"Just Do Your Job": Obedience, Routine Tasks, and the Pattern of Specialization*

Filipe R. Campante† Davin Chor‡

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Abstract

We study the interplay between cultural attitudes and the economic environment, focusing on attitudes towards obedience in the workplace. We establish two key stylized facts. First, at the country level, an upward shift in workplace obedience over time is associated with more exporting in industries that feature a high routine task content ("Specialization Fact"). Second, at the individual level, the degree of "export-routineness" in the economic environment that respondents were exposed to in their formative years – but not in their adult years – shapes the pro-obedience attitudes that they carry with them into the workforce ("Obedience Fact"). Together, these two facts show that cultural attitudes on workplace obedience respond systematically to economic incentives, and that such a culture in turn shapes the subsequent pattern of industry specialization. We develop an overlapping generations model of human capital investment and cultural transmission, to understand how this aspect of culture and specialization patterns in the economy are jointly determined in the long run. In particular, the model demonstrates the possibility of an "obedience trap": countries may specialize in routine sectors (e.g., basic manufacturing) that foster a culture of obedience, at the expense of the development of more nonroutine production activities.

Keywords: Culture; Workplace Obedience; Routine Tasks; Education; Human capital; Specialization Patterns; Exports

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†Harvard Kennedy School, Harvard University and NBER. Address: 79 JFK Street, Cambridge, MA 02138, USA. Email: filipe_campante@harvard.edu

‡Department of Economics, National University of Singapore. Address: 1 Arts Link, AS2 #06-02, Singapore 117570. E-mail: davinchor@nus.edu.sg

1 Introduction

This paper studies how attitudes towards obedience in the workplace – that is, one's disposition towards following instructions that are received in a work setting, as opposed to questioning them – can shape and be shaped by the economic environment. Although relatively under-studied by economists, we make the case that this aspect of cultural attitudes is nevertheless highly relevant for understanding broader economic outcomes, such as the pattern of production and specialization.

We start from the observation that attitudes towards obedience in the workplace matter, but that they affect the productivity of workers in distinct ways across different sectors or activities. On the one hand, some production tasks are enhanced by having a more obedient workforce. A factory assembly line, for example, would not be able to function properly if workers were to interrupt and question each and every single procedure. Ngai and Chan (2012) colorfully describe how Chinese manufacturer Foxconn's production process "[does] not require 'skill' or thought; only strict implementation of instructions from management and mechanical repetition of each simple movement are required" (p.395). Workers are thus managed "through the principle of 'obedience, obedience, and absolute obedience"' (p.398).

On the other hand, production activities or tasks that involve creative or nonroutine thinking would instead be hindered if workers have a default tendency to conform to rules. For instance, it has been noted that innovative firms are ones in which "'rules' [exist], but managers [feel] free to challenge or ignore them" (Kanter 1983, p.144). Less innovative companies, in contrast, tend to be "dominated by tall hierarchies, [where] honoring the chain of command is a value" (p.76).[1] Starting from this set of observations, it follows that a broad culture of obedience in the workplace would be more conducive in the former types of production activities (e.g., assembly-line manufacturing) than in the latter (e.g., tasks requiring analytical or creative thinking).

Our first central finding establishes that pro-obedience attitudes indeed predict patterns of specialization at the country level. To operationalize this, we construct a time-varying aggregate measure of workplace obedience, using cohort variation in respondent data from the World Values Survey (WVS). We uncover strong evidence of a "Specialization Fact" when bringing together this measure with international trade data on industry-level exports, with the latter providing us a long time series that sheds light on how country specialization patterns have evolved. As a country shifts towards being (say) more obedient in its workplace attitudes, we find that this is associated with more specialization and exporting in industries that feature a higher degree of "cognitive routineness" (i.e., the attainment of pre-set limits and standards) in their task content,

[1] As a further illustration of this point, consider the following perspective offered by a director of R&D at a medical device multinational located in Singapore: "Singaporeans (...) have a tremendous respect for authority. A similar team in the US would keep questioning and want to have a healthy dialogue every step of the way. (...) Singaporeans rarely revisit and question the purpose of a task. They have a great ability to translate something from requirement to developed product. They just get it done." The same executive went on to highlight the negative consequences of such conformity: "Ideas are seldom generated, as no incentives for creativity exist in the Singaporean education system. In three years of operation, our facility has not produced a single patent, and there is no record of new ideas." (From: http://sudhirtv.com/2013/05/17/why-has-singapore-failed-to-prepare-its-citizens-adequately-for-the-knowledge-economy/.)

as coded up by Autor, Levy and Murnane (2003) from detailed occupational descriptions. This Specialization Fact is robust to including analogous controls for other determinants of comparative advantage that have featured in the empirical literature on trade patterns, including country factor endowments (Romalis 2004) and institutional forces (c.f., Nunn and Trefler 2014). The role of workplace obedience even holds when we control for how other closely-related cultural attitudes – such as views on the importance of "hard work", or on individualism – might correlate with specialization in less routine industries.

Our second key contribution is to uncover a closely-related "Obedience Fact" that speaks to a feedback effect from past patterns of specialization on workplace obedience attitudes held at the individual level, consistent with how economic conditions can affect the process of cultural transmission. To be precise, we find that educated individuals tend *ceteris paribus* to be less pro-obedience in the workplace, but this negative partial correlation is systematically weakened if one's formative years were spent growing up in an economy that featured a high degree of routineness in its export mix ("export-routineness"). Interestingly, these obedience patterns are affected by the degree of export-routineness that an individual was exposed to in her childhood and adolescent years, but *not* by the corresponding exposure in adulthood. These findings remain robust when controlling for the cohort-specific exposure to other past country conditions, such as income per capita or democracy. The results are further confirmed when using a "shift-share" instrumental variable for export-routineness, that seeks to leverage off variation in the export profile that each country-cohort was exposed to at different ages that is plausibly driven by conditions in the broader world economy, rather than by policy shocks or socioeconomic forces stemming from within the country itself.

Drawing on these two stylized facts, our third undertaking is to formally model and study the inter-dependence between specialization patterns and workplace obedience. We build an overlapping-generations model in which adults in each period choose how much human capital to allocate between two sectors. This choice depends on the individual's attitudes towards obedience, as obedience is helpful in a routine ("Basic") sector but harmful in a nonroutine ("Complex") activity. In addition, drawing on the models of cultural transmission by Bisin and Verdier (2001, 2011) and Tabellini (2008), each adult also chooses how much human capital to invest in her unique child, as well as the attitudes regarding workplace obedience to impart, in accordance with what she anticipates will be rewarded in the workplace in the next period.

The model provides a useful guide for thinking about the forces that govern the co-evolution of the structure of the economy and cultural attitudes towards obedience. Among its baseline predictions, the model delivers both the Specialization Fact and the Obedience Fact as natural implications of this interplay. What is more, the theory highlights a rich array of potential long-run outcomes relating to obedience, human capital, and specialization patterns, including the possibility of multiple steady states should production in the nonroutine sector exhibit human capital externalities. This raises in particular the prospect of an "obedience trap": An economy can find itself in a high-obedience, low-human capital steady state, where production is skewed towards the routine sector and this reinforces the transmission of a high-obedience mindset. However, this comes at the expense of the emergence of the nonroutine sector, even though an alternative low-obedience, high-human capital steady state also exists with the same underlying fundamental model parameters. This prospect is more than just a theoretical curiosity, since specialization in routine industries has been identified as an area of policy concern. The labor literature for example has shown strong evidence that routine tasks are more subject to replacement by technological advances (such as computerization), and linked such declines in routine-sector employment to the phenomenon of labor market polarization (Autor and Dorn 2013; Goos, Manning and Solomon 2014). A further interpretation of these features of the model is that cultural traits that are beneficial at certain stages of development may eventually become counter-productive.[2] Specifically, an economy that starts off with high productivity in the Basic sector may develop cultural traits that are useful in that context, but that ultimately prevent it from entering more Complex activities. This seems to capture the oft-stated concern regarding countries that, having succeeded in the early stages of industrialization, might fail to transition further, perhaps partly due to cultural forces.[3]

This paper relates to several strands of literature. The hypothesis that culture has a role in explaining socioeconomic outcomes has a long vintage.[4] On the literature that has studied the interplay between culture and economic outcomes, we are in line with more recent contributions such as Alesina, Giuliano and Nunn (2013), Talhelm et al. (2014), Giuliano and Nunn (2016), and Buggle (2017), in showing how the emergence and prevalence of cultural traits are affected by the economic environment. Unlike most of these contributions, which focus on the persistence of traits in the very long-run far beyond the specific context in which they arose, we uncover a specific example of a cultural trait that can be affected by changes in economic conditions within the shorter horizon of one to two generations. In this, we are closer to papers such as Alesina and Fuchs-Schündeln (2007), Giuliano and Spilimbergo (2014), and Campante and Yanagizawa-Drott (2015a), which show how cultural traits can be affected within an individual's lifetime, and especially so by what happens up to one's young adult years. Still within this literature, we relate to contributions such as Greif and Tabellini (2010), Tabellini (2010), Campante and Yanagizawa-Drott (2015b), and Gorodnichenko and Roland (2016), in studying how cultural traits matter from an aggregate economic perspective.

Our focus on obedience draws on related work in other social science disciplines.[5] Our findings

[2]This is reminiscent of the idea of "appropriate institutions" (Acemoglu 2006; Acemoglu, Aghion, and Zilibotti 2006), wherein institutional arrangements that are relatively efficient at particular stages of development cease to be so at later stages.

[3]For instance, in the words of Singapore's founding Prime Minister, Lee Kuan Yew: "East Asians, who all share a tradition of strict discipline, respect for the teacher, no talking back to the teacher and rote learning, must make sure that there is this random intellectual search for new technologies and products." (*Foreign Affairs*, March/April 1994). Similarly, the *Financial Times* (Jan 31, 2014) notes that while the Chinese government has stressed its desire to foster entrepreneurship and start-up businesses, "traditional Chinese culture, still influenced significantly by Confucian values such as 'obedience' [and] 'respect for authority' (...), is not naturally compatible with typical entrepreneurial values."

[4]See for example Banfield (1958), Clark (1987), Putnam (1993), and Landes (1998). For more recent overviews of this literature, see Guiso, Sapienza, and Zingales (2006), and Fernandez (2011).

[5]The line of inquiry into obedience to authority as a behavioral trait traces back at least to the classic (and

tie in with a literature in sociology that has looked at the connections between obedience ("conformity"), education, and occupational choices. For instance, Kohn's (1977) seminal contribution argued that "middle-class" occupations tend to be free of close supervision, whereas "working-class" occupations are more subject to standardization and direct oversight; the parenting styles of middle-class and working-class families consequently place different degrees of emphases on fostering conformity. This line of reasoning can thus account for the negative correlation between education and conformity (Kohn 1977; Bowles and Gintis 2011). Our results further demonstrate how this correlation can shape and be shaped by broader economic specialization patterns. We also speak to research in cultural psychology that has focused on the "tightness-looseness" dimension of different cultural environments, namely "the strength of punishment and the degree of permissiveness in a social system" (Harrington and Gelfand 2014, p.7991), to the extent that an individual's attitudes towards workplace obedience should be closely connected to the social expectation of punishment for nonconformity. This literature has further investigated the determinants of the evolution of this dimension of cultural traits, and their correlation with aggregate social outcomes (Gelfand et al. 2011; Harrington, Boski, and Gelfand 2015; Zou et al. 2009).

On a separate vein, we engage the literature in labor economics that has documented the importance of the distinction between routine and nonroutine tasks (Autor, Levy, Murnane 2003; Autor and Dorn 2013; Spitz-Oener 2006; Goos and Manning 2007; Goos, Manning and Salomons 2014; Michaels, Natraj, and Van Reenen 2014; Deming 2016).[6] Our findings uncover in particular how these task dimensions interact in interesting ways with cultural attitudes held by the workforce. Our Specialization Fact results also relate to the notion of "trade in tasks" (Grossman and Rossi-Hansberg 2008; Becker, Eckholm and Muendler 2013; Becker and Muendler 2016), by showing that cultural attitudes on workplace obedience are associated with production and exports that embody routine task content.

The paper is organized as follows. Section 2 describes the key variables and data sources we use. Section 3 documents the Specialization Fact, while Section 4 reports the Obedience Fact. Section 5 then develops the model of specialization and cultural transmission. Section 6 concludes and points to further lines of future work.

2 Data

We start by describing the major data components needed to uncover the Specialization Fact and the Obedience Fact. These are: (i) a measure of attitudes towards workplace obedience, across both countries and time; and (ii) measures of task routineness at the level of industries and of the economy.

controversial) experiments of Stanley Milgram in psychology (c.f., Milgram 1974).

[6] Xiang and Yeaple (2017) have further explored differences across countries in the extent to which their educational systems invest in cognitive versus non-cognitive dimensions of human capital.

2.1 Workplace Obedience

To measure attitudes towards obedience in the workplace, we draw on the World Values Survey (WVS), a large and comprehensive survey project on social, cultural, and political attitudes that is commonly used in social science research. The version of the WVS we use contains six waves (between 1981-2014), with a cumulative total of 229 surveys conducted in 97 countries or territories. A key feature of the WVS is that it adopts a common set of questions with standardized wording and translation across countries; many of the questions are also asked across multiple waves.[7] The typical country survey in the WVS comprises at least 1,000 respondents aged 15 and above, based on a stratified random sampling procedure.

The WVS contains a module on the topic of "Work", from which we draw a measure of attitudes towards workplace obedience. Specifically, question C061 asks the following:

> "People have different ideas about following instructions at work. Some say that one should follow one's superior's instructions even when one does not fully agree with them. Others say that one should follow one's superior's instructions only when one is convinced that they are right. With which of these two opinions do you agree?"

The categorical response options are: "Follow instructions", "Depends", and "Must be convinced first", which we recoded to take on the values 3, 2, and 1 respectively. This yields a measure that is increasing in the respondent's propensity to obey workplace instructions, as opposed to questioning their rationale. We view the particular framing of this WVS question – explicitly placing it in the context of conduct in the workplace – as a useful feature that minimizes ambiguity, as it directly solicits attitudes towards obedience in the workplace, rather than in alternative settings such as within the family or a school environment.[8] One shortcoming is that the workplace obedience question appears only in Waves 1-5 of the WVS, although as we will see, this will provide sufficient observations for us to work with. The countries for which responses on this question are reported span the range of both developed and developing economies (see Appendix Table 1).

We aggregate the individual responses from the WVS into a country-level measure of workplace obedience at each time t of interest. We construct this for $t = 1990, 1995, \ldots, 2010$, in order to align the measure closely to the five-year birth-cohort windows that we will be adopting. We associate each WVS respondent with his/her country (c), five-year birth cohort ($b = 1915, 1920, 1925, \ldots$), and self-reported gender ($g \in \{M, F\}$); note that we define b (as an example) to be 1960 for a respondent born in the window 1960-1964. We then consider the following regression model to

[7] The surveys are implemented by local research teams in each country. There is thus some variation in the subset of questions that appears in each country-wave, as some questions may get dropped for practical reasons.

[8] The WVS contains a separate question (A042) that asks respondents to identify whether they view obedience as an important quality for children. However, the manner in which this question is posed opens it to potential measurement concerns: respondents are asked to pick out up to five child qualities from a list of eleven, of which obedience is one of the options. The correlation between the responses on "workplace obedience" and a dummy variable for whether obedience in children was identified as important is 0.0435 (p-value$<$ 0.0001). Although this correlation is statistically significant, its low magnitude suggests that the two measures are picking up different dimensions of cultural attitudes towards obedience. (We will use the "obedience in children" measure later in robustness checks.)

explain the workplace obedience attitudes held by respondent r surveyed in wave w:

$$ObedWork_{r,cbw} = \beta_0 + \beta_1 Educ_{r,cbw} + \beta_X X_{r,cbw} + D^g_{cb} + D_{cw} + \epsilon_{r,cbw}. \quad (1)$$

In the above, D^g_{cb} is a country-cohort-gender fixed effect that captures the systematic component of workplace obedience specific to each (c, b, g) bin, estimated while controlling for a host of respondent characteristics. Among these, we include education ($Educ_{r,cbw}$), which we will see is an especially robust and important correlate of workplace obedience at the individual level.[9] $X_{r,cbw}$ is a further vector of respondent variables, comprising full sets of dummies for the number of children, marital status, employment status, occupation, and the size of town of residence.[10] In particular, the employment status and occupation dummies help to control for the possible influence that the respondent's current job could have on his/her propensity to agree to a statement about following workplace instructions; for example, a worker currently employed in a manufacturing production line might be more inclined to agree with the statement, when compared against someone currently in a managerial position.[11] Last but not least, the regression contains survey country-wave fixed effects (D_{cw}), which control for how prevailing conditions within the country might affect reported workplace attitudes; for example, if the country was in recession, workers might be inclined to report a greater agreement with following instructions out of concerns over job security. ($\epsilon_{r,cbw}$ denotes the idiosyncratic component of the respondent scores.)

In short, the above procedure seeks to extract a measure of workplace obedience for each country-cohort-gender bin, after removing the possible influence of a large set of respondent characteristics as well as contemporaneous country conditions on reported obedience. We estimate (1) using OLS on the pooled sample of WVS respondents across all available countries and waves. We then take the point estimates of the country-cohort-gender fixed effects, $\hat{D}^g_{cb}$'s, as a measure of the systematic component of workplace obedience for each (c, b, g) bin.

To arrive at a measure of workplace obedience in country c at time $t = 1990, 1995, \ldots, 2010$, we further compute the following weighted-average:

$$AvgObedWork_{ct} = \sum_{(c,b,g)} \omega^g_{cbt} \hat{D}^g_{cb}. \quad (2)$$

Here, the ω^g_{cbt}'s are equal to the share of the population aged 25-64 in country c at time t that belong to the (c, b, g) bin, where the relevant population structure data are taken from Barro and

[9] The education variable in the WVS provides for categorical responses ranging from 1 to 8, with 1 being "Inadequately completed elementary education", and 8 being "University with degree or upper-level tertiary certificate". Please see the Data Appendix for more detailed descriptions of these and other variables drawn from the WVS.

[10] We do not control for the age of the respondent at the time of the survey. In principle, there is some variation within each birth-cohort in the age at which respondents were surveyed. However, when we run a regression of the cohort year b against a set of dummy variables for whether the respondent was aged 15-19, 20-24,…, 75 and over, at the time of survey, the resulting R^2 is a very high 0.94 even with no other explanatory variables; this increases to 0.98 when survey wave fixed effects are included. The cohort dummies and the age dummies therefore capture very similar variation, and so we do not control for age separately when estimating (1).

[11] The WVS does not contain information on industry of employment, so occupation and employment status are used instead to control for the influence that the respondent's current job may have on his/her workplace attitudes.

Lee (2013). Moving forward, the $AvgObedWork_{ct}$ variable in (2) will serve as our main measure of prevailing attitudes at time t towards workplace obedience in the country's workforce.

Several remarks are in order with regard to this measure. First, we do find in practice that the country-cohort-gender fixed effects are relevant for explaining attitudes on workplace obedience. This is documented in Appendix Table 2, which reports successive OLS regressions similar to (1) that seek to explain this individual-level variation. Column 1 runs a basic specification containing only respondent characteristics as explanatory variables, namely a gender dummy, education and the $X_{r,cbw}$ vector, but omitting both the D^g_{cb} and D_{cw} fixed effects. The overall R^2 obtained is a relatively low 0.0121. This increases markedly to 0.0771 in Column 2 once the D^g_{cb} fixed effects are added, so that the country-cohort-gender dimensions account for about five times as much variation in workplace obedience attitudes compared to the respondent characteristics *per se*. The share of variance explained rises to 0.0856 in Column 3 where the country-wave fixed effects are further included; this last column is precisely the specification in equation (1) that we use to construct $AvgObedWork_{ct}$.

