



NATIONAL RESEARCH UNIVERSITY
HIGHER SCHOOL OF ECONOMICS

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CLOSING THE SKILLS-JOBS GAP: RUSSIA AND CHINA COMPARED

BASIC RESEARCH PROGRAM

WORKING PAPERS

SERIES: POLITICAL SCIENCE
WP BRP 53/PS/2017

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Around the world employers complain of shortages of skilled workers. Meantime, educational and training institutions often function as “bridges to nowhere.” This has implications for both social and economic development. When VET systems are ineffective, they either turn out individuals with skills that are poorly matched to the demands of the labor market, or replicate existing social divisions between rich and poor. Economic inequality, both cross-sectional and spatial, undermines the ability of educational and skill-forming institutions to equalize opportunities for young people to acquire skills usable in the labor market. This bifurcates society between a low-wage, low-skill, often informal employment sector, and a higher-skill, higher-wage sector. This problem has grown more acute everywhere as a result of automation and globalization. For this reason, experts and policy-makers around the world have called for upgrading the quality and effectiveness of vocational education and training (VET), in particular by encouraging closer cooperation between employers and schools. They seek to adapt elements of the German and other continental systems where apprenticeships are the most common pathway leading from school to jobs. Building firm-school partnerships requires overcoming two sets of collective action dilemmas, however: coordinating the interests of firms around setting professional standards and curricular goals, and establishing cooperation between employers and schools. The paper argues that cooperative arrangements vary along two dimensions: the “breadth” of collaboration by schools and firms, i.e. how many firms and schools pool their efforts to upgrade VET; and the “depth” of commitment, that is, how costly is the joint commitment by firms and schools to VET. The evidence suggests that there is typically a trade-off between deepening and broadening. The paper compares China and Russia --two large, relatively decentralized countries with different economic systems— with respect to current efforts to close the gap between skills and jobs. It draws conclusions about the nature of the circumstances under which reforms are likely to result in greater deepening or broadening of cooperation. The paper argues that the formation of effective institutions for resolving collective dilemmas result from government initiatives mobilizing existing capacities to respond to challenges in the external environment.

Keywords: Vocational Education and Training (VET), Public-Private Partnerships, skills-jobs gap, China, Russia

JEL Codes: I28, I25, J24

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² This research was conducted with the support of a grant from the Russian Science Foundation, Project No. 16-18-10425, for a collaborative project «Public-Private Partnerships in Vocational Education: Firm-Level Evidence from Russia and China»

I. Introduction: Bridges to Nowhere

People from Pittsburgh, Pennsylvania, who are of a certain age well remember Pittsburgh's "bridge to nowhere."³ The Fort Duquesne Bridge was built to cross the Monongahela River very near the point where it converges with the Allegheny River to form the Ohio River. Construction ended in 1963 with the main span of the bridge nearly but not quite reaching the opposite shore. Inter-governmental disputes and delays in obtaining the necessary right-of-ways prevented completion of construction until 1969. In 1964, one daring University of Pittsburgh student tested the theory that he could drive his car over the gap--crashing through the barriers as he went-- if he accelerated to the right speed. His hypothesis was confirmed when his car landed in the mud on the other side, overturned, but leaving him unhurt.

VET systems often resemble bridges to nowhere. Many young people graduate from schools without usable skills, or lack access to schooling in the first place. Meantime employers are hungry for personnel with the appropriate skills. Where existing institutions fail to bridge the gap, low level equilibria and labor market dualism can persist for long periods of time. As Richard Doner and Ben Ross Schneider write, the failure of VET institutions to upgrade training is characteristic of the "middle income trap," where countries can no longer compete in global product markets on the basis of low labor costs but are unable to compete in markets requiring highly skilled labor [Doner, Schneider, 2016]. Such mismatches between jobs and skills characterize other types of economies as well, however, including some high income and low income countries.

Recognizing that globalization and technological change (and, in the case of postsocialist economies, transition from a planned to a market-oriented economy) bring rapid change in the skill demands of the labor market, government and business leaders around the world have been searching for ways to improve the fit between skill formation and labor markets. Institutional solutions must overcome two sets of collective action dilemmas: coordination problems among employers who compete for skilled labor, and commitment problems between employers and schools. Joint investment in skill formation by employers and schools requires a capacity to guarantee mutual commitment and monitor performance. Effective cooperation between employers and schools requires a significant investment of time, effort and resources on both sides. Schools entering partnership agreements with employers must adapt their curricula, retrain instructors, and upgrade facilities. Employers must participate in shaping curricula, provide facilities for practical training, harmonize curriculum standards with occupational standards, and evaluate the proficiency levels of

³ *Pittsburgh Post-Gazette*, July 24, 2013 [<http://newsinteractive.post-gazette.com/thedigs/2013/07/24/pittsburghs-bridge-to-nowhere/>].

graduates. Schools have to meet government-mandated curriculum standards while blending vocational instruction and practical training into their academic programs. Schools want to ensure that their graduates are employable just as employers are concerned with the readiness of school-leavers to hold jobs.

Some economists assume that market forces will resolve the problem of coordinating skill formation with market demand. Kenneth Arrow and William Capron argued in the 1950s that in dynamically changing economies, skill shortages are inevitable as technological change in the economy outpaces changes in public investment in training facilities, curricula, and instruction methods [Arrow, Capron, 1959]. Other economists argue that employer complaints about the skill shortage are often disguised forms of lobbying for more government spending on VET [Capelli, 2014]. For the post-Soviet world, Vladimir Gimpel'son argues that the apparent shortage of skilled labor arises from an inefficient allocation of human and physical capital in an environment where bankruptcy is rare [Tan, Savchenko, Gimpelson, Kapeliushnikov, Lukyanova, 2007; Gimpelson, Kapeliushnikov, Lukyanova, 2010].

Although these arguments are reasonable, it is also the case that markets for skilled labor can fail to clear for long periods of time. Where a market for skill and labor is imperfect, a skills-jobs mismatch can perpetuate itself in a protracted low-level equilibrium trap, of which the middle-income trap is one example. Higher income countries may exhibit the same problems as well, especially in cases where high cross-sectional and spatial economic inequality traps the poor into social environments that are hard to escape. High cross-sectional economic inequality reduces cross-generational social mobility. Where cross-regional inequality is high, and mobility limited, social and economic differentials are reinforced over time. The labor market grows increasingly bifurcated between higher-skill, higher-wage employment and large-scale low-wage formal and informal labor. The combined effects of globalization and automation may render the skill endowments of large sectors of labor in developed economies superfluous, while low-wage, low-skills employment in other sectors of the economy rises.

Labor market dualism wastes a tremendous amount of human and physical capital. Individuals may underinvest in skill formation, or invest in skills for which there is no return. Private provision of skill may be expensive and risky. In principle, efficient labor markets reduce the risk that investment in VET will be underutilized. But if market-supporting institutions are poorly developed, firms and individuals in low-wage, low-skill neighborhoods, regions, or social milieux have less incentive to invest in costly training. For this reason, many developing and transitional

economies have very large informal sectors. Even high-income economies are experiencing rising informality tied to the bifurcation of the labor force between rich and poor strata, neighborhoods and regions.

