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## Industrial Metamorphosis in the Self Strengthening Movement: Li Hung-chang and the Kiangnan Shipbuilding Program

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It has been observed that during the 1870's important areas of China's self-strengthening movement came increasingly under the overall coordination of Li Hung-chang. The movement was expanded to include such concerns as personnel development and the augmentation of state income and Li was able to implement certain features of a comprehensive plan for self-strengthening throughout the empire. The result was a movement of new dimensions, one in which Li and others, on behalf of the imperial government, attempted to enrich and strengthen China in so far as this could be achieved without disturbing the basic institutions of the empire.<sup>1</sup>

However, the changes which accompanied this transformation, in some instances, seem quite inconsistent with the objectives of self-strengthening. Such was the case with the shipbuilding program at the Kiangnan Arsenal in Shanghai, China's largest self-strengthening industry. During the years from 1867 to 1875, Kiangnan completed fourteen vessels of western design, thirteen of which were powered by steam machinery.<sup>2</sup> With only a few exceptions, all were constructed entirely at the arsenal.<sup>3</sup> In the next thirty years, only one ship was completed.<sup>4</sup> Although this abrupt cutback in steamship building amounted to abandonment of China's most costly and conspicuous self-strengthening project, it has never been fully explained.<sup>5</sup> Furthermore, the stop-

- 1 Kwang-ching Liu, "Li Hung-chang in Chihli" in Feuerwerker, Murphey and Wright, *Approaches to Modern Chinese History*, University of California, 1967, 68-104. I would like to express my appreciation to the Social Science Research Council for grants during the summers of 1969 and 1970 during which much of the work on this article was completed. I am also personally indebted to Professor Kwang-ching Liu of the University of California, Davis, for his frequent and painstaking comments during the preparation stage. Needless to say, all views and conclusions expressed are the sole responsibility of the author.
- 2 See Table 1.
- 3 Kuo Ting-yee et. al. ed., *Hai-fang Tang* (abbr. *HFT*, Maritime defense archives), 5 vols., Nankang: Institute of Modern History, 1957, III, 101.
- 4 Wei Yun-kung, *Chiang-nan chih-tsao-chü chi* (abbr. *KNCTCC*, The Record of the Kiangnan Arsenal), 10 *chüan*, Shanghai: Wen-pao Shu-chü, 1905, 3:1-3.
- 5 Works which have alluded to this problem include: Liu, *Op. cit.*; John L. Rawlinson, *China's Struggle for Naval Development 1839-1895*, Harvard, 1967, 41-43; Ch'üan Han-sheng, "Ch'ing-chi te Chiang-nan chih-tsao-chü" (The Kiangnan Arsenal in the last years of the Ch'ing Dynasty) in *Li-shih yü-yen yen-chü-so chi-k'an* (Bulletin of The Institute of History and Philology), XXIII, Nankang, 1951; Stanley Spector, *Li Hung-chang and the Huai Army*, Seattle: University of Washington, 1964, 174.

page of shipbuilding at Kiangnan coincided with a major shift in national defense policy toward an emphasis on maritime defense and naval development. What prompted the Ch'ing government to deactivate one half of its facilities for naval construction at this seemingly inopportune moment? The answer to this question is clearly essential to an understanding of the rationale guiding self-strengthening during the 1870's.

Before examining the affairs of the arsenal during the 1870's, it will be useful to recall some of the circumstances surrounding the establishment of the Kiangnan Arsenal. Kiangnan was a government owned and operated plant established during the years from 1865 to 1868 when the imperial government, in an effort to cope with local rebellion, had delegated large areas of military and economic authority to the provinces.<sup>6</sup> Consequently, control over the arsenal's affairs was exercised directly by officials of the Liang Kiang Provinces, in which Shanghai was situated, under the general surveillance of the Tsungli Yamen, the organ of the central government most concerned with self-strengthening.<sup>7</sup> The central government, however, continued to exercise its administrative prerogative of assigning and transferring provincial officials. One consequence of this, during the 1860's, was that officials of proven ability in rebellion suppression and crisis management were transferred about frequently; in the four year period while Kiangnan was being established, the governor-generalship of the Liang Kiang Provinces changed hands no less than four times.<sup>8</sup>

The divergent ideas of China's strategic industrial needs held by two of these governors-general, Tseng Kuo-fan and Li Hung-chang, resulted in Kiangnan starting off on a zig-zag course of development. Tseng Kuo-fan, from the early 1860's had favored the domestic construction of steamships as a basis for long-range self-strengthening against aggression by the West.<sup>9</sup> Li, on the other hand, foresaw the enormous demands for human and economic resources which would be created by a large scale shipbuilding program and attached far greater importance to the pressing problem of producing arms and ammunition for the forces combatting the rebels. As long as the provision of arms for rebellion suppression remained critical, plans for the construction of steamships were held in abeyance. This was the case from the time Kiangnan commenced operations, in May 1865, until July 1866. During these years, Li, serving as governor-general of the Liang Kiang Provinces, drove Kiangnan to produce war materials for Tseng who was commanding the pacification campaign in north China. Despite repeated urgings, from Kiangnan Director Ting Jih-ch'ang, to begin production

6 Wang Erh-min, *Ch'ing-chi ping-kung-yeh te hsing-ch'i* (The rise of military industry in the late Ch'ing Dynasty), Nankang: Institute of Modern History, 1963, 78-79. Kwang-ching Liu, "Nineteenth Century China" in P'ing-ti Ho and Tang Tsou eds., *China in Crisis*, 2 vols., University of Chicago, 1968, Book one, 109-112.

7 Wang, *op. cit.*, 145.

8 Kuo T'ing-yee ed., *Chin-tai Chung-kuo shih-shih jih-chih* (A day by day account of recent historical events in China), 2 vols., Nankang: Institute of Modern History, 1963, II, appendix p. 19.

9 Tseng Kuo-fan, *Tseng Wen-cheng Kung ch'uan-chi* (abbr. *TWCK*, the complete works of Tseng Kuo-fan), 5 vols., including interalia *tsou-kao* (memorials) 4 chüan, Taipei: Shih-chieh Shu-chü, 1964, 2:416-18; 4:839-41. Tseng Kuo-fan, *Tseng Wen-cheng Kung shou-shu jih-chi* (Handwritten diary of Tseng Kuo-fan), 1909, chüan 14: T'ung-chih 1/7/4 (July 30, 1862).

of steamships to counter the growing maritime power of Japan, Li insisted that the arsenal's newly acquired machinery and its foreign technicians be employed solely for the production of field guns and small arms. Production of the latter, however, was notably unsuccessful and, in July 1866, when sources for the purchase of small arms opened up, Li decided that this type of production should be temporarily discontinued and that the arsenal should be relocated where it could undertake the construction of small gunboats for harbor and river defense.<sup>10</sup>