Appendix Table 2 also highlights the importance of education as a correlate, with more educated individuals being significantly less likely to agree with always following instructions in the workplace. (The standard errors are clustered at the country level.) This is an important partial correlation that we will build upon later. For each specification in the table, we also report in parentheses the p-values from F-tests for the joint significance of each of the sets of respondent-related dummy variables. These confirm that employment status and especially occupation are highly relevant for explaining workplace obedience.

It is worth mentioning a subtle feature of the construction of $AvgObedWork_{ct}$. When including both sets of D^g_{cb} and D_{cw} fixed effects in the regression in (1), note that one dummy variable will need to be dropped for each country c. In other words, these fixed effects can only be estimated subject to a choice of normalization within each country c; this implies that we cannot meaningfully interpret the differences across countries in the estimated values of the $\hat{D}^g_{cb}$'s. Apart from this technical reason, there are other independent rationale for being cautious about comparing the observed differences across countries in the raw WVS data: Other forces – such as linguistic norms in how a question is interpreted – could make it difficult to reliably interpret differences in the average level of responses received across countries. For these reasons, our focus will instead be on the within-country variation exhibited by $AvgObedWork_{ct}$ in the regressions in Section 3. Separately, the $\hat{D}^g_{cb}$'s also need to be a valid reflection of prevailing workplace attitudes within each (c, b, g) bin at time t. This is arguably less of a concern in our data setting, since the WVS waves for which the obedience at work variable is available were undertaken between 1981-2008, which overlaps considerably with the years $t = 1990, 1995, \ldots, 2010$ for the analysis of the Specialization Fact.

2.2 Task and Industry Routineness

We now turn to the measures of industry "routineness" that we adopt from the labor literature, and argue why these are well-suited to capture the extent to which production in an industry would benefit from a culture of following workplace instructions.

We draw on Autor, Levy, and Murnane (2003, ALM) for their measures of occupational and industry routineness. These are rooted in a task-based perspective of what constitutes an occupation. Based on descriptions documented in the US Dictionary of Occupational Titles (DOT), ALM code up indices of five dimensions of task content for a wide set of occupations. These distinguish between cognitive and manual task content, as well as between routine and nonroutine task sets. More specifically, the five ALM indices are: (i) routine cognitive ($T^{r,c}$), relating to the "precise attainment of set limits, tolerances and standards"; (ii) nonroutine cognitive interactive ($T^{nr,c1}$), involving responsibility for "direction, planning, or control"; (iii) nonroutine cognitive analytic ($T^{nr,c2}$), related to mathematical skills of a range of difficulty levels; (iv) routine manual ($T^{r,m}$), on the need for "finger dexterity"; and (v) nonroutine manual ($T^{nr,m}$), on the need for "eye-hand-foot coordination". (See Appendix Table 1 of ALM for the complete descriptions.) Each of these task-content indices is coded on a scale of 0-10 at the occupation level. We use the version based on the 1977 edition of the DOT, that ALM then aggregate to the industry level using information on occupational composition from the 1960 US Census Public Micro Samples, so that these measures capture pre-existing differences across industries in routine task-intensity prior to the time frame of our export data.

The ALM routineness indices were originally devised to provide an empirical handle on the extent to which occupations would be susceptible to replacement by technological advances such as computerization. We will apply them in the present study towards a different purpose, to understand the interaction between industry routineness and a pro-obedience workplace culture. In particular, the description of the routine cognitive and routine manual categories ((i) and (iv) respectively) point to these as tasks in which workers need to be able to reliably execute a pre-defined set of procedures or meet performance standards with minimal deviation, such as in production line assembly work. We therefore hypothesize that a workplace culture that encourages adhering to instructions would be complementary to the execution of such tasks. On the other hand, the nature of the nonroutine categories ((ii), (iii) and (v)) point to these as tasks in which explicit instructions for all contingencies are inherently harder to spell out, as would be the case for tasks that involve interaction with other people, or that require creative problem-solving ability. A workplace attitude of following rather than questioning instructions would in principle be less useful, or even detrimental for such tasks.

Table 1 below illustrates how industries compare in terms of their routine and nonroutine task requirements on each of the five ALM dimensions. The ALM measures are available for a total of 142 industries, these being industry categories based on the US Census Industry Code (CIC) system.[12] For the purposes of this summary, Table 1 groups the industries broadly into "Agriculture, Mining

[12]Specifically, we use the measures presented in the "Ind6090" codes in ALM. This is a coarser version of the US CIC system that aggregates various subsets of CIC industries, in order to allow for consistent cross-time comparisons to be made. We adopt this "Ind6090" industry coding system throughout our empirical analysis. We constructed a crosswalk from the more conventional US SIC codes into this "Ind6090" classification on the basis of industry names and descriptions, so that industry-level variables (such as factor intensities) constructed for SIC codes can be easily mapped to the "Ind6090" codes. See the Data Appendix for details.

and Construction", "Manufacturing", and "Services". Observe that the manufacturing sector ranks highest in terms of routine task content, on both manual and cognitive dimensions. It is also the least nonroutine of sectors, based on both the cognitive interactive and analytic criteria. At first glance therefore, the manufacturing sector broadly conforms to the stereotype that it is composed of routine, repetitive tasks; we should however stress that there is considerable variation across industries within the manufacturing sector that we will exploit in the regression analysis.

[TABLE 1 HERE]

In order to summarize the information across task dimensions more succinctly, we follow Autor and Dorn (2013) in constructing the following measures based on the difference between the routine and nonroutine task indices:

$$\begin{aligned} RTC_i &= \ln(T_i^{r,c}) - \ln(T_i^{nr1,c}) - \ln(T_i^{nr2,c}), \\ RTM_i &= \ln(T_i^{r,m}) - \ln(T_i^{nr,m}), \text{ and} \\ RT_i &= RTM_i + RTC_i. \end{aligned}$$

For each industry i, this yields measures of cognitive routineness (RTC), manual routineness (RTM), and overall routineness (RT) respectively. It is useful to note that the cognitive and manual routineness measures do differ in meaningful ways. Across industries in the manufacturing sector, the correlation between RTC_i and RTM_i is actually slightly negative (-0.3449). Appendix Table 3 moreover shows that there are industries ranked in the top five most cognitively routine that are nevertheless ranked among the least manually routine (e.g., Logging); conversely, there are industries that are very manually routine that are among the least cognitively routine in the manufacturing sector (e.g., Drugs). Bearing in mind the conceptual distinction between these two routineness measures, we will eventually focus on cognitive routineness in our empirical analysis, since the requirement to attain "set limits, tolerances, and standards" is closer to the notion of following workplace instructions. In contrast, the manual routine concept of "finger dexterity" – the ability to use one's fingers "rapidly and accurately" – would arguably depend not just on the worker's willingness to follow instructions, but also on his/her physical condition.

3 The "Specialization Fact"

We establish in this section the first of our two key empirical findings, namely that cultural attitudes towards workplace obedience are systematically associated with the pattern of industry specialization. We hypothesize in particular that when the prevailing mindset of workers becomes more disposed towards following – rather than questioning – workplace instructions, this is associated with a shift in the production structure within an economy towards industries where the tasks performed are more routine in nature (the "Specialization Fact").

3.1 Specification and Empirical Strategy

Our empirical strategy draws on detailed data on country exports to capture patterns of specialization. The use of trade flow data has a key advantage: while data on domestic industrial production is available (from sources such as the UNIDO), these tend to feature less consistent country and industry coverage over time. We therefore turn to the trade data from the Feenstra et al. (2005) World Trade Flows dataset, which provides product-level bilateral trade flows for the years 1962-2000; we have extended this to include 2001-2014, by procuring UN Comtrade data for those additional years and processing these according to the Feenstra et al. (2005) protocols.[13] We concorded the trade flows from their original Standard International Trade Classification (SITC) Rev 2 product codes into the CIC-based industry codes adopted by ALM (as documented in the Data Appendix), in order to facilitate merging with the industry routineness measures.

To establish the Specialization Fact, we adopt regression specifications of the form:

$$\begin{aligned} \log(Export_{cit}) &= \alpha_0 + \alpha_1 AvgObedWork_{c,t-5} \times RT_i + \sum_{\{l,m\}} \alpha_{lm} L_{l,c,t-5} \times M_{m,i} \\ &\quad + D_{ct} + D_{ci} + \epsilon_{ict}, \end{aligned} \tag{3}$$

where the dependent variable is the log value of exports from country c in industry i at time t. We work with country-industry exports which have been averaged over five-year windows, i.e., 1990-1994, 1995-1999, ..., 2010-2014; these are associated respectively with $t = 1990, 1995, \ldots, 2010$.[14]

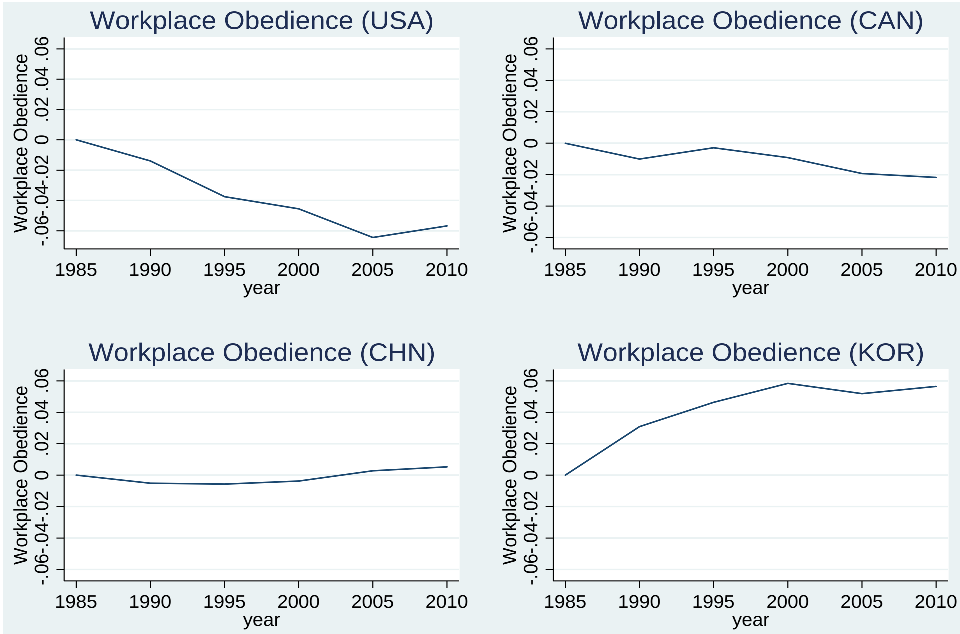
The key effect of interest is the interaction coefficient, α_1, since this captures whether country attitudes that favor workplace obedience are accompanied by a greater volume of exports in more routine industries. To ensure that α_1 can be interpreted as this differential effect of workplace obedience across industries at various levels of routine task-intensity, we estimate (3) with country-time fixed effects (D_{ct}) to absorb the main effect of $AvgObedWork_{c,t-5}$, and with country-industry fixed effects (D_{ci}) to account for the direct effect of RT_i. Since the industry routineness measures do not vary with time, the presence of the country-industry fixed effects means that α_1 will be estimated off within-country variation in attitudes towards workplace obedience. We will later present results based on a less stringent combination of fixed effects, to confirm that this within-country variation is what is crucial for our findings.

Based on how the $AvgObedWork_{ct}$ variable was constructed, such within-country shifts in prevailing attitudes towards workplace obedience stem from changes over time in the age-gender

[13] The Stata code for cleaning the raw UN Comtrade Data into the World Trade Flows dataset format are available at: http://www.robertfeenstra.info/data/. The Feenstra et al. (2005) series from 1962-2000 are based on a subset of the raw UN Comtrade data (specifically, 72 countries that accounted for the vast majority of world trade), while the data from 2001-2014 which we processed are based on the entire sample of countries in UN Comtrade. Very similar results (available on request) are obtained if we were to restrict the 2001-2014 trade flows to the original 72 countries in Feenstra et al. (2005).

[14] We focus on the intensive rather than the extensive margin of trade, as zero trade flows are not that frequent in our sample. There are a total of 20,010 possible observations (from 58 countries, 69 industries, and 5 time periods); of these, 19,589 or 97.9% of the data points are non-zero. The low percentage of zeroes is due to the relatively coarse industry categories and the use of five-year averaged trade flows.

Figure 1: Country Workplace Obedience over Time: Illustrative Examples



structure of the workforce, namely the ω^g_{cbt} weights in equation (2). Figure 1 depicts several illustrative examples of how workplace obedience has evolved.[15] Not surprisingly, the magnitudes of the changes in $AvgObedWork_{ct}$ over time are small, consistent with the population structure and hence cultural attitudes shifting slowly. There are nevertheless interesting contrasts, with average obedience decreasing during this period in the USA and Canada, rising instead in the case of Korea, while holding relatively steady in China. As we shall see, this variation – when exploited in tandem with the differences in routineness across industries – will be sufficient to uncover a significant relationship on α_1. (Appendix Table 4 reports summary statistics for $AvgObedWork_{ct}$ and other variables used in the Specialization Fact analysis.)

To further alleviate concerns related to simultaneity between log exports and country workplace attitudes, we estimate (3) using a one-period (i.e., five-year) lagged value, i.e., $AvgObedWork_{c,t-5}$. Separately, an underlying assumption in this empirical approach is that the RT_i variable constructed on the basis of information from one benchmark country (in this case, the US) is a valid reflection of routine task-intensity in other countries. On this count, the use of a measure of RT_i based on the state of technology in the US in the 1960s is arguably more appropriate, given that our diverse sample (listed in Appendix Table 1) comprises a number of countries that were still at relatively early stages of development in the 1990s.[16]

[15]The value of $AvgObedWork_{ct}$ is normalized to 0 in each country series, bearing in mind the earlier discussion from Section 2.1 that we cannot directly compare the absolute levels across countries.

[16]Comparable results are obtained using industry-level routineness measures constructed using weights from the 1970 or 1980 US Census instead (available on request). Bear in mind also that any differences between RT_i and the actual industry routineness in other countries that can be attributed to classical measurement error would attenuate our estimates of α_1 and bias us away from obtaining significant findings.

The regression model in (3) takes guidance from a recent body of work in empirical trade that has used a similar strategy to tease out sources of comparative advantage, by identifying whether certain country characteristics (e.g., factor endowments, institutions) facilitate specialization and hence exporting in industries that are dependent on such country conditions for production.[17] It is thus important to ascertain that the effect of country workplace obedience is robust to controlling for other forces that determine comparative advantage. These are denoted in (3) by the $L_{l,c,t-5} \times M_{m,i}$ terms: Each of the $L_{l,c,t-5}$'s is a country variable (e.g., the per worker capital stock, one-period lagged), paired up with a relevant industry characteristic, $M_{m,i}$ (e.g., its capital intensity), in order to determine whether the interaction is important for explaining export patterns.

3.2 Country Obedience and Export Patterns

We report the key findings on the Specialization Fact in Table 2, starting with results based on the overall routineness measure, RT_i. Column 1 presents a basic regression in which only the workplace obedience interaction term has been included on the right-hand side with the country-year and country-industry fixed effects. The positive and significant estimate for α_1 confirms that as country attitudes become (say) more pro-obedience, this is associated with an increase in exporting in industries that are more routine task-intensive. (The standard errors reported are clustered by country.) This finding holds when dropping agricultural and mining sector exports, and restricting the sample to only manufacturing industries in Column 2. Workplace obedience thus affects specialization patterns even just within the manufacturing sector.

[TABLE 2 HERE]

The subsequent two columns check that this key result is robust to accounting for other conventional sources of comparative advantage. Column 3 controls for the neoclassical Heckscher-Ohlin forces, namely how factor endowments can favor exporting in industries that rely intensively on the use of those factors. Following Romalis (2004), we include an interaction term between the country stock of physical capital per worker and an industry measure of capital-intensity, as well as a second interaction between a measure of country human capital and industry skill-intensity.[18] Column 4 further accounts for the potential role of country institutions (cf., Nunn and Trefler 2014). This draws on a recent line of work that has demonstrated the relevance of such institutional conditions as the rule of law (Levchenko 2007; Nunn 2007; Costinot 2009) and financial development (Manova 2013) for shaping patterns of specialization. We therefore interact each of these institutional variables against a full set of industry dummies, to soak up any characteristics that capture

[17] This in turn draws on earlier work, epitomized by Rajan and Zingales (1998), that adopted this empirical strategy to estimate the effects of country conditions (such as financial development) on growth across different industries. We differ slightly from the bulk of this literature in focusing on within-country sources of variation, rather than cross-country differences, in the pattern of specialization.

[18] The country endowment variables are drawn from the Penn World Tables, Version 9.0; a lagged five-year average for each window is used. The respective factor intensity measures are constructed as the log real capital stock per worker and the log ratio of non-production to total workers in 1980-1989, based on the NBER-CES dataset for US manufacturing industries. Please see the Data Appendix for more details on the construction of these controls.

an industry's dependence on the rule of law and deep financial institutions respectively. The estimates from these columns point to the relevance of Heckscher-Ohlin forces: An increase in the capital stock prompts a shift towards exporting in more capital-intensive industries, with a similar pattern observed too for the effect of human capital. Importantly, country attitudes on workplace obedience continue to be associated with increased exports in more routine industries, even when controlling for these endowment-based and institutional sources of comparative advantage.

We next separate the overall routineness index into its cognitive (RTC_i) and manual (RTM_i) components. Of note, the patterns we have uncovered appear to be driven by the cognitive dimensions of task content (Column 5); the interaction coefficient in Column 6 for $AvgObedWork_{ct} \times RTM_i$ remains positive but is not statistically significant. This is in line with the observation that an attitude of following instructions would be particularly beneficial for performing routine cognitive tasks, on the basis of their definition relating to the attainment of "set limits, tolerances or standards". In the rest of this paper, we therefore focus on the RTC_i measure, although it should be stressed that the results are similar when using the overall RT_i measure instead.

To get a sense of the implied magnitudes, consider that the median within-country five-year change in $AvgObedWork_{c,t-5}$ is -0.00723, so that country workplace attitudes in general tend towards becoming less obedient over time in our regression sample. With this median change, the estimates in Column 5 imply that exports would be 0.7% lower in an industry that is one standard deviation more cognitively routine.[19] For perspective, this change is smaller than the magnitude of the corresponding effects of country factor endowments: The median within-country change in physical capital stock in our sample would be associated with a 3.0% higher volume of exports in an industry that is one standard deviation more capital-intensive; the analogous effect for the role of country human capital is 4.6%.[20]

The specification in (3) is already an exacting one, given the sets of fixed effects that are in use. Table 3 nevertheless demonstrates that the finding of a positive and significant coefficient on $AvgObedWork_{c,t-5} \times RTC_i$ is robust under a series of further checks. We consider in Column 1 how country workplace obedience might interact with industry skill-intensity, as well as how the country skill endowment might interact with industry (cognitive) routineness. Given that the cross-industry correlation between RTC_i and skill-intensity is negative and fairly large (-0.83), this check helps to verify that the RTC_i term in the $AvgObedWork_{c,t-5} \times RTC_i$ interaction is not simply picking up a relationship with industry skill-intensity.[21]

[TABLE 3 HERE]

[19]The standard deviation of RTC_i over manufacturing industries is 0.442. The coefficient estimate in Column 5 would then predict that exports would be lower by $100\% \times (1 - \exp\{2.3146 \times (-0.00723) \times 0.442\}) \approx 0.7\%$ when comparing industries that are one standard deviation apart in terms of cognitive routineness.

[20]The calculation for the "average" in-sample effect of physical capital accumulation in raising exports in an industry that is one standard deviation more capital-intensive is given by: $100\% \times (\exp\{0.1923 \times 0.206 \times 0.745\} - 1) \approx 3.0\%$. The corresponding effect of human capital accumulation is: $100\% \times (\exp\{1.0573 \times 0.105 \times 0.405\} - 1) \approx 4.6\%$. (The median change seen in countries' (log) physical and human capital stocks is 0.206 and 0.105 respectively. The standard deviation in capital and skill intensity across the manufacturing industries is 0.745 and 0.405 respectively.)