This effect has begun to be felt both in Russia and China, where market reform began in the 1980s and 1990s. In both, high economic inequality has strongly pronounced spatial aspects. In China, the single greatest economic and social divide is between the urban and rural populations, marked by the distinction between holders of urban and rural registration status. Urban residents' incomes are over three times those of rural residents [Shi, Sato, Sicular, 2013; Shi, 2016] whereas urban household incomes in the richest provincial-level unit (Shanghai) are only about 2.3 times those of the poorest (Gansu).⁴ In Russia, geographical disparities across regions are extreme, with median incomes in Moscow exceeding those in poor regions such as Kalmykia and Tuva by a factor of 4. In both countries, moreover, inequality in wealth is still higher, with Russia leading the world: in Russia, the top 1% of wealth-holders own 74.5% of all recorded wealth. The top 1% in China and the US lag well behind Russia in the concentration of wealth, owning only 43.8% and 42.1% of all wealth, respectively [Credit Suisse, 2016].

This paper analyzes recent efforts to overcome the skills-jobs gap in China and Russia. Both countries are large, regionally heterogeneous, and high in spatial inequality and labor market dualism. Both are administratively decentralized in education and skill formation; subnational units regulate and finance schools, and for the most part, firms do not provide general or industry-specific training. To a large extent, labor markets are regional or local, as are educational jurisdictions. In both, business and government leaders regularly complain of serious shortages of skill. Russia and China are both in the middle 50% of countries in the world by national income per capita (Russia's in 2015 was \$24,510 on a PPP basis measured in current international \$US, while China's was \$14320).⁵ However, I take advantage of the substantial variation they exhibit across regions with respect to the nature of public initiatives to close the gap between skills and jobs. Common to all these policy efforts is the call for closer cooperation between educational institutions and firms. Specifically, like many other countries, both have sought to adopt "dual education" methods from Germany, Switzerland, and Austria [Pilz and Li, 2014]. This is a difficult challenge in both countries because of the coordination dilemma among employers, and the commitment problem between employers and schools. Where these difficulties have been overcome, it is generally as a result of government

⁴ China Data Online. Figures are for 2013.

⁵ Taking the WDI figures for gross national income per capita, in purchasing power parity terms and calculated in current \$US, the median figure for the world was \$11,310; the 75th percentile was \$25670, and the 25th percentile was \$4750. Therefore, both Russia and China fall into the middle 50% of the distribution.

initiative. The similarity of these new local three-way partnerships among government, business, and schools in such disparate countries raises the two questions of this paper: under what conditions do governments build such partnerships, and what are the ingredients of their success? Before turning to these formal institutions, however, let us look more closely at the problem of the mismatch of skills and jobs in Russia and China.

II. Skills Shortage or Skills Mismatch?

A common complaint everywhere on the part of business leaders is that there is a shortage of qualified personnel. This is true both in developed countries and developing countries. Sometimes it is couched in terms of the need for highly-skilled workers as industry makes the transition to automation and the rise of the “industrial internet.” More often, it is an argument that there are shortages of skilled and experienced workers in middle-skill jobs, such as in the building trades. In other cases, these complaints concern local skill shortages. The company Manpowergroup annually surveys employers around the world, and consistently reports that employers regard the shortage of skilled workers to be a major problem.⁶ For example, its 2016 report found that 40% of employers around the world had difficulty finding workers in such fields as the building trades, IT, engineers and sales representatives. The Manufacturing Institute also sounds the alarm about the shortage of skilled workers [Deloitte, 2015]. Often the problem is couched as a shortage of people with the right skills - a skills mismatch more than a skills shortage [McGowan and Andrews, 2015; OECD 2013, 2016].

The argument that there is a skills shortage or mismatch is also a common theme in Russia. A recent Price Waterhouse Cooper survey suggests that 71% of respondents in the BRICS countries were concerned about a lack of skilled labor. 85% of Russian CEO's were concerned about a shortage of skilled labor and deemed it a threat to economic and political stability [PWC, 2014]. A 2012 survey of 6000 businesses conducted for OPORA, the association representing small and medium-sized business, found that two thirds of members considered finding skilled workers a serious problem [OPORA Rossii, 2012] Similarly, an RSPP survey found that 64% of firms considered the shortage of skilled labor to be one of the most severe problems facing them [RSPP, 2014].

Comparable complaints are voiced in China as well [OECD, 2015]. For example, “the American Chamber (AmCham) China reports that aside from rising labour costs, high turnover rate, and the impact of regulations, the severe shortage of appropriately skilled employees is among the

⁶ <http://www.manpowergroup.com/talent-shortage-2016>

human resource challenges that remain a major concern for AmCham China members.” [Mehrotra, Gandhi, and Kamaladevi, 2015]. For more than a decade, the domestic and foreign press has been sounding the alarm about the shortage of skilled labor in the dense manufacturing regions of China.⁷ Certainly wages in the dense manufacturing regions of the East and Southeast, such as the Pearl River Delta, have more than tripled in the last decade.⁸ There, manufacturing is rapidly shifting to labor-saving automated industrial technologies requiring high-skill labor. A prestigious team of Chinese and international experts warned of “China’s Looming Human Capital Crisis: Upper Secondary Educational Attainment Rates and the Middle Income Trap,” [Niny Khor et al., 2016]. The report indicated that as of 2010, fewer than a quarter of the labor force had attended upper (higher) secondary school. They linked this skill deficit to the threat that China might fall into the “middle income trap.”

It may seem surprising that the former Soviet bloc countries face skills shortages, given the high educational and skill endowments of their populations at the point market transition began. However, as many researchers have observed, labor productivity in the Soviet world was low, and for many types of skill, the return on skill fell further during the transition as the mismatch between the types of skill provided by the communist planners were woefully ill-suited to the demands of competitive enterprises [Kezdi, 2006; Loyalka et al., 2016; Carnoy, Loyalka, Androushak, Proudnikova, 2012]. This may reflect, as the Hungarian economist Gabor Kezdi wrote, the turbulence of the transition, where prior skill endowments were devalued and more general skills enabled individuals to adapt [Kezdi, 2006]. For Russia, Elizabeth Brainerd found decreasing returns to vocational education in the 1990s and rising returns for higher education [Brainerd, 1998]. Certainly throughout the bloc, as opportunities for higher academic education opened up, there was an explosive growth of enrollments in higher education at the expense of enrollments in vocational education. Figure 1 shows the trends in Russia:

⁷ [http://www.businessinsider.com/only-solution-to-chinas-labor-shortage-2016-2]; [http://www.sinojobs-careerdays.com/files/sjcd/content/press-releases/2013-09-18-Shortage%20of%20skilled%20labor%20in%20China.pdf]; [http://www.china.org.cn/english/MATERIAL/172145.htm]

⁸ *The Economist*, “The PRD is Exporting Jobs but Producing More Goods for the Home Market,” May 4, 2017.

