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Embedded Interests and the Managerial Local State: the political economy of methanol fuel-switching in China

GENIA KOSTKA and WILLIAM HOBBS*

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This paper analyzes the determinants of Chinese government support for methanol automobile fuel development. At the national level, a preference for low carbon alternatives, ongoing bureaucratic restructuring, and profitability concerns of the national oil companies' (NOCs) help to explain a lack of support for methanol fuel. At the local level, a short-term and localized view of industry development explains why some governments actively promote methanol fuel through local standardization, subsidies, and management of NOC oppositions. The case of methanol fuel illustrates how local governments with strong, embedded interests filled in the national-level policy vacuum on this issue. These findings contribute to the ongoing debate on the evolving central-local relations in China and hold lessons for alternative fuel adoption efforts underway in many parts of the world.

* Genia Kostka is an Assistant Professor of Chinese Business Studies at the Frankfurt School of Finance and Management in Germany. William Hobbs is a PhD student in the Department of Political Science at the University of California, San Diego. The authors are thankful for receiving funding from the Developmental Leadership Program (www.dlprog.org) and Dr. Werner Jackstädt Stiftung. The authors also thank Shi Xiangying for her research assistance and Sarah Eaton, Adrian Leftwich, and Christine Polzin for helpful comments on earlier drafts.

Introduction

In the coming decades, China will look to a number of alternative fuel and energy options to address national energy security concerns, stem local pollution, and reduce greenhouse gas (GHG) emissions. Since there is no magic bullet which could provide simple, easy solutions to all of these problems as a whole, adopting alternative fuels and energies is likely to be a complex process involving combinations of fuel and energy choices and difficult tradeoffs. While it is possible that markets themselves will help to address the emerging energy crisis in China and elsewhere, the actions of governments will be decisive when energy issues are fused with political economy questions, as they are in matters of energy security and GHG emissions.

Many studies and news reports have examined China's efforts to develop alternative energy sources and boost energy efficiency.[1] However, there is a lack of scholarship on sub-national energy policy and the politics behind varying degrees of government support within China for alternative fuels and energy sources. This study begins to explore this complex terrain and argues that sub-national governments have a key role to play in shaping China's ability to craft innovative solutions to energy dilemmas of the present and future. The question we consider is: how do the currents of local politics channel sub-national governments' efforts to promote alternative fuels and energy sources? To address this question, this paper analyzes recent developments in Chinese government support for the methanol fuel and automobile industry. The analysis examines actors and interests at the national, provincial and municipal levels and seeks to explain the varying degrees of support for coal-based methanol business development at these different levels.

This paper focuses on methanol fuel-switching because methanol is a promising alternative fuel in China given the domestic natural resources and industrial structure. Methanol can be derived from coal, which China possesses in abundance, as well as natural gas. However, the potential benefits and costs of widespread methanol fuel are arrayed differently across localities and between different levels of government.[2] This paper argues that the disparate cost-benefit weightings of methanol fuel replacement partly account for wide divergence in policy outcomes within the Chinese polity. At the national level, factors that help to explain the recent withdrawal of government support for methanol fuel replacement include a preference for low carbon fuels; the existence of ongoing bureaucratic restructuring, and; profitability concerns of China's national oil companies (NOCs). At the local level, a more short-term and localized view of energy development may explain why some sub-national governments actively encourage

[1] For examples of academic research, see: Bo Kong, 'China's Energy Decision-Making: becoming more like the United States?', *Journal of Contemporary China*, 18 (62), (2009), pp. 789–812; Nan Zhou, Mark D. Levine, and Lynn Price, 'Overview of Current Energy-Efficiency Policies in China', *Energy Policy* 38 (11), (2010), pp.1-37.

[2] Potential benefits: while not as clean as automobile fuel-switching options like electric, hydrogen, or dimethyl leter, pure methanol fuel (M100) is still cleaner than diesel or gasoline with respect to carbon monoxide and nitrous oxide emissions. Also, emissions from the use of methanol fuel have around half the atmospheric reactivity of those from gasoline which results in less smog (Gregory Dolan, 'Methanol Fuels: The Time Has Come', in paper presented at the 2009 Chinese Methanol Fuels and Methanol Automobile Industry Summit, available at http://www.methanol.org/pdfFrame.cfm?pdf=DolanISAF.pdf, last accessed on October 20th, 2010). Also, the potential for methanol to be produced from a number of energy sources, including coal, make it a versatile option for improving energy security. The main disadvantages: although the use of coal-based methanol fuel reduces local air pollution by lowering carbon monoxide and nitrous oxide emissions, blended methanol fuel produces overall greenhouse gas emissions that are twice that of gasoline (ibid.). This is in conflict with China's national goal to reduce the CO2 emitted per unit GDP by 40 to 45 percent by 2020 compared to its 2005 levels. Also, coal-based methanol is neither as cheap nor as clean as natural gas or natural gas-based methanol.

