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The Political Economy of Educational Content and Development: Lessons from History

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The Political Economy of Educational Content and Development: Lessons from History

Abstract

Beyond years of schooling, educational content can play an important role in the process of economic development. Individuals' choices of educational content are often shaped by the political economy of government policies that determine the incentives to acquire various skills. We first present a model in which differences in human capital investments emerge as an equilibrium outcome of private decisions and government policy choices. We then illustrate these dynamics in two historical circumstances. In medieval Europe, states and the Church found individuals trained in Roman law valuable, and eventually supported productive investments in this new form of human capital. In late 19th-century China, elites were threatened by the introduction of Western science and engineering and continued to select civil servants—who enjoyed substantial rents—based on their knowledge of the Confucian classics; as a result, investments in productive, modern human capital were not made.

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1 Introduction

Economists have long viewed education as an important determinant of economic development and growth.¹ Most analyses have focused on broad education quantities: years of schooling, enrollment rates, and school construction. Much less attention has been paid to the importance of different types of educational *content* to a country's economic development.² Individuals investing in human capital often have a choice among several types of content; for example, at the secondary level, individuals may have the choice of studying in academic or vocational tracks; at the tertiary level, individuals may choose to study law, business, the humanities, the natural sciences, or engineering, among other subjects. At the aggregate level, different skills present in the population can make some sectors of the economy more successful than others, and can help determine a country's rate and direction of technical change, either through the adoption of existing technology or through innovation.

In this work, we consider the role that governments play in shaping incentives to acquire different forms of human capital. Governments—and elites more generally—have an interest in the content of schooling because it plays a role in determining the quality and stability of political and social institutions, as well as states' fiscal and legal capacities: government administrations rely, directly and indirectly (e.g., through the raising of revenues), on particular forms of human capital; elites' positions often depend on their skills, professions, and incomes.³ Also, political participation of various sorts—including political protest—may depend on people's specific types of human capital: the content of

¹See Easterlin (1981); Mankiw et al. (1992); Benhabib and Spiegel (1994); Psacharopoulos and Patrinos (2004). Review articles by Krueger and Lindahl (2001) and Hanushek and Woessmann (2008) summarize the existing evidence on the effects of education on growth rates.

²Some examples of papers that widen the scope of analysis are Aghion et al. (2009), Jones (2011), Algan et al. (2011), and Huang (2012).

³See, among others, Besley and Persson (2010), Dinicco and Prado (2012), and Dal Bó et al. (2012) on state capacity and development.

people's education might support seated elites, but it can also threaten them.⁴

We argue that individuals' investments in different forms of human capital are important to economic development, and that these investments are often shaped by the political economy of government policies that determine the incentives to acquire various skills. Just as the provision of schools and teachers is an outcome of political economic forces and affects development, so are the structure of educational institutions in a society and the costs and benefits of investing in particular forms of human capital.⁵

While our focus will be on two historically important development experiences—medieval Europe's Commercial Revolution and China's abortive modernization in the 19th century—the study of educational content, and the political economy nexus, remain relevant. Looking across developing countries today, there is enormous variation in the specific forms of human capital acquired. In Figure 1, we show the distributions of tertiary enrollment shares, by field, for non-OECD countries (data come from the UNESCO Institute for Statistics). The variation in the subjects studied across countries is striking: the share of students enrolled in science or engineering programs ranges from 4% to 45%, and the interquartile range is from 15% to 25%; in social science, business, and law, enrollment ranges from 8% to 58%, with an interquartile range from around 30% to 45%; enrollment in the humanities or education programs ranges from 4% to 72%, and the interquartile range is from around 15% to 30%.

[Figure 1 about here]

Content differences across developing countries often reflect governments' explicit policy aims, and political concerns often frame governments' policy choices. Singapore's gov-

⁴See Botero et al. (2012). Governments also have a stake in the content of education because education serves as a channel through which ideology can be shaped. See Clots-Figueras and Masella (2009); Friedman et al. (2011).

⁵On the political economy of the provision of schools and teachers, see, for example, Engerman et al. (1999), Acemoglu and Robinson (2008), and Naidu (2010).

ernment has long supported education in science and technology, initially as a matter of national survival (Lee et al., 2008); it now stands as the most positive outlier in the *Science and Engineering* category of Figure 1, with 45% of tertiary-level students enrolled in these fields. Since the revolution of 1959, Cuba's government has encouraged training in medicine as part of a strategy of improving public health (Spiegel and Yassi, 2004); it is one of the positive outliers in the *Health* category of Figure 1, at 23%. Bloom et al. (2006, p. 57) write that, "The first attempt to create a post-secondary education system in Guinea Bissau was initiated by the Ministry of Justice in 1979 with the establishment of a law school to train professionals for the administration of justice. A few years later, a school of education was established for training secondary school teachers."⁶

Content choices sometimes pose ideological dilemmas for governments. For example, since the economic reforms of the late 1970s, there has been a shortage of native-born business managers in China, continuing into recent years (Lane and Pollner, 2008). On the one hand, the Chinese government prioritizes economic growth, and so might wish to encourage training in business schools. On the other hand, the ruling Communist Party might wish to suppress modern business education: the Party could eventually face ideological challenges from wealthy individuals trained in Western-style business courses that do not tend to emphasize either communism or nationalism. It appears that, in the eyes of the Chinese government, the benefits of allowing the study of Western management practices outweigh the potential threats to existing elites: the flourishing of business schools in Beijing, Shanghai, Shenzhen, and elsewhere in recent years is evidence of the Party's stance.⁷

⁶There are many other examples of governments' explicit attempts to encourage study in specific fields. For example, India's government is now pursuing greater technical and managerial training (Altbach, 2009, p. 42), and recently announced that "it will establish an additional eight Indian Institutes of Technology and seven Indian Institutes of Management, along with 30 new research-oriented central universities." It is worth noting that the issue of educational content arises in secondary schooling as well, with the choice between vocational and academic education receiving attention from policymakers and scholars (for example, Psacharopoulos (1987) and Bennell (1996)).

⁷Religious educational content presents another policy dilemma in many developing countries. For exam-

In this work, we consider the potential acquisition of a new, more productive form of knowledge. Private incentives to invest in this modern type of human capital may be sub-optimal: there may exist uncertainty regarding the returns to the new form of knowledge; there may exist positive externalities arising from the human capital investment. These externalities might lead governments to *subsidize* investment in new, productive skills, to push investment toward the socially optimal level. However, governments or elites may choose *not* to encourage investment: new forms of human capital could empower new classes of individuals; lead to political pressure on the seated government; or, draw investment away from skills the government needs to function.⁸ The purpose of this paper is to show how differences in educational content emerge as an equilibrium outcome—possibly far from being socially optimal—of both private decisions to invest in different forms of human capital, and government policy choices that affect the costs and benefits of acquiring different skills.

We follow other economists in pointing to government institutions and elites' incentives as important ultimate sources of variation in human capital.⁹ However, we emphasize a particular policy channel that has not received a great deal of study: governments choose the structure of educational institutions and shape the content of education within those institutions. Importantly, the government's views on human capital acquisition will depend on the type of human capital being produced in a society's educational institutions, and on elites' expected payoffs from people's investments in various skills.

To clarify government's role in shaping the incentives to invest in different types of human capital, in Section 2 of this paper we present a simple model in which individu-

ple, the role of madrassas in the Islamic world has attracted widespread attention, as has education in yeshivas in Israel (see Andrabi et al. (2006) and Berman (2000)).

⁸Glaeser et al. (2004), among others, emphasize the role human capital plays in shaping political institutions.

⁹See, for example, Engerman and Sokoloff (2005).

als choose whether to invest in a new form of educational content, which may have social returns exceeding private returns. Individuals face a private cost of acquiring the new form of human capital; importantly, the cost can be offset by government policy—that is, a subsidy—toward the new form of human capital.¹⁰ Governments might value investments in productive forms of human capital because they generate higher incomes, and so higher expected revenues. Of course, new human capital may affect the probability that the seated government remains in power.¹¹ In general, governments will trade off their desire to grow the economy against their potential loss of power in choosing a policy toward the new educational content. The theoretical discussion suggests that, if governments are threatened by economic change, they will act to stifle investment in new skills, with adverse consequences for development.

We next illustrate these predictions through two historical case studies: medieval Europe, which witnessed the creation of the first modern universities, and late imperial China, where a “traditional” system of education was slowly replaced by a more modern curriculum that introduced the study of Western science and engineering. Both cases make clear the role played by governments in individuals’ investments in new forms of human capital.

In Section 3, we discuss medieval Europe, where Roman law was studied in the world’s first universities beginning in the 11th century, following the “rediscovery” of Justinian’s Code. States (both secular and religious) found individuals who had studied law valuable, and generally supported investments in this new form of human capital, for example, by granting privileges to universities and their students. Employment in secular and Church

¹⁰The role of elites in the provision of education is discussed, by Acemoglu and Robinson (2000), and Galor and Moav (2006), among others.

¹¹Novel forms of human capital may threaten existing elites’ rents and thus be destabilizing; this is discussed (in the context of “innovation” in general) in the model of Acemoglu and Robinson (2006). It is also conceivable that new forms of knowledge may serve to bolster existing regimes: they could improve the effectiveness of the military or the bureaucracy (against both internal and external threats), or simply be ideologically effective. In particular, the link between educational investments and military needs has been investigated by Aghion et al. (2012).

administrations increased the labor market returns to legal study. These implicit subsidies paid off: lawyers trained at universities reduced the uncertainty of, and obstacles to, trade across Europe's then highly-fragmented states.