[21]Interestingly, the results from Column 1 indicate that a higher human capital endowment is associated with exporting in less cognitive-routine industries.

In Columns 2-7, we confirm that these results are driven by attitudes that are specific to workplace conduct, as opposed to other societal values that a broad culture of obedience might be correlated with. The auxiliary measures of country attitudes that we explore in these columns are constructed using the same procedure as that described for $AvgObedWork_{ct}$ in Section 2.1, by computing a population-weighted average of country-cohort-gender dummies; the latter are obtained from a regression of the surveyed attitude against a large set of respondent observables following the specification in equation (1).[22] Column 2 examines attitudes towards "independence" as a desirable quality in children (based on question A029 in the WVS), specifically whether this might affect specialization in cognitively more versus less routine industries. In Column 3, we turn to the possibility that the workplace obedience measure might be picking up whether the society in question is one that emphasizes the importance of "hard work" as a value to be inculcated in children (question A030). Next, Column 4 controls for the degree to which individuals in a country view "work as a duty to society" (question C039). Column 5 explores whether "workplace obedience" might be proxying for where societal attitudes lie on the spectrum of "individualism" versus "collectivism", which Hofstede (2001) and more recently Gorodnichenko and Roland (2016) have argued is important for understanding differences in aggregate economic outcomes across countries. We do so by controlling for the extent to which individuals report seeing themselves "as an autonomous individual", as a proxy for pro-individualist attitudes (question G023). Column 6 then examines whether the workplace obedience measure might be confounded by attitudes towards the importance of "obedience in children" instead (question A042).[23]

The results obtained reassure us that workplace obedience is indeed distinct as a cultural trait in the manner in which it consistently correlates with exporting in more routine industries. The interaction involving $AvgObedWork_{c,t-5}$ and RTC_i remains positive and significant when each of these alternative measures of country attitudes is interacted with RTC_i and used as an additional right-hand side control (Column 2-6). The role of $AvgObedWork_{c,t-5}$ even remains robust when all these auxiliary interaction terms are tested jointly in the same regression (Column 7).[24]

We have subjected the results to a series of further tests, drawing on the battery of checks commonly performed in the closely-related empirical literature on sources of comparative advantage. In the interest of space, we report these findings as Appendix Tables, while providing a brief summary here. We have confirmed that the Specialization Fact is robust when controlling for interactions between other country characteristics and RTC_i (Appendix Table 5). These include: log GDP per capita; physical capital per worker; median age; and the shares of the workforce aged 25-29, 30-34,..., and 60-64. The first two country variables speak to the possibility that more developed or more capital-abundant countries might be better-placed to specialize in routine industries, for example due to their possessing more advanced technologies that can reliably execute

[22] These regressions are each run pooling together observations from all available waves (up to six) of the WVS.

[23] The questions related to "independence", "hard work" and "obedience in children" are from the same set of WVS questions in which respondents are asked to identify five qualities out of a list of eleven that they view as important qualities for children.

[24] The number of countries that remain in the sample drops from 56 to 35 as the WVS questions on "work as a duty to society" and whether "I see myself as an autonomous individual" are available for fewer countries.

routine tasks. The last two variables help ensure that the demographic structure *per se* is not driving the significant effect of $AvgObedWork_{c,t-5} \times RTC_i$, even though populations weights were used to construct the country obedience measure. Separately, the Specialization Fact stands up when controlling for $AvgObedWork_{c,t-5}$ interacted with other potentially relevant industry characteristics (Appendix Table 6), namely: the value-added share in total shipments; physical capital intensity; job complexity from Costinot (2009); and the Herfindahl index of input use based on Levchenko (2007). In particular, the last two measures are meant to control for the possibility that obedience could be a complementary attribute in industries with more complicated production instructions.

The last set of specification checks in Table 4 is worth elaborating on. Column 1 adopts a simpler measure of country obedience; this is a population-weighted measure analogous to (2), but uses the mean of the raw obedience scores for respondents in each (c, b, g) bin *in lieu* of the regression-corrected $\hat{D}^g_{cb}$'s. To address the likelihood of measurement error, we instrument for this simpler country obedience variable with the $AvgObedWork_{c,t-5}$ variable constructed earlier. Comparable results are obtained with this approach. We revert to the preferred $AvgObedWork_{c,t-5}$ measure in Column 2; the results are shown in this column to be robust to controlling for the lagged dependent variable (log exports from the preceding five-year window). Column 3 subsequently shows that the Specialization Fact continues to hold when using the Arellano-Bond dynamic panel estimator, where lagged levels of the right-hand side variables are used as instruments in a first-differenced version of equation (3).[25] In the remaining two columns, we clarify the sources of variation that are responsible for our key finding. Column 4 estimates the regression using just the minimal set of fixed effects required to absorb the main effects of $AvgObedWork_{c,t-5}$ and RTC_i, namely country-year and industry dummies. Though still positive, the loss of statistical significance on the estimate for α_1 highlights that the use of country-industry fixed effects in (3) is crucial for uncovering the Specialization Fact: This finding is about the relationship between within-country changes in workplace obedience over time and industry-level exports, rather than about how obedience affects the cross-sectional pattern of specialization. Finally, Column 5 includes industry-year dummies in (3), for a fully-saturated specification where all pairwise fixed effects for the country, industry, and time dimensions are used; the estimate of α_1 remains significant at the 5% level.

[**TABLE 4 HERE**]

In sum, we have documented a systematic and robust Specialization Fact: Shifts over time that leave the workforce more pro-obedience in their mindsets are associated with an increase in exporting in industries that are more intensive in their use of (cognitively) routine tasks. While our empirical strategy should strictly speaking not be viewed as delivering estimates of a causal effect, the patterns nevertheless consistently point to a complementarity between attitudes favoring workplace obedience and the execution of routine tasks in production.

[25] The results are however weaker when using the Blundell-Bond estimator (available on request). For this latter system estimator to be valid, one requires that the first-difference of the log export variable would have to be uncorrelated with the country-industry fixed effects. But this requirement could be called into question if countries with long-term comparative advantage in an industry are able to grow their exports in the industry at a faster rate.

4 The "Obedience Fact"

We turn next to describe the second key empirical finding of this paper. The results from the previous section raise a natural follow-up question: How might the structure of economic activity – specifically, how oriented it is towards routine production activities – in turn shape the attitudes on workplace obedience that are subsequently transmitted over time within a country?

For this purpose, we take as a starting point the link between human capital and attitudes towards obedience. The sociology literature on conformity has stressed that individuals with higher levels of education are less likely to agree with always following instructions at work (Kohn 1977; Bowles and Gintis 2011); this negative correlation between education and workplace obedience is present too in the WVS data, as we confirmed earlier in Section 2.1. While this relationship could be partly driven by selection on the basis of individuals' inherent traits, the literature has nevertheless argued for the presence of a causal impact of additional education: in the words of Kohn (1977, p.190), "[education] is important because self-direction requires more intellectual flexibility and breadth of perspective than does conformity; tolerance of nonconformity, in particular, requires a degree of analytic ability that is difficult to achieve without formal education."

We will thus ask how education and the intensity of routine tasks in the broader economy might interact in shaping the transmission of attitudes towards workplace obedience over time. In particular, we shall find that past exposure to a high level of "export-routineness" – especially exposure that comes at a young, formative age – can systematically dampen the negative partial correlation between education and pro-obedience attitudes (the "Obedience Fact").

4.1 Specification and Empirical Strategy

We return to the individual-level WVS data for this analysis. While this data is cross-sectional in nature in any single survey, the coverage across birth cohorts provides a rich source of variation in the conditions that the respondents were exposed to at different ages.

Our empirical strategy will require in particular a summary measure of the routine task-intensity of the economy that individuals came into contact with at various points of time in the past. We construct the "Export-Routineness" variable ($expRTC$) for this purpose. For each country and year, this is defined as the weighted-average value of RTC_i, where the weights used are proportional to the country's export value in the respective industries i in the given year. Thus, the higher is $expRTC$, the more the specialization pattern in the economy would be oriented towards cognitive-routine task-intensive industries. In practice, we use a five-year moving window average of $expRTC$ (for 1965-69, 1970-1974,..., 2000-2014) to smooth out year-to-year fluctuations; we also associate WVS respondents to $expRTC$ values on the basis of their current country-of-residence.[26]

[26]The WVS unfortunately does not contain information on country-of-birth. To the extent that differences between country-of-birth and country-of-residence would introduce classical measurement error in the $expRTC$ values that are associated with respondents, this should bias the regressions against finding significant results. For countries that experienced political transitions during the sample period, such as the former Soviet Republics or the Czech Republic, we adopt the $expRTC$ values of the pre-transition country as the exposure measures for individuals from these nations. The Data Appendix reports the list of transition countries. The results are robust to excluding the

Figure 2: Export-Routineness over Time: Three Examples

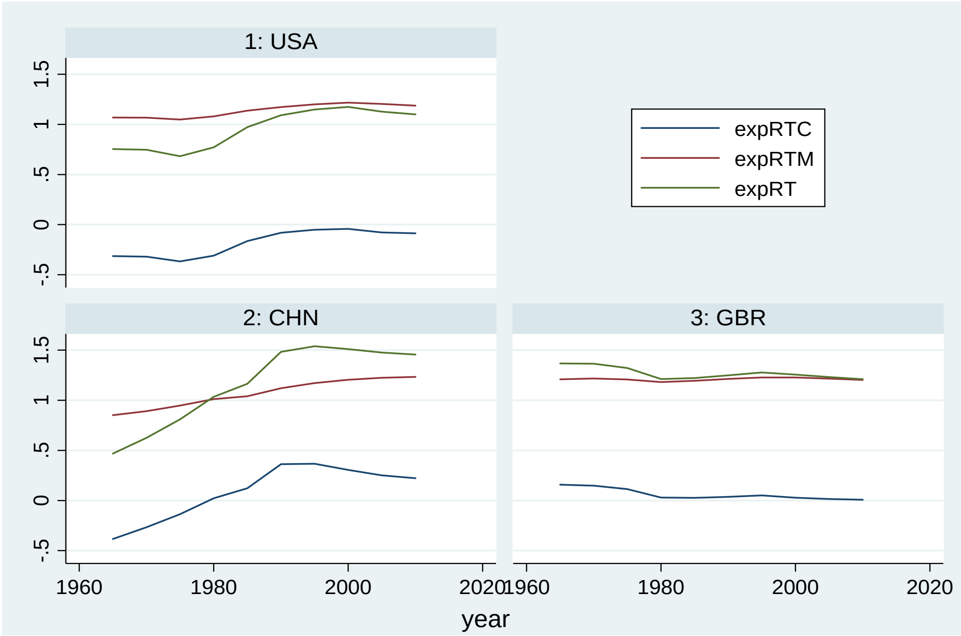


Figure 2 presents the evolution of the export-routineness variable in a few select countries, to illustrate the variation present in this measure both across and within economies; for comparison, the figure also includes analogously-constructed measures of the overall and manual routineness of the countries' exports ($expRT$ and $expRTM$ respectively).[27] The USA and China are examples of countries where export-routineness has been rising over time in the past fifty years. In the case of China, this coincides with the rise in its manufacturing exports, especially in cognitive-routine industries such as textiles, apparel, and footwear. This trend has started tapering off in the early 2000s, reflecting a shift in the composition of China's production and exports towards less routine industries. In contrast, Great Britain provides a case where export-routineness has been on a moderate secular downward trend, consistent with a structural shift away from manufacturing and into services in the British economy.

For a given country, the variation in export-routineness over time implies that individuals from different birth cohorts will be exposed to different economic environments over the course of their lifetimes. To capture a respondent's exposure to export-routineness at a particular age, we create the variable $expRTCageA_{cb}$, defined as the cognitive export-routineness that an individual in birth cohort b in country c experienced during the five-year window *when he/she was of age* A, where $A = 0, 5, 10, \ldots$, etc. Recall that we have adopted five-year birth cohorts throughout this empirical exercise, so that individuals born in say 1960-1964 are treated as being from the same cohort. As

transition countries from the regression (see Appendix Table 7).

[27] The correlation between the five-year moving average of $expRTC$ and $expRTM$ is 0.57, when looking across all countries for which export data is available. The corresponding correlation between $expRTC$ and $expRT$ is 0.97. The cognitive export-routineness measure thus tracks overall export-routineness very closely.

a concrete example, the measure of $expRTCage10_{cb}$ for the cohort b born in the years 1960-1964 would then be the average value of $expRTC$ for country c during the window 1970-1974, this being the five-year window in which that cohort turned age 10.

We will use this variation in exposure to export-routineness in the following specification:

$$\begin{aligned} ObedWork_{r,cbw} &= \beta_0 + \beta_1 Educ_{r,cbw} + \beta_2 Educ_{r,cbw} \times expRTCageA_{cb} \\ &\quad + \beta_X X_{r,cbw} + D^g_{cb} + D_{cw} + \epsilon_{r,cbw}. \end{aligned} \tag{4}$$

As in the earlier regression (1) from Section 2.1, this seeks to explain attitudes towards workplace obedience as a function of respondent characteristics, including education ($Educ_{r,cbw}$). What is new here is that, following up on our previous discussion, we also interact respondent education with $expRTCageA_{cb}$, in order to understand how exposure at a particular age A to an economic environment with a cognitively-routine export profile might influence the relationship between education and workplace obedience.

The specification includes a basic set of fixed effects, to control for potential determinants of $ObedWork_{r,cbw}$ that are common to each country-cohort-gender (D^g_{cb}), or that reflect influences specific to the country during the WVS survey wave (D_{cw}). In particular, the D^g_{cb} dummies control for the level effect of any exposure to past conditions within each country that is specific to each cohort-gender bin, including (but not limited to) the main effect of past export-routineness (i.e., $expRTCageA_{cb}$). In (4) therefore, the interaction effect of interest, β_2, will be estimated from variation within each country-wave, as well as from the variation across individuals at different education levels within each country-cohort-gender group.

Among the auxiliary controls on the right-hand side ($X_{r,cbw}$), we include full sets of dummy variables for marital status and the number of children. We do not include the employment status, occupation, and size of town dummies that were used in the earlier estimation of equation (1) in Appendix Table 2, since these are controls that are arguably more prone to endogeneity critiques (related to, say, the self-selection of more obedience-minded individuals into particular occupations). That said, the findings reported below are very similar even were this longer list of controls to be included in the $X_{r,cbw}$ vector (results available on request).[28]

It is useful at this juncture to discuss what might undermine the interpretation of a causal relationship running from past export-routineness to individual attitudes on workplace obedience in the above specification. Bear in mind first that the measure used to capture exposure to a routine task-oriented economy ($expRTCageA_{cb}$) is plausibly exogenous from the perspective of any given individual. A more subtle reverse causality argument would instead posit that there could have been broad shifts affecting the cultural attitudes held by specific country-cohort-gender groups (such as a surge in pro-obedience attitudes during a particular decade in a country's modernization experience), and that this could have prompted an increase in the expansion of schooling *and* a shift towards specialization in more routine industries at the same time. It might appear at first

[28]The WVS does not carry information on the respondent's parents, such as their education level or occupation, which in principle could be useful for understanding patterns of cultural transmission within the family.

glance that such a mechanism could help to rationalize the positive interaction coefficient between individual education and $expRTCageA_{cb}$. What is less clear, however, is how this could account for the finding that it is $expRTC$ exposure experienced *only* at particular ages, specifically one's schooling years, that generates the positive interaction effect. It is precisely the age-specificity of this effect that invites the interpretation that what is driving these patterns is a mechanism related to cultural transmission that takes place during an individual's formative years. (Under the proposed reverse causality story, one might instead expect to see a positive interaction effect involving export-routineness only during the years of the country's modernization push.)

Notwithstanding the above arguments, we seek to further allay concerns on causality with an instrumental variables strategy. We construct a "shift-share" instrument for the export-routineness in country c at time t that seeks to isolate a source of variation in the observed export mix of country c that is plausibly driven by conditions external to the country. To do so, we take the initial industry profile of country c's exports in the year prior to the start of each five-year window (i.e., 1964 for the 1965-69 window), and infer from this a predicted profile of export values for the five years that follow (i.e., 1965, 1966,…, 1969). More specifically, for each $t = 1965, 1970, \ldots, 2010$ and each $s = 0, 1, \ldots, 4$, we predict country c's exports in industry i and year $t+s$ using:

$$\widetilde{Exports}_{ci,t+s} = Exports_{ci,t-1} \times \frac{Exports_{-c,i,t+s}}{Exports_{-c,i,t-1}}, \tag{5}$$

where the subscript $-c$ refers to all countries in the world excluding c. In words, this assumes a growth rate for country c's industry-level exports that is equal to that observed for trade by the rest of the world (i.e., total world trade in that industry excluding country c's exports and imports). We then compute the weighted-average of the industry RTC_i measures using the predicted export values, $\widetilde{Exports}_{ci,t+s}$, as the weights; a simple mean of this is taken over each five-year window, i.e., 1965-1969, 1970-1974,…, 2010-2014, to obtain our instrumental variable, $\widetilde{expRTC}$, for export-routineness. Intuitively, the predicted export profiles from (5) that go into constructing $\widetilde{expRTC}$ would reflect forces related to worldwide export demand shifts or broad technological developments that raise global export supply, rather than pertaining to policy shifts or socioeconomic forces that are specific to country c itself. This would deliver a valid instrument for our purposes, to the extent that these global export market shifts do not directly influence workplace obedience attitudes within country c, other than through their effect on the routineness profile of the country's exports.

4.2 Past Export-Routineness and Attitudes towards Workplace Obedience

We proceed to report the findings on the Obedience Fact. Table 5 presents the results from the specification in (4); the successive columns correspond to separate regressions for $A = 0, 5, \ldots, 35$ respectively, to uncover the effect that exposure to export-routineness at the different ages A has on attitudes towards workplace obedience. Panel A in the table reports the ordinary least squares results, while Panel B reports the findings when using $\widetilde{expRTC}$ – specifically the predicted export-routineness that cohort b in country c is exposed to at age A – as an instrumental variable.

Across all columns of Table 5, we obtain a negative and significant main effect of education, reconfirming the basic pattern that more educated individuals exhibit a lower propensity to agree with always following instructions at work. Importantly, we also find that this negative correlation is dampened by exposure to an economy with a cognitively routine export structure. Such past exposure thus appears to tilt individuals with a higher level of education towards being more amenable to pro-obedience attitudes. In particular, the estimated coefficient of $Educ_{r,cbw} \times expRTCageA_{cb}$ is positive and significant at the 5% level for age 5, 10, 15, and 20 exposure (Columns 2-5). (All standard errors are clustered by country.) This is true regardless of whether the estimation is by ordinary least squares (OLS) or by instrumental variables (IV), with the latter delivering slightly larger point estimates.[29] The largest effects are obtained for age 5 and 10 experience with export-routineness, with the point estimates of the interaction coefficients decreasing and eventually becoming insignificant for exposure at progressively older ages all the way through age 35.[30]

[TABLE 5 HERE]

These patterns suggest that cultural attitudes on appropriate behavior in the workplace are transmitted early on during an individual's life, for example through the family or through the schooling system, and a part of these attitudes persists into adult life until the age at which the respondents were surveyed by the WVS. These attitudes that are passed on at a young age appear to be a response to the economic conditions that prevail at the time of transmission: the more oriented the economy was towards routine industries at that time, the more it would be associated with pro-obedience workplace attitudes even among those individuals who eventually attain higher levels of education. These patterns are moreover consistent with empirical findings elsewhere in the literature that life experiences leave an especially strong mark on individual attitudes when they happen during one's so-called "formative years" (e.g., Giuliano and Spilimbergo 2014).

