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Better Jobs

Economic impacts of a new fighter plane

Extensive Summary

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seo economic research

Extensive Summary¹

Taking part in the F-35 programme implies tens of billions of euro's of turnover for the Dutch economy. The F-35 makes the Dutch aircraft industry more innovative causing additional spin-offs. The programme leads to a shift of employees out of other jobs, increasing their productivity. The net employment effect is positive in the short term but zero in the long term.

Introduction

Policy options

In the Joint Strike Fighter (JSF) programme the Netherlands participates in developing and producing a new fighter plane: the F-35. In July 2012 the Dutch House of Representatives summoned the Cabinet to terminate the Netherlands involvement in the programme. The Cabinet decided to first research the effects of discontinuing participation in the JSF programme. The Ministry of Economic Affairs, Agriculture and Innovation commissioned SEO Economic Research to investigate the industrial consequences and employment effects of three policy options:

- Continue the participation of the Netherlands in the F-35 programme;
- Stop the participation of the Netherlands in the F-35 programme and buy another fighter plane;
- Stop participating in the test phase while continuing in other parts of the F-35 programme.

Next to industrial consequences and employment effects this report also looks at the impact on the knowledge economy of the Netherlands. Parallel to the research by SEO the financial consequences for the Netherlands government have been investigated by the Netherlands Court of Audit (2012). Assumptions of this study are geared to the assumptions of the Netherlands Court of Audit.

Brief context

The Netherlands participation in the F-35 programme has been put down in four memorandums of understanding: on development (MoU SSD); production (MoU PSFD); European cooperation in production and sustainment (MoU P&S); and testing (MoU IOT&E). Apart from the United States, the Netherlands, the United Kingdom, Norway, Denmark, Italy, Turkey, Canada and Australia take part in the F-35 programme. In the period until 2034 the expectation is that 3103 fighter planes will be produced for partner countries. Moreover, non-partner countries can order F-35 planes. At this moment the F-35 programme is moving from the development phase to the phase of initial production. At the same time, operational tests are carried out. The United States, United Kingdom, Norway, Italy, Turkey and Australia have are ordering F-35 planes. At this moment (October 2012) the Netherlands have not ordered any plane, except for two test-planes.

An initial condition of the Dutch Cabinet regarding participation in developing and producing the F-35 is that this should not be more expensive for the taxpayer than buying a ready-made

¹ This is a summary of the Dutch-language report Bisschop et al. (2012).

fighter plane (Dutch House of Representatives, 2001-2002). To cover excess expenses of participation the Dutch government and industry entered into a joint financing agreement in 2002. The companies involved in the programme will pay back the difference between the costs of participating in the F-35 programme and buying a ready-made fighter plane in the period 2002-2052.

Literature review

First a literature review was carried out into the effects of large investments in defence. The review shows that preciously little has been written about the economic impacts of large industrial projects such as the F-35 programme. Most authors limit themselves to cost changes, the number of fighter planes to be bought or technical possibilities of different planes (Younossi et al., 2005; Gertler, 2009; Cook et al., 2003; Lorell & Leveaux, 1998).

On the other hand, many articles were published about the economic impact of military expenditures in general. However, the results are not clear. Proponents of the 'guns and butter' approach consider creating employment as a reason for positive effects of military expenditures on economic growth (Benoit, 1978; Heo, 2010; Chan, 1995; Adams & Gold, 1987). Researchers who identify negative effects are often called proponents of the 'guns or butter' theory. The opportunity costs of military expenditures are dominant in this approach (Heo, 2010; Ward & Davis, 1992; Caruso & Francesco, 2012).

Hartley (2008) looks into the economic and industrial aspects of the Eurofighter Typhoon programme. Based on a back of the envelope computation, Hartley reports 66,500 jobs. Pollin & Garrett-Peltier (2007) show that government expenditures on defence in the United States induce fewer jobs than equal government expenditures on for instance health care or infrastructure.

Earlier NIVR (2006) and PWC (2008) have analysed the anticipated turnover and employment induced by the participation of the Netherlands in the F-35 programme; and the importance of the programme for the knowledge economy of the Netherlands. They conclude that participation in the F-35 programme leads to positive effects. In a second opinion, CPB (2009) adds critical remarks to the PWC (2008) report. CPB concludes that there is only a shift of jobs and that the net employment effect is zero. CPB also states that PWC does not take account of increases in labour productivity over time; PWC denies this.

Literature on knowledge and innovation

The Dutch aircraft industry is an innovative sector; the share of research and development (R&D) investments is relatively high. R&D leads to innovations which cause new products, productions processes, knowledge and services (Van de Vijver en Vos, 2006; PWC, 2008; NIVR, 2006; OECD, 2011; Coe and Helpman, 1995). The literature distinguishes technological and market-related spin-offs and spillovers. Technological spin-offs and spillovers are effects which occur as companies use new or improved technologies for new customers within (spin-off) or outside of (spillover) the industry. Market related effects occur as companies acquire a better reputation or new contacts causing new assignments within (spin-off) or outside of (spillover) the industry.