methanol fuel development through local standardization, subsidies, and managing NOC opposition.[3]

The findings presented here also contribute to the ongoing debate on the evolving central-local relations in China's post-reform area. One school argues that a steady downward shift of economic power has empowered local governments at the expense of Beijing.[4] Others counter that central political and economic strength remains resilient through a unitary system that is ruled by one nationally integrated party wielding coercive institutional tools and an effective cadre management system.[5] In the case of methanol, local government actions are not necessarily at odds with the interests of the center, a finding that stands in contrast to the oft-made assumption that central-local relations tend to be zero-sum. We argue that local governments' divergent responses to energy dilemmas are a result of the absence of well-defined central directives. Guidance from above is lacking at times because of limited state capacity to micro-manage processes; insufficient resource provisions; large policy time lags caused by China's long chain of governmental hierarchy, and; ongoing bureaucratic reforms at the national level. Local officials are well-positioned to step in to this 'vacuum' and craft policies tailored to the realities of local industry. In doing so, local government agents act in an ad-hoc managerial and problem-solving capacity, handling competing local demands and interests. Using the example of methanol business development, this paper shows how local governments act as strategists and entrepreneurs, forming and maintaining local linkages with businesses to accomplish short-term objectives.[6]

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[3] Coal-based blended methanol is created and distributed as follows: first, fertilizer enterprises produce methanol in the process of making fertilizer; this is followed by specialized enterprises mixing methanol with gasoline, followed by distribution at specialized gasoline stations. Methanol automobile fuel can be used as pure methanol (M100) or as mixes of gasoline, additives, and methanol from 5 percent methanol (M5) up to 85 percent (M85). M5 through M30 are more common as they can be used as fuel in automobiles without significant engine conversions. Both local companies producing and mixing fuel and NOCs are capable of supplying mixed methanol fuel to the public, however, given the supply infrastructure and market dominance of NOC's, oil majors are often the only players which can distribute the fuel on a large scale.

[4] See for example: Shaoguang Wang, 'The rise of the regions: fiscal reform and the decline of central state capacity in China', in Andrew G. Walder (ed.), *The Waning of the Communist State: Economic Origins of Political Decline in China and Hungary* (Berkeley: University of California Press, 1995), pp. 87–113.

[5] See for example: Yasheng Huang, *Inflation and Investment Controls in China: The Political Economy of Central-Local Relations During the Reform Era* (New York: Cambridge University Press, 1996); John P. Burns, 'Strengthening central CCP control of leadership selection: the 1990 nomenklatura', *China Quarterly*, no. 138 (1994), pp. 458–491; Yumin Sheng, 'Central–Provincial Relations at the CCP Central Committees: Institutions, Measurement and Empirical Trends, 1978–2002', *China Quarterly*, no. 182 (2005) pp. 338-355. For an excellent literature review, see Jae Ho Chung, 'Studies of central–provincial relations in the People's Republic of China: a mid-term appraisal', *China Quarterly*, no. 142 (1995), pp. 487–508.

[6] This dynamic is not unique to the methanol fuel industry. Many sub-national governments promote 'local champions' even when sub-national government involvement in an industry would seem frowned upon by central authorities. Anhui Province's Chery Automobile, for example, was initially an illegal enterprise, registered as a 'car parts supplier', due to strict entrance limits in the automobile industry at the time (Weidong Liu and Henry Wai-chung Yeung, 'China's Dynamic Industrial Sector: The Automobile Industry', *Eurasian Geography and Economics*, 49 (5), (2008), pp. 523-548). Thun writes in depth on the contribution of local government support for automobile industry development in Shanghai, Beijing, Guangzhou, Changchun and Wuhan (Eric Thun, *Changing Lanes in China: Foreign Direct Investment, Local Governments, and Auto Sector Development* (New York: Cambridge University Press, 2006). The case of methanol automobile and fuel promotion differs from these comparisons in that the widespread feasibility of the product (methanol fuel) is currently unknown and sales of the product require the use of potential competitors' distribution infrastructure.

The analysis is based on 55 interviews conducted with government officials and business managers at the national level in Beijing and at the provincial, municipal, and county levels in Shanxi during a four-month long period of fieldwork in 2010. The research concentrates primarily on Shanxi Province, which is currently China's second largest coal producer and has been the base for national, provincial, and municipal methanol programs for over ten years. Other provinces such as Guizhou, Shaanxi, and Zhejiang also have locally-driven methanol initiatives, but Shanxi has the largest-scale programs as well as the longest history, making it the most suitable candidate for exploring this issue. Semi-structured interviews were conducted with officials from the National China Association of Alcohol and Ether Clean Fuel and Automobiles, provincial and municipal methanol offices, local Economic Commissions, Environmental Protection Bureaus, and Development and Reform Commissions, as well as fertilizer companies and fuel distributors. The analysis also draws from government policy documents, statistical yearbook data, internal enterprise reports, and company visits.