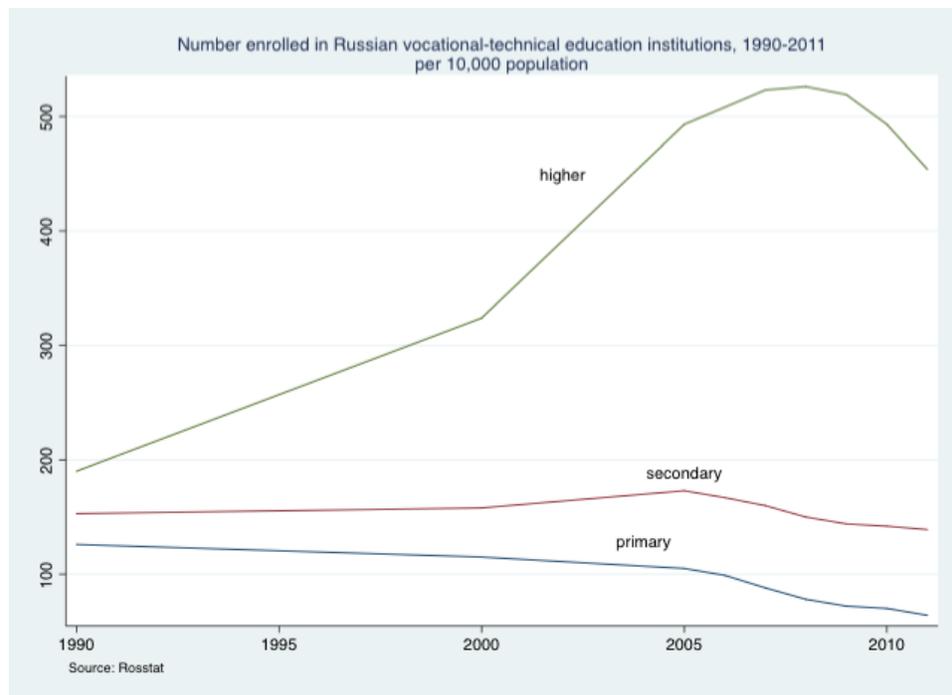


Figure 1: Number of students enrolled in Russian VET institutions, 1990-2011

The rush to acquire postsecondary credentials in turn created a negative selection effect for students enrolling in vocational schools and an oversupply of university graduates, many of whom held degrees from new, commercial and non-accredited institutions [Strategy 2020, 2013]. However, particularly as transition economies recovered and demand for skilled workers and specialists rose again, firms reported skill shortages and complained about the poor quality of graduates of vocational schools and the excessive numbers of people trained as jurists and economists rare [Tan, Savchenko, Gimpelson, Kapeliushnikov, Lukyanova, 2007]. Of course, to some degree, as Vladimir Gimpel'son argues, it is the less productive firms that are more likely to complain of shortages of skill, suggesting that the supply of skilled personnel is inefficiently allocated [Gimpelson, Kapeliushnikov, Lukyanova, 2010]. Nonetheless, it was in response to a widely-felt shortage of skilled workers and engineers - particularly relative to the urgency of raising productivity and upgrading technology - that Vladimir Putin and Dmitrii Medvedev, in their roles as prime minister and president, set ambitious targets for improving Russia's VET system. Putin went so far as to call for the "restoration of a 'workers' aristocracy'" that by 2020 would comprise at least a third of the skilled workforce, or 10 million persons.⁹ In his December 2016 message to parliament, President Putin declared that "Russia needs skill cadres, engineers, workers, who are ready to fulfill tasks of a new level. Therefore together with business we are development a contemporary system of secondary vocational education, and are

⁹ This was in remarks to the All-Russian Popular Front as part of Putin's election campaign in 2012. [http://www.newsru.com/finance/29feb2012/pusuppose.html]

organizing the training of instructors of secondary vocational schools on the basis of advanced international standards.”¹⁰ One of the targets Putin set in his May 2012 decrees was the creation of 25 million new high-productivity jobs by 2020. In Putin’s 2013 message to parliament, he called on business and government to collaborate in formulating a new set of professional standards and called for creating a new “national council on professional qualifications.” He demanded a substantial upgrading of the system of vocational education that would be based on practical training, “training at real production, when theory is backed up by practical skills.”¹¹

The Russian government has taken up the challenge. The country joined WorldSkills in 2012. In 2014 the government laid out a plan for reform of secondary vocational educational institutions that would increase the number of graduates by 2020 to 50,000 people “who had demonstrated a level of training corresponding to the standards of WorldSkills.” In 2016, the government issued a program called “Worker Cadres for Advanced Technologies” and allocated 24 billion rubles to it.¹²

In 2013 the Agency for Strategic Initiatives (ASI) - an interagency governmental body established by Putin to stimulate business development in Russia - announced a call for proposals from regional governments for plans to upgrade VET by incorporating German-style “dual education” methods. This specifically called for industry participation in both revising the curriculum and overseeing practical training. The goal was to induce schools and firms to offer something like German-style apprenticeships. The ASI gave particular priority to high-technology industries and commitments by enterprises to contribute a substantial share of the funding.¹³ Thirteen regions were selected to serve as pilots. Elsewhere I have detailed the selection process and its preliminary results [Remington, 2017]. Below, I will discuss the patterns of firm-school partnerships that resulted.

Similarly, in China, VET reform has assumed growing priority for the government. Recognizing that administrative responsibility for VET was divided between competing ministries (of education and of human resources and social security), the government formed an inter-agency coordinating body as early as 2004 to manage their coordination. In 2005, the State Council issued a decision to increase enrollments in VET institutions, and to forge more linkages between schools and employers. It created 100 model secondary and tertiary vocational schools to demonstrate best practices in linking industry with education [Stewart, 2015]. In December 2013, at the Third Plenum of the Central Committee of the 18th Party Congress, CCP General Secretary Xi Jinping called for

¹⁰ President’s address to the Federal Assembly, December 1, 2016
[<http://kremlin.ru/events/president/news/53379>]

¹¹ President’s address to the Federal Assembly, December 12, 2013
[<https://rg.ru/2013/12/12/poslanie.html>]

¹² Anna Makeeva, “Rossiiskim kolledzham ne doveriaut ni grazhdane, ni rabotodateli,” *Kommersant*, May 16, 2017.

¹³ <http://asi.ru/staffing/dualeducation/>

“quicken steps in the development of a modern vocational education system.” In particular, he urged: more innovation in VET and especially more cooperation between schools and firms; higher quality VET, to include “soft skills” and “comprehensive competencies”; and granting greater authority to the regions to administer schools and their fit to the labor market together with significant support from the central government. In March 2014, Prime Minister Li Keqiang followed up in his work report to the National People’s Congress, calling for the development of “a modern employment-oriented vocational education system.” [Stewart, 2015] The central government not only demanded that the share of students in upper secondary vocational schools rise from 20% of the total to 50% by 2020, but in 2014 it called for close and flexible integration of enterprises and schools—including internships and apprenticeships-- to be adopted throughout the country.¹⁴

Although enrollments in vocational schools have increased substantially, enrollments in regular academic high schools have risen much faster, as Figure 2 shows.

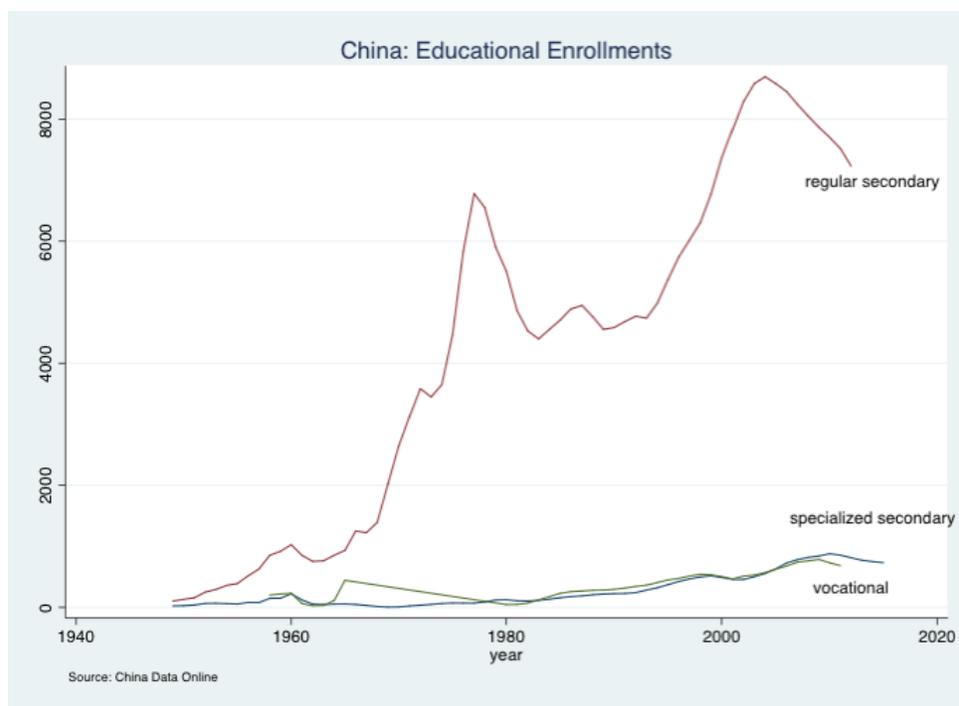


Figure 2: Educational enrollments in China

Simultaneously achieving the goals of increasing enrollments, increasing quality, and linking education and industry faces both institutional and non-institutional obstacles. Culturally, as experts

