based on a nationally representative sample of roughly 80,000 individuals in 76 countries. Given that the latter data are publicly not available, we cannot assess the correlation between these two alternative measures. Nevertheless, a casual observation of figures presented in Falk et al. (2017) generally confirms the country ranking in terms of patience reported in Hens et al. (2016).

fact that the survey sample in each country was defined in terms of a relatively homogenous group (first- and second-year students in economics and business departments) appears to be conducive for cross-national comparisons. Second, one might argue that our measure of patience simply picks up other country-level characteristics (such as propensity to save or institutional environment). We account for these potential confounding factors using an extended list of controls $\boldsymbol{X}_i$, introduced further below. A third concern is a relatively small number of countries represented in the survey. In view of this limitation, our empirical results are tentative and should be taken with care.

In the robustness checks, we approximate a country's level of patience with the index of long-term orientation by Hofstede et al. (2010). As mentioned in section 2, this index is constructed based on individuals' responses to several questions in the World Values Survey (WVS), such as whether children should be encouraged to learn at home the trait of "thrift, saving money and things". This index is available for 91 countries and, since WVS is a representative national survey, is likely to be characterized by a high degree of representativeness. However, one should also be aware of the limitations of this index to approximate a country's level of patience. Using the above-mentioned WVS question as an example, one could argue that the Hofstede's index reflects individuals' childrearing choices rather than their time preference rates.[29] For this reason, we take the measure from Hens et al. (2016) as our baseline proxy for a country's patience and report the results based on the Hofstede's long-term orientation index merely as a robustness check.

4.2 Results

As a first pass at the data, we regress the *GDP per capita* against *Patience*. As can be seen from column (1) in Table 1 and the corresponding scatterplot in Figure 3, the two measures are positively and significantly correlated, with a very high goodness of fit ($R^2 = 0.486$). Our baseline vector of controls draws on Gorodnichenko and Roland (2011) and consists of three groups of variables. First, to account for the role of geography in the economic development, we control for a country's absolute latitude and longitude, and include a dummy for being landlocked. Second, to ensure that our results are not driven by religious believes (and the

[29] This caveat may explain the fact that Spearman's rho correlation coefficient between the measure of patience by Hens et al. (2016) and Hofstede's long-term orientation is only 0.32, see also footnote 10.

associated differences in values and norms), we include a set of religion controls from Barro and McCleary (2003), who quantify percentages of population practicing major religions in 2000 (e.g., Protestant, Catholic, Muslim, Hindu, Buddhist, etc.). Third, we control for a country's legal origin (British, French, German, or Scandinavian), see La Porta et al. (2008). As can be seen from column (2) of Table 1, the coefficient of *Patience* declines in size but remains highly significant after the inclusion of these controls.