The following section provides a historical overview of the methanol automobiles and fuel market in China. The subsequent section analyzes the recent developments in government policies toward the methanol industry and develops the argument about the determinants of policy decisions or indecision. The final section summarizes the key findings and places the analysis in the larger context of general fuel-switching and alternative energy adoption initiatives.

Context: the development of methanol fuel and automobiles in China

This section aims to place the analysis into a historical context by highlighting the evolving roles of different levels of the Chinese government since the emergence of the methanol automobile fuel industry in China in the 1980s. Three phases of methanol fuel development in China are identified: the first phase began with foreign joint ventures which facilitated technology transfer; during the second phase, methanol fuel development moved to nationally-supported pilots; and in the third phase sub-national governments supported and experimented with local pilots.

Phase 1: 1980 – 2002 – Early development and Sino-American cooperation

The first phase of government support is characterized by nationally coordinated domestic research and international cooperation. Methanol automobile fuel first received Chinese national attention in the early 1980s when the Chinese National Transport Ministry listed M15 (gasoline blended with 15 percent methanol) research as a national research project and the Chinese Academy of Sciences subsequently listed M85 (gasoline blended with 85 percent methanol) research in their key projects for the 7th Five Year Plan (1986-1990). In 1996, the Chinese Ministry of Technology and Science initiated a cooperative international research project on methanol fuel, partnering with the Massachusetts Institute of Technology, Ford, Volkswagen, the Tsinghua University Department of Chemical Engineering, and the Chinese Academy of Sciences. As a result of this cooperation, the Shanxi Datong Automobile Factory produced China's first methanol automobile, leading to a series of national methanol automobile projects beginning in 1998 and continuing through 2010.

Phase 2: 1998 – 2008 – National project emphasis

During the second phase, national ministries conducted methanol automobile pilots in selected areas in China and created incentives for using methanol fuels through toll fee reductions and tax allowances. The national emphasis spurred automobile development in several provinces. This

was followed by the national government's near disappearance from methanol fuel development beginning in 2008.

The first methanol fuel pilot was launched in 1998 in Yuci District in Shanxi, a province chosen due to its richness in coal resources. The Shanxi Provincial Economic Commission coordinated the national level project and contracted a local enterprise to convert engines of 50 city mini-buses to use M85. As reimbursement for joining the pilot, participating buses were exempted from road tolls and received subsidies for each engine conversion. In 2005, the national government approved an '863' project which involved the engine conversions of an additional 100 buses and 200 taxis.[7] Like the previous pilot project, bus and taxi drivers were exempted from road tolls and subsidized for engine conversions. During early 2000, large automobile manufacturers responded to these test projects and the national emphasis behind them and produced several models of flexible fuel vehicles (FFVs). These automobile manufacturers included large players like Shanghai Automobile Industry, Anhui Province's Chery Automobile, and Chongqing's Chang'an Motors.

In addition to these national-level pilot programs, national leaders pushed forward China's overall methanol fuel development agenda. One deputy prime minister, Zeng Peiyan, especially emphasized the necessity of developing methanol fuel.[8] Another minister, the former head of the Ministry of Machinery and Industry, He Guangyuan, was so out-spoken in his support that the Chinese media dubbed him the 'minister of methanol' (*jiachun buzhang* 甲醇部长). He Guangyuan recommended the advancement of methanol fuel projects to Hu Jintao and Wen Jiabao after their taking office in 2003.

The early proactive support of methanol fuel development was followed by steadily decreasing national emphasis since 2008. In 2008, the Ministry of Finance (MOF) discontinued national financial subsidies for engine conversions, and, with the exception of the 863 project which came to an end in 2010, the methanol car pilots became provincial projects. The road toll exemptions were also eliminated after many drivers received exemptions without actually using methanol fuel. In 2010, the Ministry of Industry and Information (MII) announced its position that electric automobiles should be the main direction of the Chinese automobile industry and excluding methanol automobiles from its development plan.[9] Another key shift was a speech of the chairman of China Petroleum and Chemical Corporation (from here on referred to as Sinopec), Wang Tianpu, in August 2010, announcing that Sinopec would not expand M15 sales to the rest of the Chinese automobile fuel market. Official reasons cited by Sinopec include toxicity concerns and methanol fuel's potential to disrupt Sinopec's stable and profitable gasoline business,[10] though many experts in the methanol industry believed that the latter reason was of particular importance.[11] The withdrawal of support from major oil companies may ultimately affect China's ability to promote methanol fuel on a large scale, given the NOC's

[7] China's National 863 Program offers financial support to foster technology innovation in China.

[8] Zhigui Peng, 'The new definition, development, and rethinking of methanol fuel industry in China', presented at the 17th International Symposium on Alcohol Fuels, 2008.

[9] Zhongguo Huagong Wang [ChemNet], 'Jiachun Qiche: Zai Zhengce De Miwu Zhong Qianxing' ['Methanol Automobiles: moving forward within the policies' fog'], http://news.chemnet.com/item/2010-08-17/1400688.html, (17 August 2010).

