

# **The economic effect of military facility contraction: A Naval case study**

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## **Abstract**

The global financial turmoil of 2008 has resulted in the curtailment of military expenditure in most western countries. At a sub-regional level reductions in the level of activity at a major military facility can have significant economic impact. In the light of this, the paper has two objectives: to analyse the impact of the decision to terminate naval shipbuilding at the United Kingdom's Portsmouth Naval Base; and, for illustrative purposes, to examine the possible economic consequences of further contraction at the facility. In pursuit of these aims it is necessary to establish the output, income and employment generated by the base using a bespoke input-output model. The methodology employed can, with appropriate adjustments, be utilised in other military or civilian contexts.

*Keywords:* naval facility contraction; local economy; shipbuilding; input-output analysis.

JEL Codes: H54, R42, R58

## 1. INTRODUCTION

The global financial turmoil of 2008 has resulted in the curtailment of military expenditure in most western countries. In a local context, reductions in activity at a major military installation can have significant negative economic ramifications. In the light of this, the article attempts to identify the sub-regional impact of a range of possible changes affecting the United Kingdom's Portsmouth Naval Base. More specifically, the study has two objectives; First, to consider the impact on the local economy of the decision to end shipbuilding at the Base. Second, for illustrative purposes, to assess the economic impact of two additional contraction scenarios: the downgrading of the facility to a purely operational status; and base closure. In order to achieve these objectives, for comparative purposes, a baseline of the 2011 impact of the base was established.

The Portsmouth Naval Base is located on the south coast of England and has constituted a maritime hub for eight centuries. The facility has attracted a cluster of defence-related activities and has stimulated the development of naval heritage tourism. In aggregate, this combination of activity is of major benefit to the City of Portsmouth and its hinterland. An assessment of the then economic contribution of the Base was published, immediately prior to the world financial crisis (see Asteris *et al.*, 2007). The paper did not however, encompass "what if" scenarios contained in this paper. Furthermore, the earlier model has been upgraded. In the period since 2007, the economic circumstances of both the United Kingdom (UK) and the world in general have become more clouded. For the UK the changed environment has implied curtailed public spending in areas such as defence. In responding to these cuts the Royal Navy (RN) has been required to shed personnel and physical resources. It is this ongoing rebalancing which provides the rationale for the analysis contained in this paper.

The paper is structured as follows. Section 2 provides background whilst Section 3 sets out the 'tools' of investigation. Next, the economic impact of the Portsmouth Naval Base is examined. Section 5 uses the data assembled as the basis for quantifying the implications of 3 contraction gradations. The penultimate section then considers the extent to which redundant defence facilities swiftly re-materialise as civilian resources spawning economic benefits. The conclusion highlights the main findings.

## 2. BACKGROUND

Since the demise of the Soviet Union, numerous studies have been conducted in order to establish the impact of reduced military activity on host local economies. Examples from the United States of America range from area-wide to base specific studies (see, Sommers, 2004; Lahr, 2004; Weaver, 2006; Charles, 2010; and Tadow, 2012). The UK defence sector has also come under the academic microscope (see for instance: Bishop, 2000; Grainger, *et al.* 2005; Hunter, 2009; Reference Economic Consultants, 2010; and Doel, 2011). A common feature of these studies is that they demonstrate the relatively high multiplier effects generated by defence establishments across all sectors of a sub-regional economy and thus imply that the impact of change can have substantial 'knock-on' effects<sup>1</sup>. A review of studies of defence contraction, over the period from 1968 to 2010, and their methodologies, by Droff and Paloyo (2014) is revealing<sup>2</sup>. It shows that a sizeable number make use of input-output models, to quantify the scale of the economic impact. In most cases the analysis is of a single event, such as closure or the threat of it. By contrast, the framework in this paper permits a number of contraction or expansion outcomes to be considered simultaneously, on the basis of a single model. Droff and Paoyo, 2015 also point out the crucial importance of 'good' data. In the case of the Portsmouth Naval Base the authors were fortunate in having access to detailed and robust statistics for employment, salaries, and equipment and service purchases provided by a range of military and civilian sources within the Base. Where statistics were unavailable the assumptions used in estimating them are set out.

The 2010 *Strategic Defence and Security Review* - SDSR Cabinet Office, 2010 required a reduction in the defence budget of around 8 per cent and set out a reshaping programme based on rationalisation of the armed forces. The RN's role in the blueprint focuses on a reduction in uniformed personnel from 35,000 to 29,000 and a diminution in the number of warships.

It is intended that in future the active fleet will consist of two new Queen Elizabeth class aircraft carriers, 11 submarines; 19 destroyers and frigates<sup>3</sup>; and a number of smaller and specialist craft<sup>4</sup>. There are also 13 Royal Fleet Auxiliary (RFA) ships in service, crewed by civilians<sup>5</sup>. In April 2012 Portsmouth was the base-port for 29 RN surface vessels and just under half the Navy's uniformed personnel.

It will also be 'home' to the two new aircraft carriers being built by BAE Systems. This firm is crucial to the Navy's capability in terms of equipment provision, maintenance and support. As such it is a key component of Britain's maritime capability. Research by Oxford Economics, 2011 suggested that almost two-fifths of manufacturing jobs in Portsmouth were

dependent on the activities of the company in the local area, with 75 per cent of those staff residing in South Hampshire. At that time, BAE employed 4,000 people in the Maritime Services and Naval Ships divisions at the Base and other locations within the area.

In 2009 BAE and the MoD signed an agreement which guaranteed the former £230 million (m) per year of shipbuilding and support work. This agreement specified that BAE would provide support for complex warships and base services at Portsmouth. As part of the agreement, BAE is committed to efficiency improvements. As a consequence, it was announced in November 2013 (see Pickford, 2013) that naval shipbuilding at Portsmouth was to end because of insufficient orders to sustain construction at all its UK yards.

### **3. THE 'TOOLS' OF INVESTIGATION**

Figure 1 shows the geographical area covered by the paper. This comprises the main urban centres of South Hampshire sub-regional economy, with a combined population of over 1.3m people and containing about 50,000 businesses. It is estimated<sup>6</sup> that in 2011 the area produced output of around £48.5billion (bn) equivalent to a Gross Value Added (GVA) of around £23.7bn<sup>7</sup> and supported around 485,000 full-time equivalent (FTE) jobs.

*Insert Figure 1 here*

The indirect and induced effects of an economic tremor can be measured using input-output analysis. Although as Droft and Paloyo, 2014 point out this is not the only technique available to the researcher, it is regularly used in defence impact studies. As with all existing models, it has both strengths and weaknesses. The input-output technique is effective in defining the sectors most likely to be impacted both directly and indirectly from an economic setback<sup>8</sup>. It is, however, a static model, which by its nature, does not pick up other mitigating factors that might be occurring at the same time. These include; reinvestment in other sectors, or the freeing up capital and labour to shift into more profitable sectors. That stated, a later section of this paper emphasises that labour is not homogeneous and does not always make a successful transition to alternative sectors<sup>9</sup>. Despite the above comments, the input-output model is extensively used in applied research, principally because of its ability to predict the sectors likely to be impacted by an economic shock. Early warning is thereby provided, which permits remedial action to be initiated.

The Centre for Economic Analysis and Policy (CEAP) at the University of Portsmouth has systematically developed, and revised, a series of such models over a number of years. An

earlier version of the model used here is set out in Asteris *et al.*, 2007. The research used for this paper uses the same standard form of model. Even so, it incorporates the impact of changes to the UK Standard Industrial Classifications (SIC), which brings the statistics in line with those used in the rest of Western Europe. The result is that the baseline employment data for the model has had to be reverse engineered in order to synchronise with the format of the published UK National Input-Output tables, which are based on the earlier 2003 SIC construct.

The core of the model is designed to estimate the likely direct and indirect impact of changes in the sub-regional economy following an economic shock. Whilst it must be acknowledged that such models are generally considered to be at their most accurate when compiled using survey-based data (see, for example, Bishop et al, 2000; Harris, 1997; or Harris and Liu, 1998), this approach is both costly and time consuming. Other approaches, such as hybrid survey and non-survey techniques, including the Location Quotient approach, which is used in this paper, are useful alternatives.

After synchronising the data, the standard model form is one where in region or sub-region  $r$  the inputs from the  $i^{\text{th}}$  industry per unit of gross output of the  $j^{\text{th}}$  sector,  $a_{ij}^r$ , are determined by the national coefficient, i.e.

$$a_{ij}^r = k_i(a_{ij}) \quad (1)$$

In the Location Quotient approach the determining relationship is assumed to be proportional with  $k_i$  and is thus interpretable as a constant,

$$a_{ij}^r = k_i^r a_{ij} \quad 0 \leq k_i^r \leq 1 \quad (2)$$

In the model the value of  $k_i^r$  is set equal to  $LQ_i^r$  if less than or equal to one; otherwise it is set equal to one, thus if

$$LQ_i^r = \frac{\left(\frac{E_{ir}}{E_r}\right)}{\left(\frac{E_{in}}{E_n}\right)} \quad (3)$$

(Where  $\frac{E_{ir}}{E_r}$  is the proportion of total employment in region r,  $E_r$ , in the ith industry and  $\frac{E_{in}}{E_n}$  is the proportion of total national employment,  $E_n$ , in the ith industry.)

Then, 
$$k_i^r = LQ_i^r \quad 0 \leq LQ_i^r \leq 1 \quad (4)$$

$$k_i^r = 1 \quad LQ_i^r \geq 1 \quad (5)$$

Thus, for the  $k_i^r < 1$  cases, the model allocates the source of intermediate output to external flows in the sub-regional import account.

Local area output estimates can be derived by combining information from a range of sources: the UK Input-Output (I-O) Supply and Use tables, the UK Annual Business Enquiry (ABI), the UK Annual Population Survey (APS) and the UK Defence Analytical Services Agency (DASA).

