

# **Misestimation: Explaining US Failures to Predict Nuclear Weapons Programs**

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## **Abstract**

Various policy options have been proposed for slowing or halting the spread of nuclear weapons, yet all rely on sound intelligence about the progress of nuclear aspirants. Historically, the United States's record of estimating foreign weapons programs has been uneven, overestimating the progress made by some proliferators while underestimating others. This paper seeks to catalogue and evaluate the intelligence work surrounding sixteen of the twenty-five states that are thought to have pursued nuclear weapons, and to provide a framework for evaluating the causes of distorted intelligence estimates of nuclear proliferation. In particular, we identify twelve specific hypotheses related to politics, culture, bureaucracy, and organizational culture, then explore how they play out in practice through two case studies (North Korea and Israel). We find that the US has overestimated nuclear programs much more frequently than it has underestimated or correctly estimated them.

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## Introduction

In recent years, nuclear proliferation has been an urgent concern of international politics. Many policy options have been proposed for slowing or halting the spread of nuclear weapons, ranging from security guarantees and economic incentives to economic and diplomatic sanctions, blockades, sabotage, targeted military strikes, and regime change. Each approach has its disadvantages, but all rely on sound intelligence about the sophistication, location, and capability of nuclear facilities or the structure of proliferation networks that provide technical components to aspiring states.

Yet the overestimation of Iraq's nuclear program before the Iraq War is not the only case of US intelligence estimates being grossly wrong. Before the Persian Gulf War, US intelligence agencies made the opposite mistake, regarding Iraq's nuclear program to be almost a decade away from constructing a nuclear weapon when in fact fissile material could have been ready within a couple of years.<sup>1</sup> Iran's nuclear program has consistently been overestimated: warnings that Iran would develop nuclear weapons within three to five years have been consistently issued (and consistently wrong) since the mid-1980s.<sup>2</sup> Yet the US underestimated the speed with which states such as the Soviet Union, Israel, and Taiwan would progress toward a preliminary nuclear capability.

Understanding when (and why) US intelligence estimates have been skewed is crucial to improving intelligence estimates, preventing unnecessary conflicts, and broadening public and academic knowledge of intelligence capabilities. While the failure in Iraq was accompanied by a pack of careful analyses,<sup>3</sup> such explanations are limited by a lack of historical context. Without understanding the history of US intelligence estimates of nuclear programs, it is difficult to identify whether the factors that led to the Iraqi estimate are structural or circumstantial, habitual or aberrant.<sup>4</sup> The continued controversy over the 2007 and 2010 National Intelligence Estimates (NIE), which judged that Iran had halted its nuclear weapons program in 2003 and had not resumed it, demonstrates the importance of the question.<sup>5</sup>

Until recently, there had been no systematic public account of US intelligence experience with regard to nuclear weapons programs. However, with the publication of *Spying on the Bomb*, Jeffrey Richelson provided an extensive historical overview of US intelligence on 13 states (Nazi Germany, the Soviet Union, China, France, India, Israel, South Africa, Taiwan, Iraq, North Korea, Libya, Pakistan, and Iran).<sup>6</sup> Richelson's work is primarily historical, seeking to catalogue the US intelligence programs rather than to subject them to evaluation and analysis. In order to systematically study the causes of US nuclear intelligence failures, we draw from and extend Richelson's canonical work, adding evidence from three additional states (Argentina, Brazil, and South Korea) and systematically comparing the estimates of all of these programs to the actual

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<sup>1</sup> Compare the estimate in Director of Central Intelligence 1991, p. 3, which suggests the “late 1990s,” with Albright, Berkout and Walker 1997, p. 327.

<sup>2</sup> See Appendix.

<sup>3</sup> See, for example, Cirincione, et al. 2004, Silberman and Robb 2005.

<sup>4</sup> Russell 2005, in a brief survey, argues that they are structural.

<sup>5</sup> National Intelligence Council 2007. The intelligence community continues to hold the judgment in the face of Republican skepticism; see Risen and Mazzetti 2012.

<sup>6</sup> Richelson 2006.

progress made by each state. We additionally identify twelve specific hypotheses of intelligence distortion related to politics, culture, bureaucracy, and organizational culture, then explore how they play out in practice through two case studies (North Korea and Israel). These cases were chosen because a) together they illustrate most of the common distortions and b) they differ along a number of important dimensions, including time period, outside help, and friend/enemy status.

Our universe of cases—countries that have at least explored a nuclear option—combines the cases listed by Singh and Way with Jo and Gartzke for a total of 25 states.<sup>7</sup> The ten ‘successful’ states who are known to have or are suspected of having obtained nuclear explosive capability are the United States, the United Kingdom, the Soviet Union, France, China, Israel, India, South Africa, Pakistan, and North Korea. The first two are omitted from the study as US intelligence estimates were unnecessary. We include a number of states that, according to Singh and Way, have seriously pursued at least a nuclear weapons option: South Korea, Libya, Brazil, Argentina, Iraq, and Iran. We omit most of the states that they classify as having only explored weapons due to a lack of declassified information on intelligence estimates or on the programs themselves: Switzerland, Sweden, Yugoslavia, Australia, Algeria, and Romania. However, we include Taiwan, coded by Singh and Way as exploratory, since good estimates are available. Imperial Japan and Nazi Germany had active programs during World War II; due to similar informational limitations, the latter is included while the former omitted. Other states are suspected of having had nuclear programs, but little hard evidence exists of an independent effort.<sup>8</sup> Finally, Belarus, Kazakhstan, and the Ukraine may have briefly had physical possession of weapons, though since they were “born nuclear” they do not warrant inclusion.

We start our analysis for each program from its beginning or from the first available estimate of the program—whichever is earlier. Our analysis ends when a subject state tests a nuclear explosive or conducts a decisive test that gives them sufficient confidence in their designs (most cases), is invaded (Germany and the two Iraq cases), a program is ended (Taiwan, South Africa, South Korea, Libya, Argentina, Brazil), a program is believed to have been divulged to the United States (Israel) or the last NIE regarding an ongoing program has been released (Iran). We divide the Iraqi program into two observations, the first ending with the first Gulf War in 1991, the second with Operation Iraqi Freedom in 2003. We omit a second potential period for India (1974–1998) as capability had already been achieved, and a potential first period for Iran (1974–1979) due to a lack of data. This gives us a total of seventeen observations, which are listed in Table 1 below, along with the approximate dates for each program from Jo and Gartzke and the years covered by our analysis.<sup>9</sup>

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<sup>7</sup> Singh and Way 2004 code 23 countries between 1945 and the present, separating them into “exploring” and “pursuing”; Nazi Germany and Imperial Japan add two. Jo and Gartzke 2007 code 21 between 1941 and 2002, excluding Libya, Switzerland, Australia, and Algeria due to a lack of a top-level decision to produce (rather than procure) weapons. See Montgomery and Sagan 2009 on coding differences.

<sup>8</sup> Levite includes additional countries in the “tried but gave up” category: Egypt, Italy, postwar Germany and Japan, Canada, the Netherlands, and Norway. He also notes that there have been assertions, but no data, on Finland, Greece, Spain, and Turkey. Levite 2002/2003, p. 62.

<sup>9</sup> Except Libya and India, for which we use the Singh and Way pursuit coding, and Taiwan’s second attempt, for which we use the Singh and Way explore coding.

**Table 1: Scope of the Study**

| State        | Programs                | Our Analysis | Upper Limit                    |
|--------------|-------------------------|--------------|--------------------------------|
| Germany      | 1941–1945               | 1941–1945    | End of World War II            |
| Soviet Union | 1943–                   | 1945–1949    | Test                           |
| France       | 1954–                   | 1946–1960    | Test                           |
| China        | 1956–                   | 1955–1964    | Test                           |
| Israel       | 1955–                   | 1957–1969    | Meir/Nixon meeting             |
| India        | 1964–1974               | 1958–1974    | Test                           |
| Taiwan       | 1967–1976,<br>1987–1988 | 1965–1988    | End of Program                 |
| South Africa | 1971–1990               | 1969–1990    | End of Program                 |
| South Korea  | 1971–1975               | 1970–1975    | End of Program                 |
| Libya        | 1970–2003               | 1970–2003    | End of Program                 |
| Pakistan     | 1972–                   | 1974–1998    | Test                           |
| Argentina    | 1976–1990               | 1974–1990    | End of Program                 |
| Brazil       | 1978–1990               | 1975–1990    | End of Program                 |
| North Korea  | 1982–                   | 1982–2006    | Test                           |
| Iran         | 1984–                   | 1984–2007    | 2007 NIE                       |
| Iraq(1)      | 1973–1991               | 1981–1991    | End of Persian Gulf War        |
| Iraq(2)      | 1991–2003               | 1991–2003    | End of Operation Iraqi Freedom |

In the following section, we generate twelve hypotheses contributing to intelligence distortion based on a review of the literature on intelligence estimation. We then demonstrate the process of evaluating these hypotheses using Israel and North Korea, identifying key estimates and determining whether each estimate was under, over, or correct. These two states were chosen so as to demonstrate each of the distortions we found to be operative in the universe of cases; they also provide a helpful contrast between sources of error about allies and those about rogue states. We conclude with policy and research implications.