¹⁴ “National Medium and Long Term Education Reform and Development Plan (2010-2020)” [http://www.gov.cn/jrzq/2010-07/29/content_1667143.htm]; “Decision on the Acceleration of Modern Vocational Training.” [http://tvvet.ac.nz/wp-content/uploads/2015/06/Decisn-of-the-State-Council2014_booklet.pdf]

widely acknowledged, the entrenched habit of granting prestige to non-manual occupations and academic education and disdaining manual labor and education leads many to regard vocational education as a pathway for unsuccessful students or the children of migrant laborers. Surveys of vocational students find that nearly all say that they are there because they could not get into an academic high school [Shi, 2012; Woronov, 2011; Song, Loyalka and Wei, 2013]. As in Russia, negative selection then affects the quality of education and the skill profiles of graduates. Institutionally, the vocational and academic tracks are separate, with few cross-walks between them [Cooke, 2005]. Certainly for the most part, employers avoid engagement with vocational schools. As one vocational school administrator told a visiting researcher: “It is very passive, CTE [career and technical education] in our country now. Especially with hands-on practice, industries are supposed to help, but industries have no motivation to do it. Some managers of industries may understand the importance of hands-on practice for students, [but] a lot more managers do not even bother to think about it. We have to work so hard to convince the managers to accept our students, but students are only allowed visiting the site. Students want actual hands-on experience, this is even more difficult [to obtain].”[Hou, 2010]. The same point was made by a Chinese scholar: “A number of studies carried out in recent years in different regions clearly indicate that in general, domestic enterprises currently lack sufficient motivation to participate in vocational education....On the one hand, the motivation and enthusiasm on the part of enterprises to participate in vocational education is limited; on the other hand, students who are in the enterprise for practice tend to be used as a source of cheap labor.”¹⁵ Some studies, indeed, find negative returns on the schooling in vocational institutions. One found that compared to students attending academic high schools, vocational students in China perform worse both in general and specific skills and are more likely to drop out of school.¹⁶ Some scholars therefore argue that the government’s goal of expanding enrollments in vocational schools may be misguided until the quality and prestige of manual education are increased.

Closely related to the skills-jobs mismatch is the problem of informal employment, i.e. employment that is unregistered, unregulated and untaxed. In both countries, a substantial share of employment is informal. The key point here is that, while definitions and measurement of informality are disputed, informal employment tends to be characterized by low wages and low skill. In Russia, while the labor-age population is declining, the share of employment that is registered and

¹⁵ “Wo guo qi ye can yu zhi ye jiao yu de kun jing ji qi tu po—ji yu gong gong xuan ze li lun yu lao dong jing ji xue de fen xi [Predicaments and Breakthroughs in the Participation of Chinese Enterprises in Vocational Education: An Analysis Based on Public Choice Theory and Labor Economics],” *Research in Educational Development* (March 2015), pp. 52-58. [http://en.cnki.com.cn/Article_en/CJFDTOTAL-SHGJ201503013.htm]

¹⁶ “Vocational vs. Academic High School,”

[http://reap.fsi.stanford.edu/research/vocational_education_versus_academic_high_school_a_study_on_relative_value_added]

incorporated into the system of formal labor protection and social insurance has been declining at the expense of the share of employment that is off-book. Most new employment in the last decade has been in the informal sector, which has reached (depending on how it is defined) anywhere between 15 and 33% of total employment [Gimpel'son, Kapeliushnikov, 2013; Tsepliaeva and Sonina, 2014]. Wages in the informal sector are typically 20% - 33% lower than in the formal sector.

In China, estimates of the share of informal sector workers also vary widely. One 2009 estimate puts informal urban employment at 60%. [Huang, 2009]. This would make China's rate lower than sub-Saharan Africa but higher than Latin America. However, another estimate for 2010 estimates it to be 30% [Cai, Du and Yan, 2013]. Roughly speaking, 35%-40% of the urban workforce in China is informal, compared with about 30% in Russia.¹⁷ Whatever the actual size of the informal sector in China, all experts agree that it is overwhelmingly composed of migrants who lack urban hukous.

Informality in China is higher than in Russia because of the high overlap between migrant workers and the informal sector (most informal workers are migrants) [ILO, 2012; Gallagher, Lee, Kuruvilla, 2011]. Approximately a quarter of urban workers in China are migrants, but in typical industrial cities the figure is 40%-45%, and in some cities it is as high as 70%-80% of the labor force. [Chan, 2009] Specialists describe the rural migrant workers in cities as "a huge underclass of super-exploitable and low-cost labor." [Chan, 2009; Solinger, 2008] Only in the last few years have they begun to acquire the right to a labor contract, pension income, health care, unemployment, and other social protections. Actual enforcement of these rights has been slow, however, and the rights themselves are limited. For example, rural migrants obtain their health insurance through their place of residence, making benefits difficult to access when they are in the city. Moreover, when migrant workers move to another province or even city, they lose the employer's portion of the contributions [Yang, 2009]. Although there are not recent figures on the extent of the problem, employers often do not pay into the social insurance funds for rural migrants [Park and Cai, 2011].

Immigrant labor in both countries makes up a sizable share of the informal labor force. 60% of the sample represented in the report on low-wage labor in the US just discussed were immigrants (of those, more than half were undocumented). Their precarious status helps explain their vulnerability to employer abuses. Likewise, in China, urban migrant workers (a category that

¹⁷ For figures on China, see [Park and Cai, 2011; Chan, 2009]. For figures on Russia, see [Strategy 2020, p. 215]. A July 2012 report analyzing labor market trends in Russia found about 22 million workers employed in the economy but outside the observed and reported sector. These included unregistered self-employed individuals; private farmers; household service workers such as nannies; and family micro-businesses. The share of informal workers has been increasing throughout the 2000s while the number of workers in the formal sector is declining.

overlaps very considerably with the informal workforce) earn just over half of what workers with an urban hukou earn [Lam, Liu, Schipke, 2015]. In Russia, workers in the informal sector (including those workers on short-term contracts) receive on average about one-third less than formal sector workers [Gimpel'son, Kapeliushnikov, 2013]. A large share of the informal labor force in Russia is made up of migrants from CIS countries, particularly Central Asia [Yudina, 2005].

Thus in both countries, substantial shares of the workforce either work in the shadows of the formal economy or is trapped into low-wage employment for protracted periods. This situation contributes both to income inequality and inadequate contributions to social insurance programs for pensions, unemployment, and health care.

