Nepotism, Human Capital and Economic Development*

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Abstract. This paper suggests that nepotism affects economic development by hindering human capital development. In our dynamic general equilibrium model, individuals perceiving nepotistic labor markets experience a weaker economic motive to invest in human capital. Nepotism is explained as an evolving cultural norm with different nepotistic equilibria, relevant for economic development. We test the central prediction of the model by relating scores from the Programme for International Student Assessment (PISA) to an indicator for perceived nepotism at the country level. Our findings indicate a negative association between nepotism and human capital. Subsample analysis and fixed effects estimations further corroborate the incentive narrative.

Keywords: nepotism; human capital; economic growth; norm transmission; culture
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1 Introduction

Cultural values play a significant role in shaping economic behavior and outcomes (Alesina and Giuliano, 2015). Within this broad relationship, the phenomenon of nepotism is receiving growing attention. This paper suggests nepotism as an important barrier to human capital development, providing a novel explanation for the disconnect of education input and human capital outcomes uncovered by the global learning crisis (World Bank, 2018). We define nepotism as a recruitment practice in labor markets that favors social ties over human capital endowments. Assuming that investments in human capital are incentivized by the expectation of higher earnings in the future, we argue that individuals perceiving labor markets to be nepotistic experience a weaker economic motive to invest. Accordingly, these individuals will dedicate fewer resources to the acquisition of human capital, ultimately manifested in lower test scores. The cases of Singapore and Lebanon illustrate our narrative. Singapore, the top performer in the Programme for International Student Assessment (PISA) 2015, is well-known for its successful anti-nepotism policy implemented during the past decades (Bellows, 2009). In Lebanon, in contrast, nepotism is a widespread phenomenon according to Transparency International (2012) and, in line with our rationale, the country performed among the lowest in the PISA study. This paper investigates whether these illustrations feed from a theoretically-grounded pattern with robust empirical support.

In order to scrutinize the proposed nepotism mechanism and its impact on economic development we develop a dynamic general equilibrium, in which nepotism is explained as an evolving cultural norm (building on Bisin and Verdier (2001) and Boyd and Richerson (1985)). Perceived nepotism affects effort at school and cognitive ability at the individual level as well as aggregate human capital at the macro-level. The theory is embedded in an endogenous growth model where human capital is an essential driver of technological progress and economic development (building on central elements of unified growth theory from Galor and Weil (2000), Galor and Moav (2000) and Galor (2005)). We show that there exist multiple cultural steady states, with and without nepotism, and that nepotism leads to inferior economic growth and perhaps even stagnation. A one-off intervention (an affirmative action policy) has the potential to set labor markets free of nepotism and initiate development towards a steady state of high economic growth.

In the empirical section, we test the central prediction of our framework with random and fixed effects models using panel data from 72 countries. We relate our proxy for human capital, the country-level PISA score, to a perceived nepotism indicator derived from the Executive Opinion Survey (EOS), which captures our definition of nepotism remarkably well. Our results indicate that nepotism is an important and statistically significant determinant of human capital. Controlling for economic performance, secondary

net enrollment rates and region and year fixed effects, we find that an increase in one standard deviation of the perceived nepotism indicator decreases on average the PISA scores by 0.16 standard deviations. Interestingly, this statistical association is robust to adjusting for overall corruption perception and additional variables related to education systems. We further divide the sample by OECD-membership to ease interpretation concerns related to multicollinearity and find that estimates remain indicative of our theoretical prediction. Remarkably, the statistically significant and negative association between nepotism and human capital is also obtained in empirical specifications absorbing all time-invariant unobserved heterogeneity drawing upon the Non-OECD sample.

With this paper, we mainly contribute to two strands of literature. First, we contribute to the literature on culture and development by providing a novel mechanism by which culture affects economic development via human capital accumulation (Alesina and Giuliano, 2015).[1] Within this broad field, our research connects more directly to studies that investigate the consequences of nepotism. While Weber (1904) already conceptually linked nepotism to firm performance, more recent studies aim at quantifying its consequences at the workplace. For instance, nepotism has been associated with lower worker efforts and skills, lower firm investments and performance (Bennedsen et al., 2007; Bertrand and Schoar, 2006; Bramoullé and Goyal, 2016; Parise et al., 2018; Pérez-Gónzalez, 2006), poor firm management (Lemos and Scur, 2018), poor bureaucratic performance (Rauch and Evans, 2000) and firm size (Ilias, 2006). With this paper, we are the first to investigate consequences that transcend the workplace and infiltrate into the classroom. This is somewhat unexpected given the importance of expected labor market outcomes for human capital investments.[2]

Second, our hypothesis complements the mechanism at play in the human capital theory developed by Schultz (1961) and Becker (1962), as well as core assumptions of the unified growth theory by Galor (2005). The analysis also adds to recent empirical work on the human capital responses to its (perceived) returns at the microeconomic level. These studies suggest that individuals respond to higher returns with higher investments, in line with the human capital theory. For example, Foster and Rosenzweig (1996) claim that the green revolution augmented returns to education, which in turn increased enrollment

[1] For examples of different mechanisms see Alesina and Giuliano (2010), LaFave and Thomas (2017) and Yang (2019).

[2] Coco and Lagravinese (2014) provide a similar rationale that substantially deviates both theoretically and empirically from ours. In terms of theoretical considerations, we develop the first dynamic general equilibrium model on the nepotism-human capital relationship and conceptualize nepotism as a cultural equilibrium, presenting multiple cultural steady states and their impact on economic development. In addition, we show in the model how to escape from nepotistic equilibria. In terms of empirical analysis, we contribute to the literature by deriving empirical support via established panel data techniques for the first time, allowing for the influence of overall corruption perception and time-invariant unobservables. Moreover, we are able to make first-use of a remarkably suitable proxy for perceived nepotism that allows us to include both OECD and non-OECD countries in our analysis. Finally, we also differentiate ourselves by carrying out subsample and transmission channel analysis that are consistent with the storyline of this paper.

rates in India. Similarly, Kingdon and Theopold (2008) estimate a positive association between regional returns to years of schooling and schooling attendance in India, whereas Attanasio and Kaufmann (2014) estimate a positive effect of expected returns to schooling on college enrollment in Mexico. Kuka et al. (2020) documents higher human capital investments induced by an increase in returns to education via the provision of immigrant work authorization. Other experimental studies estimate a positive impact of higher perceived returns on different human capital measures, such as schooling quantity and time dedicated for homework in the Dominican Republic (Jensen, 2010) and test scores in Madagascar (Nguyen, 2008) and Uganda (Riley, 2017). Our study complements the incentives narrative of human capital theory by focusing on a cultural attitude in labor markets as the disincentivizing force, while providing greater external validity. This is to the best of our knowledge, the first paper considering nepotism within the rationale of human capital theory as described above.

The remainder of the paper is structured as follows. In Section 2 we set up the model, show its implications in form of comparative statics, and derive the cultural dynamics and their consequences for economic development. In Section 3 we report the empirical analysis, including the data and descriptives, empirical specifications and results. Section 4 concludes.

2 The Model

2.1 Production

Consider a society that at any time t produces output using white collar workers performing professional, managerial, or administrative work, denoted by M_t, and blue collar workers, L_t. White collar labor input is measured in terms of human capital (i.e. cognitive skills) and blue collar labor input is measured in units of raw labor. Both types of work are fully complementary such that we could imagine firms consisting of headquarters performing M_t-tasks and of workplaces performing L_t-tasks. This notion is captured in the aggregate production function

$$Y_t = 2A_t \cdot \min\{M_t,\ \alpha L_t\} \qquad \Rightarrow \qquad M_t = \alpha L_t, \tag{1}$$

in which Y_t denotes output and A_t is a measure of total factor productivity (TFP).[3] The second equation in (1) is an equilibrium condition requiring efficient production. The parameter α provides the constant

[3]For simplicity, we do not model physical capital. In an extended model, it could be considered that the elite has claims to output as an investor or firm owner. If the elite has the power to manipulate the return to capital through its hiring of management, this feature is likely to dampen (revealed) nepotism.

ratio of white vs. blue collar input in production, $0 < \alpha < 1$. Firms operate on competitive markets. In equilibrium, firms make zero profits and factors are paid in proportion to their equilibrium productivity, $w_t^M/w_t^L = (\partial Y_t/\partial M_t)/(\partial Y_t/\partial L_t)$, in which w_t^M is the wage per unit of white collar human capital and w_t^L is the wage per unit of blue collar labor input. Thus, $w_t^M = A_t$ and $w_t^L = \alpha A_t$ (off equilibrium wages are zero for the non-limiting factor).

2.2 Structure of Society

We assume an overlapping generations framework. At any time t the economy is populated by a continuum of measure 1 of adult individuals. The adults of time (or generation) t were born and received an education at time $t-1$. The society is divided into an elite of size λ and the rest of society, of size $1-\lambda$, $0 \leq \lambda < 1$. The elite is defined by the feature that some of its members achieve a managerial position through nepotism from members of the previous generation of the elite. The rest of society can achieve managerial positions only through qualification, i.e. through effort in education. Implicitly we assume that old members of the elite experience utility when management positions are filled from their group (their extended family, their clan, friends etc). The population is stationary and the group size is constant. In any period each member of the group gives birth to a new member of the group. This means that the elite membership is transmitted via birthright from one generation to the next and that the non-elite experiences (limited) economic mobility but no social mobility.

Specifically, we assume that adults of both social classes are either employed as white collar worker or blue collar worker. A share s_t of the elite receives white collar jobs regardless of skills, $0 \leq s_t \leq 1$. We say that nepotism exist when $s_t > 0$ and use s_t as a measure of the degree of nepotism in society. This means that

$$M_t^N = s_t \lambda \tag{2}$$

white collar positions are filled by nepotism rather than merit and qualification. Let M_t^Q denote management positions filled by qualification such that

$$M_t = M_t^N + M_t^Q, \tag{3}$$

Each individual is endowed with one unit of raw labor. Human capital, in contrast, is individual-specific, depending on schooling outcomes. Individuals are heterogenous with respect to the ability to learn at school. In order to arrive at a closed-form solution we assume that ability is independently and

uniformly distributed in the unit interval, $a \in (0,1)$, implying that no group has an ability advantage.[4]

2.3 Education

In order to tailor the theory for our empirical section, we focus on schooling outcomes, i.e. we ignore choices regarding the type of school or the length of the education period. Schooling outcomes, controlled in this way, depend on ability and effort at school. Schooling outcomes are measured in terms of human capital. We normalize schooling outcomes such that individuals who exert no effort obtain one unit of human capital. Individuals who exert effort obtain human capital $(1+\rho)$, in which $\rho > 0$ could be conceptualized as the return to (effort in) education. Exerting effort at school entails disutility, which declines with increasing ability of the student. Specifically, we assume that an individual of ability $a(i)$ experiences disutilty $\beta A_t/a(i)$. The scaling of disutility with A_t is harmless for our results at the micro-level.[5] At the aggregate level, the scaling with TFP prevents that the importance of disutility for the choice of effort vanishes asymptotically in a growing economy. The scaling could be motivated by the notion that the alternative to exerting effort (doing homework etc.) becomes more attractive in a technological more developed environment because technology comprises also leisure technology (TV, video-games etc).

Individuals are motivated to exert effort at school by the prospect of getting hired as a white collar worker. Let p_t denote the probability to obtain a white collar job. Expected income is thus given by $p_t(1+\rho)w_t^M + (1-p_t)w_t^L$. Individuals who did not get a white collar position by nepotism need to exert effort at school in order to have a chance to get hired for a white collar job. Otherwise they receive income w_t^L for sure. Assuming a linear utility function such that expected utility from consumption equals expected income, we obtain that an individual i exerts effort at school if

$$p_t(1+\rho)w_t^M + (1-p_t)w_t^L - \beta A_t/a(i) > w_t^L.$$

[4]Here, we focus on preferential hiring of members of an elite. The model is, however, general enough to allow for the discussion of various types of quotas in the process of development. For example, management position could also be assigned preferentially to a marginalized class or by gender of the applicant.

[5]Alternatively, we could replace the additively separable utility function by a multiplicative one in which disutility from effort interacts with utility from consumption of wage income such that the scale of production is eliminated by income and substitution effects. We could also, alternatively, let the return to education depend on effort with no change qualitative results. Moreover, we could assume that effort is a continuous choice variable. For an interior solution we need a declining return to effort and the entailed non-linearity prevents an analytic solution. In numerical experiments, we verified that the qualitative results are robust against this extension independently from whether we allow firms to observe the effort level of students or not (results available upon request).

Inserting wages and solving for ability the condition becomes

$$a(i) \geq \frac{\beta}{p_t(1+\rho-\alpha)} \equiv \bar{a}_t. \tag{4}$$

Higher disutility from effort β increases the ability threshold $\bar{a}_t$ that has to be crossed for exerting effort. Likewise, a higher return to education ρ or a higher probability p_t to get hired as a white collar worker reduces the ability threshold. The probability p_t, however, is endogenous and determined in general equilibrium.

2.4 Human Capital and Employment

The share of the population not benefiting from nepotism is given by all individuals who do not belong to the elite (of group size $1-\lambda$) and the members of the elite who are not promoted by nepotism (of group size $(1-s_t)\lambda$.[6] From the uniform distribution of ability we conclude that a measure $1-\bar{a}_t$ of these individuals exerts effort at school. The share of high-skilled individuals in society is thus obtained as

$$H_t = [1-\lambda+(1-s_t)\lambda]\,(1-\bar{a}_t)\,. \tag{5}$$

By the law of large numbers, a share p_t of these individuals manages to get a white collar job such that total human capital employed in M-tasks is given by

$$M_t^Q = (1+\rho)p_t H_t. \tag{6}$$

The remaining high-skilled individuals as well as individuals who did not exert effort at school and did not receive a white collar job by nepotism are employed as blue collar worker such that

$$L_t = [1-\lambda+(1-s_t)\lambda]\,\bar{a}_t + (1-p_t)\,[1-\lambda+(1-s_t)\lambda]\,(1-\bar{a}_t)\,. \tag{7}$$

[6] In an earlier version of this paper we assumed that members of the elite are discouraged by nepotism to exert effort at school. This leads to quantitatively similar and qualitatively identical results as the present setup.