## Hypotheses: Sources of Distortion in Intelligence Estimates

Even beyond the usual difficulties associated with forecasting in international relations, national intelligence estimation is a difficult process. The analysts charged with monitoring the political and technical events that comprise foreign nuclear weapons programs must navigate many pressures that threaten to distort assessments. Analysts must balance between relevance and objectivity, urgency and alarmism, and conservatism and uncertainty in the face of rapidly changing demands and targets. In this section, we catalog political, cultural, bureaucratic, and organizational effects, organizing these sources of distortion into hypotheses. These hypotheses are not an exhaustive list of possible sources of intelligence failure, for two reasons. First, this list omits most of the psychological sources of estimation distortion in order to focus on distinctively group- or higher-level processes. Second, the list is tailored to estimates of clandestine nuclear programs, to which some hypothesized sources of intelligence failures do not pertain.<sup>10</sup> The sources of distortion are summarized in Table 2 below.

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<sup>10</sup> For a similar, more general endeavor, see George 2010.

**Table 2: Intelligence Distortion Hypotheses**

| Type      | Distortion  | Literature  |
|-----------|---|---|
| Political | 1. The ideology of the executive may encourage or promote those estimates that conform to the desired view.<br>a. Members of the executive branch select preferred primary intelligence.<br>b. Requests to agencies may be suggestive, leading, or constraining.<br>c. Certain leaders may marginalize or ignore agencies.<br>d. The choice of DCI may affect the environment of political neutrality.<br>e. Standards of proof may be raised prohibitively if they contradict preferences. | (Bar-Joseph 1995)<br>a: (Ransom 1985, p. 26)<br>b: (Lowenthal 2000, p. 124)<br>c: (Lowenthal 2000, p. 123)<br>d: (Ransom 1985, p. 43) |
|           | 2. Policy initiatives, past, present and future, can affect estimates<br>a. Existing policy in an area makes difficult or precludes objective analysis, whether logically or psychologically<br>b. Not enough importance attached to an area of geography or analysis, collection failure<br>c. Likelihood of major action resulting from estimate  | a: (Ransom 1985)<br>(Lowenthal 1985)<br>b: (Wohlstetter 1981)<br>c: (Bar-Joseph 1995)<br>(Hastedt 1987)                               |
|           | 3. Likelihood of disclosure / politicization of estimate. A function of the level of consensus regarding a given action in the domestic policy arena.   | (Hastedt 1985)<br>(Hastedt 1987)<br>(Ransom 1985)   |
|           | 4. Cultural biases create mistaken assumptions of capabilities.   | (Ford 1993)<br>(Lowenthal 1985)<br>(Ascher 1978)  |
|           | 5. Misestimating intent / motives / resolve of subject state.   | (Handel 2003)<br>(Booth 1979)   |
|           | 6. Analysts misinterpret the involvement of outside sources   |   |
|           | 7. Multiple advocacy among agencies causes<br>a. compromise<br>b. domination  | (Bar-Joseph 1995)<br>(Handel 2003, pp. 28, 44)<br>(Lowenthal 2000, p. 122)  |
|           | 8. A fragmented bureaucracy stalls the dissemination and aggregation of useful data.  | (Handel 2003, p. 35)  |
|           | 9. Data overwhelms the analytic system, signals not separated from noise.   | (Wohlstetter 1981)<br>(Lowenthal 1985, p. 49)   |
|           | 10. Preference for secret over open sources   | (Hastedt 1985, p. 143)<br>(Turner 1985, pp. 116-117)  |
|           | 11. Recent experience with intelligence failures  |   |
|           | 12. Mistaken induction / conceptual rigidity: assumptions derived from historical experiences may not apply   | (George 2004) (Ascher 1978)<br>(Choucri and Robinson 1978)<br>(Kuhns 2003, p. 90)   |

## Political

The intelligence producer-consumer relationship is a delicate one. An intelligence agency must continually mediate between serving the needs of its consumers and maintaining objectivity. Intelligence must balance between concerted support for decided policy and maintaining objective estimation about developing future threats and most regions of the world. This tension is exacerbated by policymakers' general dissatisfaction with intelligence estimates, which tend to question deeply-held ideologies and detract from treasured policy initiatives. As Betts writes, "intelligence cannot live with politicization, but policy cannot live without it."<sup>11</sup>

The early Director of the Office of National Estimates (ONE) Sherman Kent argued that

<sup>11</sup> Betts 2003.

credibility, not influence, should be the goal of intelligence producers.<sup>12</sup> Ford has since shown how Kent's doctrine, combined with a move to Langley, changing leadership style in the White House, and a general decline in the quality of ONE staff in the 1950s, led to a separation of intelligence estimating from policymakers.<sup>13</sup> Subsequent decades have seen a trend toward more 'activist,' politicized relationships as "the need to successfully gain the decisionmakers' attention detaches [analysts] from [Kent's] ethic."<sup>14</sup> This newer approach is not without its advocates: Hastedt suggests that the intelligence-policy relationship is necessarily politicized, and argues that "rather than try to improve the quality of estimates by depoliticizing the estimating process, attention must be given to holding in check the potential for corruption."<sup>15</sup>

Whether due to the nature of the relationship or the peculiarities of specific policymakers, intelligence consumers may issue leading requests for estimates that put distortionary pressure on competing intelligence agencies and analysts, or cause selection of preferred estimates from between these agencies.<sup>16</sup> While express evidence of executive ideological politicization is difficult if not impossible to attain (from either classified or open sources), the possibility is clearly real.<sup>17</sup> Hypothesis 1 evaluates these propositions for each case, considering five possible mechanisms of politicization. First (a.), members of the executive branch may overtly select from preferred primary or finished intelligence sources in order to craft a picture that supports their desired policy, discarding or ignoring contrary information.<sup>18</sup> Second (b.), requests to agencies may be suggestive, leading, or constraining of objective analysis and tacitly encourage analysts to adhere to the preferred line.<sup>19</sup> Third (c.), the perspective that certain leaders hold toward intelligence generally may serve to marginalize or ignore agencies that endeavor to produce policy-relevant intelligence.<sup>20</sup> Fourth (d.), the appointment of intelligence chief (formerly the DCI, now DNI) may affect the environment of political neutrality in subtle and circuitous ways relating to their sense of their role, their view of the intelligence community generally, their relationship with the executive, and so on.<sup>21</sup> Fifth (e.), policymakers may raise or lower evidentiary standards for intelligence based on their views of the issue area. For example, Ellis and Keefer discuss President Clinton's experience with intelligence on Sino-Pakistani missile transfers in spite of the Arms Export Control Act: "Flexibility was seen as key to the Clinton team's foreign policy...[which] led to conflict with the intelligence community and with key members of Congress over the standards of evidence for missile technology transfers."<sup>22</sup> Goodman describes a more general—but equally distortionary—process: "As a result of considerable policy pressure, the intelligence community in 1998-1999 began to lower its standards for judging strategic threats, describing known missile programs [in North Korea, Iran,

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<sup>12</sup> Kent 1968, p. 34.

<sup>13</sup> Ford 1993.

<sup>14</sup> Bar-Joseph 1995, p. 11.

<sup>15</sup> Hastedt 1987, p. 8. Corruption, for Hastedt, is a function of "personalities, closed and rigid belief systems, ulterior political motives," and the allowance of secrecy for analysts.

<sup>16</sup> For a recent example, see Mazzetti 2006.

<sup>17</sup> An excellent general discussion of ideological politicization can be found in Bar-Joseph 1995.