Planning for the move had just begun in December 1866,<sup>11</sup> when Li was transferred from his acting post of Liang Kiang Governor-general to relieve Tseng as the commander of the north China pacification campaign; at the same time, Tseng was moved back to the Liang Kiang governor-generalship, the post which he had held prior to Li's acting appointment.<sup>12</sup> Finding the arsenal's affairs in an unsettled condition, Tseng moved to remold Kiangnan in accordance with his own conception of China's strategic industrial needs. During early 1867, he appraised the resources available for strategic industrial development. These included the original machinery purchased for the arsenal most of which was for shipbuilding, thirty to forty additional machines which had been constructed for ordnance production, and more than one hundred items of general machine shop equipment which Tseng had ordered in the United States several years earlier.<sup>13</sup> Human resources were scanty; management was in the hands of enthusiastic but inexperienced Chinese officials. The only trained technicians on the staff were a handful of foreign shipwrights who had been hired at the time of establishment. (Though Prince Kung of the Tsungli Yamen had suggested overseas training for Banner personnel to fill technical posts in the arsenal shortly before Kiangnan was established, his proposal never materialized; largely because of Li's feeling that basic education in mathematics and science should precede overseas study and his preference for bringing foreign technicians to China where Chinese could learn from them on the job. The foreign shipwrights employed at Kiangnan, however, showed very little expertise in ordnance production and had little or no effect in improving the technical competency of their Chinese co-workers.<sup>14</sup>) Financial resources were also limited. Li had financed the initial establishment of Kiangnan with funds which he and Ting Jih-ch'ang raised in local government circles; production costs were allocated from Huai Army supply accounts which were at Li's disposal.<sup>15</sup> Material resources: fuel, metals and the like were purchased from foreign supplies in Shanghai or directly from abroad.<sup>16</sup>

10 *HFT*, III, 4-5, 6, 11, 12, 27-28. Li Hung-chang, *Li Wen-chung Kung ch'uan-chi* (abbr. *LWCK*, the complete works of Li Hung-chang), 7 vols., including *interalia tsou-kao* (memorials) 80 *chüan*; *p'eng-liao han kao* (letters to official colleagues) 20 *chüan*; *i-shu han-kao* (letters to Tsungli Yamen) 20 *chüan*, Taipei: Wen-hai chu pan-she, 1965, *memorials*, 9:33-5.

11 Yü Yüeh ed., *Shang-hai hsien-chih* (History of the Shanghai district), 32 *chüan*, 1872, 2:28-9.

12 *Spector*, 117.

13 *LWCK memorials*, 9:31-35. Yung Wing, *My Life in China and America*, New York: Henry Holt, 1909, 160-4, *KNCTCC*, 3:1.

14 *LWCK memorials*, 9:31-35. *HFT*, III, 13-26. *KNCTCC*, 3:58-9.

15 *LWCK memorials*, 9:31-35. Chou Shih-ch'eng, *Huai-chün p'ing-nien-chi* (Record of the Huai Army's pacification of the Nien Rebels), 1877, 11:9.

16 *LWCK memorials*, 9:31-5.

Despite the limited resources at his disposal, Tseng determined to push ahead with his plans for shipbuilding. Several months after taking office, in May 1867, he placed an important memorial before the court in which he pointed out that the revenues of the Liang Kiang Provinces were insufficient for him to discharge the two most urgent military duties at hand: the establishment of steamship building and the provisioning of the forces fighting the Nien Rebels in north China. In Tseng's judgement, China then had the necessary equipment and personnel to begin building ships; lack of funds was the only serious obstacle. As a temporary solution, he requested that 20% of the proceeds of the Shanghai maritime customs be deducted from the 40% which was regularly forwarded to the Board of Revenue in Peking and that this amount be retained in the Liang Kiang Provinces. One half, or 10% of the total proceeds, would be used for support of the forces combatting the rebels and the remaining 10% would be used for steamship building. Tseng's proposal gained prompt approval and the Kiangnan Arsenal began receiving regular support for steamship building from the maritime customs in June 1867.<sup>17</sup>

Once imperial approval was given to augment the arsenal's income with 10% of the Shanghai maritime customs proceeds, Customs Taotai Ying Pao-shih, who was also a director of the arsenal, purchased a new ten acre site south of the city at Kao-ch'ang Miao on the banks of the Huang-p'u River. During the winter of 1867-68, buildings were erected and equipment set up for the production of machinery and ordnance and a plant for the construction of steamships was installed—including a drydock. By 1870, a translation office, a language school and a technical training program were established with a view to development of technical competency among personnel at the arsenal.<sup>18</sup>

The construction of steamships began promptly. By August 1868, the first vessel, a paddle wheel steamer, was completed.<sup>19</sup> From 1868 to 1875, production at Kiangnan reflected Tseng Kuo-fan's concern for the domestic construction of steamships. Although a new cadre of foreign technicians began machine production of Remington breech-loading rifles and cartridges between 1871 and 1875,<sup>20</sup> from 1867 through 1875, over 40% of all income was devoted to the steamship program, more than twice the amount spent on the next highest category of expense.<sup>21</sup> Shipbuilding was also under the direction of foreigners: six or seven British and French technicians.<sup>22</sup> Though the ships were built entirely at Kiangnan, all materials employed were purchased from abroad.<sup>23</sup>

17 *TWCK memorials*, 4:808-9.

18 *Shang-hai hsien-chih*, 2:28-9; Knight Biggerstaff, *The Earliest Modern Government Schools in China*, Ithaca, New York, 1961, 165-176.

19 *TWCK memorials*, 4:808-9.

20 *HFT*, III, 101.

21 The actual figure is higher than 40% because part of the costs for operation of the vessels was deducted from the 20% of the maritime customs proceeds before it was sent to the arsenal and paid directly to the Kiangnan Steamship Control and Training Bureau. Yang Chia-lo ed., *Yang-wu yun-tung wen-hsien hui-pien* (abbr. *YWYT*), 8 vols., Taipei: Shih-chieh Shu-chü, 1963, IV, 28-41. *KNCTCC*, 4:2. *HFT*, III, 77.

22 *Tseng Wen-cheng kung shou-shu jih-chi, chüan* 32: *Tung-chih* 7/12/15 (Jan. 27, 1863).

23 *YWYT*, IV, 33.

TABLE 1  
Specifications and cost of vessels built at  
the Kiangnan Arsenal 1867-75

<i>date completed</i>	<i>name</i>	<i>length beam (ft)</i>	<i>horse power</i>	<i>displacement (tons)</i>	<i>description</i>	<i>construction cost (taels)</i>
1868 Aug.	T'ien-chi changed to Hui-chi	217 32	150	600	wooden hull paddle wheel	81,397
1869 May-June	T'sao-chiang	211 32	80	640	wooden hull propeller	83,306
1869 Aug. 25	Tse-hai	206 33	125	600	wooden hull propeller	82,736
1870 Sept.-Oct.	Wei-ching	241 38	150	1,000	wooden hull propeller	118,031
1872 May 24	Chen-an changed to Hai-an	352 49	500	2,800	wooden hull propeller	355,190
by 1872 July		70 23			armor plate twin propeller	5,360
by 1872 July		70 23			armor plate twin propeller	see below
by 1874 Jan.		70			armor plate twin propeller	13,599 including above vessel
1873 Dec. 23	Yü-yüan	352 49	500	2,800	wooden hull propeller	318,717
1874-75	Chin-ou	123	200		ironclad (monitor class)	62,586
1874-75					armor plate twin propeller	8,960
1874-75					armor plate twin propeller	10,943
1874-75					motorized sampan	990
1874-75					foreign style sailing vessel	57,005

Sources: *KNCTCC*, 3:1-3:55. *TWCK memorials*, 4:839-41. *YWYT*, IV, 33-4; 40-41. *HFT*, III, 45; 60-61; 75; 83-90; 137-38. W.A.P. Martin (Ting Wei-liang) ed., *Chung-hsi wen-chien-lu* (Seen and heard in China and the West), 4 vols., 1877, I, 22. *Shen Pao* (Shanghai News), 40 vols., Taipei: Taiwan hsieh-sheng shu-chu, Tung-chih 12/11/5. Yao Wen-nan, ed., *Shang-hai-hsien hsü-chih* (History of the Shanghai district continued), 1918, 13:4-5.