2.5 Nepotism as an Evolving Social Norm

The culture of firms hiring friends and relatives may survive in the long run because it is transmitted from one generation to the next.[7] A plausible assumption is that next period's nepotism depends positively on the level of this period's nepotism such that there exist two extreme steady states: no nepotism ($s_t = 0$) and complete nepotism ($s_t = 1$). Another plausible assumption is that the share of employed white collar workers that were hired due to qualification and merit (M_t^Q) influences nepotism negatively. These considerations are captured in the modified replicator dynamics for a two-trait population model:

$$\Delta s_t \equiv s_{t+1} - s_t = (\gamma - \mu M_t^Q)(1 - s_t)s_t. \tag{8}$$

For $\mu = 0$ this boils down to the standard two-trait model of logistic growth with γ determining the adjustment speed (Bisin and Verdier, 2001; Boyd and Richardson, 1985). The parameter μ measures the power of M^Q workers to break the transmission of nepotism from one generation to the next.

2.6 Productivity

Human capital does not only affect current productivity, it is also conducive to long-run growth. Following considerations in standard unified growth theory (Galor and Weil, 2000) we capture this idea in reduced-form as a law of motion for TFP:

$$A_{t+1} = f(H_t)A_t, \tag{9}$$

with $f > 0$ and $f' > 0$. Technological progress is thus imagined to result from learning-by-doing of high-skilled individuals or, alternatively, from the adoption of new technologies, which is facilitated by human capital (Nelson and Phelps, 1966).[8] In general equilibrium all labor markets clear and individuals

[7] This intergenerational stickiness indirectly speaks to the literature on intergenerational mobility, which focuses on the measurement of intra-family correlations and parent-child transmission mechanisms. It investigates for example whether the correlation between parents' and children's labor market outcomes is due to genetics or nurture (Black and Devereux, 2011). In our setup, the parent-child relationship does not play a central role. Instead, the model explores how the culture of nepotism relates to human capital investments of both elite and non-elite members. As this cultural force influences intergenerational mobility via human capital investments and ultimately income levels, our narrative introduces a new potential explanation for the (within-group) intergenerational stickiness of labor market outcomes. Note however that our mechanism foresees outgroup interactions, as the behavior of non-elite members is influenced by labor market practices favoring elite members. Moreover, as non-elite members in managerial positions influence nepotism negatively, non-elite managers also influence the human capital investments of the elite.

[8] An alternative would be to model explicitly the impact of human capital and education on R&D and the innovation of technologies (see e.g. Strulik et al., 2013). We abstain from this refinement because the micro-foundation of economic growth is not the main focus of our paper.

form the correct expectation of getting hired according to qualification. This completes the description of the model.

2.7 Solution

At any given time t, A_t and s_t are predetermined and due to the simple setup the model exhibits a closed-from solution. From (1) to (7) we obtain:

Proposition 1 (Interior Equilibrium) *The unique interior general equilibrium of educational outcomes and labor allocation is given by:*

$$L_t = \frac{1+\rho-\lambda\rho s_t}{1+\rho+\alpha} \tag{10a}$$

$$M_t = \frac{\alpha(1+\rho-\lambda\rho s_t)}{1+\rho+\alpha} \tag{10b}$$

$$M_t^Q = \frac{(1+\rho)\left[\alpha-(1+\alpha)\lambda s_t\right]}{1+\rho+\alpha} \tag{10c}$$

$$H_t = \frac{(1-\lambda s_t)(1+\rho-\alpha)\left[\alpha-(1+\alpha)\lambda s_t\right]}{\left[\alpha+\beta-(1+\beta)\lambda s_t\right](1+\rho)+\alpha\left[\beta(1-\lambda s_t)-\lambda\rho s_t\right]} \tag{10d}$$

$$p_t = \frac{\beta}{1+\rho-\alpha} + \frac{\alpha-(1+\alpha)\lambda s_t}{(1-\lambda s_t)(1+\rho+\alpha)} \tag{10e}$$

The easiest way to prove the proposition is by backward induction. Take (10) and verify that (1)–(7) are fulfilled. From inspection of (10c) we obtain a condition for the interior equilibrium to prevail. In equilibrium, all markets clear and individuals have formed the correct expectation about the probability of being hired for management. Equation (10a)–(10c) shows the solution for employment of blue-collar workers, total white collar workers, and white collar workers hired due to qualification, as a function of the models fundamentals, the level nepotism s_t, the size of the elite λ, the return to education ρ and the relative productivity of blue collar work α. Equation (10d) shows the solution for the share of high-skilled workers (the share of individuals who exerted effort in education), which relates to the main object of investigation in the empirical part of the paper. Equation (10e) shows the equilibrium probability to be hired for white collar work faced by high-skilled individuals. Comparative statics of the solutions are discussed with Propositions 3 and 4.

Proposition 2 (Integrated vs. Segregated Society) *An interior solution with the rest of society contributing to white collar work exists for $s_t < \bar{s} \equiv \alpha/\left[\lambda(1+\alpha)\right]$. Otherwise, nobody exerts effort in education and $M_t^Q = H_t = 0$. The threshold $\bar{s}$ is declining in the size of the elite λ.*

When nepotism is sufficiently strong, the probability of getting a white collar job through qualification is sufficiently low such that even the most talented individuals from the rest of society exert no effort

at school and the share of high-skilled people in society is zero. The nepotism threshold is declining in the population share of the elite because a total of λs_t of white collar jobs is not available for the rest of society. Naturally, prevailing nepotism has less severe consequences if it applies only to a small share of society. Since s_t is bounded from above by one, the threshold is never crossed for sufficiently low $\lambda < \alpha/(1+\alpha)$. The threshold depends positively on α, which is also intuitive since $\alpha = M_t/L_t$ measures the relative amount of available white collar jobs. In the following, we focus on the more interesting case of an integrated society in which at least some individuals obtain a white collar job due to qualification.

Proposition 3 (Nepotism and Cognitive Skills) *At the interior equilibrium, the probability to get a white collar job by qualification p_t as well as the population share of individuals supplying high cognitive skills H_t and the measure of white collar workers hired by qualification M_t^Q are declining in nepotism, $\partial p_t/\partial s_t < 0$, $\partial H_t/\partial s_t < 0$ and $\partial M_t^Q/\partial s_t < 0$.*

The result for M_t^Q can be read off from (10c). For the rest of the proof we take the derivative of (10e) and (4) and (5):

$$\begin{aligned}
\frac{\partial p_t}{\partial s_t} &= -\frac{\lambda}{(1-\lambda s_t)^2(1+\rho+\alpha)} < 0, \\
\frac{\partial H_t}{\partial s_t} &= -\lambda(1-\bar{a}) - [1-\lambda+(1-s_t)\lambda]\,\frac{\partial \bar{a}}{\partial p_t}\frac{\partial p_t}{\partial s_t} < 0.
\end{aligned}$$

Intuitively a higher level of nepotism, ceteris paribus, reduces the probability to obtain white collar work through qualification and reduces the motivation to exert effort at school. As a result, the population share of high-skilled individuals and therewith the average cognitive skills of students declines. This is the main hypothesis that we will scrutinize in the empirical section. The feature that $\partial M_t^Q/\partial s_t < 0$ will be important for the evolution of the economy.

Proposition 4 (Size of the Elite) *An increasing size of the elite drives down the probability to obtain white collar work by qualification and reduces the population share of high-skilled individuals.*

For the proof, we take the derivative of (10e) and of (4) and (5):

$$\begin{aligned}
\frac{\partial p_t}{\partial \lambda} &= -\frac{s_t}{(1-\lambda s_t)^2(1+\rho+\alpha)} < 0 \\
\frac{\partial H_t}{\partial \lambda} &= -s_t(1-\bar{a}) - [1-\lambda+(1-s_t)\lambda]\,\frac{\partial \bar{a}}{\partial p_t}\frac{\partial p_t}{\partial \lambda} < 0.
\end{aligned}$$

In order to relate better to the empirical part, we compute another measure of nepotism. "Perceived nepotism", denoted by n_t, is computed as the share of management positions filled by nepotism, i.e. the share of management positions not filled by merit and qualification:

$$n_t = \frac{M_t^N}{M_t} = \frac{\lambda s_t(1+\rho+\alpha)}{\alpha\,(1+\rho-\lambda\rho s_t)}. \tag{11}$$

This measure varies in sync with s_t and shares a lower bound at zero with s_t. Its size, however, is also determined by other parameters of the economy and society. Inspection of (11) shows that n_t depends positively on the size of the elite λ and the relative size of management input α and ambiguously on the return to education ρ. Specifically, (11) rationalizes a great variation of perceived nepotism across societies in which nepotism is prevalent and s_t is close to 1. For an intuition consider a society in which the elite consists of just one family. Although this family manages to position all their members in management, there are plenty of management positions left to be filled by the rest of society such that the measure of perceived nepotism is (much) smaller than 1. The other comparative static results are inferred straightforwardly from inspection of (10).

2.8 Nepotism and Static Inefficiency

Aside from the dynamic effects of nepotism through the loss of human capital induced growth (discussed in the next section), there exists also a loss in terms of static inefficiency. To see this, observe that declining nepotism increases white collar work M_t as well as blue collar work L_t. The reason for this seemingly implausible result is that M_t is measured in units of human capital. Declining nepotism leads to higher cognitive skills per person in white collar work, implying that less white collar workers are needed for the same tasks. In other words, the management of firms becomes more efficient. Redundant former white collar workers are employed in blue collar work. This observation can be stated more formally.

Corollary 1 (Static Inefficiency) *With nepotism, aggregate output Y is*

$$\Delta Y_t = \frac{\lambda\rho s_t}{1+\rho} \cdot 100$$

percent lower than in an identical economy without nepotism.

The proof computes output according to (1) and (10a) with and without nepotism and then computes the ratio of both output levels. We observe that inefficiency increases in the degree of nepotism s_t, the size of the elite λ, and the return to (effort in) education ρ.

The effect of nepotism on the scale of production can be interpreted as declining firm size. A negative relationship between nepotism and average firm size can be observed observed empirically, see Figure A2 in the Appendix, which uses firm size data from Bento and Restuccia (2017) for a sample of 67 countries. The prediction is also consistent with the observation that, in developing countries, many small firms are lead by less well educated managers (e.g. La Porta and Shleifer, 2008). Here, the phenomenon is explained by one particular mechanism, namely nepotism that drives down human capital and the efficiency of management. The result can also be interpreted as a particular manifestation of misallocation of talent (Murphy et al., 1991), driven by inefficient social norms, similar as in Hsieh et al. (2019).[9]

2.9 Dynamics

We next investigate comparative dynamics. The feature that human capital hired by qualification depends negatively on nepotism ($\partial M_t^Q/\partial s_t < 0$ in (10)) modifies the replicator dynamics (8) in a non-trivial way:

$$\Delta s_t = \left[\gamma - \mu M^Q(s_t)\right](1 - s_t)s_t. \tag{12}$$

We illustrate the behavior of norm transmission with the help of Figure 1. The panel on the left hand side shows the case where μ is sufficiently low such that $\gamma > \mu M^Q(0)$. As a result Δs_t is positive for all s_t and the society converges towards complete nepotism ($s = 1$). The right hand side of Figure 1 shows the opposite case where μ is sufficiently large such that $\gamma < \mu M^Q(1)$. Now, Δs_t is always negative, and the society unambiguously moves toward a steady state without nepotism ($s = 0$). The impact of white collar workers hired by qualification is strong enough to break the transmission of the social norm of nepotism at any level of s_t. Of course a necessary, non-sufficient conditions for this outcome is that white collar workers are hired $M_t^Q > 0$, i.e. that society is situated at an interior equilibrium for all s_t (see Proposition 1).

The intermediate case, where $\mu M^Q(1) < \gamma < \mu M^Q(0)$, is the the most interesting one. It is shown in the center panel of Figure 1. At low values of nepotism the impact of (the relatively many) white collar workers hired by qualification is dominating and the society converges towards a steady state where nepotism is eliminated. At high values of nepotism, in contrast, white collar workers hired by family

[9]Since the firms produce with constant return to scale on competitive markets, profits are zero irrespective of the degree of nepotism, and the question may arise who bears the costs of nepotism. In static equilibrium, the costs of misallocation are born by the unskilled managers (to see this, recall that M is measured in units of human capital). In dynamic equilibrium, missallocation affects knowledge accumulation and spills over as a negative externality on the whole society (see below).

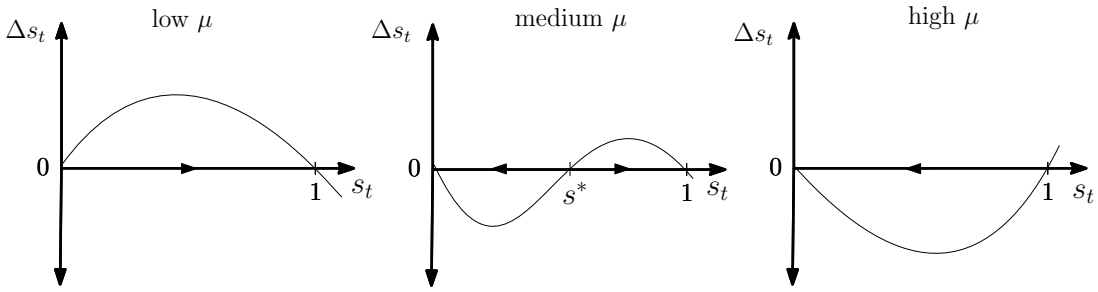

Figure 1: Social Norm Dynamics

connections dominate and the cultural norm of nepotism is socially transmitted toward the steady state $s = 1$. The following proposition summarizes these observations more formally.

Proposition 5 (Multiple Cultural Steady States) *For μ in an intermediate range,*

$$\frac{(1+\alpha+\rho)\gamma}{\alpha(1+\rho)} < \mu < \frac{(1+\rho)\left[\alpha(1-\lambda)-\lambda\right]\gamma}{1+\alpha+\rho}, \tag{13}$$

there exist an unstable equilibrium at

$$M^{Q^*} = \frac{\gamma}{\mu} \quad \Rightarrow \quad s^* = \frac{\alpha(1+\rho)-(\gamma/\mu)(1+\rho+\alpha)}{(1+\alpha)(1+\rho)\lambda} \tag{14}$$

with $\Delta s_t < 0$ for $s_t < s^*$ and $\Delta s_t > 0$ for $s_t > s^*$.

For the proof, M^{Q^*} is obtained by setting (12) to zero for $s \neq 1$ and $s \neq 0$. Inserting M^{Q^*} into (10c) and solving for s_t provides s^*, with $\partial s^*/\partial\mu > 0$. Setting $s^* = 0$ provides the lower bound for μ in (13) and setting $s^* = 1$ provides the upper bound.