<sup>18</sup> Ransom 1985, p. 26.

<sup>19</sup> Lowenthal 2000, p. 124.

<sup>20</sup> Lowenthal 2000, p. 123. For an excellent summary of the changing executive-intelligence relationships (and also executive-DCI relationships), see Andrew 1996.

<sup>21</sup> Ransom 1985, p. 43.

<sup>22</sup> Ellis and Kiefer 2007, pp. 51-55.

and Iraq] as more immediate threats than did previous assessments.”<sup>23</sup>

However, direct executive politicization does not exhaust the possibilities for ideological estimative distortion. For instance, the broader course of policy initiatives, past, present, and planned, can affect the estimation process in at least three ways. Less a problem of corruption than selective attention, Hypothesis 2 suggests that relatively rare collection failures can have political causes. By necessity, “national interest...determines intelligence priorities,”<sup>24</sup> but variations in how the national interest is to be pursued are likely to influence intelligence requests and corresponding adjustments in collection capabilities are often viscous.<sup>25</sup> There are three possibilities. First (a.), existing policy in an area may preclude or make objective analysis prohibitively difficult, whether logically or psychologically.<sup>26</sup> Second (b.), politicians may privilege or slight certain regions or issues depending on their expertise, campaign promises, or a host of other strategically arbitrary motivations, and these vicissitudes may influence agencies’ ability to collect constant and sound intelligence.<sup>27</sup> Third (c.), the likelihood of major action resulting from an estimate may affect that estimate in two ways: the prospect of major military or diplomatic action may skew determinations, while a sense that little can be done regardless of the intelligence gathered may discourage collection of data.<sup>28</sup>

Lastly, there is good reason to think that the likelihood of disclosure or the public politicization of an estimate may temper the conclusions reached in that estimate. Hastedt notes that since the 1970s, declining trust in government and extended executive and legislative control over the bureaucracy have created more public consumers of intelligence than ever before, with corresponding effects on transparency in intelligence agencies and scrutiny of estimates and estimators.<sup>29</sup> The years since Hastedt wrote have only amplified this trend, and added to it a contemporary proclivity to disclose executive summaries of NIEs when so doing would promote policy initiatives.<sup>30</sup> Ransom notes that the likelihood of disclosure and politicization is inversely related to the level of consensus among the public and policy communities: the more consensus, the less likely disclosure and politicization are likely to occur.<sup>31</sup> Hypothesis 3 asserts that the possibility of disclosure alters the contents of an estimate and, secondarily, that the level of domestic consensus regarding a given action correlates negatively with this possibility.<sup>32</sup>

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<sup>23</sup> Goodman 2008, p. 123.

<sup>24</sup> Lowenthal 1985, p. 47.

<sup>25</sup> Hulnick 2006 reminds us that human intelligence assets take years to recruit and implant—but even satellite telemetry cannot always be reprogrammed easily.

<sup>26</sup> Ransom 1985, p. 26, Lowenthal 1985. The primary case here is the U.S.’s agreement not to maintain operations in the Shah’s Iran led to surprise at his collapse.

<sup>27</sup> Wohlstetter 1981.

<sup>28</sup> Hastedt 1987, Bar-Joseph 1995.

<sup>29</sup> Hastedt 1985, p. 148.

<sup>30</sup> See Andrew 1996 for some history of disclosures. Since then, a complex game has evolved in which disclosures may come from the executive or intelligence agencies themselves. Either possibility could affect the content of estimates.

<sup>31</sup> Ransom 1985, p. 43.

<sup>32</sup> Also Hastedt 1987, p. 48, Ransom 1985, p. 43, Betts 2003. For a more recent example, see Spector and Cohen 2008. The authors surmise that the White House overruled a previous agreement among intelligence agencies not to release the contents of the critical 2007 Iran NIE,

## Cultural

Ascher, in his treatise on economic forecasting, tends in a different direction: his analysis pays little attention to institutional makeup and maintains that estimative methodology is less important than the assumptions the analyst applies to the task.<sup>33</sup> In estimating international relations, invalid assumptions can result from biases and misinformation about other states and cultures. These assumptions can affect estimates of a state's capabilities, intent, motives, or resolve. As long as "human perceptions are ethnocentric"<sup>34</sup> (or otherwise extrapolated from features of the estimator's experience) "mirror-imaging" will remain a problem and will cause inaccurate estimates based on misperceived or overly rational motivations.<sup>35</sup>

Hypothesis 4 evaluates assumptions of technical capabilities, asking whether estimates of manufacturing capacity or the abilities of scientific communities are skewed by cultural biases. This category need not be limited to cultural or racial biases: failure to properly calculate potential output, for instance, may fall under this category if it resulted from a failure to understand an economic system.

Hypothesis 5 covers assumptions by the analyst of the political intent, motives, or resolve of the subject state. The decision to pursue, assemble, and test nuclear weapons is always a political one and so a proper estimate requires estimating the likelihood of those decisions. This mechanism is indicated when the historical evidence suggests a mistaken appraisal of the target country's interests at stake in the nuclear program, or from a failure to adequately understand the leadership's thinking on nuclear matters.<sup>36</sup>

Hypothesis 6 serves to evaluate the impact of outside sources on a nuclear weapons program, whether from allied third party states, nuclear proliferation rings, or other established nuclear countries by espionage. Seeking international assistance is a common practice in the pursuit of nuclear weapons, and appears to be accelerating. Many states—including all of the original "nuclear five"—have pursued nuclear weapons while receiving help from outside their borders, whether in the form of data from others' programs (whether willingly or not), scientists brought from abroad, or parts manufactured in other countries, although the extent to which this assistance has been useful is debated.<sup>37</sup> The recent rise of clandestine nuclear networks only increases this trend, although, again, how effective these networks are is contested.<sup>38</sup> In the

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and so the subsequent release had biased and unintended affects.

<sup>33</sup> Ascher 1978, p. 199.

<sup>34</sup> Handel, quoted in Ford 1993, p. 74.

<sup>35</sup> Lowenthal 1985, p. 49.

<sup>36</sup> Handel 2003, pp. 12-14, Booth 1979. Because the decision to build a nuclear weapon represents a failure of general deterrence, much of the work on that subject is informative here. For more on the importance of accurately appraising interest and intent, see George and Smoke 1974 and Morgan 2003.

<sup>37</sup> Recent quantitative studies have attempted to evaluate the extent to which assistance has affected states' nuclear programs. Fuhrmann 2009 and Kroenig 2009 have argued that civilian and sensitive assistance respectively have accelerated nuclear weapons programs; for a counterpoint, see Montgomery 2010.

<sup>38</sup> Braun and Chyba 2004, Montgomery 2005.

instances where substantial outside assistance did take place, the effect of this assistance ranged widely, from sporadic nudging to close collaboration. Determining the extent of this assistance and estimating its effect presents a special difficulty for intelligence analysts.

## Bureaucratic

Another class of distortions derives from the internal bureaucratic politics and institutional structure of the intelligence community. With components of the nuclear intelligence effort spread between the CIA, the military intelligence organizations, and the Departments of State and Energy, inter-organizational politics are critical, especially when producing consensus documents like a national intelligence estimate (NIE).<sup>39</sup> While this multiple advocacy can promote analytical pluralism, it also creates serious difficulties for the estimating process.<sup>40</sup>

Hypothesis 7 holds that pathologies in inter-organizational estimation can take two forms: (a.) multiple advocacy can lead to compromise behavior (most famously in CIA and General Westmoreland's estimates of Vietcong strength during the Vietnam War); or (b.) an imbalance of resources or favor could cause some agencies' preferred forecasts to dominate others (for example, in the CIA's interpretation of Iraq's aluminum tube purchases over the correct Department of Energy analysis).<sup>41</sup>

Relatedly, a fragmented bureaucracy may stall the dissemination and aggregation of useful data as agencies in competition defend their scarce information for advantages over their peers.<sup>42</sup> Hypothesis 8 is coded as operative when these dynamics substantively affect the estimation process.

## Organizational

Organizational models of domestic politics refer to those that deal with a culture or set of accepted practices that inhere in certain organizations or agencies.<sup>43</sup> Hypotheses 9-12 give the most relevant practices for the estimation of nuclear weapons programs.