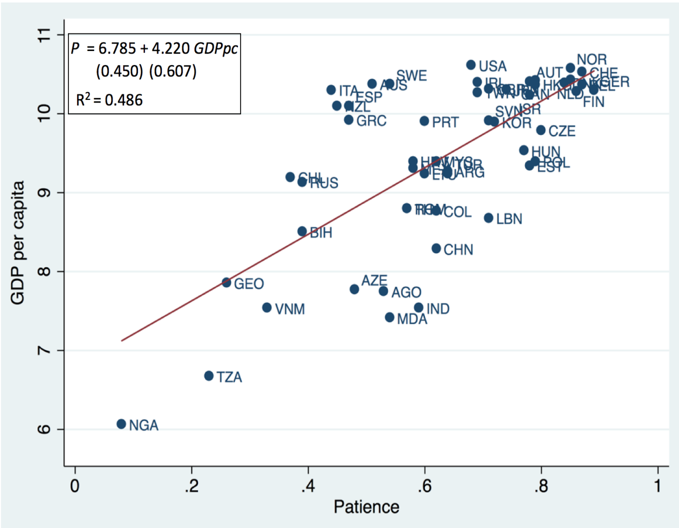

Figure 3: *Correlation between patience and GDP per capita.*

In columns (3) through (7), we include the vector of country-level controls, $\boldsymbol{X}_i$. To make sure that our measure of time preference does not merely reflect the propensity to save, we control in column (3) for a country's gross *Savings rate* (as a percent of GDP) in 2000 from the World Bank. Notice that the link between the time preference rate and the economic development goes beyond the effect of the savings rate, emphasized in the growth theory. In the remaining columns, we subsequently include controls for alternative determinants of economic development that have been shown to be correlated with economic outcomes. It is generally recognized that a country's economic well-being depends on the quality of institutions (Acemoglu et al. 2001). We take the *Rule of Law* index in 2000 from Worldwide Governance Indicators as our benchmark proxy for institutional quality. In a recent contribution, Ashraf and Galor (2013) found a negative link between ethnic diversity and economic growth. To account for this alternative channel, we control for ethnic *Fractionalization* using data from Fearon (2003). Obviously, a country's time preference rate is not the only cultural value that may affect economic performance. Using a wide range of cultural dimensions (from Hofstede, World Values Survey, Schwartz Values Survey, etc.) Gorodnichenko and Roland (2011, 2016) have found a positive robust relationship between a country's level of *Individualism* from Hofstede and income per capita. We include this control variable in column (6). One could also argue that a country's long-term orientation merely reflects the stability of its institutions. To account for this potential confounding factor, we control in column (7) for *Government Stability* (averaged over 1980-2000), drawn from the ICRG. Lastly, column (8) controls for a country's level of *Trust*, constructed based on the well-known generalized trust question from the World Values Survey (see, e.g., Guiso et al. (2009)). As can be seen from Table 1, the coefficient of *Patience* remains highly robust to the inclusion of the above-mentioned list of controls.[30]

Table 1: *Patience and GDP per capita.*

	Dependent variable: *GDP per capita*							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Patience	4.220***	3.268***	3.152***	1.881***	1.890***	2.070***	2.074***	1.995**
	(0.607)	(0.848)	(0.861)	(0.662)	(0.681)	(0.651)	(0.659)	(0.707)
Savings rate			0.016	0.013	0.013	0.014	0.011	0.013
			(0.021)	(0.018)	(0.018)	(0.016)	(0.018)	(0.021)
Rule of law				0.776***	0.782***	0.687***	0.674***	0.702***
				(0.123)	(0.133)	(0.113)	(0.115)	(0.146)
Fractionalization					0.077	0.159	0.097	0.044
					(0.491)	(0.421)	(0.410)	(0.404)
Individualism						0.012*	0.012*	0.012
						(0.006)	(0.006)	(0.007)
Government stability							0.047	0.047
							(0.134)	(0.148)
Trust								-0.001
								(0.005)
Geo&Religion controls	no	yes	yes	yes	yes	yes	yes	yes
Legal origin dummies	no	yes	yes	yes	yes	yes	yes	yes
Observations	51	50	46	46	46	42	42	41
R-squared	0.486	0.687	0.749	0.895	0.895	0.918	0.919	0.915

Note: The table reports OLS estimates. The dependent variable is log GDP per capita (at purchasing power parity) in 2000 and the main explanatory variable is a country's level of *Patience* drawn from Hens et al. (2016). Geo controls include a country's absolute latitude and longitude, and a dummy variable for being landlocked. Religion controls are percentages of population in a given country practicing major religions. Legal origin dummies are controls for French, German, Scandinavian, and British legal origin, whereby the latter one is the base category. Robust standard errors in parentheses. ***, **, * indicate significance at the 1, 5, and 10% levels, respectively.

Although the inclusion of the above-mentioned control variables mitigates the omitted variables bias, our simple OLS regressions provide no information on the direction of the effect. Since patience of economic agents may itself depend on the level of economic develop-

[30] We further verify the validity of our results in a wide range of unreported robustness checks. In particular, we consider alternative institutional measures using data from the World Bank's Doing Business or International Country Risk Guide and control for alternative cultural dimensions from Hofstede and World Values Survey. The coefficient on *Patience* remains fairly robust across specifications.

ment, the link between the time preference rate and the GDP per capita is prone to the issue of reverse causality. Therefore, we interpret our results merely as conditional correlations.[31]

Consider now the link between patience and total factor productivity. As can be seen from columns (1), (3), and (5) of Table 2, *Patience* is positively and significantly correlated with our measures of total factor productivity from Penn World Tables, TFP_{PWT}, Hall and Jones (1999), TFP_{HJ}, and Jones and Romer (2010), TFP_{JR}, respectively. These correlations are robust to the inclusion of geographical and religion controls in columns (2), (4), and (6), respectively. These results are consistent with Proposition 2. In view of the small number of observations, we consider them as tentative, however.