The intermediate case of multiple equilibria is of particular policy relevance. It shows that a culture of nepotism can be broken by affirmative action. If a society is converging to or situated at $s = 1$, a sufficiently strong enforced increase of non-elite individuals in white collar work, brings society permanently on a path towards the steady state at $s = 0$. After a one-time movement of $M_t^Q < (M^Q)^*$, s starts declining permanently.[10]

[10]Potentially, there exists another, degenerate way to break the nepotism culture. To implement this feature we would need to extend the model towards a minimum effort level required in education in order to be considered for management position such that individuals with ability level $\hat{a}_t$ are considered unfit for management, $\hat{a}_t < \bar{a}_t$. Then, if $1 - \hat{a}_t < s_t$, not all positions available to be filled by nepotism can be filled due to the low ability of the elite.

2.10 Long-Run Economic Development

Inspection of (9) shows that an economy is capable of perpetual growth of TFP and thus (from (1)) perpetual growth of income per capita if $f(H_t) > 1$. Otherwise the economy converges towards stagnation. This observation motivates the following result.

Proposition 6 (Growth and Stagnation) *Off the steady state, productivity and per capita income declines in nepotism. If furthermore $f(H(1)) < 1 < f(H(0))$, then a society converging towards the steady state of nepotism ($s = 1$) experiences convergence toward economic stagnation while a society converging to the steady state free of nepotism ($s = 0$) experiences long-run economic growth.*

For the proof, we first note that the share of high-skilled individuals in society is a function of nepotism, $H_t = H(s_t)$, see (10d), and that it is declining in nepotism, see Proposition 2. Thus, $\frac{\partial f}{\partial H}\frac{\partial H}{\partial s} < 0$. The qualitative separation of steady states is then ensured by observing $\frac{A_{t+1}}{A_t} < 1$ for $f(H(1)) < 1$ as well as $\frac{A_{t+1}}{A_t} > 1$ for $f(H(0))$. Intuitively, if white collar workers are not hired according to cognitive skills, the white collar department works sufficiently inefficiently and adopts new technologies not fast enough to sustain long-run productivity growth (see Bloom and van Reenen 2007, 2010; La Porta and Shleifer, 2008; Syverson, 2011; for evidence that firms of high productivity are on average run by better educated managers.)

According to Proposition 6, nepotism can cause stagnation at the steady state, namely if $f(H(1)) < 1 < f(H(0))$. It does, however, not imply that all nepotistic societies necessarily stagnate in the long run:

Corollary 2 (Comparative Growth) *If $1 < f(H(1))$, then societies converging towards the steady state of nepotism ($s = 1$) converge towards a balanced growth path where growth is lower than along the balanced growth path that is approached free of nepotism ($s = 0$).*

The testable implication is that, ceteris paribus (i.e. controlling for potential confounders), nepotism exerts a negative influence on long-run growth.

As suggested by unified growth theory (Galor, 2005; Galor and Weil, 2000), inefficiently low accumulation of human capital slows down knowledge accumulation, productivity advances and economic growth, Our argument refines the rationale of unified growth theory by suggesting that the behavioral response of education to technological progress depends on the perception of labor market institutions. If individuals perceive the labor market to be nepotistic, the conventional one-to-one association between enrollment in education and human capital output is broken and the reinforcing mechanism between technology and human capital that leads to sustained economic growth decelerates.

We finally illustrate the potential long-run evolution of societies with a numerical example. We use a narrow notion of white collar work and associate it with professional, managerial, technical jobs. Using values for the U.S. in the year 2007 from Table 3b in Acemoglu and Autor (2011) we set $\alpha = 0.34/(1-0.34) = 0.51$. We set the return to high cognitive skills ρ to 0.4. This implies a return per year of schooling of 3.3 percent for 12 years of schooling. Notice that the return is associated with effort and not with attendance at school. It implies a skill premium for non-elite white collar workers of $(1+\rho)/\alpha = 2.7$. We assume that the elite comprises 10 percent of society ($\lambda = 0.1$) and that a generation takes 25 years. We use a simple linear knowledge production function $f(H_t) = \delta_t H_t$ and set $\delta = 2.5$ such that, if there is long-run growth, TFP (and income per capita) grow at about 1.3 percent annually at the steady state. We have no guidelines to determine the remaining parameter values and set them (arbitrarily) to $\beta = 0.2$ and $\gamma = 0.7$. We set $A(0) = 1$ and the initially prevailing norm $s(0)$ to 0.5, implying that half of the elite gets white-collar jobs due to kin connections. We experiment with alternative values for μ, in order to illustrate alternative long-run economic and social developments.

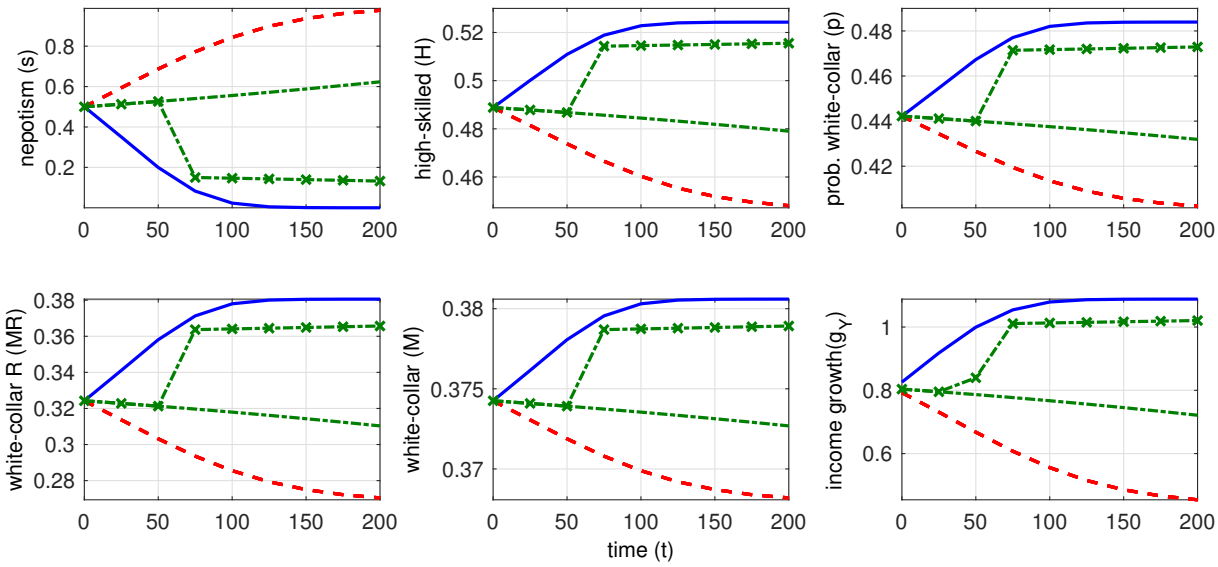

Figure 2: Nepotism and Development

Parameters: $\alpha = 0.51$, $\beta = 0.2$, $\gamma = 0.7$, $\delta = 2.5$, $\lambda = 0.1$, $\rho = 0.4$ and blue (solid) lines: $\mu = 4$, red (dashed) lines: $\mu = 1$; green (dash-dotted) lines: $\mu = 2$. x-crossed lines: policy intervention at year 50 enforces (for 1 generation) $s = 0.15$.

We first consider the case of $\mu = 4$, reflected by blue (solid) time paths in Figure 2. Here, the power of non-elite white collar workers is strong enough to break the cultural norm of nepotism. The society converges towards the nepotism-free steady state, which is approximately reached after 4 generations (at time 100). With declining nepotism the probability to get a white collar job by qualification increases

(upper right panel) and the population share of high-skilled individuals H_t, i.e. the average level of cognitive skills in society increases (upper center panel). Moreover, non-elite human capital in white-collar work (lower left panel) as well as total white-collar human capital (lower center panel) and total employment of workers (not shown) increases along the adjustment path towards the steady state. As a result, TFP and income per capita growth increases (lower right panel). Summarizing, nepotism is negatively associated with cognitive skills and economic development.

The opposite case is shown by red (dashed) lines, reflecting the case of $\mu = 1$. Here, non-elite white collar workers have insufficient power to break the cultural trait of nepotism and nepotism increases further causing a decline in the probability to get a white collar job by qualification and a decline of the population share of high-skilled individuals (average cognitive skills). As result, also total human capital in white collar work and thus efficiency and the scale of production declines. At the prevailing low average skill level, there is too little knowledge adoption (or learning by doing) and long-run growth is not sustainable. The economy converges towards stagnation (lower right panel).

The case of multiple cultural equilibria is shown for $\mu = 2$ and represented by green (dash-dotted) lines in Figure 2. Here, we have two stable extreme steady states separated by an unstable intermediate steady state. Assuming that the society starts on the "wrong side" of the intermediate steady state, it converges towards full nepotism. The speed of convergence is relatively low since $(\gamma - \mu M_R)$ is smaller than for the red-lines case where $\mu = 1$. But in the end, the power of non-elite white collar workers is not high enough to break the culture of nepotism. Adjustment dynamics are slow enough that a small window of observations could suggest that nepotism is almost constant at an intermediate level.

Next, we demonstrate the power of affirmative action. For that purpose we implement a policy that enforces $s = 0.15$ in year 50. Adjustment dynamics are shown by green crossed lines in Figure 2. Apparently, the policy was strong enough to break the nepotism culture. After termination of the affirmation action policy in year 75 and beyond, the society self-sustains a low level of nepotism and converges slowly towards the nepotism-free steady state and positive long-run growth.

3 Empirical Analysis

In this section, we focus on the central proposition of our model. Proposition 3 states that cognitive skills are declining in nepotism levels. More concretely, our model predicts that educational outcomes of the young population are negatively affected by the degree of nepotism experienced by the adult

population in labor markets. To directly test for the main prediction of the model, we relate the PISA scores as an indicator for the cognitive skills of 15-year old students to a novel indicator of perceived nepotism across countries.

3.1 Data and Descriptives

Our data consists of a panel of countries participating in PISA, a multi-country study implemented by the Organisation for Economic Cooperation and Development (OECD) that assesses the reading, mathematics and science skills of 15-year-old students every three years since the year 2000. We use the waves of 2009, 2012 and 2015 in our analysis.[11] Pooling the three rounds gives us a total of 72 countries and an average observation number per country of 2.6, amounting to a total number of 184 observations.[12]

The PISA study seeks two objectives that are valuable for our analysis. First, PISA emphasizes its effort in designing a large-scale test that is culturally and linguistically neutral, as well as equivalent in difficulty and scale across countries, which enhances international comparability. Second, the sample design, usually a two-step stratified random sampling procedure first selecting schools and then students, recovers a nationally representative sample of 15-year-old students (OECD, 2016).[13] While these features are important for our analysis, PISA scores might recover internationally comparable educational performance only imperfectly. For instance, Eivers (2010) discusses cross-cultural comparability issues related to translation equivalence, test formats and attitudes towards low-stakes examinations.[14] Moreover, the focus on reading, math and science subjects plausibly fails to fully capture the multidimensional complexity of educational objectives and outcomes (see Gür et al. (2012) for a discussion on Turkey). In spite of these issues, PISA scores aggregated at the country level are closely associated with economic growth (Hanushek and Woessmann, 2012). Given that the aggregate level and the economic growth angle of

[11] We are unable to include other rounds due to data constraints on our measure for perceived nepotism.

[12] The 2009 values for Austria and the United Arab Emirates, as well as the values for Argentina, Kazakhstan and Malaysia 2015 are excluded from the sample due to data quality issues. For the case of Argentina and Malaysia, coverage was insufficient. Kazakhstan scores are not reliable due to lenient marking (OECD, 2016). For Austria, teacher strikes during the assessment lowered the reliability of the data. For the United Arab Emirates, the varying time periods during which data was collected in different regions of the country decreased the reliability of the scores (OECD, 2010). Given that there is no GDP and/or perceived nepotism data for Macao(China), Miranda(Venezuela), Kosovo, and Liechtenstein, these economies are excluded from the analysis.

[13] As the population of secondary students might not be representative of 15-year-olds in low-enrollment countries, we control for secondary net enrollment rates to adjust for these differences.

[14] To the extent that cross-country differences related to translation equivalences, test formats and attitudes towards low-stakes examinations remain constant over time or are more homegenous within geographical regions, the country and region fixed effects inclusion in our specifications partly address this issue.

human capital are the focus of our analysis, we believe that PISA scores are a suitable proxy for human capital in our setup.

The skills in reading, mathematics and science are measured via a test that takes two hours in total.[15] The test measures not only the knowledge of students but also their capacity to apply that knowledge. Moreover, information on the students and their family background, as well as additional information on the schools are collected (OECD, 2016). For example, students are asked to indicate the interval corresponding to the number of books they have at home.[16] We use this data to generate the share of students corresponding to each interval and use it in our transmission channel analysis as a proxy for human capital valuation at home (Beaton et al., 1996; Mullis et al., 2000; Schütz et al., 2008). Similarly, we generate potentially relevant controls from these surveys such as the country-specific share of schools with autonomy on academic content decision-making, and the share of schools with external examination (Hanushek et al., 2013).

We construct our measure of nepotism from a survey item of the Executive Opinion Survey (EOS) conducted yearly by the World Economic Forum (WEF). The EOS is a rotating panel dataset available since the time period of 2005-2006 and captures the opinion of business leaders around the world on a broad range of topics. The sample design follows a dual stratification procedure that aims at capturing a representative sample of firm owners based on firm size and economic sector. For the time period of 2012-2013, more than 13.000 business leaders in 148 economies participated in this survey. For our sample of 72 economies, the average sample size consists of 114 interviews per country per wave, covering leaders of small, medium and large enterprises operating in economic sectors such as agriculture, manufacturing industry, non-manufacturing industry and services (WEF, 2007, 2014).

Firm owners were asked to evaluate recruitment practices in their respective countries on a scale from 1 to 7, where 7 implies that senior management positions are held by "mostly professional managers chosen for merit and qualifications" and 1 stands for "usually relatives or friends without regard to merit" (WEF, 2014).[17] We argue that the inverted scale of this item captures our definition of nepotism whereby the

[15] In 2015, the assessment was mainly computer-based. To ensure comparability with previous mainly paper-based tests, PISA carefully selected test items that have been proven to be equal in their measurement in paper-based and computer-based assessments. In our analysis, we make use of year fixed effects to tackle remaining concerns.

[16] The eligible intervals are 0-10, 11-25, 26-100, 101-200, 201-500 and more than 500.

[17] Note that the question is formulated in an impersonal manner, allowing the respondent to communicate his/her perception without having to implicate herself/himself.

emphasis on merit and qualifications is crucial for the interpretation of responses.[18] Accordingly, we use it as our proxy for perceived nepotism, henceforth nepotism. According to this measure, countries such as New Zealand, Finland and Norway had the lowest perceived nepotism in 2015, while Algeria, Italy and Romania had the highest. Indonesia, Brazil, Chile and France are median countries.[19] To the best of our knowledge, this is the first paper using this indicator as a proxy for nepotism.