Hypothesis 9 tests Roberta Wohlstetter's classic account of the inchoate intelligence community's failure to predict Pearl Harbor as an inability to separate the crucial informational signals from the ambient noise.<sup>44</sup>

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<sup>39</sup> Hastedt notes additionally that the internal structure of an organization can cause distortion; these are omitted from the study as too difficult for an outsider to evaluate. He writes: "hierarchy, specialization, and centralization can be identified as the major sources of distortion" in the organizational sphere. Hastedt 1985, p. 141.

<sup>40</sup> Handel 2003, p. 42.

<sup>41</sup> Authors who have discussed the compromise and domination dynamics include Bar-Joseph 1995, Handel 2003, pp. 28, 44, and Lowenthal 2000, p. 122.

<sup>42</sup> Handel 2003, p. 35.

<sup>43</sup> A general account of these dynamics can be found in Wilson 1989. While this study explicitly eschews psychological explanations of estimative distortion, when these dynamics are encouraged by organizational culture in an aggregate sense, these effects might be classified as organizational.

<sup>44</sup> Wohlstetter 1981, Lowenthal 1985, p. 49

Hypothesis 10 draws upon an organizational bias that Director of Central Intelligence Stansfield Turner thought he had identified in intelligence agencies: an “excessive emphasis on the use of secret data as opposed to open information.” He points out that the latter might well be better disposed than secret intelligence to “the long-range forecasting of political, economic, and military trends.”<sup>45</sup> This hypothesis is to some extent implicitly present whenever outside academics or analysts are not consulted, but is considered be operative here when specific, valuable open sources go unanalyzed and unincorporated into estimates.

We might think that recent experience with intelligence failures on this or other issues might well distort analysts’ propensities to make conservative or assertive claims. Unwilling to be caught off guard again, analysts may overstate their evidence to emphasize alarming trends.<sup>46</sup> Handel, however, argues that the process tends to operate more often in the inverse: “intelligence organizations tend to err in the direction of excessive caution and underutilization of information.”<sup>47</sup> This may be especially true after overestimating a critical case. Hypothesis 11 tests this possibility.

Hypothesis 12 takes on the what is perhaps the most difficult issue of social forecasting:<sup>48</sup> the problem of mistaken induction from past trends onto future possibilities. The issue of determining the proximity and character of a discontinuity in prior political trends is a fundamental, irreducible one in social and political analysis and can never be solved completely. However, it is clear that unreflective “conceptual rigidity”<sup>49</sup> can be damaging to proper intelligence estimation and that some steps can be taken to identify and confront mistaken or unfounded assumptions in specific issue areas.<sup>50</sup> Imaginative or “surprise-sensitive forecasting” might well serve to identify threatening possibilities that might otherwise go unconsidered.<sup>51</sup>

## US Intelligence on Nuclear Programs

In Table 3, we list and evaluate the decisive estimates of each of the 17 time periods made by the US intelligence community. While the community’s knowledge of a program is best understood with a constellation of documents, memos, articles, and interviews, the table concentrates on concrete verifiable estimates of overall capabilities and intentions. Below we discuss two case studies, Israel (1957-1969) and North Korea (1982-2006), between which all but two of the hypotheses (Hypothesis 10, preference for secret over open sources and 12, mistaken induction/conceptual rigidity) can be observed in practice.

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<sup>45</sup> Turner 1985, pp. 116-117, Hastedt 1985, p. 143. Note that in Turner’s formulation this bias might well be bound up with Hypothesis 5.

<sup>46</sup> Jervis 2006 discusses this bias in relation to the estimates on the Iraqi program.

<sup>47</sup> Handel 2003, p. 41.

<sup>48</sup> On the issue of forecasting intelligence, see George 2004, Lefebvre 2004, p. 243, Handel 2003, p. 43, Kuhns 2003, p. 90; in international politics generally, see Doran 1999, Choucri and Robinson 1978; for a treatise on economic forecasting, see Ascher 1978.

<sup>49</sup> Handel 2003, p. 45.

<sup>50</sup> Kuhns 2003, p. 88.

<sup>51</sup> Ascher 1978, pp. 202, 211.

**Table 3: Estimate Accuracy**

| State        | Date | Evidence                                  | Accuracy | Estimate   | Actual  |
|--------------|------|---|----------|--|---|
| Germany      | 1943 | Compton, <i>Situation in Germany</i>      | Correct  | lack of censorship indicates reactor work<br>pretense of work as usual | no large scale project<br>work as usual               |
|              | 1944 | Furman, <i>Report on Enemy Activities</i> | Over     |  |   |
| Soviet Union | 1946 | ORE 3/1                                   | Under    | Test between 1950-53   | August, 1949  |
|              | 1947 | ORE Soviet Capabilities...                | Under    | No working reactor   | Lab 2 reactor operational                             |
|              | 1948 | JCS JIC <i>Estimate of the Status...</i>  | Under    | mid-1950 earliest, mid-1953 probable                                   | August, 1949  |
|              | 1949 | DCI to Truman                             | Under    | mid-1949 earliest, mid-1953 probable                                   | August, 1949  |
| France       | 1956 | OSI, <i>Nuclear Energy Activities...</i>  | Over     | Plutonium ready by 1957  | Test would occur in Feb. 1960                         |
|              | 1957 | NIE 100-6-57                              | Over     | Plutonium available, weapon possible 1958                              | Test would occur in Feb. 1960                         |
|              | 1958 | CIWS French Nuclear...                    | Over     | A test could occur at any time   | Test would occur in Feb. 1960                         |
|              | 1959 | OSI French Nuclear Weapons..              | Over     | Test possible by Nov. 1959   | Test would occur in Feb. 1960                         |
| China        | 1956 | NIE 13-56                                 | Correct  | A primitive nuclear research capability                                | Most capacity would be developed in subsequent years  |
|              | 1957 | NIE 13-57                                 | Under    | Independent program unlikely before 1961                               | Soviet support withdrawn by 1959                      |
|              | 1957 | NIE 100-57                                | Under    | Chicom unwilling to divert resources                                   | Necessary commitments were made                       |
|              | 1959 | NIE 13-59                                 | Under    | No production capacity before 1963                                     | Most elements were in place by 1963                   |
|              | 1960 | NIE 13-2-60                               | Correct  | 1963 most probable with Soviet support                                 | This date correct without Soviet support              |
|              | 1962 | NIE 13-2-62                               | Correct  | Test possible 1963, likely delayed                                     | Test delayed a year                                   |
|              | 1963 | SNIE 13-2-63                              | Correct  | Test likely in 1964  | Test in 1964, though not for the right reasons        |
|              | 1964 | SNIE 13-4-64                              | Under    | Next few months possible, likely next year                             | Test a few months later                               |
| Israel       | 1960 | SNIE 00-8-60                              | Under    | Primary complex was not detected                                       | Dimona was discovered shortly after                   |
|              | 1961 | NIE 4-3-61                                | Correct  | Plutonium by 1965-6, weapon by 1966-7                                  | Accurate to the best of our knowledge                 |
|              | 1969 | Assessments                               | Under    | Organizations conclude a weapon  | Capability was probably attained some years earlier   |
| India        | 1961 | NIE 4-3-61                                | Over     | Weapon possible in 1968-9, unlikely                                    | Test of nondeliverable device in 1974                 |
|              | 1964 | NIE 4-2-64                                | Over     | 12 bombs are possible by 1970  | Test of nondeliverable device in 1974                 |
|              | 1965 | SNIE 31-1-65                              | Over     | A test could occur within months                                       | Test of nondeliverable device in 1974                 |
|              | 1966 | NIE 4-66                                  | Over     | Within a year of decision, next few years                              | Test of nondeliverable device in 1974                 |
| Taiwan       | 1964 | NIE 43-64                                 | Under    | Any test would probably not affect Taiwan                              | Nuclear program in 1965                               |
|              | 1966 | NIE 4-66                                  | Under    | Only India likely to undertake a program                               | Nuclear program in 1965                               |
|              | 1974 | NIC-M-85-10001                            | Correct  | Taiwan conducts a program w/NW in mind                                 | Nuclear program in progress                           |
|              | 1987 | Albright 1998                             | Correct  | Taiwan seeking a reprocessing plant                                    | Reprocessing program restarted                        |
| South Africa | 1971 | OSI <i>Atomic Energy Activities...</i>    | Correct  | No material, no design, y-plant discussed                              | only lab-scale uranium enriched                       |
|              | 1974 | CIA Surveyor article                      | Under    | Lacks all facilities but enrichment                                    | Somchem lab designed & tested a scale model that year |
|              | 1974 | SNIE <i>Prospects for Further...</i>      | Under    | judges no serious threat to S.A.                                       | threat was used as rationale for bomb                 |
|              | 1976 | CIA Surveyor article                      | Under    | Sees no evidence of bomb development                                   | A scale model has been tested                         |
|              | 1977 | CIA S.A.'s Uranium Enrichment...          | Over     | Several devices worth of HEU/yr.                                       | Really one every 12–18mo.                             |
|              | 1984 | NIE <i>Trends in...</i>                   | Over     | Enough HEU/yr. for two to four devices                                 | Really one every 12–18mo.                             |