Table 2: *Patience and total factor productivity.*

	Dependent variable:					
	TFP_{PWT}		TFP_{HJ}		TFP_{JR}	
	(1)	(2)	(3)	(4)	(5)	(6)
Patience	0.870***	0.714***	1.627***	1.227**	0.594***	0.392*
	(0.227)	(0.259)	(0.521)	(0.615)	(0.194)	(0.213)
Geo&Religion controls	no	yes	no	yes	no	yes
Observations	44	43	39	38	30	29
R^2	0.223	0.388	0.185	0.308	0.130	0.480

Note: The table reports OLS estimates. The dependent variable is the TFP index from Penn World Tables in columns (1) and (2), from Hall and Jones (1999) in columns (3) and (4), and from Jones and Romer (2010) in columns (5) and (6). The main explanatory variable is a country's level of *Patience* drawn from Hens et al. (2016). Geo controls include a country's absolute latitude and longitude, a dummy variable for being landlocked. Due to the small number of observations, religion controls are restricted to the share of protestants and catholics only. Robust standard errors in parentheses. ***, **, * indicate significance at the 1, 5, and 10% levels, respectively.

As a robustness check, we rerun our econometric specification from equation (28) using Hofstede's long-term orientation score as an alternative proxy for a country's patience. The results of these robustness checks are presented in Appendix B. As can be seen from Tables B.1 and B.2, the correlations between the long-term orientation score and the respective outcome variable are qualitatively similar to the ones obtained using the baseline measure of patience. More precisely, the positive relationship between GDP per capita and long-term orientation reported in Table B.1 remains significant at the five percent level after the inclusion of all control variables from Table 1. In Table B.2, we observe a positive unconditional correlation between long-term orientation and the two measures of total factor

[31] To come closer towards a causal inference of the effect of long-term orientation on the economic well-being, Dohmen et al. (2015) instrument their measure of patience by the share of protestants in a given country (Weber 1930). However, this instrument is likely to violate the exclusion restriction since protestantism might affect economic well-being through channels other than patience, e.g., hard work ethics, fairness, etc. Moreover, the share of protestants is only weakly correlated with the measure of patience used in the current paper.

productivity – TFP_{PWT} and TFP_{JR}, defined as in Table 2. After including geographic and religious controls, only the relationship between TFP_{JR} and *Long-term orientation* remains significant at the five percent level. Overall, the evidence presented in Tables 1 and 2, as well as B.1 and B.2 is consistent with our theoretical predictions.

5 Concluding Remarks

The rate of time preference is a key primitive which provides a potential micro-level source for the substantial differences of living standards across nations. The prevailing view is based on the favorable effect of patience on individual accumulation processes as a broad set of dynamic choice theories highlight that a smaller rate of time preference leads to higher stock of physical and human capital and to the development of better technologies. Our paper complements this view by providing a novel explanation of how higher patience of economic agents gets transmitted into greater economic well-being. We elaborate that higher patience among a country's agents allows to solve pertinent organizational issues more efficiently since long-term firm-supplier-relationships which mitigate hold-up problems can then be maintained. Hence, countries where lower rates of time preference prevail on average exhibit greater aggregate welfare and a higher total factor productivity.

Our theoretical model is stylized in many respects. For instance, it does not allow for supplier re-matching after a relational contact has been broken. As a result, relational contracts are stable over time and there is no role for dynamics. Allowing for these additional features, as well as considering a broader range of optimal contracts along the lines of Levin (2003) would constitute an interesting research agenda. Furthermore, given that relational contracting is only one of the channels through which patience affects economic well-being, considering alternative explanatory factors (e.g., saving behavior, accumulation of human and physical capital, etc.) in a unified framework and calibrating the resulting equilibrium would contribute to our understanding of the economic effects of patience. Our simple analytically tractable general equilibrium model lends itself suitable for this type of analysis. Lastly, to keep our analysis simple, we have treated a country's patience as an exogenous factor. Endogenizing the patience level of a country's economic agents might provide an interesting theoretical exercise, which we relegate to the future research.