While these scores are collected yearly, the WEF publishes weighted biennial values only. We conceptualize the lagged perception of nepotism to have an impact on current learning outcomes for two reasons. First, we expect early incentive effects to reduce early skills, which in turn stunt later learning efforts and outcomes. This is in line with the rationale of skills complementarity by Cunha and Heckman (2007). Second, it might take time for investment decisions shaped by perceived nepotism to become visible in test scores. Given that we expect that the effect of interest is cumulative and dilatory, we link the average of lagged nepotism values to the respective PISA scores.[20] By doing so, we consider the time spacing of PISA rounds and acknowledge the data constraints of the EOS. More precisely, we link the PISA 2015 country averages to the arithmetic mean of the nepotism scores from the three lagged time periods 2011-2012, 2012-2013 and 2013-2014 and the PISA 2012 values to the mean from nepotism scores of 2008-2009, 2009-2010 and 2010-2011. The PISA 2009 values are in turn matched to the 2005-2006, 2006-2007 and 2007-2008 values. Figure 3 depicts the resulting match and suggests a negative association between nepotism and PISA scores averaged across subjects.

We combine the PISA and EOS data with country-level variables from additional sources. GDP data is obtained from the World Development Indicators. Information on net enrollment rates for secondary schooling are provided by the UNESCO. Finally, we obtain the Corruption Perception Index (CPI) from Transparency International (TI), previously used in the economic literature as an indicator for overall perceived corruption (e.g. Escresa and Picci, 2017; Ugur, 2014). For missing observations in these controls, we impute values by using the average values of each wave.[21] For each of these controls, we

[18] While this is clearly a perception of the degree of nepotism, it could arguably stand for the degree of nepotism itself. This is not a necessary assumption for our analysis, but one we would like to entertain. The WEF argues that the perception of the interviewees is consistent with reality by cross-validating the survey data with empirical facts, whenever available. For example, they show that the correlation between their item on perceived impact of tuberculosis on businesses and the actual prevalence of tuberculosis is of -0.84. A similar exercise is shown for internet usage (WEF, 2007, pp. 133-134). Moreover, as agents of the private sector, respondents are in close contact with recruitment practices, which enables them to assess related questions with greater accuracy.

[19] See countries ordered by nepotism scores in Table A1.

[20] Moreover, averaging nepotism scores across years helps us reduce measurement error.

[21] See Table 1 for the number of observations per variable for the main variables of interest and Table A2 for the same table with all variables used in our analysis.

include a dichotomous variable indicating imputed values in all estimations, which mitigates the risk of imputed values driving our estimations.

We now turn to the descriptive statistics of our data. Table 1 depicts the mean, overall, between and within standard deviation, as well as the number of observations of the main variables of interest by OECD membership. We focus on the PISA scores averaged across the three available subjects, henceforth PISA score(s). We provide descriptive statistics and regression results using separately reading, math and science scores in the Appendix and show that results are qualitatively equivalent to those from the main text. The data on PISA scores, GDP, and enrollment stem from the three PISA wave years, namely 2009, 2012 and 2015, while values for nepotism and CPI are calculated averaging the three lagged time periods as described above.

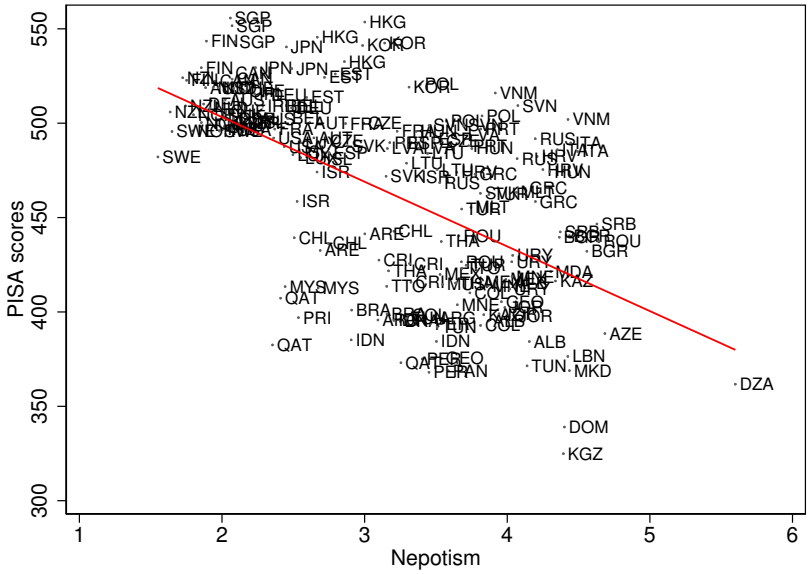

Figure 3: Nepotism and Cognitive Skills

Variable	Mean			SD			between-SD			within-SD			Observations		
	O	N	P	O	N	P	O	N	P	O	N	P	O	N	P
PISA score	494	428	463	28.1	50.0	51.5	29.7	51.1	55.5	6.17	7.21	6.66	99	85	184
GDP	3732	2348	3093	1452	2361	2041	1409	2173	1995	1950	2121	2035	99	85	184
Enrollment	90.5	86.0	88.4	5.49	9.28	7.79	5.26	9.60	8.15	1.77	2.45	2.11	85	48	133
Nepotism	2.78	3.63	3.17	0.77	0.66	0.84	0.74	0.69	0.88	0.20	0.21	0.20	99	85	184
CPI	68.5	44	57.2	17.0	16.9	20.8	16.8	16.2	21.4	2.62	2.89	2.77	99	84	183

Note: O stands for OECD sample, N for non-OECD sample and P for Pooled sample. PISA score refers to the average of math, science and reading scores at the country level. GDP data is in per capita/10 and PPP values. Enrollment refers to secondary net enrollment rates. Nepotism has a scale of 1-7 with higher values reflecting more nepotism, whereas CPI is on a 0-100 scale, with higher values representing lower levels of perceived corruption.

Table 1: Descriptive Statistics by Sample

As shown in Table 1, slightly less than half of the pooled sample corresponds to non-OECD countries. The relatively large number of non-OECD countries contributes to the considerable variation in variables of interest for our pooled sample of countries, which can be confirmed by comparing mean values for the OECD and non-OECD sample.[22] Interestingly, both between- and within-country SD show non-negligible variation. By comparing these two, it becomes evident that as expected, the former is substantially larger. For instance, for the case of nepotism in the pooled sample, the between-SD is close to reaching unity, while the within-variation amounts to one fifth of a unit.

		Nepotism	GDP	Enrollment	CPI
Pooled	Nepotism	1			
	GDP	-0.665***	1		
	Enrollment	-0.122	0.363***	1	
	CPI	-0.815***	0.778***	0.320***	1
OECD	Nepotism	1			
	GDP	-0.638***	1		
	Enrollment	-0.143	0.287**	1	
	CPI	-0.876***	0.741***	0.231*	1
Non-OECD	Nepotism	1			
	GDP	-0.545***	1		
	Enrollment	0.173	0.249*	1	
	CPI	-0.559***	0.701***	0.176	1

Note: Values for 2015. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 2: Correlation Matrix

Table 2 shows the correlation of the main variables of interest for the pooled, OECD and non-OECD samples in the year 2015. As shown in the table, our measure of nepotism is highly correlated with our indicators for economic activity and perceived corruption across samples. Interestingly, these correlations show a substantial reduction in the non-OECD sample. For instance, the correlation between nepotism and CPI drops from -0.815 in the pooled sample to -0.599 in the non-OECD sample. On the other hand, this value increases in magnitude for the sample of OECD countries. This is likely related to the requirements for OECD membership, which plausibly ensure a high degree of homogeneity among member countries. Non-OECD countries on the other hand did not go through such a membership filter, such that more diverging combinations of nepotism and corruption levels are possible. The picture is similar for the other two PISA wave years. We discuss this issue further in the next section.

[22] See 2015 values per country for GDP, PISA scores and Nepotism in Table A1.

3.2 Empirical Specification

Figure 3 illustrates the central relationship of interest of our empirical analysis. It plots our measure of nepotism against the PISA scores for the years 2009, 2012 and 2015. The figure shows a visually strong negative relationship which we formally explore in this section.[23] To draw upon both between- and within-country variation, we estimate random effects models at the country level as follows:

$$Y_{ct} = \alpha_1 + \beta_1 Nepotism_{c\bar{t}} + \beta_2 GDP_{ct} + \beta_3 Enrollment_{ct} + \gamma_r + \epsilon_t + e_{ct} \tag{15}$$

where the dependent variable Y_{ct} stands for PISA scores for country c at time t. $Nepotism_{c\bar{t}}$ is our main indicator of interest as described in Section 3.1, GDP_{ct} is GDP per capita (PPP) in logarithm, which adjusts for differences in economic activity across country-years. $Enrollment_{ct}$ stands for net enrollment rates for secondary schooling. γ_r and ϵ_t stand for regional and PISA wave fixed effects, while e_{ct} is a classical error term. The regional fixed effects allow us to draw on variation within more homogeneous geographical regions (see Table A1 for the region categories), while the PISA wave fixed effects let us control for aggregate time trends. To ease endogeneity concerns, we extend Equation (15) as follows:

$$Y_{ct} = \alpha_1 + \beta_1 Nepotism_{c\bar{t}} + \beta_2 GDP_{ct} + \beta_3 Enrollment_{ct} + \delta_1 X'_{ct} + \delta_2 CPI_{c\bar{t}} + \gamma_r + \epsilon_t + e_{ct} \tag{16}$$

where X'_{ct} stands for the share of schools with autonomy to decide academic content, and the share of schools that undergo an external examination for student assessments, whereas $CPI_{c\bar{t}}$ is our indicator for overall perceived corruption. We include the autonomy and external examination variables to reduce the scope for the potentially confounding role of supply side factors of education systems (Hanushek et al., 2013).[24]

Controlling for $CPI_{c\bar{t}}$ tackles a major threat to the identification of β_1. Arguably, there is a common underlying factor driving overall corruption perception and perceived nepotism in similar directions. Hence, a conditional correlation between nepotism and human capital might be reflecting pervasive effects of overall corruption on human capital through a misallocation of funds, lack of transparency in

[23] Note as well the low and high nepotism clusters analogous to the theoretical model.

[24] Another potential supply-side confounder is university quality, which might incentivize students to exert effort. Unfortunately, comparable data on university quality for the pool of PISA countries is not available (Valero and Van Reenen, 2019). In spite of this, we are able to control for the time-invariant component of university quality in some of our specifications. Furthermore, note that while our nepotism mechanism is demand-driven, supply-side factors might be also indirectly affected via demand effects.

accounting or the proliferation of rent-seeking activities, among others (e.g. Ehrlich and Lui, 1999; Mo, 2001). Controlling for overall corruption allows us to rule out such alternative interpretations, providing in this way more robust evidence to our model prediction.[25] As having both perceived corruption and nepotism in the same regression models posits interpretation concerns related to multicollinearity, we additionally estimate our models for the OECD and non-OECD samples. This subsample analysis is informative as the correlation between nepotism and corruption significantly differs in the two subsamples.

Although the indicators of perceived nepotism and corruption are relatively highly correlated (see Table 2), they fundamentally measure two distinct phenomena. Nepotism is specific to labor markets and within-group dynamics, while corruption refers to a more general phenomenon. Nepotism can be a dimension of corruption but corruption encompasses also many other dimensions that can be neutral, complementary or substitutes to nepotism.[26] For example, Olken (2007) provides evidence from a field experiment in Indonesia for a substitution effect. He suggests that villagers randomly assigned to imminent audit on village road projects substitute a funds diversion type of corruption with nepotism. Moreover, the way these two indicators are measured is very different. On the one hand, the CPI is a composite indicator that aims at capturing the overall perception of corruption in the public sector by averaging indices of 13 different institutional quality data sources, combining assessments on perceived accountability, bribery, public procurement and misuse of public funds, among others (Transparency International, 2016). On the other hand, our measure for nepotism captures the perception of business leaders on the specific and exclusive issue of nepotism for senior management positions (WEF, 2014). Therefore, in spite of the high correlation, important differences can be observed between these two. As depicted in Figure A1 in the Appendix, countries with the same corruption perception score can be heterogeneous in their nepotism scores, and vice versa. For example, while Uruguay and Kazakhstan have similarly high levels of nepotism, the former has much lower corruption perception levels. Conversely, Malaysia and Jordan score both similarly in corruption perception, but Jordan perceives nepotism substantially stronger than Malaysia.

In our most conservative exercise, we estimate country-fixed effects models of equations (15) and (16). This comes at the cost of eliminating between-country variation and increasing attenuation bias stemming from measurement error in the nepotism variable (Griliches and Hausman, 1986). However,

[25] We argue that this type of omitted variable is the main identification threat we face. Conversely, reverse causality plausibly plays a minor role in this respect as it is very unlikely that the human capital of 15-year old children is driving contemporaneous perceived nepotism.

[26] In a scenario of white-collar jobs in the public sector being obtained through bribery, corruption might also disincentivize human capital investments.

it brings the great advantage of allowing for time-invariant unobserved heterogeneity, which, in tandem with our controls capturing the most relevant time-variant factors, substantially reduces the scope for omitted variable concerns.

An important aspect of our narrative is the mechanism at work in the relationship of interest. Our storyline suggests that underinvestment in human capital induced by nepotism leads to lower test scores. The transmission channels that bring to life such a relationship can take different forms such as learning effort, parental involvement and investments in education-related assets. To investigate this, we expand equation (15) by $\theta_1 T_{ct}$ to get equation (17):

$$Y_{ct} = \alpha_1 + \beta_1 Nepotism_{c\bar{t}} + \beta_2 GDP_{ct} + \beta_3 Enrollment_{ct} + \theta_1 T_{ct} + \gamma_r + \epsilon_t + e_{ct} \quad . \tag{17}$$

Plausible transmission channels for this analysis should be microfounded in nature, identifiable at the macro level and internationally comparable. We use the number of books at student's homes as an intermediating factor meeting these criteria that proxies for investments in human capital and valuation of human capital at home. Accordingly, we interpret changes of β_1 by comparing estimations of equations (15) and (17).

3.3 Results

3.3.1 Main Results

The main results are reported in Table 3. Columns 1, 3 and 5 control for GDP per capita in logarithm, secondary net enrollment rates, and regional and PISA-wave fixed effects (e.g. the baseline model of equation (15)), whereas the remaining columns control in addition for a measure of general perceived corruption, the CPI, and two variables related to the institutional features of school systems, namely the share of schools with autonomy in academic content and the share of schools with external evaluation (e.g. the extended model of equation (16))[27]. The first two columns use the full sample, columns 3 and 4 the OECD sample and columns 5 and 6 the non-OECD sample.