As noted above, many economists argue that the market will tend to correct these problems by raising the price of skilled labor, and that shortages are an inevitable consequence of rapid technical change in a dynamic economy [Arrow and Capron, 1959]. They also note that employers' claims are exaggerated in order to push for more government support for VET [Capelli, 2014]. On the left, skeptics point out that relatively few employers are actually unable to find the workers they need or have to slow down production for want of an adequately qualified workforce [Osterman and Weaver, 2014]. They show that wages in the aggregate have lagged well behind productivity as well as behind the compensation paid to top-level managers, and that if employers were seriously hampered by skill shortages, they would invest in training. Of course, as the early economic theorists of human capital pointed out, employers are inhibited from allocating resources to training, especially industry-specific skills, for fear that rivals will poach the trained workers [Gimpel'son, 2010; Acemoglu & Pischke, 1998]. Political scientists have pointed out that social protection laws in some coordinated market economies serve to guarantee a return on investment of skill by individuals, and are supported by employers as a means to prevent wage competition among firms [Estevez-Abe, Iversen and Soskice, 2001].

Notwithstanding these objections from the right and the left, it is entirely plausible that mismatches between skills and jobs can persist over long periods of time, placing both firms and individuals at a disadvantage. Moreover, to the extent that the institutions undergirding market transactions (transparent information about job vacancies, requirements, and compensation levels; security of property rights; ease of labor mobility; adaptability of the administrative hierarchies controlling education), the greater the waste of human and capital resources in the society. Firms may forego investing in more advanced technologies for want of the labor needed to operate them, and workers may drop out of the labor market or remain in low-wage jobs for indefinite periods. Such a

labor market will feature high dualism, i.e. a formal sector with relatively high wages and a large informal sector employed in low-skill, low-wage jobs. For both workers and employers in countries where inequality and informal employment are high, low-wage workers find that the material returns to investment in education are low [Doner and Schneider, 2016]. Thus to the extent that market institutions are inefficient, the magnitude of wasted human and physical resources will be greater.

Planned economies resolve the dilemma of matching skill formation to the needs of production through administrative means, determining in advance how many workers in each particular occupational category must be trained in order to achieve projected production plan targets. Soviet-type planned economies set the number of places in vocational educational schools and assigned graduates to jobs according to the specialization they received. This system suffered from many deficiencies, among them a lack of technological innovation, labor hoarding (as enterprises held on to excessive numbers of workers as hedges against sudden surges in production), and a very low return on investment in skill [Hewett, 1988; Kornai, 1992]. However, market-oriented economies can devise institutional solutions to the problems of low inter-firm coordination on skill formation and low cooperation between firms and schools. Such solutions tend either to incorporate multiple employers and schools in consortial arrangements organized around aligning the objectives of educational institutions with the skill demands of dominant local sectors of industry. I characterize such arrangements as “broad” in the sense that multiple partners coordinate their efforts. Alternatively, in some cases a particular large employer dominating a given region is willing to join with schools in joint investment in “deep” (i.e. resource-intensive) partnerships. In these cases, schools adapt their curricula to the skills standards set by the employer while the employer agrees to take on training functions, gaining thereby the opportunity to recruit the best trainees. Whether the arrangements are broad or deep, government, in the form of regional or local executive and educational authorities, enforces the agreements.

III. Building Partnerships between Employers and Schools

I have argued that spatial economic disparities can create low-skill equilibrium traps. Yet although regional decentralization can yield spatial inequality, it can also encourage local experimentation if economic and political leaders of regional units compete for investment resources or political advancement [Jin, Qian, and Weingast, 2005; Qian and Weingast, 1996; Weingast, 1995; Montinola, Qian and Weingast, 1995]. Subnational competitive pressures may be found in both Russia and China, inducing regional actors to devise new institutional arrangements to foster

economic development by improving the match between VET and local labor markets. Where they are established, such arrangements show promise in reducing the waste of human and physical resources, raising living standards, and reducing inequality. In contrast to many previous efforts to improve the fit between VET and the labor market which have focused on national –level programs, these efforts take the form of local partnerships among firms, schools, and governments.¹⁸

As I noted above, these vary along two dimensions, breadth and depth. Breadth refers to the number of firms and schools that coordinate their efforts. Broad-based agreements to regulate the labor market involving multiple firms in the same industry have been termed “collectivist” or “solidaristic” in the literature [Thelen, 2004; Swenson, 2002].¹⁹ They aim at creating a pool of skilled labor available to multiple firms, avoiding the threat of poaching of employees by rival firms and competing by offering better wages. Where individual firms meet their needs for training through in-house training or by contracting with outsiders, the institutions are called “segmental.”

The second dimension along which partnership agreements vary is “depth.” This refers to the costliness of the commitment made by firms and schools. High-cost commitments require an investment of time, effort and material resources on both sides. Firms may supply training equipment to schools, provide hands-on practical training at training centers or on the production floor, provide specialists for instruction at schools, collaborate with schools in revising curricular content and standards, evaluate the proficiency of graduates, and help meld occupational proficiency standards with the curricular requirements set by government education bodies. Deep investment by the schools is also required, as they revise their educational programs, retrain instructors, and place greater emphasis on practical training of students. For many schools, such collaboration with employers forces them to emphasize their role in economic development at the expense of their social responsibilities as schools of last resort for problem students and sources of retraining for laid-off workers.

Plotting these two dimensions against each other yields a two-by-two matrix of four ideal types:

¹⁸ A good analysis of the failure of Clinton-administrative efforts to streamline and upgrade federally-sponsored jobs training programs in the US is [Martin, 2000].

¹⁹ Thelen uses the term “solidaristic” rather than “collectivist” and defines such systems as: “the collective provision of a plentiful supply of workers with highly portable skills (to which all firms contribute and from which all firms can also draw)”.

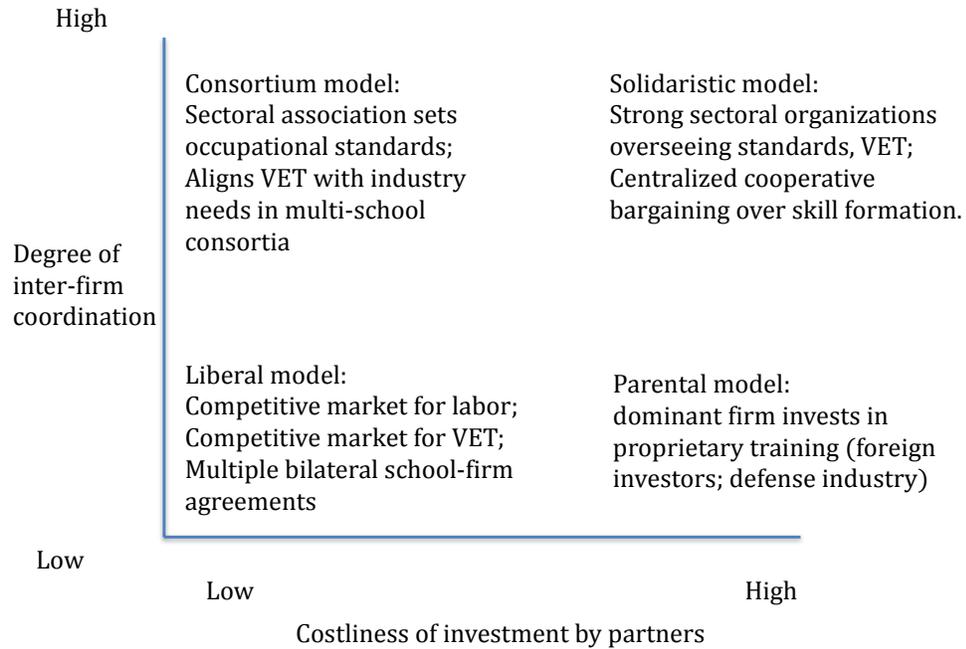


Figure 3: Four models of PPP in VET

In the upper right quadrant are solidaristic European models of VET, as found in Germany, Austria, Switzerland, Denmark Norway, Netherlands, and other countries. Nancy Hoffman (2011) summarizes the elements of what she terms “strong VET systems” as follows:

1. Public-private partnerships among the national government, schools, employers, and trade unions organized and administer VET;
2. Employers are legally responsible for determining the qualifications required for occupations in their branches of the economy;
3. Employers work through sectoral organizations to participate in setting VET curricula and establishing and administering assessments of competence;
4. A government education body, usually at the national level, is responsible for assuring the standardization and quality of schooling.