Our paper provides supportive empirical evidence for the model's predictions. Yet, we would like to stress that our empirical results should be interpreted cautiously for two reasons. First, some of the tests (in particular, of the link between time preference rate and total factor productivity) rely on a small number of observations. Once large-scale data on patience and TFP become available, our results should be reconsidered. Second, although we control for some of the alternative explanations of the link between patience and economic well-being (e.g., savings rate or institutions), we cannot rule out that patience may also work via channels other than the one suggested in our model. However, in view of the strong accord of our model with the recent firm-level evidence (Calzolari et al. 2015 and Helper and Henderson 2014), we consider relational contracting to be an important and understudied channel through which patience gets transmitted into higher aggregate well-being.

A Mathematical Appendix

A.1 Proof of Lemma 1

A simple differentiation of π_H^r from (19) with respect to δ_M shows that $\pi_H^{r\prime}(\delta_M) < 0$ if and only if $(1-\beta)^{\frac{1}{1-\alpha(1-\eta)}} > \beta^{\frac{\alpha\eta}{1-\alpha}}(1-\beta)^{\frac{1-\alpha\eta}{1-\alpha}}$. The latter inequality can be rearranged as $(1-\beta)^{-\frac{\alpha(1-\eta)}{1-\alpha(1-\eta)}} > \beta$, which holds true for all $\beta, \alpha, \eta \in (0,1)$. That is, π_H^r is more likely to be positive the lower δ_M.

If δ_M is equal to $\hat{\delta}_M$ from (23), ICC_H from (22) is fulfilled with equality. In this case, a headquarter's per-period profit under relational contracting is given by $\pi_H^r = \frac{\delta_H}{1+\delta_H}\pi_H^D + \frac{1}{1+\delta_H}\pi_H^s$ and it is larger than per-period profit under spot contracting, π_H^s only if $\pi_H^D > \pi_H^s$. Using (10) and (16) therein, this condition can be expressed as $\beta^{\frac{1}{1-\alpha\eta}} > \beta^{\frac{1-\alpha(1-\eta)}{1-\alpha}}(1-\beta)^{\frac{\alpha(1-\eta)}{1-\alpha}}$. The latter inequality can be rearranged as $\beta^{-\frac{\alpha\eta}{1-\alpha\eta}} > (1-\beta)$, which holds true for all $\beta, \alpha, \eta \in (0,1)$. Since $\pi_H^r > \pi_H^s$ for $\delta_M = \hat{\delta}_M$ and $\pi_H^{r\prime}(\delta_M) < 0$, we have $\pi_H^r > \pi_H^s$ for all $\delta_M \leq \hat{\delta}_M$.

A.2 Proof of Proposition 1

Using (19) and (10), we define

$$\begin{aligned} \Psi^r(\delta_M^{low}) &\equiv (1-\alpha) - \frac{1-\alpha(1-\eta)}{1+\delta_M^{low}}\left(\delta_M^{low}(1-\beta)^{\frac{1}{1-\alpha(1-\eta)}} + \beta^{\frac{\alpha\eta}{1-\alpha}}(1-\beta)^{\frac{1-\alpha\eta}{1-\alpha}}\right), \\ \Psi^s &\equiv \beta^{\frac{1-\alpha(1-\eta)}{1-\alpha}}(1-\beta)^{\frac{\alpha(1-\eta)}{1-\alpha}}(1-\alpha\eta), \end{aligned} \tag{A.1}$$

whereby $\Psi^r > \Psi^s$ for any $\delta_M^{low} < \hat{\delta}_M$ due to Lemma 1. Using these definitions together with the assumed distribution functions $\gamma(\theta)$ and $\phi(\delta_M)$ in (26), the FE condition simplifies to:

$$\frac{1+\delta_H}{\delta_H}AX^{-\frac{\alpha}{1-\alpha}}\left(\rho\Psi^r\int_{\theta^r}^{\infty}\theta^{\frac{\alpha}{1-\alpha}}\kappa\underline{\theta}^{\kappa}\theta^{-\kappa-1}d\theta + (1-\rho)\Psi^s\int_{\theta^s}^{\infty}\theta^{\frac{\alpha}{1-\alpha}}\kappa\underline{\theta}^{\kappa}\theta^{-\kappa-1}d\theta\right) = f_E. \tag{A.2}$$