In Section 4, we study 19th century China, where encounters with Western powers brought the study of Western science and engineering into some Chinese schools. For centuries, civil service exams based on the Confucian Classics had selected China's social and political elite; dismantling the traditional education system was perceived as a severe threat by those elites. Consequently, they preserved strong social and economic incentives to study traditional content. As a result, for much of the 19th century, the study of Western subjects was limited; China lacked skills useful in modern industry, and experienced limited economic development.

Finally, in Section 5, we briefly describe a range of additional applications of our theory, summarize our results, and offer concluding thoughts.

2 A Model of the Study of New Educational Content

2.1 Types of human capital and agents in the model

We wish to study human capital investment decisions in a simple setting that clarifies the role of political economy in determining investments in different skills. To begin, suppose that there exist two types of knowledge, and correspondingly two educational tracks in a society: one type is traditional (t), and the second type is modern (m). We assume that modern education makes individuals more productive. For all individuals in society, the (private) income earned having invested in modern human capital, y_m , is greater than the income earned having invested in the traditional human capital, y_t . Importantly, we assume that there is also a social benefit beyond the private return (a positive externality)

from studying the new type of knowledge; call this benefit B , which is produced by each individual with modern human capital.

Traditional individuals (type t) make up share ω of the population; the modern ones (m) make up share $(1 - \omega)$. These types of individuals differ in their costs of acquiring each type of education. We denote the cost of acquiring education of type $e \in \{t, m\}$ for an individual of type $i \in \{t, m\}$ as c_{ei} , and assume the following:

- Modern education is more costly to acquire than traditional education for all individuals: $c_{mt} > c_{tt}$ and $c_{mm} > c_{tm}$.
- Modern education is *relatively* more costly to acquire for the traditional types: $c_{mt} - c_{tt} > c_{mm} - c_{tm}$.
- Traditional education is preferred to no education: $y_t > c_{tm}$ and $y_t > c_{tt}$.¹²
- Private incentives are not sufficient to generate investment in modern human capital: $y_m - y_t < c_{mm} - c_{tm}$ (and thus $y_m - y_t < c_{mt} - c_{tt}$).¹³

We also assume that there exists a governing elite, whose share in the population is a (small) measure ε , coming from the traditional population. Elites earn income by taxing income at rate τ ; elites also are in position to extract the surplus B when individuals invest in modern human capital.¹⁴

Elites are able to subsidize the acquisition of modern education by the modern-type in-

¹²We thus assume that all individuals acquire some kind of education; one should interpret the model as focusing on individuals seeking education—the relevant segment of society for the dynamics to be studied here.

¹³Of course, there will be cases in which modern human capital earns high private returns, and thus private incentives will generate investment (if not at the socially optimal level). We believe that especially when a new form of human capital first becomes available, private returns are likely to be uncertain, and the gap between private and social returns is likely to be very large, leaving investment levels far below the social optimum. Similarly, Jones (2011) points out that highly specialized training is much more valuable when complementary skills are also developed; the complementarity in investments could lead individuals to privately choose sub-optimal investment levels under incomplete information.

¹⁴Each member of the elite could also earn a return on their traditional human capital; as this would not change any of our comparisons of interest, we omit this potential source of income from the model.

dividuals.¹⁵ In addition to the direct cost of the subsidy, elites might pay an additional cost $D \geq 0$. This may represent administrative costs of dispensing the subsidy, or other costs that are incurred by the elite when supporting the study of modern subjects. Particularly important are ideological costs: the elite may pay a psychological cost in accepting the fact that a new form of knowledge needs to be promoted. In addition, training in modern education may undermine elites' authority: traditional education might contain an ideological component that supports the incumbent elite, while modern education might omit, or even challenge, these teachings. D drives a wedge between the optimal choice of subsidy and the option chosen by the elite. The cost of subsidizing each modern individual's modern education is thus:

$$\text{Subsidy} = (c_{mm} - c_{tm}) - (1 - \tau)(y_m - y_t) + D.^{16}$$

For notational purposes, we define $S \equiv (c_{mm} - c_{tm}) + D$; thus, the cost of subsidizing a modern type individual's investment in modern human capital is $S - (1 - \tau)(y_m - y_t)$.

2.2 Investment decisions with static political economy concerns

In the absence of any subsidy from the governing elite, all individuals (both type m and type t) invest in traditional human capital. This may not be socially optimal, depending on the size of the positive externality, B . Total output is y_t and thus the elite gains τy_t .

Alternatively, the elite could subsidize investment in modern human capital by the

¹⁵We assume that elites will provide a subsidy that leaves modern-type individuals just indifferent between choosing modern and traditional education (though this is not essential to the model). We also assume that the required subsidy to encourage traditional types to invest in human capital is greater than the resources available to the elite.

¹⁶Note that we assume that individuals value income linearly to simplify the notation of the model. Nothing of importance would change if individuals had a concave utility function with respect to income. We also assume that τ is taken as given by the elites. Of course, elites may be tempted *ex post* to tax modern human capital at a higher rate, but we abstract from these dynamic inconsistency concerns in the current model.

modern types, paying $(1 - \omega) \cdot [S - (1 - \tau)(y_m - y_t)]$. In that case, elites would obtain gross revenues from taxing individual incomes, plus the external benefit from investments made in modern human capital, less the subsidy paid:

$$\begin{aligned} & \tau [\omega y_t + (1 - \omega)y_m] + (1 - \omega)B - (1 - \omega) [S - (1 - \tau)(y_m - y_t)] \\ \iff & \tau y_t + (1 - \omega) [(y_m - y_t) + B - S]. \end{aligned}$$

The elites choose whether to subsidize modern education by comparing this payoff to τy_t . If the cost of subsidizing modern education S is not too high, the elite will choose to subsidize investment in modern human capital; specifically, if the following holds:

$$S < (y_m - y_t) + B.$$

Note that if $D = 0$, that is, if there are no indirect costs of the subsidy, then this condition becomes $c_{mm} - c_{tm} < (y_m - y_t) + B$: elites will subsidize modern human capital whenever the social benefits exceed the social costs (the externality is internalized). However, if the elite pay some ideological cost when supporting modern education, or if there are other indirect costs associated with paying the subsidy ($D > 0$), elites may not make the socially optimal decision. If S is too high, the government will not subsidize investments in modern human capital, and both traditional and modern types will choose traditional education; this will be socially sub-optimal whenever $c_{mm} - c_{tm} < (y_m - y_t) + B$.

2.3 Investment decisions with dynamic political economy concerns

We now add dynamic political economy concerns to the model: elites may not simply pay indirect, or ideological, costs when supporting modern human capital; they may lose power if modern-type individuals are politically strengthened by their education and in-

come.¹⁷ Suppose that agents care about payoffs in two periods; the set of agents is the same as in the static, one period model above, but in the second period, we now allow the first period elite to lose power.¹⁸

We model the probability of the elite *losing* power, $\pi \in [0, 1]$, as a function of the productivities of the two types of human capital, and of the shares of types in the total population: $\pi = \pi(y_m, y_t, \omega)$. In what follows, we simply assume that who will be the elite in the second period is determined by the relative shares of output produced by each of the two types of individuals. If output is produced only through the t technology (i.e., modern education is not subsidized) the elite remains in power. If, instead, the modern type of human capital is acquired by the modern-type individuals, the elite loses power if the value of output produced by individuals with modern human capital is larger than the value of traditional types' output. That is, $\pi = 1$ if $(1 - \omega)y_m > \omega y_t$, and $\pi = 0$ otherwise.¹⁹

We make several simplifying assumptions:

- If the first period elites lose power, their second period payoff is zero.²⁰
- If the first period elites maintain power, parameters are such that their first period subsidy choice remains optimal in period 2.
- Non-elites' investment decisions are not affected by political economy considerations: although their *class* might be empowered, we assume that this does not increase the expected second period payoff for any single *individual*, as the "elite" are

¹⁷The fear that modernization may erode the elite's "incumbency advantage" is also at the core of the model by Acemoglu and Robinson (2006). Acemoglu et al. (2005) and Jha (2010) discuss the rise of powerful merchant interests in early modern Europe, and Britain in particular.

¹⁸We assume that agents do not discount the future. Adding a positive discount rate does not change any of our conclusions.

¹⁹We thus assume, essentially, that the ruling class is the one owning the means of production. One might also believe that the ideological cost D affects the elite's likelihood of remaining in power: the greater the mismatch between modern education and the ideology supporting the existing elite, the more likely is modern education to lead to regime change. For simplicity, we do not incorporate this channel into our model, but we discuss its implications below.

²⁰The assumption of zero payoff is not necessary for our results. This is a simple way to capture elites' second period loss of utility.

a trivially small fraction of the ruling class. Thus, non-elites' investment decisions in each period are the same as those in the static model.