| <b>State</b> | <b>Date</b> | <b>Evidence</b>                            | <b>Accuracy</b> | <b>Estimate</b>                                      | <b>Actual</b>   |
|--------------|-------------|--|-----------------|--|---|
| Pakistan     | 1974        | SNIE <i>Prospects for Further...</i>       | Correct         | At least a decade away                               | Capability probably attained in 1986                    |
|              | 1975        | INR <i>Pakistan and the Non-...</i>        | Over            | Earliest weapon in 1980                              | Capability probably attained in 1986                    |
|              | 1978        | CIA <i>Untitled</i>                        | Correct         | Weapon possible early 80s, likely later              | Capability probably attained in 1986                    |
|              | 1983        | INR  | Correct         | Weapon possible 1985-6                               | Correct, but with pu instead of heu                     |
|              | 1986        | SNIE -classified-                          | Correct         | Concludes a bomb could be ready                      | Correct   |
| South Korea  | 1974        | DCI NIO 1945-74                            | Under           | Needs at least a decade                              | Work under way  |
|              | 1975        | Gilette <i>U. S. Squelched Apparent...</i> | Correct         | Moving rapidly towards a nuclear weapon              | Reprocessing plant one of last few items needed         |
| Argentina    | 1974        | DCI NIO 1945-74                            | Over            | Nuclear weapons capability in early 1980s            | Problematic enrichment by 1983, no full capability      |
|              | 1983        | Kessler and Knapik 1983                    | Under           | No knowledge of enrichment efforts                   | Enrichment plant announcement                           |
|              | 1985        | NIC-M-85-10001                             | Correct         | Constrained by economics, domestic politics          | No intent to develop nuclear weapons                    |
| Brazil       | 1975        | NIE 93-1-75                                | Correct         | No decision to make nuclear weapons                  | Accurate  |
|              | 1983        | SNIE 93-83                                 | Under           | mid-1990s to produce HEU                             | early 1990s   |
|              | 1985        | NIC-M-85-10001                             | Correct         | Constrained by economics, domestic politics          | No intent to develop nuclear weapons                    |
| Libya        | 1975        | CIA <i>Qadhafi's Nuclear Weapons Aims</i>  | Correct         | Domestic crash program; ten years                    | Mostly attempting to buy a weapon, but 10 years correct |
|              | 1985        | CIA <i>The Libyan Nuclear Program</i>      | Correct         | Rudimentary, highly unlikely within 10 years         | Major problems  |
|              | 1988        | CIA <i>Middle East-South Asia</i>          | Correct         | Goal cannot be reached for at least a decade         | Little effort being made                                |
|              | 1996        | CIA <i>Section 721</i>                     | Under           | No mention of nuclear program                        | Assistance from A.Q. Khan                               |
|              | 2001        | CIA <i>Section 721</i>                     | Correct         | Efforts to obtain dual-use technologies              | Assistance from A.Q. Khan                               |
|              | 2002        | CIA  | Over            | Enough HEU for a weapon by 2007                      | 9-centrifuge cascade                                    |
| North Korea  | 1985        | NIC-M-85-10001                             | Under           | Plutonium from the reactor by 1990                   | Reactor started in 1986                                 |
|              | 1992        | DCI Gates 1992                             | Over            | A few months to a couple of years                    | Reprocessing plant not finished by 1992                 |
|              | 1998        | DIA 1998 (Sanger)                          | Over            | New nuclear complex at Kumchang-ni                   | Empty tunnels   |
|              | 2001        | CIA <i>Section 721</i>                     | Correct         | North Korea centrifuge enrichment program            | Acquiring components                                    |
| Iran         | 1988        | CIA NESA 88-10027X                         | Correct         | Iran will eventually try to develop a capability     | Long-term plans laid                                    |
|              | 1992        | DCI Gates 1992                             | Over            | Iran could have a weapon by 2000                     | Enrichment not until 2006                               |
|              | 1995        | SOS Christopher 1995                       | Over            | Iran has a crash effort                              | Very little effort                                      |
|              | 1997        | ACDA director 1997                         | Over            | Iran could not produce fissile material until 2005-6 | Enrichment not until 2006                               |
|              | 2000        | CIA <i>Assessment 2000</i>                 | Over            | Cannot rule out Iranian acquisition                  | No source of fissile materials                          |
|              | 2002        | DCI Tenet                                  | Correct         | Iran could have a weapon by 2010                     | Possible, if worst-case estimate                        |
| Iraq (1)     | 1983        | CIA <i>Iraqi Nuclear Program...</i>        | Under           | Does not identify program, design                    | Both exist  |
|              | 1983        | CIA <i>Iraqi Nuclear Program...</i>        | Under           | Focussed on plutonium                                | A robust enrichment program by this point               |
|              | 1983        | CIA <i>Iraqi Nuclear Program...</i>        | Correct         | Not enough material before 1990s                     | Material could have been ready by 1992                  |
|              | 1991        | NIE  | Under           | HEU by late 1990s                                    | Albright estimates by 1992                              |
|              | 1991        | NIE  | Over            | Crash bomb six months to a year                      | Inspectors estimate over a year                         |
| Iraq (2)     | 1993        | CIA <i>Senate testimony</i>                | Over            | Without inspection, five to seven years              | Much infrastructure was lost, unlikely in five to seven |
|              | 1999        | JAEIC <i>Reconstitution of...</i>          | Over            | Gradual program, five to seven years                 | Much infrastructure was lost, unlikely in five to seven |
|              | 2002        | NIE <i>Iraq's Continuing Program.</i>      | Over            | Program begun: five to seven years                   | Program had not begun                                   |

Note: Sources for this table can be found in the Appendix.

## **Israel, 1957-1969**

U.S. intelligence estimates of Israel's nuclear program were generally late and of poor quality. Though Israel began producing the sensitive materials necessary to start nuclear research in 1950<sup>52</sup> and began close cooperation with French nuclear scientists in 1956, it was not until 1960 that American policymakers were made aware of Israel's progress toward a bomb. Had any number of pieces of information been appreciated in those four years, U.S. policymakers would have had knowledge about the program sooner.

In 1957, the year Israel broke ground on the Dimona reactor complex in the Negev desert, Israel also abandoned its request for an American 10 MWth reactor and accepted instead a small Soreq research reactor. This did not arouse suspicion at the CIA.<sup>53</sup> Israel accepted the loss of American assistance because it had received the help it needed from France in the form of a 18 MWth thermal research reactor and plutonium separation technology the same year. French contractors would later assist with construction at Dimona. In 1958, U.S. analysts received U-2 imagery of Israel's primary nuclear facility at Dimona in the Negev desert, two years after the construction was started. This same year, the intelligence community urged the U.S. Atomic Energy Commission and the State Department to step up collection efforts against countries seeking nuclear weapons, but Israel was not included as a country of interest.<sup>54</sup> In March and April 1958, State Department officials conducted a series of interviews with Dr. Ernst Bergmann, the head of the Israel Atomic Energy Commission and major proponent of the bomb program at the behest of U.S. intelligence agencies. He seems to have been carelessly taken at his word—except for his important admission that his country was planning to build a research reactor (which these agencies assumed meant the U.S. reactor).<sup>55</sup> In mid-1959, information on the Dimona complex was furnished to the CIA by human intelligence sources “but was discounted because the other information in the item was demonstrably untrue.”<sup>56</sup>

Between August and December 1960, a wide range of information became available to U.S. intelligence agencies who finally came to appreciate the existence and sophistication of the Israeli program. The decisive piece of information came when University of Michigan nuclear scientist Henry Gomberg was debriefed at the State Department in December about a recent trip to Israel during which he gleaned enough information to guess accurately at the contours and intent of the Israeli program.<sup>57</sup>

Though the Israeli leadership intended to maintain strict secrecy regarding the program, a relatively large quantity of information had leaked in the four years prior to the American realization, most of which was ignored by U.S. intelligence agencies. Had they launched even a casual collation or collection effort, more surely could have been shaken loose and the program

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<sup>52</sup> In 1956, Israel requested 10 tons of heavy water from the AEC but later abandoned the request; this information was not transmitted to the intelligence community. Director of Central Intelligence 1961b, p. 8.