It is useful to point out that the interaction effect between education and export-routineness that these regressions uncover is not at odds with the broader stylized fact of a negative relationship between education and obedience. The $expRTC$ measure has a range of values between -2.622 and 0.992, so that the overall effect of education remains negative (though statistically indistinguishable from zero) when evaluated at the maximum possible level of exposure to export-routineness.[31]

A natural concern at this juncture is that there could be other forces specific to the country-cohort that have been omitted from the regressions, which could threaten our interpretation of the

[29] We obtain healthy Kleinberger-Paap Wald F-statistics in excess of 400 across all the IV columns, which suggests that the issue of weak instruments is unlikely to be a major concern.

[30] We have found similar results in the pattern of the interaction effect of export-routineness across different ages of exposure when using cohort-gender fixed effects (i.e., D_b^g), in place of the country-cohort-gender (D_{cb}^g) fixed effects in the specification in (4); please see Appendix Table 8. Note that this specification allows us to estimate the main effect of $expRTCageA_{cb}$. This main effect takes on a negative sign for ages 5 and 10 exposure that may seem counter-intuitive (Columns 2 and 3, Appendix Table 8), but this finding turns out not to be robust to controlling for the level effect of measures of cohort exposure at age A to other country conditions; in Appendix Table 9, this is demonstrated using the measures of exposure to log GDP per capita, openness, and democracy as additional controls.

[31] Even if one were to focus on the regression where the estimated interaction coefficient is at its largest, namely the IV regression in Column 3, the point estimate of the β_1 coefficient added to 0.992 times the β_2 coefficient remains slightly negative.

interaction effect. In this regard, the thorough specification in (4), with its use of country-cohort-gender fixed effects, helps to address the level effect of any such omitted variables on individual attitudes. However, one could still be worried that there are other forces specific to the country or country-cohort that might alter the relationship between individual education and workplace attitudes, and that omitting these from the regression could bias the estimate of β_2.

In Table 6, we therefore add to the right-hand side of (4) an extensive set of controls in the form of interaction terms between individual education and each country-wave dummy (i.e., terms of the form $Educ_{r,cbw} \times D_{cw}$). This controls for the possibility that there could be contemporaneous country-specific forces or conditions – such as the export-routineness of the economy at the time the WVS survey was conducted – that could influence the observed relationship between education and reported obedience. The results obtained are once again consistent with a cultural transmission interpretation: Exposure to export-routineness between the ages of 0-19 affects workplace attitudes (Columns 1-4), but that experienced in age 20 and after no longer matters in terms of statistical significance (Columns 5-8). Interestingly, the largest effects are now found for age 0 exposure under OLS in Panel A, although the peak effect under the IV regressions in Panel B remains at age 5 exposure. (Bear in mind that the estimated education coefficient in this table loses its interpretation as the main effect of education, since this variable is collinear with the full set of $Educ_{r,cbw} \times D_{cw}$ interactions.) The estimates in the first four columns of Panel B provide a sense of how much pro-obedience attitudes can shift in response to exposure to a routine task-oriented economy at a young age. Consider a once-off one standard deviation increase in $expRTC$ experienced at a particular age A (where $A = 0, 5, 10, 15$); the implied rise in proclivity towards workplace obedience would range from between 0.06 standard deviations (for $A = 15$) and 0.11 standard deviations (for $A = 5$), for an individual who eventually completes tertiary education ($Educ_r = 8$).

[TABLE 6 HERE]

In the remainder of this section, we perform a series of checks to bolster our confidence in the robustness of these findings and to address lingering concerns over interpretation. For succinctness, we report only the interaction coefficient between respondent education and export-routineness for these checks; these estimates are based on the IV specification used in Table 6, this being the most thorough specification which controls for the $Educ_{r,cbw} \times D_{cw}$ terms. Panel A of Table 7 speaks to a potential criticism of the "shift-share" IV, namely that the predicted export flows in (5) may not cleanly capture a source of variation in export growth that stems from external rather than domestic forces. This would be a particular concern for countries that make up a large share of world trade, since changes in import demand and export supply in such countries could more easily spill over onto trade conditions for the rest of the world. We therefore drop all countries that had a share of world imports or exports that exceeded 5% at any point in time between 1965-2014.[32] The regression estimates are not sensitive to restricting the country sample in this manner.

[TABLE 7 HERE]

[32]The countries dropped are: Canada, China, France, Germany, Great Britain, Italy, Japan, and the USA.

In Panel B of the table, we validate that the effects of export-routineness indeed impact on attitudes on obedience that are specific to workplace conduct, rather than on obedience in parent-child relations. We replace here the left-hand side variable with the indicator for whether respondents viewed obedience in children as important (WVS question A042). When doing so, we do not obtain any significant effects on the interaction terms between education and $expRTC$, nor do the point estimates of these coefficients exhibit any clear pattern with respect to the age of exposure.

The exercise in Panel C considers whether it is indeed exposure to export-routineness, as opposed to other salient characteristics about the industry composition of exports, that is driving the results. Here, we construct analogous measures of the skill-intensity and physical capital-intensity of each country c's export profile and map these to what respondents in the country from birth cohort b were exposed to at age A; these are each interacted with individual education, and included as additional right-hand side variables. The factor intensity measures here are constructed using data from the US NBER-CES manufacturing dataset for 1960-1969, so we use an export-routineness variable based only on manufacturing exports in these regressions for consistency, while also instrumenting for the measures of the factor intensity of country exports using similarly-constructed "shift-share" IVs. Even with these additional controls, the key export-routineness interaction terms remain significant at least at the 5% level for exposure between ages 5 through 19 (Panel C). We have furthermore explored whether the findings are robust to controlling for country measures of broader political and economic conditions that each cohort was exposed to at specific ages. The additional covariates considered here are respondent education interacted with: (i) log income per capita; (ii) country openness (exports over GDP); and (iii) the country democracy score (from the Polity IV dataset), where each of these variables is computed as an average during the five-year window when the respondent was age A. The estimated interaction coefficients between education and export-routineness across different ages retains similar patterns (Panel D).

A number of related tests are performed and reported in Appendix Table 7. We obtain similar findings when using a measure of export-routineness based on the overall RT index, rather than on the cognitive RTC index. The results are also largely unaffected when countries that experienced political transitions are dropped. In several of these cases, one ends up associating the export-routineness values from the same pre-transition country (e.g., the Soviet Union) to several post-transition states, but this does affect the finding of a significant interaction effect for exposure at young ages. Last but not least, we have also confined the construction of the $expRTC$ variable to manufacturing exports and found qualitatively similar results.

The Obedience Fact that we have just presented points to an important feedback effect: Patterns of specialization in the economy appear to affect the incentives to transmit pro-obedience workplace attitudes to the next generation. The sources of variation that we have exploited to uncover this latter fact are more subtle, hinging on variation in cohort- and age-specific exposure within countries to establish that pro-obedience attitudes can be shaped by the experience of growing up in a cognitive-routine task-intensive economy.

5 A Model of Endogenous Transmission of Workplace Obedience

We now draw direct motivation from our two key empirical findings, to set up a model to analyze how specialization patterns and cultural attitudes on workplace obedience can co-evolve over time. Conceptually, the Specialization Fact establishes a link between workplace obedience attitudes within a country at time t and the contemporaneous pattern of industry specialization. In turn, the Obedience Fact speaks to how the pattern of specialization at time t affects the transmission of workplace obedience attitudes to the time-$(t+1)$ generation. Taken together, the two facts thus point us towards developing an overlapping generations model of endogenous human capital investment and cultural transmission. The model will help to shed light on the long-run steady state outcomes that could arise for an economy, including the possibility of being caught in an "obedience trap".

5.1 Setup

Consider a small-open economy that is composed of a unit measure of identical households. We adopt this small-open economy perspective and focus on how conditions in this economy evolve over time, given the within-country nature of the Specialization and Obedience Facts.

At any point t in time, each household is composed of one working adult and her unique descendant. Time is discrete, and each individual within the household lives for exactly two periods. We index households by $r \in [0,1]$, and let $H_{rt} \geq 0$ denote the human capital that the working adult in household r at time t possesses. This H_{rt} is an endowment from the adult's perspective, but it is an outcome of the human capital investment decision undertaken by her parent in the preceding time period, $t-1$. Separately, we let θ_{rt} denote the degree of pro-obedience attitudes held by this working adult, with a higher θ_{rt} corresponding to a greater propensity to follow (rather than question) workplace instructions. We will assume that θ_{rt} takes on values within a bounded subset of the real line, $\left[\underline{\theta}, \overline{\theta}\right]$. Note that θ_{rt} is likewise the outcome of a cultural transmission decision undertaken at time $(t-1)$ by the individual's parent. In what follows, we will consider a representative individual who is a working adult at time t, and set up her decision problem.

The economy in question features two industries, and human capital is the only factor of production. The representative individual faces a decision over how to allocate her H_{rt} (equivalently, her available units of labor effort) across these two industries. Taking guidance from the Specialization Fact, the two industries differ in the (cognitive) routineness of their production tasks.

The first industry is a routine or "Basic" sector (denoted by subscript B), in which pro-obedience workplace attitudes would raise the productivity of each unit of human capital. For example, one can think of this as an assembly-line manufacturing sector, in which it is important for workers to follow and execute work orders without continuously questioning them in the middle of a production run. We therefore specify the following production function for this Basic sector:

$$y_{Brt} = A_{Bt}(f(\theta_{rt})h_{Brt})^{\beta}, \text{ where } 0 < \beta < 1. \tag{6}$$

Here, $h_{Brt} \in [0, H_{rt}]$ is the units of human capital allocated by the individual from household r to the Basic sector at time t. For simplicity, the output y_{Brt} from the individual's effort is assumed to accrue directly to her. In the above specification, workplace attitudes towards obedience, θ_{rt}, affect the individual's effective units of human capital in this sector. We assume that: $f'(\cdot) > 0$ and $f''(\cdot) \leq 0$, so that pro-obedience attitudes raise a worker's effective human capital in the routine sector B, but at a (weakly) diminishing rate. The A_{Bt} term is a pure productivity shifter that reflects the current state of technology in the Basic sector.

Turning to the nonroutine or "Complex" sector (subscript C), this is a sector in which workplace obedience instead hinders and lowers the effectiveness of human capital. When the adult from household r applies $h_{Crt} \in [0, H_{rt}]$ units of her human capital to this sector, the amount of output she produces is given by:

$$y_{Crt} = A_{Ct}(g(\theta_{rt})h_{Crt})^{\gamma} \left(\int_{\tilde{r}\in[0,1]} g(\theta_{\tilde{r}t})h_{C\tilde{r}t}d\tilde{r} \right)^{1-\gamma}, \text{ where } \ 0 < \gamma < 1. \tag{7}$$

We assume that: $g'(\cdot) < 0$ and $g''(\cdot) \leq 0$, so that workplace obedience is detrimental to production outcomes in the Complex sector.[33] Note that each individual's output depends not only on her own human capital, but also on the aggregate amount of effective human capital that is channeled to sector C by all households in the economy, i.e., $\int_{\tilde{r}\in[0,1]} g(\theta_{\tilde{r}t})h_{C\tilde{r}t}d\tilde{r}$. This production function therefore incorporates the idea that nonroutine tasks feature a greater scope for human capital externalities than routine tasks. The definition of "nonroutine cognitive" tasks in Autor, Levy and Murnane (2003) incorporates a dimension involving "direction, control, or planning", which speaks to the need for interaction with other workers in performing such tasks, hence providing scope for cross-worker spillovers to emerge. In nonroutine industries where creative thinking and active questioning are required, such externalities could also arise from the cross-fertilization of ideas or from working in teams. Observe that in a symmetric equilibrium in which all workers choose the same h_{Crt}, the production function in (7) will feature constant returns in the aggregate amount of human capital allocated to this sector; this will facilitate the tractability of the model moving forward. Once again, A_{Ct} is an aggregate productivity term associated with this sector.

Apart from the above decision regarding how much labor to allocate to each production sector, the adult at time t also faces further choices over how much resources to invest to prepare her child for the workplace in time $t+1$. There are two components to this investment decision. First, the parent chooses how much human capital, $H_{r,t+1}$, to endow her child with. We denote the cost in monetary terms of this investment in the child's education by $\omega(H_{r,t+1})$, where we make the usual convexity and regularity assumptions for this cost function: $\omega'(\cdot) > 0$, $\omega''(\cdot) > 0$, $\omega(0) = 0$, and $\lim_{H \longrightarrow \infty} \omega(H) = \infty$. Second, the parent also chooses the degree of pro-obedience workplace

[33] For most of our results, a milder assumption – specifically, $\beta f'/f > g'/g$ – will suffice. In words, this would require that workplace obedience be sufficiently more complementary to human capital in the B compared to the C sector. In particular, the stronger assumption that $g' < 0$ is needed for one result, namely that $\frac{d\theta}{dH} < 0$ (the correlation between obedience and human capital is negative) in an economy that features a very high level of nonroutineness (i.e., $\rho \longrightarrow 0$); see Lemma 2.

attitudes, $\theta_{r,t+1}$, to transmit to the next generation. Following the literature (c.f., Bisin and Verdier 2001, 2011), we adopt the view that the cultural transmission process incurs a cost on the parent, which in pecuniary terms is given by $\tau(\theta_{r,t+1} - \theta_{r,t})$; for example, this can be viewed as the value of time spent ingraining workplace obedience values in the child. We shall assume that this cultural transmission cost function satisfies: $\tau'(0) = 0$ and $\tau''(\cdot) > 0$. The transmission cost is therefore convex and increasing in the absolute distance between the attitudes of the parent and that which are passed on to the child. This feature introduces "inertia" in the cultural transmission process, so that though workplace attitudes can shift across generations, they do so in a way that exhibits persistence.

We now write down the full decision problem of the representative individual at time t. Under the overlapping generations structure of the model, each adult is concerned only with the expected present discounted value of income earned by herself and her time-$(t+1)$ descendent, net of the cost of investments (incurred at time t) in the child's human capital and workplace obedience attitudes:

$$\begin{aligned} \max_{h_{Brt}, h_{Crt}, H_{r,t+1}, \theta_{r,t+1}} \quad & y_{Brt} + p_{Ct} y_{Crt} + \delta \mathbb{E}_t \left(y_{Br,t+1} + p_{C,t+1} y_{Cr,t+1} \right) \\ & \qquad - \omega(H_{r,t+1}) - \tau \left(\theta_{r,t+1} - \theta_{rt} \right), \qquad (8) \\ & \text{subject to: } \; h_{Brt} + h_{Crt} \leq H_{rt} \text{ and } \; h_{Br,t+1} + h_{Cr,t+1} \leq H_{r,t+1}. \end{aligned}$$

In the above, the B-good is set as the numeraire in each time period, while the price of the C-good at time t is denoted by p_{Ct}; this price is exogenous from the perspective of agents in this small-open economy. (The discount factor is δ, where $0 < \delta < 1$.) We will further assume that the time-t decision-maker has rational expectations over the future state of technology and goods prices, and that the actual stochastic properties of these random variables are such that: $\mathbb{E}_t(A_{B,t+1}) = A_{Bt}$, $\mathbb{E}_t(A_{C,t+1}) = A_{Ct}$, and $\mathbb{E}_t(p_{C,t+1}) = p_{Ct}$. In other words, each individual's best guess of what technology and goods prices will be in the next time period is given by the current level of these respective variables.[34,35]

5.2 Implications from the Model

We proceed to analyze the model, by solving first the individual's decision problem spelled out in (8). To understand the aggregate outcomes that this implies for the economy, we will then focus on characterizing the model's symmetric steady states, namely in which: (i) all households make identical decisions; and (ii) both H_{rt} and θ_{rt} are constant in the long-run. (In what follows, the r subscript is therefore omitted unless there is cause for ambiguity.)

Inspecting the maximand in (8), one can see that the time-t labor allocation problem of the working adult is additively separable from the investment decisions that she makes for the next

[34] An alternative assumption is that the representative individual at time t may not have full knowledge of the process that governs the evolution of sector productivities or prices, and instead myopically extrapolates the economic conditions at time t into the next period ("myopic altruism").

[35] For simplicity, we also assume that each household is not credit-constrained when bearing the costs of investing $H_{r,t+1}$ and $\theta_{r,t+1}$ in the next generation.

generation. Specifically, the problem in (8) can be broken into two parts, namely: (I) choosing h_{Bt} and h_{Ct} to maximize current period income, $y_{Bt} + p_{Ct}y_{Ct}$; and (II) choosing H_{t+1} and θ_{t+1} to maximize the expected (discounted) next-period income of her child net of the costs of these investments, $\delta\mathbb{E}_t\left(y_{B,t+1} + p_{C,t+1}y_{C,t+1}\right) - \omega(H_{t+1}) - \tau\left(\theta_{t+1} - \theta_t\right)$.

Consider first the labor allocation decision in (I) over h_{Bt} and h_{Ct}. This is a relatively straightforward optimization problem, subject to the human capital constraint, $h_{Bt} + h_{Ct} = H_t$; the details of the derivations are in the Model Appendix. Bear in mind here that the individual adult takes the aggregate effort level in the C sector, $\widetilde{h_{Ct}} \equiv \int_{\tilde{r}\in[0,1]} g(\theta_{\tilde{r}t})h_{C\tilde{r}t}d\tilde{r}$, as given when performing this optimization. It is only after deriving the first-order conditions with respect to h_{Bt} and h_{Ct} that we then introduce the assumption of symmetry across households (i.e., $\theta_{\tilde{r}t}$, $h_{B\tilde{r}t}$, and $h_{C\tilde{r}t}$ respectively equal for all $\tilde{r} \in [0,1]$). These algebraic steps yield the following expressions for the allocation of human capital between the two industries at time t in the symmetric equilibrium:

$$h_{Bt} = \min\left\{\left(\frac{\beta}{\gamma}\frac{A_{Bt}}{p_{Ct}A_{Ct}}\frac{f(\theta_t)^\beta}{g(\theta_t)}\right)^{\frac{1}{1-\beta}},\ H_t\right\}, \text{ and} \tag{9}$$

$$h_{Ct} = \max\left\{H_t - \left(\frac{\beta}{\gamma}\frac{A_{Bt}}{p_{Ct}A_{Ct}}\frac{f(\theta_t)^\beta}{g(\theta_t)}\right)^{\frac{1}{1-\beta}},\ 0\right\}. \tag{10}$$

Of note, the model allows for the possibility of corner solutions. For a given level of H_t and θ_t, the above expressions imply that individuals will allocate all their human capital to the Basic sector when $A_B/(p_C A_C)$ is sufficiently large (so that productivity in the B sector is sufficiently high relative to that in sector C), or when γ is small (so that individual effort in the Complex sector exhibits steep diminishing returns). Under either of these circumstances, the economy features complete specialization in the Basic sector.

From (9) and (10), it is also clear that h_{Bt} is (weakly) increasing in θ_t, while the converse applies to h_{Ct}, since $f' > 0$ and $g' < 0$. A stronger degree of pro-obedience workplace attitudes therefore leads to more labor effort being allocated to the Basic sector, as well as a corresponding decrease in that channeled to the Complex sector. In terms of what this implies for the structure of the economy, it will be useful to define: $\rho_t \equiv y_{Bt}/y_{Ct}$, this being the ratio of output in the routine relative to the nonroutine industries. Substituting the expressions in (9) and (10) into the definitions of the production functions in (6) and (7), one can show that ρ_t is in fact increasing in θ_t, so that a more pro-obedience workplace culture will imply a higher degree of "routineness" in the economy. The model therefore delivers an implied pattern of production that is entirely consistent with the Specialization Fact reported in Section 3.

Building on the above observations, we therefore consider two cases when examining possible long-run steady states below. These are a first case where the economy features complete specialization in the Basic sector, and a second case in which production is diversified across industries. We address the nature of the investment decisions in human capital and cultural transmission in turn for each of these cases. In what follows, for results that pertain to steady-state properties, we shall assume that the processes governing A_{Bt}, A_{Ct}, and p_{Ct} are mean-stationary, i.e., that $\mathbb{E}_t(A_{B,t+1}) = A_B$, $\mathbb{E}_t(A_{C,t+1}) = A_C$, and $\mathbb{E}_t(p_{C,t+1}) = p_C$; this is so that the steady state will feature a constant level of human capital and pro-obedience attitudes over each generation.