The economic value of knowledge development, innovation, spin-offs and spillovers cannot be estimated quantitatively. There are no integral indicators, and the scientific literature offers an insufficient basis. The direction of an effect can be estimated, but not its size. Therefore these effects are described separately in this report, using scientific literature and interviews with stakeholders.

Turnover and value added

Future turnover for Dutch companies involved in the F-35 programme has been estimated using the 'JSF thermometer' of the Ministry of Economic affairs, Agriculture and Innovation. In the JSF thermometer, turnover possibilities consist of 'purchase orders', 'prognoses and long term agreements', 'requests for quotations' and 'opportunities'. To account for uncertainties, SEO has estimated for each type (and per phase of the F-35 programme) the probability that the contracts will result in production for Dutch companies. If the Netherlands stops its participation in the test phase, these probabilities are lower. For the sustainment phase we assumed that the Netherlands will reclaim a volume of production (turnover) equal to its own expenditures on sustainment. This practice is not uncommon in the defence industry.

If another fighter plane is bought the Dutch government will demand industrial participation in terms of production for Dutch companies. While the new European directive 2009/81/EC limits the possibilities for such demands, it does not make them impossible. Currently, Dutch policy aims at 60 per cent industrial participation, including knowledge transfers.

In addition to the direct turnover, indirect turnover for Netherlands suppliers has been computed using an input-output table. The related value added has also been estimated. These are gross effects which should not be interpreted as additional effects for the Netherlands economy. Table 1 shows that continued participation in the F-35 programme yields the highest gross turnover and value added. Buying another fighter plane will cause F-35 production to disappear from the Netherlands. The turnover and value added from industrial participation is lower than if f-35 participation is continued. This goes for both the production phase and the sustainment phase.

Company payments and investments

If F-35 participation is continued, we expect the transfers as a result of the joint financing agreement (described above) of companies to the State to be over € 200 million. If participation is stopped, these transfers will fall back strongly. If the Netherlands leaves the test phase the transfers will also fall, but less strongly.

Company interviews learned that 70 per cent of the current investments made in relation to the F-35 programme cannot be used for other purposes. About 20 per cent can be put to an alternative use, but only in the long term. Finally, 10 per cent can be used for other goals immediately. The size of useless investments is between 50 and 100 million euro's.

Table 1 Gross turnover and value added are lower if F-35 participation is stopped

	Production phase		Sustainment phase		
	2013-2017	2018-2034	2013-2017	2018-2064	
Gross direct turnover (million euro's)					
Continue	822	4,500	52	11,877	
Stop	-285	-1,652	-52	-5,578	<i>Compared to Continue</i>
Stop test phase	-78	-391	-10	-2,375 ²	<i>Compared to Continue</i>
Gross indirect turnover (million euro's)					
Continue	494	2,704	31	7,139	
Stop	-171	-992	-31	-3,353	<i>Compared to Continue</i>
Stop test phase	-47	-236	-6	-1,428	<i>Compared to Continue</i>
Gross direct value added (million euro's)					
Continue	351	1,920	22	5,087	
Stop	-121	-699	-22	-2,389	<i>Compared to Continue</i>
Stop test phase	-32	-160	-4	-1,017	<i>Compared to Continue</i>
Gross indirect value added (million euro's)					
Continue	206	1,130	13	2,982	
Stop	-72	-414	-13	-1,400	<i>Compared to Continue</i>
Stop test phase	-20	-99	-3	-596	<i>Compared to Continue</i>

Source: SEO Economic Research

Employment

We used turnover to compute gross employment, including estimates of expected growth of labour productivity. Also, **displacement** in the labour market was a part of the analysis. Many people are and will be involved in the F-35 programme or in industrial participation for an alternative fighter plane. However, these jobs are for the most part not additional for the Dutch economy. Without the F-35 (or without industrial participation), the greater part of the people who would work on the F-35 programme will find other jobs.

At present, there are hardly any qualified technicians who are unemployed, and it is expected that shortages will continue to exist. This implies that technical employees working in jobs related to fighter planes, will be displaced from other jobs. Part of the jobs will be filled by people from abroad. This is not unusual in industrial production, especially for airplanes. Commercial and administrative jobs will in part be filled by unemployed people. In the long term additional employment will lead to wage increases which reduce employment in other jobs. This tendency towards labour market equilibrium will then cause full displacement.

Displacement and the use of foreign labour lead to relatively limited net employment effects for the Dutch economy. In addition, over time labourers become more productive. Hence, both in gross and in net terms fewer people are needed to produce an equal amount of production. Finally, people who switch jobs are expected to be more productive. Correcting for these elements and mechanisms, the net effect on employment and value added has been estimated. The net effects are presented in Table 2.

² Uncertain estimate. It is unclear which consequences the negative signal of stepping out of the test phase will have on decision making with respect to orders for sustainment.