In the CEAP model, because the UK Input-Output data lag the employment data series, the output series (final plus intermediate demand) from the UK (I-O) Supply and Use Tables has been rolled forward from 2004 series (last available tables). This has been done using a linear regression forecasting function based on the data for the preceding 6 years. The Northern Ireland GVA is also stripped out of the series utilising a uniform scalar to give industry by industry total output for Great Britain (GB).

ABI employment data, which is available at the GB (rather than the UK) level and below, has been converted to full-time equivalent (FTE) jobs. Unfortunately the ABI excludes the self-employed and those in the armed services. The former are estimated to total around 3.5m and the latter over 159,000 overall in GB. In order to adjust for this shortfall, self-employment by industrial sections has been redistributed pro-rata to the 123 sectors making up the I-O industry groupings<sup>10</sup>; armed services personnel have been added to I-O sector 115 (Public administration and defence). The results provide a more realistic estimate of the total FTE jobs than reliance on ABI data alone. Dividing total output in each I-O industry sector by the number of augmented FTE jobs gives the average output per FTE for each of

the 123 I-O industry sectors in any given year. This forms the basis for distributing output to each area based on the estimated employment levels.

Assuming that the diffusion of technology is fairly uniform across GB, this method partially compensates for productivity differentials via the industrial structure, but it does not easily account for the quality of human capital or the level of physical capital investment. It may be argued that there is a positive relationship between the quality of human capital and level of investment and the wage level relative to the national average. Thus, if wages are above the national average there must be higher local productivity to support this differential. The average output per FTE is adjusted by the relative local 20 percentile wage differential as defined by the UK Annual Survey of Hours and Earnings (ASHE). The 20 percentile wage is chosen because the lower levels of the wage stratum are more sensitive to market conditions and their wage bargaining strength is more sensitive to overall productivity than those at the upper end of the wage scale (see for example Blanchflower, 2007).

The results of this type of estimation have been used to generate estimated Gross Value Added (GVA); tests indicate that the methodology is relatively robust. Those by the authors suggest that the figures are within a percentage point of the ONS figures. The model tends to slightly underestimate in comparison with UK ONS regional GVA estimates but overestimate when compared with figures produced by some of the commercial forecasting organisations.

A schematic of the steps in the calculation of local output is shown in figure 2.

### **Insert Figure 2 here**

Output and FTE employment for each of the sectors sub-regionally can be estimated by using data from UK ONS and other sources, as set out in the Figure. In the case of employment the sub-regional figure is the sum of the lower three totals of FTEs on the left hand side of Figure 2. For output, GB output by 123 sectors is divided by GB FTE employment for the same 123 sectors (top two blocks in Figure 2) to derive a vector of average output per FTE (uppermost block, right hand side, in Figure 2). The national output per FTE job figure is then 'weighted' by a local wage/productivity index (2<sup>nd</sup> block, right hand side, Figure 2) to produce a vector of local output per FTE (3<sup>rd</sup> block, right hand side, Figure 2). Multiplying this by the vector containing the number of local FTE jobs in each of the 123 sectors (bottom left block in the right hand column of Figure 2) gives the vector of outputs for

each of the 123 sectors present in the local economy. The employment structure within the area can be compared to the national structure to obtain a vector of local 'Location Quotients'.<sup>11</sup> This is subsequently used to scale down the national input-output tables, to derive local input-output coefficients. This in turn, is subtracted from an identity matrix to obtain the local Leontief Inverse Matrix, which provides a simulation of the interactions between sectors within the sub-regional economy.

The CEAP model can be adapted for more than one sub-regional area using the same basic formulation and re-loading appropriate primary data for the new area. It can also be 'rolled forward' in subsequent years by refreshing both the national and sub-regional data. With respect to the Portsmouth Naval Base, direct spending attributable to it, together with related household expenditure can then be utilised in the model to estimate the associated indirect and induced expenditure within the sub-regional economy. These, combined with the direct economic effects form the aggregate impact of the Naval Base on the sub-regional economy, in terms of both the baseline and any alternative scenario.

The overall economic impact of expenditure emulating from the Naval Base (as quantified later in the paper), can be divided into four parts – the direct, indirect, induced effects and a feedback loop. Figure 3 provides a diagrammatic representation and explanation of these effects.

### **Insert Figure 3**

The direct and indirect impact of the Base on the sub-regional economy can be measured through the employment that the installation provides to residents of the sub-region and the salaries that they subsequently spend within the local economy, as well as the supplies and services purchased locally by the Base and its constituent companies (see Figure 3)<sup>12</sup>. Although it is assumed that these households spend their disposable income entirely within the sub-regional economy, the extent to which this occurs depends upon the area's capacity to meet their demands. If an industry sector is absent or under-represented locally, goods produced by that sector will have to be imported from outside the area. The direct effect of household spending locally is thus net of imports. When estimating the multiplier, the model automatically compensates for any sectoral under-representation.

The analysis specifically takes account of the fact that many service personnel live in the area only during the week or when their ship is in port. It was therefore assumed that these individuals spent a smaller portion of their disposable income in the sub-regional economy; the remainder being spent at their home region or in other locations that their ship may visit. The



analysis also acknowledges that at any point in time the majority of Portsmouth-based ships will be on active service. Even so, crews spent some time alongside in the City. This suggests that crew with home addresses outside the sub-regional area spend a portion of their income on local goods and services whilst they are in Portsmouth. Conversely, those who reside locally are likely to remit a portion of their disposable income to their families whilst their ship is away from its 'home' port. This was also factored in to the first round impact of spending.

In addition to the direct effect of household spending, account was also taken of cash injections provided by others who either worked at the Base or visiting it for a short period. For instance, people who commute daily into the Naval Base from their homes outside the sub-region can be expected to spend a relatively small sum of money each working day on a narrow band of commodities which they purchase whilst in the area. Similarly, visiting ships' crew and heritage tourists will also spend money on selected commodities whilst staying in the area.

The indirect effect takes place when the Naval Base and firms located within it directly purchase a proportion of their supplies and services within the area. As with household spending, the value of these expenditures is dependent upon the capacity of the sub-regional economy to meet them.

Demand for products and services used by the Naval Base also leads to a multiplier effect via the feedback loop as firms within the supply chain restock and take on employees to meet the additional demand originating from the Base. The size of this multiplier also depends upon the capacity of local firms to supply the needs of the businesses, which supply the Base. Again, the structure of the local economy determines the magnitude of this effect.

The Induced effects are mainly associated with the first round of household (consumer) spending and that of people who visit the base. A subsequent induced effect, or feedback loop, occurs when this primary spending is further re-circulated as other residents are employed in sectors that provide goods and services to local shops and businesses selling direct to local households. Local businesses will also need to restock and staff will be employed to meet this demand. Employees of these firms will, in turn, receive a salary, which they themselves will spend as consumers in the local economy. Thus boosting the multiplier effect, conditional on the capacity of local firms to supply meet the additional demand.

Estimating the impact of a reduction of activity at the Naval Base involves research based largely on published statements. This approach makes it possible to arrive at realistic underpinning assumptions: for example, with respect to whether all employment associated

with an activity would be lost if work were to be transferred elsewhere, and the probable timescale of such a change. The baseline primary quantitative analysis (direct effect) is thus adjusted in line with the underpinning assumptions and the indirect and induced effects re-calculated within the input-output model. By comparing the outcomes of selected changes with the baseline, the estimated impact is calculated.

#### **4. THE ECONOMIC IMPACT OF THE BASE**

This section begins by examining the role of the Base within the local defence cluster and then considers the facility's employment and monetary impact.

A number of elements constitute the Naval Base:

- Personnel working for the Base Commodore,
- Ships and crews of the Portsmouth Flotilla,
- RN and tri-service lodger units<sup>13</sup>;
- BAE Systems ( Maritime Services and Naval Ship divisions),
- Civilian contractors<sup>14</sup>,
- Historic dockyard attractions and support services<sup>15</sup>.

The Naval Base is a major component of the local defence cluster. However, there are other military entities spread throughout the sub-region (See Asteris et al., (2007)). These include the Fleet Headquarters at Whale Island (adjacent to the Naval Base) and two major training establishments, HMS Collingwood and HMS Sultan in Fareham and Gosport respectively.

The defence industrial base is also well represented. It includes significant private sector suppliers to the MoD, such as Lockheed Martin, Northrop Grumman and Qinetiq. These firms, in turn, have commercial relations with other organisations locally. Hence, the inter-linkages between the military and the defence industrial base are substantial.

According to The Defence Analytical and Statistics Agency (DASA 2012) around 27,500 MoD staff were based in Hampshire in January 2012. Just over 50 per cent of these were located within the Portsmouth sub-regional area, with two-thirds of this total in the City of Portsmouth. The majority within the area (around 80 per cent) were military personnel.

It is estimated that there were 3,750 full-time equivalent (FTE) permanent service and civilian staff on the base (out of a total of 11,900 FTE jobs, see Table 1). The majority, 84 per cent, worked for BAE, with nearly 50 per cent of all permanent jobs in BAE's Maritime Services division. A further 8,150 FTE jobs within the naval base were associated with ships' crew, permanent contractors and the heritage area. Some 3,500 permanent FTE jobs were held by contractors; of these 975 were sub-contractors to BAE<sup>16</sup>. The remainder, were either contracted directly to the Naval Base Command, or worked for one of the civilian firms with premises within the facility. These provided essential services such as building maintenance and harbour tug operations. Most contractors spent a significant portion of their working time at the base. Indeed, some were semi-permanently located there. In the paper it is assumed that this category of contractors spent around half their time within the facility. Table 1 suggests that over 75 per cent of FTE jobs are held by local residents.

### **Insert Table 1 here**

In addition to the 11,900 FTE jobs detailed, there were over 800 daily visitors to the facility. These undertook specific tasks, attended meetings or provided ad hoc services. They are not included within the employment totals but it is likely that they generate notional expenditure. It is assumed that they spent a small amount of money locally, in a similar manner to other staff, who commuted to the Base daily.