It can be easily shown that:

$$\int_{\theta^g}^{\infty}\theta^{\frac{\alpha}{1-\alpha}}\kappa\underline{\theta}^{\kappa}\theta^{-\kappa-1}d\theta = \frac{\kappa\underline{\theta}^{\kappa}(1-\alpha)}{\kappa(1-\alpha)-\alpha}\left(\theta^g\right)^{-\frac{\kappa(1-\alpha)-\alpha}{1-\alpha}} \quad , \quad g \in \{s,r\},$$

whereby θ^s and θ^r are given by (24) and (25), respectively. Utilizing these terms in (A.2) and solving the resulting expression for X, we obtain the aggregate production index:

$$X(\rho) = \left[\rho\left(\Psi^r(\delta_M^{low})\right)^{\frac{\kappa(1-\alpha)}{\alpha}} + (1-\rho)(\Psi^s)^{\frac{\kappa(1-\alpha)}{\alpha}}\right]^{\frac{1}{\kappa}} \left(\frac{\kappa(1-\alpha)(1+\delta_H)}{f_E(\kappa(1-\alpha)-\alpha)\delta_H}\right)^{\frac{1}{\kappa}} \underline{\theta} A^{\frac{1-\alpha}{\alpha}}. \quad \text{(A.3)}$$

The first-order derivative of $X(\rho)$ with respect to ρ is positive only if $\Psi_r(\delta_M^{low}) > \Psi_s$, which holds true for all parameter values according to Lemma 1. We thus have $X'(\rho) > 0$ and, by equation (4), $V'(\rho) > 0$.

A.3 Proof of Proposition 2

Similar to Melitz (2003), we derive the average firm productivity in a given market from the price index. Using (2), the equilibrium price index can be expressed as:

$$P = \left[\rho N \int_{\theta^r}^{\infty} (p^r)^{\frac{\alpha}{\alpha-1}} \frac{\gamma(\theta)}{1-\Gamma(\theta^r)} d\theta + (1-\rho) N \int_{\theta^s}^{\infty} (p^s)^{\frac{\alpha}{\alpha-1}} \frac{\gamma(\theta)}{1-\Gamma(\theta^s)} d\theta\right]^{\frac{\alpha-1}{\alpha}} = N^{\frac{\alpha-1}{\alpha}} p(\tilde{\theta}) = N^{\frac{\alpha-1}{\alpha}} \frac{1}{\alpha\tilde{\theta}},$$

whereby $1-\Gamma(\theta^g)$ is the ex-ante probability of successful entry under the governance mode $g \in \{s, r\}$; p^s and p^r given by (9) and (13), respectively; θ^s and θ^r are given by (24) and (25), respectively; and $\tilde{\theta}$ represents the average (total factor) productivity:

$$\tilde{\theta}(\rho) = \left[\frac{\rho}{1-\Gamma(\theta^r)} \int_{\theta^r}^{\infty} \theta^{\frac{\alpha}{1-\alpha}} \gamma(\theta) d\theta + \frac{(1-\rho)\left(\beta^\eta(1-\beta)^{1-\eta}\right)^{\frac{\alpha}{1-\alpha}}}{1-\Gamma(\theta^s)} \int_{\theta^r}^{\infty} \theta^{\frac{\alpha}{1-\alpha}} \gamma(\theta) d\theta\right]^{\frac{1-\alpha}{\alpha}}. \quad \text{(A.4)}$$

Using the definition of Pareto productivity from (27), it can be shown that:

$$\frac{1}{1-\Gamma(\theta^g)} \int_{\theta^g}^{\infty} \theta^{\frac{\alpha}{1-\alpha}} \kappa \underline{\theta}^\kappa \theta^{-\kappa-1} d\theta = (\theta^g)^{\frac{\alpha}{1-\alpha}} K \quad , \quad g \in \{s, r\}, \quad \text{(A.5)}$$

whereby $K \equiv \frac{\kappa(1-\alpha)}{\kappa(1-\alpha)-\alpha} > 0$ for all $\kappa > \alpha/(1-\alpha)$. Utilizing these expressions in (A.4) and substituting for θ^s and θ^r from (24) and (25), we obtain after simplification a closed-form solution for the average productivity:

$$\tilde{\theta}(\rho) = X(\rho) \left[\frac{\rho}{\Psi^r} + \frac{(1-\rho)\left(\beta^\eta(1-\beta)^{1-\eta}\right)^{\frac{\alpha}{1-\alpha}}}{\Psi^s}\right]^{\frac{1-\alpha}{\alpha}} \left(\frac{A}{K}\right)^{\frac{1-\alpha}{\alpha}},$$

whereby Ψ^r and Ψ^s are defined in equation (A.1), and $X(\rho)$ is given by (A.3). Since $X'(\rho) > 0$ (see Appendix A.2), the sufficient condition for $\tilde{\theta}'(\rho) > 0$ is

$$\frac{1}{\Psi^r} - \frac{\left(\beta^\eta(1-\beta)^{1-\eta}\right)^{\frac{\alpha}{1-\alpha}}}{\Psi^s} > 0. \tag{A.6}$$