Table 2 Net effects are relatively small

	Production phase		Sustainment phase		
	2013-2017	2018-2044	2013-2017	2018-2074	
Net employment (total man-years)					
Continue	752	-1,066	62	-62	
Stop	-307	307	-62	62	<i>Compared to Continue</i>
Stop test phase	-92	92	-12	12	<i>Compared to Continue</i>
Net value added (million euro's)					
Continue	98	29	8	272	
Stop	-38	-11	-8	-125	<i>Compared to Continue</i>
Stop test phase	-11	-2	-2	-54	<i>Compared to Continue</i>

Source: SEO Economic Research

Sensitivity analysis

We carried out a sensitivity analysis using different assumptions:

- Euro/dollar exchange rate: plus or minus 20 per cent
- Price of fighter planes: present expectation or plus 20 per cent
- Long-term economic scenario: high or low
- Total production of F-35 fighter planes: 3217 to 4950 planes³
- Increase of labour productivity for displaced employees: 2.5 to 10 per cent
- Netherlands direct F-35 turnover in the sustainment phase: 11.9 billion to 16.7 billion euro's

This analysis shows that two factors influence the net employment effects strongly: the long-term economic scenario and the increase of productivity for people who change jobs. Independent of assumptions, the net employment effects are relatively small in the short term and zero in the long term. Using the sensitivity analysis, we estimated margins for all quantitative research results.

Knowledge and innovation

Expenditures on military R&D usually lead to more innovations than expenditures on civil R&D. In the long term innovations imply technological spin-off and spillover effects which contribute to a better competitive position of firms. Many examples show that the F-35 programme has given an impulse to cooperation in the Netherlands military aircraft production cluster. Participation in an international programme offers possibilities to obtain new market knowledge, contacts and skills on an international scale. This leads to market related spin-offs and spillovers, which imply new economic activities and additional profits.

Ending participation in the F-35 programme will have a negative effect on spin-offs and spillovers. Reductions in military production may have consequences for civil production. Technological development within the programme will then take place outside of the Netherlands. If another fighter plane is bought, Dutch companies will again have to invest to get a position within long term agreements. Also, knowledge development and technological spin-offs and spillovers are expected to be smaller if another plane is bought. It is unclear whether the Dutch industry can participate in follow-on development for fighter planes which have already

³ The low estimate is partly inspired by Boeder (2009).

been developed elsewhere. Moreover, the market size of alternative fighter planes is smaller. The consequences of ending participation in the test phase are harder to estimate. The effect is negative but possibly limited if the Netherlands keeps committing itself strongly to the other parts of the F-35 programme.

Conclusions

The results of the research are summarized in Table 3. The F-35 programme involves a turnover for the Netherlands of 24 to 38 billion euro's. Of this turnover, 1 to 1.7 billion euro's will occur in the years 2013-2017. Added up over the period 2013-2064, the programme will lead to a shift of about 75,000 man-years, out of other jobs. Per year this implies on average 1,400 shifted jobs. As employees shift jobs, they become 2.5 to 10 per cent more productive. The net value added will increase by 0.2 to 0.9 billion euro's added over the period 2013-2064. The net employment effect of participation in the F-35 programme is at most 1,350 man-years (270 jobs) until 2017. In the long term the employment effect is zero because of a tendency towards labour market equilibrium. As a conclusion, the F-35 programme mainly yields more high-value work, in part through creating knowledge and innovations.

Table 3 F-35 yields little net employment but does stimulate production and innovation

	Production phase en sustainment phase		
	2013-2017	2018-2074	
Turnover (million euro's)			
Continue	1,070 to 1,720	23,240 to 36,570	
Stop	-750 to -330	-19,040 to -11,480	<i>Compared to Continue</i>
Stop test phase	-180 to -110	-6,390 to -3,970	<i>Compared to Continue</i>
Net value added (million euro's)			
Continue	70 to 160	110 to 690	
Stop	-70 to -30	-330 to -90	<i>Compared to Continue</i>
Stop test phase	-20 to -10	-120 to -30	<i>Compared to Continue</i>
Net employment (total man-years)			
Continue	330 to 1,350	-1830 to -500 ⁴	
Stop	-630 to -130	140 to 620	<i>Compared to Continue</i>
Stop test phase	-170 to -50	50 to 170	<i>Compared to Continue</i>
Knowledge and innovation			
Continue	Positive	Positive	
Stop	Negative	Negative	<i>Compared to Continue</i>
Stop test phase	Negative	Negative	<i>Compared to Continue</i>
Spin-offs and spillovers			
Continue	Positive	Positive	
Stop	Unknown	Negative	<i>Compared to Continue</i>
Stop test phase	Unknown	Unknown	<i>Compared to Continue</i>

Source: SEO Economic Research

⁴ Including positive effects in the years before 2013 the total net employment effect is zero.

If the Netherlands stops its participation in the F-35 programme and buys another fighter plane, turnover and value added will be reduced by about half, which is largely due to limitations on industrial participation orders as a result of European directives. If the Netherlands leave the test phase, 15 to 20 per cent will be lost. About two thirds of effects on value added and employment is caused by the sustainment of the F-35 or an alternative plane. The production phase pertains to about one third of the effects.

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