Some noteworthy advances were made during these years. The propeller propulsion system introduced on the second vessel was moved to a protected position below the water line on the third. The first three vessels were armed with smooth bore brass cannon; beginning with the fourth, rifled steel ordnance purchased from abroad was installed.<sup>24</sup> The construction of small twin-propeller armor-plated gunboats was initiated. These craft had a shallow draught and were well armed and highly maneuverable—excellently suited for harbor and river defense.<sup>25</sup>

Despite the considerable number of ships built at Kiangnan and the technological improvements which they embodied, the shipbuilding program encountered bitter opposition. At the root of most of the criticism was official dismay at what was considered the excessive cost of the new program. The first onslaught came in 1869. In September 1868, following the suppression of the Nien Rebellion, a general reshuffling of provincial officials resulted in the transfer of Tseng Kuo-fan from the governor-generalship of the Liang Kiang Provinces to that of the metropolitan province of Chihli; Tseng's replacement at Nanking was the Chinese Moslem official Ma Hsin-i.<sup>26</sup> By early 1869, Ma found that the Kiangnan shipbuilding program was in financial difficulty. Fiscal reorganization following the suppression of the Nien had deprived the arsenal of the Huai Army funds used to support production of arms and ammunition. Beginning in 1869, it became necessary to borrow from the 10% of maritime customs proceeds allotted for shipbuilding to support arms production and capital construction.<sup>27</sup> At the same time, production costs for the second and third vessels were mounting due to the increased purchasing of foreign materials for the propeller propulsion systems. In early 1869, Ma submitted a memorial explaining the cramped financial situation at Kiangnan and requesting that the other 10% of customs proceeds, which had been allotted for rebellion suppression, be assigned to the arsenal.<sup>28</sup> Subsequent to a memorial in opposition submitted by the Board of Revenue, this request was disapproved. The Board, under the leadership of Lo Tun-yen an official known for his opposition to modernization,<sup>29</sup> argued that these funds were badly needed at the capital and relied on the formalistic rationale that Tseng Kuo-fan's original memorial had stipulated that the allocation of 10% of the customs proceeds for rebellion suppression was only a temporary measure and that the funds would revert to the Board of Revenue after the emergency had terminated.<sup>30</sup>

24 *HFT*, III, 40, 60, 71, 75, 90-91. *KNCTCC*, 5:1-2.

25 *Martin, op. cit.*, I, 22.

26 *Kuo, op. cit.*, I, 513.

27 *KNCTCC*, 4:12.

28 *HFT*, III, 51-2.

29 *Ch'ing Shih* (History of the Ch'ing Dynasty), 8 vols., Taipei: Kuo-fang yen-chiu-yuan, 1961, IV, 2792; IV, 4818-19.

30 *HFT*, III, 55-57.

This rejection did little to deter officials who supported Kiangnan's shipbuilding program. During the second quarter of 1869—possibly before official notification of the disapproval of Ma's memorial had been received in the Liang Kiang Provinces—acting Customs Taotai Tu Wen-lan forwarded the entire 20% of the customs proceeds to the arsenal despite the lack of imperial authorization to do so.<sup>31</sup> By August 25, 1869, official notification of the disapproval had reached the Liang Kiang Provinces for, on that date, the arsenal petitioned Kiangsu Governor Ting Jih-ch'ang to memorialize the matter once more.<sup>32</sup> Ting personally inspected the arsenal and, in October, submitted a memorial lauding the production taking place there, observing that additional funds would be needed and pointing out the necessity of planning ahead for the cost of vessel maintenance and operation.<sup>33</sup> In October, at Ting's urging, Ma submitted a second memorial requesting allotment of the additional 10% of customs proceeds. This document, which bore the cosignatures of Tseng Kuo-fan and Li Hung-chang, stressed that the additional funds were needed to support other arsenal operations such as capital construction, machine building and ordnance production, as well as shipbuilding.<sup>34</sup> In the interim, Tung Hsun, a member of the Tsungli Yamen and an official known for his progressive views, had been appointed President of the Board of Revenue.<sup>35</sup> Ma's second memorial was referred to the Tsungli Yamen where it received sympathetic consideration; after careful study, approval was recommended. Consequently, in December 1869, the Kiangnan Arsenal was assigned a permanent annual income of 20% of the proceeds of the Shanghai maritime customs commencing retroactively from the beginning of 1869.<sup>36</sup>

Once the provincial officials and members of the Tsungli Yamen who supported Kiangnan had overcome the bureaucratic resistance to peace time spending for strategic industrial development, production at the arsenal progressed rapidly. Between 1870 and 1872, in addition to advances in small arms production, four more vessels were completed, construction of the *Yü-yüan* was partially completed, and work on *Chin-ou* was begun. However the cost of production also multiplied quickly from 200,000 to over 400,000 taels each year.<sup>37</sup> The largest and most conspicuous category of expense was the shipbuilding program. Not only were some of these new vessels larger, more sophisticated and, therefore, more costly but the arsenal was now burdened with the mounting expense of maintenance and operation of completed vessels. Though Tseng Kuo-fan (who returned to his old post of Liang Kiang Governor-general after the assassination of Ma Hsin-i in August 1870) established the Kiangnan Steamship Control and Training Bureau to direct the

31 *HFT*, III, 57-59.

32 Ting Jih-ch'ang, *Fu-wu kung-tu* (Public papers on governing Kiangsu), 50 *chüan*, 1877, 42:9-10.

33 *Chiang-nan chih-tsao-chü ch'üan-an* (The complete account of the Kiangnan Arsenal), Shanghai:Kiangnan Arsenal, no date, Chiang-su hsun-fu Ting Jih-ch'ang p'ien, Tung-chih 8/9/8.

34 *KNCTCC*, 4:11-13.

35 *Ch'ing Shih*, IV, 2792.

36 *Chiang-nan chih-tsao-chü ch'üan-an*, Tsungli Yamen tsou, Tung-chih 8/11/25.