<sup>53</sup> Cohen 1998, p. 81.

<sup>54</sup> Director of Central Intelligence 1961b, p. 7.

<sup>55</sup> Director of Central Intelligence 1961b, p. 10.

<sup>56</sup> Director of Central Intelligence 1961b, p. 8.

<sup>57</sup> Cohen 1998, p. 87.

could have been discovered earlier. The failure is doubly grave considering the fact that U.S. intelligence agencies were tracking French nuclear scientists in the run-up to that country's 1960 test in the Sahara.<sup>58</sup>

After 1960, both the Israeli nuclear program and US estimates of it were increasingly enveloped in secrecy. However, we know enough to posit that Israel achieved preliminary nuclear capability in November of 1966 when nuclear scientists recorded the successful completion of a 'decisive test'—possibly a zero-yield trial.<sup>59</sup> Israel may have cemented this by assembling one or more weapons following Egypt's attack during the Six-Day War. Whether or not this account is to be accepted as accurate, the American image of the program is somewhat confused. In September of 1961, nine months after a post-mortem was completed on the American failure to discover the program sooner and an alarmed President Kennedy demanded information, the intelligence community included Israel in a National Intelligence Estimate that surveyed the nuclear capabilities of non-Soviet countries. This accurately concluded that Israel could assemble an explosive device in 1965-66.<sup>60</sup> At the same time, there is reason to believe that American intelligence continued to underestimate Dimona's capacity even after discovering the facility, though the incomplete body of the best current open-source knowledge cannot allow us to be sure. NIE 4-3-61 accepted French and Israeli statements at face value and assessed the Dimona reactor as a 26 MWth heavy water unit. Open source data cannot decisively reject this hypothesis, but it also offers very strong reasons to believe that Dimona was at least a 40 MWth reactor from the start. The evidence for the higher estimate comes from debriefed French contractors who noticed both reactor power and cooling ducts several times too large for a 24 MWth reactor. Information on plutonium output from the defector Mordechai Vanunu and other sources suggests that the reactor had been running at 70 MWth for its entire lifetime. Looking at all the available open-source information, Albright, Berkout, and Walker conclude that the correct answer falls somewhere in the 40–70 MWth range.<sup>61</sup>

Following this and pressure from the Kennedy administration, Ben Gurion agreed to allow American inspectors to visit Dimona in the week of May 15, 1961. These visits were informal, cordial, and conducted by AEC scientists without access to intelligence; as a result, they were unsurprisingly uninformative.<sup>62</sup> Seven more inspections over the next decade produced similar results.<sup>63</sup> Most official estimates from this period remain classified; there is some anecdotal evidence to suggest that formal estimates during this period and after were eschewed due of the sensitivity of the subject in favor of informal conversations between JAEIC members.<sup>64</sup> This almost certainly did nothing to satisfy the 1961 post-mortem's recommendation of diminished viscosity of shared information.

By the time Nixon came to office, ambiguity remained regarding both the U.S.' knowledge of the Israeli program and its policy toward it. Johnson's tacit opposition to the program had not carried the weight of Kennedy's disapproval, who once threatened Ben Gurion that further stonewalling

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<sup>58</sup> Office of Strategic Intelligence 1956, pp. 39-43.

<sup>59</sup> Cohen 1998, pp. 231-232.

<sup>60</sup> Director of Central Intelligence 1961a, p.2.

<sup>61</sup> Albright, Berkout, and Walker 1997, pp. 257-262.

<sup>62</sup> Cohen 1998, p. 107.

<sup>63</sup> Cohen 1998, pp. 175-194.

<sup>64</sup> Richelson 2006, p. 265.

on the issue would “...jeopardize [the] American commitment to Israel’s security and well being.”<sup>65</sup> A 1968 State Department memo still asserted that Israel had “not embarked on a program to produce a nuclear weapon.”<sup>66</sup> National Security Advisor Henry Kissinger convened NNSM 40, a policy planning board—though without the input of the Arms Control and Disarmament Agency (ACDA) and the Atomic Energy Commission (AEC)—to recommend to the president a position on Israeli nuclear weapons. However, by the time Nixon met with Israeli Foreign Minister Golda Meir in the Oval Office in September 1969, preparatory estimates from all sources had assessed the nuclear-capable Jericho missiles and the Plumbat uranium affair and concluded that a bomb had likely already been produced. It seems likely that Meir and Nixon discussed the program openly at that meeting, though its contents have never been divulged.<sup>67</sup>

The CIA’s failure in the late 1950s to properly identify Israel’s reactor complex at Dimona resulted, like most intelligence failures, from multiple overlapping distortions. The primary problem was that intelligence agencies attached too little importance to evaluating and aggregating data about Dimona and Israel’s program more generally. The overwhelming quantity of information that became available to the Joint Atomic Energy Intelligence Committee (JAEIC) in the second and third weeks of December 1960 suggests that had similar attention been devoted to the Dimona installation at an earlier period in its development, many of these clues would have become apparent.<sup>68</sup> Israel was not prominently discussed in a 1957 NIE of nuclear proliferation and was only listed in the lowest possible priority for intelligence collection the year before; a year later, Israel’s program was raised to Second Category. This meant that as late as 1961 all analysis on the Israeli program was “performed on a part-time basis by one intelligence analyst... who is responsible for corresponding coverage of over forty Bloc and Non-Bloc countries.”<sup>69</sup> The CIA’s own post-mortem on its Special National Intelligence Estimate of 1960 declared that “the second priority status of Israel tended to reduce the effort and urgency attributed to this program.”<sup>70</sup> Instead, the accidental discovery of the site by U-2 in 1958 was not confirmed until two years after the fact.

The close relations of the Israeli and American governments was likely a major impediment to accurate analysis and probably contributed to a failure to fully appreciate the warning signs at every level of government. Political will is of decisive importance in this case: it is hard to imagine Kennedy exhibiting a reaction similar to Eisenhower’s apathy at being shown preliminary imagery of the site,<sup>71</sup> and a demand for further information could have led to the site’s discovery two years earlier. Furthermore, there is some evidence that analysts and policymakers alike assumed that the program could not be completed without US knowledge or assistance; French and Israeli statements regarding their collaboration were accepted at face

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<sup>65</sup> Cohen 1998, p. 193.

<sup>66</sup> Cohen and Burr 2006, p. 2.

<sup>67</sup> Cohen and Burr 2006. It should be noted that many observers think that American intelligence estimates afterward did not improve and that Mordechai Vanunu’s assertions of Dimona’s upgrade and increased production caught many in the intelligence community by surprise, though the present level of declassification cannot verify this and in any case these estimates fall beyond the scope of this study.

<sup>68</sup> Director of Central Intelligence 1961b, pp. 7-8.

<sup>69</sup> Director of Central Intelligence 1961b, p. 5.

<sup>70</sup> Director of Central Intelligence 1961b, p. 2.