Notice that, if this condition is fulfilled for the highest possible Ψ^r, it holds a fortiori for *any* given parameter combination. Since Ψ^r is decreasing in δ_M (see Appendix A.1), Ψ^r reaches its maximum at $\delta_M = 0$. Substituting for Ψ^r and Ψ^s from (A.1) and evaluating the resulting expression at $\delta_M = 0$, the sufficient condition from (A.6) simplifies to

$$\beta(1-\alpha\eta) - (1-\alpha) + (1-\alpha(1-\eta))\left(\beta^\eta(1-\beta)^{1-\eta}\right)^{\frac{\alpha}{1-\alpha}} > 0. \tag{A.7}$$

A tedious but straightforward analysis shows that the left-hand side of the above inequality is increasing in α. That is, if inequality (A.7) is fulfilled for the smallest possible α, it holds a fortiori for any $\alpha \in (0, 1)$. Substituting $\alpha = 0$ in (A.7) yields $\beta > 0$, which implies $\tilde{\theta}'(\rho) > 0$.

A.4 Partial Contractibility

To introduce the notion of partial contractibility into our model, we build on the seminal contributions by Acemoglu et al. (2007) and Antràs and Helpman (2008). More specifically, we assume that each input, h and m, is produced with a set of input-specific activities, $\chi_h(a)$ and $\chi_m(a)$, respectively, indexed by points on the unit interval, $a \in [0, 1]$. These activities are costlessly combined to inputs according to the Cobb-Douglas production functions:

$$h = \exp\left[\int_0^1 \log \chi_h(a)da\right] \quad , \quad m = \exp\left[\int_0^1 \log \chi_m(a)da\right]. \tag{A.8}$$

We assume that courts can verify and enforce M's activities only in the range $[0, \mu]$, $\mu \in [0, 1]$, while the remaining manufacturing activities in the range $(1-\mu)$ are not verifiable and, therefore, cannot be stipulated in a formal contract. For simplicity, we assume that the entire range of headquarters' activities, $\chi_h(a) \in [0, 1]$ is verifiable and enforceable by courts.

The timing of this extended game is as follows. After the fixed cost of entry is sunk, productivities are drawn and suppliers' time preference rates are revealed, final good producers choose the governance mode $g \in \{s, r\}$. Both under spot and relational governance mode, parties stipulate in period s_0 or r_0 the following terms in a formal contract: H's activities $\{\chi_h^s(a)\}_{a=0}^1$, M's contractible (c) activities $\{\chi_{mc}^s(a)\}_{a=0}^\mu$, and the commitment of H to compensate M's contractible activities with their marginal revenue product. The timing in subsequent periods of the game under spot (s_1-s_3) or relational (r_1-r_3) contracting is as described in section 3.1.1.

Consider first the choice of contractible activities. Under either $g \in \{s, r\}$, firms stipulate the level of contractible activities, $\{\chi_h(a)\}_{a=0}^1$ for H and $\{\chi_m(a)\}_{a=0}^\mu$ for M, which maximize joint profits, $\pi^g = R^g - \int_0^1 \chi_h(a)da - \int_0^1 \chi_m(a)da$. This maximization problem yields investment in contractible (c) activities, $x_h^g = \eta\alpha R^g$ and $x_{mc}^g(a) = (1-\eta)\alpha R^g$, $\forall a \in [0, \mu]$, and the revenue, $R^g = \left(\zeta X^{-\alpha}\alpha^{\alpha z}\theta^\alpha(1-\eta)^{\alpha(1-z)} \exp\left[\alpha(1-\eta)\int_\mu^1 \log \chi_m^g(a)da\right]\right)^{\frac{1}{1-\alpha z}}$, whereby $z \equiv \eta + (1-\eta)\mu$. Since all contractible activities are rewarded with their marginal revenue product, the joint revenue net of compensations for contractible activities is given by $(1-\alpha z)R^g$.