Under these assumptions, there are three possible scenarios:

1. First, the elite might choose not to subsidize modern education. It will thus remain in power in period 2. The total payoff to the elite across the two periods will be:

$$2\tau y_t.$$

2. Second, the elite might choose to subsidize modern education. If $(1 - \omega)y_m < \omega y_t$, the elite will maintain power in period 2. The total two-period payoff to the elite in this scenario will be:

$$2\{\tau y_t + (1 - \omega)[(y_m - y_t) + B - S]\}.$$

3. Finally, the elite might subsidize modern education, but lose power in the second period, because $(1 - \omega)y_m > \omega y_t$. This will generate second period payoffs of zero. Total elite payoffs are thus:

$$\tau y_t + (1 - \omega)[(y_m - y_t) + B - S].$$

Consider the problem facing elites: they first must anticipate whether modern human capital, if it is acquired, would lead to a regime change. It is straightforward to see that for given productivity levels of modern and traditional human capital, y_m and y_t , traditional elites will maintain power, even when modern human capital is acquired by modern types, as long as $\omega > \frac{y_m}{y_t + y_m}$. This threshold defines Regions I and II in Figure 2, separating them from Regions III and IV (demarcated by the heavy dashed line). Specifically, for ω to the

right of the threshold, elites can ignore questions of regime change. They choose whether to subsidize modern education just as in the static case: they will subsidize modern types' acquisition of modern human capital if $S < (y_m - y_t) + B$. The corresponding line separates Regions I and II: if the cost of the subsidy (both direct and indirect) is small enough, elites will support modern education (Region I); if the subsidy is too expensive, elites do not support modern education (Region II).

[Figure 2 about here]

On the other hand, if $\omega < \frac{y_m}{y_t + y_m}$, forward-looking elites understand that, if modern types are able to acquire modern human capital, then elites will lose their positions in period 2. Elites will thus only be willing to subsidize modern education if they are compensated in period 1 for the income they will forego in period 2. That is, they subsidize modern education if the following holds:

$$2\tau y_t < \tau y_t + (1 - \omega) [(y_m - y_t) + B - S].$$

Solving for S , one finds:

$$S < (y_m - y_t) + B - \frac{\tau}{1 - \omega} y_t.$$

Suppose ω is small, near zero. Then, the level of subsidy elites are willing to pay is below that level which they are willing to pay in the static case by approximately τy_t . Elites need a value of S below the static political economy threshold, *and* they must be compensated for lost income in period 2 (which would have been τy_t). For larger values of ω , elites require subsidy costs to be even lower: they know they will lose power in period 2, and with lower values of ω , their subsidy earns returns on fewer individuals.

Thus, below the curve in Figure 2, elites are willing to support modern education: they earn a great enough return on their subsidy, for enough individuals, that they are willing to concede power in period 2—this is Region III.²¹ Above the curve, in Region IV, elites face subsidy costs that are too high to incentivize modern human capital investment, so they choose to maintain power, and earn tax revenues on the traditional human capital in society.

This simple model could be extended to allow modern human capital accumulation to threaten the elite’s power through an *ideological* channel, rather than through the economic empowerment of the modern-type individuals. Traditional education may contain ideological content that is supportive of the incumbent elite, while modern education may not—indeed, modern education might actively undermine the ideology that supports the elites. In our model, if π were a function of the ideological cost, D , with greater values of D reducing the likelihood that elites will remain in power (along with imposing immediate costs of subsidizing modern education), then the range of parameters (y_m , y_t , and ω) that would allow elites to support modern education while maintaining power would be smaller. In Figure 2, the heavy dashed line that demarcates Regions I and II would no longer be independent of the cost of the subsidy, S . One can imagine the line pivoting clockwise, shrinking Regions I and II, and thus reducing the likelihood that elites subsidize modern education. Intuitively, even with a very large traditional class (which could maintain economic superiority), if modern education weakens the elite ideologically, they may still lose power if they support investment in modern human capital.²²

²¹Note that the curve defining Region III need not cross the x-axis to the left of $\omega = \frac{y_m}{y_t + y_m}$. Exploring alternative cases does not change the essential points of the model.

²²There are other extensions to the model that are interesting, but that we leave to future work: first, elites might try to invest in modern human capital themselves to maintain their positions when the new class takes power. For example, Chinese Communist Party elites’ attempts to insinuate their family members into powerful, corporate positions could allow elite families to preserve their status even if the Communist Party loses power. Another extension would make transition to a new regime stochastic: a risk averse elite might be unlikely to support highly productive human capital even if there is only a small risk of losing power—that small

The comparative statics of this simple model are straightforward, yet deliver interesting predictions. First, a lower cost of subsidizing modern technology (S) makes the introduction of modern technology more likely (vertical move down in the graph). This is true regardless of political economy concerns in the model.

Second, greater positive externalities make subsidies for modern education more likely: both the line dividing Regions I and II, and the curve dividing Regions III and IV, shift up with a greater value of B : elites gain more from a given subsidy, so are more willing to support investments in modern human capital.

Finally, more productive modern human capital *does not* imply that a subsidy for modern human capital is more likely. The effects are ambiguous. In Figure 2, increased productivity of modern human capital (greater y_m) has the following effects: first, the line defining Regions I and II—where elites do not face a threat of losing power—will move to the right. More productive modern human capital means a bigger threat to elite power in period 2. This will work *against* a subsidy for modern human capital even though it is more productive. Of course, an increase in y_m will also shift up both the line dividing Regions I and II, and the curve dividing Regions III and IV, potentially increasing the likelihood of elite support for modern human capital. Productivity is linked to public policy in an interesting way, mediated by political economy. This interaction between incentives to support productive human capital and political economy concerns about maintaining power is precisely what we explore in our case studies next.

likelihood could loom large in elite decision making.

3 Historical Case Study 1: Roman Law and Universities in Medieval Europe

The theoretical framework just outlined suggests that new forms of human capital may be acquired sub-optimally, and that government policy can play an important role determining how much of a new form of human capital will be acquired. In this and the following section we examine two historical instances in which new forms of human capital became available. In both cases, governments played critical roles in determining whether and how much of the new human capital would be accumulated, with important consequences for economic development.

3.1 Roman Law as New Educational Content

The high Middle Ages saw a resurgence of economic activity in Europe. New cities were founded, old cities grew, the volume and the scope of trade expanded. States also began to take on modern forms, centralizing the monopoly of violence. This economic expansion and institutional transformation changed Europe from a rural backwater (relative to Asia and the Islamic world) into an urban and commercial continent, arguably setting the stage for the subsequent projection of European domination across the oceans, and the “Great Divergence” (Lopez, 1976; Postan, 1973; Britnell, 1993; Epstein, 2000; Buringh and van Zanden, 2009). Around the same time, in the late 11th and 12th centuries, individuals came to Italy, most notably, to Bologna, from across Europe to study the newly “rediscovered” Justinian Code of Roman law under the tutelage of legal scholars. Other locations, such as Provence, the Lombard cities and Ravenna, also saw renewed interest in, and development of, Roman law (Vinogradoff, 1929, p. 33).

Roman law was a distinct, qualitative improvement over the judicial systems in place

up to that point.²³ Traditional systems of law, such as the Germanic ones, had a series of drawbacks. First, they were very local. Second, they were traditionally based on kinship, honor and superstition. Finally, they were informal—formal trials were seldom used. Roman law, in contrast, was a broad system of legal knowledge. It was a science “in which individual legal decisions, rules, and enactments were studied objectively and were explained in terms of general principles and truths basic to the system as a whole” (Berman, 1983, p. 120). It was flexible and it could look back on centuries of scholarly discussion, development and refinement, condensed in the Digest (*Pandectae*), a rich collection of comments by Roman jurists on the topics of property rights, obligations, contracts, family and inheritance law, and on criminal law.

Most important, perhaps, was Roman law’s suitability to the needs of an economically flourishing society. Renewed trade and growing cities had created economic opportunities, and the citizens of Medieval Europe were looking for a legal system to match their needs. Savigny (1834, vol. 3, p. 84) writes that:

The first and foremost reason [for the reemergence of Roman law] were the needs of Lombard cities... These cities were now extremely rich, populated and active. Their brisk trade and commercial activities required a developed civil law; the Germanic systems of national laws were not adequate... [Roman law] could deliver a body of law that matched these newly emerging needs. [own translation]

The complementary evolution to the rediscovery of Roman law and Roman legal thinking was the development of an educational institution that would teach and disseminate this body of knowledge: the university.

The needs of a commercial society that had prompted the rediscovery of Roman law also characterized its teaching at universities. Students wished to study law not as a pastime, but for professional purposes: “Medieval legal education was not directed towards

²³We do not dismiss the value of pre-Roman legal systems or alternative social and institutional arrangements, such as guilds or the Hanseatic league. We argue that a written, formal, and organized system of laws had a positive contribution to the outcomes studied here.

the training of law teachers but of professional legal practitioners” (Rüegg, 1992, p. 25). Scholarly activity was also concerned with practical aspects: “[T]he twelfth-century glossators of the Roman law were particularly sophisticated in their reconstruction and transformation of the older Roman law of contracts, in part just because of the demands placed upon them in that respect by the rapid economic changes of their time” (Berman, 1983, p. 245).

Training in the law, in Bologna and soon in other universities, attracted thousands of students each year. Universities quickly spread across Europe, with their charters granted by Kings, the Holy Roman Emperor and the Pope. Table 1 evidences this development: there were no universities in Europe in the 11th century; by the end of the 13th, there were more than a dozen; by the end of the 14th, the number had more than doubled again.

[Table 1 about here]

The application of Roman law also spread across Europe, and had a significant impact on social and economic life in the Middle Ages even before becoming the sole official source of jurisdiction.²⁴ Vinogradoff (1929) writes that individuals who had studied Roman law served as “town-clerks acting as jureconsults to cities and to princes, and taking part in the discussions of ordinary tribunals as assessors”; that they settled political and commercial disputes; and, that the influence of Roman law was “especially manifest in the law of contracts.”²⁵ By the beginning of the 13th century jurists trained in Roman law came to dominate the personnel of the chanceries of kingdoms such as France and England, as well as of the Church (Swanson, 1979, p. 15, Nardi, 1992, pp. 92–3); courts in the Low Countries were resolving commercial conflicts by the 14th century as well (Gelderblom, 2011); and, in

²⁴For a rich description of the process of early adoption of Roman law across Europe in the Middle Ages, refer to the series *Ius Romanum Medii Aevi* (1956–1986, 7 vols., Milan: Giuffrè).