Data<sup>17</sup> suggests that people from across the sub-regional area were employed at the Base; the majority lived in the urban areas of South Hampshire with significant concentrations in Portsmouth, Gosport, Fareham and Southampton. A majority of the Southampton cohort were employed in shipbuilding (65 per cent), whilst more than forty per cent from Gosport were military personnel. Portsmouth residents provide a significant proportion of the labour used in Maritime Services, contracting and the heritage area.

In order to estimate the employment and income effects through the multiplier process, it was important to determine as closely as possible the direct expenditure generated by employment and supply chain activities within the Base<sup>18</sup>.

The direct expenditure impact was composed of four main elements. First, household expenditure: this relates to the 9,125 service and civilian personnel<sup>19</sup> working on the Base who lived within the area. Primary data on gross salaries for BAE and heritage staff was obtained from the companies. Cost of employment figures were available for BAE sub-contractors from which household income/expenditure was estimated<sup>20</sup>. Estimates were also

produced for the potential household income/expenditure of MoD civilians, armed service personnel and other contractors<sup>21</sup>. Overall, it is calculated that the gross impact of salaries on the local economy in 2011 was over £221m.

In order to distribute local household expenditure the proportion available as disposable income from gross salaries was calculated. After deducting for income tax and national insurance, in line with the effects of taxes and benefits on household income (Larkin 2011) the potential net household expenditure available was calculated at £181.445m.

Turning to armed service personnel employed directly by the Base Commodore, it was estimated that the gross salary of local domicile personnel in this cohort was around £2.5m per annum – equating to net salaries of just over £2m. Allowing for the effects of expenditure taxes and the structure of the local economy, it was estimated that they would make expenditures of around £1.2m into the local economy.

The expenditure impact of personnel on Portsmouth-based ships required a more complex calculation. Estimates suggest that, on average, ships spend 38 per cent of their time 'alongside', see Asteris et al (2007)<sup>22</sup>. As for the potential spend by crews within the local economy, it was presumed that those with a local address spent their net income locally, minus an amount equivalent to the average daily spend by visiting crew (£43) multiplied by the average number of days spent in other ports whilst away from Portsmouth.

Overall, this suggests that locally based ships' crew living within the sub-regional area had gross salaries of around £24m per annum. After deductions this was reduced to around £20m of which it was calculated £12m would be spent locally. In total, it was estimated that expenditure by locally domiciled service personnel (on ship or shore), was £13.3m per annum. When this is added to the £94.9m of estimated expenditure by civilian staff who reside locally the figure rises to £108.2m per annum.

For the purpose of this paper, various categories of what might be termed 'visitors' to the Base constituted the second element of expenditure. These include; visiting ships' crews, Heritage site visitors and the crew of Portsmouth based ships who are domiciled elsewhere in the UK outside the surrounding areas.

Data from the Naval Base shows that a total of 32 foreign and non- Portsmouth based UK naval vessels and RFAs visited Portsmouth in 2011. The total number of crew of these ships was approximately 9,100. Assuming each ship stayed for an average of 4 days, this

suggests the equivalent of more than 36,000 potential day visits. Calculating the value of spending by these visiting crews in the local area was initially problematic. This was because there were no reliable primary figures available, the only sources, in the press, suggesting an amount of additional spending when large US capital ships were in port. However, these figures were not robust and there was no indication as to how the figure was derived. In order to overcome this problem, visiting sailors were classified as if they were overseas tourists, and their expenditure was assumed to be the same as that for tourists from their home country as defined by the 2010 Travel Trends Survey (ONS 2011). The 31 per cent of expenditure that the average tourist spent on accommodation was subtracted from this figure to reflect the fact that most would return to their ship each night. Using these assumptions the spending impact could be valued. This methodology gave average daily spend figures for services personnel in three broad categories: from North America £68; European Union countries (including the UK) £43 and the Rest of the World £50. In addition, account was taken of the fact that a proportion of service personnel would be required to remain onboard during their stay alongside; hence the number of potential daily visits was deflated by 20 per cent.

The total value of expenditure by visiting ships' crews, at 2011 prices, was thus estimated at about £2.3 m per year. To determine which sectors benefited from this expenditure, it was presumed that the pattern of spending replicated that suggested by the UK Tourism Survey. This revealed that the sectors that benefit are: Catering (32 per cent), Transport (26 per cent), Retail (23 per cent), Entertainment Services (14 per cent) and Other Services (5 per cent).

The crews of Portsmouth Based ships residing outside the local area (approximately 50 per cent) were treated the same as other visiting sailors. It is assumed that they spend the equivalent of the average daily expenditure by visiting UK crews (£43), multiplied by the number of days their ship spent in Portsmouth<sup>23</sup>. Thus, it was estimated that in total the crews of Portsmouth-based ships who were domiciled outside the local area spent around £11.2 m per annum in the local economy.

A further element of visitor expenditure was provided by those visitors (mainly civilians) attracted to Portsmouth Historic Dockyard. It was reported that the visitor footfall in the year to March 2012 was 380,000. Some 30 per cent of these were local people (they therefore provided no additional impact and were discounted), 30 per cent were day visitors from

outside the local area living within a 90 minute drive time of the Base. The remaining 40 per cent were 'staying' tourists who spent one or more nights in the local area.

In order to calculate their impact on the local economy it is estimated that those within the 90 minute drive zone spent an average of £43 each (equivalent to visiting UK service personnel) whilst those staying overnight spent £62 as estimated by the 2010 Travel Trends Survey (ONS 2011). On this basis, visitors to the Historic Dockyard accounted for expenditure of £14.2m per annum into the local economy<sup>24</sup>.

Taken overall, the total value of 'visitor' expenditure was estimated at £27.712m per annum.

Expenditure on supplies and services by the base constitutes the third expenditure element. This relates to the value of purchases made by BAE and the Heritage section from other local companies<sup>25</sup>. Purchase ledger data from BAE showed that in 2011 the company spent around £192m within the local economy. Of this, over half was accounted for by shipbuilding. It was calculated that in addition to local expenditure a further £190m was purchased from elsewhere in the UK and £80m from abroad<sup>26</sup>.

For the Heritage area, valuations were on the basis of primary information supplied or published by a number of the organisations within the Portsmouth Historic Dockyard. As with BAE, it was assumed that 60 per cent of the expenditure was with companies outside the locality. On this basis the Heritage area spent around £5.5m per annum with other local companies. Thus, together, BAE and the Heritage area were estimated to directly spend £197.5m in the local economy through their purchases from other local companies located within the area.

The fourth and final component of expenditure was attributable to commuters and occasional visitors to the base. Permanent service and civilian staff whose home was situated within commuting distance (adjacent local authority areas) could be expected to spend a small proportion of their income in the Portsmouth area. Based on the ONS Expenditure and Food Survey, this is likely to be spent in local shops (47 per cent), garages (22 per cent), public houses, cafés and restaurants (11 per cent) and entertainment outlets (20 per cent). It was presumed that they spent an average of £6 a day in the local area (see for instance, Asteris et al., 2007). On the supposition that commuters worked a 5 day week and a 46 week year, on average they spent £1,380 per annum in the local economy. The analysis suggests that the cumulative effect of this group's spending amounted to £0.64m per annum.

### **Total Direct and Indirect Expenditure**

The combined potential expenditure impact derived from the location of companies and staff within the Base is estimated at £334m per annum. As is evident from Table 2, the largest portion was from the purchase of supplies and services (£197.5m). Spending by armed service and civilian staff, who reside locally, was the second largest portion (£108.2m) whilst visitor spending was third (£27.7m). Finally, the residual, (£0.6m) was from estimated commuter expenditure.

### **Insert Table 2 here**

Given the above estimates, first round local expenditure generated by the Base constituted an annual injection of £334m into the local economy (see column 4, Table 2 above). Some 40 per cent of this represents expenditure by individuals (household, tourist and commuter expenditure) (£136.6m) and 60 per cent (£197.5m) the purchase of services and supplies by companies. In combination, these two amounts provide the catalyst for the induced and indirect multiplier effects. Table 3 shows that this injection spans almost all the industrial and commercial sectors of the local economy. The impact is most noticeable in Manufacturing and Business and Financial Services. The former broad sector includes Shipbuilding and the latter Facilities Management, two sectors where in 2011 BAE played a dominant role within the Portsmouth Economy.

### **Baseline Impact of the Naval Facility**

It is now feasible to trace how these initial injections percolated through the local economy. Together with output associated with direct employment at the base, this provides the baseline impact against which potential change can be assessed.

As noted earlier, the local economy produced gross output of around £48.5billion in 2011. This was the result of the combination of productive capacity and labour within the locality. In the national economy productivity rates differ; capital intensive industrial sectors produce high rates of output per employee and Service sectors, such as, Facilities Management low rates it is assumed this is also the case locally.

In output terms, the largest sectors in the local economy are Financial and business services and Manufacturing. In terms of employment, the local economy generated more than 566,000 jobs, which equated to around 485,000 FTE positions. The most significant employment sectors were: the Public Sector, which includes direct MoD service and civilian

employment (28 per cent of jobs); Financial and Business Services (21 per cent) and Retail and Wholesale (12 per cent). Manufacturing, accounted for about 11 per cent of total employment. Calculations by the authors suggest that the estimated output per FTE was lower in the Naval Base than in the local area generally, which suggests that many of the jobs at the base are lower value-added. This is primarily because value added per FTE in Facilities management (the sector in which BAE Maritime Services business is located), has one of the lowest productivity rates. The estimated total direct output from the Base was almost £959m in 2011. Overall, in sectoral terms, this was equivalent to some 4.9 per cent of local Public sector output and 2.7 per cent of manufacturing output. Calculations suggest that the Base provided around 2 per cent of all local area output.