We might add two additional elements found in Germany in particular:

5. Traditionally high social prestige attached to possession of a “calling” (*Beruf*);
6. Post-World War II social consensus on the importance of “social partnership” in place of labor-capital conflict.

Note that these solidaristic systems with high commitment on the part of employers, schools, government and society, tend to arise in smaller countries, with high levels of dependence on foreign

trade and investment. Historically, bargaining among centralized associations of employers and trade unions has played out at the national level. As Peter Katzenstein showed, in smaller northern European states that are highly dependent on global exports tend to build institutions to share the gains and costs of maintaining internationally competitive industries across business and labor [Katzenstein, 1985].

Since Russia and China lack powerful centralized trade unions and delegate responsibility for administering VET to the regional level, it is likely that where solidaristic arrangements between schools, employers, and government, are found, they are likely to be established at the regional or local level. Labor will not be at the bargaining table, and business will participate only to the extent that employers themselves can coordinate around their common interests in VET.

Note also that all the strong VET system reviewed by Hoffman assign a primary role for coordinating school-firm cooperation in VET to sectoral associations. These serve as intermediaries between individual firms and individual schools, both determining the professional standards for particular occupations that VET institutions must incorporate into their curricula. To the extent that intermediary organizations are empowered by law to impose common obligations on their member firms, they overcome business's collective action dilemma and represent the interests of their sectors in negotiations with government and schools. Observation of effective collectivist systems of VET suggests, therefore, that sectoral organizations play an indispensable role as intermediaries.

In the bottom left quadrant of the matrix are "liberal" systems where there is low cooperation between employers and schools and little coordination among firms over the content and methods of VET. To a considerable extent, regions in Russia and China fall into this quadrant. Local and regional governments, acting through technical high schools and colleges, are the principal suppliers of VET. For the most part, firms meet their skill needs by hiring from the market or providing in-house training. Moreover, Russia and China retain a legacy system of state-funded vocational schools that are often out of touch with current labor market skill needs. Consequently, in Russia and China, governments seeking a deeper joint investment in VET on the part of schools and employers must find functional equivalents for the elements that make dual education work in Germany. VET systems tend to be located in the bottom left quadrant, where there is little coordination across firms and only limited joint investment by firms and schools. Few schools provide systematic internship opportunities, and apprenticeships are the exception rather than the rule. In both countries, the practice of giving students unpaid or low-paid internships or "practice" at firms (for example, in the

summer), is relatively common. These are often low quality because there is little instruction and little coordination with the school curriculum.

In Russia and China, however, as a legacy of the old planned industrial economy, enterprises often provide opportunities for trainees to practice their skills at the enterprise or a training facility owned by the enterprise. These practices vary widely in the degree to which enterprises devote time and effort to instruction. In China, as Li Jun pointed out, student trainees provide a ready source of low-cost labor, while firms are unwilling to allocate resources to training.²⁰ In other cases, however, enterprises do assign experienced workers to supervise and instruct trainees. The adoption of “dual education” methods specifically requires enterprises to commit themselves to providing real practical training to complement theoretical instruction. (In strong VET systems in continental Europe, it is sectoral associations that play the role of shaping the curriculum, ensuring that practical training complements classroom instruction, and evaluating results. Sometimes the sectoral association’s role goes further, and actually delivers the instruction.) However, the dual education model is spreading both in Russia and China. In each case, the central government has developed pilot projects in selected regions (13 in Russia, 17 in China) to test ideas on how to implement dual education. In both cases, the central government wants to see the dual education model spread to all regions by 2020.²¹

In the pilot regions in Russia where dual education has been implemented, it is particularly common for large firms (often defense firms, but sometimes foreign investors such as Volkswagen) to act as sponsors for dedicated training programs at local technical high schools and colleges. Our interviews in Russian regions suggested that defense industry enterprises, and large enterprises working for the state in strategic sectors such as aerospace, are eager to form partnerships with

²⁰ Cf Klorer und Stepan (2015). Almost identical comments were made by the person in charge of the Russian ASI pilot project for dual education.

²¹ In China, the Ministry of Education launched the “contemporary apprenticeships pilot program” in August 2015, affecting 17 regions and 100 vocational colleges and 27 secondary VET schools, in partnership with 8 enterprises. But the pilot program facing limits due to the unwillingness of firms to fund it (despite the fact that firms must pay a training levy of around 2% of payroll, which is returned to the enterprise if they provide training).

In Russia, the Agency for Strategic Initiatives launched an initiative in 2013 to select regions for a project designed to encourage closer cooperation between firms and vocational schools through new “dual education” programs for vocational education. The goal was to encourage regions to foster partnerships between firms and schools under which firms would bear a significant share of the cost of training. ASI stipulated that the project was to give particular priority to high-technology industries. Other criteria for selecting pilot regions included the requirement that firms contribute a substantial share of the funding, that the project would result in creating new jobs, and that it showed a probability of attracting further investment to the region. All funding was to come from the regional government and the participating firms. The ASI also offered administrative and methodological support from the federal level, including from the Ministry of Education, the Ministry of Labor, the Ministry of Trade and Industry, the World Bank, and the Russian-German Foreign Trade Chamber. The ASI competition itself was held in November and December 2013, following several months of preparatory work by the ASI and its partners. In January 2014 ASI selected the first ten regions for participation in the project, adding another three regions in 2015 from among the original applicant pool. Altogether 23 regions applied; ten regions were not chosen; and another 60 (or 62 if the new Crimean regions are included) did not apply.

schools and to invest significant resources in such partnerships.²² Collectivist forms of linkage between firms and schools, requiring coordination across multiple employers in the same sector, are much rarer.

In some regions of Russia and China there are partnerships closer to the top left quadrant, i.e. modest levels of investment of time, effort, and material resources by the partners but uniting multiple employers. These are efforts by employers—sometimes the employers in a particular sector and in a particular region—to coordinate on the standards required for certification and licensing in their industry. Coordination occurs through the formation of an organization such as a sectoral council which then works with a consortium of local VET institutions at the secondary and tertiary level to ensure that the VET curriculum matches the needs of industry for entry-level and mid-skill jobs. In several of the Russian regions where pilot programs for dual education are underway, sectoral organizations play a central role in coordinating enterprises in particular branches and linking them to VET institutions. In Tambov region, the governor in 2012 directed that sectoral associations would be formed in six branches of the economy and assigned them responsibility for setting policy on VET in their sector. In Ulyanovsk, the aviation industry has formed a cluster council to coordinate training and hiring practices. In Krasnoyarsk, the light industry association works with one of the technical high schools to provide education and training for its ten members. In multiple regions, the machine-building association has taken a leading role as intermediary between government, schools, and firms to organize VET according to the sector’s requirements. In one of these, the association had to pressure the member firms to collaborate. Moving still further from the upper left to the upper right quadrant is the case of Samara, where the machine-building association spearheaded the creation of a training center for mechatronics at a technical high school to serve the needs of industry in the region and persuaded the member firms and regional government each to pay half the cost. High collectivism and high investment thus puts Samara’s machine-building industry in the top right quadrant of the matrix. Similarly, the giant firm Proton, in Perm’ krai, which makes rockets, cars, and much else, establish a training center serving the needs of industry throughout the region. A few large firms even have their own licenses to provide accredited instruction, such as Aviastar in Ulyanovsk and Progress in Samara.