37 *HFT*, III, 101, 97.

operation, maintenance and administration of the new vessels, funds for these purposes were taken from the same 20% of customs proceeds which supported the arsenal.<sup>38</sup> In addition to this, fuel and materials required by the ships came directly from the arsenal's supplies.<sup>39</sup> As a result, by early 1872, the shipbuilding program including the maintenance and operation of completed vessels had consumed close to one half of the 1,870,000 taels which the arsenal had received from the maritime customs.<sup>40</sup> A new wave of opposition was generated: on the one hand, central government officials renewed their complaints against what they regarded as a costly and ineffective program of the Liang Kiang provincial government; and on the other, Li Hung-chang began to entertain serious doubts about the advisability of further steamship building at Kiangnan.

During 1871, in a move designed to silence growing opposition to the high cost of the steamship program at Kiangnan and to place shipbuilding on a firm financial basis, the Tsungli Yamen advanced a proposal for the rental of Kiangnan ships to Chinese merchants who would bear the costs of operating and maintaining them and thereby relieve the arsenal of this burden.<sup>41</sup> Both Tseng Kuo-fan and Li Hung-chang, who since 1870 had been serving as the governor-general of Chihli, were consulted. In January 1872, while the Tsungli Yamen's proposal was under discussion, the shipbuilding program at Kiangnan and the arsenal itself were the subject of a new and potentially ruinous attack. A memorial of Sub-Chancellor of the Grand Secretariat Sung Chin recommended that the allotments of the Kiangnan Arsenal and the Foochow Shipyard be halted and that the funds revert to the central government where they could be put to better use for disaster relief in Chihli and other purposes that might be determined by the central bureaucracy. Sung observed that the threat of naval attack from the West was no longer imminent. In any case, even if an attack should come, he judged that Chinese-built vessels would be no match for those constructed in the West. The traditional water forces, he argued, could cope with local pirates and traditional junks were better suited for commercial carrying—particularly the transport of grain which would be twice as costly if accomplished with steamers.<sup>42</sup>

Liang Kiang Governor-general Tseng Kuo-fan was asked to respond to Sung's criticism with respect to whether or not the operations of the Kiangnan Arsenal should be halted.<sup>43</sup> Tseng died on March 12, 1872, before making a formal reply to Sung Chin's memorial. However, on February

38 *HFT*, III, 77. On several occasions individual vessels were deployed. When this took place, the recipient organizations defrayed these expenses.

39 *YWYT*, IV, 34-41.

40 *HFT*, III, 97. *YWYT*, IV, 34. The estimate of one half includes most of the cost of the *Hai-an* completed several months later as well as a part of the cost of the *Yü-yüan* and a fraction of the maintenance and operation costs estimated to the end of 1871 from aggregate figures from the launching of each vessel through 1873.

41 *LWCK letters*, 11:31.

42 *YWYT*, V, 105-6.

43 *YWYT*, V, 106-7.



24, less than a month before his death, he wrote to the Tsungli Yamen expressing his views on Kiangnan's shipbuilding program. Tseng frankly acknowledged that Chinese-built vessels were inferior to those constructed in the West but argued that the difficulties and expense involved in domestic shipbuilding should not deter China from pursuing this project which he regarded as essential to self-strengthening. He lent his support to the idea of renting Kiangnan vessels to Chinese merchants and recommended a change in emphasis in the arsenal's construction program to include vessels of commercial specifications since it seemed unlikely that most of the vessels completed thus far would be suitable for commercial use.<sup>44</sup>

After Tseng's death, the court sought the advice of Li Hung-chang on Sung Chin's proposal.<sup>45</sup> Although Li had been away from the Liang Kiang provinces since 1866, his status as co-founder of Kiangnan had assured him of a voice in the arsenal's affairs. Nevertheless, with the passage of time, his influence dwindled. By 1869, authority over the arsenal was confused. Kiangsu Governor Ting Jih-ch'ang advocated that technological matters (*yang-wu*) should come under the joint control of the governors-general of Liang Kiang and Chihli while financial dealings with the maritime customs should be handled by the Kiangsu governor.<sup>46</sup> The reasons for including the Chihli governor-general in this proposed hierarchy are not immediately apparent, however it seems likely that it was because Tseng Kuo-fan had actually exercised supervisory control during 1868-70 while occupying the post in Chihli. In any case, late in 1870, when Li assumed the governor-generalship of Chihli, he observed that he had not exercised direct control over the Kiangnan Arsenal for some time.<sup>47</sup> And during 1871, while incumbent in the Chihli post, he was primarily involved with local matters at Tientsin.<sup>48</sup> Tseng Kuo-fan, on the other hand, was back in the Liang Kiang provinces and very much absorbed in supervising the affairs of the Kiangnan Arsenal. Tseng's influence was clearly preponderant. After Tseng's death, co-founder Li from his position as governor-general of Chihli, resumed an active role in the overall guidance of the arsenal, assuming also advisory capacity in technological matters such as operations and personnel. Primary responsibility for the latter, however, remained with the Liang Kiang governor-general who served concurrently as commissioner of southern ports.<sup>49</sup> The renewal of Li's influence over Kiangnan was undoubtedly strengthened by two factors: his close personal relationship with high officials at the arsenal such as Feng Chünkuang who had been appointed during Li's earlier incumbency in Liang Kiang; and secondly, the strategic sensitivity of his post in Chihli and his concurrent responsibilities as commissioner of northern ports. These offices carried with them the responsibility for defense of the capital, Chihli Province, Manchuria and Inner Mongolia.<sup>50</sup> In reaching important decisions regarding the largest arsenal in the empire, the imperial government quite naturally turned to Li for advice.

44 *HFT*, II, 325-6.

45 *LWCK memorials*, 19:44.

46 Ting Jih-ch'ang, *op. cit.*, 42:3-4.

47 *LWCK memorials*, 17:16.

48 Wang, *op. cit.*, 87.

49 See *LWCK letters*, 13:11; 14:38-39, for examples of the primary position of the southern commissioner in these matters.

Since Li's departure from Kiangnan, his views on shipbuilding and closely related problems had undergone a gradual evolution. With respect to shipbuilding, Li had long harbored serious doubts about the program which Tseng had promoted at Kiangnan. In 1866, before leaving the arsenal, he stated that it was his intention that Kiangnan should build only small gunboats. In June 1869, after the launching of the second vessel, Li wrote to Tseng that the ship was far below the standards of western warships. And in 1871, he again wrote to Tseng observing that Kiangnan-built vessels conformed to neither commercial nor military standards.<sup>51</sup> Subsequently, he suggested that the arsenal switch to the production of foreign style sailing ships which he regarded as better suited for commercial use and more economical. Finally, in February 1872, Li wrote to a fellow official that he had felt, for a long time, that Kiangnan's shipbuilding program would not strengthen China against the West and that it was excessively costly.<sup>52</sup> From this growing awareness of the shortcomings of Kiangnan's ships, Li came to appreciate the inadequacy of the arsenal's technical manpower resources. The functioning of the on-the-job training program is unclear; but it was clear to Li that neither this program nor the tradition-bound formal training in the arsenal school<sup>53</sup> would provide the first class Chinese engineers and technicians needed to augment and replace the foreign advisers in the shipyard. It was undoubtedly with this in mind that Li, in 1871, reversed his stand on technological training and joined Tseng Kuo-fan in sponsoring the China Educational Mission to send Chinese youths to the United States for schooling. It was anticipated that when these students returned some would take positions in arsenals and shipyards.<sup>54</sup> Furthermore, Li's early preference for the production of ground forces rather than naval armament was strengthened by his years of service as ground forces commander. After his appointment as governor-general of Chihli and commissioner of northern ports in 1870, he hastened to build a logistical base for the Huai Army, the force through which he would discharge his new defense responsibilities. In the area of military industrial development, his efforts were directed chiefly to the small arsenal in Tientsin which he transformed into a major industrial complex for the production of gunpowder and ammunition.<sup>55</sup>