²⁵See Vinogradoff (1929, pp. 133–144).

the German lands of the Holy Roman Empire, there was an extended period of early, unofficial adoption by cities, territorial lords, and the Church, called “Frührezeption” (Trusen, 1962; Coing, 1964; Wieacker, 1967). Decisions made by secular and religious elites played a crucial role in the spread of universities and Roman law.

3.2 The Political Economy of University Establishment and of the Adoption of Roman Law

The law school in Bologna emerged as a “focal point” (Moraw, 1992, p. 247) for the education of jurists in the 10th century. Masters and their students formed corporations (*societates*) to institutionalize the teaching arrangement and defend their rights. However, it was far from obvious that these corporations would enjoy the support of the elites of the time—secular Kings and Emperors, Church elites and Popes—or even of the cities they resided in.

The Church initially looked at the new form of training with suspicion. Universities were a competitor of cathedral schools and monastic schools—the traditional places where it had educated its elites up to then. Afraid of losing its monopoly of education, the Church imposed a ban on the study of medicine and civil law by monks and canons, particularly since the schools of medicine and civil law were led by laymen. This ban was issued in the Council of Clermont (1130), and reiterated in the Council of Reims (1131) and in the second Lateran council of 1139 (Verger, 1977–1999). Cities also had an ambivalent relationship to the new institution. The presence of a large number of (mainly wealthy) students and teachers was of course attractive; however, the unclear legal status of students was also a source of ‘town and gown’ conflicts.²⁶

In contrast to this, Emperor Frederick I Barbarossa’s approach to the students of law

²⁶For example, merchants often attempted to seize some student’s property to satisfy debts incurred by his compatriots.

reflected his understanding of the usefulness of jurists. In 1155, he met the students of Bologna just outside the city walls and issued a bill of privileges, the *Authentica Habita*. With this constitution, the Emperor granted professors and students freedom of movement for the purposes of their studies. He also forbade the right of reprisal against foreign scholars, and decreed that students summoned to court could choose to be tried by their own masters (teachers) or by the bishops' courts, rather than by the local courts (Nardi, 1992). To protect themselves further, early in the 13th century students in Bologna founded "universities" of students and gave themselves written statutes (Weimar, 1977–1999; Rashdall, 1895, vol. 1, p. 152).

The growing importance of jurists and of their specialized knowledge of Roman law in defining rulers' powers became clear at the Imperial Diet of Roncaglia (1158), a key moment in Frederick Barbarossa's attempts to restore the Imperial powers over Italy. The Emperor attended the diet accompanied by four legal counsellors from Bologna—Bulgarus, Martinus Gosia, Iacobus, and Hugo de Porta Ravennate—who provided expert legal advice (Georgi, 1977–1999); in exchange, he confirmed the privileges of *Authentica Habita*.

As in the case of Frederick Barbarossa, the other authorities' suspicion of the new institution vanished with the realization of the usefulness of jurists, and of the role of universities as providers of highly educated graduates to staff the ranks in public and Church administration (Verger, 1977–1999). Popes, Emperors, and other lords (spiritual and temporal) found individuals trained in law at university to be extremely valuable: Moraw (1992, p. 247) writes that

[the universities] made possible the emergence of groups of persons who, as legal experts, occupied posts of growing importance for the life of society. The communities needed these specialists for their domestic administration and legal system, in the quest for increasing autonomy and in the competitive struggle with their neighbors.

In sum, the authorities of the epoch contributed to the success of the university, and

the teaching of Roman law, in two ways. First, Popes, Kings, Holy Roman Emperors, and city governments issued privileges and granted various rights to universities and their students—as in the case of the *Authentica Habita*, or of the protection *tamquam filios speciales* (“like dearly beloved sons”) explicitly accorded by Pope Honorius III to the students of Paris, who had been harassed by the local bishop (Nardi, 1992, p. 85). Second, Kings, Emperors, and Popes increased the labor market returns to university study by hiring graduates of the universities to staff their chanceries and administrations. In doing this, they clearly signaled to potential students that the university study was not just an intellectual pastime, but that it taught skills that were valued and that could eventually be rewarded with prestigious and lucrative positions.

3.3 Interpretation and Consequences

Viewed through the framework of the model above, the case of the introduction of Roman legal knowledge to medieval Europe has three distinguishing features. First, without the intervention of the authorities, investment in the new type of knowledge would have been suboptimal: the private costs of studying Roman law were very high, and there were returns to legal knowledge not internalized by the individual. Second, after an initial period of suspicion, elites saw that the new knowledge was not threatening to their status. Third, the new type of knowledge was highly productive.

As discussed above, universities had a troubled start in medieval Europe. Students were often held at ransom by the city’s merchants, and the legal status of the *universitates*, the corporations that they founded, was unclear. These sources of uncertainty, paired with the high costs of travel in the Middle Ages, certainly pushed down the number of students. However, beginning with Emperor Barbarossa’s support, these hurdles began to be eliminated. The rights and privileges granted to universities reduced the cost of acquiring

a university education: more certainty about the legal value of the degrees attained and the elimination of the risk of being held at ransom by local authorities were factors that diminished the costs (c_{mm}) faced by potential students when choosing an educational path.

Rulers—both secular and ecclesiastical ones—also increased the returns to education in Roman law by providing attractive career perspectives to graduates, effectively subsidizing study. The evidence on the careers of Medieval jurists is rich, and points toward the fact that many graduates followed a career in the service of secular administrations: as counsellors, members of the chanceries, or envoys of Kings, Emperors, princes or cities. Even in the Church the highest-ranking appointments were reserved to jurists trained in Roman law, in addition to canon law (Moraw, 1992, p. 266).²⁷

We analyzed the biographies of over 1,200 graduates of law from the university of Bologna, between its foundation and the early 17th century. These data, first collected by Alidosi (1623), give insights into the careers of graduates of the oldest and most distinguished law faculty in Europe.²⁸ In Table 2, we categorize the career choices of the Bolognese graduates into four broad areas: clerical positions in the Church, administrative positions in the Church, academia, and public administration. As the data include graduates of canon and Roman law together, the large number of careers in the Church is not surprising.²⁹ However, jurists' occupations in the Church were often related to administrative tasks. At the same time, almost a quarter of graduates went into explicitly secular administrative positions, such as governors or *podestà*—these were professional managers of cities, appointed for one year, taking the place of aristocratic administrators. They went from city to city together with a small group of judges, notaries, and secretaries (Moraw,

²⁷Different attempts to reconstruct the careers of Medieval graduates of law have been published by Stelling-Michaud (1960), Martines (1968), and Kuhn (1971). A recent project is the "Repertorium Academicum Germanicum", available online at <http://www.rag-online.org/>. Cf. also the survey in Coing (1973), pp. 81ff.

²⁸To our knowledge, this is the first quantitative examination of the work by Alidosi.

²⁹Moreover, as many students of the Middle Ages had taken the minor orders, clerical activities often overlapped with secular ones (Moraw, 1992, p. 269).

1992, p. 148; Greif, 1998).

[Table 2 about here]

The changing attitudes of medieval elites toward universities and the teaching of Roman law reflects their perception of the threat posed by the new form of knowledge, and their eventual appreciation that legal study was not inconsistent with their ideology. Initially, rulers looked at universities with suspicion. The Church's control of learning was endangered (D was perceived to be high); ruling elites, both Church and secular, might have been challenged by a new set of legally-trained bureaucrats (π was perceived to be high as well). In a later phase, rulers—as in the case of Emperor Barbarossa—realized that their positions could actually be strengthened by encouraging the study of Roman law (both D and π were seen to low). The consolidation of their power, and the increased incomes that new human capital helped generate, led states (including the Church) to subsidize investment in the new human capital. Elites discovered over time that they were in Region I of Figure 2: they were unlikely to be unseated by individuals trained in Roman law, and indeed, the benefits from modern education were significant.

To understand the economic impact of legal studies in the context of the Middle Ages, and thus the potential productivity of the new form of human capital (y_m) as well as its social returns (B), two important aspects have to be taken into account. The first is the high number of different polities. After the collapse of the Carolingian empire, by some accounts the number of polities increased from 10 to more than 200 in the year 1300 (Tilly, 1990). Different polities had different jurisdictions, different customs, and different weights and measures; it was nearly impossible to prosecute, for example, an insolvent buyer across the borders of territories. The second is the absence, compared to the modern world of nation-states with well-defined boundaries, of a clear demarcation of the different aspects of sovereignty between the political actors—Popes, Bishops, Kings or Emperors, local feu-

dal lords, cities etc. These different layers of sovereignty led to a situation in which “no single power agency controlled a clear-cut territory or the people within it” (Mann, 1986, p. 386).