[10] Qijue Chen. 'Zhongshihua Cheng Bu Xiwang Jiachun Qiyou Rushi Jiachun Qiye Zaoyu Jiaji' ['Sinopec states that it does not wish for methanol fuels to enter the market, methanol enterprises encounter attacks from two sides'], *Shanghai Zhengquan Bao [Shanghai Securities News]*, (2 August 2010).

[11] Interview 25, July 2010, Shanxi Transportation Methanol Project Office; Interview 70, September 2010, China Association of Alcohol and Ether Clean Fuels and Automobiles.

supply infrastructures and market dominance. One week after Sinopec's announcement, Shaanxi Province – a coal-rich province neighboring Shanxi Province – postponed its plans to launch its methanol fuel strategy in October 2010.

Phase 3: Since 2006 –Sub-national promotion

In the third phase, some local governments began to actively create and manage local methanol programs at the provincial and municipal level. Despite the national de-emphasis of methanol automobiles in 2010 and the absence of subsidies or a national M15 regulatory standard, provinces in Guizhou, Shaanxi, Shanxi, and Zhejiang set up provincial methanol offices to plan and promote methanol. Inner Mongolia, Hebei, Ningxia, Shandong, and Xinjiang were also in the process of setting up offices and expressed great interest in the development of methanol fuel.[12] The majority of these provinces entering the methanol fuel business such as Shaanxi and Shanxi have locally based coal production, but others, such as Zhejiang do not.

Among the different provincial governments, Shanxi has shown the greatest interest in methanol fuel business development. Shanxi's provincial support began tentatively in 2002 when the Shanxi Economic Commission expanded methanol fuel pilot projects beyond the nationally-led pilot, adding projects in four additional municipalities in the province. The government then negotiated with Sinopec to provide low-level methanol blends, M15, on a large scale. The government won Sinopec's provincial branch as a partner in 2006 after local officials threatened to offer sales rights for methanol fuel directly to local stations and agreeing to condone Sinopec's initial practice of selling cheaper blended methanol fuel as normal 'No. 93' gasoline. The Shanxi provincial government also created various methanol promoting incentives. Most importantly, the government offered engine conversion subsidies in 2008 and 2009, giving 5000 Yuan, or 50 percent of cost, for bus conversions and 1000 Yuan, or 20 percent of cost, for taxi conversions. After the national road toll exemptions were eliminated in 2008, the Shanxi government continued exempting tax levies on M85 and M100.

In addition to nationally and provincially-supported methanol programs, municipal governments also fostered the development of home-grown engine conversion companies. One municipality in Shanxi in particular, Yuncheng, gave strong support to a small, privately-owned engine conversion enterprise in order to promote M85 and M100 compatible automobiles. The municipal government regularly stepped in during crisis situations, serving as a go-between for the enterprise and its suppliers, and also helped during negotiations with methanol production companies and the provincial government. For example, during 2006, after Sinopec's entry into the market and unrelated international market disturbances, methanol fuel prices briefly rose to the point that methanol fuel became more expensive than gasoline. In Yuncheng, the municipal Economic Commission convinced a local methanol producer to temporarily supply local methanol stations at reduced, but still profitable prices to maintain methanol fuel's price advantage over gasoline, thus protecting the local market development.[13] In contrast, during the brief price peak car drivers in other municipalities reverted their engines to their original settings and refused to try the fuel again, even after prices returned to normal levels.[14]

[12] Interview 70, China Association of Alcohol and Ether Clean Fuels and Automobiles, September 2010; Zhongguo Huagong Wang [ChemNet], 'Jiachun Qiche: Zai Zhengce De Miwu Zhong Qianxing' ['Methanol Automobiles: moving forward within the policies' fog'], (http://news.chemnet.com/item/2010-08-17/1400688.html, 2010).

[13] Interview 43, July 2010, Methanol Engine Conversion Company

[14] Interview 38 and 39, July 2010, Yuncheng Economic Commission; Interview 43, July 2010, Methanol Engine Conversion Company

The three phases illustrate the trend that China's national support for blended methanol fuel waned and some local states step in to actively manage methanol fuel market development themselves. The next section summarizes the behaviors and embedded interests of government actors since the mid-2000s.

Explaining governments' diverging interests

As described above, the various levels of government managed regulation and support for methanol fuels differently. *Table 1* summarizes the national, provincial, and municipal governments' perspectives on methanol, each of which will be examined in the next three sections of this paper.