After receiving the imperial invitation to memorialize in reply to Sung Chin, Li corresponded extensively with officials at both the Kiangnan Arsenal and the Foochow Shipyard before submitting his views to the court on June 20, 1872. His memorial which bears the title "Steamship

50 Wang Erh-min, "Nan-pei-yang-ta-ch'en chih chien-chih chi ch'i ch'üan-li chih k'uo-chang" (The establishment of the northern and southern commissioners and the expansion of their authority) in *Ch'ing-shih chi chin-tai-shih yen-chiu lun-chi* (Collected research on Ch'ing and modern history), Taipei: Ta-lu tsa-chih she, 1967, 196-7.

51 *LWCK letters*, 9:9, 11:7.

52 *HFT*, II, 325. *LWCK letters*, 12:2.

53: Biggerstaff, *op. cit.*, 165-199, discusses the functions of the schools.

54 *LWCK Tsungli Yamen letters*, 1:19-21.

55 K. C. Liu, "Li Hung-chang in Chihli", 83. Wang Erh-min, *Ch'ing-chi ping-kung-yeh te hsing-chi*, 87.

construction cannot be halted" was an impassioned plea for the continuation of industrial modernization to save China from further foreign encroachment. However, on the subject of steamship building at the Kiangnan Arsenal, Li expressed serious reservations. He felt that a country with land area as great as China's should give priority to the development of ground forces. Though he admired the ironclads of the West, he observed that their draught was too great for most of China's harbors. Furthermore, they were not entirely suitable for the purely defensive naval strategy which he advocated. He favored the construction of small shallow draught, armor-plated, harbor defense gunboats. Li also noted that he had already directed Kiangnan that military vessels constructed in the future should not exceed the size of the fifth major vessel, the *Hai-an*.

If these guidelines for ship construction were followed, Li felt that the arsenal could continue operation within the limits of the income from customs—provided that a separate plan was worked out to defray the costs of steamship maintenance and operation.<sup>56</sup> Li's thinking on this problem was greatly influenced by the ideas of Feng Chün-kuang, a director of Kiangnan, and an outspoken advocate of steamship building and balanced industrial development.<sup>57</sup> Feng recommended steamship rentals to merchants combined with a grant of monopoly rights for the transport of tribute grain from south to north China to insure Chinese merchants a profitable carrying trade in the face of well developed competition from Western steamers. In Feng's judgement, only two of Kiangnan's steamers could be converted for commercial rental: the fourth vessel, the *Wei-ching*, and the *Chin-ou* which was just then in the planning stage. The remaining ships were of purely military design. Feng recommended that these be assigned to patrol the coast with the costs of maintenance and operation to be borne by the provinces in which they patrolled. If the rental of the *Wei-ching* proved profitable, he felt future construction at Kiangnan should emphasize commercial vessels.

Li's memorial reiterated Feng's plan of assigning military vessels to coastal provinces for patrolling and support and recommended that this could be accomplished economically by concurrently eliminating the traditional water forces of the provinces. Though Li later used Feng's idea of granting a monopoly on transport of tribute grain to cultivate commercial steam navigation, he felt that discussion of ship rentals to merchants for the purpose of hauling grain could be delayed, for the time being, since there were no vessels which had the required specifications.

Feng did not confine his suggestions to the immediate problem of easing the burden of steamship maintenance. He saw that this was only a symptom of the economic backwardness which was undermining China's efforts to strengthen herself. Failure to exploit natural resources and develop

56 *HFT*, II, 367-72. cf. David Pong, *Modernization and politics in China as seen in the career of Shen Pao-chen (1820-1879)*, University of London, unpublished Ph.D. dissertation, 1969, 249-254. Professor Pong has examined many of these same documents in an analysis of Li's position on Sung Chin's proposal to close the Foochow Shipyard. His interpretation of Li's equivocal position on shipbuilding expressed in this memorial was arrived at independently from my own. Pong states that Li's support of shipbuilding "was more an expression of his sense of Real politik than of conviction". Pong also points out that Li later stated that he felt obliged to agree with Shen Pao-chen and Tso Tsung-t'ang who were supporters of shipbuilding.

57 *HFT*, III, 98-110. Li was not an addressee on this report which contains Feng's views but internal evidence from Li's memorial leaves little doubt that he had read Feng's report prior to submitting the memorial.

basic industries was the underlying reason for the outflow of funds which left the empire unable to solve fundamental defense problems such as steamship maintenance. To correct this situation, he advanced a series of proposals for the modernization of the extractive, refining, and transportation industries. As a first step, he recommended the employment of water pumping machinery in Chinese coal mines. With these pumps, Chinese miners could reach the deep deposits where the coal was of a quality comparable to the foreign coal that had captured the Chinese market. Secondly, he advocated the modernization of the domestic iron industry through the introduction of Western refining and processing machinery. This, he predicted, would enable China to produce iron equal in quality to that produced in the West at a competitive price. Eventually, it would free strategic industries from dependence on costly imported iron. Finally, he called for the establishment of new mines and iron processing plants near navigable waterways and the employment of rented steamships to move basic fuels and raw materials to production centers and markets during the months when they were not carrying tribute grain. This would help further to free Kiangnan from steamship maintenance and upkeep expense and, at the same time, bring down the costs of fuels and basic industrial raw materials. He advised that the financial basis of this development plan could be sustained by the sale of coal and iron produced in excess of government requirements and the reinvestment of profits in machinery; this would increase the quantity of production and reduce the unit price. As the next phase of industrialization, he advocated investment in textile machinery and the machine production of fabrics suitable for China's various regions.

Feng's analysis of the steamship maintenance problem brought him to grips with one of the basic problems limiting the development of the Kiangnan Arsenal, the high cost of imported fuels and raw materials. By the end of 1873, Kiangnan spent over one and one-half million taels, about 52% of all funds expended, for imported materials<sup>58</sup> the cost of which included not only transport and insurance charges but the profits of several foreign middlemen as well. Li's memorial echoed Feng's arguments for the introduction of western machinery and methods in the coal and iron industries, but Feng's views were presented *in toto* to the Tsungli Yamen by Liang Kiang Governor-general Ho Ching who attached a strong negative endorsement.<sup>59</sup> There is no indication that they were given further consideration at this time.