There are also pilot projects in China where multiple employers in a particular field, such as nursing, IT, tourism, transportation and finance, have formed consortia to promote cooperation

²² “‘Bigger and Denser’: Dual Education in the Russian Regions,” unpublished report on interviews with representatives of firms, schools, government agencies, and business associations in six regions (Samara, Sverdlovsk, Ulyanovsk and Tambov oblasts, and Krasnoyarsk and Perm’ krais). This research was funded by a grant from the Russian Science Fund (Project number 16-18-10425, “Private-Public Partnerships in Secondary Vocational Education: The Case of Firms in Russia and China.”)

between employers and schools. In the Pudong district of Shanghai, for example, the Shanghai Institute of Health Sciences receives funding from the central and municipal governments to provide scholarships to poor students for training in nursing. A more well-known case is the cooperation between the Sino-German Vocational and Technical College and a consortium of small and medium-sized German firms in Tianjin for training in multiple fields. Here the German *Auslandhandelskammer* - Germany's foreign arm of the domestic association of Industrial and Trade Chambers—is the catalyst for the cooperation [Stewart, 2015].

Probably the most common partnership arrangements found in Russia and China are the “parental” models (the bottom right quadrant) where a single big firm acts as a sponsor of VET. Where a single large firm dominates its industry in a given region, poaching of skilled personnel by other firms recedes as a threat. Usually with the encouragement of local government, local education authorities work with the firm to ensure that the education and training provide not only firm-specific skills, but also more generic skills and knowledge that are transferable to other firms in the industry. In several Russian regions, large firms that bear a substantial amount of economic and social responsibility for their town (what Russians call “city-forming enterprises”), and consider patronage of schooling a traditional part of their obligation to the community, have been quite willing to revive traditional Soviet practices of patronage (*sheftstvo*) and mentoring (*nastavnichestvo*) as part of the adoption of “dual education” methods. (In our interviews, one respondent observed that dual education was essentially the same as the traditional Soviet system, except that everything was “bigger and denser.”) Sometimes a holding company comprising multiple enterprises in multiple regions assumes responsibility for determining curricular standards and training opportunities for all the firms in the company. (This is the case with the ASB Agro-Holding company in Tambov). In the case of parental relationships, the school depends heavily on its parent firm for material support, such as training equipment, maintenance of facilities, stipends to instructors, practical instruction, and employment of their graduates.

Such parental relationships are also evident when large foreign manufacturing firms locate plants in Russia and China. For example, large German firms such as Volkswagen typically seek to replicate the German system of dual education as much as possible when they invest in production facilities outside Europe. As in Germany, VW's goal is to complement classroom instruction at the technical college with on-the-job training at training centers located at or near the production facility and “learning stations” and master-instructor supervision on the production floor. These arrangements are quite similar in Russia and China. In Russia, Volkswagen built an assembly plant in

Kaluga oblast', where it works with the Kaluga automotive industry training center. In China, where Volkswagen has nearly 30 production facilities, it establishes partnerships with local technical colleges. In every case, the school-firm partnership is a condition of Volkswagen's investment, and is specifically approved and supported by the region's governor. In both Russia and China, these partnerships are not necessarily "public-private," because in many cases the partners are a large state-owned enterprise and the local school or schools [Quanquan, 2009]. They may arise either because a school seeks a sponsoring enterprise, or because an enterprise seeks a school for a partnership. In the latter case, it may be that the firm is a new investor, as when a foreign firm invests in the region, or a state-owned-enterprise seeks a new or deeper partnership with a school in order to expand or upgrade training. The latter has been the case in the last several years in Russia as the significant increase in military spending has impelled the military-industrial complex to invest more heavily in training.

IV. Trade-Off between Broadening and Deepening Cooperation

Examination of these efforts by regional governments in Russia and China to encourage closer cooperation by firms and schools in VET, leads to the conclusion that they result either in broadening or deepening of partnerships, i.e. moving along the vertical or the horizontal axis—but not both. True solidaristic arrangements appear to be rare and institutionally difficult to achieve. The reason for this has to do with the trade-off between cost and control for firms. Firms that seek to maximize control over training cannot also minimize the cost of training [Anderson and Hassel, 2013]. If a large firm dominates a local economy, it may calculate that the benefit of supplying public goods, in the form of training beyond what the firm can itself consume, outweighs the costs. In such cases, the firm itself may take the initiative in proposing new forms of deep cooperation with local VET institutions, with government serving as guarantor. When a single firm is lacking, however, and no one firm is willing to pay a disproportionate share of the cost of supplying a pool of skilled labor to the industry, government in cooperation with a regional association or chamber of commerce is likely to persuade multiple firms in the industry each to contribute a modest share of its resources to a collective effort to align schooling with the skill needs of the industry. If the regional economy consists of multiple smaller firms, however, government is more likely to work through the schools to create multiple career-oriented educational tracks.

A dominant firm in a region is more likely to be willing to assume responsibility for providing the externalized benefit of surplus skill formation than is a group of relatively equally-sized firms in the same industry because of the collective action problem. A parental firm receives a

number of benefits, nonetheless. It acquires principal influence in determining the academic program and acquiring specific information about each student that trains at the firm. This affords it an advantage in selecting and recruiting the best. Moreover, such firms strongly benefit by reducing adaptation time, i.e. the period during which a newly hired employee acclimates to the production process and work culture of the firm.²³ These benefits lower the cost to the firm of losing employees to rivals. Particularly when the government uses its funding and administrative powers to induce one or more VET institution to invest jointly with the dominant firm in training programs where classroom instruction is complemented by on-the-job practical training, such programs satisfy the needs of the firm while allowing the accumulation of skill on the part of workers who may subsequently depart for jobs elsewhere. The public good here is a by-product of the partnership between the government, the school, and the firm. As the human resources director of a large defense plant in Samara put it, recruiting workers directly from on-the-job training programs through partnerships with schools is “the main alternative to the labor market.”

However, when multiple firms in multiple sectors compete in the same region for labor, fears of poaching and the small size of firms inhibits deepening of cooperation and favors broad but shallow partnerships. (For smaller firms, training costs represent a much higher share of production costs.) In that case, it is institutionally less costly for government to forge ties across educational institutions than across firms. In that case we are likely to see movement vertically along the left axis. Government may encourage sectoral clusters to develop common standards for professional qualifications, and then align educational programs to meet those standards through career-oriented educational pathways. Firms’ coordination on occupational standards requires less commitment of time, effort and resources than would direct participation in instruction and training, while government can advertise the region’s pool of mid- and high-skill labor in fields that it considers important for future economic development.

The issue of government’s involvement in forging agreements to deepen or broaden employer-school linkages raises one final question. Under what circumstances do governments intervene to form employer-school partnerships? Three factors stand out, which can be summarized as competition, crisis, and capacity. When they converge, government actors are much more likely to initiate firm-school partnerships. There are many examples from our three countries.