The output by sector figure in column 1 of Table 3 relates to the activities of those employed at the Base, the figure presented also takes account of exports as well as stock building and fixed capital formation as set out in the national input-output tables. In Table 3 the accompanying levels of jobs are set out by industrial sector rather than by the organization for which they work as in Table 2. This shows that overall output from the Base was £958m in 2011 and FTE employment of 11,900. Table 3 also sets out the impact of first round spending into the local economy by individuals who were employed by or were directly associated with the Base (driving the induced effect) and the purchases made in the local economy by the Base itself and other organisations located within it (driving the indirect effect). In total these amounted to £334.1 million in 2011.

***Insert Table 3 here***

The other key element of the Naval Base is the knock-on impact of its expenditure on the wider economy. It is these indirect and induced effects, which the paper examines next.

As stated previously, the model measures the direct impact of the Base and its' employees (the "first round" effect) and it also measures the additional indirect and induced multiplier effects that occur when the first round expenditure creates further demand through the second, third and fourth tier supply chain linkages<sup>27</sup>.

Overall, it was calculated that the first round, induced and indirect effects of expenditure attributable to the Base created additional final output in excess of £723m within the local area. This figure comprises £334m from the first round, £145.5m from the induced and £243.5m from the indirect effect.



### ***Insert Table 4 here***

This expenditure/output also created additional employment within the local economy. Average local productivity figures are used to estimate the additional levels of FTE employment. The model builds in the diverse productivity levels that apply for each industrial sector. This key feature of input-output models is not usually present in alternative approaches which provide aggregated figures for the multiplier.

Table 4 shows that expenditure from the base supported almost 7,900 additional FTE jobs across the local economy. The main beneficiaries of these additional jobs were the Financial and Business Services sector, the Public Sector and Manufacturing. The key feature of the Table is that it demonstrates how the activity at the Base rippled out to all local industrial sectors and, as was suggested by the direct employment figures, these would be felt across South Hampshire.

### ***Baseline measures of local output and employment***

The combination of the primary output and employment data, together with the downstream expenditure and the jobs it supports, provides the baseline against which change can be subsequently measured.

### ***Insert table 5 here***

Table 5 highlights the baseline position of the naval facility. It is estimated that, overall, it generated output of almost £1.7bn in 2011 and supported both directly and indirectly just under 20,000 FTE jobs. These figures equate to 3.5 per cent of local output and 4.1 per cent of employment. The Base is particularly important to manufacturing in that it provides or indirectly supports nearly 7 per cent of all such employment in the area. It is even more significant for specific sectors such Shipbuilding (70 per cent of local FTE jobs); Property and Facilities Management (27 per cent); Metal Goods (22 per cent) and Public Administration and Defence (14 per cent). The final row of Table 6 suggests that every £1m directly generated by the Base stimulated another £0.75m of spending in other sectors in the local economy. In the case of employment for every 100 FTE jobs at the facility the downstream spending generated another 66 jobs elsewhere in the local area. Even without taking account of co-located military establishments and the wider defence industrial base, the scale and reach of the facility had a sizeable impact on the local economy<sup>28</sup>.

## **5. PORTSMOUTH NAVAL BASE CONTRACTION SENARIOS**

The article now turns to quantifying the negative impact that different contraction scenarios at the Base might entail, beginning with the economic implications of ending naval ship construction at Portsmouth. It then considers the impact of two further contraction scenarios, though there is, of course, no official indication that either of these is or was planned. The rationale for putting them forward is simply to illustrate the flexibility of the approach adopted in this paper.

### **Assumptions Underpinning the Contraction Scenarios**

The following general assumptions underpin all three of the contractions examined:

- The UK Defence Budget will continue to be squeezed in future years.
- Any rundown at the Base is phased in over a 5 year period.
- New classes of ships constructed by BAE will be subject to through-life support.<sup>29</sup>
- Deep maintenance and disposal of nuclear submarines will remain located at Devonport.
- Amphibious ships will all be co-located with the Royal Marines, who are primarily based in the West Country.

Specific assumptions applied to individual scenario are as follows:

#### ***Scenario 1: ending of shipbuilding at Portsmouth***

- As announced in 2013, shipbuilding ceases at Portsmouth and its workload is shared by the two Clyde yards. The present complement of destroyers and frigates remain at Portsmouth and are joined by the two new carriers. The consequences are that shipbuilding activity at the Base winds down and that Maritime Services continues at around its previous level.
- Ships' crew numbers increase by 15 per cent<sup>30</sup>; Naval Base civilian and armed service staff under Base Commodore control remains at current levels; shipbuilding staff levels reduce by 90 per cent<sup>31</sup>, BAE Maritime Services staff, other contractors and heritage site employees remain at current levels.
- On the expenditure side, ships' crew household expenditure rises by 10 per cent; household spending by Naval Base civilian and armed service staff under the control of the Base Commodore remains at current levels; household spending by shipbuilding staff reduces by 70 per cent; household spending by BAE Maritime

Services staff, other contractors and staff of the heritage site continues at existing levels. Spending by heritage site visitors, visiting ships' crew all remain at the same level. Commuter spending reduces by 17 per cent. Spending on supplies and services reduces by 45 per cent.

**Scenario 2: Base is reduced to a fleet operating station**

- Shipbuilding and deep maintenance take place on the Clyde and at Devonport respectively. The current complement of destroyers and frigates remain at Portsmouth and are joined by the two new aircraft carriers. The rationale for this is that deep maintenance unit costs are reduced by ensuring that there is a continuous workload at Devonport and this helps to offset the cost of submarine maintenance. BAE withdraw from ship support activity to concentrate on new build work and Babcock<sup>32</sup> concentrate on ship maintenance activity at Devonport.
- The consequences of the reduction in activity are that shipbuilding and ship support activity at Portsmouth winds down, while ships' crew numbers increase by 15 per cent; naval base staff under the control of the Base Commodore decline by 50 per cent; shipbuilding staff by 90 per cent; BAE ship support staff and other contractors by 80 per cent<sup>33</sup>, heritage site employment remains at current levels.
- On the expenditure side, household expenditure by ships' crew increased by 10 percent; household spending by Naval Base civilian and armed service staff under the control of the Base Commodore reduced by 45 and 30 per cent<sup>34</sup> respectively; household expenditure by shipbuilding staff reduced by 70 per cent; household expenditure by BAE ship support staff and other contractors reduced by 60 and 70 per cent respectively; and household expenditure by heritage site spending remained at current levels; Spending by heritage visitors and visiting ships' crew remained at current levels, while Commuter spending decreased by 72 per cent. Spending on supplies and services reduced by 90 per cent<sup>35</sup>.

**Scenario 3: Base closes and all activity is relocated elsewhere in the UK**

- The rationale for this reduction is that the MoD has to drastically reduce fixed costs and does this by concentrating its surface fleet activity at Devonport. If this were to happen, it is probable that all associated training and administrative activity would also move to the West Country (this move is not included in the simulation) and the naval base would be put on the disposal list. The consequences of the contraction

are that: no ships' crew would be located at Portsmouth; the Base Commodores' organisation together with shipbuilding and ship support operations would be mothballed and staff moved elsewhere or made redundant. A skeleton 'crew' of around 10 per cent would be required to maintain the fabric of the base until disposal, all contract employment ceases and heritage site employment reduces by 25 per cent.

- On the expenditure side, almost all household expenditure is lost although some residual expenditure remained, for instance it was assumed that: some service staff maintain their home in or around the Portsmouth area; some staff take early retirement but remain domicile in the area; others are unable to move for various reasons such as a spouses employment. As a result, these former staff would continue to spend money in the local economy but at a reduced rate. Heritage visitor numbers and their expenditure were thus reduced by 25 per cent; all visiting ships' crew spending was lost. Commuter and casual visitor spending decreased by 94 percent. Spending on supplies and services reduced by 93 per cent<sup>36</sup>.

### ***The impact of each scenario***

The outcome of ending shipbuilding at Portsmouth (Scenario1) shows a clear decrease from the baseline position. Overall, the total jobs figure of 15,900 is 3,875 below the baseline figure and estimated output almost £372m lower. The outcome if Portsmouth became a fleet operating base was significantly more serious for the local area. The total number of FTE jobs reduced to 9,000 (10,775 below the baseline position) associated economic output was reduced to £760m (£921 below the baseline position). Table 6 suggests that the bulk of the losses were in Financial and Business Services and Manufacturing (7,300 combined). Around half of the losses were from direct jobs, the rest were the result of the consequential reduction of downstream expenditure spread across the wider economy. The outcome of the Base closing and all the work being transferred elsewhere (Scenario 3) is the most serious contraction. It was estimated that 11,275 FTE equivalent direct jobs would be lost, leaving a residual of 625. The impact on direct output was to wipe out over £916m of productive capacity (leaving a rump of less than £43m). Since a residual of household expenditure remained there was still an estimated £112million being pumped into the local economy each year and this supported a total of 1,225 downstream FTE jobs. In this scenario, almost 18,000 FTE jobs were lost with reductions impacting across most sectors of the local economy. The effect was particularly significant in the Public Sector, Financial and Business

Services and Manufacturing. Even in sectors with a relatively insignificant presence in the base, such as Retail and Construction, losses are in the range of 700 to 900 FTE jobs.

***Insert Table 6 here***

It is useful to compare and contrast the impacts of each of the contractions outlined in this paper and these are set out next.

### **Contraction Scenarios Compared**

Figure 4 sets out the change in direct employment from the various scenarios. The cessation of shipbuilding produces a modest decline from the baseline position. The significant decline in BAE shipbuilding and sub-contract shipbuilding staff is partially offset by the increase in crew brought about by the arrival of the new aircraft carriers. If ship support activity is also radically reduced, so that the Base becomes a Fleet operating center, there are decreases in all major elements of employment except ships' crew, which remains above the baseline position. In the case of base closure, the analysis suggests that there is merely a rump of direct employment left at the facility with no ships' crew and just a skeleton staff maintaining the fabric of the base until it is sold.