After the Tsungli Yamen had considered the opinions of Li, Ho Ching and several other provincial leaders, it submitted its final recommendations strongly supporting the continuation of strategic industrial development and steamship building. However, specific proposals for reducing the financial burden created by the steamship program were limited to the areas of vessel operation and maintenance. It was suggested that Li Hung-chang develop a scheme for rental of steamships to Chinese merchants and that military steamers be assigned to the coastal provinces for patrolling and support if requested by the concerned provincial officials. However, Li's proposal for halting construction of junks for the traditional water forces so as to save funds for the maintenance of

58 KNCTCC, 4:6.

59 HFT, III, 95-98.

steamships was ignored. Nor was any mention made of the modernization of the coal and iron industries or the employment of steamships to promote industrial development. An edict of August 5, 1872 approved these recommendations.<sup>60</sup> Both the rental scheme and the plan for the assignment of military steamers were conceived to provide a solution to the pressing financial problem caused by steamship maintenance. Neither offered a solution to the basic problem of economic underdevelopment which underlay the high cost of steamship construction and industrial development. Though Feng Chün-kuang had recognized this problem and attempted to deal with it, his suggestions did not prevail. This being the case, even if the ship maintenance problem at Kiangnan could be solved, the development of production at the arsenal was headed for further difficulties.

Though the shipbuilding program at Kiangnan was nominally continued by the edict of August 5, 1872, an abrupt slowdown in construction took place. Major vessels begun by 1872 were completed but no new ones were started. New construction was limited to a pair of small harbor defense vessels of the type which Li favored and several miscellaneous craft. The reasons for this slowdown stem from the financial problems at the arsenal and the influence of Li Hung-chang's strategic priorities.

Neither of the two plans designed to reduce the burden of steamship maintenance on Kiangnan's budget provided any relief. The ship rental plan ran into complications before the end of the year. By December 1872, Li had established a steamship line, the China Merchants' Steam Navigation Company, for the transport of tribute grain. Though it was anticipated that the company would rent Kiangnan steamers,<sup>61</sup> a variety of circumstances militated against this. First, since Feng Chün-kuang's suggestion for converting the *Wei-ching* was not followed, when the company began operations, no Kiangnan vessels were ready for commercial service. Secondly, due to the high cost of foreign materials at Kiangnan, the construction cost for new commercial vessels was far greater than the purchase price of comparable foreign-built ships. The higher cost of insurance for the more costly Chinese-built ships made it less profitable to employ them than the cheaper foreign-built vessels.<sup>62</sup> In some instances, the foreign insurance companies which insured China Merchants' vessels flatly refused to insure Chinese-built vessels at the actual construction cost thereby making it extremely risky to employ the Chinese ships. Furthermore, monopolistic pressures from foreign steamship companies forced the China Merchants' Company to rely largely on the transport of tribute grain for its business. Consequently, after it had acquired a fleet of five foreign vessels, it

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60 *HFT*, II, 385-9.

61 *LWCK memorials*, 20:32-33.

62 *LWCK letters*, 13:12-13.

found that there was no need for additional Kiangnan-built ships.<sup>63</sup> By 1874, no Kiangnan vessels had been rented to merchants and both Li Hung-chang and Southern Commissioner Li Tsung-hsi expressed grave doubts about the feasibility of building commercial vessels for rental at Kiangnan.<sup>64</sup>

By 1874 also, the plan for the assignment of military vessels to the provinces for patrolling and upkeep had failed completely.<sup>65</sup> This scheme clearly required the backing and direction of a supra-provincial authority. The imperial government, however, looked to the coastal provinces to take the initiative and request the ships. The provinces hesitated to assume additional defense expenditures and reorganize their naval forces at a time of relative peace.<sup>66</sup> Consequently no vessels were assigned and the Kiangnan Arsenal continued to bear the full expense for maintenance and operation of the ships which it had built.

As it became increasingly clear that neither of the plans to finance steamship maintenance and operations could relieve Kiangnan's budget of this expense, Li Hung-chang began openly advocating the curtailment of further construction. In June 1873, he advised Southern Commissioner Li Tsung-hsi that Kiangnan should not undertake too many diverse types of production lest it do none of them well. He regarded Feng Chün-kuang's idea of building ironclads as excessively costly and of doubtful outcome.<sup>67</sup> In January of the following year, Li brought up the underlying problem of the high cost of production with foreign materials. In a letter to Commissioner Li in the south, he noted that construction costs for the *Hai-an* and the *Yü-yüan* were enormous and that the financial burden created by vessel upkeep was still onerous. "My idea," wrote Li, "is that, if expenses exceed income, we should temporarily stop shipbuilding, wait until there is a surplus and then resume."<sup>68</sup> The only qualification of this, in Li's mind, was the construction of small shallow-draught ironclads of the monitor class. He maintained a genuine, though cautious, interest in the *Chin-ou*, an experimental vessel of this type which was then under construction at Kiang-

63 *HFT*, II, 486. The measures taken by the foreign merchants to inhibit the development of the China Merchant Company can be explained by the attitude of the foreign shipping lines toward their newly found competition. A report to the head of the Russel Company dated June 12, 1874, stated: "The Chinese Company are [sic] giving us a great deal of trouble—and as we reduce our tariff rates one half on the days when their steamers are dispatched our earnings are kept low. There is however, no help for it." On June 13, 1874, the Shanghai manager of Butterfield and Swire wrote in his letter to London: "We are considering with Russels measures against the Chinese company which we hope will result in their subsidence." Quoted in Liu Kwang-ching, *Anglo-American Steamship Rivalry in China*, Harvard University Press, 1962, 152.

64 *HFT*, II, 497.

65 *HFT*, II, 486.

66 *Ch'ou-pan i-wu shih-mo* (The complete account of our management of barbarian affairs), 7 vols., Taipei: Kuo-feng chu-pan-she, 1963, including interalia Tung-chih-chao, 100 *chüan*, 86:9-10. Here Ting Pao-chen, Governor of Shantung, explains that financial difficulties prevented Shantung from accepting Foochow Ships. Rationale would apply to Kiangnan vessels also. See also *HFT*, II, 486.

67 *LWCK letters*, 13:10-11.

68 *LWCK letters*, 13:27-28.

nan.<sup>69</sup> Moreover, Li's own strategic preference for ground forces development was galvanized by the atmosphere of mounting crisis with Japan over Taiwan and the need to equip coastal armies. The results are apparent in the allocation of Kiangnan's resources from at least 1874; the amount devoted to ordnance production (for the most part Remington breech-loading rifles) during 1874-75 was almost equal to the entire amount spent for ordnance production from 1867-73.<sup>70</sup>