In this context, the introduction of Roman legal knowledge was a useful innovation, contributing to the expansion of urbanization, long-distance trade and small-scale commerce that characterized—despite the obstacles described above—the high Middle Ages. Thanks to the sophistication of Roman law in the field of contracts, and the fact that a common legal language was now shared all over Europe (because of the similarity of curricula across universities), medieval jurists who worked as lawyers, judges, notaries, or procurators supported the unfolding of commercial activities. Berman (1983, p. 336) writes:

In fact, the new jurisprudence of the late eleventh and twelfth centuries provided a framework for institutionalizing and systematizing commercial relations in accordance with new concepts of order and justice. Without such new legal devices as negotiable bills of exchange and limited liability partnerships, without the reform of the antiquated commercial customs of the past, without mercantile courts and mercantile legislation, other social and economic pressures for change would have found no outlet.

In addition to supporting commercial exchange, jurists played an important role in public administrations (Berman, 1983, p. 120). Here, again relying on the common, pan-European framework of Roman law, they could help solve the conflicts of rivaling sovereignties between Church and states, and between secular states. Roman law thus fulfilled the roles that have been identified by the literature (Greif, 2005, 2008a,b; Acemoglu and Johnson, 2005) as crucial to economic development: it placed constraints on rulers, thereby signaling that property rights were secure, provided mechanisms for contract enforcement, and facilitated coordination among powers.³⁰

³⁰In related work (Cantoni and Yuchtman, 2010), we go beyond the analysis of jurists’ careers and try to investigate the potential aggregate economic effects of Roman law in Medieval Europe. We exploit the arguably exogenous introduction of universities (and thus of Roman legal thinking) in the German lands of the Holy Roman Empire as a consequence of the Western Schism of 1378, and consider their impact on the intensity and location of the granting of market rights. Our findings support a causal effect of university foundation (and of penetration of Roman legal knowledge) on economic development.

4 Historical Case Study 2: The Introduction of Western Education in Late Imperial and Republican China

4.1 Traditional Education in China and the Introduction of Western Science

For hundreds of years, the traditional Chinese education system, focused on the study of the Confucian classics, prepared students to take imperial exams with the goals of achieving gentry status and receiving a position in the imperial civil service. The traditional education system was, through its provision of human capital, its transmission of Confucian ideology, and its selection of social elites, a pillar of imperial China's social structure, government, and economy (Elman, 2000).

Students began their studies as young children, typically in schools that were funded by their clans. After memorizing the thousands of characters comprising the Confucian classics (which might take over a decade), students would devote yet more time to practicing their composition skills—most importantly, the “eight-legged essays” on which they were evaluated in the examinations—and reading commentaries and histories that would be useful for their exams. Advanced study would take place in academies, generally organized and paid for privately, that prepared students to take civil service exams.

Traditional Chinese education had a remarkably narrow focus: mastery of the Confucian classics and the ability to write the eight-legged essays were almost exclusively the skills that determined success on the imperial exams in the late Qing Dynasty. Students responded to the incentives offered by the examination system and typically did not seek broad educations that went beyond the material needed to succeed in the exams. One official, a holder of the highest, *jìnshì*, degree in the examinations, “complained privately that the civil service lacked men with any practical talent because the selection process made little effort to stress administrative concerns”. Another official stated that China's literati

“study things they will never use and later use what they have never studied” (Elman, 2000, pp. 573, 589).

In Table 3, we present some data on the topics about which “policy questions” were asked in mid-19th century provincial-level exams (the Table is based on figures reported in Elman, 2000, p. 722). In both 1840 and 1849, topics in the humanities—the Classics, History, Poetry, and Philology—dominated the exams. In contrast, scientific questions nearly never appeared: no questions about nature were asked in 1840, across seven provinces’ exams, and only one such question was asked, across 15 provinces’ exams, in 1849. Even where questions on more applied topics were assigned, the style of writing, rather than the substance, was the most important metric by which an exam candidate was judged (Elman, 2000; Chang, 1955).

[Table 3 about here]

Prior to the 19th century, Chinese exposure to European science was extremely limited, and the gap between Chinese and Western science in the 19th century was massive. However, in the 19th century, encounters with Western imperialist powers introduced new fields of study to China—most notably, modern science, mathematics, and engineering. Missionary schools, some Jesuit and many Protestant, began to teach foreign languages and Western math, science, and engineering in the second half of the 19th century. Military (arsenal) schools, first established in the 1860s by the Qing government, provided applied training in Western science and engineering and produced Chinese-language translations of important books in the natural and applied sciences. A small modern educational hierarchy, including high schools and universities (privately funded, and often located in Western-controlled treaty ports), taught modern subjects as well. Finally, some Chinese students accessed Western knowledge through study abroad; Japan and the United States played important roles in training Chinese in modern subjects like medicine, engineering,

and law.

4.2 The Political Economy of Education Reform in Late Imperial China

In the mid- to late-19th century, military defeats to Western countries in the Opium Wars and to Japan in the Sino-Japanese War indicated to many Chinese a need for modernization. Reformers urged military changes, political changes, and especially changes in the structure and content of education. One Qing dynasty official felt that “the military successes of Meiji Japan were a model for China and that emulating the Japanese would require expanded education in the sciences and industry” (Elman, 2006, p. 201). The importance of educational reform was even emphasized by the (Guangxu) Emperor: in 1898, he wrote, “Our scholars are now without solid and practical education; our artisans are without scientific instructors; when compared with other countries we soon see how weak we are” (Headland, n.d., p. 116). The narrow focus of the Imperial civil service exams was recognized by political reformers in the second half of the 19th century as being particularly problematic. In 1896, for example, Liang Qi-chao “pointed out the deleterious influence of the civil examinations on learning. Most candidates would master whatever curriculum was set on the examinations ... Hence, curricular reform was mandatory to change the learning habits of literati who sought public office” (Elman, 2000, p. 598).

Some efforts were made to increase the incentives to study modern educational content. First, the government enacted policies that reduced the cost of studying Western subjects: it established military arsenal schools, which provided training in science and engineering; opened some schools with training in foreign languages and Western subjects; and, supported the study of Western subjects by sending some students to study in Japan, Europe, and the United States. In addition, late in the 19th century, attempts were made to introduce Western subjects into the civil service exams, and so into the traditional schools’

curriculum. In 1898, it seemed that radical educational reform would be implemented during the “100-days reform,” but conservatives ultimately re-asserted themselves (Karl and Zarrow, 2002).

Throughout the second half of the 19th century, arguments for, and acts of, educational reform were met by powerful resistance from conservative officials. Attempts at promoting investments in modern human capital were ultimately rebuffed, as officials argued that the investments in Western education ought to be sharply circumscribed: the goal was “Self-Strengthening,” which meant preserving the core of Chinese learning and culture by studying Western subjects only to the extent necessary to prevent being militarily defeated by foreign powers. There were impassioned defenses of Chinese education. One individual argued that “For five thousand years the spirit of the sages has continued in China . . . [we] absolutely must not do as the Japanese, who had dispensed with their own learning in favor of Western learning” (Weston, 2002, p. 108). Not only were cautious officials concerned about the cultural losses stemming from educational reform, but they also saw a threat to the imperial government, and to their own positions, from the study of Western subjects. Zhang Zhidong, a government official, argued in the late 19th century that “if [one] want[s] to strengthen China and preserve Chinese learning, [one] must study Western learning. Yet, if someone [studies Western learning] without first firmly being rooted in Chinese learning to cultivate his character, he may become a rebel leader if he has a strong body and a slave [to the West] if he is weak. He will cause more harm [to society] than a person who knows nothing about Western learning” (Hon, 2002, p. 89).

Conservative Chinese officials for the most part succeeded in preserving the incentives to study the Classical curriculum in the traditional education system. Their most effective policies were, first, preserving the material covered on the civil service exams; second,

maintaining the links among the exams, “gentry” status, and economic rents;³¹ and third, limiting the application of Western learning in the labor force by restricting the activities of modern, Western firms.³²

On net, it is clear that the modern schools did not attract the very best away from the traditional system: according to Chang (1955, p. 204), until late in the 19th century studying Western subjects was considered “shameful.” Elman (2006, p. 158) writes that elites who studied Western subjects were “considered marginal because they usually had failed the more prestigious civil examinations.”

4.3 Interpretation and Consequences

Viewed through the framework of our model, the case of the introduction of Western scientific knowledge to 19th century China shares features with medieval Europe. First, without an active policy change by ruling elites, investment in the new type of knowledge would have been suboptimal: the costs of studying Western science were very high in the 19th century, especially when taking into account the opportunity cost of foregoing study of the Confucian Classics; second, there were returns to the new human capital not internalized by the individual. Unlike the case of medieval Europe, imperial Chinese elites—especially conservatives—felt persistently threatened by the possibility of a class of individuals trained in Western subjects. They also faced high ideological costs of subsidizing Western schooling. Thus, the imperial government did not act decisively to support investment in modern human capital throughout the 19th century, despite the opportunity

³¹Positions in civil service, besides guaranteeing a high social standing, were extremely lucrative. Chang (1962) estimates that administrative secretaries (lower-level members of the gentry) earned good incomes of up to 1,500 *taels* per year. District level officials, who passed higher level exams, earned 30,000 *taels* per year; high-level officials earned 180,000 *taels* per year—truly massive incomes at the time—over 100 times the income of a well-off secretary. Gentry members who did not serve in the imperial civil service could also acquire great wealth by working in fields like tax collection and in the salt administration.

³²Of course, limitations on the activity of Western firms were also motivated by a variety of reasons other than the desire to reduce the returns to Western education.

to invest in highly productive skills.