***Insert Figure 4 here***

Figure 5 shows the total number of FTE jobs under each of the contraction scenarios. These are benchmarked against the baseline position. The dark portion of each column represents the direct FTE jobs within the Base itself and the light portion the downstream jobs elsewhere in the local economy. Both show a decline but in the scenario of the base closing altogether the number of downstream FTE jobs far exceeds the residual Base employment.

***Insert Figure 5 here***

The time path of any reduction is assumed to be around five years<sup>37</sup>. Figure 6 shows an indicative path of employment change. There is the sudden reduction in shipbuilding employment followed by a more gradual reduction as the jobs associated with downstream spending are shed over the following years. If the Base were to become a Fleet operating station, the sudden drop in shipbuilding activity is followed by a more gradual rundown in other activity as units and work are transferred elsewhere. In the case of complete closure the rundown is sharp in the first year followed by a more gradual decline throughout the rest of the period as activity is relocated and downstream jobs decline as a result of lost expenditure associated with the base.

***Insert Figure 6 here***

The scenarios above do not take into account the effect that a partial or complete closure of the Base might have on other elements of the local defence industrial base or co-located command, support and training establishments. However, the impact is likely to be significant as witnessed by the previous closures of naval facilities at Chatham (Kent) and Portland (Dorset).

Clearly, the closure of the Portsmouth Naval Base would have other implications for the local area which can only be a matter of conjecture. It can be assumed, however, that the impact would be significant. BAE alone has an additional 1,150+ jobs within the local area and the RN a further 5,150 staff on adjacent shore bases or with other organisations lodged within the Naval Base itself. Under a closure scenario all of these positions might be threatened in the short-run, particularly if the Base were put up for disposal.

## **6. ADJUSTING TO CHANGE**

Hitherto, the paper has restricted the consideration of downsizing to the gross impact of contraction, viz. the impact of changes without the introduction of possible offsetting positive adjustments. Consequently, the numerical outcomes can be viewed as constituting the upper limit of negative employment and income effects. In practice, over time, affirmative factors will act to mitigate some or all of the losses arising from the contraction in defence activity, though 'turning swords into ploughshares' is more often than not a far from seamless process.

Southern England, one of the most defence dependent regions in Europe, has had extensive experience of adjusting to changes in the level of military activity during the post-Cold War era. It is therefore instructive to note the subsequent and to a degree contrasting history of two former naval facilities: HMS Vernon (a shore establishment with a waterfront location in Portsmouth) and HMS Daedalus (a Royal Naval air station situated at Lee-On-Solent some four miles from the city). The former commenced its slow demise in 1987 and did not re-open as Gunwharf Quays; an 'up-market' mixed retail, entertainment and residential cluster, until 2001. By 2012 it provided more employment opportunities and a greater flow of income than under its former guise as a naval facility. HMS Daedalus also failed to attract rapid alternative use. Following closure in 1996, the site lay fallow until subsequently designated an enterprise zone by the Government in 2011, in an attempt to 'kick start' alternative investment and use.

Slightly further afield, the area associated with the former Portland Naval Base in Dorset, which was an early casualty of the ending of the Cold War, has experienced some difficulty in adapting to change. The base itself finally closed in 1995 and the adjacent RN air station in 1999. However, the rundown and redeployment of personnel from the three main MoD service and civilian organisations formally based at Portland (Flag Officer Sea Training, the Sea Systems Controllerate and the Defence Research Agency) had started earlier. Unemployment levels in Weymouth and Portland, that traditionally were below the national average, in the summer quarter, began to edge up to the UK average as closure loomed and only started to fall back again once the site was handed over to Portland Port Ltd to be brought back into commercial maritime related use in 1996. Employment gained a further fillip as the national sailing Academy came on-line and the build up to the 2012 Olympic Games commenced. Unemployment eventually returned to a level consistently below the UK average, but above the county average, where it has remained. Even so, youth unemployment remained high and unemployment is higher than the district average in the ward adjacent to the former naval base.

However, the nature of the Portland labour market has changed markedly. Vacancy data suggested that following closure, the type of jobs on offer were more likely to be part-time<sup>38</sup>. Labour Force Survey (LFS) data indicates that those made redundant, were adjusting to the changed situation by taking on alternative employment or opting for self-employment. Hence, economic activity rates remained close to the national average, dipping only slightly post closure before recovering, and throughout the period long-term unemployment remained relatively static. There were also some indications of a “mini brain drain” as people moved away. LFS data suggests that qualification levels<sup>39</sup> fell and an economic and labour market profile from Dorset County Council in 2013 reported an outflow of younger people and an influx of those in the pre-retirement age bracket<sup>40</sup>. To add to the evidence of a changing labour market, the Annual Survey of Hours and Earnings showed that pay was also significantly below the UK average after the closure, although there are no comparable figures for the pre-closure period<sup>41</sup>. Substantial out-commuting was also a feature of the local economy, suggesting that a significant number of local residents have to travel outside the local area to obtain employment commensurate with their personal skill set. Another indication of the fragility of the local economy is given by business survival rates, In Dorset generally these are better than the national average but in Weymouth and Portland they are at, or below, the national average after three years of operation<sup>42</sup>.

Turning to the most recent defence-related contraction to be visited upon Portsmouth, the demise of warship construction, the potential outcome is not particularly positive. The experience from elsewhere in the UK suggests that the experience of people in the former workforce, post-redundancy, tends to vary considerably. This was certainly the case following the closure of the Swan Hunter shipyard on Tyneside in 1993 (see Tomaney et al. 1998). Designers and others with higher skill sets found a demand for their skills elsewhere

in Britain and overseas. For others who remained in the locality, alternative work often resulted in less attractive terms and conditions, often with a move into less permanent types of employment. The overall aftermath was that: 'the local economy suffered from the negative multipliers generated by irregular and insecure work and reduced incomes' (Tomoney et. al. 1998, p.410). While Portsmouth has a relatively diversified economy, there is a danger that without supporting measures it could experience a similar outcome. Since the ending of naval construction at Portsmouth, recruitment advertisements for staff with key ship construction skills have appeared in the local press from companies as far afield as British Columbia, but the prospects for other workers are less certain.

Overall, past experience in southern England suggests that considerable time elapses before closed naval facilities are brought back into major economic use. Even so, as Gunwharf Quays illustrates, in the longer term replacement activity could well exceed that lost as a result of reduced naval employment. This article has not attempted to measure such displacement activity because as Droff and Paloyo (2014) attest 'none of the models currently in use are sufficiently dynamic to capture 'any equilibrating processes that the economy might undergo'.

This shortcoming of the tools of analysis notwithstanding, since the end of the Cold War areas of the UK experiencing significant problems as a result of defence contraction have been able to draw on a range of assistance at both European Union (EU) and national level. The EU's Konver programme of the 1990s, for example, constituted a funding stream to facilitate adjustment to defence cuts (see Hooper and Cox 1996). More recently in specific response to the end of warship construction in the city, the UK government created the position of Minister for Portsmouth to help co-ordinate measures designed to foster economic growth. Promising initiatives to date have included a £5m fund to assist companies develop technology for unmanned boats and submarines. That stated, how readily and how effectively the economy of Portsmouth and its surrounding area will adjust to the loss of its shipbuilding capability is not discernable at this point in time. Moreover, as this paper has sought to demonstrate, the adjustment required would be far greater if the Naval Base were to be reduced to an operating station or closed.

## **7. CONCLUSION**

Whilst many studies of the local or regional impact of defence activity utilise input-output models in order to quantify the economic consequences of a distinct change in military activity, this paper has used the methodology to identify a range of contraction outcomes. In doing so, the analysis has served to highlight the importance of the Portsmouth Naval Base to the local economy. The activities at the Base, in conjunction with downstream multiplier effects through the defence supply chain, household and other expenditures, were estimated to have produced about £1.7bn of output in 2011. This supported approaching 20,000 jobs in

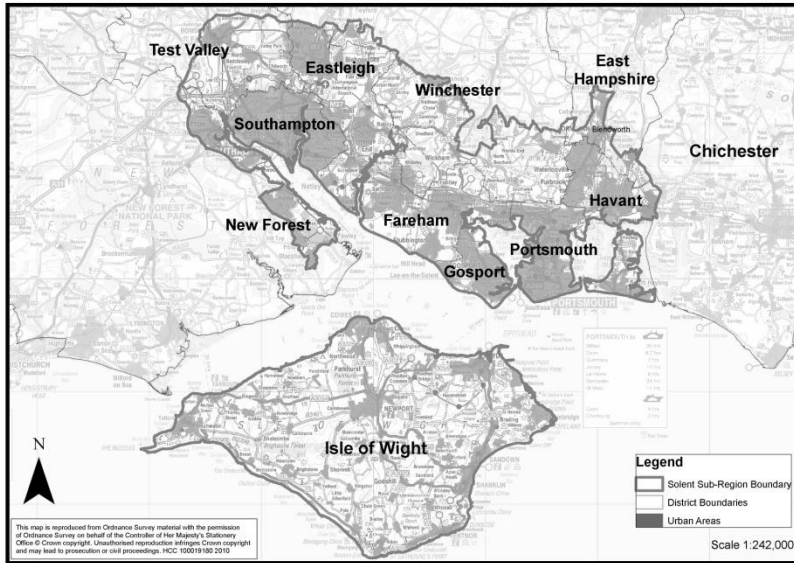


the local economy. Overall, Base activities represented almost 3.5 per cent of local area output and more than 4 per cent all FTE jobs. For specific sectors it was even more important; supporting almost 70 per cent of jobs in shipbuilding, 27 per cent in Facilities Management and 14 per cent of those in Public Administration and Defence.