The fate of the Kiangnan shipbuilding program was finally decided during the maritime defense crisis with Japan in late 1874 and the ensuing debate over maritime defense during 1874-75. In May 1874, the armed forces of Japan occupied parts of Taiwan. Though Japan attempted to explain this move as a retaliatory measure for the maltreatment of certain Ryukyuan fishermen who had been shipwrecked on Taiwan several years earlier, it was clear to some Chinese policy makers that Japan had emerged as a powerful expansionist force in East Asia. With this change in the international balance of power, China was forced to make an urgent and realistic reassessment of her own military strength. On the matter of naval preparedness, qualified foreign advisers such as Prosper Giguel, the French superintendent of the Foochow Shipyard, pointed out China's weaknesses and counselled the Ch'ing Government to avoid a naval confrontation with Japan. Among other deficiencies, Giguel observed that China's gunboats and wooden battle ships were no match for the Japanese ironclads.<sup>71</sup> Though China, with an assist from Great Britain, maneuvered successfully to avoid a naval showdown with Japan, in the negotiations which took place, the Chinese found themselves dealing from a position of weakness. The settlement that was eventually reached provided that, in return for the Japanese departure from Taiwan, China would reimburse the costs of the expedition and indemnify the families of the Ryukyuan. Ultimately this led to China relinquishing its claim to suzerainty over the Ryukyus in favor of Japan.<sup>72</sup>

On November 5, 1874, just five days after the settlement with Japan was reached, a memorial from the Tsungli Yamen offered proposals for strengthening maritime defense and called for the leading officials of the empire to submit their views.<sup>73</sup> For several months thereafter a high level debate over defense policy took place. The viewpoints of the various officials were correlated by the Tsungli Yamen and presented to the throne. Finally on May 30, 1875, a new maritime defense policy was announced.<sup>74</sup> Though most of the officials who submitted memorials expressed opinions on Kiangnan's shipbuilding program, none were so important as those of Li Hung-chang and Shen Pao-chen for the terms of the new policy gave these two officials full responsibility for the future of shipbuilding and the development of a steamship fleet.

69 *North China Daily News*, Sept. 2, 1875, in British Public Record Office F. O. 233/85, 3815.

70 *YWYT*, IV, 32, 39.

71 *LWCK letters*, 14:4. It seems that the Japanese capability with ironclads was probably exaggerated, Rawlinson, *op. cit.*, 61.

72 Hosea Ballow Morse, *The International Relations of the Chinese Empire*, 3 vols., Taipei: Book World Co., 1963, II, 270-75.

73 *YWYT*, I, 26-30.

74 *YWYT*, I, 153-55.

In a memorial on maritime defense submitted in December 1874, Li stated bluntly that ground forces must remain the basic element in China's defense. He recommended that ground elements together with select naval forces be employed to guard the most strategic points along the coast, i.e. the approaches to Peking and the mouth of the Yangtze. Ideally, these points would be defended by coastal defense forts, harbor defense gunboats and naval mines. This defense line was to be backed up by highly mobile infantry units which would guard against enemy landings elsewhere along the coast. An outer defense perimeter of ironclads and conventional battleships would also be established. In Li's judgement, the Chinese arsenals should supply the ammunition and naval mines required for this strategy; Kiangnan, specifically, should increase its ammunition production. Aside from the Remington rifles produced at Kiangnan, he felt that other small arms as well as heavy ordnance requirements should be purchased from abroad. He reasoned that domestic production of heavy ordnance, which required substantial investment in foreign machinery and constant supply of foreign iron and steel, should be delayed, at least until China had opened iron and coal mines operating on western principles. In looking over the Kiangnan-built vessels for their suitability for employment with this plan, Li determined that only the *Hai-an* and the *Yü-yüan* could be regarded as battleships. The remainder of the major vessels he classified as wooden gunboats—of little value in a modern maritime defense scheme. Since construction cost of Kiangnan vessels was more than twice the purchase price of comparable foreign-built ships due to the high cost of imported materials, Li advised that foreign purchase would be the most economical and advantageous method of acquisition.<sup>75</sup>

Li not only regarded Kiangnan-built vessels as inordinately expensive and ill-suited to China's requirements, the following year, he went so far as to characterize Kiangnan ships as "little different than foreign purchases; all materials coming from abroad and all work directed by foreigners."<sup>76</sup> Though Kiangnan's on-the-job training program had been in operation for more than five years, the arsenal's dependence on foreign technicians was now greater than it had ever been.<sup>77</sup>

Though Shen Pao-chen, in his memorial, did not speak directly to the problem of shipbuilding at Kiangnan, he placed highest priority on the acquisition of ironclads—none of which had yet been completed at Kiangnan. He further recommended that each of China's new defense plants should be assigned a specialized and appropriate production mission such as ordnance, ammunition

75 *LWCK memorials*, 24:13-25. For a study of the controversy over maritime defense at this time see: Immanuel Hsu, "The great policy debate in China 1874: maritime defense vs. frontier defense," *Harvard Journal of Asiatic Studies*, XXV (1964-65), 212-28.

76 *YWYT*, IV, 33.

77 The average annual expenditure for foreign advisers prior to 1874 was 21,721 taels. During 1874-75, this figure increased to 31,526 taels per year. *YWYT*, IV, 31, 39.



or shipbuilding. Such a division of responsibility, he reasoned, would promote excellence in production through specialization and further economy through elimination of duplication.<sup>78</sup> At the time, Kiangnan, of course, was engaged in all three types of production.

The new maritime defense policy adopted in May, 1875, failed to offer any new solutions to the serious financial problems which had already restricted shipbuilding at Kiangnan. Though several of the memorials submitted prior to the announcement of the policy had stressed the need for modernization of the domestic coal and iron industry, the edict approved the opening of only two modern coal mines. No headway was made on either of the plans to relieve Kiangnan of ship operation costs. Plans for the construction of commercial steamers for rental were abandoned entirely<sup>79</sup> and no mention was made of the scheme for assignment of military vessels to the provinces to replace traditional water forces. Instead, administrative changes embodied in the new policy established regional maritime defense commands in north and south China; Northern Commissioner Li Hung-chang and Southern Commissioner Shen Pao-chen were named to head these commands and were given responsibility for maritime defense and naval development in their respective regions. Financially, the new policy established a maritime defense fund of 4,000,000 taels to be paid annually by various provinces: 2,000,000 to the southern commissioner and 2,000,000 to the northern commissioner.<sup>80</sup>

By the second half of 1875, the financial prospects for the continuation of shipbuilding looked somewhat brighter. Although ordnance production was expanding and the burden of steamship maintenance was mounting, construction costs for the last of the fourteen vessels were completed from 1875 income. Presumably some of the customs income for 1876 as well as the new maritime defense fund would be available to the southern commissioner to finance the construction of additional ships. But this was not to be the case. Southern Commissioner Shen Pao-chen had shown his preference for ironclads; and the launching of Kiangnan's first small monitor-type ironclad, in September 1875, proved conclusively that the arsenal was incapable of further construction of this class. Not only were the guns improperly positioned, the vessel itself was incapable of putting to sea.<sup>81</sup> Furthermore Shen had strongly disapproved of broad diversification in production such as that carried on at Kiangnan. Moreover, in 1875, he and Northern Commissioner Li agreed that first

78 Ko Shih-chün ed., *Huang-ch'ao ching-shih-wen hsü-pien* (The continued collection of writings on statecraft of the imperial dynasty Ch'ing), 32 vols., Shanghai: T'u-shu chi-ch'eng-chü, 1888, 101:15-20. Shen Pao-chen, *Shen Wen-su kung cheng-shu* (The public papers of Shen Pao-chen), 7 *chüan*, 1880, 5:22.