Steady state with complete specialization. Suppose that all working adults allocate their entire human capital to the B sector. The decision problem that the representative adult faces over how much H_{t+1} and θ_{t+1} to invest in the next generation then reduces to:

$$\max_{H_{r,t+1},\theta_{r,t+1}} \qquad \delta\mathbb{E}_t(A_{B,t+1})\left(f(\theta_{t+1})H_{t+1}\right)^{\beta} - \omega(H_{t+1}) - \tau(\theta_{t+1}-\theta_t). \tag{11}$$

In the Appendix, we show that the first-order condition with respect to θ_{t+1} will imply that in steady state, each parent opts to transmit the highest possible level of obedience to her child, i.e., $\theta_{t+1} = \overline{\theta}$. Intuitively, with complete specialization in the Basic sector, pro-obedience workplace attitudes unambiguously raise the return to individual human capital, and this creates the incentive to transmit the highest degree of θ possible.

With the above property, the optimal level of human capital that the adult will invest in her child will then satisfy the following first-order condition (with respect to H_{t+1}):

$$\delta A_B \beta f(\overline{\theta})^{\beta} = H_{t+1}^{1-\beta}\omega'(H_{t+1}). \tag{12}$$

This equation yields a unique solution for H_{t+1}, since the right-hand side is an increasing function in H_{t+1}. (Recall that $0 < \beta < 1$ and that the cost function ω is convex.) Moreover, one can see that a higher δ or A_B will be associated with an increase in the level of human capital that is invested in the next generation.[36] We summarize this discussion of this steady state under complete specialization in the following:

Lemma 1 *Consider the symmetric steady state in which the economy is completely specialized in the Basic sector. Then, for all periods t, the workplace obedience attitudes transmitted satisfy $\theta_{t+1} = \overline{\theta}$, while the level of human capital invested in the next generation is given by the (unique) value of H_{t+1} that solves equation (12). All else equal, an increase in households' patience, or an improvement in the productivity of the Basic sector, will result in a higher steady-state level of human capital.*

The above result provides a potential interpretation of the developments paths seen in the East Asian tigers, where it has been argued that high levels of economic output were accompanied by a high degree of obedience or discipline within the workforce. In our model, this would correspond to a case in which the productivity parameter A_B were large, so that the economy ends up being in a high-human capital, high-obedience steady state, with a high degree of specialization in industries where production is routine in nature.

[36] For this scenario to be consistent with a steady state in which no labor is allocated to the C sector, the following condition needs to be satisfied: $\left(\frac{\beta}{\gamma}\frac{A_B}{p_C A_C}\frac{f(\overline{\theta})^{\beta}}{g(\overline{\theta})}\right)^{\frac{1}{1-\beta}} > H^{spec}$, where H^{spec} is the value of H_{t+1} that solves (12). This will ensure that h_{Ct} in equation (10) is zero.

It is also worth pointing out that the transition path to the above steady state is one in which individual household decisions raise both θ and H towards their steady-states values.[37] At any point in this transition, any increase in human capital will be channeled towards production in the routine sector, and this in turn raises the incentive for parents to instill a greater degree of pro-obedience attitudes in their children. In other words, this process of converging to the steady state features a complementarity between workplace obedience attitudes and human capital, in the sense that investments in θ and H are mutually reinforcing. As we will see below, this complementarity can be broken if one were to consider steady states that feature diversification across industries.

Steady state with diversified production. We turn to the case in which individuals allocate a strictly positive amount of human capital to both industries in the steady state. Under diversified production, the decision problem that each working adult faces at time t in terms of how much to invest in their child is now given by:

$$\begin{aligned} \max_{H_{r,t+1},\theta_{r,t+1}} \quad & \delta\left(\mathbb{E}_t(A_{B,t+1})\left(f(\theta_{t+1})h_{B,t+1}\right)^{\beta}+\mathbb{E}_t(A_{C,t+1})\left(g(\theta_{t+1})h_{C,t+1}\right)^{\gamma}\widetilde{h_{C,t+1}}^{1-\gamma}\right) \\ & \qquad -\omega(H_{t+1})-\tau(\theta_{t+1}-\theta_t), \qquad (13) \\ & \text{subject to: } \; h_{Br,t+1}+h_{Cr,t+1}\leq H_{r,t+1}. \end{aligned}$$

Recall that $\widetilde{h_{C,t+1}}$ reflects the spillovers from the aggregate level of human capital in the C sector on individual workers in that sector. Note that in (13), $h_{B,t+1}$ and $h_{C,t+1}$ are themselves functions of H_{t+1} and θ_{t+1}, these being the levels of human capital that the child will optimally allocate between both industries at time $t+1$ when she is working. In solving the above investment problem, the parent at time t anticipates how her choice of $H_{r,t+1}$ and $\theta_{r,t+1}$ will in turn affect $h_{B,t+1}$ and $h_{C,t+1}$; this is explicitly taken into account when deciding upon the level of human capital and cultural attitudes to invest in her child.

To solve the above decision problem, we take the first-order conditions with respect to $H_{r,t+1}$ and $\theta_{r,t+1}$ for the representative individual's problem. (Note that we first treat $\widetilde{h_{C,t+1}}$ as given from the individual's perspective when taking these first-order conditions, before imposing the symmetry assumption across households; see the Appendix for details.) After some algebra, we obtain:

$$\delta\gamma A_C g(\theta_{t+1})H_{t+1}\left(\frac{\beta\rho}{\gamma+\beta\rho}\frac{f'}{f}+\frac{\gamma}{\gamma+\beta\rho}\frac{g'}{g}\right) = \tau'\left(\theta_{t+1}-\theta_t\right), \text{ and} \qquad (14)$$

$$\delta\gamma A_C g(\theta_{t+1}) = \omega'\left(H_{t+1}\right). \qquad (15)$$

Equation (14) is the first-order condition with respect to θ_{t+1}; this sheds light on the forces that affect the degree of pro-obedience attitudes invested in the child, taking the level of human capital

[37] Suppose that the economy is completed specialized in the Basic sector at time t, but that $\theta_t < \bar{\theta}$. The marginal cost of cultural transmission would be equal to $\tau'(\theta_{t+1}-\theta_t)$. Since $f' > 0$, the marginal benefit of raising obedience – in terms of an increase in output in the Basic sector – would be positive. Equating the marginal cost with the marginal benefit, and with $\tau'(0) = 0$ and $\tau'' > 0$, this would imply that the parent would choose to raise pro-obedience attitudes in her child above the level seen in the current generation, i.e., $\theta_{t+1} > \theta_t$.

H_{t+1} as given. On the other hand, equation (15) speaks to what affects the incentives to invest in human capital, taking θ_{t+1} as given. (Recall that ρ is the ratio of output in the Basic relative to the Complex sector, as defined earlier.) While the optimal choice of θ_{t+1} and H_{t+1} is obtained by solving the above two equations simultaneously, it is nevertheless instructive to inspect each first-order condition in turn, to understand what shapes the incentives to invest in workplace obedience and in human capital respectively.

In particular, working with (14) yields the following result related to the endogenous transmission of pro-obedience attitudes:

Lemma 2 *Consider an economy that is diversified in production between the Basic and Complex sectors. The first-order condition for θ_{t+1} implies that transmitted workplace obedience attitudes satisfy the following properties:*

(i) $\frac{\partial \theta_{t+1}}{\partial H_{t+1}} < 0$ *in a neighborhood of* $\rho = 0$*;*

(ii) $\frac{\partial \theta_{t+1}}{\partial H_{t+1}} > 0$ *as* $\rho \longrightarrow \infty$*; and*

(iii) $\frac{\partial \theta_{t+1}}{\partial H_{t+1}}$ *is increasing in* ρ*.*

The above lemma describes how prevailing economic conditions, as summarized by the routineness ρ of the structure of production, systematically shape the incentives to transmit cultural attitudes that encourage workplace obedience. This affects specifically the relationship between transmitted attitudes and human capital: When the economy is very nonroutine in its output structure, a higher level of human capital is associated with a less obedient workplace culture. But this correlation is progressively reversed if the economy were instead to become more routine in its output composition. This result thus provides a theoretical rationalization for the Obedience Fact uncovered earlier in the WVS respondent data in Section 4. Intuitively, when ρ is small and the economy is very nonroutine, any increment in human capital will be allocated primarily to production in the Complex sector. As workplace obedience is detrimental to productivity in that sector, this then diminishes the incentives to pass on pro-obedience attitudes, resulting in a negative partial correlation between H_{t+1} and θ_{t+1}. However, this negative correlation is weakened as ρ gets progressively larger, as any marginal increase in human capital will be channelled more and more towards the Basic sector where obedience is instead a complementary attribute. The incentives will then tilt towards raising transmitted workplace obedience on the margin.

Turning to (15) and the incentives to invest in the next generation's human capital, H_{t+1}, we can derive the following:

Lemma 3 *Consider an economy that is diversified in production between the Basic and Complex sectors. The first-order condition for H_{t+1} implies that the level of human capital investment is decreasing in θ_{t+1}. Moreover, all else equal, an increase in households' patience, or an improvement in productivity in the Complex sector, will result in a higher level of human capital.*

These properties are a quick consequence of (15), and the assumptions that $g' < 0$ and $\omega'' > 0$. Since the Basic sector features diminishing returns to human capital, whereas the Complex sector features constant returns in the aggregate, it is technological conditions in the latter sector (i.e., A_C) that are pivotal for shaping the incentives to accumulate human capital in any steady state that features diversified production. A higher θ_{t+1} would tilt the economy towards a relatively more routine production structure, and this in turn reduces the incentive to invest in H_{t+1} (since the B sector features diminishing returns to human capital). This thus provides a force towards breaking the strict complementarity between workplace obedience and human capital seen in the earlier complete specialization case.

Accordingly, this opens the door to a richer array of steady state outcomes, including the possibility of multiple steady states. To see this, we solve (14) and (15) simultaneously to pin down the steady-state values of θ and H. (We refer to the steady-state values of the respective variables by removing the time subscript.) Setting $\theta_{t+1} = \theta_t = \theta$ in (14), and recalling that $\tau'(0) = 0$, the steady-state level of workplace obedience satisfies the equation: $Z(\theta) = 0$, where the function $Z(\theta)$ is defined by:

$$Z(\theta) \equiv \left(\frac{\beta\rho}{\gamma + \beta\rho} \frac{f'}{f} + \frac{\gamma}{\gamma + \beta\rho} \frac{g'}{g} \right). \tag{16}$$

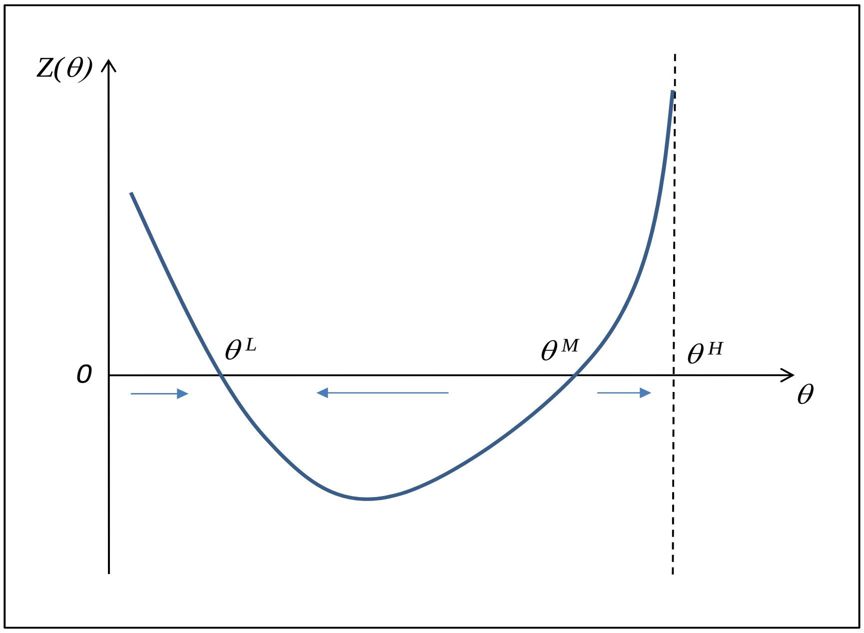
In a symmetric steady state, one can show by direct substitution that: $\frac{\beta\rho}{\gamma+\beta\rho} = \left(\frac{\beta}{\gamma} \frac{A_B}{p_C A_C} \frac{f^\beta}{g} \right)^{\frac{1}{1-\beta}} \frac{1}{H}$ and $\frac{\gamma}{\gamma+\beta\rho} = 1 - \left(\frac{\beta}{\gamma} \frac{A_B}{p_C A_C} \frac{f^\beta}{g} \right)^{\frac{1}{1-\beta}} \frac{1}{H}$. Since (15) implies $H = (\omega')^{-1} (\delta\gamma A_C g(\theta))$, the right-hand side of (16) can indeed be written solely as a closed-form function of θ after substituting out all endogenous variables. Note that $Z(\theta)$ is in general a non-linear function of θ, and one can readily provide examples where the equation $Z(\theta) = 0$ yields multiple solutions for the same set of values for the primitive parameters of the model (in particular, β and γ).

To provide a concrete illustration of this, consider the simple functional forms: $f(\theta) = \theta$ and $g(\theta) = 1 - \theta$, where $\theta \in [0, 1]$, to describe how workplace obedience affects effective labor input in each sector. Moreover, we adopt a simple convex function, $\omega(H) = \frac{1}{2}\kappa H^2$, for the human capital cost function. Figure 3 sketches the behavior of $Z(\theta)$ under these functional forms, for a scenario in which $\frac{A_B}{p_C A_C}$ lies in an intermediate range of values, i.e., neither sector has a particularly large technological advantage over the other.[38]

Figure 3 demonstrates that three steady states are possible. The first two of these correspond to the two roots of the equation $Z(\theta) = 0$ and are labeled $\theta = \theta^L$ and θ^M in the figure. Note from (14) that when $Z(\theta_{t+1}) < 0$, we have $\tau'(\theta_{t+1} - \theta_t) < 0$. The convexity of τ and the assumption that $\tau'(0) = 0$ then imply that $\theta_{t+1} - \theta_t < 0$, so that workplace obedience decreases over time for any $\theta_{t+1} \in (\theta^L, \theta^M)$. A similar argument implies that transmitted workplace obedience will be increasing with time for initial values in the intervals $[0, \theta^L)$ and $(\theta^M, 1)$. These directions of motion mean that θ^L is a stable equilibrium, whereas θ^M is unstable. There is also a third possible steady state, which is $\theta = 1$. To see this, recall that $\frac{\beta\rho}{\gamma+\beta\rho} = \left(\frac{\beta}{\gamma} \frac{A_B}{p_C A_C} \frac{f^\beta}{g} \right)^{\frac{1}{1-\beta}} \frac{1}{H}$. With the adopted functional forms for $f(\theta)$ and $g(\theta)$, we can see that this last expression is strictly increasing in θ and moreover tends to infinity as θ approaches 1. It follows that there exists a unique $\theta^H \in (0, 1)$,

[38]The qualitative shape of $Z(\theta)$ is very similar for a wide range of values for the parameters β, γ, δ, and κ.

Figure 3: An Illustration of Multiple Steady States in the Diversified Economy



illustrated by the vertical dotted line in Figure 3, at which $\frac{\beta\rho}{\gamma+\beta\rho} = 1$. However, the direction of motion of θ implies that transmitted workplace obedience will keep increasing for any initial value above θ^M, and will in fact surpass θ^H and approach $\theta = 1$; this is because $Z(\theta_{t+1}) > 0$ for any $\theta_{t+1} \in (\theta^M, 1)$. When workplace obedience increases beyond θ^H, the economy thus moves from diversification back to the case of complete specialization in the Basic sector (as ρ tends to infinity). Thus, $\theta = 1$ is an alternative stable steady state outcome for an economy that commences from an initial situation with diversified production.

To sum up the above discussion, there are two stable steady states corresponding to $\theta = \theta^L$ and $\theta = 1$. In light of the negative correlation between steady state human capital and workplace obedience implied by (15), we label these as the low-θ, high-H and the high-θ, low-H steady states respectively. In particular, we refer to the latter steady state as an "obedience trap": The predominant workplace mindset is one of following instructions, and this tilts the economy towards specialization in the Basic sector, at the expense of the development and expansion of the Complex sector. Such reliance on the routine sector can be a cause for concern, given that the labor market polarization literature has documented that workers engaged in routine tasks are more prone to be displaced by technological advances (e.g., Autor and Dorn 2013; Goos, Manning and Solomon 2014).

The occurrence of such an "obedience trap" can be mitigated were $p_C A_C$ to increase relative to A_B, either for exogenous reasons (such as a large productivity shock to the Complex sector) or as a response to systematic policies (such as import protection for the Complex sector). With a lower value of $\frac{A_B}{p_C A_C}$, the $Z(\theta)$ curve in Figure 3 would shift vertically downwards to such an extent that it can end up assuming negative values for all $\theta \in [0, \theta^H)$. An economy that initially starts in a situation with diversified production would then transition unambiguously towards the low-obedience steady state, given that the Complex sector has become more productive; the high-θ, low-H steady state would be eliminated. (The converse would of course happen if instead it were the Basic sector that experienced a large productivity shock relative to the Complex sector, namely that the high-obedience steady state would emerge as the unique long-run outcome.)

6 Conclusion

We have established two key empirical facts: Cultural attitudes towards workplace obedience are linked to increased specialization in routine sectors (the "Specialization Fact"). In turn, the experience of growing up in an economy that is specialized in routine economic activities can shape pro-obedience attitudes. While educated individuals tend to be less pro-obedience in their workplace attitudes, this negative partial correlation is systematically weakened if one's formative years were spent in an economy that featured a high degree of "export-routineness" (the "Obedience Fact").

To make sense of these novel facts, we have constructed a model of endogenous transmission of cultural attitudes towards obedience and human capital accumulation. This framework allows us to consider the implications of this interplay between culture and patterns of specialization. In particular, in the presence of human capital externalities in the (skill-intensive) nonroutine sector, multiple steady states could arise. The model thus generates the possibility of an "obedience trap": countries may specialize in routine activities, thus inducing pro-obedience attitudes that in turn hinder the development of nonroutine sectors. Since the routine sector is relatively less skill-intensive, the "obedience trap" would be accompanied by a reduced level of steady-state human capital. This possibility underscores the concern expressed by policy makers and other observers, that pro-obedience cultural traits might make it hard for countries to transition from the early stages of industrialization, even though such traits were helpful in those early stages. Finally, it suggests that policy interventions that shift the structure of the economy away from its comparative advantage, such as protection, could have redeeming features: they might allow the economy to break away from the obedience trap. A full consideration of the desirability of such interventions, as well as of the potential impact on economic growth of this interplay between attitudes towards obedience and the production structure of an economy, is left for future research.

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Data Appendix

This Appendix documents details related to the datasets used and variables constructed for the empirical analysis.

A. World Values Survey

The "Workplace Obedience" variable is based on question C061, as described in Section 2.1. The education variable is from question X025, where the eight response categories are: 1 = Inadequately completed elementary education; 2 = Completed elementary education; 3 = Incomplete secondary education: technical/vocational type; 4 = Complete secondary education: technical/vocational type; 5 = Incomplete secondary education: university-preparatory type; 6 = Complete secondary education: university-preparatory type; 7 = Some university without degree or lower-level tertiary certificate; 8 = University with degree or upper-level tertiary certificate.