The Qing government clearly viewed modern, Western subjects with some ambivalence. On the one hand, the study of modern science and engineering could support the state by improving technology, potentially increasing income and modernizing the military. On the other hand, the study of the traditional curriculum had been linked to the selection of social elites and bureaucrats for centuries; questioning the curriculum implied questioning the qualifications of the social and political elite, as well as undermining the Confucian ideology that linked the Manchurian Qing dynasty to its Han subjects and legitimized the imperial bureaucracy. Elites faced not only a high, static ideological cost, D , but also a dynamic one: moving away from the Confucian education system could have weakened the emperor and the civil service. Elites educated in modern subjects—inside or outside the civil service—would also have represented a threat to traditional types' positions and status; thus, traditional elites perceived a high risk of being replaced, (π was seen to be high as well).

Conservative officials, and influential conservatives within the imperial household (notably, the Empress Dowager Cixi) felt that any investment in modern human capital beyond what was absolutely necessary to modernize the military was a grave threat to their positions of power. Thus, although the government slightly subsidized the study of modern subjects (by establishing some modern schools), the opportunity cost of studying modern subjects was maintained at a high level, by reserving massive social and economic rents to those who studied the traditional curriculum. Conservative elites believed that they were in Region IV of Figure 2: they saw individuals trained in Western subjects as a grave threat, and believed that Western education would undermine their positions, and thus did not support investments in modern human capital.

The result, as one would expect, was limited acquisition of the new skills. At the same

time, China's economic development in the second half of the 19th century was not impressive: outside the Western-controlled treaty ports, China did not modernize economically or institutionally. The Qing government continually faced conflicts, both internal and external, and pressure for institutional reform; in 1905, the system of imperial exams was abolished and a modern school system established; the decline of traditional institutions continued, and the last Qing emperor abdicated in 1912. It is difficult to know whether different policy choices by the Qing government could have encouraged greater investment in modern human capital in the second half of the 19th century, and even more difficult to know whether this might have had consequences for China's economic development.³³ We present evidence from the period immediately following the downfall of the Qing Empire that can provide some suggestive answers to these questions.

First, different government policies very likely would have encouraged greater investment in modern human capital. Yan (2007) finds that the number of advanced students enrolled in modern schools (high schools or universities) increased from under 150,000 in 1912 to well over 500,000 in 1930. The economic environment in Republican China was far from perfect—the 1910s and 1920s were times of internal conflict across China—but the Republican government encouraged modern industry and certainly did not promote a traditional education system. Eliminating the rents associated with traditional study and allowing the development of modern industry was enough to dramatically increase the number of individuals studying modern subjects.

There also exists evidence suggesting that investments in modern human capital could have promoted economic development in imperial China. Bai and Kung (2011) present evidence that Chinese counties with more Protestant missionaries were more urbanized

³³Lin (1995) and Huff (2003) argue that China's traditional education system was a hindrance to technological progress for centuries, as it diverted elites' attention away from scientific discovery. The question here is whether China would have more effectively adopted Western technology and modernized its economy, rather than indigenously innovated new technologies.

(and thus plausibly more developed) than other counties in the early 20th century. Importantly, the channel through which missionaries affected urbanization seems to have been the transmission of Western knowledge: it was particularly the presence of missionaries from denominations involved in school and hospital construction that was associated with greater urbanization.

An early 20th century directory of individuals who had returned to China from study in America provides an indication of the usefulness to modern firms of the human capital provided by Western schools. The directory first notes (perhaps with some exaggeration) that “[I]t does not seem possible to give an adequate estimate of what the [returned] students as a whole have done for their country. But probably it is within the bounds of safety as well as propriety to say that it has been entirely due to their efforts and influence that the country is being modernized” (Tsinghua University, 1917). Clearly, the size of the positive externality from modern schooling, B , was seen to be exceptionally high. In Table 4, the sectors in which these individuals were employed in 1917 are summarized. It is clear that many of them were able to use their human capital in modern industries like the railroads and mining; in white collar positions, like banking; and in practicing medicine; many also found employment as officials in the Republican government.

[Table 4 about here]

Examining individual-level data, Yuchtman (2010) finds that in the 1920s, the Tianjin-Pukou Railroad paid extremely high wages to individuals who were trained at high levels in modern schools, especially those trained as engineers (that is, y_m was high, too). Traditionally-educated workers earned wage premiums relative to unskilled workers, but significantly lower wages than the engineers. This suggests that individuals who studied modern subjects, especially engineering, were differentially productive in the railroads. Greater investment in modern human capital thus might have supported the establish-

ment and growth of modern, industrial firms in 19th century China. Historical evidence thus suggests that a consequence of Qing policies incentivizing the study of traditional subjects was under-investment in productive, modern human capital, and consequently, delayed economic modernization.

5 Discussion and Conclusion

Development economists have long viewed variation in educational attainment across countries as an important factor determining the wealth of nations (e.g., Mankiw et al., 1992). There has been far less discussion among economists of the importance of differences in the content of education across countries and across time. We argue that specific educational content can play an important role in economic development and that government policies play a crucial role in determining incentives to acquire different skills. Governments and elites can play a salutary role, overcoming market failures that make individual investment levels sub-optimal, or they can play a damaging role, in pursuit of their own interest in maintaining power.

We have presented a simple model that makes clear how individual choices and governments' incentives interact in producing an equilibrium level of investment in a specific form of human capital. To illustrate the mechanisms of the model in historically important contexts, we have closely examined two cases to establish a tighter link among government policy, investments in particular types of human capital, and consequences for economic activity. These cases make clear that a new, productive form of human capital will only be invested in when governments do not discourage investment, and when governments act to reduce the uncertainty individuals face in choosing their fields of study. Indeed, government encouragement of investment (through institutional changes or through intervention in the labor market) can be crucial to ensuring that individuals choose to acquire new skills

in a situation characterized by uncertain returns. We believe that these insights can be applied still more broadly to a variety of additional historical and present-day settings.

The rise and fall of Islamic science in the Middle Ages represented part of an epochal shift in the wealth and power of the civilizations of the West, and have received the attention of many scholars. Chaney (2008) presents an analysis along the lines suggested by our model: Islamic elites who controlled educational institutions in the Middle Ages initially promoted the study of logic and science, because the gains from spreading these skills (more converts to Islam) outweighed the drawbacks (potential criticism of the established religious elites). This period of elite support for scientific study saw the flourishing of Islamic society. As Islam succeeded in conquering and converting the vast majority of the populations in the Middle East, the gains to elites from people's investments in the study of logic and science fell relative to the costs and elites moved to prevent the further study of these subjects. Unsurprisingly, with elites moving to prevent the study of science, Islam fell behind, ceding its scientific preeminence to Europe.

Moving forward in time, the 20th century is full of cases of governments implementing policies affecting educational content, driven by political economy concerns. One dramatic instance was the passage of the National Defense Education Act in the United States in 1958. In this case, government support for scientific education was massively increased following the successful launch of the *Sputnik 1* satellite by the Soviet Union. The example reveals an angle of the political economy problem governments face that was outside our model: the U.S. elite was threatened by *Sputnik* both because the population of the U.S. evaluated the government according to its standing relative to the Soviet Union (hence, there existed some internal political incentives), and because there was a plausible *external* threat to the elites if Soviet technology became too advanced. The twentieth century also saw elites consider the introduction of "capitalist," Western content in China, as well as in

the Eastern bloc, prior to 1990.³⁴

We view our work on the *content* of education and work on the *quality* of education (e.g., Hanushek and Woessmann (2012)) as important complements to development research that has focused on quantities of human capital almost exclusively. Further study of educational content and educational institutions as crucial determinants of human capital in a society, and thus growth, appear to us to be an important, under-explored area of study. In addition, the content of education shapes not only productive capacities, but also ideology, providing an additional political economy dimension to government policies toward human capital provision that is worthy of study.

³⁴See Abramitzky and Sin (2012), on the availability of Western books in the Eastern bloc.

References

- Abramitzky, Ran and Isabelle Sin**, “Book translations as idea flows: The effects of the collapse of Communism on the diffusion of knowledge,” May 2012. Manuscript, Stanford University.
- Acemoglu, Daron and James A. Robinson**, “Why Did the West Extend the Franchise? Democracy, Inequality, and Growth in Historical Perspective,” *Quarterly Journal of Economics*, 2000, 115 (4), 1167–1199.
- **and** – , “Economic Backwardness in Political Perspective,” *American Political Science Review*, February 2006, 100 (1), 115–131.
- **and** – , “The Persistence and Change of Institutions in the Americas,” *Southern Economic Journal*, 2008, 75 (2), 282–299.
- **and Simon Johnson**, “Unbundling Institutions,” *Journal of Political Economy*, 2005, 113 (5), 949–995.
- , – , **and James A. Robinson**, “The Rise of Europe: Atlantic Trade, Institutional Change, and Economic Growth,” *American Economic Review*, June 2005, 95 (3), 546–579.
- Aghion, Philippe, Leah Boustan, Caroline Hoxby, and Jerome Vandenbussche**, “The Causal Impact of Education on Economic Growth: Evidence from U.S.,” March 2009. Unpublished.
- , **Torsten Persson, and Dorothee Rouzet**, “Education and Military Rivalry,” *NBER Working Paper Series*, May 2012, 18049.
- Algan, Yann, Pierre Cahuc, and Andrei Shleifer**, “Teaching Practices and Social Capital,” October 2011. Unpublished.
- Alidosi, Giovanni**, *Li dottori bolognesi di legge canonica e civile dal principio di essi per tutto l'anno 1619*, Bologna: Nicolò Tebaldini, 1623.
- Altbach, Philip G.**, “The Giants Awake: Higher Education Systems in China and India,” *Economic and Political Weekly*, June 2009, 44 (23), 39–51.
- Andrabi, Tahir, Jishnu Das, Asim Ijaz Khwaja, and Tristan Zajonc**, “Religious School Enrollment in Pakistan: A Look at the Data,” *Comparative Education Review*, August 2006, 50 (3), 446–477.
- Bai, Ying and James Kai-sing Kung**, “Diffusing Useful Knowledge while Spreading God’s Message: Protestantism and Economic Prosperity in China, 1840–1920,” February 2011. Unpublished, Hong Kong University of Science and Technology.