79 This was not specifically stated in the Tsungli Yamen's memorial of May 30, 1875. However, in another memorial submitted May 27, Hsüeh Fu-ch'eng recommended that commercial construction be discontinued, *YWYT*, I, 155-60. In a memorial in response to Hsueh's memorial, the Tsungli Yamen indicated that it had dealt with this suggestion in its memorial of May 30, *YWYT*, I, 161-62. From this it is clear that the Tsungli Yamen's failure to discuss further commercial building in its May 30 memorial meant that there would be none. The imperial approval of this memorial officially concluded plans to build commercial steamers at Kiangnan.

80 *YWYT*, I, 162-5; II, 378.

81 *LWCK memorials*, 30-36, 39. *North China Daily News*, Sept. 2, 1875, in British Public Record Office F. O. 233/85, 3815.

priority should be given to building up a defense fleet for north China which would include ironclads. Since it was also agreed that the 2,000,000 taels annual appropriation for northern maritime defense was insufficient to accomplish this objective, Shen relinquished the south's share of the maritime defense fund to Northern Commissioner Li in order that the northern fleet might be quickly established.<sup>82</sup> With the passage of the entire maritime defense fund to Northern Commissioner Li's control the financial basis for continuing steamship building at Kiangnan was again limited to the amounts which could be allocated from the customs income; for Li had made his position clear time and time again: Kiangnan ships were too costly, technically inferior and ill-suited to China's strategic needs. He favored naval augmentation through foreign purchase and would certainly not expend the new funds for construction at Kiangnan. Shen's position was equally clear and it was equally unlikely that he would attempt further construction with whatever was available from the customs income.

In 1875, as the focus of naval development shifted to north China, Li and Shen began to concentrate the resources of the Kiangnan Arsenal on the production of ordnance—including heavy ordnance<sup>83</sup>—and ammunition needed to bolster the new maritime defense policy. By 1878, Southern Commissioner Shen Pao-chen observed that Kiangnan had become entirely and irreversibly committed to the production of ordnance and ammunition—largely in response to the demands placed upon it by Northern Commissioner Li.<sup>84</sup> Meanwhile the unsolved financial problems which had undermined the shipbuilding program continued to plague the arsenal. Customs income declined and Kiangnan's reliance on costly imported materials continued;<sup>85</sup> in 1878, Commissioner Shen complained that customs income no longer covered basic production costs.<sup>86</sup> In the same year, Li observed that one half of the customs income was devoted to the direct costs of steamship maintenance.<sup>87</sup> And by 1880, the cumulative diminution of the arsenal's custom income due to allocations to the Kiangnan Steamship Control and Training Bureau totalled more than 693,000 taels.<sup>88</sup> Even so, one vessel remained unmanned for lack of funds.<sup>89</sup>

82 YWYT, II, 378.

83 The conversion to heavy ordnance production at Kiangnan despite Li Hung-chang's 1874 recommendation against this are discussed in Thomas L. Kennedy, *The Establishment and Development of the Kiangnan Arsenal 1860-1895*, unpublished Ph.D. dissertation, Columbia University, 1968, 158-169.

84 *Shen Wen-su Kung cheng-shu*, 7:60-61.

85 *KNCTCC* 4:2-4; 6-7.

86 *Shen Wen-su kung cheng-shu*, 7:60-61.

87 *LWCK memorials*, 32:5-9.

88 *HFT*, III, 147.

89 YWYT, II, 379.

To recapitulate: from 1867 to 1872, while Tseng Kuo-fan and other Liang Kiang officials together with officials of the Tsungli Yamen struggled to overcome central government indifference and opposition to the establishment of Kiangnan's steamship program, Li Hung-chang remained aloof. He offered nothing but criticism of Kiangnan ships and his cosignature on a memorial which argued that the arsenal should be granted customs proceeds not simply for shipbuilding but for ordnance and ammunition production as well. The title of Li's memorial submitted in 1872, shortly after Tseng's death, "Steamship construction cannot be halted" was actually quite misleading in view of his attitude towards Kiangnan's program. He recommended a substantially reduced construction program and made even this recommendation conditional upon the solution of the steamship maintenance problem and the development of a domestic industrial base along the lines suggested by Feng Chün-kuang. When neither of these conditions could be realized, the mounting costs, relative inferiority, and complete reliance on foreign materials and technical manpower in Kiangnan's shipbuilding program gradually convinced Li that foreign purchase was the most practical and economical mode of naval augmentation. The administrative arrangements of the new maritime defense policy of 1875, and the subsequent decision to focus funds for naval development in north China, merely secured for Li the financial control necessary to ensure that funds available for vessel acquisition would be used for foreign purchase rather than construction at Kiangnan. Under Li's guidance and the leadership of Shen Pao-chen, the arsenal gradually converted to the production of ammunition and ordnance, production missions which Li regarded as more suitable for China's early stage of industrial development.

Li's decision to halt shipbuilding at Kiangnan can best be understood as a pragmatic response to the economic, social, administrative and international conditions prevailing in China during the late 1860's and the early 1870's. The government's failure vigorously to promote development of the raw materials, industrial commodities, and transportation industries had forced Kiangnan to rely on costly imported materials which, raised production costs to prohibitive levels. To those costs were added the expenses of ship maintenance and operation largely because government administrative inaction had permitted the provinces to resist Li's scheme for naval reorganization based upon provincial control and support of Kiangnan steamers. The inferior quality of Kiangnan ships resulted, most probably, from the lack of trained personnel which was, in turn, a result of the failure to effect rapid and sweeping change in the educational system. The consequences were not only inferior quality but prolonged reliance on the technological skills of a small group of foreigners. Finally, high cost and low quality, in the presence of developed competition from western shipping firms, prevented the employment of Kiangnan vessels for commercial carrying. Li reversed a commitment to industrial production which proved overly optimistic in view of the government's unwillingness to change related features of the traditional state and society; to carry through the shipbuilding dreams of Tseng Kuo-fan, major changes in the status quo, even broader than those suggested by Feng Chün-kuang, would have been required. As it became clear that such changes were impossible because of the prevailing political climate, Li set his sights on an objective that was possible—and far more practical: the acquisition of a modern fleet through purchase rather than construction. Though Li's plans for naval development later went awry because of other problems, there is no doubt that his decision to halt shipbuilding at Kiangnan at this time

was a rational and a pragmatic one and that it saved China from pursuing further this project which was utterly incapable of strengthening the empire.<sup>90</sup>

Through further research, the significance of these observations may perhaps be broadened. The difficulties experienced in the shipbuilding program at Kiangnan suggest a framework of problems which leaders such as Li would confront as they attempted to steer China along the course of strategic industrial development. Further study of strategic industries during the crucial decades prior to the Sino-Japanese War will hopefully clarify not only the precise nature of these structural limitations but also their interaction with the reform ideas and programs of individual leaders such as Feng and Li.

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90 For a detailed study of Li's pragmatism in an early period, see Kwang-ching Liu "The Confucian as Patriot and Pragmatist: Li Hung-chang's Formative Years 1823-1866" in *Harvard Journal of Asiatic Studies*, XXX, 1970, 5-45.