The other respondent characteristics used are: gender (X001), age (X003), year of survey (S020), number of children (X011), marital status (X007), employment status (X028), size of town (X049), and occupational dummies (X036). For the number of children, a set of dummy variables is used corresponding to whether the respondent has 0, 1, 2,..., 7, or more than 8 children. For marital status, a dummy variable is used for each of the following categories: married; living together as married; divorced; separated; widowed; single/never married; living apart but steady relation; unreported/missing. For employment status, this is a indicator variable equal to 1 if the response is "Full time", "Part time", or "Self-employed"; it is equal to 0 if the response is "Retired", "Housewife", "Student", or "Unemployed"; the response "Other" is recoded as missing. For size of town, this is a set of dummy variables with eight categories ranging from "2,000 and less" to "500,000 and more". For the occupational dummies, this comprises eighteen separate categories, such as: "Employer/manager of establishment with 500 or more employed"; "Professional worker"; "Non-manual office worker"; "Skilled manual"; "Unskilled manual"; "Agricultural worker"; "Member of armed forces". A separate additional dummy is generated for unreported/missing data for each of the marital status, employment status, size of town, and occupation dummies.

Several other measures of cultural attitudes are also drawn from the WVS. The "Child Obedience" variable is a binary variable based on question A042. The importance of "independence" in children is a binary variable based on question A029. The importance of "hard work" in children is a binary variable based on question A030. The variable on "work is a duty to society" is from question C039; the responses are recoded from 1 ("Strongly disagree") to 5 ("Strongly agree"). Respondents' views on whether "I see myself as an autonomous individual" are from G023; the responses are recoded from 1 ("Strongly disagree") to 4 ("Strongly agree").

B. Exports

The international trade data are originally from UN Comtrade. These have been made available for the years 1962-2000 by Feenstra et al. (2005) in the World Trade Flows dataset. We extended the years of coverage to include 2001-2014 using UN Comtrade data separately procured for these latter years, and running the Stata code posted by Rob Feenstra (http://www.robertfeenstra.info/data/) to process the raw data into the World Trade Flows dataset format. These bilateral trade flows are reported for Standard International Trade Classification (SITC) Rev 2 codes. Priority is given to values reported at the import dock; only when these are not available are values at the export dock used. From 1984-2000, the World Trade Flows dataset contain observations in which one of the reporting countries was from a list of 72 countries, as reported in Table 1 of Feenstra et al. (2005); these cover more than any 98% of world trade by value. This data constraint does not apply for 2001-2014, but we have checked that the findings are very similar when limiting the analysis to data from the same list of 72 reporting countries for these latter years.

A concordance was then performed from SITC Rev 2 to Standard Industrial Classification (SIC) 1987 four-digit industry codes, the latter being a classification system very close to the Census Industry Category codes in Autor, Lavy and Murnane (2003). The concordance weights were constructed using detailed customs-based data on US exports from 1989-2006 from Feenstra et al. (2002), in which SITC, SIC and HS codes were recorded with each observation. There is a complication arising from the fact that some SIC codes are excluded from use by US customs: Customs is unable to distinguish between physical specimens of goods from some groups of SIC codes, as the SIC code definitions are based on the process of manufacturing or method of preparation. In such circumstances, US customs chose a default "destination" code for these goods, and excluded the rest of the codes from use. We use Table 3 in Feenstra et al. (2002) to break up "destination" codes on the basis of the value of shipments observed in the NBER-CES Manufacturing dataset, to recover trade values for the "excluded" codes.

Finally, the SIC codes are mapped to the Census Industry Category (CIC) codes in Autor, Lavy and Murnane (2003), using a matching process based on industry names. There is a high-level of similarity in the industry names used in the SIC and CIC systems. Two independent research assistants were asked to perform this name-matching process, and there was a high degree of agreement particularly for the manufacturing codes. ALM have devised a time-consistent version of the CIC system (Ind6090), by aggregating various subsets of CIC codes in later years, in order to get a consistent coding system from 1960-1990. The export data are mapped from SIC to this ALM Ind6090 coding system. There are a total of 142 Ind6090 industries, with 61 of these being from manufacturing.

In the individual-level regressions in Section 4, export data from pre-transition countries is associated with respondents from countries that subsequently experienced political transitions. The list of transition countries is: Azerbaijan, Armenia, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Lithuania, Latvia, Moldova, Tajikistan, Turkmenistan, Ukraine, Uzbekistan (all from the former Soviet Union); Czech Republic and Slovakia (all from the former Czechoslovakia); Bosnia, Croatia, Slovenia, Macedonia, Serbia (all from the former Yugoslavia); Bangladesh (formerly part of Pakistan); North and South Yemen (treated as one entity throughout the analysis); and East and West Germany (treated as one entity throughout the analysis).

C. Country-level variables

Age Structure of the Population: From Barro and Lee (2013). The median age is computed for the population aged between 25 to 64. Similarly, population shares were computed for ages 25-29, 30-34,. . ., and 60-64, expressed as a share of the population aged between 25 to 64.

Physical Capital, Human Capital, Real GDP per capita: From the Penn World Tables, version 9.0. The real GDP per capita series used is the output-side measure of real GDP.

Rule of law: From the International Country Risk Group (ICRG) measure of "Law and Order". The original series is monthly, on a scale of 0-6. A simple average is taken to obtain the annual index for each country; years with less than 12 months of reporting are dropped.

Financial development: From the Financial Development and Structure Dataset (Beck et al. 2000), November 2013 update. The key variable used is private credit from deposit banks and other financial institutions, divided by GDP.

Total population, Openness: From the World Bank's World Development Indicators.

Democracy: From the Polity IV dataset (Marshall and Jaggers 2014). We use the democracy score, which is on a scale of 0 to 10. Observations scored as -66, -77, and -88 in the original data (to reflect periods of foreign interruption or domestic transition) are dropped.

D. Industry-level variables

Factor intensities: From the NBER-CES Manufacturing Dataset. Physical capital intensity is the log value of real capital per worker. Skill intensity is the log number of nonproduction workers over total employment. Data for four-digit SIC industries are summed up to the relevant ALM CIC industry codes, where the latter is the industry coding system in which the "Specialization Fact" regressions are run. Average values over 1980-1989 are used. The value-added to total shipments ratio used in robustness checks was constructed in a similar manner.

Complexity: The job complexity measure is from Costinot (2009), and captures the average number of months it would take for a new employee with the required education background to become "fully trained and qualified" for their job in the industry. This is in turn based on responses to a question in the Panel Survey of Income Dynamics (PSID). The original measure in SIC 1972 industry codes was mapped to the SIC 1987 classification system. For each ALM CIC industry, the median job complexity value over constituent four-digit SIC 1987 industries is taken. The second complexity measure is constructed following Levchenko (2007). The 1992 U.S. Input-Output Tables in SIC codes are converted to a CIC industry-based matrix of direct requirement coefficients. The Herfindahl index of each industry's use of inputs is then computed.

Model Appendix

In this Appendix, we provide the derivations and proofs for the model from Section 5.

Labor allocation problem at time t. The decision problem of the representative individual:

$$\begin{aligned} \max_{h_{Bt},h_{Ct}} \quad & A_{Bt}(f(\theta_t)h_{Bt})^{\beta} + p_{Ct}A_{Ct}(g(\theta_t)h_{Ct})^{\gamma}\widetilde{h_{Ct}}^{1-\gamma} \\ & \text{subject to: } \; h_{Bt} + h_{Ct} \leq H_t, \end{aligned}$$

where we have dropped the r subscript to ease the notation. Substituting the labor constraint into the maximand, one can see that the first-order condition reduces to: $\beta \frac{y_{Bt}}{h_{Bt}} = \gamma \frac{y_{Ct}}{h_{Ct}}$. Defining $\rho_t \equiv \frac{y_{Bt}}{y_{Ct}}$, it follows that:

$$h_{Bt} = \frac{\beta \rho_t}{\gamma + \beta \rho_t} H_t, \text{ and} \tag{17}$$

$$h_{Ct} = \frac{\gamma}{\gamma + \beta \rho_t} H_t. \tag{18}$$

Next, substitute the expressions in (17) and (18) back into the production functions in (6) and (7), and then plug these into the definition of ρ_t. After some simplification, one obtains:

$$\frac{\rho_t^{1-\beta}}{(\gamma + \beta\rho_t)^{\gamma-\beta}} = \frac{A_{Bt}}{A_{Ct}} \frac{f^{\beta}}{g^{\gamma}} \frac{\beta^{\beta}}{\gamma^{\gamma}} H_t^{\beta-\gamma} \widetilde{h_{Ct}}^{\gamma-1}. \tag{19}$$

Applying now the symmetry assumption across households, we have: $\widetilde{h_{Ct}} = g\frac{\gamma}{\gamma+\beta\rho_t}H_t$. Substituting this expression for $\widetilde{h_{Ct}}$ into (19) and simplifying yields: $\frac{\beta\rho_t}{\gamma+\beta\rho_t} = \left(\frac{\beta}{\gamma}\frac{A_B}{p_C A_C}\frac{f^{\beta}}{g}\right)^{\frac{1}{1-\beta}} \frac{1}{H_t}$. Since $f'(\theta_t) > 0$ and $g'(\theta_t) < 0$, it follows that ρ_t is indeed increasing in θ_t, as claimed in the main text. We now plug this last expression for $\frac{\beta\rho_t}{\gamma+\beta\rho_t}$ into (17) and (18). The expressions for h_{Bt} and h_{Ct} reported in equations (9) and (10) in the main text then follow; the min and max operators in these latter equations accommodate the possibility of corner solutions.

Steady state with complete specialization. Under complete specialization in the Basic sector, output in the Complex sector $y_{C,t+1}$ is equal to zero and all human capital H_{t+1} is allocated to the Basic sector. The decision problem for the time-t adult over how much θ_{t+1} and H_{t+1} to invest in her child is then given by (11) in the main text. In a steady state, we have $\theta_{t+1} = \theta_t$, so that $\tau'(\theta_{t+1} - \theta_t) = \tau'(0)$. It follows from (11) that it is optimal to raise θ to its maximum value $\overline{\theta}$, since output in the Basic sector is increasing in θ.

Replacing θ_{t+1} by $\overline{\theta}$ in (11), the first-order condition for H_{t+1} reported in equation (15) in the main text follows immediately. An increase in either δ or A_B implies that $H_{t+1}^{1-\beta}\omega'(H_{t+1})$ must increase. Since $\omega'' \geq 0$, H_{t+1} will rise as well, as stated in Lemma 1.

Steady state with diversified economy. Recall that the decision problem facing the time-t

adult over how much to invest in her child is given by (13). Note that the adult anticipates that the child will set $h_{B,t+1} = \frac{\beta\rho_{t+1}}{\gamma+\beta\rho_{t+1}} H_{t+1}$ and $h_{C,t+1} = \frac{\gamma}{\gamma+\beta\rho_{t+1}} H_{t+1}$ in the next time period, bearing in mind that we are in a diversified economy. Substituting these expressions into (13), and taking the first-order condition with respect to θ_{t+1}, one obtains:

$$\begin{aligned}\frac{A_B}{A_C}\beta\left(f\frac{\beta\rho_{t+1}}{\gamma+\beta\rho_{t+1}}H_{t+1}\right)^{\beta}\left(\frac{f'}{f}+\frac{\gamma}{\gamma+\beta\rho_{t+1}}\frac{1}{\rho_{t+1}}\frac{d\rho_{t+1}}{d\theta_{t+1}}\right)&\\ +\gamma\left(g\frac{\gamma}{\gamma+\beta\rho_{t+1}}H_{t+1}\right)^{\gamma}\left(\frac{g'}{g}-\frac{\beta\rho_{t+1}}{\gamma+\beta\rho_{t+1}}\frac{1}{\rho_{t+1}}\frac{d\rho_{t+1}}{d\theta_{t+1}}\right)\widetilde{h_{C,t+1}}^{1-\gamma} &= \frac{1}{\delta A_C}\tau'.\end{aligned}$$

We replace $\widetilde{h_{C,t+1}}$ in the above using the expression from the time-$(t+1)$ analogue of equation (19). The equation in (14) then follows after some algebraic steps.

Turning to the first-order condition with respect to $H_{r,t+1}$, direct differentiation of (13) yields:

$$\begin{aligned}\frac{A_B}{A_C}\beta\left(f\frac{\beta\rho_{t+1}}{\gamma+\beta\rho_{t+1}}H_{t+1}\right)^{\beta}\left(\frac{\gamma}{\gamma+\beta\rho_{t+1}}\frac{H_{t+1}}{\rho_{t+1}}\frac{d\rho_{t+1}}{dH_{t+1}}+1\right)H_{t+1}^{\beta-1}&\\ +\gamma\left(g\frac{\gamma}{\gamma+\beta\rho_{t+1}}H_{t+1}\right)^{\gamma}\left(-\frac{\beta\rho_{t+1}}{\gamma+\beta\rho_{t+1}}\frac{H_{t+1}}{\rho_{t+1}}\frac{d\rho_{t+1}}{dH_{t+1}}+1\right)H_{t+1}^{\gamma-1}\widetilde{h_{C,t+1}}^{1-\gamma} &= \frac{1}{\delta A_C}\omega'.\end{aligned}$$

We perform a similar substitution using (19) to replace $\widetilde{h_{C,t+1}}$ in the above. The equation in (15) then follows after some algebraic simplification. (Note that there is no need to directly derive an expression for $\frac{d\rho_{t+1}}{d\theta_{t+1}}$ or $\frac{d\rho_{t+1}}{dH_{t+1}}$ in the above manipulations, as all the relevant terms involving these derivatives cancel out in the simplification steps.)

For Lemma 2, we totally differentiate (14) taking ρ as given from the perspective of the individual. This yields:

$$\left(\frac{\beta\rho}{\gamma+\beta\rho}\left(\frac{f''g}{f}+\frac{f'g'}{f}-\frac{(f')^2g}{f^2}\right)+\frac{\gamma}{\gamma+\beta\rho}g''-\frac{1}{\delta A_C\gamma H}\tau''\right)\partial\theta_{t+1} \quad = \quad -\frac{1}{H}\left(\frac{\beta\rho}{\gamma+\beta\rho}\frac{f'g}{f}+\frac{\gamma}{\gamma+\beta\rho}g'\right)\partial H_{t+1}.$$

The derivative assumptions that we have made allow us to sign the coefficient of the term in $\partial\theta_{t+1}$ to be unambiguously negative. It follows that the sign of $\frac{\partial\theta_{t+1}}{\partial H_{t+1}}$ will inherit the sign of $\left(\frac{\beta\rho}{\gamma+\beta\rho}\frac{f'g}{f}+\frac{\gamma}{\gamma+\beta\rho}g'\right)$. In a neighborhood of $\rho = 0$, this is clearly negative since $g' < 0$. Conversely, as $\rho \longrightarrow \infty$, this is clearly positive, since $g' > 0$. As for the third part of the lemma, one can see that $\left(\frac{\beta\rho}{\gamma+\beta\rho}\frac{f'g}{f}+\frac{\gamma}{\gamma+\beta\rho}g'\right)$ is increasing in ρ for any given value of θ_{t+1}. It follows that $\frac{\partial\theta_{t+1}}{\partial H_{t+1}}$ is increasing in ρ.

Table 1
Task Routineness by Broad Sectors

	Agriculture, Mining & Construction	Manufacturing	Services
Routine cognitive	4.84 (1.90)	5.87 (0.81)	4.00 (1.57)
Nonroutine cognitive, interactive	2.23 (1.81)	1.44 (0.37)	2.24 (0.90)
Nonroutine cognitive, analytic	3.05 (0.94)	2.97 (0.52)	3.76 (0.82)
Routine manual	3.61 (0.43)	3.98 (0.27)	3.74 (0.56)
Nonroutine manual	2.06 (0.45)	1.32 (0.33)	1.14 (0.76)

Note: The task routineness measures are based on the 1977 DOT coding and are mapped to the industry level using 1960 US Census industry weights, as constructed by Autor, Levy & Murnane (2003). Each index takes values from 0-10. For each column, a simple average of each routineness measure is taken over the industries within each broad set of sectors, with the standard deviation reported in parentheses. For "Agriculture, Mining & Construction", this comprises industries on the Autor, Levy & Murnane (2003) Ind6090 CIC codes ranging from 16 to 66; for "Manufacturing", this comprises codes ranging from 100 to 392; and for "Services", this comprises codes ranging from 400 to 901.

Table 2

"Specialization Fact": Workplace Obedience and Country-Level Patterns of Specialization

Dependent variable:	**Log (Exports$_{cit}$)**					
	(1)	(2)	(3)	(4)	(5)	(6)
Routineness measure:	RT	RT	RT	RT	RTC	RTM
AvgObedWork$_{c,t-5}$ × Routineness$_i$	1.6275***	6.0246***	2.7224***	2.8511**	2.3146**	1.3896
	[0.3904]	[1.0643]	[1.0070]	[1.1516]	[1.1393]	[2.1153]
Phy. Capital Stock$_{c,t-5}$ × Capital Intensity$_i$			0.1852***	0.1847***	0.1923***	0.1958***
			[0.0583]	[0.0599]	[0.0613]	[0.0596]
Human Capital Stock$_{c,t-5}$ × Skill Intensity$_i$			1.2670***	1.0783***	1.0573***	1.2337***
			[0.2385]	[0.2489]	[0.2643]	[0.2376]
Rule of Law$_{c,t-5}$ × Industry$_i$ dummies?	N	N	N	Y	Y	Y
Financial Devt$_{c,t-5}$ × Industry$_i$ dummies?	N	N	N	Y	Y	Y
Country-year (ct) dummies?	Y	Y	Y	Y	Y	Y
Country-industry (ci) dummies?	Y	Y	Y	Y	Y	Y
Observations	19,589	17,063	16,194	15,016	15,016	15,016
No. of countries	58	58	58	56	56	56
R^2	0.9500	0.9523	0.9579	0.9611	0.9611	0.9610

Notes: Standard errors are clustered by country; ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively. The dependent variable is log exports at the country-industry level averaged over each five-year window (1990-1994 through 2010-2014), where the industry classification follows the Ind6090 CIC codes from Autor, Levy and Murnane (2003). The AvgObedWork measure is a population-weighted average of the estimated country-cohort-gender fixed effects, as described in Section 2.1. All country-level explanatory variables, including AvgObedWork, are five-year lagged averages of the corresponding log export observations. The industry routineness measure used in Columns 1-4 is the overall RT measure, while Columns 5 and 6 respectively use the cognitive routineness (RTC) and manual routineness (RTM) measures. All columns include country-year and country-industry fixed effects. Columns 4-6 further include country measures of rule of law and financial development, each interacted against a full set of Ind6090 CIC industry dummies.