Under spot contracting, M chooses the level of non-contractible activities, $\{\chi_m(a)\}_{a=\mu}^1$, that maximize $(1-\beta)(1-\alpha z)R^s - \int_\mu^1 \chi_m(a)da$. This maximization problem yields equilibrium investment in non-contractible (n) activities, $x_{mn}^s(a) = (1-\beta)(1-\eta)\alpha R^s$, $\forall a \in (\mu, 1]$, and the associated revenue $R^s = (1-\beta)^{\frac{\alpha(1-z)}{1-\alpha}}\Theta A X^{-\frac{\alpha}{1-\alpha}}$, whereby Θ and A are defined as in section 3.1.2. Since H (M) obtains under spot contracting the fraction β (respectively, $1-\beta$) of the net ex-post surplus, both parties' pure profits read $\pi_H^s = \beta(1-\alpha z)R^s$ and $\pi_M^s = (1-\beta)(1-\alpha z)R^s - x_{mn}^s - \varepsilon$. Substituting for R^s and x_{mn}^s, we obtain both parties' equilibrium profits under spot contracting:

$$\pi_H^s = \beta(1-\beta)^{\frac{\alpha(1-z)}{1-\alpha}}(1-\alpha z)\Theta A X^{-\frac{\alpha}{1-\alpha}} \quad , \quad \pi_M^s = (1-\beta)^{\frac{1-\alpha z}{1-\alpha}}(1-\alpha)\Theta A X^{-\frac{\alpha}{1-\alpha}} - \varepsilon, \quad \text{(A.9)}$$

whereby Θ and A are defined as in section 3.1.2 and $z \equiv \eta + (1-\eta)\mu$ is defined for notational simplicity.

Under relational contracting, M promises to provide the amount of non-contractible inputs which maximizes joint profits, $(1-\alpha z)R^r - \int_\mu^1 \chi_m(a)da$. This maximization problem yields equilibrium investment in non-contractible activities, $x_{mn}^r(a) = (1-\eta)\alpha R^r$, $\forall a \in (\mu, 1]$, and the associated revenue $R^r = \Theta A X^{-\frac{\alpha}{1-\alpha}}$. If a supplier provides the first-best level of manufacturing components, x_{mnk}^r, the headquarter compensates him with a bonus

B and H's and M's profits on the equilibrium path are given by $\pi_H^r = (1-\alpha z)R^r - B$ and $\pi_M^r = B - (1-\mu)x_{mn}^r - \varepsilon$, respectively. Utilizing equilibrium x_{mn}^r and R^r therein, Under relational contracting, both parties' profits read:

$$\pi_H^r = (1-\alpha z)\Theta A X^{-\frac{\alpha}{1-\alpha}} - B \quad , \quad \pi_M^r = B - \alpha(1-z)\Theta A X^{-\frac{\alpha}{1-\alpha}} - \varepsilon. \tag{A.10}$$

Since H's inputs are fully secured by formal contracts, M's profit in case of a deviation is the same as under spot contracting, i.e., $\pi_M^D = \pi_M^s$. M's incentive compatibility constraint thus reads $\pi_M^r + \frac{\pi_M^r}{\delta_M} \geq \pi_M^s + \frac{\pi_M^s}{\delta_M}$ and the associated equilibrium bonus that fulfills this ICC_M with equality is given by:

$$B = \left((1-\beta)^{\frac{1-\alpha z}{1-\alpha}}(1-\alpha) + \alpha(1-z)\right)\Theta A X^{-\frac{\alpha}{1-\alpha}}. \tag{A.11}$$

Utilizing this bonus in (A.10), we obtain both parties' per-period profits on the equilibrium path under relational contracting:

$$\pi_H^r = (1-\alpha)\left(1-(1-\beta)^{\frac{1-\alpha z}{1-\alpha}}\right)\Theta A X^{-\frac{\alpha}{1-\alpha}} \ , \ \pi_M^r = (1-\alpha)(1-\beta)^{\frac{1-\alpha z}{1-\alpha}}\Theta A X^{-\frac{\alpha}{1-\alpha}} - \varepsilon. \tag{A.12}$$

As before, the incentive compatibility of a relational agreement also depends on H's deviation incentives. A headquarter may renege on the relational contract by refusing to provide the ex-post bonus. Using $B = 0$ in (A.10), we obtain H's one-shot profit from deviation, $\pi_H^D = (1-\alpha z)\Theta A X^{-\frac{\alpha}{1-\alpha}}$. The ICC_H is fulfilled if and only if $\pi_H^r + \frac{\pi_H^r}{\delta_H} \geq \pi_H^D + \frac{\pi_H^s}{\delta_H}$.