- Benhabib, Jess and Mark M. Spiegel**, "The Role of Human Capital in Economic Development: Evidence from Aggregate Cross-Country Data," *Journal of Monetary Economics*, October 1994, 34 (2), 143–173.
- Bennell, Paul**, "General versus Vocational Secondary Education in Developing Countries: A Review of the Rates of Return Evidence," *Journal of Development Studies*, December 1996, 33 (2), 230–247.
- Berman, Eli**, "Sect, Subsidy, and Sacrifice: An Economist's View of Ultra-Orthodox Jews," *Quarterly Journal of Economics*, August 2000, 115 (3), 905–953.
- Berman, Harold**, *Law and Revolution: The Formation of the Western Legal Tradition*, Cambridge, Mass.: Harvard University Press, 1983.
- Besley, Timothy and Torsten Persson**, "State Capacity, Conflict, and Development," *Econometrica*, January 2010, 78 (1), 1–34.
- Bloom, David, David Canning, , and Kevin Chan**, "Higher Education and Economic Development in Africa," Technical Report, The World Bank 2006.
- Botero, Juan, Alejandro Ponce, and Andrei Shleifer**, "Education and the Quality of Government," May 2012. Unpublished, Harvard University.
- Britnell, Richard H.**, *The Commercialisation of English Society 1000–1500*, Cambridge: Cambridge University Press, 1993.
- Buringh, Eltjo and Jan Luiten van Zanden**, "Charting the 'Rise of the West': Manuscripts and Printed Books in Europe, A Long-Term Perspective from the Sixth through Eighteenth Centuries," *Journal of Economic History*, 2009, 69 (2), 409–445.
- Cantoni, Davide and Noam Yuchtman**, "Medieval Universities, Legal Institutions, and the Commercial Revolution," June 2010. Unpublished.
- Chaney, Eric**, "Tolerance, Religious Competition and the Rise and Fall of Muslim Science," November 2008. Manuscript, Harvard University.
- Chang, Chung-li**, *The Chinese Gentry: Studies on their Role in Nineteenth-Century Chinese Society*, Seattle: University of Washington Press, 1955.
- , *The Income of the Chinese Gentry*, Seattle: University of Washington Press, 1962.
- Clots-Figuerras, Irma and Paolo Masella**, "Education, Language and Identity," July 2009. Unpublished.
- Coing, Helmut**, "Römisches Recht in Deutschland," in "Ius Romanum Medii Aevi," Vol. 5:6, Milano: Giuffrè, 1964.

- , “Die juristische Fakultät und ihr Lehrprogramm,” in Helmut Coing, ed., *Handbuch der Quellen und Literatur der neueren europäischen Privatrechtsgeschichte*, Vol. I, München: C.H. Beck, 1973, pp. 39–128.
- Dal Bó, Ernesto, Frederico Finan, and Martin Rossi**, “Strengthening State Capabilities: The Role of Financial Incentives in the Call to Public Service,” 2012. NBER Working Paper 18156.
- Dincecco, Mark and Mauricio Prado**, “Warfare, fiscal capacity, and performance,” *Journal of Economic Growth*, September 2012, 17 (3), 171–203.
- Easterlin, Richard A.**, “Why Isn’t the Whole World Developed?,” *Journal of Economic History*, March 1981, 41 (1), 1–19.
- Elman, Benjamin A.**, *A Cultural History of Civil Examinations in Late Imperial China*, Berkeley: University of California Press, 2000.
- , *A Cultural History of Modern Science in Late Imperial China*, Cambridge, Mass.: Harvard University Press, 2006.
- Engerman, Stanley L. and Kenneth L. Sokoloff**, “The Evolution of Suffrage Institutions in the New World,” *Journal of Economic History*, 2005, 65 (4), 891–921.
- , **Elisa V. Mariscal, and Kenneth L. Sokoloff**, “The Persistence of Inequality in the Americas: Schooling and Suffrage, 1800–1945,” 1999. Unpublished, University of California, Los Angeles.
- Epstein, Stephan R.**, *Freedom and Growth: The Rise of States and Markets in Europe 1300–1750*, London: Routledge, 2000.
- Friedman, Willa, Michael Kremer, Edward Miguel, and Rebecca Thornton**, “Education as Liberation?,” *NBER Working Paper Series*, April 2011, 16939.
- Galor, Oded and Omer Moav**, “Das Human-Kapital: A Theory of the Demise of the Class Structure,” *Review of Economic Studies*, 2006, 73 (1), 85–117.
- Gelderblom, Oscar**, “The Resolution of Commercial Conflicts in Bruges, Antwerp, and Amsterdam (1250-1650),” in Debin Ma and Jan Luiten van Zanden, eds., *Law and Long-Term Economic Change*, Stanford University Press, 2011, pp. 244–276.
- Georgi, Wolfgang**, “Roncaglia,” in “Lexikon des Mittelalters,” Vol. VII, München and Zürich: Artemis & Winkler, 1977–1999, p. 1021.
- Glaeser, Edward L., Rafael La Porta, Florencio Lopez de Silanes, and Andrei Shleifer**, “Do Institutions Cause Growth?,” *Journal of Economic Growth*, 2004, 9, 271–303.

- Greif, Avner**, "Self-Enforcing Political Systems and Economic Growth: Late Medieval Genoa," in Robert H. Bates, Avner Greif, Margaret Levi, Jean-Laurent Rosenthal, and Barry R. Weingast, eds., *Analytic Narratives*, Princeton, N.J.: Princeton University Press, 1998, chapter 1, pp. 23–63.
- , "Commitment, Coercion, and Markets: The Nature and Dynamics of Institutions Supporting Exchange," in Claude Menard and Mary M. Shirley, eds., *Handbook of New Institutional Economics*, Norwell, Mass.: Kluwer, 2005, chapter 28, pp. 727–786.
- , "Coercion and Exchange: How did Markets Evolve?," 2008. Unpublished, Stanford University.
- , "The Impact of Administrative Power on Political and Economic Development: Toward a Political Economy of Implementation," in Elhanan Helpman, ed., *Institutions and Economic Performance*, Cambridge, Mass. and London: Harvard University Press, 2008, chapter 1, pp. 17–63.
- Hanushek, Eric A. and Ludger Woessmann**, "The Role of Cognitive Skills in Economic Development," *Journal of Economic Literature*, September 2008, 46 (3), 607–668.
- and – , "Do Better Schools Lead to More Growth? Cognitive Skills, Economic Outcomes, and Causation," *Journal of Economic Growth*, 2012, 17, 267–321.
- Headland, Isaac Taylor**, *Court Life in China: The Capital, its Officials and People*, Champaign, IL: Project Gutenberg, n.d.
- Hon, Tze-Ki**, "Zhang Zhidong's Proposal for Reform: A New Reading of the *Quanxue pian*," in Rebecca E. Karl and Peter Zarrow, eds., *Rethinking the Reform Period. Political and Cultural Change in Late Qing China*, Cambridge, Mass.: Harvard University Press, 2002, chapter 3, pp. 77–98.
- Huang, Fali**, "Why Did Universities Precede Primary Schools? A Political Economy Model Of Educational Change," *Economic Inquiry*, April 2012, 50 (2), 418–434.
- Huff, Toby E.**, *The Rise of Early Modern Science. Islam, China and the West*, Cambridge: Cambridge University Press, 2003.
- Jha, Saumitra**, "Financial Innovations and Political Development: Evidence from Revolutionary England," August 2010. Stanford University Working Paper.
- Jones, Benjamin F.**, "The Knowledge Trap: Human Capital and Development Reconsidered," September 2011. Unpublished.
- Karl, Rebecca E. and Peter Gue Zarrow**, *Rethinking the 1898 Reform Period: Political and Cultural Change in late Qing China*, Vol. 214 of *Harvard East Asian monographs*, Cambridge, Mass.: Harvard University Asia Center, 2002.