Our analysis indicates that countries with high levels of nepotism perform worse in PISA scores. In column 1, the specification is able to explain 66% of the international variation in PISA scores. The coefficient for nepotism is negative and statistically significant at the 1% level. An increase of one standard deviation in the nepotism indicator is associated with a decrease in the PISA score by

[27] Note that higher values of the CPI represent lower levels of perceived corruption

0.16 standard deviations (SD).[28] The magnitude of this conditional correlation reveals potentially severe implications. If, for example, the population of Algeria had perceived the role of nepotism to be as weak as the population in New Zealand did for the years 2011-2014, they would have obtained 38 additional points in their 2015 PISA scores. The implications for economic development of such a nation-wide cognitive jump are substantial. According to estimates from Hanushek and Woessmann (2012), this would imply an increase in the annual GDP growth rate of 1.5-3 percentage points. Turning to column 2, the specification is able to explain 75% of the international variation in PISA scores. Adjusting for additional controls makes the nepotism coefficient decrease to 0.11 SD. The coefficient remains statistically significant at the 5% level, unlike the coefficient for the logarithm of GDP p.c., which drops to insignificant levels. This estimate is particularly noteworthy given that it is net of the influence of overall perceived corruption.

	(1) Full sample b/se	(2) Full sample b/se	(3) OECD b/se	(4) OECD b/se	(5) Non-OECD b/se	(6) Non-OECD b/se
Nepotism	-9.60***	-6.77**	-4.63	0.60	-12.24***	-10.14***
	(3.40)	(3.25)	(4.56)	(4.99)	(3.68)	(3.21)
GDP	33.87***	18.23	10.29	5.07	27.42**	13.94
	(11.13)	(11.39)	(10.85)	(8.07)	(13.60)	(12.29)
CPI		0.95***		0.57***		0.95***
		(0.16)		(0.19)		(0.29)
Observations	184	184	99	99	85	85
Countries	72	72	36	36	37	37
R-squared	0.66	0.75	0.56	0.71	0.51	0.63

Note: Random effects regressions at the country level. *, **, *** denote significance at the 0.1, 0.5 and 0.01 levels, respectively. Standard errors in parenthesis clustered at the country level. Dependent variable is country-level average of PISA scores across subjects. All regressions control for secondary net enrollment rates, region and year fixed effects, as well as for imputation dummies for variables with missing values. Columns 2, 4 and 6 control in addition for the share of schools with autonomy in academic content and with external evaluation.

Table 3: Main Results. Effect of Nepotism on PISA Scores

We now look at the implications of the high correlation between nepotism and CPI (see Table 2) for our estimates. On the one hand, it is remarkable that the coefficient for nepotism in column 2 remains significant under the presence of multicollinearity that the inclusion of CPI involves. On the other hand however, high correlations among covariates speak against ceteris paribus interpretations. We exploit subsample analysis to ease this concern. For that purpose, we divide the sample into OECD and non-OECD countries. The correlation between nepotism and CPI is significantly lower among non-OECD countries. It drops 26 percentage points to 56%, while the OECD sample shows an even higher correlation

[28] Similar effects have been found in experimental studies that estimate the impact of significantly raising the aspirations of students in Madagascar (Nguyen, 2008) and Uganda (Riley, 2017) via role models interventions. Our estimates are complementary to this evidence in the sense that they link perceptions on education-related prospects to investments in human capital and learning outcomes.

than the pooled sample (see Table 2). Hence, our attempt of separating the effect of nepotism on PISA scores from the CPI effect is more plausible for the non-OECD subsample, whereas multicollinearity and interpretation concerns would amplify in the OECD sample.

The results are reassuring. For the low-correlation sample of non-OECD countries in columns 5 and 6, the coefficient is highly statistically significant and even higher in magnitude than in columns 1 and 2. This reinforces the implication that nepotism is associated with poor performance on its own and not simply as a signal for overall corruption. For the case of the OECD sample, the coefficients in columns 3 and 4 are not distinguishable from zero. Arguably, this is a consequence of the sample consisting of a more homogeneous group of countries. For instance, the variation in PISA scores nearly halves compared to the other two samples (see Table 2). Moreover, the coefficient is less precisely estimated than the one for the non-OECD sample, even though the sample size is bigger. This might be a statistical consequence of multicollinearity being higher in the OECD sample. Overall, the results in this table suggest that countries with high levels of nepotism perform worse in PISA scores.[29]

3.3.2 Fixed Effects Estimations

In this section, we report results from country fixed effects estimations, absorbing all time-invariant unobserved heterogeneity. This represents a conservative exercise as most of the variation in the variables of interest stems from differences between countries. In spite of this, we observe non-negligible variation in our nepotism indicator over time (see Table 2).[30] The fact that the data source of our indicator is a rotating panel tracking respondents over time further reinforces the interpretation of this variation as systematic changes in perceived nepotism. Interestingly, this relates to our theoretical model in Section 2. There, we pose nepotism as a cultural trait that, while it can reach stable equilibria, it can also find itself in a transitional phase where significant changes over short or long time periods are possible. That is, while cultural norms can be persistent, they do not need to be immovable. What is more, rapid changes in cultural attitudes and beliefs are also possible. For instance, relatively rapid changes have been documented for attitudes towards redistribution (Giuliano and Spilimbergo, 2014), trust (Fehr, 2009; Francois et al., 2018), religion (Gruber and Hungerman, 2008), state intervention (Alesina and Fuchs-Schündeln, 2007) and free market (Di Tella et al., 2007). In the same vein, Stevenson and Wolfers

[29]We also estimate models with subject-specific PISA scores, with similar results (Tables A3-A5). Moreover, we estimate models with a nepotism indicator covering a time period lagged by two years instead of one (Tables A6-A9). The estimated nepotism coefficients are highly statistically significant and increase in magnitude compared to those from the baseline specification. This is consistent with the idea of skills complementarity posed by Cunha and Heckman (2007) and with our conceptualization of a cumulative and dilatory effect of nepotism.

[30]This variation might be the result of recurring disturbances, for instance related to globalization forces.

(2011) document sharp changes in the trust on public institutions and perceived honesty of journalists within a 4 years time window.[31]

We present the fixed effects results for the full (columns 1 and 2), OECD (columns 3 and 4) and non-OECD sample (columns 5 and 6) in Table 4. As shown in the first two columns, the estimates for the full sample drop to insignificant levels in both, the baseline and extended model. For the OECD sample, the coefficients are statistically insignificant as before. Remarkably, our previous results for the non-OECD sample, which is the sample with the largest within-variation in the variables of interest, are robust to the inclusion of country fixed effects. In columns 5, the estimate is negative, similar in magnitude to the estimates in Table 3, and statistically significant at the 5% level. This estimate brings the great advantage of absorbing all time-invariant determinants of learning outcomes. However, unobserved factors varying over time remain a concern. In this respect, by controlling for changes in overall corruption perception in column 6, we rule out the most direct threat to the estimated relationship.[32] While we acknowledge that making causal inferences is difficult in a cross-country regression setup, this conservative estimate fails to dismiss our model prediction and is able to provide robust evidence for the nepotism-human capital association.

	(1) Full sample b/se	(2) Full sample b/se	(3) OECD b/se	(4) OECD b/se	(5) Non-OECD b/se	(6) Non-OECD b/se
Nepotism	-5.06	-5.21	2.89	3.97	-10.54**	-11.22***
	(4.63)	(4.38)	(6.20)	(6.86)	(4.55)	(3.95)
GDP	19.30	6.94	-0.24	-9.59	13.19	6.09
	(15.38)	(14.35)	(21.14)	(20.82)	(25.33)	(21.79)
CPI		0.66***		0.26		0.78*
		(0.21)		(0.25)		(0.40)
Observations	184	184	99	99	85	85
Countries	72	72	36	36	37	37
R-squared	0.10	0.20	0.13	0.23	0.28	0.38

Note: Fixed effects regressions at the country level. *, **, *** denote significance at the 0.1, 0.5 and 0.01 levels, respectively. Standard errors in parenthesis clustered at the country level. Dependent variable is country-level average of PISA scores across subjects. All regressions control for secondary net enrollment rates, year fixed effects, as well as for imputation dummies for variables with missing values. Columns 2, 4 and 6 control in addition for the share of schools with autonomy in academic content and with external evaluation.

Table 4: Fixed Effects. Effect of Nepotism on PISA Scores

[31]For instance, Bellows (2009) suggests that nepotism practices changed substantially within few years. See Warner (2013) for a detailed discussion on (rapid) cultural changes of corporate practices, including recruitment practices, in East Asian countries and Giuliano and Nunn (2019) for a general discussion on cultural persistence and change.

[32]We estimate models with subject-specific PISA scores, which yield similar results (Tables A10-A12). Moreover, we also estimate these models with a nepotism indicator covering a time period lagged by two years instead of one. Results are highly similar, as shown in Tables A13-A16.

3.3.3 Transmission Channels

We now show evidence on transmission channels which is consistent with a causal interpretation of our previous estimates. Plausible transmission channels should be microfounded in nature, identifiable at the macro level and internationally comparable. We consider the number of books at home as a factor meeting these three criteria. As a response to the lack of income and wealth data, this variable has been interpreted as a proxy for socioeconomic background in microstudies (Schütz et al., 2008). A large number of books at home has also been interpreted as an indicator for a home environment that esteems education, values knowledge acquisition and promotes the learning efforts of children (Beaton et al., 1996; Mullis et al., 2000; Schütz et al., 2008). We argue that at the macro level and conditioning for GDP p.c., this indicator stands for the latter interpretation. We make use of the share of students corresponding to various intervals of the number of books at home as described in Section 3.1. Plotting nepotism against these categories shows a negative relationship between nepotism and the valuation of human capital in terms of the number of books at home (see Figures A3-A8). The share of students falling into the category of low stocks of books at home (i.e. the category for relatively low valuation of human capital) increases with nepotism levels. On the contrary, for the categories representing large numbers of books at home and hence high valuation of human capital, the share of students decreases with nepotism levels.

	(1) b/se	(2) b/se	(3) b/se	(4) b/se	(5) b/se	(6) b/se	(7) b/se	(8) b/se
Nepotism	-9.60***	-7.98**	-9.15***	-6.49*	-8.62**	-9.18***	-8.54**	-6.57*
	(3.40)	(3.56)	(3.47)	(3.51)	(3.59)	(3.44)	(3.39)	(3.45)
% with 0-10 books		-0.78**						0.00
		(0.35)						(.)
% with 11-25 books			-1.71***					-2.07**
			(0.59)					(0.91)
% with 26-100 books				2.06***				1.53**
				(0.65)				(0.77)
% with 101-200 books					2.15***			-0.71
					(0.78)			(1.16)
% with 201-500 books						2.16***		3.31***
						(0.62)		(1.07)
% with 500 books or more							-0.40	-4.71***
							(0.89)	(1.46)
Observations	184	182	182	182	182	182	182	182
R-squared	0.66	0.69	0.73	0.72	0.71	0.71	0.67	0.79

Note: Random effects regressions at the country level. *, **, *** denote significance at the 0.1, 0.5 and 0.01 levels, respectively. Standard errors in parenthesis clustered at the country level. Dependent variable is country-level PISA average scores across subjects. All regressions control for secondary net enrollment rates, log GDP per capita, region and year fixed effects, as well as for imputation dummies for variables with missing values and for the share of missing observations for the number of books at home.

Table 5: Transmission Channels

Results in Table 5 suggest that the number of books at students' homes represents an intermediating factor in the investigated relationship.[33] Part of the effect associated with the nepotism indicator migrates to the book variables, as identified by comparing the nepotism coefficient in column 1 with its counterparts in the remaining columns. Moreover, the coefficients for the books variables are usually highly statistically significant. Inline with our predictions, a low stock of books at home is negatively associated with the PISA scores (columns 2 to 4), whereas medium to high stocks of books at home show mostly positive coefficients (columns 4 to 7). For instance, one percentage point increase of students having 201-500 books at home is associated with an increase of 2.16 points in the PISA scores. Finally, in column 8, we estimate coefficients for all book variables simultaneously. We interpret these estimates cautiously as multicollinearity concerns are amplified by including six highly correlated variables that aim at measuring closely-related indicators.[34] Our estimates show that a switch of one percentage point from the share of students having 0-10 books at home to those having 26-100 or 201-500 books at home has a positive and statistically significant effect, holding the other categories constant. At the same time, a switch to the 11-25 or 500 books or more categories has a negative and statistically significant effect, suggesting mixed evidence for this channel when investigating a specific switch between categories.

Overall, the results in Table 5 tentatively suggest that part of the effect of nepotism on human capital works through the cumulative valuation of human capital by students or their parents, which is manifested in the purchase of books kept at home.

4 Conclusion

In this paper we proposed a dynamic general equilibrium model that explains nepotism as a (locally) stable cultural steady state. In this context we have shown that perceived nepotism reduces effort at school and cognitive ability of the workforce. Through this channel, nepotism reduces aggregate productivity and technological advances and can explain low economic growth and, at the extreme, stagnation in a culturally determined poverty trap. Here we focussed on a closed economy. In the context of an open economy, another, complementary pathway of nepotism on macroeconomic performance is conceivable, which operates through brain drain. Internationally mobile individuals of high ability may exert effort in education but then leave the country because of the low expected reward of education at home due to

[33] See similar results for subject-specific estimates in Tables A17-A19.

[34] As these categories shares are proportions that sum up to 1, the category of 0-10 books is left out as baseline. Given that all the other categories are held constant, an increase in any of the categories included must imply a decrease in the baseline category.

nepotism. This way they may contribute to increasing productivity abroad and reduced productivity at home and to a deterioration of the terms of trade.

Our empirical analysis has shown that higher nepotism levels are systematically related to lower human capital, as predicted by our theoretical model. While our empirical analysis does not allow us to claim a causal relationship, we provide a novel theory through which culture affects development, and provide robust empirical evidence supporting this association. By controlling for economic performance, supply-side factors and overall perceived corruption, as well as for all time-invariant determinants of human capital, our estimates speak directly to our model prediction and significantly reduces the scope for alternative interpretations. The analysis on transmission channels reinforces our nepotism-incentives storyline by suggesting that higher nepotism is associated with a lower stock of books at home, which in turn negatively affects students' performance in the PISA scores.