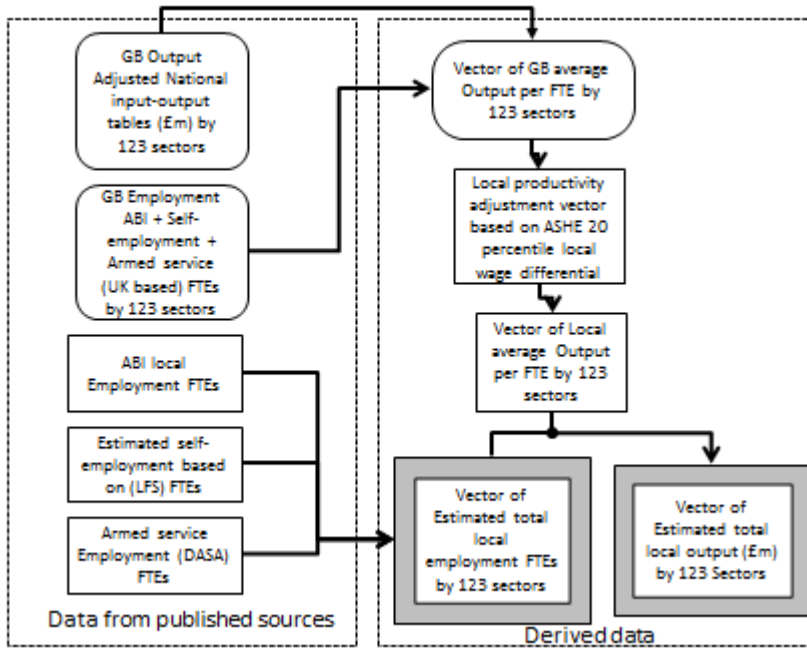
The Base itself provided employment for an estimated 11,900 people, 60 per cent of whom were civilian employees working for defence dependent companies and the MoD. Of these almost 77 per cent live within the local area. There were also a significant number of jobs associated with other defence companies and local RN and MoD establishments.

On the basis of the assumptions made to support the various contraction outcome scenarios presented, it is estimated that employment losses of around 4,000 to 18,000 FTE jobs could occur. What is also clear is that the brunt of any change would fall disproportionately upon the urban areas of South Hampshire, as this was where most of the workforce lived. However, because of the multiplier effect the decline would be felt across all sectors and locations in the local economy. Thus any change that impacts directly on the Base is likely to ripple out to other sectors that are not commercially connected to the facility. In short, the analysis contained in this paper demonstrates the importance of using reliable primary data, or if this is unavailable, transparent and traceable assumptions to estimate the primary impact. Further, the paper demonstrates the flexibility achievable as a result of using the input-output methodology to account for downstream effects and also to examine a range of outcomes in a consistent and coherent manner. Moreover, the suppleness of the approach extends to the investigation of other types of military facilities and geographical contexts both in the UK and elsewhere. Finally, it is worthy of note that the experience in Southern England indicates that it would be erroneous to presume that redundant military facilities will rapidly re-emerge as civilian assets generating compensatory employment and income flows.

## Figures



**Figure 1: The Solent Local Enterprise Sub-Regional Partnership Area**



**Figure 2: The stages of estimating local output**

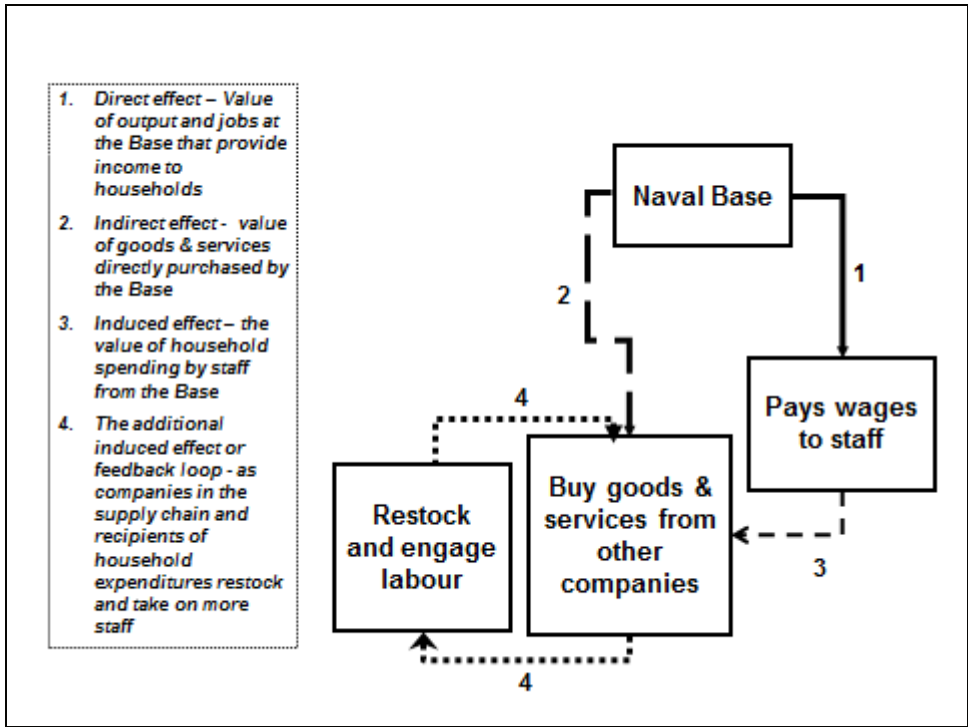


Figure 3 – Direct, Indirect and induced effects of the Naval Base

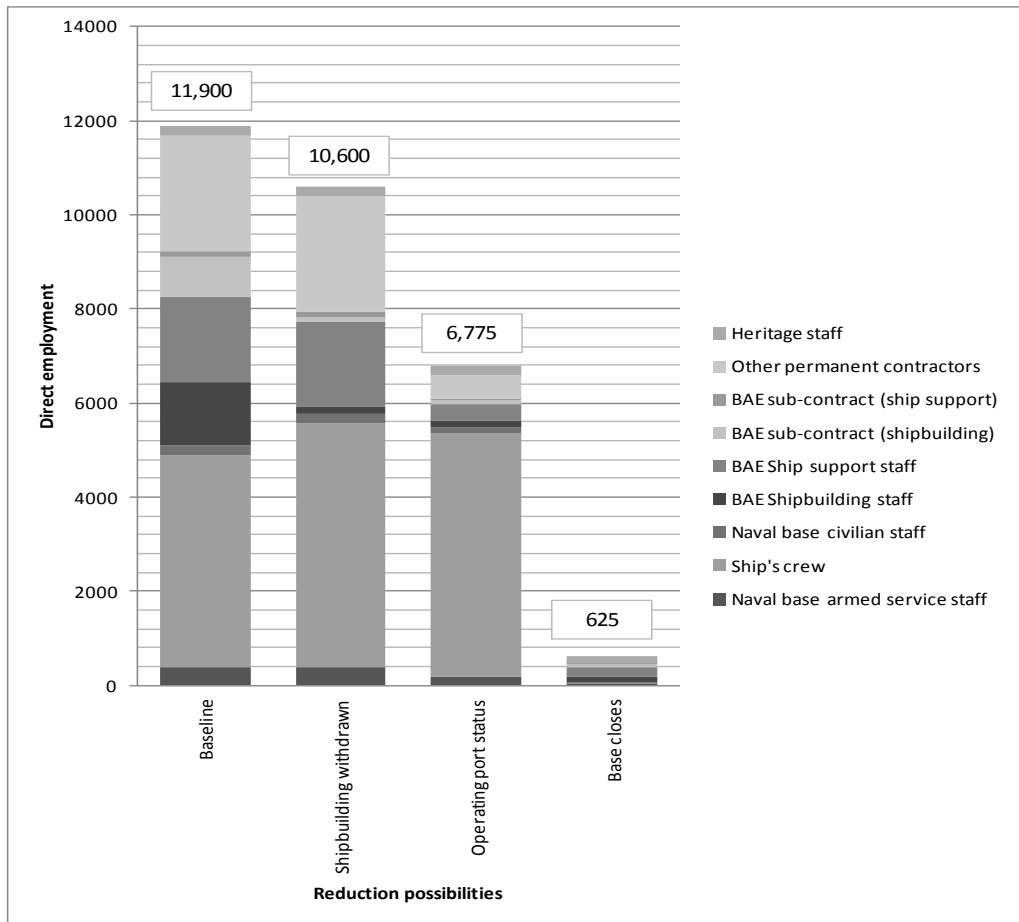
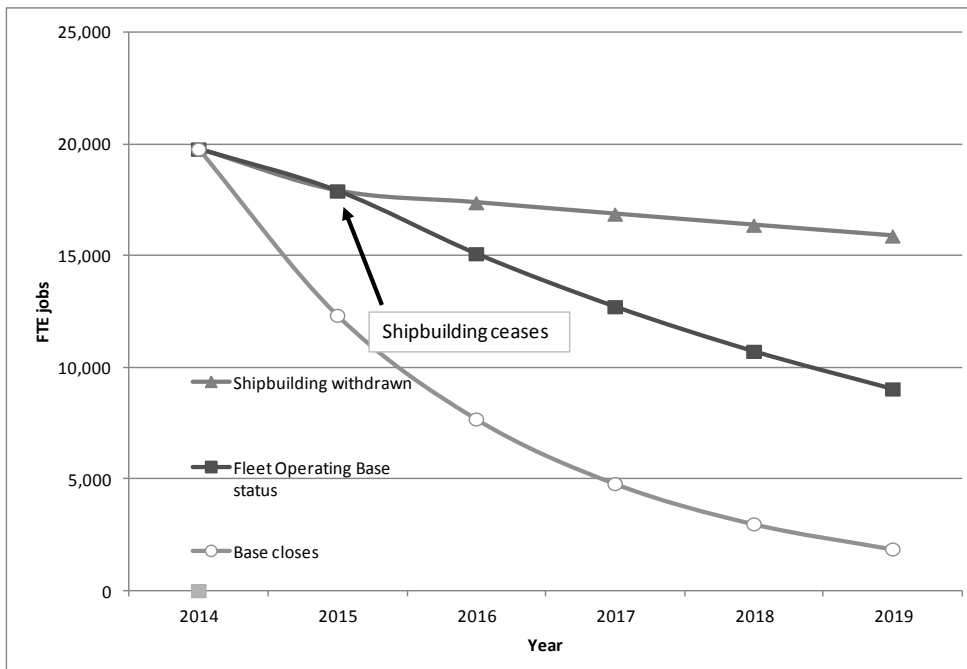