<sup>71</sup> Cohen 1998, p. 84.

value, a lenience that would have been inconceivable in evaluating Sino-Soviet interactions.<sup>72</sup> The result of these conditions was that positive data was not recognized in the usual data noise, particularly because reports were rarely distributed adequately. (H2)

The US experience with the Israeli program is unique in a number of ways; this is reflected in six other operative hypotheses. Especially after 1961 and during the NSSM 40 process, the close bilateral relationship uniquely hindered the estimating process, as fear of disclosure prevented the production of formal or interagency NIEs (H3). Next, analysts underestimated Israeli technical capabilities, as it was believed that Dimona could not be completed without US or French assistance (H4). The SNIE noted that “the belief that any such aid would be readily known to the US led to a tendency to discount rumors of Israeli reactor construction and French collaboration...”<sup>73</sup> Early complacency led to a major underestimation of Israeli intent and resolve (H5). As noted, French assistance to the program was much more extensive than expected by US estimates, as statements were taken more or less at face value (H6). While the US community possessed much of the data that could have warned policymakers of Dimona’s existence years earlier, much of it went unappreciated and unanalyzed as the result of insufficient transmission or recognition of importance (H8, H9).<sup>74</sup>

## North Korea, 1982-2006

The current Yongbyon site, where the bulk of North Korea’s nuclear infrastructure sits, was started in 1962, when the Soviet Union agreed to supply the Democratic Republic of Korea (DPRK) with a small (2 MWth) IRT-2000 research reactor. In the 1970s, North Korea separated a small amount of plutonium from the fuel rods of this research reactor.<sup>75</sup> North Korea joined the International Atomic Energy Agency in 1974, and placed this research reactor under safeguards in 1978.<sup>76</sup>

In the late 1970s, North Korea began planning to build a 5 MWe graphite-moderated reactor at Yongbyon, which went critical in the mid-1980s. In the mid- to late-1980s, construction was started on a second (50 MWe) graphite-moderated reactor and a plutonium reprocessing facility at the same site; in 1989, construction on a third (200 MWe) graphite-moderated reactor located in another location (Taechon) also began. Additional facilities are known to exist. A reprocessing facility, also located at Yongbyon, was begun in the late 1980s; an earlier pilot facility may have also existed. This facility was intended to have two process lines sufficiently large to reprocess spent fuel for all of North Korea’s reactors; at the time of the Agreed Framework in October 1994, one of the lines was almost complete.<sup>77</sup>

In December 1985, the Soviet Union agreed to supply four light-water nuclear power reactors if North Korea joined the Nonproliferation Treaty (NPT). North Korea signed the NPT, but failed

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<sup>72</sup> Director of Central Intelligence 1961b, p. 2.

<sup>73</sup> Director of Central Intelligence 1961b, p. 2-3.

<sup>74</sup> Cohen 1988, p. 84.

<sup>75</sup> See Hibbs 1992 and Albright and O’Neill 2000 on this separation, which the North Koreans later admitted.

<sup>76</sup> On the North Korean program from 1945–1980, see Mazarr 1995.

<sup>77</sup> Bermudez Jr. 1994, Bermudez Jr. 1999a, Bermudez Jr. 1999b, Albright and O’Neill 2000, Bermudez Jr. 2002.

to submit a safeguards inspection agreement with the IAEA by the extended deadline of December 1988. In 1989, the DPRK shut down the 5MWe reactor for about 70 days, removing and reprocessing some of the fuel rods and extracting the plutonium. While North Korea claims that it only removed a few damaged fuel rods and reprocessed about 90 g of plutonium, they could have extracted up to several kilograms, depending upon how many fuel rods they removed and the efficiency of the extraction process.<sup>78</sup> In parallel, the DPRK is rumored to have conducted a series of high explosive tests between about 1983 and 1991;<sup>79</sup> further tests were rumored to have occurred between 1991 and 1994.<sup>80</sup>

In 1994, the DPRK again shut down the 5MWe reactor and withdrew the fuel rods from the core. The history of the reactor was partially destroyed by removing the rods without noting where in the core they were placed, making it difficult to reconstruct the operating history of the reactor and therefore the number of fuel rods that the DPRK had withdrawn in 1989. After the threat of economic sanctions and a face-saving trip by former President Jimmy Carter, the US negotiated the Agreed Framework with the North Koreans, shutting down the reactor and preventing reprocessing of the fuel rods removed from it.

The CIA first noted the construction of the 5MWe reactor in 1982, but noted that it “is not designed to produce the quantities of plutonium needed for a nuclear weapons program,” and in a separate assessment noted that “We have no basis for believing that the North Koreans have either the facilities or materials necessary to develop and test nuclear weapons.” In 1984, the CIA revisited the reactor, judging that it would take at least three more years before it would be complete.<sup>81</sup> In 1985, a general estimate noted that the reactor was capable of producing “significant quantities of plutonium by 1990.”<sup>82</sup> Two years later, the CIA issued a report entitled “North Korea: Potential for Nuclear Weapon Development,” that called North Korea’s efforts “a considerable developing capability.” North Korea issued a denial of its weapons aims in 1989.<sup>83</sup> Satellite imagery showed that North Korea was building what appeared to be a reprocessing plant in June 1989.<sup>84</sup> The State Department estimated in 1991 that North Korea would not be able to develop a nuclear weapon until mid-decade, while the Pentagon and the DIA estimated three to five years, and experts at the DOE labs several more.<sup>85</sup>

In February 1992, CIA director Robert Gates estimated that North Korea had only a few months to a couple of years before they would have a nuclear bomb, while the director of the State Department’s intelligence arm (INR) Toby Gati argued that North Korea would need two or more years; this difference was attributed by an administration official to the need for the CIA to project worst-case estimates after their underestimation of Iraq, while the official attributed the State Department’s focus on diplomacy to its inclination to say that there was still time to solve the problem. Gates’ replacement, James Woolsey, stated that North Korea “could have enough

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<sup>78</sup> On the operating history of the 5MWe reactor and estimates of the plutonium extracted, see Albright and O'Neill 2000.

<sup>79</sup> Nuclear Threat Initiative 2005.

<sup>80</sup> Yu 1996.

<sup>81</sup> Wampler 2003, Documents 1, 2, 4.

<sup>82</sup> Director of Central Intelligence 1985, p. 17.

<sup>83</sup> Wampler 2003, Document 7.

<sup>84</sup> Richelson 2006, p. 357.

<sup>85</sup> Wampler 2003, Document 15, Mack 1991.

nuclear material” for one or maybe two weapons.<sup>86</sup> A separate estimate assessed that “there was more than a 50 percent chance that the country might already possess a very small nuclear arsenal, consisting of one or two bombs,”<sup>87</sup> while the State Department argued that due to reprocessing inefficiencies, the material was likely to be less than what is required for a single weapon. However, the State department had earlier accepted that the reprocessing plant was actually a manufacturing plant. After the Agreed Framework was signed, the DIA argued that North Korea would operate a covert program regardless of agreements, while the INR argued that the North was looking for improved relations.<sup>88</sup>

The variability in intelligence estimates was not simply limited to agency differences. As Pollack notes, most of the CIA estimates were consistent with each other through the 1990s, but in 2001 the intelligence estimates rewrote the past, stating that “[t]he Intelligence Community judged in the mid-1990s that North Korea had produced one, possibly two, nuclear weapons,” then that “the US . . . has assessed since the early 1990s that the North has one or possibly two [nuclear] weapons using plutonium it produced prior to 1992.”<sup>89</sup>

Unfortunately, these estimates cannot be properly assessed. While the assessment of plutonium production and separation is still up for debate, with the differing estimates of the CIA, DIA, and the INR, someone must be wrong. The INR was clearly wrong about the reprocessing plant, but arguments have been made that they were correct about the North’s intent in general; while the North did eventually start a HEU program, it was small in scale until at least 2000.<sup>90</sup> Nonetheless, the evidence is somewhat ambiguous.

However, US officials did turn out to be incorrect about one particular suspected facility at Kumchang-ri, where satellite imagery seemed to indicate by the summer of 1998 a major tunneling operation, suspected to be nuclear-related. After negotiations and threats, a team inspected the site in May 1999 and found no indications of nuclear activity; a follow-up visit in 2000 found nothing additional.<sup>91</sup>

Finally, estimates concerning the DPRK HEU program and transfers to and from Pakistan were more-or-less correct. The Clinton administration reportedly learned of transfers between North Korea and Pakistan in 1998 or 1999, according to the Congressional Research Service (CRS).<sup>92</sup> The CIA first mentioned seeking components for uranium enrichment specifically until the latter half of 2001, when it reported that “the North has been seeking centrifuge-related materials in large quantities to support a uranium enrichment program. It also obtained equipment suitable for use in uranium feed and withdrawal systems.”<sup>93</sup>

In October 2002, Assistant Secretary of State James Kelly visited North Korea and accused the

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<sup>86</sup> Quoted in Richelson 2006, p. 522

<sup>87</sup> Richelson 2006, p. 523

<sup>88</sup> Richelson 2006, pp. 522-524.

<sup>89</sup> National Intelligence Council 2001, p. 9, Central Intelligence Agency Nonproliferation Center 2002, Pollack 2003, p. 12.

<sup>90</sup> Montgomery 2005.

<sup>91</sup> Richelson 2006, pp. 527-529.

<sup>92</sup> Niksch 2005.