<insert Table 1 here>

National level: experimentation with pilots, long-term strategy, bureaucratic restructuring, and NOC interests

Methanol fuel received strong national support from the 1980s through 2008. The central government emphasized the early research and development of methanol fuel and automobiles, and set up pilot projects to test their use. National ministries and universities cooperated with foreign partners, facilitating technology transfer and domestic production. Also, the government, with the help of the oil majors, created standards for high level blend M85 and M100 methanol fuels. Yet, since 2008, the support for blended methanol has waned. National engine conversion subsidies, pilot projects, and road toll exemptions were discontinued or passed to provincial governments. Sinopec, which realized significant profits from M15 sales, withdrew from the market in 2010 and delayed the formulation of M15 fuel standards. Also in 2010, methanol fuel was excluded from the development plan of the Ministry of Industry and Information. These actions could be considered a natural and calculated pulling out, given that young industries must at some point prove their competitiveness and ability to survive without government support, but the abrupt and unexpected withdrawals in 2008 seem to contradict this, reflecting a sudden shift in policy focus as opposed to a more gradual withdrawal.

This study argues that the national government's benefits from promoting methanol fuel, including energy security and the long-term potential from clean forms of methanol, were not enough to overcome (a) national preferences for long-term viable and low carbon energy development plans, including those related to reducing carbon emissions, (b) the mismanagement and emerging policy gap during bureaucratic restructuring, and (c) the opposition of state oil majors due to low-level blend methanol's potential to lower gasoline profitability and market share.

Long-term view and low-carbon energy development plans

The central government's withdrawal from the methanol fuel market corresponds with increasing promotion of electric cars and other long-term, non-fossil fuel options. This trend indicates a more long-term view of energy development, under the premise that enduring energy security and climate change mitigation efforts depend on decreased use of fossil fuels. This long-term approach to energy development is underscored by the central government's strengthened commitment to ambitious carbon intensity reductions by 2020, aiming to reduce carbon intensity by 40-45 percent based on 2005 levels. This in particular has important implications for

methanol fuel because one of the most attractive aspects of methanol is that it can be produced from China's abundant coal resources, yet GHG emissions from coal-based methanol are twice those of gasoline. Although methanol fuel has many benefits, including low cost and lower emissions of some local air pollutants than gasoline, it does not have the many clear potential advantages for emissions and energy security that electric cars or hydrogen vehicles would possess.

Frequent restructuring of China's energy bureaucracy

Throughout the 2000s, frequent reforms of China's energy bureaucracy resulted in bureaucratic turmoil and turf fights at the national level. Agencies in charge of methanol were not clearly appointed or lacked the authority, autonomy, and tools to govern the energy and fuel markets. As a result of the ongoing bureaucratic restructuring, a significant methanol policy gap emerged that deprived the methanol fuel market of central government management and coordination.

For example, prior to the major energy bureaucracy reforms in 2008, the NDRC drafted a policy file on methanol fuel and gathered opinions from different government departments and market actors, but this policy failed when bureaucratic responsibilities for the fuel were reassigned from the NDRC's Energy Bureau to the newly formed National Energy Administration (NEA). The failure of the initial draft policy was in part caused by an ongoing transition period during which new policy managers adapted to their responsibilities.[15] Beyond this, although the NEA was better staffed than the NDRC Energy Bureau, there were only 112 employees working at the national level, far fewer than needed. By comparison, the United States Department of Energy has around 4,000 employees working on energy issues.[16] Also, the NEA was intended to resolve planning and coordination issues, yet it lacked the power to carry out many of its assigned tasks, including the authority to effectively coordinate the interests of ministries, commissions, and state-owned energy companies.[17] To improve coordination, a National Energy Commission (NEC) was set up with more than 21 members that ranked at a higher level than both NDRC and the NEA in the hierarchy of power, but there was again a considerable time lag before the new ministry started to operate. Throughout 2009, negotiations among key department leaders took place to agree on the so-called 'super ministry's' core leadership and tasks. Official NEC appointments were made only in January 2010[18] and following up to the creation of the 'super ministry' for energy, power struggles among different departments resulted in no clear lines of responsibilities and accountabilities. While in some areas there was significant double work among agencies to fight for territory, in other areas issues simply fell 'fell through the grid'. Methanol fuels were one example of the latter.

The roles of NOCs

State-owned oil majors also played an important role shaping methanol fuel policies at the national level. Sinopec was asked by the central officials to take the lead in methanol fuel development and methanol standard creation. Sinopec created standards for high-blend methanol

[15] Interview 70, September 2010, China Association of Alcohol and Ether Clean Fuels and Automobiles

[16] Erica S. Downs. 'China's 'New' Energy Administration - China's National Energy Administration Will Struggle to Manage the Energy Sector Effectively', *China Business Review*, November-December, (2008), pp. 42-45.

[17] Ibid.