To ensure that Propositions 1 and 2 continue to hold in this extended framework, it suffices to prove that $\pi_H^r > \pi_H^s$ (see Lemma 1). Note that the latter relationship holds if and only if

$$(1-\alpha)\left(1-(1-\beta)^{\frac{1-\alpha z}{1-\alpha}}\right) - \beta(1-\beta)^{\frac{\alpha(1-z)}{1-\alpha}}(1-\alpha z) > 0. \tag{A.13}$$

A tedious but straightforward analysis shows that the left-hand side of the above expression is increasing in β. That is, if inequality in (A.13) holds for $\beta = 0$, it holds a fortiori for all $\beta \in (0,1)$. It can be immediately seen that the left-hand side of (A.13) is equal to zero if $\beta = 0$ and, therefore, we have $\pi_H^r > \pi_H^s$ for all permissible parameter values. Following the approach from section 3.1.3, it is straightforward to establish Propositions 1 and 2.

B Appendix Tables

Table B.1: *Long-term orientation and GDP per capita.*

	Dependent variable: *GDP per capita*							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Long-term orientation	2.484***	1.540**	1.630**	1.205**	1.201**	1.185**	1.188**	1.247**
	(0.429)	(0.747)	(0.706)	(0.505)	(0.513)	(0.531)	(0.539)	(0.532)
Savings rate			0.036***	0.023**	0.025**	0.027**	0.026*	0.029*
			(0.014)	(0.010)	(0.011)	(0.012)	(0.014)	(0.015)
Rule of law				0.930***	0.908***	0.814***	0.802***	0.841***
				(0.101)	(0.115)	(0.133)	(0.127)	(0.130)
Fractionalization					-0.188	-0.221	-0.253	-0.316
					(0.402)	(0.445)	(0.431)	(0.452)
Individualism						0.011**	0.011**	0.012**
						(0.005)	(0.005)	(0.005)
Government stability							0.025	0.059
							(0.115)	(0.104)
Trust								-0.004
								(0.004)
Geo&Religion controls	no	yes	yes	yes	yes	yes	yes	yes
Legal origin dummies	no	yes	yes	yes	yes	yes	yes	yes
Observations	91	88	81	81	78	74	74	70
R-squared	0.213	0.590	0.673	0.862	0.858	0.849	0.849	0.852

Note: The table reports OLS estimates. The dependent variable is log GDP per capita (at purchasing power parity) in 2000 and the main explanatory variable is a country's long-term orientation score drawn from Hofstede et al. (2010). Geo controls include a country's absolute latitude and longitude, and a dummy variable for being landlocked. Religion controls are percentages of population in a given country practicing major religions. Legal origin dummies are controls for French, German, Scandinavian, and British legal origin, whereby the latter one is the base category. Robust standard errors in parentheses. ***, **, * indicate significance at the 1, 5, and 10% levels, respectively.

Table B.2: *Long-term orientation and total factor productivity.*

	Dependent variable:					
	TFP_{PWT}		TFP_{HJ}		TFP_{JR}	
	(1)	(2)	(3)	(4)	(5)	(6)
Long-term orientation	0.299**	0.129	0.607	0.031	0.420***	0.273**
	(0.136)	(0.179)	(0.388)	(0.430)	(0.145)	(0.112)
Geo&Religion controls	no	yes	no	yes	no	yes
Observations	74	72	75	73	57	56
R^2	0.059	0.237	0.036	0.358	0.127	0.636

Note: The table reports OLS estimates. The dependent variable is the TFP index from Penn World Tables in columns (1) and (2), from Hall and Jones (1999) in columns (3) and (4), and from Jones and Romer (2010) in columns (5) and (6). The main explanatory variable is a country's long-term orientation score drawn from Hofstede et al. (2016). Geo controls include a country's absolute latitude and longitude, a dummy variable for being landlocked. Due to the small number of observations, religion controls are restricted to the share of protestants and catholics only. Robust standard errors in parentheses. ***, **, * indicate significance at the 1, 5, and 10% levels, respectively.

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