Our main findings are consistent with microeconomic evidence that causally links higher (perceived) returns to human capital investments and eduction outcomes (Attanasio and Kaufmann, 2014; Jensen, 2010; Kingdon and Theopold, 2008; Kuka et al., 2020; Nguyen, 2008; Riley, 2017). Our estimations complement the incentives narrative of human capital investments and provide greater external validity. Distinct from the above-mentioned studies that typically underscore information failures and aspirations, we draw attention to a novel disincentivizing force involving cultural aspects of labor markets.

A natural question that derives from this analysis asks why countries vary in their levels of (perceived) nepotism in the first place. While there is an established literature on the determinants of corruption levels across countries (i.e. Alesina et al., 2003; La Porta et al., 1999), studies on the causes for international differences in nepotism are to our knowledge not available. In relation to the origins of nepotism, Greif (2006) suggests that kinship groups initially played a crucial role in medieval Europe by providing safety nets, facilitating trade and establishing cooperation among individuals. Only later, corporation-based institutions substituted this cultural practice, partly as a consequence of the introduction of Christian doctrines that undermined the importance of kinship groups. Following this reasoning, nepotism would initially emerge as a beneficial practice against uncertainty in the absence of well-functioning labor markets. Another interesting aspect could be the role of natural resources in discouraging human capital investments and promoting nepotism (see Gylfason, 2001). These considerations on the differences in nepotism across societies provide fertile ground for future research, especially considering that understanding the determinants of nepotism has important implications for human capital accumulation and ultimately economic development.

The analysis in this paper implies that the consequences of perceived nepotism are far-reaching as they transcend the working place, ultimately harming human capital and economic performance. Policies targeting human capital should closely examine the perception that students and their parents have on the *relative* reward of human capital in labor markets, and how these might affect education commitment and support. Importantly, theoretical considerations showed that one-off interventions have the potential to free labor markets from nepotism and drive countries into sustained economic growth. Hence, the consideration of our conclusions may potentiate education policy efforts, drive individuals into effectively seizing their schooling opportunities and contribute to the economic development of nations.

5 Appendix

5.1 Descriptives

Country	Code	Region	GDP	PISA Score	Nepotism
OECD					
New Zealand	NZL	Commonwealth	3518	505.9	1.636
Finland	FIN	Western Europe	3908	522.7	1.752
Norway	NOR	Western Europe	6403	504.5	1.800
Netherlands	NLD	Western Europe	4694	507.9	1.915
Sweden	SWE	Western Europe	4570	495.8	1.983
Denmark	DNK	Western Europe	4579	504.3	2.008
Switzerland	CHE	Western Europe	5732	506.3	2.027
Canada	CAN	Commonwealth	4312	523.3	2.071
United Kingdom	GBR	Western Europe	3901	499.9	2.117
Australia	AUS	Commonwealth	4405	502.3	2.234
Ireland	IRL	Western Europe	6030	509.0	2.287
United States	USA	Commonwealth	5319	487.6	2.437
Belgium	BEL	Western Europe	4182	502.5	2.460
Germany	DEU	Western Europe	4404	508.1	2.488
Japan	JPN	Asia	3783	528.9	2.489
Luxembourg	LUX	Western Europe	9373	483.3	2.498
Puerto Rico	PRI	Commonwealth	3531	397.0	2.536
Austria	AUT	Western Europe	4425	492.2	2.644
Iceland	ISL	Western Europe	4422	480.9	2.702
Estonia	EST	Eastern Europe	2761	524.3	2.718
Chile	CHL	Latin America	2226	442.7	3.206
France	FRA	Western Europe	3784	495.7	3.228
South Korea	KOR	Asia	3418	519.1	3.311
Israel	ISR	MENA	3210	471.7	3.367
Latvia	LVA	Eastern Europe	2302	486.8	3.380
Spain	ESP	Southern Europe	3236	491.4	3.485
Czech Rep.	CZE	Eastern Europe	3061	490.8	3.540
Turkey	TUR	Asia	2331	424.8	3.711
Slovak Rep.	SVK	Eastern Europe	2840	462.8	3.812
Mexico	MEX	Latin America	1750	415.7	3.813
Portugal	PRT	Southern Europe	2661	497.0	3.815
Poland	POL	Eastern Europe	2531	503.9	3.823
Slovenia	SVN	Eastern Europe	2904	509.3	4.075
Greece	GRC	Southern Europe	2413	458.5	4.197
Hungary	HUN	Eastern Europe	2508	474.4	4.298
Italy	ITA	Southern Europe	3429	485.0	4.494
Non-OECD					
Singapore	SGP	Asia	8334	551.6	2.071
Qatar	QAT	MENA	11594	407.3	2.411
United Arab Emirates	ARE	MENA	6579	432.6	2.688
Hong Kong	HKG	Asia	5359	532.6	2.858
Indonesia	IDN	Asia	1036	395.5	3.205

Country	Code	Region	GDP	PISA Score	Nepotism
Brazil	BRA	Latin America	1481	395.0	3.249
Costa Rica	CRI	Latin America	1462	415.8	3.325
Peru	PER	Latin America	1212	393.6	3.459
Lithuania	LTU	Eastern Europe	2704	475.4	3.508
Thailand	THA	Asia	1526	415.3	3.637
Trinidad and Tobago	TTO	Latin America	3146	423.0	3.683
Colombia	COL	Latin America	1311	410.1	3.738
Jordan	JOR	MENA	840.8	399.0	3.943
Georgia	GEO	Asia	900.5	405.4	3.959
Albania	ALB	Southern Europe	1097	415.2	4.024
Montenegro	MNE	Southern Europe	1529	418.7	4.034
Uruguay	URY	Latin America	1995	430.0	4.038
Malta	MLT	Southern Europe	3448	463.4	4.063
Tunisia	TUN	MENA	1086	371.4	4.139
Russia	RUS	Eastern Europe	2452	491.8	4.196
Croatia	HRV	Southern Europe	2103	475.4	4.250
Moldova	MDA	Eastern Europe	569.6	421.3	4.305
Bulgaria	BGR	Eastern Europe	1700	439.6	4.365
Dominican Republic	DOM	Latin America	1372	339.0	4.401
Lebanon	LBN	MENA	1189	376.4	4.425
Vietnam	VNM	Asia	560.8	502.0	4.426
North Macedonia	MKD	Southern Europe	1276	368.9	4.436
Romania	ROU	Eastern Europe	2067	437.5	4.644
Algeria	DZA	MENA	1377	361.7	5.599

Note: List of all countries included in the analysis. Countries grouped by OECD membership and ordered after ascending order in perceived nepotism scores.

Table A1: Country values. Year 2015

Variable	Mean			SD			between-SD			within-SD			Observations		
	O	N	P	O	N	P	O	N	P	O	N	P	O	N	P
PISA score	494	428	463	28.1	50.0	51.5	29.7	51.1	55.5	6.17	7.21	6.66	99	85	184
Science score	496	432	467	29.8	50.3	51.7	31.1	51.6	55.6	6.58	8.26	7.40	99	85	184
Reading score	493	426	462	25.0	47.8	49.8	25.9	50.5	55.0	7.35	8.28	7.77	99	85	184
Math score	491	425	461	31.4	54.3	54.7	33.6	54.0	57.5	6.31	7.31	6.77	99	85	184
GDP	3732	2348	3093	1452	2360	2041	1409	2173	1995	195	212	203	99	85	184
Enrollment	90.5	86.0	88.4	5.49	9.28	7.79	5.26	9.60	8.15	1.77	2.45	2.11	85	48	133
Nepotism	2.78	3.63	3.17	0.77	0.66	0.84	0.74	0.69	0.88	0.20	0.21	0.20	99	85	184
CPI	68.5	44.0	57.2	17.0	16.8	20.8	16.8	16.0	21.3	2.62	2.87	2.76	99	84	183
Acad. content	0.57	0.44	0.51	0.22	0.22	0.23	0.21	0.21	0.23	0.04	0.05	0.04	94	78	172
External exams	0.61	0.73	0.67	0.25	0.22	0.25	0.19	0.20	0.20	0.18	0.11	0.15	95	85	180
% 0-10 books	13.7	24.5	18.7	6.90	10.0	10.0	6.60	10.1	10.3	1.52	2.05	1.78	98	84	182
% 26-100 books	29.8	27.1	28.5	3.32	5.56	4.69	3.10	5.91	5	1.19	0.97	1.09	98	84	182
% 101-200 books	17.4	11.0	14.4	3.72	4.58	5.24	3.59	4.61	5.39	0.72	0.74	0.73	98	84	182
% 201-500 books	13.8	6.47	10.4	4.42	3.96	5.57	4.27	3.91	5.64	0.85	0.64	0.76	98	84	182
% =>500 books	7.96	4.09	6.18	3.19	2.66	3.53	3.05	2.60	3.46	0.64	0.49	0.58	98	84	182

Note: O stands for OECD sample, N for non-OECD sample and P for Pooled sample. PISA Reading, Math and Science refer to the test scores in the corresponding subject at the country level. GDP data is in per capita/10 and PPP values. Enrollment is net secondary enrollment rates. Nepotism has a scale of 1-7 with higher values reflecting more nepotism, whereas CPI is on a 0-100 scale with higher values standing for less perceived corruption. The share of books of different ranges stand for the share of students having a number of books at home within that range.

Table A2: Descriptive statistics by sample

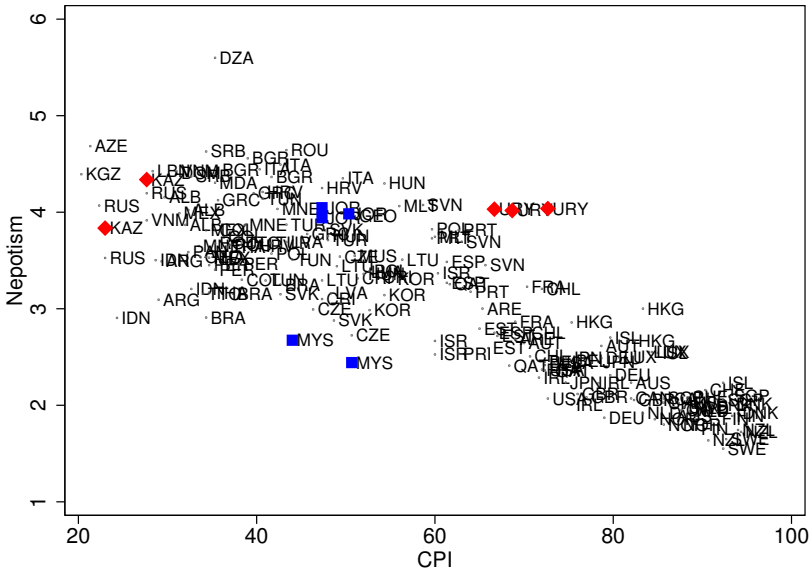

Figure A1: Nepotism and Corruption Perception Index

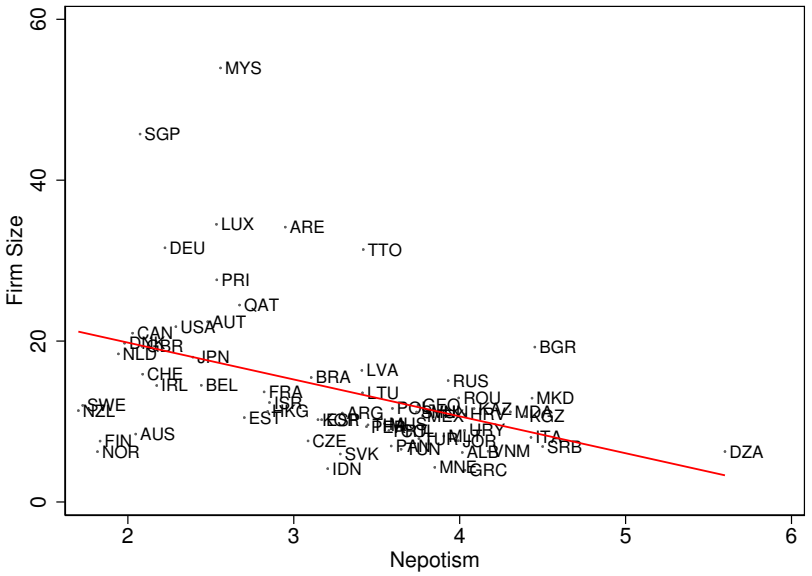

Figure A2: Nepotism and Average Firm Size

5.2 Main Results by Subject

	(1) Full sample b/se	(2) Full sample b/se	(3) OECD b/se	(4) OECD b/se	(5) Non-OECD b/se	(6) Non-OECD b/se
Nepotism	-13.49***	-9.86***	-7.51*	-0.10	-17.31***	-14.43***
	(3.88)	(3.78)	(4.47)	(4.92)	(5.15)	(4.35)
GDP	31.28***	15.54	7.96	4.94	24.04*	8.52
	(10.92)	(11.43)	(10.87)	(8.46)	(12.99)	(12.13)
CPI		0.97***		0.45**		1.21***
		(0.17)		(0.20)		(0.29)
Observations	184	184	99	99	85	85
Countries	72	72	36	36	37	37
R-squared	0.63	0.72	0.59	0.68	0.46	0.60

Note: Random effects regressions at the country level. *, **, *** denote significance at the 0.1, 0.5 and 0.01 levels, respectively. Standard errors in parenthesis clustered at the country level. Dependent variable is PISA reading scores. All regressions control for secondary net enrollment rates, region and year fixed effects, as well as for imputation dummies for variables with missing values. Columns 2, 4 and 6 control in addition for the share of schools with autonomy in academic content and with external evaluation.

Table A3: Main results. Effect of Nepotism on PISA Reading Scores

	(1) Full sample b/se	(2) Full sample b/se	(3) OECD b/se	(4) OECD b/se	(5) Non-OECD b/se	(6) Non-OECD b/se
Nepotism	-6.15*	-3.52	-0.99	3.07	-9.34**	-7.03*
	(3.72)	(3.49)	(4.98)	(5.25)	(3.80)	(3.63)
GDP	39.70***	24.71**	21.34*	13.79	31.34**	21.38*
	(11.34)	(11.71)	(12.57)	(9.47)	(13.87)	(12.58)
CPI		0.91***		0.68***		0.72***
		(0.14)		(0.20)		(0.28)
Observations	184	184	99	99	85	85
Countries	72	72	36	36	37	37
R-squared	0.69	0.76	0.54	0.69	0.56	0.66

Note: Random effects regressions at the country level. *, **, *** denote significance at the 0.1, 0.5 and 0.01 levels, respectively. Standard errors in parenthesis clustered at the country level. Dependent variable is PISA math scores. All regressions control for secondary net enrollment rates, region and year fixed effects, as well as for imputation dummies for variables with missing values. Columns 2, 4 and 6 control in addition for the share of schools with autonomy in academic content and with external evaluation.