Table 3
"Specialization Fact": Controlling for Other Cultural Variables

Dependent variable:	**Log (Exports$_{cit}$)**						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Routineness measure:	RTC	RTC	RTC	RTC	RTC	RTC	RTC
AvgObedWork$_{c,t-5}$ × Routineness$_i$	3.9917**	3.9970**	3.9946**	2.6886*	6.1064***	4.0555**	4.9030***
	[1.6524]	[1.6693]	[1.7233]	[1.4644]	[1.9315]	[1.7061]	[1.6655]
Phy. Capital Stock$_{c,t-5}$ × Capital Intensity$_i$	0.1693***	0.1693***	0.1613**	0.1465**	0.1118**	0.1683***	0.1221**
	[0.0606]	[0.0607]	[0.0607]	[0.0611]	[0.0533]	[0.0605]	[0.0549]
Human Capital Stock$_{c,t-5}$ × Skill Intensity$_i$	0.6233*	0.6233*	0.6214*	1.0186**	0.7897*	0.6228*	1.0780**
	[0.3556]	[0.3557]	[0.3555]	[0.3907]	[0.3997]	[0.3556]	[0.3974]
Human Capital Stock$_{c,t-5}$ × Routineness$_i$	-0.6398**	-0.6414**	-0.5343*	-0.2534	-0.5444	-0.6059*	0.1140
	[0.2857]	[0.2931]	[0.3115]	[0.3496]	[0.3654]	[0.3040]	[0.3833]
AvgObedWork$_{c,t-5}$ × Skill Intensity$_i$	3.2687	3.2688	3.2677	3.0911	5.9223***	3.2682	5.0543***
	[1.9568]	[1.9574]	[1.9569]	[2.0268]	[1.7641]	[1.9569]	[1.7329]
Indepedence$_{c,t-5}$ × Routineness$_i$		0.0866					4.5815**
		[2.0325]					[2.2308]
Hard Work$_{c,t-5}$ × Routineness$_i$			3.2748**				0.2240
			[1.4907]				[2.3170]
Work as a Duty$_{c,t-5}$ × Routineness$_i$				0.9121			1.9561**
				[0.6829]			[0.7413]
Individualism$_{c,t-5}$ × Routineness$_i$					-0.1477		-0.6223
					[0.8867]		[0.9552]
AvgObedChildren$_{c,t-5}$ × Routineness$_i$						-1.5092	-3.0561
						[2.9918]	[3.0319]
Rule of Law$_{c,t-5}$ × Industry$_i$ dummies?	Y	Y	Y	Y	Y	Y	Y
Financial Devt$_{c,t-5}$ × Industry$_i$ dummies?	Y	Y	Y	Y	Y	Y	Y
Country-year (ct) dummies?	Y	Y	Y	Y	Y	Y	Y
Country-industry (ci) dummies?	Y	Y	Y	Y	Y	Y	Y
Observations	15,016	15,016	15,016	11,256	10,842	15,016	9,669
No. of countries	56	56	56	41	40	56	35
R^2	0.9612	0.9612	0.9612	0.9661	0.9687	0.9612	0.9712

Notes: Standard errors are clustered by country; ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively. The dependent variable is log exports at the country-industry level averaged over each five-year window (1990-1994 through 2010-2014), where the industry classification follows the Ind6090 CIC codes from Autor, Levy and Murnane (2003). The AvgObedWork measure is a population-weighted average of the estimated country-cohort-gender fixed effects, as described in Section 2.1; the additional measures of cultural attitudes in Columns 2-7 are constructed in an analogous fashion based on different WVS questions (as listed in the Data Appendix). All country-level explanatory variables, including AvgObedWork, are five-year lagged averages of the corresponding log export observations. The industry routineness measure used in all columns is the cognitive routineness (RTC) measure. All columns include country-year and country-industry fixed effects, as well as country measures of rule of law and financial development each interacted against a full set of Ind6090 CIC industry dummies.

Table 4
"Specialization Fact": Additional Specifications

Dependent variable:	Log ($Exports_{cit}$)				
	(1)	(2)	(3)	(4)	(5)
Routineness measure:	RTC	RTC	RTC	RTC	RTC
	ObedWork (IV)	Lag Dep Var	Arellano-Bond	Other FEs	Other FEs
$AvgObedWork_{c,t-5}$ × $Routineness_i$	3.6734**	3.2397***	17.6514**	0.1694	3.7812**
	[1.5079]	[1.0380]	[8.0174]	[0.4881]	[1.5760]
Phy. Capital $Stock_{c,t-5}$ × Capital $Intensity_i$	0.1682***	0.1305***	-0.1038	0.2494***	0.0406
	[0.0601]	[0.0443]	[0.2537]	[0.0818]	[0.0818]
Human Capital $Stock_{c,t-5}$ × Skill $Intensity_i$	0.7359*	0.2081	0.2925	0.5247**	-0.2826
	[0.3831]	[0.2524]	[0.6438]	[0.2012]	[0.6041]
Human Capital $Stock_{c,t-5}$ × $Routineness_i$	-0.5047	-0.8325***	-0.2859	0.2254	-0.1287
	[0.3181]	[0.2039]	[0.6767]	[0.1820]	[0.5703]
$AvgObedWork_{c,t-5}$ × Skill $Intensity_i$	3.0168*	2.9458**	1.8218	0.0079	4.2063**
	[1.7696]	[1.2398]	[9.0203]	[0.5112]	[1.9155]
Log ($Exports_{ci,t-5}$)		0.2989***	0.3870***		
		[0.0243]	[0.0430]		
Rule of $Law_{c,t-5}$ × $Industry_i$ dummies?	Y	Y	Y	Y	Y
Financial $Devt_{c,t-5}$ × $Industry_i$ dummies?	Y	Y	Y	Y	Y
Country-year (ct) dummies?	Y	Y	Y	Y	Y
Country-industry (ci) dummies?	Y	Y	Y	N	Y
Industry (i) dummies?	N	N	N	Y	N
Industry-year (it) dummies?	N	N	N	N	Y
Observations	15,016	14,857	11,546	15,016	15,016
No. of countries	56	56	55	56	56
R^2	0.9611	0.9670	---	0.8169	0.9641
F-stat	93.17	---	---	---	---
AR1	---	---	0.0000	---	---
AR2	---	---	0.2211	---	---
Sargan	---	---	372.32	---	---

Notes: Standard errors are clustered by country; ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively. The dependent variable is log exports at the country-industry level averaged over each five-year window (1990-1994 through 2010-2014), where the industry classification follows the Ind6090 CIC codes from Autor, Levy and Murnane (2003). The AvgObedWork measure is a population-weighted average of the estimated country-cohort-gender fixed effects, as described in Section 2.1. The exception is Column 1, where a population-weighted average of the simple country-cohort-gender mean scores from the WVS is used, and AvgObedWork is used instead as an instrumental variable (in both the interaction terms involving industry routineness and industry skill-intensity). All country-level explanatory variables, including AvgObedWork, are five-year lagged averages of the corresponding log export observations. The industry routineness measure used in all columns is the cognitive routineness (RTC) measure. All columns include country measures of rule of law and financial development, each interacted against a full set of Ind6090 CIC industry dummies. Column 2 includes lagged exports from the previous five-year period as a right-hand side variable, while Column 3 performs Arellano-Bond estimation. Column 1-3 control for country-year and country-industry fixed effects; Column 4 controls instead for country-year and industry fixed effects; and Column 5 controls for country-year, country-industry, and industry-year fixed effects.

Table 5

"Obedience Fact": How Past Exposure to Export-Routineness Affects Workplace Obedience

Dependent variable:	**Importance of obedience in the workplace**							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ExpRTC exposure at:	Age 0	Age 5	Age 10	Age 15	Age 20	Age 25	Age 30	Age 35
A: OLS								
$Education_r$	-0.0198***	-0.0204***	-0.0207***	-0.0220***	-0.0239***	-0.0247***	-0.0250***	-0.0250***
	[0.0049]	[0.0046]	[0.0042]	[0.0036]	[0.0033]	[0.0033]	[0.0031]	[0.0030]
$Educ_r \times ExpRTCexposure_{cb}$	0.0110	0.0143**	0.0159***	0.0111*	0.0078	0.0053	0.0011	-0.0002
	[0.0077]	[0.0068]	[0.0057]	[0.0062]	[0.0058]	[0.0066]	[0.0064]	[0.0069]
Observations	50,497	65,199	78,809	90,112	99,228	106,399	112,779	111,169
No. of countries	65	65	65	65	65	65	65	65
R^2	0.0727	0.0719	0.0740	0.0740	0.0756	0.0775	0.0785	0.0792
B: Instrumental Variables								
$Education_r$	-0.0208***	-0.0199***	-0.0207***	-0.0215***	-0.0241***	-0.0250***	-0.0256***	-0.0253***
	[0.0048]	[0.0048]	[0.0043]	[0.0038]	[0.0034]	[0.0032]	[0.0031]	[0.0030]
$Educ_r \times ExpRTCexposure_{cb}$	0.0080	0.0160**	0.0165***	0.0151**	0.0086	0.0057	0.0023	0.0008
	[0.0084]	[0.0073]	[0.0061]	[0.0061]	[0.0066]	[0.0070]	[0.0067]	[0.0070]
Observations	49,907	64,717	77,572	87,685	96,616	103,494	109,552	108,111
No. of countries	65	65	65	65	65	65	65	65
R^2	0.0725	0.0718	0.0737	0.0729	0.0752	0.0775	0.0783	0.0785
Kleinberger-Paap Wald F-stat	419.47	642.49	774.09	1097.48	874.51	960.49	871.03	745.28
Additional controls:	All columns: Number of children, Marital status							
Country-wave (cw) dummies?	Y	Y	Y	Y	Y	Y	Y	Y
Cty-cohort-gender (cbg) dummies?	Y	Y	Y	Y	Y	Y	Y	Y

Notes: Standard errors are clustered by country; ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively. The dependent variable is the response provided to WVS question C061 on one's propensity to follow instructions in the workplace. Each successive column tests for whether the cognitive routineness of exports (expRTC) that the respondent was exposed to in the five-year window where he/she turned age A (where A=0, 5, 10 etc.) affects attitudes towards workplace obedience. All columns include survey country-wave and country-cohort-gender fixed effects, as well as a full set of dummies for number of children and marital status. Panel A performs the estimation via OLS, while Panel B reports instrumental variables estimates using a constructed "shift-share" IV for expRTC.

Table 6

"Obedience Fact": Controlling for Education Interacted by Country-Wave Fixed Effects

Dependent variable:	**Importance of obedience in the workplace**							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ExpRTC exposure at:	Age 0	Age 5	Age 10	Age 15	Age 20	Age 25	Age 30	Age 35
A: OLS								
$Education_r$	0.0220***	0.0190***	0.0081***	0.0085***	0.0069***	0.0031***	0.0016***	0.0014
	[0.0024]	[0.0025]	[0.0024]	[0.0016]	[0.0008]	[0.0004]	[0.0006]	[0.0012]
$Educ_r \times ExpRTCexposure_{cb}$	0.0304***	0.0234***	0.0176**	0.0119**	0.0060	0.0017	-0.0043	-0.0063
	[0.0060]	[0.0071]	[0.0073]	[0.0057]	[0.0048]	[0.0050]	[0.0060]	[0.0071]
Observations	50,501	65,203	78,813	90,116	99,232	106,403	112,784	111,173
No. of countries	65	65	65	65	65	65	65	65
R^2	0.0774	0.0762	0.0780	0.0777	0.0791	0.0811	0.0819	0.0827
B: Instrumental Variables								
$Education_r$	0.0187***	0.0230***	0.0088***	0.0101***	0.0070***	0.0031***	0.0015**	0.0011
	[0.0041]	[0.0027]	[0.0025]	[0.0017]	[0.0010]	[0.0004]	[0.0006]	[0.0013]
$Educ_r \times ExpRTCexposure_{cb}$	0.0222**	0.0346***	0.0196**	0.0177***	0.0064	0.0014	-0.0024	-0.0042
	[0.0104]	[0.0077]	[0.0077]	[0.0062]	[0.0071]	[0.0060]	[0.0069]	[0.0078]
Observations	49,907	64,717	77,572	87,685	96,616	103,494	109,552	108,111
No. of countries	65	65	65	65	65	65	65	65
R^2	0.0771	0.0760	0.0777	0.0768	0.0788	0.0811	0.0816	0.0820
Kleinberger-Paap Wald F-stat	87.92	153.39	144.45	195.42	166.76	217.45	227.32	239.66
Additional controls:	All columns: Number of children, Marital status							
Country-wave (cw) dummies?	Y	Y	Y	Y	Y	Y	Y	Y
Cty-cohort-gender (cbg) dummies?	Y	Y	Y	Y	Y	Y	Y	Y
$Educ_r \times$ Country-wave (cw) dummies?	Y	Y	Y	Y	Y	Y	Y	Y

Notes: Standard errors are clustered by country; ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively. The dependent variable is the response provided to WVS question C061 on one's propensity to follow instructions in the workplace. Each successive column tests for whether the cognitive routineness of exports (expRTC) that the respondent was exposed to in the five-year window where he/she turned age A (where A=0, 5, 10 etc.) affects attitudes towards workplace obedience. All columns include survey country-wave and country-cohort-gender fixed effects, respondent education interacted with country-wave fixed effects, as well as a full set of dummies for the number of children and marital status. Panel A performs the estimation via OLS, while Panel B reports instrumental variables estimates using a constructed "shift-share" IV for expRTC.

Table 7
"Obedience Fact": Further Robustness

Dependent variable:	**Importance of obedience in the workplace**							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ExpRTC exposure at:	Age 0	Age 5	Age 10	Age 15	Age 20	Age 25	Age 30	Age 35
<u>Instrumental Variables</u>								
	A: <u>Drop Countries with >=5% Share of World Exports or Imports</u>							
$Educ_r \times ExpRTCexposure_{cb}$	0.0229**	0.0357***	0.0217***	0.0182***	0.0077	0.0022	-0.0021	-0.0042
	[0.0104]	[0.0077]	[0.0076]	[0.0063]	[0.0070]	[0.0060]	[0.0071]	[0.0080]
	B: <u>Alternative RHS variable: Importance of Obedience in Children</u>							
$Educ_r \times ExpRTCexposure_{cb}$	0.0002	-0.0012	-0.0004	0.0009	-0.0009	0.0017	0.0044	0.0047
	[0.0056]	[0.0030]	[0.0024]	[0.0024]	[0.0029]	[0.0027]	[0.0028]	[0.0033]
	C: <u>Controlling for $Educ_r$ × Country-Cohort Exposure to Export Skill- and Capital-Intensity</u>							
$Educ_r \times ExpRTCexposure_{cb}$	0.0180*	0.0380***	0.0192**	0.0181**	0.0109	0.0030	-0.0056	-0.0136*
	[0.0106]	[0.0077]	[0.0078]	[0.0071]	[0.0081]	[0.0071]	[0.0080]	[0.0071]
	D: <u>Controlling for $Educ_r$ × Country-Cohort Exposure to Income per capita, Openness, Democracy</u>							
$Educ_r \times ExpRTCexposure_{cb}$	0.0244	0.0317**	0.0234***	0.0322***	0.0163**	0.0012	-0.0097	-0.0179**
	[0.0276]	[0.0143]	[0.0089]	[0.0071]	[0.0080]	[0.0072]	[0.0087]	[0.0080]
Additional controls:	All columns: Dummies for Number of children, Marital status							
Country-wave (cw) dummies?	Y	Y	Y	Y	Y	Y	Y	Y
Cty-cohort-gender (cbg) dummies?	Y	Y	Y	Y	Y	Y	Y	Y
$Educ_r$ × Country-wave (cw) dummies?	Y	Y	Y	Y	Y	Y	Y	Y

Notes: Standard errors are clustered by country; ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively. The dependent variable is the response provided to WVS question C061 on one's propensity to follow instructions in the workplace, except in Panel B where the dependent variable is instead drawn from WVS question A042 on the importance of obedience in children. Each successive column tests for whether the cognitive routineness of exports (expRTC) that the respondent was exposed to in the five-year window where he/she turned age A (where A=0, 5, 10 etc.) affects attitudes towards workplace obedience. All columns include survey country-wave and country-cohort-gender fixed effects, respondent education interacted with country-wave fixed effects, as well as a full set of dummies for the number of children and marital status. All columns report instrumental variables estimates using a constructed "shift-share" IV for expRTC; the Kleinberger-Paap F-statistics obtained range between 19.85 and 406.63. Only the coefficient on the interaction term between respondent education and expRTC exposure at age A is reported. In Panel A, countries that had a world share of exports or imports >=5% in any five-year window between 1965 and 2010 are dropped; these are CAN, CHN, DEU, FRA, GBR, ITA, JPN, and USA. In Panel C, additional controls for respondent eduction interacted with the skill-intensity and capital-intensity of country-cohort exposure to exports are included; these latter variables are also instrumented using an analogously constructed "shift-share" IV. In Panel D, controls for respondent education interacted with country-cohort exposure to log GDP per capita, exports over GDP, and democracy are included.

Appendix Table 1
The Workplace Obedience Measure: List of Available Countries/Territories

Albania (ALB)	Germany (DEU)	Puerto Rico (PRI)
Algeria (DZA)	Guatemala (GTM)	Romania (ROM)
Argentina (ARG)	Hong Kong (HKG)	Russia (RUS)
Armenia (ARM)	Hungary (HUN)	Saudi Arabia (SAU)
Australia (AUS)	India (IND)	Serbia (SRB)
Azerbaijan (AZE)	Indonesia (IDN)	Singapore (SGP)
Bangladesh (BGD)	Iran (IRN)	Slovakia (SVK)
Belarus (BLR)	Japan (JPN)	Slovenia (SVN)
Bosnia-Herzegovina (BIH)	Jordan (JOR)	South Africa (ZAF)
Brazil (BRA)	Korea (KOR)	Spain (ESP)
Bulgaria (BGR)	Kyrgyzstan (KGZ)	Sweden (SWE)
Canada (CAN)	Latvia (LVA)	Switzerland (CHE)
Chile (CHL)	Lithuania (LTU)	Taiwan (TWN)
China (CHN)	Macedonia (MKD)	Tanzania (TZA)
Croatia (HRV)	Mexico (MEX)	Turkey (TUR)
Czech Republic (CZE)	Moldova (MDA)	Uganda (UGA)
Dominican Republic (DOM)	Morocco (MAR)	Ukraine (UKR)
Egypt (EGY)	New Zealand (NZL)	United States (USA)
El Salvador (SLV)	Nigeria (NGA)	Uruguay (URY)
Estonia (EST)	Norway (NOR)	Venezuela (VEN)
Finland (FIN)	Peru (PER)	Vietnam (VNM)
Georgia (GEO)	Philippines (PHL)	Zimbabwe (ZWE)

Notes: List of 66 countries/territories in which WVS question C061 on following instructions in the workplace was asked in at least one survey-wave. The "Specialization Fact" regressions in Tables 2-4 and Appendix Tables 5-6 contain fewer countries due to the lack of information on physical and human capital endowments for a small number of countries. The "Obedience Fact" regressions in Tables 5-7 and Appendix Tables 7-9 contain one fewer country, as there is no information on respondent education for HRV in the WVS.

Appendix Table 2
Explaining Attitudes Towards Workplace Obedience

Dependent variable:	Following Instructions in the workplace (1-3)		
	(1)	(2)	(3)
$Education_r$	-0.0240***	-0.0216***	-0.0202***
	[0.0043]	[0.0033]	[0.0029]
$Gender_r$ (1=Female; 0=Male)	-0.0291***	---	---
	[0.0099]		
Country-cohort-gender (cbg) dummies?	N	Y	Y
Country-wave (cw) dummies?	N	N	Y
	Additional controls: with p-value of test of joint significance		
Dummies for number of children?	Y (0.0315)	Y (0.2095)	Y (0.2227)
Dummies for marital status?	Y (0.0000)	Y (0.1886)	Y (0.0000)
Dummies for size of town	Y (0.0582)	Y (0.1683)	Y (0.2135)
Dummies for employment status?	Y (0.0803)	Y (0.0169)	Y (0.0028)
Dummies for occupation?	Y (0.0000)	Y (0.0000)	Y (0.0000)
Observations	125,709	125,625	125,625
No. of countries	65	65	65
R^2	0.0121	0.0771	0.0856

Notes: Standard errors are clustered by country; ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively. The dependent variable is the response provided to WVS question C061 on one's propensity to follow instructions in the workplace. Column 1 contains only respondent characteristics as explanatory variables, while Column 2 adds country-cohort-gender fixed effects, and Column 3 further adds country-survey wave fixed effects. Each column includes full sets of dummy variables for number of children, marital status, size of town, employment status, and occupation of the respondent. The p-value from a F-test for the joint significance of each of these sets of respondent-related dummy variables is reported.

Appendix Table 3
The Five Most and Least Routine Manufacturing Industries

	Cognitive (RTC)		Manual (RTM)
Five Least Routine		Five Least Routine	
Not specified food industries (122)	-0.869	Logging (230)	-0.039
Drugs (181)	-0.613	Dairy Products (101)	0.428
Guided missiles, space vehicles, and parts. Ordnance, and Aircraft and parts (362)	-0.374	Cement, concrete, and gypsum, and plaster products (251)	0.619
Plastics, synthetics, and resins; Soaps and cosmetics; Agricultural Chemicals; Industrial and miscellaneous chemicals (346)	-0.311	Sawmills, planing mills, and millwork (231)	0.620
Newspaper publishing and printing (171)	-0.305	Beverage (120)	0.774
Five Most Routine		Five Most Routine	
Logging (230)	1.079	Not specified food industries (122)	1.451
Apparel and accessories, except knit (151)	1.080	Engine and turbines; Construction and material handling machines; metalworking machinery; machinery, except electrical, n.e.c.; etc. (176)	1.474
Footwear, except rubber and plastic (221)	1.141	Drugs (181)	1.519
Yarn, thread, and fabric mills (142)	1.308	Newspaper publishing and printing (171)	1.644
Knitting mills (132)	1.410	Printing, publishing, and allied industries except newspapers (172)	1.766

Notes: Based on the Ind6090 CIC codes from Autor, Levy and Murnane (2003). The table lists the five most and least routine manufacturing industries, for the cognitive and manual routineness measures respectively. The manufacturing industries are those industries with CIC codes ranging from 100 to 392.