[18] Zhihong Wan. 'Wen Heads 'Super Ministry' for Energy', *China Daily,* http://www.chinadaily.com.cn/china/2010-01/28/content_9388039.htm, (28 January 2010), last accessed on June 23, 2011.

fuels such as M100 and M85 that do not threaten Sinopec's gasoline business because using such high blended fuels requires engine conversions. However, China's oil majors delayed the development of M15 fuel standards and M15 fueling stations. As low blended fuels can be used with existing engines and methanol fuel would stand in direct competition to Sinopec's and Petrochina gasoline sales, this was arguably a wise business decision if deliberate. Domestic producers have a large methanol production capacity, and given that private gasoline stations could establish a sufficient supply network, Sinopec and Petrochina would experience strong domestic competition. On the other hand, if Sinopec had expanded its own sales of M15 fuel, the methanol market may have destabilized the oil majors' relatively stable gasoline market. In addition, although Sinopec was able to sell the M15 fuel as normal No. 93 gasoline for several years and achieved large profit margins, it was eventually forced to correctly label the fuel after complaints from the public. Sinopec's M15 fuel prices subsequently reflected the addition of cheaper methanol fuel, lowering profit margins and partially removing one of the primary incentives for the oil majors to sell methanol.

Given China's politically powerful and relatively autonomous state-owned oil companies, combined with the existence of inter-departmental fragmentation in energy, it is difficult for the national bureaucracy to micro-manage policies which involve redistribution and drawbacks or which do not impact core interests. According to Kong, adopting and implementing redistributive policies at the national level in China is becoming increasingly difficult.[19] National level decision-making on methanol fuel promotion is no exception, especially during institutional reform and transition. Without NOCs' support for methanol fuel switching, and as the central government's stand towards methanol business development gradually shifted from coordinated national support towards no direct policy, management of methanol automobile fuel development was left to the provinces.

Provincial level: embedded economic interests, short-term strategies, and pollution considerations

Several provincial governments, including Shanxi Province, have continued to support methanol fuel, despite the recent national level withdrawal. Significantly and in contrast to government inaction at the national level, provincial officials took aggressive steps to promote methanol, employing methods outside of the formal bureaucracy. For example, provincial leaders in Shanxi and Guizhou actively managed opposition from oil majors.[20] Opposition from Sinopec in Shanxi was countered by threats and unofficial deals sidestepping other local suppliers, thus allowing Sinopec to reap significant profits from methanol sales. Shanxi officials also created methanol promotion offices, planned the methanol engine conversion pilots, and formed closed alliances with local companies, negotiating pilot expansions and distribution rights with them. As pilots expanded, establishing a M15 standard became increasingly necessary with many small producers entering the market, but there was no national action. Shanxi, like eight other provinces, responded by developing its own provincial standard. In addition to planning, coordinating, and forming alliances, government officials also sought to persuade stakeholders and decision-makers to buy in to methanol fuel through framing the coal-based methanol fuel as

[19] Bo Kong. "China's Energy Decision-Making: Becoming More Like the United States?" *Journal of Contemporary China* 18(62), (2009): 789 - 812.
[20] Interview 70, September 2010, China Association of Alcohol and Ether Clean Fuels and Automobiles

a clean, cheap, and locally beneficial alternative to imported gasoline.[21] This is despite the fact that Sinopec was allowed to sell M15 fuel at the same cost as gasoline, taking away the cost advantage for consumers, and also that methanol fuel is 'clean' in terms of local pollutants but 'dirty' with respect to GHG emissions.

Two explanations help in understanding provincial governments' aggressive, managerial support of methanol fuel: (a) a more short-term and localized view of energy development prioritizing economic benefits for local coal and fertilizer enterprises, and (b) local, visible pollution reduction benefits from the use of methanol which was especially important to provinces with national government and international media pressure to reduce air pollutants. Both economic interests and environmental concerns at the local level in some provinces outweighed the difficulties of promoting the fuel. Hence, provincial governments were especially willing to continue support despite the lack of methanol fuel promotion at the national level.

Economic interests and a localized view of energy development

In terms of local economic interests in Shanxi, methanol fuel potentially benefits primarily local coal and fertilizer industries, and methanol promotion policies do not negatively influence core business interests. For example, Shanxi as the second largest coal producer in China, favors the development and diversification of coal markets. Especially with new demands beginning in 2006 to increase GDP per unit of standard coal equivalent, Shanxi's provincial government faces pressure to increase the value-added of products manufactured from coal in the province. Methanol fuel's profit margins are high and through the use of coal-based methanol fuel, Shanxi can keep more profits within its borders. Also, the expansion of the methanol market has significant benefits for fertilizer companies as methanol fuel diversifies their product base and grants them greater market stability. In addition to embedded business interests, a thriving local methanol fuel business helps provincial government officials to meet their economic growth and employment targets. Although cadre evaluations include environmental and energy targets, economic growth is still one of the safest bets for government officials chasing career promotions.

Provincial economic interests are substantial and lead to a support of methanol in the short-term. Unlike the long-term development of electric cars supported by the national level, methanol fuel is technologically nearly within China's grasp, and promotion of the fuel results in relatively immediate results for businesses and the economy. The national level has few of these short-term incentives because of the many different provinces, most of which do not have the significant economic interests in methanol in comparison to major coal-producing provinces.