Figure 4: Number of direct FTE jobs under different contraction scenarios



**Figure 5: Total FTE employment under different contraction scenarios**



**Figure 6: Indicative time paths of FTE job losses under different contraction scenarios**

Tables Page

**Table 1: Direct employment of staff (FTEs)**

| Category of staff                                   | Total         | Resident within the sub-regional area <sup>1</sup> | Sub-regional residents as a Percentage of total |
|---|---------------|--|---|
| Portsmouth Naval base permanent armed service staff | 400           | 250  | 63%   |
| Portsmouth Naval base MoD civilian staff            | 225           | 200  | 89%   |
| Shipbuilding permanent & fixed term staff           | 1,325         | 1,250  | 94%   |
| Maritime Services permanent & fixed term            | 1,800         | 1,750  | 97%   |
| <b>All permanent staff</b>                          | <b>3,750</b>  | <b>3,450</b>                                       | <b>92%</b>                                      |
| Ships' crew   | 4,500         | 2,200  | 49%   |
| BAE Sub-contract staff                              | 975           | 925  | 95%   |
| Other permanent contract staff                      | 2,475         | 2,350  | 95%   |
| Heritage staff                                      | 200           | 200  | 100%  |
| <b>Crew, contractor and heritage staff</b>          | <b>8,150</b>  | <b>5,675</b>                                       | <b>70%</b>                                      |
| <b>Grand totals</b>                                 | <b>11,900</b> | <b>9,125</b>                                       | <b>77%</b>                                      |

Sources: PNB Commodores Office, BAE (2012), Portsmouth Naval Base Property Trust, and Asteris et al (2007).

Note: <sup>1</sup> Refers to the area shown in Figure 1

All figures have been rounded to the nearest 25

**Table 2: Naval Base expenditure – the direct effect**

| Cohort   | Number of staff <sup>1</sup> | Gross salaries £m <sup>1</sup> | Net salaries <sup>2</sup> £m | Local expenditure <sup>3</sup> £m |
|--|------------------------------|--------------------------------|------------------------------|-----------------------------------|
| Base service personnel residing locally  | 250                          | £2.467                         | £2.023                       | £1.207                            |
| Crew residing locally  | 2200                         | £24.732                        | £20.280                      | £12.095                           |
| <i>Armed Service personnel residing locally</i>                                  | 2450                         | £27.199                        | £22.303                      | £13.302                           |
| BAE permanent workforce residing locally   | 3000                         | £93.013                        | £76.271                      | £45.490                           |
| MoD & Heritage permanent civilian staff residing locally                         | 400                          | £9.509                         | £7.798                       | £4.651                            |
| All contractors residing locally   | 3275                         | £91.565                        | £75.084                      | £44.782                           |
| <i>Civilian Staff residing locally</i>   | 6675                         | £194.088                       | £159.153                     | £94.923                           |
| <b>Total Household income/expenditure (a)</b>                                    |                              | <b>£221.287</b>                | <b>£181.455</b>              | <b>£108.224</b>                   |
| Ship's Crew residing elsewhere in UK   |                              |                                |                              | £11.185                           |
| Visiting Ships' Crew   |                              |                                |                              | £2.349                            |
| Heritage Visitors  |                              |                                |                              | £14.179                           |
| <b>Visitor spending (b)</b>  |                              |                                |                              | <b>£27.712</b>                    |
| <b>Local purchase of supplies and services (c)</b>                               |                              |                                |                              | <b>£197.498</b>                   |
| <b>Civilian and service commuters and base visitors residing out of area (d)</b> |                              |                                |                              | <b>£0.640</b>                     |
| <b>Total (a+b+c+d)</b>   |                              |                                |                              | <b>£334.075</b>                   |

Notes: <sup>1</sup> Staff figures are rounded to nearest 25, income and expenditure figures rounded to nearest £1,000

<sup>2</sup> Net salaries are the residual after deductions for income tax, employers and employees national insurance

<sup>3</sup> Available for local consumption after the effect of imports, and expenditure taxes are taken into account

**Table 3: Naval Base employment direct output, and inputs to local economy**

| Sector                                 | Base FTE Employment | Base output (£m) | Expenditure by companies <sup>1</sup> (£m) | Expenditure by individuals <sup>2</sup> (£m) | Total first round expenditure inputs £m |
|--|---------------------|------------------|--|--|---|
| Primary Products                       | -                   | 0.0              | 0.0  | 0.5  | 0.5                                     |
| Manufacturing <sup>3</sup>             | 2,675               | 259.3            | 63.5                                       | 10.4   | 73.9                                    |
| Construction                           | 425                 | 49.4             | 24.9                                       | 1.4  | 26.3                                    |
| Retail & Wholesale                     | 75                  | 5.2              | 0.5  | 36.6   | 37.1                                    |
| Hotel and Catering                     | 75                  | 5.4              | 0.4  | 26.7   | 27.1                                    |
| Transport, Telecom and Vehicle Repairs | 625                 | 68.5             | 3.5  | 18.5   | 22.0                                    |
| Financial and Business Services        | 2,525               | 109.4            | 61.9                                       | 25.2   | 87.1                                    |
| Public Sector <sup>4</sup>             | 5,150               | 434.3            | 36.1                                       | 6.3  | 42.4                                    |
| Cultural and Other Services            | 325                 | 27.3             | 6.7  | 11.0   | 17.7                                    |
| <b>Total</b>                           | <b>11,900</b>       | <b>958.7</b>     | <b>197.5</b>                               | <b>136.6</b>                                 | <b>334.1</b>                            |

Source: Authors' calculations.

Notes:

<sup>1</sup>Input driving indirect effect (c from Table 2)

<sup>2</sup>Input driving induced effect (a+b+d from Table 2)

<sup>3</sup>Includes Utilities

<sup>4</sup>Includes armed service personnel.

All employment figures are rounded to the nearest 25, output and expenditure to the nearest £100,000

**Table 4: Downstream expenditure and employment impact of the Naval Base**

| Sector                                 | 1st round (a)      |             | Induced multiplier (b) |              | Indirect multiplier (c) |              | Total downstream impact (a+b+c) |              |
|--|--------------------|-------------|------------------------|--------------|-------------------------|--------------|---------------------------------|--------------|
|  | injection £million | FTE jobs    | output £million        | FTE jobs     | output £million         | FTE jobs     | output £million                 | FTE jobs     |
| Primary Products                       | £0.5               | <25         | £1.1                   | <25          | £1.6                    | <25          | £3.2                            | 25           |
| Manufacturing                          | £73.9              | 600         | £26.2                  | 150          | £54.2                   | 325          | £154.3                          | 1,075        |
| Construction                           | £26.3              | 225         | £11.3                  | 100          | £27.6                   | 225          | £65.2                           | 550          |
| Retail & Wholesale                     | £37.1              | 650         | £4.9                   | 50           | £10.8                   | 100          | £52.7                           | 800          |
| Hotel and Catering                     | £27.1              | 425         | £1.5                   | 25           | £1.8                    | 25           | £30.4                           | 475          |
| Transport, Telecom and Vehicle Repairs | £22.0              | 200         | £29.0                  | 275          | £34.8                   | 350          | £85.8                           | 825          |
| Financial and Business Services        | £87.1              | 950         | £58.7                  | 625          | £91.4                   | 1,050        | £237.2                          | 2,625        |
| Public Sector                          | £42.4              | 775         | £7.3                   | 125          | £13.7                   | 200          | £63.5                           | 1,100        |
| Cultural and Other Services            | £17.7              | 225         | £5.5                   | 75           | £7.5                    | 100          | £30.7                           | 400          |
| <b>Total</b>                           | <b>£334.1</b>      | <b>4050</b> | <b>£145.5</b>          | <b>1,425</b> | <b>£243.5</b>           | <b>2,400</b> | <b>£723.1</b>                   | <b>7,875</b> |

Note: All output figures are rounded to the nearest £100,000 and all employment figures to the nearest 25

**Table 5: Baseline impact of the Naval Base**

| Sector                                | Base Direct output<br>£million | Base Direct FTE<br>Employment | Downstream output<br>£million | Downstream FTE<br>employment | Base total output<br>£million | Base total FTE<br>employment |
|---------------------------------------|--------------------------------|-------------------------------|-------------------------------|------------------------------|-------------------------------|------------------------------|
| Primary products                      | 0.0                            | -                             | £3.2                          | 25                           | 3.2                           | 50                           |
| Manufacturing                         | 259.3                          | 2,675                         | £154.3                        | 1,075                        | 413.6                         | 3,750                        |
| Construction                          | 49.4                           | 425                           | £65.2                         | 550                          | 114.6                         | 975                          |
| Retail & wholesale                    | 5.2                            | 75                            | £52.7                         | 800                          | 57.8                          | 875                          |
| Hotel and catering                    | 5.4                            | 75                            | £30.4                         | 475                          | 35.8                          | 575                          |
| Transport telecom and vehicle repairs | 68.5                           | 625                           | £85.8                         | 825                          | 154.3                         | 1,450                        |
| Financial and business services       | 109.4                          | 2,525                         | £237.2                        | 2,625                        | 346.6                         | 5,150                        |
| Public sector                         | 434.3                          | 5,150                         | £63.5                         | 1,100                        | 497.8                         | 6,250                        |
| Cultural and other services           | 27.3                           | 325                           | £30.7                         | 400                          | 58.1                          | 725                          |
| <b>Total</b>                          | <b>958.7</b>                   | <b>11,900</b>                 | <b>£723.1</b>                 | <b>7,875</b>                 | <b>1,681.8</b>                | <b>19,775</b>                |
| Output and employment multipliers     |                                |                               |                               |                              | 1.75                          | 1.66                         |