<sup>93</sup> Central Intelligence Agency Nonproliferation Center 2001.

regime of conducting a clandestine HEU program based on intelligence that indicated that North Korea had sought parts from Russia and had acquired aluminum tubes sufficient for 2600 P2 centrifuge casings, although the latter intelligence did not become publicly available until 2005.<sup>94</sup> A special, untitled report by the CIA, released on November 19, 2002, stated “we assess that North Korea embarked on the effort to develop a centrifuge-based uranium enrichment program about two years ago.”<sup>95</sup>

These estimates seemed to be publicly confirmed when a shipment of 214 6000-grade aluminum tubes were intercepted on April 12, 2003, as a French ship sailed through the Suez Canal on their way to North Korea via China. These tubes, unlike the Iraqi tubes, fit very closely dimensions of centrifuge plans that the A.Q. Khan network passed on to North Korea.<sup>96</sup> Musharraf verified in 2005 that A.Q. Khan had passed “probably a dozen” centrifuges to North Korea.<sup>97</sup> Yet, as David Albright has argued, extrapolating the size or even existence of a program from a set of tubes is highly dubious; moreover, an unnamed CIA official in 2004 stated that the CIA was not even certain whether that such a plant existed.<sup>98</sup>

Since North Korea ejected IAEA inspectors in late 2002, other than the interception of the aluminum tubes in 2003, no further solid evidence has emerged that could confirm any other estimates regarding North Korea’s nuclear capabilities. No specific site has been identified, and CIA estimates remained static, arguing that North Korea “has pursued a uranium enrichment capability at last in the past.”<sup>99</sup> The 2010 revelations regarding North Korea’s new enrichment plant at Yongbyon have done nothing to clarify the past history of the program.

The 2006 North Korean nuclear test is not a satisfactory test of US intelligence simply due to the North Korean decision to announce on October 3 that it would test, followed by the actual test on October 9. The uncertainty that preceded the test as to the location of the potential test site before the test seemed to indicate a lack of sources outside of defectors and satellite imagery, although in the end the site at which vehicle movement and cable reels were spotted (near P’unggye-yok) was correct. Additionally, in 2005 some intelligence officials leaked information to the New York Times regarding preparations being made for a test, which turned out to be false.<sup>100</sup>

The changes noted by Pollack in 2001 and 2002 that re-wrote the history of intelligence estimates potentially indicate (along with the Iraq and Libyan cases) an influence of executive ideology (H1). The HEU intelligence may have been influenced by policy initiatives (H2a); North Korea by October 2002 had already been placed in the Axis of Evil, the Nuclear Posture Review, and the National Security Strategy, all of which characterized North Korea as a belligerent state.<sup>101</sup> Indeed, estimates seem to track policy closely, since the characterization of North Korea’s HEU program has been walked back over time in step with a renewed commitment to the Six-Party Talks. Poor ability to penetrate North Korea led to wildly varying estimates from different

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<sup>94</sup> International Herald Tribune Robbins and Hussain 2002, 2005b.

<sup>95</sup> Central Intelligence Agency Nonproliferation Center 2002.

<sup>96</sup> Warrick 2003.

<sup>97</sup> Agence France Presse 2005a.

<sup>98</sup> Albright 2007.

<sup>99</sup> Central Intelligence Agency Nonproliferation Center 2008, p. 6.

<sup>100</sup> <http://www.armscontrolwonk.com/index.php?id=698>.

<sup>101</sup> Department of Defense 2001, Bush 2002, National Security Council 2002.

agencies, at least some of which must be wrong; in particular, as one unnamed administration official noted, State Department estimates seemed to be biased due to their focus on diplomacy (H2b,c). By contrast, the DIA consistently assumed that North Korea would cheat on any agreement, leading to an overestimation of their likely capabilities in the mid-1990s, and to leaks regarding DPRK tests in 2005 (H5). With the high degree of disagreement between the different intelligence agencies, worst-case estimates seemed to prevail at the level of the DCI/DNI (H7). The failure to predict Iraq may have influenced estimates of North Korean capabilities, leading to the overestimation by the DCI of North Korean capabilities in 1992, as the same unnamed official noted (H11).

## Discussion

Although a full analysis of each of the cases is far beyond the scope of this paper, the results here are suggestive of two findings. First, the overall patterns of estimation indicate that not only have they been generally off, but that they are biased towards overestimation; second, the two most-different cases show that general hypotheses drawn from the literature on intelligence failures are readily apparent in cases of nuclear proliferation intelligence, but vary in their frequency.

The US intelligence agencies' experience with foreign nuclear weapons programs has been poor. Across the seventeen observation periods, the quality of the estimates is low: averaging over the multiple estimates within each case, nine were generally overestimated and five were generally underestimated; only three were correct (one by accident, see Table 4/Table 4). Of seven foreign weapon tests, intelligence agencies provided US policymakers with definite and timely warning nearly as many times as they failed to do so; removing the announced North Korean test, the US intelligence record is only 50%.

**Table 4: Overview of Findings**

| State        | Estimate  | Warn? |
|--------------|-----------|-------|
| Germany      | Over      | -     |
| Soviet Union | Under     | no    |
| France       | Over      | yes   |
| China        | *         | yes   |
| Israel       | Under     | -     |
| India        | Over      | no    |
| Taiwan       | Under     | -     |
| South Africa | Over      | no    |
| Pakistan     | Correct   | yes   |
| South Korea  | Under     | -     |
| Argentina    | Over      | -     |
| Brazil       | Correct   | -     |
| Libya        | Over      | -     |
| North Korea  | Over      | yes   |
| Iran         | Over      | -     |
| Iraq(1)      | Under     | -     |
| Iraq(2)      | Over      | -     |
|              | 5 under   | 4 yes |
|              | 2 correct | 3 no  |
|              | 9 over    |       |

\*correct, but for the wrong reason.

The most-different case studies presented above show evidence for almost all hypotheses, although only two hypotheses are found in both cases: the state of policy towards a country distorting intelligence collection and/or analysis (H2) and misestimating the intent, motives, or resolve of the subject state (H5). The remainder of the hypotheses were found only in one case or the other, suggesting that variance in time period, status as allies or enemies, and other factors may make certain mechanisms more or less likely to operate.

The state of policy toward a country affected analytic determinations in both cases, although through very different mechanisms; this is largely attributable to the fact that the United States enjoyed a close relationship only with Israel. Nonetheless, the persistence of policy-related distortions across these two very different cases suggests that analysts should distance themselves and their efforts from the prevailing policy environment and evaluate data as objectively as possible, without regard for the consequences of their findings. This is especially important when dealing with nuclear proliferators, where the stakes are high, successful policy hinges on having good information, and policy predicated on mistaken assumptions can be dangerous. Breaking this pattern will be crucial to halting nuclear proliferation in coming years, as the next proliferators may be American allies or in regions the U.S. has not traditionally considered to be in its vital interest.

The second common mechanism across both cases indicates that the analytic process could be improved by investing more effort in political and psychological profiles of the countries and leaders in question to better predict intent, motives, and resolve.<sup>102</sup> A 1985 CIA analysis of previous estimates of nuclear programs notes that while most estimates acknowledge political factors, they nevertheless exhibit “a tendency to focus on predicting when countries will become technically capable of producing a nuclear explosion.”<sup>103</sup> The report found that “in virtually every case the decision to build an explosive device...has been a gut-level reaction by the top political leader at the time” and, furthermore, “in the broader political arena, nuclear matters have become much more subject to the normal pull and tug of domestic politics.”<sup>104</sup> Better political analysis, while notoriously difficult, could have helped to alleviate the confusion regarding, for instance, the Israeli program. These findings strongly recommend putting more emphasis on the collection and analysis of political factors.

Most importantly, these particular results should not cause us to lose sight of the broader point: containing the spread of nuclear weapons requires excellent intelligence under difficult circumstances. In most of the advanced nuclear weapons programs, U.S. intelligence analysts were unable to provide American policymakers with accurate assessments. Inaccurate or incomplete information about the capacities and locations of clandestine installations can seriously constrain a sensitive policymaking process. Every effort should be made to improve the quality of this information, but given the historical record, policymakers ought to maintain a healthy skepticism regarding the quality of information they are being offered and calibrate policy accordingly.

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<sup>102</sup> Hymans 2006.

<sup>103</sup> Director of Central Intelligence 1985, p. 7.

<sup>104</sup> Director of Central Intelligence 1985, pp. 12-13.

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