Table A4: Main results. Effect of Nepotism on PISA Math Scores

	(1) Full sample b/se	(2) Full sample b/se	(3) OECD b/se	(4) OECD b/se	(5) Non-OECD b/se	(6) Non-OECD b/se
Nepotism	-10.70***	-7.17**	-6.64	-1.75	-11.35***	-8.81**
	(3.51)	(3.36)	(4.71)	(5.07)	(3.68)	(3.60)
GDP	30.68***	13.95	1.43	-4.91	26.18*	10.55
	(11.71)	(11.91)	(10.23)	(9.09)	(14.39)	(13.22)
CPI		1.04***		0.60***		0.94**
		(0.21)		(0.22)		(0.41)
Observations	184	184	99	99	85	85
Countries	72	72	36	36	37	37
R-squared	0.65	0.74	0.55	0.71	0.48	0.61

Note: Random effects regressions at the country level. *, **, *** denote significance at the 0.1, 0.5 and 0.01 levels, respectively. Standard errors in parenthesis clustered at the country level. Dependent variable is PISA science scores. All regressions control for secondary net enrollment rates, region and year fixed effects, as well as for imputation dummies for variables with missing values. Columns 2, 4 and 6 control in addition for the share of schools with autonomy in academic content and with external evaluation.

Table A5: Main results. Effect of Nepotism on PISA Science Scores

5.3 Main Results (2 Years Lag)

	(1) Full sample b/se	(2) Full sample b/se	(3) OECD b/se	(4) OECD b/se	(5) Non-OECD b/se	(6) Non-OECD b/se
Nepotism	-12.22***	-9.45***	-6.08	0.38	-13.24***	-12.65***
	(3.61)	(3.43)	(4.47)	(4.28)	(4.30)	(3.87)
GDP	32.62***	17.33	10.09	5.27	27.32**	13.60
	(11.09)	(11.19)	(10.65)	(8.00)	(13.70)	(12.17)
CPI		0.93***		0.57***		0.95***
		(0.16)		(0.20)		(0.29)
Observations	184	184	99	99	85	85
Countries	72	72	36	36	37	37
R-squared	0.67	0.75	0.56	0.71	0.52	0.64

Note: Random effects regressions at the country level. *, **, *** denote significance at the 0.1, 0.5 and 0.01 levels, respectively. Standard errors in parenthesis clustered at the country level. Dependent variable is country-level averages of PISA scores across subjects. The time period covered by the nepotism indicator is lagged by two years instead of one. All regressions control for secondary net enrollment rates, region and year fixed effects, as well as for imputation dummies for variables with missing values. Columns 2, 4 and 6 control in addition for the share of schools with autonomy in academic content and with external evaluation.

Table A6: Main results. Effect of Nepotism on PISA Scores

	(1) Full sample b/se	(2) Full sample b/se	(3) OECD b/se	(4) OECD b/se	(5) Non-OECD b/se	(6) Non-OECD b/se
Nepotism	-14.20***	-10.44***	-7.28	1.88	-16.80***	-15.93***
	(3.79)	(3.75)	(4.82)	(4.34)	(4.73)	(4.35)
GDP	31.01***	15.20	7.94	4.76	24.74*	8.60
	(10.85)	(11.33)	(10.88)	(8.44)	(13.04)	(12.01)
CPI		0.98***		0.49**		1.24***
		(0.17)		(0.20)		(0.29)
Observations	184	184	99	99	85	85
Countries	72	72	36	36	37	37
R-squared	0.64	0.72	0.58	0.68	0.47	0.61

Note: Random effects regressions at the country level. *, **, *** denote significance at the 0.1, 0.5 and 0.01 levels, respectively. Standard errors in parenthesis clustered at the country level. Dependent variable is PISA reading scores. The time period covered by the nepotism indicator is lagged by two years instead of one. All regressions control for secondary net enrollment rates, region and year fixed effects, as well as for imputation dummies for variables with missing values. Columns 2, 4 and 6 control in addition for the share of schools with autonomy in academic content and with external evaluation.

Table A7: Main results. Effect of Nepotism on PISA Reading Scores

	(1) Full sample b/se	(2) Full sample b/se	(3) OECD b/se	(4) OECD b/se	(5) Non-OECD b/se	(6) Non-OECD b/se
Nepotism	-10.47***	-7.97**	-4.63	0.44	-10.50**	-9.36**
	(3.96)	(3.72)	(4.87)	(4.57)	(4.83)	(4.70)
GDP	37.66***	23.42**	21.19*	14.44	31.14**	20.96*
	(11.25)	(11.43)	(12.19)	(9.33)	(14.00)	(12.54)
CPI		0.86***		0.65***		0.72**
		(0.14)		(0.21)		(0.28)
Observations	184	184	99	99	85	85
Countries	72	72	36	36	37	37
R-squared	0.69	0.76	0.55	0.69	0.56	0.66

Note: Random effects regressions at the country level. *, **, *** denote significance at the 0.1, 0.5 and 0.01 levels, respectively. Standard errors in parenthesis clustered at the country level. Dependent variable is PISA math scores. The time period covered by the nepotism indicator is lagged by two years instead of one. All regressions control for secondary net enrollment rates, region and year fixed effects, as well as for imputation dummies for variables with missing values. Columns 2, 4 and 6 control in addition for the share of schools with autonomy in academic content and with external evaluation.

Table A8: Main results. Effect of Nepotism on PISA Math Scores

	(1) Full sample b/se	(2) Full sample b/se	(3) OECD b/se	(4) OECD b/se	(5) Non-OECD b/se	(6) Non-OECD b/se
Nepotism	-13.97***	-10.51***	-7.90*	-1.89	-14.31***	-12.78***
	(4.04)	(3.76)	(4.44)	(4.49)	(4.82)	(4.47)
GDP	29.10**	12.90	1.18	-4.73	25.05*	9.82
	(11.75)	(11.72)	(10.14)	(9.16)	(14.50)	(13.07)
CPI		1.01***		0.60***		0.92**
		(0.21)		(0.23)		(0.40)
Observations	184	184	99	99	85	85
Countries	72	72	36	36	37	37
R-squared	0.66	0.74	0.55	0.71	0.49	0.62

Note: Random effects regressions at the country level. *, **, *** denote significance at the 0.1, 0.5 and 0.01 levels, respectively. Standard errors in parenthesis clustered at the country level. Dependent variable is PISA science scores. The time period covered by the nepotism indicator is lagged by two years instead of one. All regressions control for secondary net enrollment rates, region and year fixed effects, as well as for imputation dummies for variables with missing values. Columns 2, 4 and 6 control in addition for the share of schools with autonomy in academic content and with external evaluation.

Table A9: Main results. Effect of Nepotism on PISA Science Scores

5.4 Fixed Effects Estimates by Subject

	(1) Full sample b/se	(2) Full sample b/se	(3) OECD b/se	(4) OECD b/se	(5) Non-OECD b/se	(6) Non-OECD b/se
Nepotism	-6.75	-6.85	2.89	5.05	-13.77*	-14.09***
	(5.22)	(5.05)	(7.48)	(8.55)	(6.93)	(5.10)
GDP	9.59	-2.31	-1.37	-8.54	7.17	-6.00
	(16.77)	(16.40)	(28.18)	(28.26)	(26.61)	(21.27)
CPI		0.65***		0.08		1.13***
		(0.23)		(0.34)		(0.38)
Observations	184	184	99	99	85	85
Countries	72	72	36	36	37	37
R-squared	0.08	0.17	0.06	0.14	0.20	0.39

Note: Fixed effects regressions at the country level. *, **, *** denote significance at the 0.1, 0.5 and 0.01 levels, respectively. Standard errors in parenthesis clustered at the country level. Dependent variable is PISA reading scores. All regressions control for secondary net enrollment rates, year fixed effects, as well as for imputation dummies for variables with missing values. Columns 2, 4 and 6 control in addition for the share of schools with autonomy in academic content and with external evaluation.

Table A10: Fixed effects. Effect of Nepotism on PISA Reading Scores

	(1) Full sample b/se	(2) Full sample b/se	(3) OECD b/se	(4) OECD b/se	(5) Non-OECD b/se	(6) Non-OECD b/se
Nepotism	-3.06	-3.37	5.06	4.95	-9.02**	-9.82**
	(4.93)	(4.57)	(6.20)	(6.60)	(4.18)	(4.01)
GDP	30.01**	18.25	14.08	3.86	10.52	6.00
	(13.72)	(13.53)	(19.66)	(20.53)	(24.04)	(22.68)
CPI		0.64***		0.45		0.52
		(0.18)		(0.28)		(0.33)
Observations	184	184	99	99	85	85
Countries	72	72	36	36	37	37
R-squared	0.10	0.21	0.11	0.24	0.39	0.43

Note: Fixed effects regressions at the country level. *, **, *** denote significance at the 0.1, 0.5 and 0.01 levels, respectively. Standard errors in parenthesis clustered at the country level. Dependent variable is PISA math scores. All regressions control for secondary net enrollment rates, year fixed effects, as well as for imputation dummies for variables with missing values. Columns 2, 4 and 6 control in addition for the share of schools with autonomy in academic content and with external evaluation.

Table A11: Fixed effects. Effect of Nepotism on PISA Math Scores

	(1) Full sample b/se	(2) Full sample b/se	(3) OECD b/se	(4) OECD b/se	(5) Non-OECD b/se	(6) Non-OECD b/se
Nepotism	-5.38	-5.39	0.71	1.92	-8.83*	-9.75**
	(4.69)	(4.53)	(5.91)	(6.14)	(4.35)	(4.78)
GDP	18.30	4.88	-13.44	-24.11	21.88	18.28
	(19.19)	(18.06)	(19.34)	(18.41)	(31.89)	(29.39)
CPI		0.68**		0.25		0.68
		(0.30)		(0.23)		(0.65)
Observations	184	184	99	99	85	85
Countries	72	72	36	36	37	37
R-squared	0.11	0.18	0.30	0.39	0.20	0.26

Note: Fixed effects regressions at the country level. *, **, *** denote significance at the 0.1, 0.5 and 0.01 levels, respectively. Standard errors in parenthesis clustered at the country level. Dependent variable is PISA science scores. All regressions control for secondary net enrollment rates, year fixed effects, as well as for imputation dummies for variables with missing values. Columns 2, 4 and 6 control in addition for the share of schools with autonomy in academic content and with external evaluation.

Table A12: Fixed effects. Effect of Nepotism on PISA Science Scores

5.5 Fixed Effects Estimates (2 Years Lag)

	(1) Full sample b/se	(2) Full sample b/se	(3) OECD b/se	(4) OECD b/se	(5) Non-OECD b/se	(6) Non-OECD b/se
Nepotism	-7.05	-7.59	1.50	2.78	-10.24*	-12.58**
	(4.91)	(4.57)	(6.31)	(6.49)	(5.19)	(4.89)
GDP	18.98	6.80	-0.14	-9.16	13.87	6.77
	(15.10)	(13.82)	(21.13)	(20.83)	(24.87)	(20.84)
CPI		0.67***		0.26		0.81*
		(0.21)		(0.26)		(0.41)
Observations	184	184	99	99	85	85
Countries	72	72	36	36	37	37
R-squared	0.11	0.21	0.13	0.23	0.27	0.38

Note: Fixed effects regressions at the country level. *, **, *** denote significance at the 0.1, 0.5 and 0.01 levels, respectively. Standard errors in parenthesis clustered at the country level. Dependent variable is country-level average of PISA scores across subjects. The time period covered by the nepotism indicator is lagged by two years instead of one. All regressions control for secondary net enrollment rates, year fixed effects, as well as for imputation dummies for variables with missing values. Columns 2, 4 and 6 control in addition for the share of schools with autonomy in academic content and with external evaluation.

Table A13: Fixed effects. Effect of Nepotism on PISA Scores

	(1) Full sample b/se	(2) Full sample b/se	(3) OECD b/se	(4) OECD b/se	(5) Non-OECD b/se	(6) Non-OECD b/se
Nepotism	-5.55	-6.13	3.71	6.21	-10.77*	-14.57**
	(5.16)	(5.14)	(7.68)	(8.19)	(6.27)	(5.75)
GDP	8.95	-3.22	-1.52	-8.83	6.91	-5.68
	(16.44)	(16.02)	(28.46)	(28.58)	(26.58)	(21.08)
CPI		0.67***		0.08		1.17***
		(0.24)		(0.35)		(0.40)
Observations	184	184	99	99	85	85
Countries	72	72	36	36	37	37
R-squared	0.07	0.16	0.06	0.14	0.16	0.38

Note: Fixed effects regressions at the country level. *, **, *** denote significance at the 0.1, 0.5 and 0.01 levels, respectively. Standard errors in parenthesis clustered at the country level. Dependent variable is PISA reading scores. The time period covered by the nepotism indicator is lagged by two years instead of one. All regressions control for secondary net enrollment rates, year fixed effects, as well as for imputation dummies for variables with missing values. Columns 2, 4 and 6 control in addition for the share of schools with autonomy in academic content and with external evaluation.

Table A14: Fixed effects. Effect of Nepotism on PISA Reading Scores

	(1) Full sample b/se	(2) Full sample b/se	(3) OECD b/se	(4) OECD b/se	(5) Non-OECD b/se	(6) Non-OECD b/se
Nepotism	-7.53	-8.21*	1.05	0.85	-9.10*	-10.57**
	(4.97)	(4.47)	(6.38)	(6.28)	(5.15)	(5.05)
GDP	29.99**	18.79	14.44	5.21	11.25	6.40
	(13.41)	(12.93)	(19.45)	(20.22)	(23.49)	(21.96)
CPI		0.64***		0.45		0.55
		(0.18)		(0.27)		(0.34)
Observations	184	184	99	99	85	85
Countries	72	72	36	36	37	37
R-squared	0.12	0.23	0.10	0.23	0.38	0.43

Note: Fixed effects regressions at the country level. *, **, *** denote significance at the 0.1, 0.5 and 0.01 levels, respectively. Standard errors in parenthesis clustered at the country level. Dependent variable is PISA math scores. The time period covered by the nepotism indicator is lagged by two years instead of one. All regressions control for secondary net enrollment rates, year fixed effects, as well as for imputation dummies for variables with missing values. Columns 2, 4 and 6 control in addition for the share of schools with autonomy in academic content and with external evaluation.