Pollution considerations

[21] The concept of 'framing' originates from sociological research Erving Goffman, *Frame Analysis* (Cambridge: Harvard University Press, 1974). Frame analysis has been applied to the politics of environmental, energy, and climate change discourse and describes the effectiveness of linguistic 'reframing' of policies in dominating public perceptions of issues Maarten Hajer, *The Politics of Environmental Discourse. Ecological Modernization and the Policy Process* (Oxford, UK: Clarendon Press, 1995), J. Ivan Scrase and David Ockwell, 'The Role of Discourse and Linguistic Framing Effects in Sustaining High Carbon Energy Policy: An Accessible Introduction', *Energy Policy* 38(5), (2010). For an example of how local governments reframe energy policy in China, see Genia Kostka and William Hobbs, 'Local Energy Efficiency Policy Implementation in China: Bridging the Gap between National Priorities and Local Interests', China Quarterly, forthcoming (2012).

Beginning in 2006 and continuing through the present, Shanxi has faced national and international media scrutiny on its air pollution. In 2006, the World Bank listed one of its municipalities as the world's most polluted city.[22] Methanol fuel may produce greenhouse gas emissions far greater than gasoline, but at the local level, it improves air quality and can result in less smog because of its emissions' relatively low atmospheric reactivity. For Shanxi and other provincial leaders, there is perhaps a slight preference for air quality improvement programs with greater visibility to the general public, including the smog factor, especially as local Environmental Protection Bureaus (EPBs) keep track of 'blue sky' days.[23] In visibly improving air quality, government efforts to ameliorate pollution are more salient, which may be of paramount importance to a government facing local, national, and international media pressure.

Municipal level: local economic interests, government-business coalitions, and 'pet projects'

As at the provincial level, municipal government behavior on methanol promotion can be aggressive and managerial. The case study on Shanxi's Yuncheng municipality illustrates a municipal government's intervention and negotiation to protect the development of the methanol fuel market. The managerial behavior of local government actors can be explained by embedded economics interests and the personal involvement of individual leaders who took on methanol promotion as a 'pet project'.

In Yuncheng municipality, the local privately-owned Beston Company was originally an automobile repair shop, and in 2005 was working on engine conversions for liquefied oil gas at the time. Its entrance into the methanol engine conversion market was a combination of two distinct events. The first event was that in 2005 the provincially supported Jiaxin Company had just undertaken the widespread promotion of its engine conversions, yet had run into serious technology issues. Beston saw Jiaxin's difficulties as an opportunity to enter the market. The second event was an alliance between the repair shop manager and an official in Yuncheng's Municipal Economic Commission. The two men were introduced through a classmate of the repair shop manager who had heard that the government official was interested in supporting the development of methanol fuel usage in the municipality.

Over time, the enterprise and the Economic Commission, through the government official, developed a strong partnership. For example, while petitioning for subsidies, the official's support made it clear that Beston Company was not to be considered 'outside' the government, but in partnership with it. The official and enterprise manager repeatedly petitioned the provincial government for financial support, eventually receiving an Environmental Protection Fund grant amounting to 200000 RMB.[24] However, not all companies had this support from a 'managerial' local government. In one locality, an enterprise manager without government endorsement protested when his company did not receive promised subsidies and was jailed for several days, reportedly because he petitioned as an 'outsider'. This manager eventually gave up his petition.

The Yuncheng Economic Commission support, in the form of a personal commitment from one of its high-ranking officials, also included negotiation and intervention during one major

[22] Emily Chang, 'Choking in China's Polluted City', *CNN*, http://articles.cnn.com/2009-12-15/world/china.pollution_1_coal-mines-polluted-factories?_s=PM:WORLD, (15 December 2009), accessed on June 23, 2011.
[23] Interview 7, July 2010, Shanxi Province Environmental Protection Bureau
[24] Interview 38, July 2010, Yuncheng Economic Commission.

methanol price fluctuation. In 2006, after Sinopec's entrance into the market and international market disturbances, methanol fuel prices rose to the point that the fuel became more expensive than ordinary gasoline, eliminating incentives for consumers to switch to methanol fuel. Taxi drivers protested, believing that they had been cheated. In response, and to protect the methanol automobile industry and Beston Company, who was taking the brunt of the public anger, the official from the Economic Commission negotiated a deal with a local fertilizer plant, under which the fertilizer plant supplied methanol at a reduced price to methanol gas stations. The drivers were placated and kept methanol engine conversions. This was essential to the successful promotion of methanol in Yuncheng because local car drivers new to the fuel had been uneasy about using a gasoline alternative. [25] In other localities, the price rises resulted in drivers switching back to normal gasoline and being unwilling try the fuel again.