Note: All output figures are rounded to the nearest £100,000 and all employment figures are rounded to the nearest 25

**Table 6: Contraction scenario outcomes compared**

| Sector                                | Baseline                 |                         | Contraction Scenario 1   |                         | Contraction Scenario 2   |                         | Contraction Scenario 3   |                         |
|---------------------------------------|--------------------------|-------------------------|--------------------------|-------------------------|--------------------------|-------------------------|--------------------------|-------------------------|
|                                       | Total output<br>£million | Total FTE<br>employment | Total output<br>£million | Total FTE<br>employment | Total output<br>£million | Total FTE<br>employment | Total output<br>£million | Total FTE<br>employment |
| Primary products                      | 3.2                      | 50                      | 2.3                      | 25                      | 1.0                      | 25                      | 0.6                      | -                       |
| Manufacturing                         | 413.6                    | 3,750                   | 166.9                    | 1,375                   | 61.6                     | 500                     | 39.2                     | 350                     |
| Construction                          | 114.6                    | 975                     | 88.8                     | 750                     | 21.6                     | 175                     | 7.2                      | 50                      |
| Retail & wholesale                    | 57.8                     | 875                     | 46.2                     | 725                     | 24.3                     | 400                     | 12.3                     | 200                     |
| Hotel and catering                    | 35.8                     | 575                     | 31.8                     | 500                     | 20.3                     | 325                     | 9.9                      | 150                     |
| Transport telecom and vehicle repairs | 154.3                    | 1,450                   | 130.6                    | 1,225                   | 45.8                     | 425                     | 16.5                     | 150                     |
| Financial and business services       | 346.6                    | 5,150                   | 263.7                    | 4,175                   | 80.9                     | 1,075                   | 39.3                     | 525                     |
| Public sector                         | 497.8                    | 6,250                   | 529.9                    | 6,500                   | 474.7                    | 5,675                   | 12.3                     | 175                     |
| Cultural and other services           | 58.1                     | 725                     | 49.8                     | 625                     | 30.0                     | 400                     | 17.4                     | 250                     |
| <b>Total</b>                          | <b>1,681.8</b>           | <b>19,775</b>           | <b>1,310.0</b>           | <b>15,900</b>           | <b>760.3</b>             | <b>9,000</b>            | <b>154.8</b>             | <b>1,850</b>            |

Note: All employment figures are rounded to the nearest 25, output figures to the nearest £100,000

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## Endnotes

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<sup>1</sup> It is interesting to note that while the majority of studies relating to military facility contraction or closure in the USA and the UK reveal that they have a sizeable adverse economic impact on the local community, research by Poloyo et al (2010) shows that this has not been the experience with bases operated by the German armed forces in Germany. The authors attribute the relative lack of impact on the surrounding economy to four key characteristics (which tend not to be replicated in the USA or Britain). To begin with, when compared with their American counterparts in Germany, the bases closed were much smaller. Secondly, they were relatively self-sufficient and autonomous. Thirdly, closed facilities were swiftly transferred to civilian use on the basis of substantial new investment. Finally, base occupants, whether military or civilian, tended to be reassigned to other bases, rather than declared redundant. The employment and tax revenue implications of closure were thereby minimised. In addition, it should be noted that the federal structure of German administration ensures that regional and local authorities enjoy wider powers of intervention than their counterparts in the UK.

<sup>2</sup> The Droff and Paloyo paper highlights the strengths and weaknesses of Input-Output Models (IOMs), Economic Bases Models (EBMs), Regional Keynesian Multiplier Models (RMMs), Regional Econometric Models (REMs) and Case studies/ Monographic Approaches.

<sup>3</sup> This includes the six new Type-45 destroyers and the 13 Type-26 Global Combat Ships that will gradually replace Type-23 frigates.

<sup>4</sup> Eight mine countermeasure vessels Hunt Class, (based at Portsmouth); seven Sandown Class, (based on the Clyde); four survey vessels, (based in Plymouth); four River Class Fishery patrol craft and an Ice Patrol vessel (based in Portsmouth) and smaller inshore patrol boats.

<sup>5</sup> RFA ships spend relatively long periods at sea. They are not usually base-ported at the main naval bases; for instance, the Bay class vessels are based at Marchwood military port, Southampton.

<sup>6</sup> Authors own estimations.

<sup>7</sup> GVA is the sum of wages and salaries and operating surpluses (profits). The proportionate figure is derived from the intermediate demand column of the national input output analytical tables (2005).

<sup>8</sup> Input-output modelling takes advantage of the ease with which large matrices can be inverted by computers to provide a greater level of detail regarding the disaggregation of economic impacts by industrial sector.

<sup>9</sup> A study by Tomaney, Pike and Cornford (1999) into the effect of the closure of Swan Hunter on Tyneside suggests that structural unemployment increased dramatically following the closure. Those aged under 40 and more skilled workers were often able to relocate or re-train whilst older workers either, remained unemployed or dropped out of the labour market (either through long-term sickness or retirement). Plant Closure and the local economy: The case of Swan Hunter on Tyneside, Tomaney J, Pike A and Cornford J, *Regional Studies*, 33(5), July 1999, p.401.

<sup>10</sup> For the GB total the Annual Population Survey (APS) self-employment by industry group structure is used as the basis for the pro rata redistribution to the 123 I-O sectors. For local area estimates the appropriate regional self-employment structure used to distribute local area totals which are then allocated pro-rata to the structure of employees in employment in each local area.

<sup>11</sup> The local Location Quotient (LQ) expresses the relationship between the proportion of employment within a particular industrial sector in the LEP Area and the proportion in the same sector at a national level. For example, an LQ of 0.5 for a particular sector would indicate that the LEP Area has half the proportion of employment in that sector compared with the national average. Any sector in the LEP Area which experiences a higher proportion of employment than the national average is given an LQ of 1.

<sup>12</sup> Direct output from the base might be classified as maritime security which is exported nationally and internationally rather than consumed locally. The total value of this in 2011 was estimated at £0.43bn.

<sup>13</sup> This includes other units that were located in the Naval Base and HMS Nelson but not responsible for the upkeep of the base itself. There were in the region of a further 1,500 service personnel and 1,080 MoD civilian personnel in this capacity.

<sup>14</sup> Included companies such as, Serco Denholm Ltd and Sodexo Defence Services Ltd.

<sup>15</sup> This Includes Mary Rose Trust, National Museum of the RN, HMS Victory, Action Stations and the Warrior Preservation Trust. These attractions, in total, are estimated to attract around 400,000 visitors per annum.

<sup>16</sup> Some 88 per cent work in the shipbuilding division.

<sup>17</sup> Anononised domicile information for individuals employed at the base was collated by the authors on a confidential basis some years ago.

<sup>18</sup> In order to calculate the economic impact of the Base, where possible, primary data from companies and individuals was utilised; where this proved impossible, secondary data was obtained from sources identified in this paper.

<sup>19</sup> See column 2, Table 1.

<sup>20</sup> For sub-contractors, it was assumed the same cost of employment figures associated with BAE permanent staff applied. A further 20 per cent was deducted to account for contract supplier companies profit element. This figure is in line with the gross operating surplus figure for the Other Business Services sector in the detailed national input output tables.

<sup>21</sup> Average salaries for staff, based on primary wage and domicile data for individual staff in 2004, were up-rated for inflation to estimate average salaries at 2011 prices.

<sup>22</sup> Research indicates that US and UK ships spend an average of 40 per cent of their time at "sea".

<sup>23</sup> As with visiting ships, this figure was deflated by 20 per cent to account for those required to remain onboard.

<sup>24</sup> No attempt was made to differentiate between UK and overseas visitors owing to the lack of reliable data. Thus, the figure may be regarded as one that underestimates the impact of visitors.

<sup>25</sup> Information on the spending on supplies and services by the Naval Base Commodore's operations was unavailable. It is highly likely that there is an element of local expenditure, but in the absence of reliable data (or a suitable methodology for estimating it) this was omitted from the calculations.

<sup>26</sup> Detailed figures for the amounts spent in each SIC category outside the LEP area were unavailable.

<sup>27</sup> The additional spending created through the multiplier decreases with each additional round, until it is effectively zero.

<sup>28</sup> It can be assumed that the presence of military establishments and defence-related organisations is attributable to the fact that Portsmouth has for centuries been regarded as the "home" of the RN.

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- <sup>29</sup> This included ship upgrade, repair, engineering, logistics and support services.
- <sup>30</sup> The increase is due to the QE Class aircraft carriers joining the fleet.
- <sup>31</sup> A small number of staff remained in BAE's shipbuilding facility to maintain the building and equipment should BAE need to reopen the facility at some future date. .
- <sup>32</sup> Babcock are the ship support consortium operating the Devonport Naval Base in Plymouth in the UK.
- <sup>33</sup> Unlike shipbuilding there is a small residual of ship support activity although this may not be undertaken by BAE.
- <sup>34</sup> It is assumed that 20 per cent of naval base civilian staff retire and remain within the area thus continuing to contribute to household spending.
- <sup>35</sup> This reflects the fact that almost all shipbuilding and ship support activity has ceased.
- <sup>36</sup> A small residual mainly from the heritage area remains.
- <sup>37</sup> In practice cannot be assumed to be smooth.
- <sup>38</sup> By the summer quarter of 1998 the number of vacancies in the Dorchester and Weymouth Travel To Work Area (TTWA) that were part time had increased by about two thirds since the summer quarter of 1995, whilst nationally (GB), over the same period the increase was in the order of 13 per cent.
- <sup>39</sup> The proportion of the workforce qualified to at least NVQ3 or above fell from significantly above the national average in 1997-98 to well below the national average by 2000-01.
- <sup>40</sup> Aged 45-64.
- <sup>41</sup> Resident-based ASHE data reveals that median gross weekly pay for full-time employees is considerably higher than the equivalent workplace measure.
- <sup>42</sup> See Dorset County Council, (November 2013), Weymouth and Portland Economy and Labour Market Profile, p. 19.