Table A15: Fixed effects. Effect of Nepotism on PISA Math Scores

	(1) Full sample b/se	(2) Full sample b/se	(3) OECD b/se	(4) OECD b/se	(5) Non-OECD b/se	(6) Non-OECD b/se
Nepotism	-8.06	-8.41*	-0.25	1.27	-10.84*	-12.60**
	(5.39)	(4.98)	(5.91)	(5.92)	(5.72)	(5.77)
GDP	17.99	4.85	-13.34	-23.88	23.44	19.59
	(19.07)	(17.59)	(19.32)	(18.55)	(31.10)	(27.90)
CPI		0.69**		0.25		0.72
		(0.30)		(0.23)		(0.65)
Observations	184	184	99	99	85	85
Countries	72	72	36	36	37	37
R-squared	0.12	0.19	0.30	0.38	0.22	0.28

Note: Fixed effects regressions at the country level. *, **, *** denote significance at the 0.1, 0.5 and 0.01 levels, respectively. Standard errors in parenthesis clustered at the country level. Dependent variable is PISA science scores. The time period covered by the nepotism indicator is lagged by two years instead of one. All regressions control for secondary net enrollment rates, year fixed effects, as well as for imputation dummies for variables with missing values. Columns 2, 4 and 6 control in addition for the share of schools with autonomy in academic content and with external evaluation.

Table A16: Fixed effects. Effect of Nepotism on PISA Science Scores

5.6 Transmission Channels Analysis

	(1) b/se	(2) b/se	(3) b/se	(4) b/se	(5) b/se	(6) b/se	(7) b/se	(8) b/se
Nepotism	-13.49***	-12.01***	-13.38***	-10.07**	-12.81***	-13.40***	-13.07***	-10.07**
	(3.88)	(4.15)	(3.78)	(4.39)	(4.01)	(3.81)	(3.95)	(4.24)
% with 0-10 books		-0.90**						0.00
		(0.45)						(.)
% with 11-25 books			-1.94***					-2.29**
			(0.65)					(1.09)
% with 26-100 books				2.34***				1.95**
				(0.84)				(0.93)
% with 101-200 books					2.12**			-1.76
					(0.93)			(1.39)
% with 201-500 books						2.38***		3.71***
						(0.67)		(1.19)
% with 500 books or more							0.05	-4.25***
							(0.93)	(1.65)
Observations	184	182	182	182	182	182	182	182
R-squared	0.63	0.66	0.70	0.68	0.68	0.68	0.64	0.76

Note: Random effects regressions at the country level. *, **, *** denote significance at the 0.1, 0.5 and 0.01 levels, respectively. Robust standard errors in parenthesis and clustered at the country level. Dependent variable is PISA reading scores. All regressions control for secondary net enrollment rates, log GDP per capita, region and year fixed effects, as well as for imputation dummies for variables with missing values and for the share of missing observations for the number of books at home.

Table A17: Transmission channels. Reading scores

	(1) b/se	(2) b/se	(3) b/se	(4) b/se	(5) b/se	(6) b/se	(7) b/se	(8) b/se
Nepotism	-6.15*	-4.08	-5.52	-2.98	-4.96	-5.66	-5.28	-2.59
	(3.72)	(3.94)	(3.80)	(3.68)	(3.96)	(3.80)	(3.62)	(3.70)
% with 0-10 books		-1.12***						0.00
		(0.32)						(.)
% with 11-25 books			-1.78***					-1.50*
			(0.60)					(0.85)
% with 26-100 books				2.07***				1.58**
				(0.64)				(0.78)
% with 101-200 books					2.71***			0.06
					(0.75)			(1.10)
% with 201-500 books						2.53***		3.51***
						(0.70)		(1.08)
% with 500 books or more							0.09	-4.33***
							(0.94)	(1.35)
Observations	184	182	182	182	182	182	182	182
R-squared	0.69	0.72	0.75	0.74	0.74	0.74	0.70	0.81

Note: Random effects regressions at the country level. *, **, *** denote significance at the 0.1, 0.5 and 0.01 levels, respectively. Robust standard errors in parenthesis and clustered at the country level. Dependent variable is PISA math scores. All regressions control for secondary net enrollment rates, log GDP per capita, region and year fixed effects, as well as for imputation dummies for variables with missing values and for the share of missing observations for the number of books at home.

Table A18: Transmission channels. Math scores

	(1) b/se	(2) b/se	(3) b/se	(4) b/se	(5) b/se	(6) b/se	(7) b/se	(8) b/se
Nepotism	-10.70***	-8.96**	-9.73***	-7.17**	-9.22**	-9.71***	-8.85**	-7.37**
	(3.51)	(3.53)	(3.62)	(3.44)	(3.65)	(3.55)	(3.50)	(3.38)
% with 0-10 books		-0.42						0.00
		(0.38)						(.)
% with 11-25 books			-1.66***					-2.74***
			(0.63)					(1.01)
% with 26-100 books				2.03***				1.20
				(0.65)				(0.77)
% with 101-200 books					1.91**			-0.74
					(0.82)			(1.27)
% with 201-500 books						1.77***		2.81**
						(0.63)		(1.21)
% with 500 books or more							-1.08	-5.68***
							(1.00)	(1.62)
Observations	184	182	182	182	182	182	182	182
R-squared	0.65	0.67	0.70	0.70	0.69	0.69	0.65	0.78

Note: Random effects regressions at the country level. *, **, *** denote significance at the 0.1, 0.5 and 0.01 levels, respectively. Robust standard errors in parenthesis and clustered at the country level. Dependent variable is PISA science scores. All regressions control for secondary net enrollment rates, log GDP per capita, region and year fixed effects, as well as for imputation dummies for variables with missing values and for the share of missing observations for the number of books at home.

Table A19: Transmission channels. Science scores

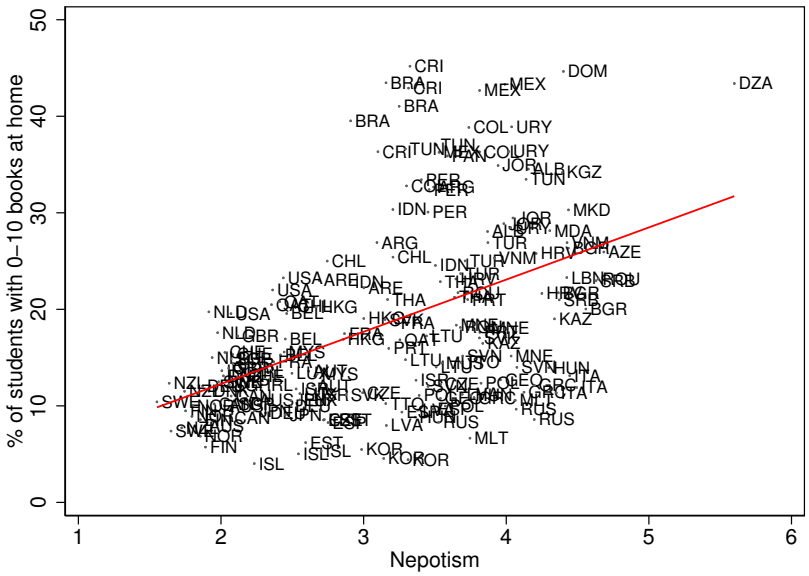

Figure A3: Nepotism and % students with 0-10 books at home

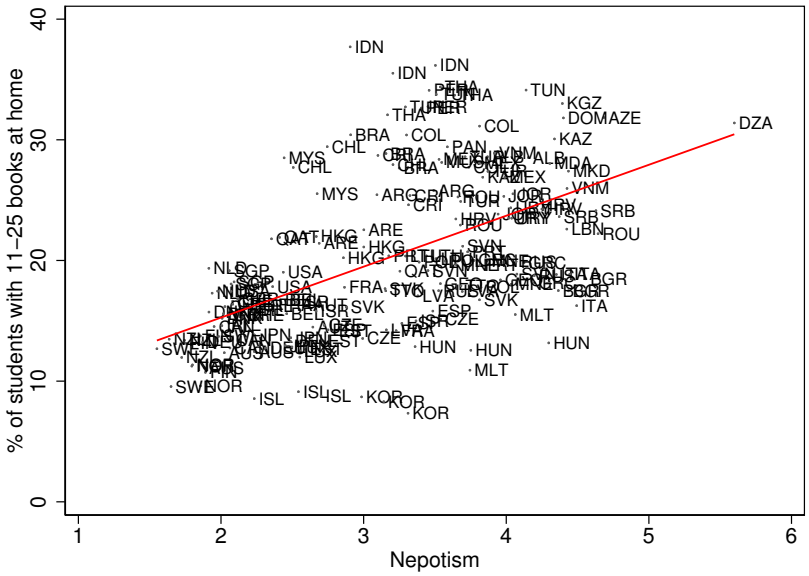

Figure A4: Nepotism and % students with 11-25 books at home

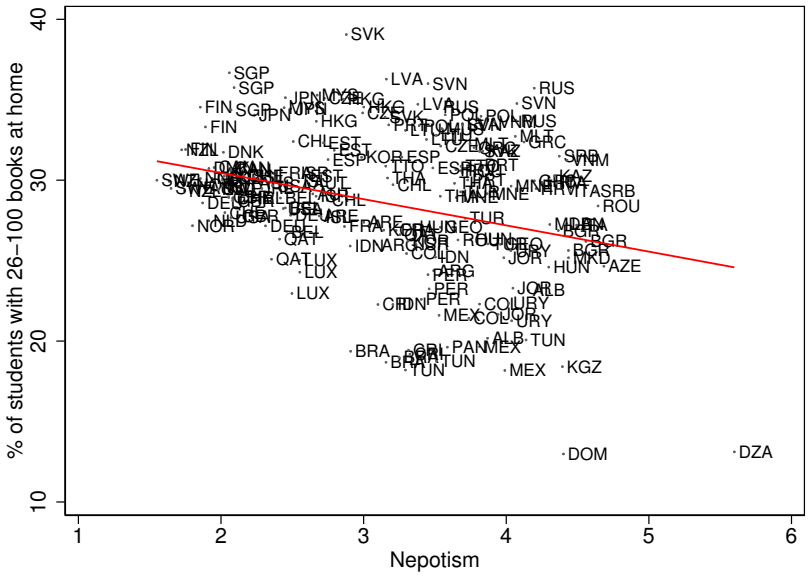

Figure A5: Nepotism and % students with 26-100 books at home

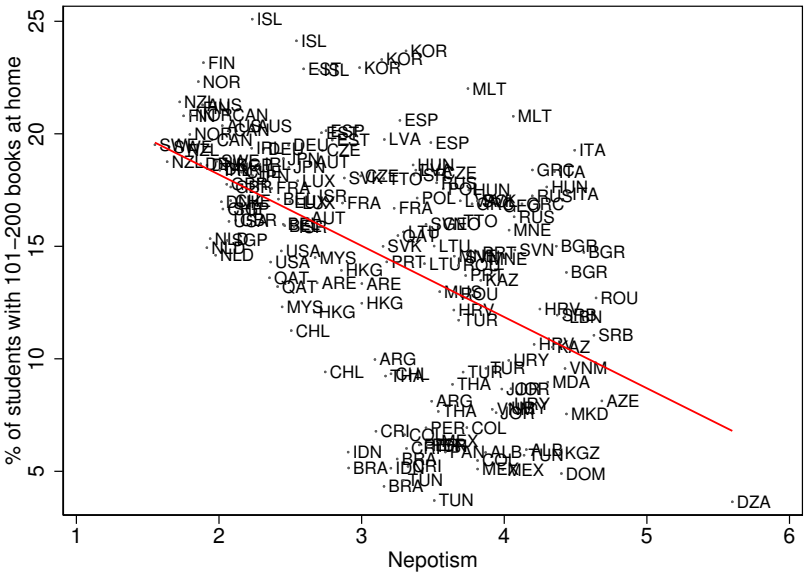

Figure A6: Nepotism and % students with 101-200 books at home

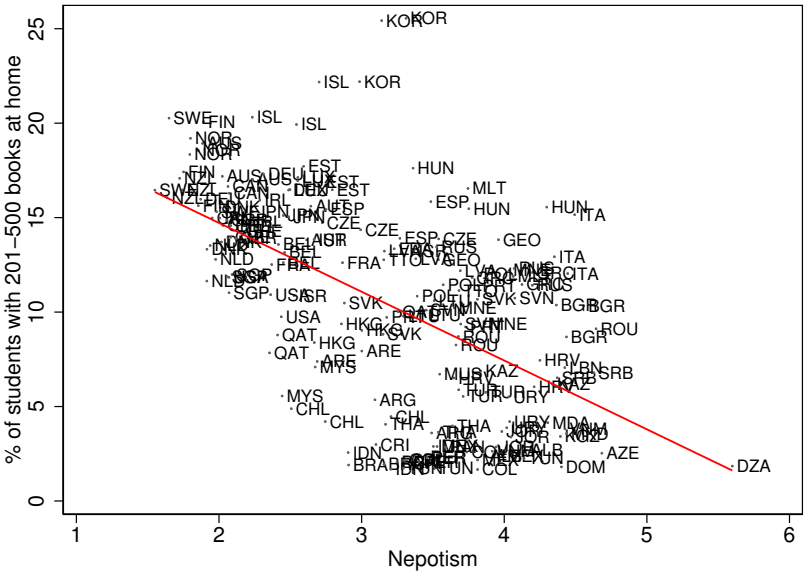

Figure A7: Nepotism and % students with 201-500 books at home

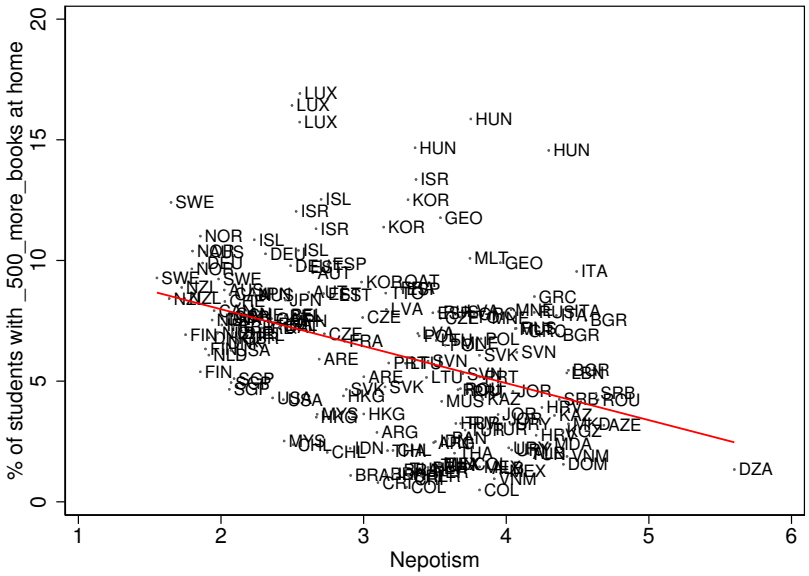

Figure A8: Nepotism and % students with 500 books or more at home

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