In Shanxi, municipal embedded economic interests that support methanol fuel are in line with those at the provincial level. Almost all municipalities have significant coal resources and fertilizer enterprises. Because of this, many municipalities have incentives to promote methanol similar to provincial incentives. Yuncheng does not have coal resources, but has many large fertilizer enterprises due to its proximity to coal-producing locations, and its importance as a provincial agricultural base. This is significant as the fertilizer enterprises benefit the most, more than coal interests, from methanol promotion in the short-term since they sell methanol directly to the market and diversify their consumer markets. These short-term benefits, or the short-term economic consequences of market stability once promotion of methanol has achieved a degree of success, create additional pressure to find short-term, reactive solutions to pressing market development issues.

Also, at the municipal level, government support for methanol can be tied to individual preferences of leaders than at either the national or provincial level. This leads to large variations in support for methanol fuel among municipals. For example, promotion in Yuncheng was especially interventionist, aggressive, and, ultimately, successful. The deciding factor in this was the government-business coalition and the enthusiasm of one Economic Commission official who took promotion and protection of the methanol industry on as a 'pet project'. This official had existing close connections to a large, profitable fertilizer enterprise and good relationships with provincial government officials. In addition, the existence of a independently successful local engine conversion company capable of competing with the dominant, provincially-supported Jiaxin made it easier to justify support. The local Beston Company was able to provide high quality engine conversion products while the provincial-level Jiaxin resolved product malfunctions in 2005. In this way, the municipal level government support and the local enterprise complemented provincial efforts and created increased market competition.

Conclusion

This paper has examined the politics of methanol fuel-switching in China and uncovered determinants of policy variation within the Chinese government. It argued that embedded interests of local governments help to account for the pro-active, managerial support of methanol business development in many locales in spite of the central government's ambivalence toward this fuel. In locales with high levels of coal and fertilizer production and local pollution concerns, the embedded interests of local governments were strong motivators for sub-national

[25] Methanol is acidic, wearing away the fuel lines of cars without appropriate equipment to handle the fuel, and many consumers believe it to be highly toxic. It is also sometimes hard to start a car running on the mixed methanol fuel in cold conditions.

governments to develop local methanol standards, create subsidy programs, and establish formal and informal incentives for businesses to join pilot programs. These pro-active responses occurred in parallel to the emergence of a yawning policy vacuum at the national level which was the combined result of bureaucratic restructuring, national oil companies' foot-dragging in government-organized regulation and planning, and a preference for long-term energy strategies. In contrast to the oft-made assumption that central-local relations tend to be zero-sum, local government actions in this case did not defy national-level directives and instead filled this 'vacuum'. To summarize, while the national government concentrated on pursuing experimental, long-term strategies to ensure energy security, at the sub-national level government agents created short-term, ad-hoc solutions to the pressing issues surrounding strategic markets, which in this case were those for methanol fuel and engine conversions.

These findings on the politics of methanol fuel-switching in China are highly relevant to fuel-switching and alternative energy adoption efforts of increasing importance to other local and national governments. It is true that many energy issues such as energy security and emissions concerns may be of primary concern to national and international actors and not local governments with limited influence over the outcomes of efforts requiring national or worldwide coordination. However, as illustrated by this study, local governments may have strong local interests which influence their behaviors in promoting specific alternative fuel and energy options. This research outlines some specific practices and methods that local governments in China use to address barriers to entry and distributional difficulties that may derail alternative fuel and energy initiatives. The case study describes and accounts for local governments' roles in both supporting methanol blend suppliers, and also creating and nurturing local markets for methanol fuel. While Shanxi's long-term experimentation with methanol fuel policy makes it somewhat unique among China's provinces, Shanxi stands to reason that the actions of other provincial or sub-national governments are also shaped by the contours of local, embedded interests.

Table 1. National and sub-national governments' perspectives on methanol

	Perspectives on methanol		Other factors influencing methanol policy outcomes
	Advantages	Disadvantages	
National: de-emphasis of methanol fuel	• Energy security • Short-term NOC profits (when selling methanol as normal fuel) • Long-term potential to be 'clean' when made from CO2 or biomass	• High GHG emissions raise carbon intensity • Market destabilization and lower profitability for NOCs, toxicity • Low acceptance among automobile owners, price fluctuations	• Reform and bureaucratic restructuring • Preference for long-term, experimental energy development such as electric cars
Provincial: variation - selective support	• Market expansion and diversification for coal and fertilizer enterprises, improved air visibility, less local air pollution	• Toxicity, low acceptance, price fluctuation	• Pre-existing government-enterprise partnerships
Municipal variation – selective support	• Market expansion for local fertilizer enterprises, improved air visibility and less local air pollution	• Toxicity, low acceptance among automobile owners, price fluctuation	• Leadership emphasis on 'pet projects', government-enterprise partnerships, ensuring social stability (avoiding or addressing protests)

Source: Based on interviews 25, 43, 51, 51, 53, and 70 with the China National Association of Alcohol and Ether Clean Fuels and Automobiles, provincial and municipal methanol or transportation government offices, Beston Automobile Conversion Company, Jinzhong Jiaxin Automobile Conversion Company, and Huadun Methanol Production Company during July to October 2010.