Appendix Table 4
Summary Statistics: "Specialization Fact"

	25th percentile	Median	75th percentile	Mean	Std. Dev.
<u>Country variables</u>					
Log Physical Capital per Worker	10.203	11.185	11.959	10.970	1.229
Human Capital	1.982	2.625	3.104	2.548	0.646
Log Real GDP per worker	9.431	10.183	10.829	10.056	0.947
Rule of Law	3	4	5	4.019	1.374
Private Credit over GDP	18.710	35.771	74.494	51.173	43.281
AvgObedWork	-0.174	-0.016	0.144	-0.022	0.223
Obedience in Children	-0.177	-0.039	0.108	-0.032	0.171
Independence in Children	-0.124	-0.012	0.152	0.016	0.164
Hard Work in Children	-0.177	0.034	0.204	-0.005	0.232
Work as a Duty	-0.243	-0.041	0.107	-0.015	0.345
Individualism	-0.145	0.086	0.218	-0.007	0.434
Median age in pop. 25-64	35	35	40	37.474	2.640
<u>Industry variables</u>					
Overall routineness (RT)	1.136	1.399	1.690	1.301	0.735
Cognitive routineness (RTC)	0.077	0.321	0.580	0.229	0.655
Manual routineness (RTM)	0.988	1.120	1.273	1.071	0.325
Overall routineness (RT, manuf. only)	1.255	1.419	1.703	1.462	0.431
Cognitive routineness (RTC, manuf. only)	0.101	0.325	0.581	0.333	0.439
Manual routineness (RTM, manuf. only)	1.031	1.127	1.289	1.129	0.277
Physical capital intensity	3.618	3.982	4.467	4.048	0.745
Skill intensity	-1.646	-1.427	-1.101	-1.375	0.405
Value-added over shipments	0.393	0.455	0.553	0.464	0.130
Job Complexity	0.277	0.385	0.621	0.443	0.236
Input Herfindahl	0.024	0.049	0.079	0.074	0.080

Notes: Summary statistics are tabulated for the baseline regression sample in Table 2, Column 1. The country variables are summarized over all country-year observations in the sample; the cultural variables (AvgObedWork through Individualism) are weighted averages of the country-cohort-gender fixed effects estimated as described in Section 2.1. The industry variables are summarized over 69 Ind6090 CIC industries (61 of which are in manufacturing).

Appendix Table 5
"Specialization Fact" Robustness: Other Country Variables

Dependent variable:	Log ($Exports_{cit}$)				
	(1)	(2)	(3)	(4)	(5)
Routineness measure:	RTC	RTC	RTC	RTC	RTC
$AvgObedWork_{c,t-5}$ × $Routineness_i$	3.9795**	4.0281**	3.9982**	3.8857**	3.7796**
	[1.6498]	[1.6500]	[1.6577]	[1.6281]	[1.6403]
Phy. Capital $Stock_{c,t-5}$ × Capital $Intensity_i$	0.1665***	0.1815***	0.1692***	0.1736***	0.1815***
	[0.0601]	[0.0581]	[0.0606]	[0.0601]	[0.0581]
Human Capital $Stock_{c,t-5}$ × Skill $Intensity_i$	0.6223*	0.6274*	0.6233*	0.6263*	0.6289*
	[0.3555]	[0.3558]	[0.3556]	[0.3554]	[0.3556]
Human Capital $Stock_{c,t-5}$ × $Routineness_i$	-0.6165*	-0.7404**	-0.6356**	-0.6030*	-0.7000*
	[0.3363]	[0.3475]	[0.3033]	[0.3038]	[0.3597]
$AvgObedWork_{c,t-5}$ × Skill $Intensity_i$	3.2695	3.2687	3.2686	3.2745*	3.2779*
	[1.9566]	[1.9579]	[1.9569]	[1.9559]	[1.9572]
Log GDP per $capita_{c,t-5}$ × $Routineness_i$	-0.0348				-0.1593
	[0.1505]				[0.2124]
Phy. Capital $Stock_{c,t-5}$ × $Routineness_i$		0.0861			0.1426
		[0.1102]			[0.1861]
Median $Age_{c,t-5}$ × $Routineness_i$			-0.0015		0.0199
			[0.0203]		[0.0143]
Age Shares in $Pop_{c,t-5}$ × $Routineness_i$?	N	N	N	Y	Y
Rule of $Law_{c,t-5}$ × $Industry_i$ dummies?	Y	Y	Y	Y	Y
Financial $Devt_{c,t-5}$ × $Industry_i$ dummies?	Y	Y	Y	Y	Y
Country-year (ct) dummies?	Y	Y	Y	Y	Y
Country-industry (ci) dummies?	Y	Y	Y	Y	Y
Observations	15,016	15,016	15,016	15,016	15,016
No. of countries	56	56	56	56	56
R^2	0.9612	0.9612	0.9612	0.9612	0.9613

Notes: Standard errors are clustered by country; ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively. The dependent variable is log exports at the country-industry level averaged over each five-year window (1990-1994 through 2010-2014), where the industry classification follows the Ind6090 CIC codes from Autor, Levy and Murnane (2003). The AvgObedWork measure is a population-weighted average of the estimated country-cohort-gender fixed effects, as described in Section 2.1. The median age variable used in Columns 3 and 5 is the median over the population aged 25-64. The age shares included in Columns 4 and 5 are the shares aged 25-29, 30-34,..., 60-64 in the population aged 25-64; one of the shares is dropped in each regression as the shares sum to 1. All country-level explanatory variables, including AvgObedWork, are five-year lagged averages of the corresponding log export observations. The industry routineness measure used in all columns is the cognitive routineness (RTC) measure. All columns include country-year and country-industry fixed effects, as well as country measures of rule of law and financial development each interacted against a full set of Ind6090 CIC industry dummies.

Appendix Table 6
"Specialization Fact" Robustness: Other Industry Variables

Dependent variable:	**Log (Exports$_{cit}$)**				
	(1)	(2)	(3)	(4)	(5)
Routineness measure:	RTC	RTC	RTC	RTC	RTC
AvgObedWork$_{c,t-5}$ × Routineness$_i$	3.2476*	2.9232**	4.2029**	4.1522**	3.5900**
	[1.6595]	[1.4127]	[1.6578]	[1.7821]	[1.6450]
Phy. Capital Stock$_{c,t-5}$ × Capital Intensity$_i$	0.1616**	0.1384**	0.1688***	0.1698***	0.1382**
	[0.0615]	[0.0671]	[0.0606]	[0.0606]	[0.0672]
Human Capital Stock$_{c,t-5}$ × Skill Intensity$_i$	0.6206*	0.6145*	0.6224*	0.6239*	0.6153*
	[0.3553]	[0.3563]	[0.3556]	[0.3556]	[0.3561]
Human Capital Stock$_{c,t-5}$ × Routineness$_i$	-0.6481**	-0.6737**	-0.6406**	-0.6390**	-0.6729**
	[0.2849]	[0.2896]	[0.2853]	[0.2859]	[0.2894]
AvgObedWork$_{c,t-5}$ × Skill Intensity$_i$	2.2229	2.9906	2.4988	3.4105*	2.0839
	[1.9888]	[1.9185]	[1.9185]	[2.0325]	[2.0488]
AvgObedWork$_{c,t-5}$ × Value-added Share$_i$	4.1244				2.8624
	[2.6869]				[5.4440]
AvgObedWork$_{c,t-5}$ × Capital Intensity$_i$		-1.3002			-1.1730
		[0.9414]			[1.1885]
AvgObedWork$_{c,t-5}$ × Complexity$_i$			2.4489		2.9730
			[1.6361]		[1.8916]
AvgObedWork$_{c,t-5}$ × Input Herfindahl$_i$				1.5545	7.9636
				[3.3172]	[5.2314]
Rule of Law$_{c,t-5}$ × Industry$_i$ dummies?	Y	Y	Y	Y	Y
Financial Devt$_{c,t-5}$ × Industry$_i$ dummies?	Y	Y	Y	Y	Y
Country-year (ct) dummies?	Y	Y	Y	Y	Y
Country-industry (ci) dummies?	Y	Y	Y	Y	Y
Observations	15,016	15,016	15,016	15,016	15,016
No. of countries	56	56	56	56	56
R^2	0.9612	0.9612	0.9612	0.9612	0.9612

Notes: Standard errors are clustered by country; ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively. The dependent variable is log exports at the country-industry level averaged over each five-year window (1990-1994 through 2010-2014), where the industry classification follows the Ind6090 CIC codes from Autor, Levy and Murnane (2003). The AvgObedWork measure is a population-weighted average of the estimated country-cohort-gender fixed effects, as described in Section 2.1. All country-level explanatory variables, including AvgObedWork, are five-year lagged averages of the corresponding log export observations. The industry routineness measure used in all columns is the cognitive routineness (RTC) measure. Column 1 includes the interaction of AvgObedWork with the industry value-added share in total shipments; Column 2 includes the interaction with industry capital intensity; Column 3 includes the interaction with a measure of industry complexity from Costinot (2009); and Column 4 includes a measure of the industry Herfindahl index of input use constructed from 1992 U.S. Input-Output Tables, following Levchenko (2007). All columns include country-year and country-industry fixed effects, as well as country measures of rule of law and financial development each interacted against a full set of Ind6090 CIC industry dummies.

Appendix Table 7
"Obedience Fact": Further Robustness Checks

Dependent variable:	Importance of obedience in the workplace							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ExpRTC exposure at:	Age 0	Age 5	Age 10	Age 15	Age 20	Age 25	Age 30	Age 35
Instrumental Variables								
	A: Overall Export Routineness (RT)							
$Educ_r$ × $ExpRTexposure_{cb}$	0.0170**	0.0244***	0.0128**	0.0128***	0.0064	0.0031	0.0013	-0.0018
	[0.0075]	[0.0055]	[0.0063]	[0.0049]	[0.0053]	[0.0044]	[0.0054]	[0.0060]
	B: Drop transition countries							
$Educ_r$ × $ExpRTCexposure_{cb}$	0.0228**	0.0353***	0.0208***	0.0191***	0.0123**	0.0047	-0.0018	-0.0065
	[0.0106]	[0.0072]	[0.0080]	[0.0061]	[0.0053]	[0.0059]	[0.0072]	[0.0077]
	C: Manufacturing Exports Only							
$Educ_r$ × $ExpRTCexposure_{cb}$	-0.0134	0.0744**	0.0715***	0.0365*	-0.0167	-0.0311*	-0.0140	0.0056
	[0.0425]	[0.0306]	[0.0230]	[0.0197]	[0.0140]	[0.0160]	[0.0195]	[0.0196]
Additional controls:	All columns: Dummies for Number of children, Marital status							
Country-wave (cw) dummies?	Y	Y	Y	Y	Y	Y	Y	Y
Cty-cohort-gender (cbg) dummies?	Y	Y	Y	Y	Y	Y	Y	Y
$Educ_r$ × Country-wave (cw) dummies?	Y	Y	Y	Y	Y	Y	Y	Y

Notes: Standard errors are clustered by country; ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively. The dependent variable is the response provided to WVS question C061 on one's propensity to follow instructions in the workplace. Each successive column tests for whether the cognitive routineness of exports (expRTC) that the respondent was exposed to in the five-year window where he/she turned age A (where A=0, 5, 10 etc.) affects attitudes towards workplace obedience. All columns include survey country-wave and country-cohort-gender fixed effects, respondent education interacted with country-wave fixed effects, as well as a full set of dummies for the number of children and marital status. All columns report instrumental variables estimates using a constructed "shift-share" IV for expRTC; the Kleinberger-Paap F-statistics obtained range between 81.39 and 725.54. Only the coefficient on the interaction term between respondent education and expRTC exposure at age A is reported. In Panel A, the measure of export routineness is based on the overall RT index (instead of RTC). In Panel B, countries that experienced political transitions are dropped. In Panel C, the measure of export routineness (RTC) is based only on manufacturing exports.

Appendix Table 8
"Obedience Fact": Specification with Alternative Fixed Effects (Cohort-Gender)

Dependent variable:	Importance of obedience in the workplace							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ExpRTC exposure at:	Age 0	Age 5	Age 10	Age 15	Age 20	Age 25	Age 30	Age 35
A: OLS								
$Education_r$	-0.0198***	-0.0202***	-0.0207***	-0.0217***	-0.0236***	-0.0247***	-0.0253***	-0.0254***
	[0.0047]	[0.0044]	[0.0040]	[0.0035]	[0.0032]	[0.0031]	[0.0030]	[0.0029]
$Educ_r \times ExpRTCexposure_{cb}$	0.0098	0.0150**	0.0157***	0.0135**	0.0111**	0.0076	0.0039	0.0038
	[0.0081]	[0.0062]	[0.0056]	[0.0052]	[0.0052]	[0.0060]	[0.0056]	[0.0064]
$ExpRTCexposure_{cb}$	-0.0159	-0.0975**	-0.0863*	-0.0423	-0.0544	-0.0544	-0.0287	-0.0114
	[0.0596]	[0.0479]	[0.0481]	[0.0385]	[0.0432]	[0.0438]	[0.0409]	[0.0410]
Observations	50,500	65,202	78,812	90,115	99,231	106,403	112,784	111,173
No. of countries	65	65	65	65	65	65	65	65
R^2	0.0637	0.0625	0.0641	0.0638	0.0649	0.0661	0.0666	0.0667
B: Instrumental Variables								
$Education_r$	-0.0207***	-0.0196***	-0.0206***	-0.0213***	-0.0238***	-0.0250***	-0.0258***	-0.0256***
	[0.0046]	[0.0046]	[0.0041]	[0.0036]	[0.0032]	[0.0031]	[0.0030]	[0.0029]
$Educ_r \times ExpRTCexposure_{cb}$	0.0070	0.0172**	0.0169***	0.0163***	0.0136**	0.0088	0.0050	0.0036
	[0.0085]	[0.0069]	[0.0062]	[0.0057]	[0.0055]	[0.0064]	[0.0060]	[0.0066]
$ExpRTCexposure_{cb}$	-0.0050	-0.0979*	-0.0938*	-0.0660	-0.0379	-0.0529	-0.0420	-0.0094
	[0.0789]	[0.0592]	[0.0496]	[0.0466]	[0.0398]	[0.0444]	[0.0488]	[0.0419]
Observations	49,911	64,721	77,576	87,689	96,620	103,498	109,557	108,115
No. of countries	65	65	65	65	65	65	65	65
R^2	0.0635	0.0624	0.0637	0.0629	0.0645	0.0661	0.0664	0.0662
Kleinberger-Paap Wald F-stat	36.02	55.89	49.93	61.62	41.75	43.63	46.85	45.54
Additional controls:	All columns: Dummies for Number of children, Marital status							
Country-wave (cw) dummies?	Y	Y	Y	Y	Y	Y	Y	Y
Cohort-Gender (bg) dummies?	Y	Y	Y	Y	Y	Y	Y	Y

Notes: Standard errors are clustered by country; ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively. The dependent variable is the response provided to WVS question C061 on one's propensity to follow instructions in the workplace. Each successive column tests for whether the cognitive routineness of exports (expRTC) that the respondent was exposed to in the five-year window where he/she turned age A (where A=0, 5, 10 etc.) affects attitudes towards workplace obedience. All columns include survey country-wave and respondent cohort-gender fixed effects, as well as a full set of dummies for number of children and marital status. Panel A performs the estimation via OLS, while Panel B reports instrumental variables estimates using a constructed "shift-share" IV for expRTC.

Appendix Table 9
"Obedience Fact": Robustness Checks for Specification with Alternative Fixed Effects (Cohort-Gender)

Dependent variable:	Importance of obedience in the workplace							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ExpRTC exposure at:	Age 0	Age 5	Age 10	Age 15	Age 20	Age 25	Age 30	Age 35
A: OLS								
$Education_r$	-0.0285***	-0.0266***	-0.0256***	-0.0251***	-0.0266***	-0.0271***	-0.0267***	-0.0263***
	[0.0067]	[0.0061]	[0.0052]	[0.0044]	[0.0038]	[0.0036]	[0.0036]	[0.0036]
$Educ_r \times ExpRTCexposure_{cb}$	0.0030	0.0113	0.0135**	0.0146***	0.0108*	0.0099	0.0031	0.0061
	[0.0088]	[0.0070]	[0.0058]	[0.0052]	[0.0055]	[0.0061]	[0.0064]	[0.0074]
$ExpRTCexposure_{cb}$	0.0265	-0.0499	-0.0537	-0.0392	-0.0475	-0.0558	-0.0410	-0.0055
	[0.0601]	[0.0467]	[0.0473]	[0.0411]	[0.0498]	[0.0519]	[0.0534]	[0.0448]
Observations	30,201	40,172	51,231	61,826	71,941	79,223	81,782	76,590
No. of countries	39	43	51	60	62	62	62	62
R^2	0.0537	0.0598	0.0645	0.0650	0.0667	0.0676	0.0685	0.0696
B: Instrumental Variables								
$Education_r$	-0.0296***	-0.0265***	-0.0260***	-0.0250***	-0.0266***	-0.0274***	-0.0274***	-0.0266***
	[0.0063]	[0.0062]	[0.0052]	[0.0045]	[0.0039]	[0.0036]	[0.0036]	[0.0036]
$Educ_r \times ExpRTCexposure_{cb}$	0.0001	0.0120	0.0129**	0.0174***	0.0135**	0.0113*	0.0037	0.0061
	[0.0091]	[0.0082]	[0.0064]	[0.0058]	[0.0059]	[0.0065]	[0.0067]	[0.0073]
$ExpRTCexposure_{cb}$	0.0380	-0.0218	-0.0425	-0.0593	-0.0321	-0.0648	-0.0562	-0.0039
	[0.0708]	[0.0507]	[0.0476]	[0.0531]	[0.0444]	[0.0574]	[0.0646]	[0.0463]
Observations	30,202	40,135	50,574	60,130	70,041	76,939	79,246	74,196
No. of countries	39	42	46	56	62	62	62	62
R^2	0.0537	0.0592	0.0629	0.0629	0.0657	0.0674	0.0679	0.0689
Kleinberger-Paap Wald F-stat	12.93	19.32	29.17	49.11	57.49	42.50	36.81	36.02
Additional controls:	All columns: Dummies for Number of children, Marital status, and Country-Cohort Exposure to log GDP per capita, Exports over GDP, Democracy, at age A							
Country-wave (cw) dummies?	Y	Y	Y	Y	Y	Y	Y	Y
Cohort-Gender (bg) dummies?	Y	Y	Y	Y	Y	Y	Y	Y

Notes: Standard errors are clustered by country; ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively. The dependent variable is the response provided to WVS question C061 on one's propensity to follow instructions in the workplace. Each successive column tests for whether the cognitive routineness of exports (expRTC) that the respondent was exposed to in the five-year window where he/she turned age A (where A=0, 5, 10 etc.) affects attitudes towards workplace obedience. All columns include survey country-wave and respondent cohort-gender fixed effects, as well as a full set of dummies for number of children and marital status; in addition, country-cohort measures of exposure to log GDP per capita, Exports over GDP, and Democracy (at age A) are included. Panel A performs the estimation via OLS, while Panel B reports instrumental variables estimates using a constructed "shift-share" IV for expRTC.