- Krueger, Alan B. and Mikael Lindahl**, "Education for growth: Why and for whom?," *Journal of Economic Literature*, December 2001, 39 (4), 1101–1136.
- Kuhn, Werner**, *Die Studenten der Universität Tübingen zwischen 1477 und 1534; ihr Studium und ihre spätere Lebensstellung*, Göppingen: Kiemmerle, 1971.
- Lane, Kevin and Florian Pollner**, "How to address China's growing talent shortage," *McKinsey Quarterly*, July 2008, 2008 (3), 33–40.
- Lee, Sing Kong, Chor Boon Goh, Birger Fredriksen, and Jee Peng Tan**, *Toward a Better Future: Education and Training for Economic Development in Singapore Since 1965*, Washington, DC: The World Bank, 2008.
- Lopez, Robert S.**, *The Commercial Revolution of the Middle Ages*, Cambridge: Cambridge University Press, 1976.
- Mankiw, N. Gregory, David Romer, and David N. Weil**, "A Contribution to the Empirics of Economic Growth," *Quarterly Journal of Economics*, May 1992, 107 (2), 407–437.
- Mann, Michael**, *The Sources of Social Power. A History of Power from the Beginning to A.D. 1760*, Cambridge: Cambridge University Press, 1986.
- Martines, Lauro**, *Lawyers and statecraft in Renaissance Florence*, Princeton, N.J.: Princeton University Press, 1968.
- Moraw, Peter**, "Careers of Graduates," in Hilde DeRidder-Symoens, ed., *A History of the University in Europe: Universities in the Middle Ages*, Vol. 1, Cambridge: Cambridge University Press, 1992, chapter 8, pp. 244–279.
- Naidu, Suresh**, "Suffrage, Schooling, and Sorting in the Post-Bellum U.S. South," September 2010. Unpublished, Columbia University.
- Nardi, Paolo**, "Relations with Authority," in Hilde DeRidder-Symoens, ed., *A History of the University in Europe: Universities in the Middle Ages*, Vol. 1, Cambridge: Cambridge University Press, 1992, chapter 3, pp. 77–107.
- Postan, Michael M.**, *Medieval Trade and Finance*, Cambridge: Cambridge University Press, 1973.
- Psacharopoulos, George**, "To Vocationalize or Not to Vocationalize? That is the Curriculum Question," *International Review of Education*, 1987, 33 (2), 187–211.
- **and Harry A. Patrinos**, "Returns to Investment in Education: A Further Update," *Education Economics*, 2004, 12 (2), 111–135.

- Rashdall, Hastings**, *The Universities of Europe in the Middle Ages*, Oxford: Clarendon Press, 1895.
- Rüegg, Walter**, "Themes," in Hilde DeRidder-Symoens, ed., *A History of the University in Europe: Universities in the Middle Ages*, Vol. 1, Cambridge: Cambridge University Press, 1992, chapter 1, pp. 3–34.
- Spiegel, Jerry M. and Annalee Yassi**, "Lessons from the Margins of Globalization: Appreciating the Cuban Health Paradox," *Journal of Public Health Policy*, 2004, 25 (1), 85–110.
- Stelling-Michaud, Sven**, *Les juristes suisses à Bologne, 1255-1330; notices biographiques et registres des actes bolonais*, Geneva: Droz, 1960.
- Swanson, Robert Norman**, *Universities, Academics, and the Great Schism*, Cambridge: Cambridge University Press, 1979.
- Tilly, Charles**, *Coercion, Capital, and European States, AD 990–1990*, Oxford: Blackwell, 1990.
- Trusen, Winfried**, *Anfänge des gelehrten Rechts in Deutschland; ein Beitrag zur Geschichte der Frührezeption*, Wiesbaden: Steiner, 1962.
- Tsinghua University**, *Who's Who of American Returned Students 1917*.
- Verger, Jacques**, "Universität," in "Lexikon des Mittelalters," Vol. VII, München and Zürich: Artemis & Winkler, 1977–1999, p. 1249.
- Vinogradoff, Paul**, *Roman Law in Medieval Europe*, Oxford: Clarendon Press, 1929.
- von Savigny, Friedrich Karl**, *Geschichte des römischen Rechts im Mittelalter*, 2nd ed., Heidelberg: Mohr, 1834.
- Weimar, Peter**, "Bologna: Rechtsschule von Bologna," in "Lexikon des Mittelalters," Vol. II, München and Zürich: Artemis & Winkler, 1977–1999, p. 374.
- Weston, Timothy B.**, "The Founding of the Imperial University and the Emergence of Chinese Modernity," in Rebecca E. Karl and Peter Zarrow, eds., *Rethinking the Reform Period. Political and Cultural Change in Late Qing China*, Cambridge, Mass.: Harvard University Press, 2002, chapter 4, pp. 99–123.
- Wieacker, Franz**, *Privatrechtsgeschichte der Neuzeit. Unter besonderer Berücksichtigung der deutschen Entwicklung*, 2nd ed., Vol. (English translation: *A History of Private Law in Europe; With Particular Reference to Germany*. Oxford: Oxford University Press, 1995.), Göttingen: Vandenhoeck & Ruprecht, 1967.
- Yan, Se**, "Real Wages and Skill Premia in China, 1858-1936, Evidence from the China Maritime Customs Archives," 2007. Manuscript.

Yuchtman, Noam, "Teaching to the Tests: An Economic Analysis of Educational Institutions in Late Imperial and Republican China," October 2010. Unpublished, University of California, Berkeley.

Figures and Tables

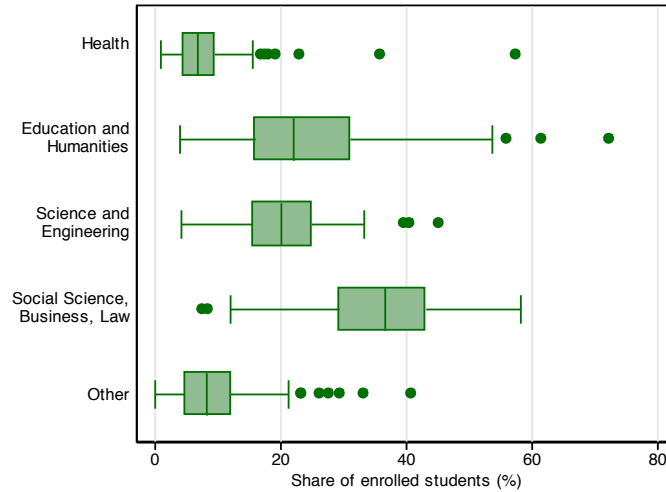


Figure 1: Box plots showing the distributions of tertiary education enrollment shares, by field, for non-OECD countries. For each country, the share is calculated as an average over all available years (maximum range:1998–2010). Source: UNESCO Institute for Statistics.

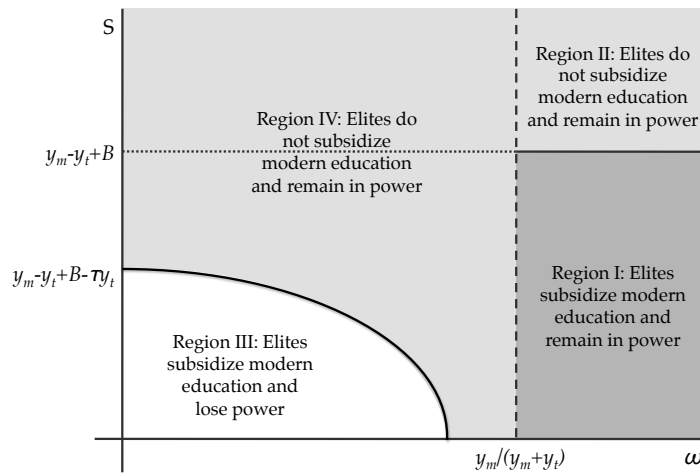


Figure 2: Elite's alternatives under dynamic political economy concerns

Table 1: Numbers of Universities

	Italy	France	British Isles	Iberia	H.R. Empire	Other Europe
1200	2	1	1	0	0	0
1250	7	2	2	2	0	0
1300	7	3	2	3	0	0
1350	10	8	2	5	0	0
1400	12	9	2	6	5	1
1450	14	14	3	6	8	2
1500	13	17	5	11	15	5

Numbers of universities active in each given year. Source: Rashdall (1895).

Table 2: Careers of Bologna Graduates in Law

Career	Number	% of sample
Church (clergy) <i>Among these: Canons (195), bishops (94), archdeacons (31), abbots (30), ...</i>	478	39.44
Church Administration <i>Among these: officials of the Inquisition (86), Protonotaries Apostolic (84), auditors at the Rota (37), ...</i>	381	31.44
Academia <i>Among these: lecturers (56), glossators (15), preceptors (10), ...</i>	91	7.51
Public Administration <i>Among these: governors (91), podestà (40), senators of the city of Bologna (36), ...</i>	262	21.62

Source: Own tabulations based on Alidosi (1623).

Table 3: Topics of Policy Questions in Qing Dynasty Provincial-level Exams

Topic	Fraction of Provinces Including Policy Question on Topic	
	1840	1849
Classical Studies	77.78	100.00
History	77.78	93.33
Learning/Selection	77.78	40.00
Literature/Poetry	55.56	26.67
Geography	55.56	53.33
Economy/Statecraft	44.44	73.33
Philology	44.44	40.00
Agriculture	22.22	6.67
World-ordering	11.11	6.67
Law	11.11	13.33
Military Matters	11.11	6.67
Pre-Han Masters	11.11	6.67
Nature	0.00	6.67
Local Governance	0.00	26.67

Notes: Table based on exam questions from 9 provincial exams in 1840 and 15 exams in 1849. Each provincial exam included 5 policy questions. Source: based on Table 8.8 in Elman (2000).

Table 4: Careers of Chinese Students Returned from Study in America

Career	Number	% of sample
Government officials	24	20.00
Academics	30	25.00
<i>Among these: Faculty (14), Administrators (4), Librarian (1), ...</i>		
Engineering and Industry	40	33.33
<i>Among these: Railroads (16), Mining (6), Iron and Steel Production (4), Petroleum (3), ...</i>		
Medical Doctors	11	9.17
Banking and Law	8	6.67
<i>Among these: Bankers (5), Lawyers (3).</i>		
Other fields	7	5.83
<i>Among these: Social work (3), Agriculture (1), ...</i>		

Source: Own tabulations based on Tsinghua University (1917).