In Russia, the governor of Kaluga oblast’ similarly served as a policy entrepreneur when Volkswagen was first considering where to locate a production facility in Russia. Indeed, he

²³ This point was frequently made by the representatives of the Russian firms we interviewed.

continues to do so. As the director of the local technical college with which the firm cooperates told us in an interview, ‘when VW and I jointly tell the governor that something is needed, he always agrees’. Much the same is true of with governors of Chinese provinces and mayors of Chinese cities - attracting FDI counts as a “policy achievement” in their competitive pursuit of national careers. A good example is the former Henan province governor, Guo Gengmao, who later went on to become first party secretary, then went to Beijing for a job at the central level. One of his first acts as governor of Henan in 2008 was to invite Foxconn to establish a huge production facility in Zhengzhou and to build a huge airport economic development zone around it - by 2010 the plant was already up and running. Note that while elections determine career advancement for politicians in the US, and central appointments in China, the mechanism for career advancement does not seem to matter as much as the strength of the incentive for local politicians to be policy entrepreneurs. Even in Russia, where governors rarely move up the ladder to higher office, they can be removed, and face competitive pressure to improve the economic development level of their regions [Rochlitz, Kulpina, Remington and Yakovlev, 2015].

The competitive environment for political leaders and business enterprises is a crucial element in explaining the formation of school-firm partnerships. Both in democratic and autocratic political systems, regional leaders compete to preserve their positions or advance their careers. Firms compete for market share. (Even monopolistic firms in the military sector work in a competitive environment insofar as the government demands that they compete with technology and quality of rival nations.) Politicians and firms compete using strategies that proved successful in the past until an exogenous shock pushes them to reform by adopting a new strategy. The exogenous shock is often an economic crisis. Chattanooga for example faced an economic crisis in 1980s as the failure or departure of its manufacturing base resulted in a critical confluence of high unemployment and high pollution. In China, the leaders of regions and cities compete to achieve policy successes (jin4kai1 jin3biao1 sai4 [- 进开 锦标赛] – enter the championship contest). To be sure, such competition for policy achievements leads to wasteful projects, such as large-scale infra-structure construction to serve as “face projects.” Many cities have far more technical schools than are needed because building schools is a quicker path to recognition than the improvement of existing schools. There is a time-incompatible incentive problem: government officials have relatively short time horizons, so building a school yields faster results than overhauling quality of education and match of schools to labor force. However, if training-oriented elements within partner firms insist on improving quality of training for local workforce, then incentives of government leaders can align

with incentives of firms and schools. For such partnerships to succeed, of course, the incentives of government officials, schools, and firms must be aligned.

A case in point is the partnerships between Volkswagen and technical colleges in Russia and China. The joint venture between Volkswagen and FAW (First Auto Works) in Changchun, China (Jilin Province), arose out of Jilin Province's deep crisis in the 1980s and 1990s as "reform and opening up" exposed its industrial base as uncompetitive. The initial agreement between VW and FAW was signed in 1996, at the time when central government policy was pushing SOEs to adapt themselves to the market economy. In Russia, Kaluga province was seeking new sources of revenues in the 2000s through FDI. The governor had developed a plan for new technology-intensive industrial clusters and was looking for outside investors. At about the same time, Volkswagen decided to expand production in new overseas markets. In addition, as the manufacturers of components for VW's cars themselves faced tougher competition in 1990s, they decided to compete on quality. In all cases, the interests of government, schools, and the firm were aligned around the desirability of attracting a major foreign investor to the region and investing deeply (jointly with the firm) in upgrading skill formation.

The third critical element is capacity. By this I mean both the administrative capacity of a regional or local government to establish and maintain partnership agreements with firms and schools, as well as a common understanding of the importance of the partnerships on the part of business, government, and educational leaders. Such cohesion is more likely to emerge when business, government and educational elites have cooperated in the past on other projects, such that they can draw on a well of mutual trust and a set of cooperative practices. In all the cases reviewed here, political leaders responded to opportunities presented by economic crisis, in an environment where they had to compete to attain and keep their offices, and where they could call upon administrative competence and social capital formed by past experience.

V. Conclusions

Our examination of Russia and China suggests that successful partnerships among firms and schools to close the skills-jobs gap must provide institutional solutions to two kinds of collective action problems: those arising among firms competing for labor in the same regional labor markets, and those arising between firms generally and schooling. For both firms and schools, joint investment in new types of VET is institutionally costly. Schools may be reluctant to invest in new partnerships with business since they must adapt their curriculum, give up part of training to firm,

change own curriculum, upgrade quality of instructors, and at the same time satisfy regional and national curriculum standards. In both Russia and China, schools note that it is sometimes hard to reconcile national or regional educational requirements with the requirements of an apprenticeship system. For example, some professions recognized by firms (e.g. mechatronics) may not be recognized in the list of professions set by central government, or requirements for a particular diploma may conflict with the time spent in apprenticeships. If schools are rewarded for meeting goals such as increasing the number of diplomas awarded rather than matching their curriculum to needs of the local labor market, schools may regard it as more trouble than it is worth to reorient their curriculum to the needs of industry. Even when they are willing to do so, however, they often lack the production machinery equivalent to that which is used at firms.

Similarly, deep investment in VET may be difficult for firms, particularly smaller firms. In the absence of a coordinating body with the capacity to enforce commitments to the partnership agreement, it is hard to establish solidaristic VET institutions. This can leave a dominant firm in a position to dictate the content of educational programs, but it weakens the incentive for the school and government to shoulder the burden of implementing dual education more widely. Ultimately, this puts a dominant firm and its supplier firms at a disadvantage because the dominant firm is expected to bear most of the burden of subsidizing the costs of financing training for instructors, providing equipment to schools, and creating apprenticeships.

Therefore we tend to see government's efforts to build new partnerships between VET institutions and employers as moving either toward aligning multiple firms and multiple schools around training in particular regionally-advantageous occupational fields, but with little commitment on the part of firms to delivering training; or toward the construction of a system of VET designed to serve the needs of a particular large firm. In the latter case—the “parental” model—there are often spillover benefits from the partnership as those who have acquired the education and training take advantage of their industry-specific skills to take jobs elsewhere. Such parental arrangements do provide a public good because the benefit to the firm from a well-designed VET program outweighs the costs of losing some trained employees.

Government plays an essential role in all of these partnership arrangements. Government underwrites agreements between firms and schools (or industrial associations and consortia of schools). In Russia and China, regional governments have primary responsibility for funding secondary and tertiary VET, so therefore can orient the schools to meet governmental economic and social policy objectives. At the same time, government can create favorable conditions to recruit or

retain industry, not only by promising attractive tax regimes, but also by ensuring that VET programs will provide industry with a stream of well-trained labor. Government often enters partnership contracts as a third party. Government is motivated to the extent that government officials believe that they can take advantage of opportunity, in a politically competitive environment, by mobilizing available administrative and social resources.

Government plays the critical role of intermediary in some case: for example, in a number of regions in Russia governors directly oversee the linkage between firms and schools. In other cases, government works through sectoral associations serving firms in the same industry and the same region. In some cases, government creates such intermediaries. In others, government designates a particular organization to serve as intermediary. For example, in Perm' krai in Russia, the regional Trade-Industrial Chamber organizes the flow of information about future job market needs between firms, government, and schools, and oversees (but does not deliver) instruction and training. Generally speaking, intermediary bodies form through the adaptation of existing organizational resources more than their creation *ex nihilo*. Whatever body plays the role of intermediary organization, its effectiveness depends upon its ability to enforce commitment to the partnership. The deeper and broader is the partnership, the more that the partners must devote real time, effort, and material resources to it, the greater must be the monitoring and enforcement capacity of the intermediary.

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